Bull. Pharm. Sci., Assiut University, Vol. 45, Issue 2, 2022, pp. 585-592.

Bulletin of Pharmaceutical Sciences
Assiut University
Website: http://bpsa.journals.ekb.eg/
e-mail: bullpharm@aun.edu.eg

BULL. PHARM. SCI. Assiut Univ.

PHYTOCHEMICAL SCREENING AND PHARMAOCOLOGICAL EVALUATION OF TECOMA GAUDICHAUDI

V. Alekhya[*1,2], T. Deepan [2] and S. Ganapaty[1]

[1]*Department of Pharmacognosy, GITAM Institute of Pharmacy, Gandhinagar, Rushikonda, Visakhapatnam-530045, Andhrapradesh, India*
[2]*Department of Pharmacognosy, GIET School of Pharmacy, NH-16, Chaitanya knowledge city, Rajamahendravaram-533296, Andhrapradesh, India*

Tecoma gaudichaudi is a tropical flowering plant in the Bignoniaceae family that is used to treat diabetes. The aim of this research was to evaluate antioxidant, anti-inflammatory, and antibacterial properties. Tecoma gaudichaudi ethanolic extract had considerable antioxidant activity. Antioxidant activity was measured using the DPPH assay, the radical scavenging method, and the superoxide assay. Antibacterial activity and antifungal activity were performed by cup plate method by using Ciprofloxacin as standard for antibacterial and antifungal activity. Ethanolic extract of Tecomo gaudichaudi shows significant antibacterial effect against S. Aureus, B. Subtilis, P. vulgaris and E. coli using ciprofloxacin (50µg/ml) as standard. Three alternative methods were used to calculate IC_{50} values for antioxidant activity. The IC_{50} values for T. gaudichaudi (21 g/ml) and ascorbic acid (12 g/ml) were obtained using the DPPH technique. For anti-inflammatory studies the extracts show remarkable zone of inhibition ranging from 58.97 to 72.35 µg/ml respectively compared to standard indomethacin. Steroids, saponins, flavonoids, triterpenes, and phenols are found in preliminary phytochemical investigation. In conclusion, ethanolic extract of Tecomo gaudichaudi shows significant antioxidant, anti-inflammatory and antibacterial properties.

Keywords: *DPPH, Hydroxy radical scavenging, Antibacterial, Anti-inflammatory, Tecoma gaudichaudi*

INTRODUCTION

Tecoma gaudichaudi DC (Bignoniaceae) is a synonym of *Tecoma castanifolia*, fast-growing shrub commonly found in India. The leaves are 8-15 cm long, flowers are golden yellow, borne in large terminal pinnacle. It is annual flowering plant that is used to heal a variety of diseases.[1,2] Literature survey reveals *T. gaudichaudi* posess various bioactive compounds such as flavonoids, alkaloids, steroids, saponins[3]. *T. gaudichaudi* has been used to treat diabetes, indigestion, infertility and erectile dysfunction[4]. The present study aims at Pharmacognostical, Phytochemical screening and to evaluate antioxidant, anti-inflammatory, antibacterial activities for *Tecomo gaudichaudi*.

MATERIALS AND METHODS

Collection of plant materials

The whole plant (aerial parts and roots) of *Tecoma gaudichaudi* was harvested in the month of September and washed thoroughly with water then dried, grinded to get coarse powder. The plant was authenticated by Prof. M. Venkaiah, Taxonomist, with voucher specimen no AV/TG/2016/2 as *Tecoma Gaudichaudi* DC. The ethanolic extract is taken and concentrated through maceration process and stored in airtight container.

Preliminary phytochemical screening

The extracts were dissolved in specific reagents through standard procedure[5] and analysed for presence of phytochemicals[6,7] such as steroids, triterpenes, saponins, flavonoids, phenols and iridoids.

Received in 3/2/2022 & Accepted in 6/4/2022

*Corresponding author: Veeramaneni Alekhya, E-mail: alekhya.veramaneni@gmail.com

Bull. Pharm. Sci., Assiut University, Vol. 45, Issue 2, 2022, pp. 585-592.

Bulletin of Pharmaceutical Sciences
Assiut University

Website: http://bpsa.journals.ekb.eg/
e-mail: bullpharm@aun.edu.eg

BULL. PHARM. SCI. Assiut Univ.

PHYTOCHEMICAL SCREENING AND PHARMAOCOLOGICAL EVALUATION OF TECOMA GAUDICHAUDI

V. Alekhya[*1, 2], T. Deepan[2] and S. Ganapaty[1]

[1]*Department of Pharmacognosy, GITAM Institute of Pharmacy, Gandhinagar, Rushikonda, Visakhapatnam-530045, Andhrapradesh, India*

[2]*Department of Pharmacognosy, GIET School of Pharmacy, NH-16, Chaitanya knowledge city, Rajamahendravaram-533296, Andhrapradesh, India*

Tecoma gaudichaudi is a tropical flowering plant in the Bignoniaceae family that is used to treat diabetes. The aim of this research was to evaluate antioxidant, anti-inflammatory, and antibacterial properties. Tecoma gaudichaudi ethanolic extract had considerable antioxidant activity. Antioxidant activity was measured using the DPPH assay, the radical scavenging method, and the superoxide assay. Antibacterial activity and antifungal activity were performed by cup plate method by using Ciprofloxacin as standard for antibacterial and antifungal activity. Ethanolic extract of Tecomo gaudichaudi shows significant antibacterial effect against S. Aureus, B. Subtilis, P. vulgaris and E. coli using ciprofloxacin (50µg/ml) as standard. Three alternative methods were used to calculate IC_{50} values for antioxidant activity. The IC_{50} values for T. gaudichaudi (21 g/ml) and ascorbic acid (12 g/ml) were obtained using the DPPH technique. For anti-inflammatory studies the extracts show remarkable zone of inhibition ranging from 58.97 to 72.35 µg/ml respectively compared to standard indomethacin. Steroids, saponins, flavonoids, triterpenes, and phenols are found in preliminary phytochemical investigation. In conclusion, ethanolic extract of Tecomo gaudichaudi shows significant antioxidant, anti-inflammatory and antibacterial properties.

Keywords: *DPPH, Hydroxy radical scavenging, Antibacterial, Anti-inflammatory, Tecoma gaudichaudi*

INTRODUCTION

Tecoma gaudichaudi DC (Bignoniaceae) is a synonym of *Tecoma castanifolia*, fast-growing shrub commonly found in India. The leaves are 8-15 cm long, flowers are golden yellow, borne in large terminal pinnacle. It is annual flowering plant that is used to heal a variety of diseases.[1,2] Literature survey reveals *T. gaudichaudi* posess various bioactive compounds such as flavonoids, alkaloids, steroids, saponins[3]. *T. gaudichaudi* has been used to treat diabetes, indigestion, infertility and erectile dysfunction[4]. The present study aims at Pharmacognostical, Phytochemical screening and to evaluate antioxidant, anti-inflammatory, antibacterial activities for *Tecomo gaudichaudi*.

MATERIALS AND METHODS

Collection of plant materials

The whole plant (aerial parts and roots) of *Tecoma gaudichaudi* was harvested in the month of September and washed thoroughly with water then dried, grinded to get coarse powder. The plant was authenticated by Prof. M. Venkaiah, Taxonomist, with voucher specimen no AV/TG/2016/2 as *Tecoma Gaudichaudi* DC. The ethanolic extract is taken and concentrated through maceration process and stored in airtight container.

Preliminary phytochemical screening

The extracts were dissolved in specific reagents through standard procedure[5] and analysed for presence of phytochemicals[6,7] such as steroids, triterpenes, saponins, flavonoids, phenols and iridoids.

Received in 3/2/2022 & Accepted in 6/4/2022

*Corresponding author: Veeramaneni Alekhya, E-mail: alekhya.veramaneni@gmail.com

Development and characterization of oral fast dissolving tablet loaded with Isradipine by direct compression method

V. Anilkumar[1], Harsh Rastogi[2*], Sangram Keshari Panda[3], Raghav Dixit[4], Neha P. Singh[5], Priyam Jyoti Das[6]

[1]Department of pharmaceutical technology, GIET School of Pharmacy, Rajahmundry, East Godavari, Andhra Pradesh, India

[2*]KIET group of Institution (KIET School of Pharmacy), Muradnagar, Ghaziabad, UP, India

[3]Jeypore College of Pharmacy, Jeypore, Koraput, Odisha, India

[4]Department of Pharmaceutical Sciences, Gurukul Kangri (Deemed to be University), Haridwar, Uttarakhand, India

[5]School of Pharmacy and Research, Dev Bhoomi Uttarakhand University, Dehradun, Uttarakhand, India

[6]Faculty of Pharmaceutical Science, Assam down town University, Gandhi Nagar, Panikhaiti, Guwahati-26, Assam, India

ABSTRACT

The primary goal of this project is to produce, characterize, and evaluate *In-vitro*Isradipine fast dissolving tablets using the direct compression method. Subsequently, the friability efficiency, bulk density (BD), tapped density (TD), particle size analysis, disintegration time, and post compression parameter of tablet like hardness, average weight, thickness and In-vitrorelease of tablet were all determined during the characterization process. The results showed concluded that formulation F1 have shown lesser disintegration time, maximum drug content, 100% cumulative drug release within 2 hrs. Six formulations F3, F2, F3, F4, F5, and F6 met all of the requirements and features necessary for a successful" formulation. For the preparations, all of the evaluation tests were completed. With changes in the ratio of disintegrant in the formulations, the drug release pattern and disintegration capabilities "of the formulations were shown to be varied. The experiment and the results reveal that Isradipine fast dissolving tablets enhance bioavailability while decreasing the dosage and dosage interval.

KEYWORDS: Isradipine, disintegration, bioavailability, fast dissolving tablets,direct compression

DOI Number: 10.14704/nq.2022.20.6.NQ22945 **NeuroQuantology 2022; 20(6): 9668-9678**

INTRODUCTION

A tablet is a medicinal dosage form that contains single periodic dose of a medicine. Oral methods are the most common way to administer medications, and oral dose forms like tablets are the most common. There are no of types of tablets are manufactured in pharmaceutical sector, some common are uncoated and film coated tablets. OSD (oral solid dosage forms) like powders, pills, capsules and tablets is administered orally[1]. This dosage form is consisted of one or more active drugs or medicament, this active material is called active pharmaceutical ingredient. The patient's disease stage may be cured by the medication in the dosage form [2].

Isradipine is a derivative of the dihydropyridine ring. Inhibits the inflow of calcium into heart and vascular tissue through 'slow' channels. As a result, "significant coronary, cerebral, and peripheral vasodilation is elicited." In comparison to other calcium channel blockers, this medication has very little cardiac depressive action. It has a specific effect on the blood vessels in the heart and in the muscles and a long-lasting vasodilator. Isradipine appears to

Gopi et al. Beni-Suef Univ J Basic Appl Sci (2022) 11:19
https://doi.org/10.1186/s43088-022-00202-6

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW Open Access

Antisense oligonucleotides: recent progress in the treatment of various diseases

Chandravadivelu Gopi[1*], Magharla Dasaratha Dhanaraju[2] and Kavitha Dhanaraju[1]

Abstract

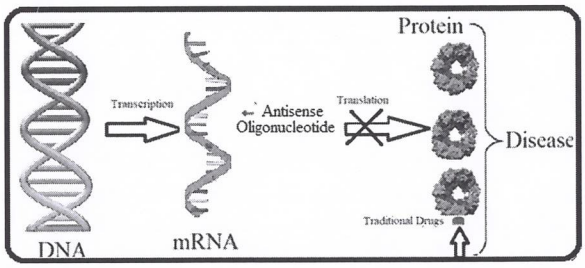
Background: Antisense oligonucleotides are a promising novel class of therapeutic agents to treat different diseases in living things. They provide an efficient method for making target-selective agents because they change gene expression sequences. Therefore, the malfunctioning protein could be stopped, and the source of disease would be obliterated. The existing reviews of antisense oligonucleotides are focusing on discovery, development and concept. However, there is no review paper concerning the latest development of antisense oligonucleotides and their different therapeutic uses. Therefore, the present work has been targeting a comprehensive summary of newly synthesized antisense oligonucleotides and their biological activities.

Main body: Antisense oligonucleotides are different from traditional therapeutic agents that are planned to interact with mRNA and modulate protein expression through a unique mechanism of action. In the last three decades, several researchers revealed the newer antisense oligonucleotides found with a high therapeutic profile due to more selective action on the drug target and thus producing a lesser side effect and low toxicity. This review emphasizes the research work on antisense oligonucleotides and their therapeutic activities.

Short conclusion: With the support of the literature review, here we enlisted various antisense oligonucleotides that were prepared by appropriate technique and explored their pharmacological activities. To the best of our knowledge, it is the right time to consider the antisense oligonucleotides as a perfect choice of treatment for different diseases due to conceptual simplicity, more selective action, lesser side effects, low toxicity and permanent cure.

Keywords: Antisense oligonucleotides, Target-selective, Treatment, Permanent cure, Various diseases

Graphical abstract



1 Background

Antisense oligonucleotides (ASOs) are accepted widely as potential therapeutics agents for different diseases in human beings [1–3]. It was discovered over 40 years ago, which resulted in modern tools of genomics and

*Correspondence: gopi@giet.ac.in
[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, NH-16, Rajamahendravaram, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Gopi et al. Beni-Suef Univ J Basic Appl Sci (2022) 11:19
https://doi.org/10.1186/s43088-022-00202-6

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW

Open Access

Antisense oligonucleotides: recent progress in the treatment of various diseases

Chandravadivelu Gopi[1*], Magharla Dasaratha Dhanaraju[2] and Kavitha Dhanaraju[1]

Abstract

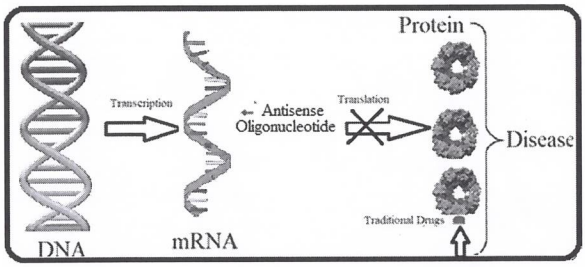
Background: Antisense oligonucleotides are a promising novel class of therapeutic agents to treat different diseases in living things. They provide an efficient method for making target-selective agents because they change gene expression sequences. Therefore, the malfunctioning protein could be stopped, and the source of disease would be obliterated. The existing reviews of antisense oligonucleotides are focusing on discovery, development and concept. However, there is no review paper concerning the latest development of antisense oligonucleotides and their different therapeutic uses. Therefore, the present work has been targeting a comprehensive summary of newly synthesized antisense oligonucleotides and their biological activities.

Main body: Antisense oligonucleotides are different from traditional therapeutic agents that are planned to interact with mRNA and modulate protein expression through a unique mechanism of action. In the last three decades, several researchers revealed the newer antisense oligonucleotides found with a high therapeutic profile due to more selective action on the drug target and thus producing a lesser side effect and low toxicity. This review emphasizes the research work on antisense oligonucleotides and their therapeutic activities.

Short conclusion: With the support of the literature review, here we enlisted various antisense oligonucleotides that were prepared by appropriate technique and explored their pharmacological activities. To the best of our knowledge, it is the right time to consider the antisense oligonucleotides as a perfect choice of treatment for different diseases due to conceptual simplicity, more selective action, lesser side effects, low toxicity and permanent cure.

Keywords: Antisense oligonucleotides, Target-selective, Treatment, Permanent cure, Various diseases

Graphical abstract



1 Background

Antisense oligonucleotides (ASOs) are accepted widely as potential therapeutics agents for different diseases in human beings [1–3]. It was discovered over 40 years ago, which resulted in modern tools of genomics and

*Correspondence: gopi@giet.ac.in
[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, NH-16, Rajamahendravaram, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Gopi et al. Beni-Suef Univ J Basic Appl Sci (2022) 11:19
https://doi.org/10.1186/s43088-022-00202-6

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW

Open Access

Antisense oligonucleotides: recent progress in the treatment of various diseases

Chandravadivelu Gopi[1*], Magharla Dasaratha Dhanaraju[2] and Kavitha Dhanaraju[1]

Abstract

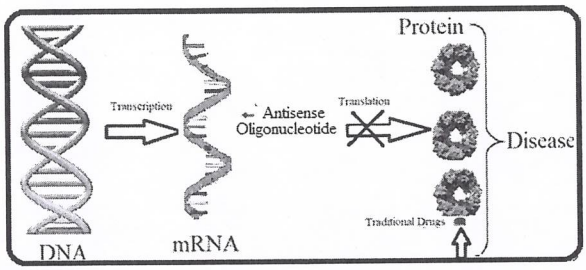
Background: Antisense oligonucleotides are a promising novel class of therapeutic agents to treat different diseases in living things. They provide an efficient method for making target-selective agents because they change gene expression sequences. Therefore, the malfunctioning protein could be stopped, and the source of disease would be obliterated. The existing reviews of antisense oligonucleotides are focusing on discovery, development and concept. However, there is no review paper concerning the latest development of antisense oligonucleotides and their different therapeutic uses. Therefore, the present work has been targeting a comprehensive summary of newly synthesized antisense oligonucleotides and their biological activities.

Main body: Antisense oligonucleotides are different from traditional therapeutic agents that are planned to interact with mRNA and modulate protein expression through a unique mechanism of action. In the last three decades, several researchers revealed the newer antisense oligonucleotides found with a high therapeutic profile due to more selective action on the drug target and thus producing a lesser side effect and low toxicity. This review emphasizes the research work on antisense oligonucleotides and their therapeutic activities.

Short conclusion: With the support of the literature review, here we enlisted various antisense oligonucleotides that were prepared by appropriate technique and explored their pharmacological activities. To the best of our knowledge, it is the right time to consider the antisense oligonucleotides as a perfect choice of treatment for different diseases due to conceptual simplicity, more selective action, lesser side effects, low toxicity and permanent cure.

Keywords: Antisense oligonucleotides, Target-selective, Treatment, Permanent cure, Various diseases

Graphical abstract



1 Background

Antisense oligonucleotides (ASOs) are accepted widely as potential therapeutics agents for different diseases in human beings [1–3]. It was discovered over 40 years ago, which resulted in modern tools of genomics and

*Correspondence: gopi@giet.ac.in
[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, NH-16, Rajamahendravaram, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296.

Research Paper

Antidote Mastery: A Survey of Antidote Knowledge and Availability among Physicians in a South Indian District

J. J. KIRUBAKARAN[1]*, R. S. R. DACHURU[2] AND D. D. MAGHARLA[3]

Department of Pharmacy, Krishna University, Machilipatnam, Andhra Pradesh 521003, [1]Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh 533103, [2]Department of Chemistry, Krishna University, Machilipatnam, Andhra Pradesh 521003, [3]Department of Pharmaceutics, Godavari Institute of Engineering and Technology, School of Pharmacy, Rajahmundry, Andhra Pradesh 533294, India

The exact frequency of poisoning is unclear, although it is the most prevalent cause of emergency room visits. It is a critical domain for emergency medicine practitioners, who are the first to see people who have been exposed to toxic substances. As a result, they must be aware of how to manage the poisoning. So, a survey was designed to identify their knowledge on antidotes for common poisonings, along with queries on antidotes and decontamination measures available within each hospital. A total of 232 people replied to the poll (77.33 % response rate). In general, data of antidotes are not found higher but differed based upon the antidote. Physicians who work in tertiary hospitals and more bedded hospitals appreciably served well. Merely 42.24 % of the 16 antidotes are accessible at each reporting hospitals on average; 18.1 % could acquire them from adjacent hospitals and 20.26 % could acquire them from a local distributor. Only 19.4 % of people can acquire an antidote within 2 h. The most common decontamination therapy is gastric lavage, while extracorporeal decontamination procedures 42.24 % and 36.64 % respectively are available in varying degrees. Knowledge of specific antidotes was shown to be connected to the size, type and location of the hospital in the East Godavari district, rather than individual physician characteristics. In roughly half of the hospitals assessed, significant antidotes are still unavailable or available within 2 h, even though all key acute decontamination therapies and procedures appear to be widely used.

Key words: Antidotes, emergency department, extracorporeal decontamination, poisoning

The true incidence of poisoning is unknown, but it is the most common cause of Emergency Department (ED) visits. This creates the challenge for the emergency medicine expertise. It is an essential domain for the emergency medicine practitioners, who are the first line people to see the people who are exposed to the toxic substances. So, its mandatory for them to know how to manage the poisoning[1]. A report from American Association of Poison Control Centers (AAPCC) and National Poison Data System (NPDS) states that above 2.1 million human poison incidences and almost 2500 poisoning-linked deaths in 2013 (7.9 deaths/million). The pattern of suicide differs in various population and culture[2]. India stands at 10th position in the world rank with an average suicidal rate of 9.74/lakh population[3]. The most common mode of suicide is by using agrochemicals, it also depends on the availability, motivation and intent[4]. In India 15 suicides took place every 1 h during the year 2015 and more than 1 lakh persons (133 623) have committed suicide[5]. According to National Crime Records Bureau, Ministry of Home Affairs Government of India, 2018 about 134 516 people committee suicide in India in the year 2018 which is 10.2 incidence of suicides per one lakh (100 000) of population[6].

Pre determining the clinical indices as earlier can help in providing appropriate supportive care which will favour in the patient outcome[7]. In any ED the first review is done using Airway, Breathing, Circulation, Disability/Dextrose (ABCD), assessment. It's mostly helpful in the assessment of poisoning[8]. The main issue in assessment is "how much the ED physician knows about the antidote?" In India less than 1 % of the hospitals have drug information centres[9]. There are very limited studies which evaluate the knowledge of physicians for antidotes in poisoning and the availability of the necessary resources to treat poisoning cases.

*Address for correspondence
E-mail: john.mpharm@gmail.com

Accepted 13 May 2022
Revised 29 March 2022
Received 24 July 2021
Indian J Pharm Sci 2022;84(3):598-603

Research Paper

Antidote Mastery: A Survey of Antidote Knowledge and Availability among Physicians in a South Indian District

J. J. KIRUBAKARAN[1]*, R. S. R. DACHURU[2] AND D. D. MAGHARLA[3]

Department of Pharmacy, Krishna University, Machilipatnam, Andhra Pradesh 521003, [1]Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajahmundry, Andhra Pradesh 533103, [2]Department of Chemistry, Krishna University, Machilipatnam, Andhra Pradesh 521003, [3]Department of Pharmaceutics, Godavari Institute of Engineering and Technology, School of Pharmacy, Rajahmundry, Andhra Pradesh 533294, India

The exact frequency of poisoning is unclear, although it is the most prevalent cause of emergency room visits. It is a critical domain for emergency medicine practitioners, who are the first to see people who have been exposed to toxic substances. As a result, they must be aware of how to manage the poisoning. So, a survey was designed to identify their knowledge on antidotes for common poisonings, along with queries on antidotes and decontamination measures available within each hospital. A total of 232 people replied to the poll (77.33 % response rate). In general, data of antidotes are not found higher but differed based upon the antidote. Physicians who work in tertiary hospitals and more bedded hospitals appreciably served well. Merely 42.24 % of the 16 antidotes are accessible at each reporting hospitals on average; 18.1 % could acquire them from adjacent hospitals and 20.26 % could acquire them from a local distributor. Only 19.4 % of people can acquire an antidote within 2 h. The most common decontamination therapy is gastric lavage, while extracorporeal decontamination procedures 42.24 % and 36.64 % respectively are available in varying degrees. Knowledge of specific antidotes was shown to be connected to the size, type and location of the hospital in the East Godavari district, rather than individual physician characteristics. In roughly half of the hospitals assessed, significant antidotes are still unavailable or available within 2 h, even though all key acute decontamination therapies and procedures appear to be widely used.

Key words: Antidotes, emergency department, extracorporeal decontamination, poisoning

The true incidence of poisoning is unknown, but it is the most common cause of Emergency Department (ED) visits. This creates the challenge for the emergency medicine expertise. It is an essential domain for the emergency medicine practitioners, who are the first line people to see the people who are exposed to the toxic substances. So, its mandatory for them to know how to manage the poisoning[1]. A report from American Association of Poison Control Centers (AAPCC) and National Poison Data System (NPDS) states that above 2.1 million human poison incidences and almost 2500 poisoning-linked deaths in 2013 (7.9 deaths/million). The pattern of suicide differs in various population and culture[2]. India stands at 10th position in the world rank with an average suicidal rate of 9.74/lakh population[3]. The most common mode of suicide is by using agrochemicals, it also depends on the availability, motivation and intent[4]. In India 15 suicides took place every 1 h during the year 2015 and more than 1 lakh persons (133 623) have committed suicide[5]. According to National Crime Records Bureau, Ministry of Home Affairs Government of India, 2018 about 134 516 people committee suicide in India in the year 2018 which is 10.2 incidence of suicides per one lakh (100 000) of population[6].

Pre determining the clinical indices as earlier can help in providing appropriate supportive care which will favour in the patient outcome[7]. In any ED the first review is done using Airway, Breathing, Circulation, Disability/Dextrose (ABCD), assessment. It's mostly helpful in the assessment of poisoning[8]. The main issue in assessment is "how much the ED physician knows about the antidote?" In India less than 1 % of the hospitals have drug information centres[9]. There are very limited studies which evaluate the knowledge of physicians for antidotes in poisoning and the availability of the necessary resources to treat poisoning cases.

Accepted 13 May 2022
Revised 29 March 2022
Received 24 July 2021
Indian J Pharm Sci 2022;84(3):598-603

***Address for correspondence**
E-mail: john.mpharm@gmail.com

How to Cite:
Ramachandran, S., Divya, K. S., Prasannakumar, P., Bhagyasri, B., Kedasi, J., Dave, O. S., Kumar, D. V., Kumari, K. A., & Kirubakaran, J. J. (2022). A study on the efficacy of tranexamic acid among pregnant women in reducing blood loss in lower segment cesarean section. *International Journal of Health Sciences*, *6*(S5), 9689–9695. https://doi.org/10.53730/ijhs.v6nS5.11493

A study on the efficacy of tranexamic acid among pregnant women in reducing blood loss in lower segment cesarean section

Dr. Somasundaram Ramachandran M.Pharm., Ph.D
Department of Pharmacology, GIET School of Pharmacy, Rajamahendravaram, AP, India.
Corresponding author email: ramsnetin@yahoo.com

Kanumuri Surekha Divya
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Pedapudi Prasannakumar
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Bonula Bhagyasri
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Jyothsna Kedasi
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Oselebe Somto Dave
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Dasapalli Veerendra Kumar
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

K Aruna Kumari
Department of Gynaecology, Harsha Hospitals, Prakash Nagar, Rajamahendravaram, AP, India.

J John Kirubakaran
Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajamahendravaram, AP, India.

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
Manuscript submitted: 9 April 2022, Manuscript revised: 18 June 2022, Accepted for publication: 27 July 2022

How to Cite:
Ramachandran, S., Divya, K. S., Prasannakumar, P., Bhagyasri, B., Kedasi, J., Dave, O. S., Kumar, D. V., Kumari, K. A., & Kirubakaran, J. J. (2022). A study on the efficacy of tranexamic acid among pregnant women in reducing blood loss in lower segment cesarean section. *International Journal of Health Sciences*, *6*(S5), 9689–9695. https://doi.org/10.53730/ijhs.v6nS5.11493

A study on the efficacy of tranexamic acid among pregnant women in reducing blood loss in lower segment cesarean section

Dr. Somasundaram Ramachandran M.Pharm., Ph.D
Department of Pharmacology, GIET School of Pharmacy, Rajamahendravaram, AP, India.
Corresponding author email: ramsnetin@yahoo.com

Kanumuri Surekha Divya
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Pedapudi Prasannakumar
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Bonula Bhagyasri
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Jyothsna Kedasi
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Oselebe Somto Dave
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

Dasapalli Veerendra Kumar
Department of Pharmacy Practice, GIET School of Pharmacy, Rajamahendravaram, AP, India.

K Aruna Kumari
Department of Gynaecology, Harsha Hospitals, Prakash Nagar, Rajamahendravaram, AP, India.

J John Kirubakaran
Department of Pharmacy Practice, Vikas Institute of Pharmaceutical Sciences, Rajamahendravaram, AP, India.

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
Manuscript submitted: 9 April 2022, Manuscript revised: 18 June 2022, Accepted for publication: 27 July 2022

Research Paper

Phytoconstituents Screening and Antioxidant Activity of *Syringodium isoetifolium* Leaf Extracts

DHANARAJU KAVITHA[1], RAMAKRISHNAN PADMINI*, G. CHANDRAVADIVELU[1] AND D. D. MAGHARLA[1]

Department of Biochemistry, Vels Institute of Science, Technology and Advanced Studies, Pallavaram, Chennai-600117, Tamil Nadu, [1]Research Lab, GIET School of Pharmacy, Rajahmundry-533296, Andhra Pradesh, India

This research aimed to explore the antioxidant potency of leaf extracts of *Syringodium isoetifolium* seagrass. In this study, seagrass leaves were collected from the local tribe's source, dried and extracted with water, alcohol, hydro alcohols, acetone and n-hexane. Phytochemical investigation on extracts was performed using chemical and gas chromatography-mass spectrometric techniques. It reveals that the extracts are enriched with pharmacologically active compounds such as phenol, polyphenol, alkaloid, glycoside, saponin, flavonoids, dicarboxylic acids and other constituents. Later, the crude extracts were estimated for antioxidant activity using different *in vitro* methods such as 2,2-diphenyl-1-picryl-hydrazyl-hydrate, total antioxidant, nitric oxide, superoxide anion and hydroxyl radical scavenging activities. The result demonstrated that the extracts exhibited higher radical scavenging activity as compared to the ascorbic acid. Among the different extracts, the hydroalcoholic extract had shown an excellent antioxidant activity due to the existence of more potent phytochemicals.

Key words: *Syringodium isoetifolium*, leaf extracts, phytochemical screening, antioxidant activity

The ecosystem is the structural and functional component of ecology where the living things interact with each other and the environment[1]. There are many ecosystems existing in the galaxy[2]. Marine ecosystems are the main ecosystems and exist in sea waters[3]. In which, seagrasses are a vital part of the marine ecosystem, found in shallow, sheltered, soft-bottomed marine waters[4]. They were found all along with the coastal areas of India[5,6]. These are belonging to the families of Cymodoceaceae, Zoseraceae, Hydrocharitaceae and Posidoniaceae[7]. Around the earth, 52 species of seagrasses were found so far in which 14 species were identified in the west and east coastal part of India[8]. The biomass of seagrass has been utilized frequently as food and drug by coastal indigenous people[9]. Seagrasses are well documented for the presence of potent diverse secondary metabolites. There is an immediate need to quantitatively survey the traditional knowledge of seagrasses in areas where they are abundant and serve as an important resource to coastal communities. In folk medicine, seagrasses have been employed for many therapeutic purposes such as skin diseases, fever, wounds, stomach problems, muscle pains and as a remedy against different kinds of rays[10]. They also provide different pharmacological activities like antioxidant[11], anti-microbial[12], anti-viral[13], against stomach problems[14], anti-diabetic[15], wounds[16], tranquillizer[17] and anticancer[18] activities etc. Human pollution has contributed most to seagrass declines around the world. There is a necessity to take some initiation to preserve the seagrass and ensure the existence of seagrass to the poor people in future. For many decades, herbal medicines have been used in developing countries as the primary source of medical treatments. The root of *Cymodocea* sp. is eaten as food commonly known as sea sugarcane. Some of *Cymodocea* sp. are used against malaria, cough and also used as tranquilizers for babies. *Halophila ovalis* was used by the fishing communities of Cuddalore and Nagapattinam districts of Tamil Nadu, South India as medicine to treat various skin diseases, burns and boils. *Cymodocea* sp. are being used as a tranquilizer for babies, as soothing helps during pregnancy and against cough and malaria. *Halophila stipulacea* (Forssk.) Asch., *Cymodocea* serrulata (R. Br.) Asch and Magnus and *Halodule pinifolia* (Miki) Hartog possessed effective antimicrobial effects against seven human pathogens[19,20]. From the past few decades, there has

Accepted 19 October 2022
Revised 21 April 2022
Received 17 February 2021
Indian J Pharm Sci 2022;84(5):1309-1322

*Address for correspondence
E-mail: padmini.sls@velsuniv.ac.in

Research Paper

Phytoconstituents Screening and Antioxidant Activity of *Syringodium isoetifolium* Leaf Extracts

DHANARAJU KAVITHA[1], RAMAKRISHNAN PADMINI*, G. CHANDRAVADIVELU[1] AND D. D. MAGHARLA[1]

Department of Biochemistry, Vels Institute of Science, Technology and Advanced Studies, Pallavaram, Chennai-600117, Tamil Nadu, [1]Research Lab, GIET School of Pharmacy, Rajahmundry-533296, Andhra Pradesh, India

This research aimed to explore the antioxidant potency of leaf extracts of *Syringodium isoetifolium* seagrass. In this study, seagrass leaves were collected from the local tribe's source, dried and extracted with water, alcohol, hydro alcohols, acetone and n-hexane. Phytochemical investigation on extracts was performed using chemical and gas chromatography-mass spectrometric techniques. It reveals that the extracts are enriched with pharmacologically active compounds such as phenol, polyphenol, alkaloid, glycoside, saponin, flavonoids, dicarboxylic acids and other constituents. Later, the crude extracts were estimated for antioxidant activity using different *in vitro* methods such as 2,2-diphenyl-1-picryl-hydrazyl-hydrate, total antioxidant, nitric oxide, superoxide anion and hydroxyl radical scavenging activities. The result demonstrated that the extracts exhibited higher radical scavenging activity as compared to the ascorbic acid. Among the different extracts, the hydroalcoholic extract had shown an excellent antioxidant activity due to the existence of more potent phytochemicals.

Key words: *Syringodium isoetifolium*, leaf extracts, phytochemical screening, antioxidant activity

The ecosystem is the structural and functional component of ecology where the living things interact with each other and the environment[1]. There are many ecosystems existing in the galaxy[2]. Marine ecosystems are the main ecosystems and exist in sea waters[3]. In which, seagrasses are a vital part of the marine ecosystem, found in shallow, sheltered, soft-bottomed marine waters[4]. They were found all along with the coastal areas of India[5,6]. These are belonging to the families of Cymodoceaceae, Zoseraceae, Hydrocharitaceae and Posidoniaceae[7]. Around the earth, 52 species of seagrasses were found so far in which 14 species were identified in the west and east coastal part of India[8]. The biomass of seagrass has been utilized frequently as food and drug by coastal indigenous people[9]. Seagrasses are well documented for the presence of potent diverse secondary metabolites. There is an immediate need to quantitatively survey the traditional knowledge of seagrasses in areas where they are abundant and serve as an important resource to coastal communities. In folk medicine, seagrasses have been employed for many therapeutic purposes such as skin diseases, fever, wounds, stomach problems, muscle pains and as a remedy against different kinds of rays[10]. They also provide different pharmacological activities like antioxidant[11], anti-microbial[12], anti-viral[13], against stomach problems[14], anti-diabetic[15], wounds[16], tranquillizer[17] and anticancer[18] activities etc. Human pollution has contributed most to seagrass declines around the world. There is a necessity to take some initiation to preserve the seagrass and ensure the existence of seagrass to the poor people in future. For many decades, herbal medicines have been used in developing countries as the primary source of medical treatments. The root of *Cymodocea* sp. is eaten as food commonly known as sea sugarcane. Some of *Cymodocea* sp. are used against malaria, cough and also used as tranquilizers for babies. *Halophila ovalis* was used by the fishing communities of Cuddalore and Nagapattinam districts of Tamil Nadu, South India as medicine to treat various skin diseases, burns and boils. *Cymodocea* sp. are being used as a tranquilizer for babies, as soothing helps during pregnancy and against cough and malaria. *Halophila stipulacea* (Forssk.) Asch., *Cymodocea* serrulata (R. Br.) Asch and Magnus and *Halodule pinifolia* (Miki) Hartog possessed effective antimicrobial effects against seven human pathogens[19,20]. From the past few decades, there has

Accepted 19 October 2022
Revised 21 April 2022
Received 17 February 2021
Indian J Pharm Sci 2022;84(5):1309-1322

*Address for correspondence
E-mail: padmini.sls@velsuniv.ac.in

Research Paper

Phytoconstituents Screening and Antioxidant Activity of *Syringodium isoetifolium* Leaf Extracts

DHANARAJU KAVITHA[1], RAMAKRISHNAN PADMINI*, G. CHANDRAVADIVELU[1] AND D. D. MAGHARLA[1]

Department of Biochemistry, Vels Institute of Science, Technology and Advanced Studies, Pallavaram, Chennai-600117, Tamil Nadu, [1]Research Lab, GIET School of Pharmacy, Rajahmundry-533296, Andhra Pradesh, India

This research aimed to explore the antioxidant potency of leaf extracts of *Syringodium isoetifolium* seagrass. In this study, seagrass leaves were collected from the local tribe's source, dried and extracted with water, alcohol, hydro alcohols, acetone and n-hexane. Phytochemical investigation on extracts was performed using chemical and gas chromatography-mass spectrometric techniques. It reveals that the extracts are enriched with pharmacologically active compounds such as phenol, polyphenol, alkaloid, glycoside, saponin, flavonoids, dicarboxylic acids and other constituents. Later, the crude extracts were estimated for antioxidant activity using different *in vitro* methods such as 2,2-diphenyl-1-picryl-hydrazyl-hydrate, total antioxidant, nitric oxide, superoxide anion and hydroxyl radical scavenging activities. The result demonstrated that the extracts exhibited higher radical scavenging activity as compared to the ascorbic acid. Among the different extracts, the hydroalcoholic extract had shown an excellent antioxidant activity due to the existence of more potent phytochemicals.

Key words: *Syringodium isoetifolium*, leaf extracts, phytochemical screening, antioxidant activity

The ecosystem is the structural and functional component of ecology where the living things interact with each other and the environment[1]. There are many ecosystems existing in the galaxy[2]. Marine ecosystems are the main ecosystems and exist in sea waters[3]. In which, seagrasses are a vital part of the marine ecosystem, found in shallow, sheltered, soft-bottomed marine waters[4]. They were found all along with the coastal areas of India[5,6]. These are belonging to the families of Cymodoceaceae, Zoseraceae, Hydrocharitaceae and Posidoniaceae[7]. Around the earth, 52 species of seagrasses were found so far in which 14 species were identified in the west and east coastal part of India[8]. The biomass of seagrass has been utilized frequently as food and drug by coastal indigenous people[9]. Seagrasses are well documented for the presence of potent diverse secondary metabolites. There is an immediate need to quantitatively survey the traditional knowledge of seagrasses in areas where they are abundant and serve as an important resource to coastal communities. In folk medicine, seagrasses have been employed for many therapeutic purposes such as skin diseases, fever, wounds, stomach problems, muscle pains and as a remedy against different kinds of rays[10]. They also provide different pharmacological activities like antioxidant[11], anti-microbial[12], anti-viral[13], against stomach problems[14], anti-diabetic[15], wounds[16], tranquillizer[17] and anticancer[18] activities etc. Human pollution has contributed most to seagrass declines around the world. There is a necessity to take some initiation to preserve the seagrass and ensure the existence of seagrass to the poor people in future. For many decades, herbal medicines have been used in developing countries as the primary source of medical treatments. The root of *Cymodocea* sp. is eaten as food commonly known as sea sugarcane. Some of *Cymodocea* sp. are used against malaria, cough and also used as tranquilizers for babies. *Halophila ovalis* was used by the fishing communities of Cuddalore and Nagapattinam districts of Tamil Nadu, South India as medicine to treat various skin diseases, burns and boils. *Cymodocea* sp. are being used as a tranquilizer for babies, as soothing helps during pregnancy and against cough and malaria. *Halophila stipulacea* (Forssk.) Asch., *Cymodocea* serrulata (R. Br.) Asch and Magnus and *Halodule pinifolia* (Miki) Hartog possessed effective antimicrobial effects against seven human pathogens[19,20]. From the past few decades, there has

*Address for correspondence
E-mail: padmini.sls@velsuniv.ac.in

Accepted 19 October 2022
Revised 21 April 2022
Received 17 February 2021
Indian J Pharm Sci 2022;84(5):1309-1322

Original Article

Utility of Different Lipids and Effect of Soya Lecithin on Sustained Delivery of Zidovudine via Biodegradable Solid Lipid Microparticles: Formulation and *in-vitro* Characterization

Nandhakumar Sathyamoorthy[1,*], Vankayala Devendiran Sundar[2], Vijayalakshmi Rajendran[3], Navyashri Sirikonda[2], Harikrishnan Narayanaswamy[1]

[1]Department of Pharmaceutics, Faculty of Pharmacy, Dr. M.G.R. Educational and Research Institute, Velappanchavadi, Tamil Nadu, INDIA.
[2]Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
[3]Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Background: Zidovudine (Azidothymidine, AZT) is widely used in the treatment of Acquired Immuno Deficiency Syndrome (AIDS) and related conditions, either alone or in combination with other antiviral agents to combat HIV. AZT is a Biopharmaceutical Classification System (BCS) class III drug and has various disadvantages. Thus, AZT is a potential candidate for delivery *via* lipid-based drug delivery system. **Materials and Methods:** In the present work, solid lipid microparticles (SLMs) of Zidovudine were developed for sustaining the drug release, to overcome or to reduce the hepatic metabolism and to ensure optimal bioavailability. A total of sixteen formulations of Zidovudine loaded solid lipid microparticles in two groups viz., one with tripalmitin and another with trimyristin were prepared by emulsion-solvent evaporation method. **Results:** The average particle size and entrapment efficiency of the prepared SLM varied between 5.48 μm-10.64 μm and 46.92 % and 58.39% respectively. The release of zidovudine from the SLM varied between 70.47% and 100% at the end of 24 hrs. 80% of the drug release which is required for obtaining the optimal therapeutic concentration was achieved by SLM 8. **Conclusion:** Formulation SLM 8 was considered best with maximum sustainability in the drug release along with maintaining therapeutic optimum. The formulation was found stable under stressed conditions.

Keywords: Zidovudine, Azidothymidine, AIDS, Solid lipid microparticles, Tripalmitin, Trimyristin.

Submission Date: 05-01-2022;
Revision Date: 26-03-2022;
Accepted Date: 21-04-2022.

DOI: 10.5530/ijper.56.3.117

Correspondence:
Dr. Nandhakumar Sathyamoorthy
Professor, Department of Pharmaceutics, Faculty of Pharmacy Dr. MGR Educational and Research Institute, Velappanchavadi, Chennai-600077, Tamil Nadu, INDIA.
E-mail: nandha.pharm@gmail.com

INTRODUCTION

Solid lipid particles were first presented in the early 1990s as an alternative to emulsions, liposomes, and polymeric microparticles as a drug delivery mechanism.[1] Solid Lipid Microparticles (SLMs) are solid lipid particles that are roughly spherical and range in size from 1 to 1000 um.[2] Solid lipid microparticles have a better physicochemical stability than other lipid-based drug carriers, such as liposomes, and are easier to sterilize and scale-up.[3] The formulation of solid lipid microparticles (SLMs) for effective oral administration of biological medicines begins with the selection of appropriate lipid excipients with the right hydrophobicity and lipolysis propensity.[4] Zidovudine is a synthetic nucleoside analogue that is increasingly being employed as the cornerstone of antiretroviral therapy for HIV infection. Zidovudine is a nucleoside analogue that inhibits HIV reverse transcriptase. It is the (-)- enantiomer of 2', 3'-dideoxy-3'-thiacytidine.[5,6] Zidovudine (Azidothymidine, AZT) is widely used in the treatment of AIDS and similar illnesses, either alone or in combination

www.ijper.org

Utility of Different Lipids and Effect of Soya Lecithin on Sustained Delivery of Zidovudine via Biodegradable Solid Lipid Microparticles: Formulation and *in-vitro* Characterization

Nandhakumar Sathyamoorthy[1,*], Vankayala Devendiran Sundar[2], Vijayalakshmi Rajendran[3], Navyashri Sirikonda[2], Harikrishnan Narayanaswamy[1]

[1]Department of Pharmaceutics, Faculty of Pharmacy, Dr. M.G.R. Educational and Research Institute, Velappanchavadi, Tamil Nadu, INDIA.
[2]Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
[3]Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Background: Zidovudine (Azidothymidine, AZT) is widely used in the treatment of Acquired Immuno Deficiency Syndrome (AIDS) and related conditions, either alone or in combination with other antiviral agents to combat HIV. AZT is a Biopharmaceutical Classification System (BCS) class III drug and has various disadvantages. Thus, AZT is a potential candidate for delivery *via* lipid-based drug delivery system. **Materials and Methods:** In the present work, solid lipid microparticles (SLMs) of Zidovudine were developed for sustaining the drug release, to overcome or to reduce the hepatic metabolism and to ensure optimal bioavailability. A total of sixteen formulations of Zidovudine loaded solid lipid microparticles in two groups viz., one with tripalmitin and another with trimyristin were prepared by emulsion-solvent evaporation method. **Results:** The average particle size and entrapment efficiency of the prepared SLM varied between 5.48 μm-10.64 μm and 46.92 % and 58.39% respectively. The release of zidovudine from the SLM varied between 70.47% and 100% at the end of 24 hrs. 80% of the drug release which is required for obtaining the optimal therapeutic concentration was achieved by SLM 8. **Conclusion:** Formulation SLM 8 was considered best with maximum sustainability in the drug release along with maintaining therapeutic optimum. The formulation was found stable under stressed conditions.

Keywords: Zidovudine, Azidothymidine, AIDS, Solid lipid microparticles, Tripalmitin, Trimyristin.

Submission Date: 05-01-2022;
Revision Date: 26-03-2022;
Accepted Date: 21-04-2022.

DOI: 10.5530/ijper.56.3.117

Correspondence:
Dr. Nandhakumar Sathyamoorthy
Professor, Department of Pharmaceutics, Faculty of Pharmacy Dr. MGR Educational and Research Institute, Velappanchavadi, Chennai-600077, Tamil Nadu, INDIA.
E-mail: nandha.pharm@gmail.com

INTRODUCTION

Solid lipid particles were first presented in the early 1990s as an alternative to emulsions, liposomes, and polymeric microparticles as a drug delivery mechanism.[1] Solid Lipid Microparticles (SLMs) are solid lipid particles that are roughly spherical and range in size from 1 to 1000 um.[2] Solid lipid microparticles have a better physicochemical stability than other lipid-based drug carriers, such as liposomes, and are easier to sterilize and scale-up.[3] The formulation of solid lipid microparticles (SLMs) for effective oral administration of biological medicines begins with the selection of appropriate lipid excipients with the right hydrophobicity and lipolysis propensity.[4] Zidovudine is a synthetic nucleoside analogue that is increasingly being employed as the cornerstone of antiretroviral therapy for HIV infection. Zidovudine is a nucleoside analogue that inhibits HIV reverse transcriptase. It is the (-)- enantiomer of 2', 3'-dideoxy-3'-thiacytidine.[5,6] Zidovudine (Azidothymidine, AZT) is widely used in the treatment of AIDS and similar illnesses, either alone or in combination

SN Comprehensive Clinical Medicine
https://doi.org/10.1007/s42399-021-00833-3

MEDICINE

SN

Recent Progress in the Treatment of Leptospirosis

Chandravadivelu Gopi[1] · Chitikina Satya Sri[1] · Gudapati Krupamai[1] · A Ramamoorthy Magesh[2] · Magharla Dasaratha Dhanaraju[3]

Accepted: 21 February 2021

Abstract

Leptospirosis is an acute anthropozoonotic infection that affects humans and animals in the last few decades due to being seriously neglected by countries located in a temperate climatic zone. The disease is often related to occupation. Therefore, the prevalence of the disease is much higher in males than in females. The usage of existing antibiotics is effective for the treatment of leptospirosis but with accompanying toxicity. In the last two decades, several researchers discovered the newer spirocidal agents found with a high therapeutic profile. But there is no review concerning recent research discoveries of spirocidal agents. Hence, an attempt had been made on the latest research findings (2007–2019) of newly synthesised/natural compounds of spirocidal agents used for the prevention and treatment of leptospirosis. To the best of our knowledge, the current review has completely analysed the treatment of leptospirosis and furnished the newer spirocidal agents such as occurrence, method of preparation and effect of these agents against spirochete bacteria and compared their activity against the standard drugs. It is the right time to consider the newer spirocidal agents for the treatment of leptospirosis because of better efficacy, least resistance and less toxicity.

Keywords Leptospirosis · Treatment · Recent research findings · Spirocidal agent

Background

In recent years, many people around the world are infected with leptospirosis and have been emerging as an important health issue [1, 2]. Leptospirosis is known to be endemic in India since the early twentieth century with most outbreaks reported from the coastal regions of the Indian peninsula and the Andaman Islands [3]. The disease was first described as an acute infectious disease with enlargement of the spleen, myalgia, jaundice, tissue haemorrhage, renal failure and nephritis by Adolf Weil [4]. Even before the description of Weil's, the disease was known as rice field jaundice in China, cane-cutter's disease in Europe and Australia, autumn fever and 7-day fever in Japan, and swineherd's disease and Sclammfieber (mud fever) in Europe and Australia [5]. Occupation with exposure to water and animal has a high risk of acquiring this disease [6, 7]. Therefore, the people who live with health hazards in the working atmosphere such as veterinarians, slaughterhouse worker, farmers, countryside rangers, sailor in rivers, waste disposal facility workers, sewer maintenance worker and people who work on a derelict building are at high risk for this disease [8, 9]. It is caused by pathogenic spirochete bacteria in the genus of *Leptospira* (Fig. 1) and is endemic in tropical and sub-tropical regions and distributed worldwide [10–13]. There are twenty-one species of *Leptospira* identified so far, in which nine of them are set to be pathogens [14, 15]. The bacteria mainly spread through the urine of the infected rat, skunks, opossums, foxes, raccoons

This article is part of the Topical Collection on *Medicine*

✉ Chandravadivelu Gopi
gopi@giet.ac.in

Chitikina Satya Sri
satyasri.pharmacy@gmail.com

Gudapati Krupamai
g.krupamai@gmail.com

A Ramamoorthy Magesh
armagesh@yahoo.co.in

Magharla Dasaratha Dhanaraju
mddhanaraju@yahoo.com

1 Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

2 Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

3 Director, Research lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

Published online: 27 February 2021

SN Comprehensive Clinical Medicine
https://doi.org/10.1007/s42399-021-00833-3

MEDICINE

SN

Recent Progress in the Treatment of Leptospirosis

Chandravadivelu Gopi[1] · Chitikina Satya Sri[1] · Gudapati Krupamai[1] · A Ramamoorthy Magesh[2] · Magharla Dasaratha Dhanaraju[3]

Accepted: 21 February 2021

Abstract

Leptospirosis is an acute anthropozoonotic infection that affects humans and animals in the last few decades due to being seriously neglected by countries located in a temperate climatic zone. The disease is often related to occupation. Therefore, the prevalence of the disease is much higher in males than in females. The usage of existing antibiotics is effective for the treatment of leptospirosis but with accompanying toxicity. In the last two decades, several researchers discovered the newer spirocidal agents found with a high therapeutic profile. But there is no review concerning recent research discoveries of spirocidal agents. Hence, an attempt had been made on the latest research findings (2007–2019) of newly synthesised/natural compounds of spirocidal agents used for the prevention and treatment of leptospirosis. To the best of our knowledge, the current review has completely analysed the treatment of leptospirosis and furnished the newer spirocidal agents such as occurrence, method of preparation and effect of these agents against spirochete bacteria and compared their activity against the standard drugs. It is the right time to consider the newer spirocidal agents for the treatment of leptospirosis because of better efficacy, least resistance and less toxicity.

Keywords Leptospirosis · Treatment · Recent research findings · Spirocidal agent

Background

In recent years, many people around the world are infected with leptospirosis and have been emerging as an important health issue [1, 2]. Leptospirosis is known to be endemic in India since the early twentieth century with most outbreaks reported from the coastal regions of the Indian peninsula and the Andaman Islands [3]. The disease was first described as an acute infectious disease with enlargement of the spleen, myalgia, jaundice, tissue haemorrhage, renal failure and nephritis by Adolf Weil [4]. Even before the description of Weil's, the disease was known as rice field jaundice in China, cane-cutter's disease in Europe and Australia, autumn fever and 7-day fever in Japan, and swineherd's disease and Sclammfieber (mud fever) in Europe and Australia [5]. Occupation with exposure to water and animal has a high risk of acquiring this disease [6, 7]. Therefore, the people who live with health hazards in the working atmosphere such as veterinarians, slaughterhouse worker, farmers, countryside rangers, sailor in rivers, waste disposal facility workers, sewer maintenance worker and people who work on a derelict building are at high risk for this disease [8, 9]. It is caused by pathogenic spirochete bacteria in the genus of *Leptospira* (Fig. 1) and is endemic in tropical and sub-tropical regions and distributed worldwide [10–13]. There are twenty-one species of *Leptospira* identified so far, in which nine of them are set to be pathogens [14, 15]. The bacteria mainly spread through the urine of the infected rat, skunks, opossums, foxes, raccoons

This article is part of the Topical Collection on *Medicine*

✉ Chandravadivelu Gopi
gopi@giet.ac.in

Chitikina Satya Sri
satyasri.pharmacy@gmail.com

Gudapati Krupamai
g.krupamai@gmail.com

A Ramamoorthy Magesh
armagesh@yahoo.co.in

Magharla Dasaratha Dhanaraju
mddhanaraju@yahoo.com

[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[2] Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[3] Director, Research lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

Published online: 27 February 2021

SN Comprehensive Clinical Medicine
https://doi.org/10.1007/s42399-021-00833-3

MEDICINE

SN

Recent Progress in the Treatment of Leptospirosis

Chandravadivelu Gopi[1] · Chitikina Satya Sri[1] · Gudapati Krupamai[1] · A Ramamoorthy Magesh[2] · Magharla Dasaratha Dhanaraju[3]

Accepted: 21 February 2021

Abstract

Leptospirosis is an acute anthropozoonotic infection that affects humans and animals in the last few decades due to being seriously neglected by countries located in a temperate climatic zone. The disease is often related to occupation. Therefore, the prevalence of the disease is much higher in males than in females. The usage of existing antibiotics is effective for the treatment of leptospirosis but with accompanying toxicity. In the last two decades, several researchers discovered the newer spirocidal agents found with a high therapeutic profile. But there is no review concerning recent research discoveries of spirocidal agents. Hence, an attempt had been made on the latest research findings (2007–2019) of newly synthesised/natural compounds of spirocidal agents used for the prevention and treatment of leptospirosis. To the best of our knowledge, the current review has completely analysed the treatment of leptospirosis and furnished the newer spirocidal agents such as occurrence, method of preparation and effect of these agents against spirochete bacteria and compared their activity against the standard drugs. It is the right time to consider the newer spirocidal agents for the treatment of leptospirosis because of better efficacy, least resistance and less toxicity.

Keywords Leptospirosis · Treatment · Recent research findings · Spirocidal agent

Background

In recent years, many people around the world are infected with leptospirosis and have been emerging as an important health issue [1, 2]. Leptospirosis is known to be endemic in India since the early twentieth century with most outbreaks reported from the coastal regions of the Indian peninsula and the Andaman Islands [3]. The disease was first described as an acute infectious disease with enlargement of the spleen, myalgia, jaundice, tissue haemorrhage, renal failure and nephritis by Adolf Weil [4]. Even before the description of Weil's, the disease was known as rice field jaundice in China, cane-cutter's disease in Europe and Australia, autumn fever and 7-day fever in Japan, and swineherd's disease and Sclammfieber (mud fever) in Europe and Australia [5]. Occupation with exposure to water and animal has a high risk of acquiring this disease [6, 7]. Therefore, the people who live with health hazards in the working atmosphere such as veterinarians, slaughterhouse worker, farmers, countryside rangers, sailor in rivers, waste disposal facility workers, sewer maintenance worker and people who work on a derelict building are at high risk for this disease [8, 9]. It is caused by pathogenic spirochete bacteria in the genus of *Leptospira* (Fig. 1) and is endemic in tropical and sub-tropical regions and distributed worldwide [10–13]. There are twenty-one species of *Leptospira* identified so far, in which nine of them are set to be pathogens [14, 15]. The bacteria mainly spread through the urine of the infected rat, skunks, opossums, foxes, raccoons

This article is part of the Topical Collection on *Medicine*

✉ Chandravadivelu Gopi
gopi@giet.ac.in

Chitikina Satya Sri
satyasri.pharmacy@gmail.com

Gudapati Krupamai
g.krupamai@gmail.com

A Ramamoorthy Magesh
armagesh@yahoo.co.in

Magharla Dasaratha Dhanaraju
mddhanaraju@yahoo.com

[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[2] Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[3] Director, Research lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

Published online: 27 February 2021

SN Comprehensive Clinical Medicine
https://doi.org/10.1007/s42399-021-00833-3

MEDICINE

SN

Recent Progress in the Treatment of Leptospirosis

Chandravadivelu Gopi[1] · Chitikina Satya Sri[1] · Gudapati Krupamai[1] · A Ramamoorthy Magesh[2] · Magharla Dasaratha Dhanaraju[3]

Accepted: 21 February 2021

Abstract

Leptospirosis is an acute anthropozoonotic infection that affects humans and animals in the last few decades due to being seriously neglected by countries located in a temperate climatic zone. The disease is often related to occupation. Therefore, the prevalence of the disease is much higher in males than in females. The usage of existing antibiotics is effective for the treatment of leptospirosis but with accompanying toxicity. In the last two decades, several researchers discovered the newer spirocidal agents found with a high therapeutic profile. But there is no review concerning recent research discoveries of spirocidal agents. Hence, an attempt had been made on the latest research findings (2007–2019) of newly synthesised/natural compounds of spirocidal agents used for the prevention and treatment of leptospirosis. To the best of our knowledge, the current review has completely analysed the treatment of leptospirosis and furnished the newer spirocidal agents such as occurrence, method of preparation and effect of these agents against spirochete bacteria and compared their activity against the standard drugs. It is the right time to consider the newer spirocidal agents for the treatment of leptospirosis because of better efficacy, least resistance and less toxicity.

Keywords Leptospirosis · Treatment · Recent research findings · Spirocidal agent

Background

In recent years, many people around the world are infected with leptospirosis and have been emerging as an important health issue [1, 2]. Leptospirosis is known to be endemic in India since the early twentieth century with most outbreaks reported from the coastal regions of the Indian peninsula and the Andaman Islands [3]. The disease was first described as an acute infectious disease with enlargement of the spleen, myalgia, jaundice, tissue haemorrhage, renal failure and nephritis by Adolf Weil [4]. Even before the description of Weil's, the disease was known as rice field jaundice in China, cane-cutter's disease in Europe and Australia, autumn fever and 7-day fever in Japan, and swineherd's disease and Sclammfieber (mud fever) in Europe and Australia [5]. Occupation with exposure to water and animal has a high risk of acquiring this disease [6, 7]. Therefore, the people who live with health hazards in the working atmosphere such as veterinarians, slaughterhouse worker, farmers, countryside rangers, sailor in rivers, waste disposal facility workers, sewer maintenance worker and people who work on a derelict building are at high risk for this disease [8, 9]. It is caused by pathogenic spirochete bacteria in the genus of *Leptospira* (Fig. 1) and is endemic in tropical and sub-tropical regions and distributed worldwide [10–13]. There are twenty-one species of *Leptospira* identified so far, in which nine of them are set to be pathogens [14, 15]. The bacteria mainly spread through the urine of the infected rat, skunks, opossums, foxes, raccoons

This article is part of the Topical Collection on *Medicine*

✉ Chandravadivelu Gopi
gopi@giet.ac.in

Chitikina Satya Sri
satyasri.pharmacy@gmail.com

Gudapati Krupamai
g.krupamai@gmail.com

A Ramamoorthy Magesh
armagesh@yahoo.co.in

Magharla Dasaratha Dhanaraju
mddhanaraju@yahoo.com

[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[2] Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[3] Director, Research lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

Published online: 27 February 2021

SN Comprehensive Clinical Medicine
https://doi.org/10.1007/s42399-021-00833-3

MEDICINE

SN

Recent Progress in the Treatment of Leptospirosis

Chandravadivelu Gopi[1] · Chitikina Satya Sri[1] · Gudapati Krupamai[1] · A Ramamoorthy Magesh[2] · Magharla Dasaratha Dhanaraju[3]

Accepted: 21 February 2021

Abstract

Leptospirosis is an acute anthropozoonotic infection that affects humans and animals in the last few decades due to being seriously neglected by countries located in a temperate climatic zone. The disease is often related to occupation. Therefore, the prevalence of the disease is much higher in males than in females. The usage of existing antibiotics is effective for the treatment of leptospirosis but with accompanying toxicity. In the last two decades, several researchers discovered the newer spirocidal agents found with a high therapeutic profile. But there is no review concerning recent research discoveries of spirocidal agents. Hence, an attempt had been made on the latest research findings (2007–2019) of newly synthesised/natural compounds of spirocidal agents used for the prevention and treatment of leptospirosis. To the best of our knowledge, the current review has completely analysed the treatment of leptospirosis and furnished the newer spirocidal agents such as occurrence, method of preparation and effect of these agents against spirochete bacteria and compared their activity against the standard drugs. It is the right time to consider the newer spirocidal agents for the treatment of leptospirosis because of better efficacy, least resistance and less toxicity.

Keywords Leptospirosis · Treatment · Recent research findings · Spirocidal agent

Background

In recent years, many people around the world are infected with leptospirosis and have been emerging as an important health issue [1, 2]. Leptospirosis is known to be endemic in India since the early twentieth century with most outbreaks reported from the coastal regions of the Indian peninsula and the Andaman Islands [3]. The disease was first described as an acute infectious disease with enlargement of the spleen, myalgia, jaundice, tissue haemorrhage, renal failure and nephritis by Adolf Weil [4]. Even before the description of Weil's, the disease was known as rice field jaundice in China, cane-cutter's disease in Europe and Australia, autumn fever and 7-day fever in Japan, and swineherd's disease and Sclammfieber (mud fever) in Europe and Australia [5]. Occupation with exposure to water and animal has a high risk of acquiring this disease [6, 7]. Therefore, the people who live with health hazards in the working atmosphere such as veterinarians, slaughterhouse worker, farmers, countryside rangers, sailor in rivers, waste disposal facility workers, sewer maintenance worker and people who work on a derelict building are at high risk for this disease [8, 9]. It is caused by pathogenic spirochete bacteria in the genus of *Leptospira* (Fig. 1) and is endemic in tropical and sub-tropical regions and distributed worldwide [10–13]. There are twenty-one species of *Leptospira* identified so far, in which nine of them are set to be pathogens [14, 15]. The bacteria mainly spread through the urine of the infected rat, skunks, opossums, foxes, raccoons

This article is part of the Topical Collection on *Medicine*

✉ Chandravadivelu Gopi
gopi@giet.ac.in

Chitikina Satya Sri
satyasri.pharmacy@gmail.com

Gudapati Krupamai
g.krupamai@gmail.com

A Ramamoorthy Magesh
armagesh@yahoo.co.in

Magharla Dasaratha Dhanaraju
mddhanaraju@yahoo.com

[1] Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[2] Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

[3] Director, Research lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

Published online: 27 February 2021

IJPSR (2021), Volume 12, Issue 1 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 24 December 2019; received in revised form, 24 May 2020; accepted, 11 July 2020; published 01 January 2021

DEVELOPMENT AND VALIDATION OF A NEW HPLC METHOD FOR THE DETECTION OF SONIDEGIB IN MOBILE PHASE AND HUMAN PLASMA

Kumar Raja Jayavarapu [1], S. Parimalakrishnan [*1] and V. D. Sundar [2]

Department of Pharmacy [1], Annamalai University, Annamalai Nagar - 608002, Tamil Nadu, India.

GIET School of Pharmacy [2], Chaitanya Knowledge City, Rajahmundry - 533296, Andhra Pradesh, India.

Keywords:

Sonidegib, HPLC, Mobile phase, Human Plasma, Linearity, Method validation

Correspondence to Author:
Dr. S. Parimalakrishnan

Associate Professor, Department of Pharmacy, Annamalai University, Annamalai Nagar - 608002, Tamil Nadu, India.

E-mail: drparimalakrishnan@gmail.com

ABSTRACT: The main aim of the present research work is to develop a sensitive, precise and accurate HPLC (High-Performance Liquid Chromatography) procedure for the selective estimation of sonidegib in both human plasma and mobile phase. An isocratic separation of sonidegib through a 5µ Zorbax C-18 analytical column with the dimensions of 25 cm × 4.6 mm utilizing mobile phase composition of methanol, water and acetonitrile at a ratio of 10:10:80 v/v. The detection of the analyte was processed at the maximum wavelength of 254 nm and with 1 ml/min flow of the mobile phase. The drug was eluted from the column at the retention time of 3.6 min in plasma samples and 4.81 min in movable phase. Five variable concentration levels of 5, 10, 15, 20, and 25 µg/ml were used for the estimation of recovery and linearity. The recovery findings were 5.03, 9.93, 14.96, 20.14, and 24.91 µg/ml, respectively, for Sonidegib in the mobile phase. Similarly, 6 concentration levels of 20, 40, 200, 400, 800, and 1200 µg/ml were utilized for recovery study, and the findings were 20.15, 40.21, 199.62, 398.16, 798.81 and 1197.28 µg/ml respectively for Sonidegib in plasma. The % RSD findings were found to be <2%, and the correlation coefficient was more than 0.999. The developed method can be useful in bioavailability and bioequivalence studies.

INTRODUCTION: Sonidegib chemically designated as *N*-[6-[(2*S*,6*R*) -2,6-Dimethylmorpholin -4-yl]pyridin-3-yl]- 2- methyl-3-[4-(trifluoromethoxy) phenyl] benzamide with molecular formula of $C_{26}H_{26}F_3N_3O_3$ and molecular weight of 485.498 g/mol. It is utilized to treat basal cell carcinoma, which has relapsed radiation therapy or after surgery in adult patients. It effectively obstructs the regulator called smoothened (SMO), inhibiting the hedgehog path from functioning. As a consequence, cancers that depend on the hedgehog path were incapable of grow [1-3].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.12(1).547-53

This article can be accessed online on www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.12(1).547-53

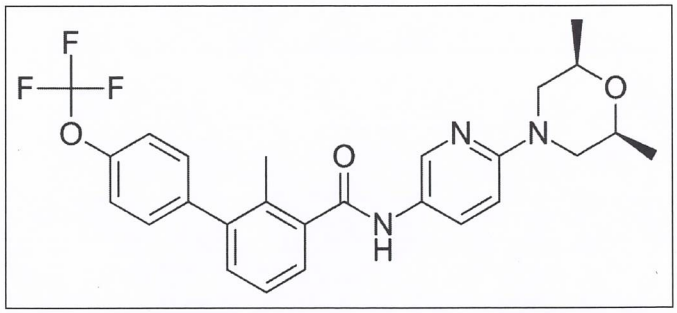


FIG. 1: CHEMICAL STRUCTURE OF SONIDEGIB

Journal of Applied Pharmaceutical Science Vol. 11(05), pp 071-078, May, 2021
Available online at http://www.japsonline.com
DOI: 10.7324/JAPS.2021.110510
ISSN 2231-3354

Method development and validation of LC–ESI–MS/MS method for the quantification of sonidegib in healthy rabbits

Vankayala Devendiran Sundar[1]*, Kumar Raja Jayavarapu[2], Parimala Krishnan[2]
[1]Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[2]Department of Pharmacy, Annamalai University, Annamalainagar, Tamilnadu, India.

ARTICLE INFO

Received on: 08/11/2020
Accepted on: 02/02/2021
Available online: 05/05/2021

Key words:
Sonidegib, basal cell carcinoma, LC–ESI–MS/MS, pharmacokinetics, precision and accuracy.

ABSTRACT

A new, specific, and precise liquid chromatography–electrospray ionization–tandem mass spectrometric (LC–ESI–MS/MS) technique was established and validated for the quantitation of sonidegib in plasma. The established procedure was applied to the pharmacokinetic study in rabbits. Chromatographic separation was achieved on Phenomenex-C_{18} (50 × 4 mm) 5-µm column and on methanol, acetonitrile and 0.1% formic acid (25:60:15 by volume) mixture as a movable phase monitored at a flow rate of 0.70 ml/minutes. Sonidegib and gliquidone internal standard were noted at *m/z* 486.2/191.1 and *m/z* 528.5/403.4, respectively. Sonidegib and gliquidone were extracted with liquid–liquid extraction. The developed procedure was linear in the concentration range of 103–1,545 ng/ml. The method was validated with intrabatch and interbatch precision and accuracy within 1.54%–7.18%, 1.82%–6.25%, 98.56%–102.80%, and 97.62%–102.76%, respectively. The technique was applied for the successful examination of the rabbit plasma sample for application in the pharmacokinetic study. This study was carried out on rabbits; the drug showed that T_{max} was 3.833 hours, C_{max} was 677.667 ± 19.81 ng/ml, and $AUC_{0\to t}$ was 6,213.58 ± 235.4. The established technique was utilized in the regular examination of sonidegib in biological matrices with a high level of accuracy and precision.

INTRODUCTION

Sonidegib is used to treat advanced basal cell carcinoma in adult patients who have persisted post-surgery or radiation therapy. Many human cancers are due to hedgehog (Hh) pathway, but Sonidegib efficiently obstructs the controller called smoothened (SMO), inhibiting the hedgehog pathway from functioning. As a consequence, cancers that depend on the hedgehog path are incapable of growth (Einolf *et al*., 2017; Fendrich *et al*., 2011; Pan *et al*., 2010). The drug prevents the transmembrane protein called SMO which plays a significant role in Hh signal transduction. This results in the prevention of Hh signaling and anti-tumor activity in several animal models. Sonidegib is chemically designated as *N*-[6-[(2*S*,6*R*)-2,6-dimethylmorpholin-4-yl]pyridin-3-yl]-2-methyl-3[4(trifluoromethoxy)phenyl] benzamide with a molecular formula of $C_{26}H_{26}F_3N_3O_3$ and a molecular weight of 485.498 g/mol (Fig. 1) (Burness, 2015). Sonidegib shows low absorption, which is widely distributed and is slowly metabolized. The study of the absorbed drug was ensued largely by hydrolytic and oxidative metabolism (Zollinger *et al*., 2014). The hedgehog pathway action (as estimated by glioma-associated oncogene-1 expression) was noted at baseline in men with localized high-risk prostate cancer. Sonidegib penetrates into the prostatic tissue and induces a >60-

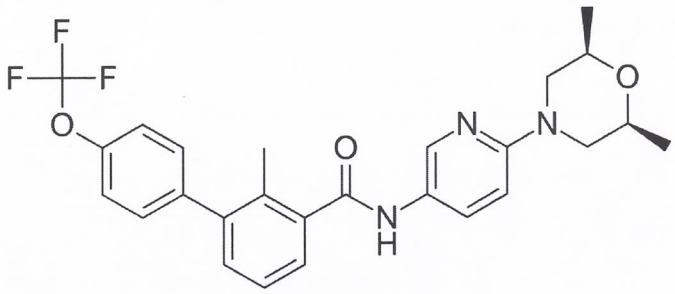


Figure 1. Sonidegib's structure.

*Corresponding Author
Vankayala Devendiran Sundar, Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India. E-mail: sundarvd @ yahoo.co.in

Research J. Pharm. and Tech. 14(12): December 2021

ISSN 0974-3618 (Print)
0974-360X (Online)

www.rjptonline.org

RJPT Research Journal of Pharmacy and Technology

RESEARCH ARTICLE

In vitro Antioxidant activity and Phytochemical composition of *Syringodium isoetifolium*

P. Kalaivani [1], D. Kavitha [1,2], P. Amudha [1]*

[1]Department of Biochemistry, Vels Institute of Science, Technology and Advanced Studies, Pallavaram, Chennai, Tamilnadu - 600117, India.

[2]GIET School of Pharmacy, NH-16,Chaitanya knowledge City, Rajamundry, Andhra Pradesh - 533296, India.

*Corresponding Author E-mail: **amudhaa85@gmail.com**

ABSTRACT:

Seagrass are the marine flowering plants found mainly in clear, shallow estuaries and coastal waters. In all temperate and trophical region seagrasses grow both internally and subtidally. One such seagrass namely *Syringodium isoetifolium* has many medicinal properities. This seagrass have most promising pharmacological activities which may include anti-inflammatory, anticancer, antidiarrheal, antihaemorrhoidal activities. This study is focussed on the phytochemical evaluation and *in vitro* antioxidant activity of aqueous, ethanol and hydroalcoholic extract of *Syringodium isoetifolium.* The qualitative analysis of *Syringodium isoetifolium* shows the presence of tannin, saponin, flavonoids, steroids, terpenoids, alkaloids, anthraquinone, polyphenol and coumarin. In all the three extracts only ethanol shows the high concentration of phytocompounds. Emodins, glycoside and anthocyanin were found to be absent in all the three extracts. Quantitative analysis of total phenol, flavonoid, saponin and tannin were found to be 193.10 ±13.52, 106.11 ± 7.42, 52.96 ± 3.64 and 81.30 ± 5.69. Superoxide anion radical, Nitric oxide and Hydroxy radical scavenging assay showed that *Syringodium isoetifolium* was an excellent scavenger of these radicals. These results are an indication of the potent antioxidant property of the extract and may be responsible for some of the therapeutic uses of *Syringodium isoetifolium.*

KEYWORDS: *Syringodium isoetifolium,* ethanol extract, Phytochemical, antioxidant property, free radical scavenger, anticancer activity.

INTRODUCTION:

Many developing countries, including India cure various diseases by these medicinal herbs[1]. These herbs were considered to be a folkoric medicine from the ancient times which has ability to treat neurological disorders, acts as an antidiabetic agent, also shows anti-inflammatory activity[2].

Nowadays herbs play an important role due to its high medicinal value and around 2500 herbs were found all over India[3]. Herbal plants naturally cures the liver diseases due to its antioxidant activity, hence it has ability to heal the damaged liver[4]. Since herbs have high medicinal value, it may cure diseases without any side effects; hence they found to be safe and effective.

Received on 02.06.2020 Modified on 18.12.2020
Accepted on 06.03.2021
Research J. Pharm.and Tech 2021; 14(12):6201-6206.
DOI: 10.52711/0974-360X.2021.01073

Traditional plants have the medicinal plants as its backbone[5]. Recent investigation shows that the medicinal plants also used in treating asthma, high blood pressure, heart diseases and other health issues[6]. Marine plants are the natural products which show high anticancer activity[7]. A unique group of marine plants namely seagrass located fully in submerged sea. Seagrass exist as a food source for sea animals which may include manatees, green sea turtles and dugongs[8]. In ecosystem, seagrass plays an important role in the biogeochemical process. This seagrass distribution declines nowadays because of natural calamities[9]. If the concentration of sea level increases, it may greatly affects the growth of seagrass. Seawater pollution because of human being is another cause for seagrass decline[10]. Seagrass productivity may be controlled by the abiotic and biotic factors; probably seagrass growth can be controlled by the effect of light, inorganic nutrients, temperature of species[11]. Seagrass can be used as potential drugs, since it has medicinal importance[12].

Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

DerPharmaChemica, 2021, 13(5): 18-25
(http://www.derpharmachemica.com/archive.html)

Development of Visible Spectrophotometric Methods for the Determination of Ranolazine in Bulk and Pharmaceutical Dosage Form

Magesh AR*, Kavitha D and Dhanaraju MD

Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294

***Corresponding author:** Magesh AR, Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294;
E-mail:armagesh09@gmail.com

ABSTRACT

Two precise, accurate and simple visible spectrophotometric methods were developed for the determination of Ranolazine in bulk drug and in pharmaceutical dosage form. The proposed methods were based on determination of ranolazine after its reaction with 3-Methyl-2-benzothiazolinone hydrazine hydrochloride and potassium dichromate and measuring the chromogen at the λmax at 661 and 432, respectively. Beer's law obeyed in the concentration range of 50-150 µg/ml for Method A and 25-125 µg/ml for Method B. The accuracy of the methods was calculated by performing recovery studies. The methods were found to be simple, economical, accurate and reproducible and can be used for routine analysis of Ranolazine in bulk drug and in pharmaceutical formulations.

Keywords: Ranolazine, UV-Vis Spectrophotometry, MBTH

INTRODUCTION

Ranolazineis an antianginal drug and chemically it is (±)-N-(2,6-dimethylphenyl)-4- [2-hydroxy-3-(2-methoxyphenoxy) propyl]-1-piperazine acetamide or Its enantiomers (R)-(+)-N-(2,6-dimethylphenyl)- 4- [2-hydroxy-3-(2- methoxyphenoxy)-propyl]-1 –piperazineacetamide [1-4] (Figure 1)

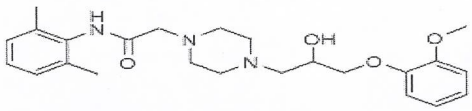


Figure 1: Structure of Ranolazine Hydrochloride

Very few spectrophotometric methods have been previously reported for the determination of Ranolazine hydrochloride in pharmaceutical dosage forms [5-10]. Other techniques reported for the assay of Ranolazine in pharmaceuticals include HPLC [11-13] and LC-MS [14-18].

Spectrophotometric methods are the most suitable methods because of their inherent simplicity, high sensitivity, low cost and extensive availability in quality control laboratories. Unfortunately, the spectrophotometric methods that have been published for the estimation of Ranolazine in their pharmaceutical formulations were associated with some disadvantages such as lack of sensitivity and also lacking in evaluating the most of the analytical method validation parameters as per ICH guidelines. Also, the reported methods have mainly emphasised on UV methods and only one visible method have been reported which utilised a reagent which has the capability to degrade the drug fast. Hence the present work was aimed in fulfilling the analytical method parameters for the developed method which is an evidence for the selectivity of the proposed method and also concentrated on incorporating statistical data's wherever necessary which indicates the novelty of the developed method.
Furthermore, utilisation of suitable stable reagent was employed in the present study which makes an efficient analytical method for the selected drug formulation.

Table 1 represents comparison of Ranolazine estimation in the present work and other published methods. The main aim of the present work is to develop simple, rapid, reliable and precise, accurate and economical methods for the estimation of Ranolazine in bulk and in Pharmaceutical dosage form by simple colorimetry using 3-Methyl-2- benzothiazolinone hydrazine and Potassium dichromate.

Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

DerPharmaChemica, 2021, 13(5): 18-25
(http://www.derpharmachemica.com/archive.html)

Development of Visible Spectrophotometric Methods for the Determination of Ranolazine in Bulk and Pharmaceutical Dosage Form

Magesh AR*, Kavitha D and Dhanaraju MD

Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294

***Corresponding author:** Magesh AR, Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294;
E-mail:armagesh09@gmail.com

ABSTRACT

Two precise, accurate and simple visible spectrophotometric methods were developed for the determination of Ranolazine in bulk drug and in pharmaceutical dosage form. The proposed methods were based on determination of ranolazine after its reaction with 3-Methyl-2-benzothiazolinone hydrazine hydrochloride and potassium dichromate and measuring the chromogen at the λmax at 661 and 432, respectively. Beer's law obeyed in the concentration range of 50-150 µg/ml for Method A and 25-125 µg/ml for Method B. The accuracy of the methods was calculated by performing recovery studies. The methods were found to be simple, economical, accurate and reproducible and can be used for routine analysis of Ranolazine in bulk drug and in pharmaceutical formulations.

Keywords: Ranolazine, UV-Vis Spectrophotometry, MBTH

INTRODUCTION

Ranolazineis an antianginal drug and chemically it is (±)-N-(2,6-dimethylphenyl)-4- [2-hydroxy-3-(2-methoxyphenoxy) propyl]-1-piperazine acetamide or Its enantiomers (R)-(+)-N-(2,6-dimethylphenyl)- 4- [2-hydroxy-3-(2- methoxyphenoxy)-propyl]-1 –piperazineacetamide [1-4] (Figure 1)

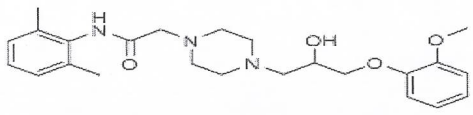


Figure 1: Structure of Ranolazine Hydrochloride

Very few spectrophotometric methods have been previously reported for the determination of Ranolazine hydrochloride in pharmaceutical dosage forms [5-10]. Other techniques reported for the assay of Ranolazine in pharmaceuticals include HPLC [11-13] and LC-MS [14-18].

Spectrophotometric methods are the most suitable methods because of their inherent simplicity, high sensitivity, low cost and extensive availability in quality control laboratories. Unfortunately, the spectrophotometric methods that have been published for the estimation of Ranolazine in their pharmaceutical formulations were associated with some disadvantages such as lack of sensitivity and also lacking in evaluating the most of the analytical method validation parameters as per ICH guidelines. Also, the reported methods have mainly emphasised on UV methods and only one visible method have been reported which utilised a reagent which has the capability to degrade the drug fast. Hence the present work was aimed in fulfilling the analytical method parameters for the developed method which is an evidence for the selectivity of the proposed method and also concentrated on incorporating statistical data's wherever necessary which indicates the novelty of the developed method.
Furthermore, utilisation of suitable stable reagent was employed in the present study which makes an efficient analytical method for the selected drug formulation.

Table 1 represents comparison of Ranolazine estimation in the present work and other published methods. The main aim of the present work is to develop simple, rapid, reliable and precise, accurate and economical methods for the estimation of Ranolazine in bulk and in Pharmaceutical dosage form by simple colorimetry using 3-Methyl-2- benzothiazolinone hydrazine and Potassium dichromate.

Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

DerPharmaChemica, 2021, 13(5): 18-25
(http://www.derpharmachemica.com/archive.html)

Development of Visible Spectrophotometric Methods for the Determination of Ranolazine in Bulk and Pharmaceutical Dosage Form

Magesh AR*, Kavitha D and Dhanaraju MD

Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294

***Corresponding author:** Magesh AR, Department of Pharmaceutical Analysis, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533294;
E-mail:armagesh09@gmail.com

ABSTRACT

Two precise, accurate and simple visible spectrophotometric methods were developed for the determination of Ranolazine in bulk drug and in pharmaceutical dosage form. The proposed methods were based on determination of ranolazine after its reaction with 3-Methyl-2-benzothiazolinone hydrazine hydrochloride and potassium dichromate and measuring the chromogen at the λmax at 661 and 432, respectively. Beer's law obeyed in the concentration range of 50-150 µg/ml for Method A and 25-125 µg/ml for Method B. The accuracy of the methods was calculated by performing recovery studies. The methods were found to be simple, economical, accurate and reproducible and can be used for routine analysis of Ranolazine in bulk drug and in pharmaceutical formulations.

Keywords: Ranolazine, UV-Vis Spectrophotometry, MBTH

INTRODUCTION

Ranolazineis an antianginal drug and chemically it is (±)-N-(2,6-dimethylphenyl)-4- [2-hydroxy-3-(2-methoxyphenoxy) propyl]-1-piperazine acetamide or Its enantiomers (R)-(+)-N-(2,6-dimethylphenyl)- 4- [2-hydroxy-3-(2- methoxyphenoxy)-propyl]-1 –piperazineacetamide [1-4] (Figure 1)

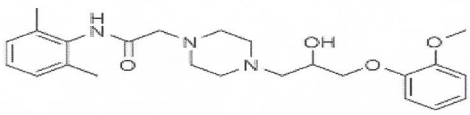


Figure 1: Structure of Ranolazine Hydrochloride

Very few spectrophotometric methods have been previously reported for the determination of Ranolazine hydrochloride in pharmaceutical dosage forms [5-10]. Other techniques reported for the assay of Ranolazine in pharmaceuticals include HPLC [11-13] and LC-MS [14-18].

Spectrophotometric methods are the most suitable methods because of their inherent simplicity, high sensitivity, low cost and extensive availability in quality control laboratories. Unfortunately, the spectrophotometric methods that have been published for the estimation of Ranolazine in their pharmaceutical formulations were associated with some disadvantages such as lack of sensitivity and also lacking in evaluating the most of the analytical method validation parameters as per ICH guidelines. Also, the reported methods have mainly emphasised on UV methods and only one visible method have been reported which utilised a reagent which has the capability to degrade the drug fast. Hence the present work was aimed in fulfilling the analytical method parameters for the developed method which is an evidence for the selectivity of the proposed method and also concentrated on incorporating statistical data's wherever necessary which indicates the novelty of the developed method.
Furthermore, utilisation of suitable stable reagent was employed in the present study which makes an efficient analytical method for the selected drug formulation.

Table 1 represents comparison of Ranolazine estimation in the present work and other published methods. The main aim of the present work is to develop simple, rapid, reliable and precise, accurate and economical methods for the estimation of Ranolazine in bulk and in Pharmaceutical dosage form by simple colorimetry using 3-Methyl-2- benzothiazolinone hydrazine and Potassium dichromate.

Ramachandran et al. Beni-Suef University Journal of Basic and Applied Sciences (2021) 10:30
https://doi.org/10.1186/s43088-021-00120-z

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Evaluation of bone healing activity of *Cissus quadrangularis (Linn), Cryptolepis buchanani,* and *Sardinella longiceps* in Wistar rats

Somasundaram Ramachandran[1*], Laith Fadhil[1], Chandravadivelu Gopi[2], Masa Amala[1] and Magharla Dasaratha Dhanaraju[3]

Abstract

Background: The object of the present study is to evaluate the effect of alcoholic extracts of *Cissus quadrangularis* (CQ), *Cryptolepis buchanani* (CB), and *Sardinella longiceps* (SL) either alone or in the combination (100 mg/kg) in the management of femur bone healing of Wistar albino rats for 8 weeks. After the period of treatment, femur bones were examined by using biochemical, radiographical, and histopathological studies.

Result: Biochemical evaluation results reveal that there is a steep increase of serum calcium level in the experimental animals during the entire period of treatment which led to an adequate supply of serum calcium to the fractured bone for healing and increases the thickness of the femur bones soon compared to control group. It had been estimated by a calibrated ocular micrometer. Radiographical images of the bones also disclose that the complete bridging of fractured bone occurred in the experimental animals after the treatment of natural compound extracts. In addition to that, all the organs of animals were safe in the experimental animals during the entire study.

Conclusion: The present study strongly recommended that these ethanolic extracts (CQCBSL) either alone or in the combination restoring the strength of the bone and reduced bone repairing period due to the rich content of calcium and other natural phytochemicals presents with them.

Keywords: *Cissus quadrangularis*, *Cryptolepis buchanani*, *Sardinella longiceps*, Femur bone healing

1 Background

Bone fracture is known as a breaking of bone with damage of soft tissues surrounding in it [1]. It is a partial or complete break in the continuity of bone occurred when there is an exposure of a high external force or impact on it [2]. Bone fracture is characterized by pain, inflammation, edema, hematoma, breakdown of periosteum, endosteum, and rupture of soft tissues [3]. There is a need to heal the fractured bone to restore the normal anatomy and prevent the chance of an unusual position [4]. Bone healing is the process in which reformation takes place from the fractured bone which consists of three major phases called inflammatory, repair, and remodelling stages [5]. The practice of the synthetic compounds and minerals with NSAID on fractured bones are raising poor compliance among the patient due to severe side-effects such as swelling, reduction in blood flow, color changes in skin and nails, discomfort, pain, nephrotoxicity, gastrointestinal bleeding, delayed blood clotting, and prolongation of treatment [6]. Therefore, there is a necessity of a newer method of treatment required to treat the fractured bone. The recent literature study stated that usage of phytochemicals in the treatment of bone healing offering promising results without side effects and reducing repair period [7]. In this study, we had taken three varieties of natural sources such as

* Correspondence: ramachandran@giet.ac.in
[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Ramachandran et al. Beni-Suef University Journal of Basic and Applied Sciences (2021) 10:30
https://doi.org/10.1186/s43088-021-00120-z

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Evaluation of bone healing activity of *Cissus quadrangularis (Linn), Cryptolepis buchanani,* and *Sardinella longiceps* in Wistar rats

Somasundaram Ramachandran[1*], Laith Fadhil[1], Chandravadivelu Gopi[2], Masa Amala[1] and Magharla Dasaratha Dhanaraju[3]

Abstract

Background: The object of the present study is to evaluate the effect of alcoholic extracts of *Cissus quadrangularis* (CQ), *Cryptolepis buchanani* (CB), and *Sardinella longiceps* (SL) either alone or in the combination (100 mg/kg) in the management of femur bone healing of Wistar albino rats for 8 weeks. After the period of treatment, femur bones were examined by using biochemical, radiographical, and histopathological studies.

Result: Biochemical evaluation results reveal that there is a steep increase of serum calcium level in the experimental animals during the entire period of treatment which led to an adequate supply of serum calcium to the fractured bone for healing and increases the thickness of the femur bones soon compared to control group. It had been estimated by a calibrated ocular micrometer. Radiographical images of the bones also disclose that the complete bridging of fractured bone occurred in the experimental animals after the treatment of natural compound extracts. In addition to that, all the organs of animals were safe in the experimental animals during the entire study.

Conclusion: The present study strongly recommended that these ethanolic extracts (CQCBSL) either alone or in the combination restoring the strength of the bone and reduced bone repairing period due to the rich content of calcium and other natural phytochemicals presents with them.

Keywords: *Cissus quadrangularis*, *Cryptolepis buchanani*, *Sardinella longiceps*, Femur bone healing

1 Background

Bone fracture is known as a breaking of bone with damage of soft tissues surrounding in it [1]. It is a partial or complete break in the continuity of bone occurred when there is an exposure of a high external force or impact on it [2]. Bone fracture is characterized by pain, inflammation, edema, hematoma, breakdown of periosteum, endosteum, and rupture of soft tissues [3]. There is a need to heal the fractured bone to restore the normal anatomy and prevent the chance of an unusual position [4]. Bone healing is the process in which reformation takes place from the fractured bone which consists of three major phases called inflammatory, repair, and remodelling stages [5]. The practice of the synthetic compounds and minerals with NSAID on fractured bones are raising poor compliance among the patient due to severe side-effects such as swelling, reduction in blood flow, color changes in skin and nails, discomfort, pain, nephrotoxicity, gastrointestinal bleeding, delayed blood clotting, and prolongation of treatment [6]. Therefore, there is a necessity of a newer method of treatment required to treat the fractured bone. The recent literature study stated that usage of phytochemicals in the treatment of bone healing offering promising results without side effects and reducing repair period [7]. In this study, we had taken three varieties of natural sources such as

* Correspondence: ramachandran@giet.ac.in
[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Ramachandran et al. Beni-Suef University Journal of Basic and Applied Sciences (2021) 10:30
https://doi.org/10.1186/s43088-021-00120-z

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Evaluation of bone healing activity of *Cissus quadrangularis (Linn), Cryptolepis buchanani,* and *Sardinella longiceps* in Wistar rats

Somasundaram Ramachandran[1*], Laith Fadhil[1], Chandravadivelu Gopi[2], Masa Amala[1] and Magharla Dasaratha Dhanaraju[3]

Abstract

Background: The object of the present study is to evaluate the effect of alcoholic extracts of *Cissus quadrangularis* (CQ), *Cryptolepis buchanani* (CB), and *Sardinella longiceps* (SL) either alone or in the combination (100 mg/kg) in the management of femur bone healing of Wistar albino rats for 8 weeks. After the period of treatment, femur bones were examined by using biochemical, radiographical, and histopathological studies.

Result: Biochemical evaluation results reveal that there is a steep increase of serum calcium level in the experimental animals during the entire period of treatment which led to an adequate supply of serum calcium to the fractured bone for healing and increases the thickness of the femur bones soon compared to control group. It had been estimated by a calibrated ocular micrometer. Radiographical images of the bones also disclose that the complete bridging of fractured bone occurred in the experimental animals after the treatment of natural compound extracts. In addition to that, all the organs of animals were safe in the experimental animals during the entire study.

Conclusion: The present study strongly recommended that these ethanolic extracts (CQCBSL) either alone or in the combination restoring the strength of the bone and reduced bone repairing period due to the rich content of calcium and other natural phytochemicals presents with them.

Keywords: *Cissus quadrangularis*, *Cryptolepis buchanani*, *Sardinella longiceps*, Femur bone healing

1 Background

Bone fracture is known as a breaking of bone with damage of soft tissues surrounding in it [1]. It is a partial or complete break in the continuity of bone occurred when there is an exposure of a high external force or impact on it [2]. Bone fracture is characterized by pain, inflammation, edema, hematoma, breakdown of periosteum, endosteum, and rupture of soft tissues [3]. There is a need to heal the fractured bone to restore the normal anatomy and prevent the chance of an unusual position [4]. Bone healing is the process in which reformation takes place from the fractured bone which consists of three major phases called inflammatory, repair, and remodelling stages [5]. The practice of the synthetic compounds and minerals with NSAID on fractured bones are raising poor compliance among the patient due to severe side-effects such as swelling, reduction in blood flow, color changes in skin and nails, discomfort, pain, nephrotoxicity, gastrointestinal bleeding, delayed blood clotting, and prolongation of treatment [6]. Therefore, there is a necessity of a newer method of treatment required to treat the fractured bone. The recent literature study stated that usage of phytochemicals in the treatment of bone healing offering promising results without side effects and reducing repair period [7]. In this study, we had taken three varieties of natural sources such as

* Correspondence: ramachandran@giet.ac.in
[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296; (A.P.

Ramachandran et al. Beni-Suef University Journal of Basic and Applied Sciences (2021) 10:30
https://doi.org/10.1186/s43088-021-00120-z

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Evaluation of bone healing activity of *Cissus quadrangularis (Linn), Cryptolepis buchanani,* and *Sardinella longiceps* in Wistar rats

Somasundaram Ramachandran[1*], Laith Fadhil[1], Chandravadivelu Gopi[2], Masa Amala[1] and Magharla Dasaratha Dhanaraju[3]

Abstract

Background: The object of the present study is to evaluate the effect of alcoholic extracts of *Cissus quadrangularis* (CQ), *Cryptolepis buchanani* (CB), and *Sardinella longiceps* (SL) either alone or in the combination (100 mg/kg) in the management of femur bone healing of Wistar albino rats for 8 weeks. After the period of treatment, femur bones were examined by using biochemical, radiographical, and histopathological studies.

Result: Biochemical evaluation results reveal that there is a steep increase of serum calcium level in the experimental animals during the entire period of treatment which led to an adequate supply of serum calcium to the fractured bone for healing and increases the thickness of the femur bones soon compared to control group. It had been estimated by a calibrated ocular micrometer. Radiographical images of the bones also disclose that the complete bridging of fractured bone occurred in the experimental animals after the treatment of natural compound extracts. In addition to that, all the organs of animals were safe in the experimental animals during the entire study.

Conclusion: The present study strongly recommended that these ethanolic extracts (CQCBSL) either alone or in the combination restoring the strength of the bone and reduced bone repairing period due to the rich content of calcium and other natural phytochemicals presents with them.

Keywords: *Cissus quadrangularis*, *Cryptolepis buchanani*, *Sardinella longiceps*, Femur bone healing

1 Background

Bone fracture is known as a breaking of bone with damage of soft tissues surrounding in it [1]. It is a partial or complete break in the continuity of bone occurred when there is an exposure of a high external force or impact on it [2]. Bone fracture is characterized by pain, inflammation, edema, hematoma, breakdown of periosteum, endosteum, and rupture of soft tissues [3]. There is a need to heal the fractured bone to restore the normal anatomy and prevent the chance of an unusual position [4]. Bone healing is the process in which reformation takes place from the fractured bone which consists of three major phases called inflammatory, repair, and remodelling stages [5]. The practice of the synthetic compounds and minerals with NSAID on fractured bones are raising poor compliance among the patient due to severe side-effects such as swelling, reduction in blood flow, color changes in skin and nails, discomfort, pain, nephrotoxicity, gastrointestinal bleeding, delayed blood clotting, and prolongation of treatment [6]. Therefore, there is a necessity of a newer method of treatment required to treat the fractured bone. The recent literature study stated that usage of phytochemicals in the treatment of bone healing offering promising results without side effects and reducing repair period [7]. In this study, we had taken three varieties of natural sources such as

* Correspondence: ramachandran@giet.ac.in
[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 12, Issue, 09 (C), pp. 43106-43109, September, 2021

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

A COMPARATIVE STUDY OF DYEING EFFICIENCY AND RETENTION CAPACITY OF FORMULATED POLYHERBAL HAIR DYE

Surya A., Deepan T*., Alekhya V and Dhanaraju M.D

GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

DOI: http://dx.doi.org/10.24327/ijrsr.2021.1209.6216

ARTICLE INFO

Article History:

Received 12th June, 2021
Received in revised form 23rd July, 2021
Accepted 7th August, 2021
Published online 28th September, 2021

Keywords:

Herbal hair dye, Patch test, Phytochemical

ABSTRACT

The weakness of every human being irrespective of their gender is to look beautiful. It has been started as ancient as from the origin of human being. Hair plays an important role in beautification. Greying of hair is the world's major concern so people practiced for hair dyeing or hair colouring to change the colour of the hair. But due to hinderances by the present marketed synthetic hair dyes, herbal hair dyes came to demand. In present research work we have been focussed on dyeing efficiency and retention capacity of formulated poly herbal hair dye. As most of the herbal hair dyes have poor retention capacity this composition provides a non-toxic way to colour the hair which also maintains hair glint and supplement that add natural beauty to hair. The used ingredients are evaluated for various parameters such as patch test, physiochemical and phytoconstituents. The results shows herbal dye can be used as alternative for synthetic dye irrespective of any side effect.

INTRODUCTION

The hair is a complex structure contains shaft and root. Hair root is underneath portion of hair that functions with dermal papilla, hair bulb, arrectopili, sebaceous glands which are used in the formation and nourishment of hair. Hair shaft is projected outward portion which contains outer cuticle that bears shingle like cells meant for protection. Middle layer cortex provides strength, colour and texture of hair while it also consists of hair blackening pigment called melanin which exists in two forms as Eumelanin that imparts brown and black colour & Pheomelanin that produces yellow, blonde, red colours and white colour in case of absence of any of these pigments. Innermost layer medulla comprises of round cells[1]

Hair colour an indicator of youthfulness and beauty, but greying of hair is a natural phenomenon or due to many reasons like environmental pollution, hereditary, stress or climatic conditions. Hence to maintain the elegancy of hair, dyeing becomes essential aspect[2]. Usually, a dye can be described as a coloured substance that has an affinity to impart colour to fibre, fur or hair. The dye is generally applied as aqueous or like semisolid substance, which may require a mordant to improve the fastness of dye on hair. Natural dyes also referred as mordant dyes. Different mordant will give different shade with same dye. Thus, mordant can be defined as an agent which allows a reaction to occur between dye and hair.

Corresponding author:* **Deepan T
GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

The increased demand reshaped the cosmetic industry, to dump various artificial and semi synthetic products in to the market. They got good attention because of their high efficacy as they penetrate the hard cuticle layer, thus high colour retention is achieved[3]. The preparations of synthetic and semi synthetic hair dye composed of chemicals such as ammonia, hydrogen peroxide, irritants like sodium lauryl sulphate, resorcinol, ethanolamine, paraben, lead acetate and mostly p-phenylene diamine of about 25%, posing multiple dangerous contrary effects like hypersensitive reactions, breast, bladder and skin cancers, reproductive abnormalities by EDCs (resorcinol, paraben), skin irritation, erythema, loss or hair, damage etc[4-6]

To overcome these adverse effects herbal formulations are highlighted. This taken us a way to formulate an herbal hair dye. Herbs like madayantika, bhringraj, nilika, bibhitika, walnut, black catechu are known for their hair blackening effects[7]. An ideal hair should be unctuous, have strong roots and should be black while these qualities are satisfied by herbal products and are safe[8]

MATERIALS AND METHODS

In the present work a comparative study of dyeing efficiency and retention capacity of formulated polyherbal hair dye the following ingredients were used.

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 12, Issue, 09 (C), pp. 43106-43109, September, 2021

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

A COMPARATIVE STUDY OF DYEING EFFICIENCY AND RETENTION CAPACITY OF FORMULATED POLYHERBAL HAIR DYE

Surya A., Deepan T*., Alekhya V and Dhanaraju M.D

GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

DOI: http://dx.doi.org/10.24327/ijrsr.2021.1209.6216

ARTICLE INFO

Article History:

Received 12th June, 2021
Received in revised form 23rd July, 2021
Accepted 7th August, 2021
Published online 28th September, 2021

Keywords:

Herbal hair dye, Patch test, Phytochemical

ABSTRACT

The weakness of every human being irrespective of their gender is to look beautiful. It has been started as ancient as from the origin of human being. Hair plays an important role in beautification. Greying of hair is the world's major concern so people practiced for hair dyeing or hair colouring to change the colour of the hair. But due to hinderances by the present marketed synthetic hair dyes, herbal hair dyes came to demand. In present research work we have been focussed on dyeing efficiency and retention capacity of formulated poly herbal hair dye. As most of the herbal hair dyes have poor retention capacity this composition provides a non-toxic way to colour the hair which also maintains hair glint and supplement that add natural beauty to hair. The used ingredients are evaluated for various parameters such as patch test, physiochemical and phytoconstituents. The results shows herbal dye can be used as alternative for synthetic dye irrespective of any side effect.

INTRODUCTION

The hair is a complex structure contains shaft and root. Hair root is underneath portion of hair that functions with dermal papilla, hair bulb, arrectopili, sebaceous glands which are used in the formation and nourishment of hair. Hair shaft is projected outward portion which contains outer cuticle that bears shingle like cells meant for protection. Middle layer cortex provides strength, colour and texture of hair while it also consists of hair blackening pigment called melanin which exists in two forms as Eumelanin that imparts brown and black colour & Pheomelanin that produces yellow, blonde, red colours and white colour in case of absence of any of these pigments. Innermost layer medulla comprises of round cells[1]

Hair colour an indicator of youthfulness and beauty, but greying of hair is a natural phenomenon or due to many reasons like environmental pollution, hereditary, stress or climatic conditions. Hence to maintain the elegancy of hair, dyeing becomes essential aspect[2]. Usually, a dye can be described as a coloured substance that has an affinity to impart colour to fibre, fur or hair. The dye is generally applied as aqueous or like semisolid substance, which may require a mordant to improve the fastness of dye on hair. Natural dyes also referred as mordant dyes. Different mordant will give different shade with same dye. Thus, mordant can be defined as an agent which allows a reaction to occur between dye and hair.

*Corresponding author: **Deepan T**
GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

The increased demand reshaped the cosmetic industry, to dump various artificial and semi synthetic products in to the market. They got good attention because of their high efficacy as they penetrate the hard cuticle layer, thus high colour retention is achieved[3]. The preparations of synthetic and semi synthetic hair dye composed of chemicals such as ammonia, hydrogen peroxide, irritants like sodium lauryl sulphate, resorcinol, ethanolamine, paraben, lead acetate and mostly p-phenylene diamine of about 25%, posing multiple dangerous contrary effects like hypersensitive reactions, breast, bladder and skin cancers, reproductive abnormalities by EDCs (resorcinol, paraben), skin irritation, erythema, loss or hair, damage etc[4-6]

To overcome these adverse effects herbal formulations are highlighted. This taken us a way to formulate an herbal hair dye. Herbs like madayantika, bhringraj, nilika, bibhitika, walnut, black catechu are known for their hair blackening effects[7]. An ideal hair should be unctuous, have strong roots and should be black while these qualities are satisfied by herbal products and are safe[8]

MATERIALS AND METHODS

In the present work a comparative study of dyeing efficiency and retention capacity of formulated polyherbal hair dye the following ingredients were used.

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH 16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296. (AP)

ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 12, Issue, 09 (C), pp. 43106-43109, September, 2021

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

A COMPARATIVE STUDY OF DYEING EFFICIENCY AND RETENTION CAPACITY OF FORMULATED POLYHERBAL HAIR DYE

Surya A., Deepan T*., Alekhya V and Dhanaraju M.D

GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

DOI: http://dx.doi.org/10.24327/ijrsr.2021.1209.6216

ARTICLE INFO

Article History:

Received 12th June, 2021
Received in revised form 23rd July, 2021
Accepted 7th August, 2021
Published online 28th September, 2021

Keywords:

Herbal hair dye, Patch test, Phytochemical

ABSTRACT

The weakness of every human being irrespective of their gender is to look beautiful. It has been started as ancient as from the origin of human being. Hair plays an important role in beautification. Greying of hair is the world's major concern so people practiced for hair dyeing or hair colouring to change the colour of the hair. But due to hinderances by the present marketed synthetic hair dyes, herbal hair dyes came to demand. In present research work we have been focussed on dyeing efficiency and retention capacity of formulated poly herbal hair dye. As most of the herbal hair dyes have poor retention capacity this composition provides a non-toxic way to colour the hair which also maintains hair glint and supplement that add natural beauty to hair. The used ingredients are evaluated for various parameters such as patch test, physiochemical and phytoconstituents. The results shows herbal dye can be used as alternative for synthetic dye irrespective of any side effect.

INTRODUCTION

The hair is a complex structure contains shaft and root. Hair root is underneath portion of hair that functions with dermal papilla, hair bulb, arrectopili, sebaceous glands which are used in the formation and nourishment of hair. Hair shaft is projected outward portion which contains outer cuticle that bears shingle like cells meant for protection. Middle layer cortex provides strength, colour and texture of hair while it also consists of hair blackening pigment called melanin which exists in two forms as Eumelanin that imparts brown and black colour & Pheomelanin that produces yellow, blonde, red colours and white colour in case of absence of any of these pigments. Innermost layer medulla comprises of round cells[1]

Hair colour an indicator of youthfulness and beauty, but greying of hair is a natural phenomenon or due to many reasons like environmental pollution, hereditary, stress or climatic conditions. Hence to maintain the elegancy of hair, dyeing becomes essential aspect[2]. Usually, a dye can be described as a coloured substance that has an affinity to impart colour to fibre, fur or hair. The dye is generally applied as aqueous or like semisolid substance, which may require a mordant to improve the fastness of dye on hair. Natural dyes also referred as mordant dyes. Different mordant will give different shade with same dye. Thus, mordant can be defined as an agent which allows a reaction to occur between dye and hair.

Corresponding author:* **Deepan T
GIET School of Pharmacy, Rajahmundry, Andhrapradesh, India

The increased demand reshaped the cosmetic industry, to dump various artificial and semi synthetic products in to the market. They got good attention because of their high efficacy as they penetrate the hard cuticle layer, thus high colour retention is achieved[3]. The preparations of synthetic and semi synthetic hair dye composed of chemicals such as ammonia, hydrogen peroxide, irritants like sodium lauryl sulphate, resorcinol, ethanolamine, paraben, lead acetate and mostly p-phenylene diamine of about 25%, posing multiple dangerous contrary effects like hypersensitive reactions, breast, bladder and skin cancers, reproductive abnormalities by EDCs (resorcinol, paraben), skin irritation, erythema, loss or hair, damage etc[4-6]

To overcome these adverse effects herbal formulations are highlighted. This taken us a way to formulate an herbal hair dye. Herbs like madayantika, bhringraj, nilika, bibhitika, walnut, black catechu are known for their hair blackening effects[7]. An ideal hair should be unctuous, have strong roots and should be black while these qualities are satisfied by herbal products and are safe[8]

MATERIALS AND METHODS

In the present work a comparative study of dyeing efficiency and retention capacity of formulated polyherbal hair dye the following ingredients were used.

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

A study on the assessment of severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio

Swaapnika M[1], Ramam Sripada[*1], Veerendra Kumar D[1], Vineela K[1], Rama Reddy K[2], Hemanth Kumar Vangala[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Psychiatry, Manasa Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 02 Jun 2020
Revised on: 01 Jul 2020
Accepted on: 12 Aug 2020

Keywords:

Depression,
Lymphocytes,
Neutrophils,
Neutrophil-Lymphocyte Ratio,
Platelets,
Platelet-Lymphocyte Ratio

ABSTRACT

To assess the severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. A total of 186 patients gave their consent to participate in this study. The symptoms and the severity of depression were assessed by using the "Hamilton rating scale for depression" (HAM-D). Blood samples were collected for biochemical analysis and were subjected to measure the values of neutrophils, lymphocytes, platelets, neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. The mean values of neutrophil-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were found to be 1.40 (±0.24), 2.52 (±0.27), 3.53 (±0.3) & 4.39 (±0.3) respectively and it was observed that the values of neutrophil-lymphocyte ratio was increased as the severity of the depression increases (r=0.9995, p=0.0005). The mean values of platelet-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were observed to be 147.21 (±34.25), 217.83 (±12.09), 267.31 (±15.86) & 316.29 (±18.44) respectively and it was found that the values of platelet-lymphocyte ratio was increased as the severity of the depression increases (r=0.9993, p=0.0007). Increase in severity of depression positively correlated with increase in the values of both neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR). Increased values of PLR showed a significant impact when compared to the values of NLR, as more than two third of the patients (71.5%) reported an increased values of PLR beyond their normal range when compared to the increased values of NLR which was just confined to only 4.8% of the study population.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4244

Production and Hosted by

Pharmascope.org

INTRODUCTION

Depression is a mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration (Mossie *et al.*, 2016). Depression is majorly caused by abuse either physically or emotionally, certain medications like corticosteroids, death or loss of loved one, genetical factors, serious illness and substance abuse (Brown and Gershon, 1993; Marcus *et al.*, 2012). According to WHO, about 300 million people are suffering from depression worldwide (Bashar *et al.*, 2019). In severe cases, depres-

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

A study on the assessment of severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio

Swaapnika M[1], Ramam Sripada[*1], Veerendra Kumar D[1], Vineela K[1], Rama Reddy K[2], Hemanth Kumar Vangala[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Psychiatry, Manasa Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 02 Jun 2020
Revised on: 01 Jul 2020
Accepted on: 12 Aug 2020

Keywords:

Depression,
Lymphocytes,
Neutrophils,
Neutrophil-Lymphocyte Ratio,
Platelets,
Platelet-Lymphocyte Ratio

ABSTRACT

To assess the severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. A total of 186 patients gave their consent to participate in this study. The symptoms and the severity of depression were assessed by using the "Hamilton rating scale for depression" (HAM-D). Blood samples were collected for biochemical analysis and were subjected to measure the values of neutrophils, lymphocytes, platelets, neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. The mean values of neutrophil-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were found to be 1.40 (±0.24), 2.52 (±0.27), 3.53 (±0.3) & 4.39 (±0.3) respectively and it was observed that the values of neutrophil-lymphocyte ratio was increased as the severity of the depression increases (r=0.9995, p=0.0005). The mean values of platelet-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were observed to be 147.21 (±34.25), 217.83 (±12.09), 267.31 (±15.86) & 316.29 (±18.44) respectively and it was found that the values of platelet-lymphocyte ratio was increased as the severity of the depression increases (r=0.9993, p=0.0007). Increase in severity of depression positively correlated with increase in the values of both neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR). Increased values of PLR showed a significant impact when compared to the values of NLR, as more than two third of the patients (71.5%) reported an increased values of PLR beyond their normal range when compared to the increased values of NLR which was just confined to only 4.8% of the study population.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4244

Production and Hosted by

Pharmascope.org

INTRODUCTION

Depression is a mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration (Mossie *et al.*, 2016). Depression is majorly caused by abuse either physically or emotionally, certain medications like corticosteroids, death or loss of loved one, genetical factors, serious illness and substance abuse (Brown and Gershon, 1993; Marcus *et al.*, 2012). According to WHO, about 300 million people are suffering from depression worldwide (Bashar *et al.*, 2019). In severe cases, depres-

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

A study on the assessment of severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio

Swaapnika M[1], Ramam Sripada[*1], Veerendra Kumar D[1], Vineela K[1], Rama Reddy K[2], Hemanth Kumar Vangala[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Psychiatry, Manasa Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 02 Jun 2020
Revised on: 01 Jul 2020
Accepted on: 12 Aug 2020

Keywords:

Depression,
Lymphocytes,
Neutrophils,
Neutrophil-Lymphocyte Ratio,
Platelets,
Platelet-Lymphocyte Ratio

ABSTRACT

To assess the severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. A total of 186 patients gave their consent to participate in this study. The symptoms and the severity of depression were assessed by using the "Hamilton rating scale for depression" (HAM-D). Blood samples were collected for biochemical analysis and were subjected to measure the values of neutrophils, lymphocytes, platelets, neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. The mean values of neutrophil-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were found to be 1.40 (±0.24), 2.52 (±0.27), 3.53 (±0.3) & 4.39 (±0.3) respectively and it was observed that the values of neutrophil-lymphocyte ratio was increased as the severity of the depression increases (r=0.9995, p=0.0005). The mean values of platelet-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were observed to be 147.21 (±34.25), 217.83 (±12.09), 267.31 (±15.86) & 316.29 (±18.44) respectively and it was found that the values of platelet-lymphocyte ratio was increased as the severity of the depression increases (r=0.9993, p=0.0007). Increase in severity of depression positively correlated with increase in the values of both neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR). Increased values of PLR showed a significant impact when compared to the values of NLR, as more than two third of the patients (71.5%) reported an increased values of PLR beyond their normal range when compared to the increased values of NLR which was just confined to only 4.8% of the study population.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4244

Production and Hosted by

Pharmascope.org

INTRODUCTION

Depression is a mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration (Mossie *et al.*, 2016). Depression is majorly caused by abuse either physically or emotionally, certain medications like corticosteroids, death or loss of loved one, genetical factors, serious illness and substance abuse (Brown and Gershon, 1993; Marcus *et al.*, 2012). According to WHO, about 300 million people are suffering from depression worldwide (Bashar *et al.*, 2019). In severe cases, depres-

Dr. M.D. DHANA RAJU, M.Pharm., Ph.D
Principal.
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City,
RAJAHMUNDRY-533 296, (A.P.)

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

A study on the assessment of severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio

Swaapnika M[1], Ramam Sripada[*1], Veerendra Kumar D[1], Vineela K[1], Rama Reddy K[2], Hemanth Kumar Vangala[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Psychiatry, Manasa Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 02 Jun 2020
Revised on: 01 Jul 2020
Accepted on: 12 Aug 2020

Keywords:

Depression,
Lymphocytes,
Neutrophils,
Neutrophil-Lymphocyte Ratio,
Platelets,
Platelet-Lymphocyte Ratio

ABSTRACT

To assess the severity of major depression in relation to neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. A total of 186 patients gave their consent to participate in this study. The symptoms and the severity of depression were assessed by using the "Hamilton rating scale for depression" (HAM-D). Blood samples were collected for biochemical analysis and were subjected to measure the values of neutrophils, lymphocytes, platelets, neutrophil-lymphocyte ratio and platelet-lymphocyte ratio. The mean values of neutrophil-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were found to be 1.40 (±0.24), 2.52 (±0.27), 3.53 (±0.3) & 4.39 (±0.3) respectively and it was observed that the values of neutrophil-lymphocyte ratio was increased as the severity of the depression increases (r=0.9995, p=0.0005). The mean values of platelet-lymphocyte ratio in mild, moderate, severe and very severely depressed individuals were observed to be 147.21 (±34.25), 217.83 (±12.09), 267.31 (±15.86) & 316.29 (±18.44) respectively and it was found that the values of platelet-lymphocyte ratio was increased as the severity of the depression increases (r=0.9993, p=0.0007). Increase in severity of depression positively correlated with increase in the values of both neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR). Increased values of PLR showed a significant impact when compared to the values of NLR, as more than two third of the patients (71.5%) reported an increased values of PLR beyond their normal range when compared to the increased values of NLR which was just confined to only 4.8% of the study population.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4244

Production and Hosted by

Pharmascope.org

INTRODUCTION

Depression is a mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration (Mossie *et al.*, 2016). Depression is majorly caused by abuse either physically or emotionally, certain medications like corticosteroids, death or loss of loved one, genetical factors, serious illness and substance abuse (Brown and Gershon, 1993; Marcus *et al.*, 2012). According to WHO, about 300 million people are suffering from depression worldwide (Bashar *et al.*, 2019). In severe cases, depres-

Available online at www.jmpas.com

ISSN NO. 2320 – 7418
DOI:10.22270/jmpas.v9i3.948

Review Article

POSSIBLE CHARACTER OF CLASSICAL THERAPEUTIC RHIZOME OF TURMERIC FOR THE PREVENTION AND THE EXECUTIVES OF NOVEL CORONA VIRUS

Anil Kumar V.*[1], Kamini Sethy[2], Dr. Himasree P.[1]

1. GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
2. Centurion University of Technology & Management, Odisha, India

Correspondence
Anil Kumar V
Assistant Professor
Department of Pharmaceutical Technology, GIET School of Pharmacy
Rajahmundry, East Godavari
Andhra Pradesh, India
✉anilvadaga@gmail.com

Keywords
Novel COVID-19, Turmeric, Curcumin, Traditional medicine, Ayurveda, antiviral, golden spice, experimental data

Received
01/07/2020
Reviewed
08/07/2020
Revised/ Accepted
14/07/2020

ABSTRACT

Human history is watching a very odd time fighting an imperceptible enemy. The novel coronavirus infection was started in late December 2019 from Wuhan city, China. A short time later, the novel corona virus (COVID-19) episode was announced as a Community Health necessity of International involvement by the World Health Organization (WHO). Presently, around more than 70 million people are suffering and more than one lakh are dead worldwide because of the highly infectious and deadly quality of the virus infection. Unfortunately, no standard medicines, drugs, or vaccines are available to treat the infection. The major clinical signs & symptoms of COVID-19 are runny nose, dry cough, high fever, fatigue, shortness of breathing, diarrhea. Clinical symptoms based on India have good, old traditional medicinal practices, for example, Ayurveda could be beneficial to treat and prevent the virus infection. Indian traditional Golden spice, the kitchen of Queen rhizomes of turmeric (curcumin) has been expressed to have antiseptic, anti-inflammatory antibacterial majorly anti-viral potential against Para-influenza virus type3(PIV-3), feline infectious peritonitis virus (FIPV), herpes simplex virus(HSV), Coxsackie virus, major pandemics of Hepatitis B Virus (HBV), Curcumin is broadly used as Ayurvedic medicine to treat cold, cough, gastric ulcers, dental issues, asthma, diarrhoea, wounds healing which are also reported as the normal clinical symptoms of COVID-19. Turmeric is answered to ensure to boost immune response during viral infections. Multidimensional antiviral restorative potentials of curcumin demand estimating its likely application to control COVID-19 along with modern therapeutic practices. But a list of empirical database and translational research is required to establish the hypothesis.

Available online at www.jmpas.com

ISSN NO. 2320 – 7418

DOI:10.22270/jmpas.v9i3.948

Review Article

POSSIBLE CHARACTER OF CLASSICAL THERAPEUTIC RHIZOME OF TURMERIC FOR THE PREVENTION AND THE EXECUTIVES OF NOVEL CORONA VIRUS

Anil Kumar V.*[1], Kamini Sethy[2], Dr. Himasree P.[1]

1. GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
2. Centurion University of Technology & Management, Odisha, India

Correspondence

Anil Kumar V
Assistant Professor
Department of Pharmaceutical Technology, GIET School of Pharmacy
Rajahmundry, East Godavari
Andhra Pradesh, India
✉anilvadaga@gmail.com

Keywords
Novel COVID-19, Turmeric, Curcumin, Traditional medicine, Ayurveda, antiviral, golden spice, experimental data

Received
01/07/2020
Reviewed
08/07/2020
Revised/ Accepted
14/07/2020

ABSTRACT

Human history is watching a very odd time fighting an imperceptible enemy. The novel coronavirus infection was started in late December 2019 from Wuhan city, China. A short time later, the novel corona virus (COVID-19) episode was announced as a Community Health necessity of International involvement by the World Health Organization (WHO). Presently, around more than 70 million people are suffering and more than one lakh are dead worldwide because of the highly infectious and deadly quality of the virus infection. Unfortunately, no standard medicines, drugs, or vaccines are available to treat the infection. The major clinical signs & symptoms of COVID-19 are runny nose, dry cough, high fever, fatigue, shortness of breathing, diarrhea. Clinical symptoms based on India have good, old traditional medicinal practices, for example, Ayurveda could be beneficial to treat and prevent the virus infection. Indian traditional Golden spice, the kitchen of Queen rhizomes of turmeric (curcumin) has been expressed to have antiseptic, anti-inflammatory antibacterial majorly anti-viral potential against Para-influenza virus type3(PIV-3), feline infectious peritonitis virus (FIPV), herpes simplex virus(HSV), Coxsackie virus, major pandemics of Hepatitis B Virus (HBV), Curcumin is broadly used as Ayurvedic medicine to treat cold, cough, gastric ulcers, dental issues, asthma, diarrhoea, wounds healing which are also reported as the normal clinical symptoms of COVID-19. Turmeric is answered to ensure to boost immune response during viral infections. Multidimensional antiviral restorative potentials of curcumin demand estimating its likely application to control COVID-19 along with modern therapeutic practices. But a list of empirical database and translational research is required to establish the hypothesis.

International Journal of Pharmaceutical Sciences and Drug Research 2020;12(5):532-536

Contents lists available at UGC-CARE

International Journal of Pharmaceutical Sciences and Drug Research

[ISSN: 0975-248X; CODEN (USA): IJPSPP]

journal home page : http://ijpsdr.com/index.php/ijpsdr

Research Article

Method Development and Validation of Gas Chromatography-Mass Spectrometry Method for Quantification of Sonidegib in Capsule Dosage Form

Jayavarapu Kumar Raja[1], Sundararajan Parimala Krishnan[1*], Vankayala Devendiran Sundar[2]

[1]*Annamalai University, Annamalai Nagar-608002, Tamil Nadu, India*

[2]*GIET School of Pharmacy, Chaitanya Knowledge City, Rajahmundry-533296, Andhra Pradesh, India*

ARTICLE INFO

Article history:

Received: 27 June, 2020

Revised: 19 August, 2020

Accepted: 26 August, 2020

Published: 30 September, 2020

Keywords:

Accuracy, Basal cell carcinoma, GC-MS, Linearity, Sonidegib, Validation.

DOI:

10.25004/IJPSDR.2020.120515

ABSTRACT

A new simple and precise gas chromatography-mass spectrometry (GC-MS) method was developed and validated for the quantification of sonidegib in the capsule formulation. The proposed work depends on the modification of sonidegib into its derivative with N, O-bis(trimethylsilyl)-trifluoracetamide (BSTFA) with 1% trimethylchlorosilane (TMCS). Selective ion monitoring technique and electron ionization method at 70 eV were utilized for the quantification of sonidegib at m/z 278. The calibration plot was rectilinear in the concentration range of 0.5 to 10 µg/mL. The relative standard deviation (RSD) value for within-day precision was ≤ 2.47% and for between-day precision was ≤ 2.45%. The bias value for within-day and between-day accuracy was found between -1.51 to 1.87. The intra- and inter-day recovery findings of sonidegib were found to be between 98.34 to 102.654% for pharmaceutical formulation. The limits of detection and quantification of sonidegib were 0.1 and 0.3 µg/mL, respectively. No interfering peaks were observed from the excipients of dosage form during the analysis of formulation. The developed procedure was successfully applied to quantify commercial sonidegib capsule dosage form to estimate the sonidegib and check the dosage form uniformity of content.

INTRODUCTION

Sonidegib chemically designated as *N*-[6-[(2*S*,6*R*) -2,6-Dimethylmorpholin -4-yl]pyridin-3-yl]-2-methyl-3-[4-(trifluoromethoxy) phenyl] benzamide with molecular formula of $C_{26}H_{26}F_3N_3O_3$ and molecular weight of 485.498 g/mol (Fig. 1). It is utilized to treat basal cell carcinoma, which has relapsed radiation therapy or after surgery in adult patients. It effectively obstructs the regulator called smoothened (SMO), inhibiting the hedgehog path from functioning. Consequently, cancers that depend on the hedgehog path were incapable of growing.[1-3] The drug prevents a transmembrane protein called SMO, which plays an important role in the hedgehog (Hh)-signal transduction; this results in the prevention of Hh-signalling and anti-tumor activity in several animal models.[4,5]

The literature on the drug revealed that no GC-MS methods were reported for the quantification of sonidegib.[6,7] The main aim of the present work was to develop and validate the GC-MS method with a simple and rapid sample preparation protocol to quantify sonidegib in pharmaceutical formulations.

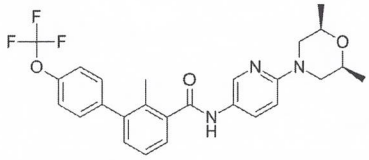


Fig. 1: Chemical structure of sonidegib

***Corresponding Author:** Dr. Sundararajan Parimala Krishnan

Address: Associate Professor, Department of Pharmacy, Annamalai University, Annamalai Nagar-608002, Tamil Nadu, India

Email ✉: drparimalakrishnan@gmail.com

Tel.: +91-9025211742

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Influence of Ketogenic Diet and Phenytoin Sodium on Isoniazid Induced Epilepsy in Wistar Rats

Somasundaram Ramachandran*, **Satya Sravanthi, Sri Ramya Manthena, Undru Liza, Masa Amala**

Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Aim: The current research was set up to estimate the influence of ketogenic diet in combination with phenytoin sodium on isoniazid induced epilepsy in rats. **Methods:** In this work 30 rats were used with weight range of 150-200gms were selected and divided into five groups. Group -1(Positive control), Group – II (Negative control), Group – III (Standard), Group – IV (Ketogenic diet), Group – V (Ketogenic diet + Standard). The doses of isoniazid, phenytoin sodium, ketogenic diet were selected and the work was executed for a period of 30 days. **Results:** At the end of the study animals were sacrificed to collect brain for estimating GABA levels in different groups. Results indicated that, there is a notable rise in levels of GABA which helps in reducing seizure latency when the ketogenic diet was added to that of standard drug. **Conclusion:** The change in levels of GABA when compared to the ketogenic diet alone and standard suggest that ketogenic diet along with standard drug may produce antiepileptic activity by increasing the levels of GABA in isoniazid induced epilepsy in rats.

Key words: Epilepsy, Ketone diet, Isoniazid, Phenytoin, GABA.

INTRODUCTION

Epilepsy is the chronic disorder which generates baseless, periodic seizures. A seizure is an unexpected hastens of electrical activity in the brain. There are mainly of two classes 1. Generalized seizures (Damage entire brain), 2. Focal (or) partial seizures (Damage only a region of brain). Epilepsy is a common neurological disorder that has an effect on nearly 65 million people throughout the world. Epilepsy can be seen in any one, but it is more usual in children and older people. It is found slightly greater in males compared to females. It is the group of neurological disorder characterized by epileptic seizures. It mainly has an effect on nearly 1% of population in youngsters and 3% of the population in older people. Mostly 80% of people with the disorder are seen in the developing countries. Epilepsy is a disorder of the brain distinguished by unforeseeable and regular occurrences of a temporary alteration of performance due to dysfunctional, simultaneous and repeated firing of numerous brain neurons.[1]

Lamentably, the drugs obtainable in present day medicine first they are unsuccessful to manage the seizure activity in some patients next quite commonly generate undesirable effects like neurotoxicity, hepatic failure and sometimes expose to risk of drug interactions. There are many treatment options other than medication, one among them is Ketone diet and it is beneficial for people who don't respond to medication. Ketogenic diet (KD) is a medically supervised moderate- protein diet, high cholesterol and low carbohydrate, which was used successfully in patients with pharmaco resistant epilepsy.[1,2] The classic KD consists of a very high amount of fat combined with protein and carbohydrate.[3,4] KD was developed in 1920 in response to the survey that fasting had anti-seizure activity.[5,6] At the time of fasting, body metabolizes the fat stores by lipolysis and next the fatty acids

Submission Date: 07-04-2020;
Revision Date: 17-07-2020;
Accepted Date: 09-09-2020

DOI: 10.5530/ijper.54.4.196

Correspondence:
Dr. S Ramachandran
Professor and Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry-533296, Andhra Pradesh, INDIA.
Phone no: +91 9949261973
Email id: ramsnetin@yahoo.com

Influence of Ketogenic Diet and Phenytoin Sodium on Isoniazid Induced Epilepsy in Wistar Rats

Somasundaram Ramachandran*, Satya Sravanthi, Sri Ramya Manthena, Undru Liza, Masa Amala

Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Aim: The current research was set up to estimate the influence of ketogenic diet in combination with phenytoin sodium on isoniazid induced epilepsy in rats. **Methods:** In this work 30 rats were used with weight range of 150-200gms were selected and divided into five groups. Group -1(Positive control), Group – II (Negative control), Group – III (Standard), Group – IV (Ketogenic diet), Group – V (Ketogenic diet + Standard). The doses of isoniazid, phenytoin sodium, ketogenic diet were selected and the work was executed for a period of 30 days. **Results:** At the end of the study animals were sacrificed to collect brain for estimating GABA levels in different groups. Results indicated that, there is a notable rise in levels of GABA which helps in reducing seizure latency when the ketogenic diet was added to that of standard drug. **Conclusion:** The change in levels of GABA when compared to the ketogenic diet alone and standard suggest that ketogenic diet along with standard drug may produce antiepileptic activity by increasing the levels of GABA in isoniazid induced epilepsy in rats.

Key words: Epilepsy, Ketone diet, Isoniazid, Phenytoin, GABA.

INTRODUCTION

Epilepsy is the chronic disorder which generates baseless, periodic seizures. A seizure is an unexpected hastens of electrical activity in the brain. There are mainly of two classes 1. Generalized seizures (Damage entire brain), 2. Focal (or) partial seizures (Damage only a region of brain). Epilepsy is a common neurological disorder that has an effect on nearly 65 million people throughout the world. Epilepsy can be seen in any one, but it is more usual in children and older people. It is found slightly greater in males compared to females. It is the group of neurological disorder characterized by epileptic seizures. It mainly has an effect on nearly 1% of population in youngsters and 3% of the population in older people. Mostly 80% of people with the disorder are seen in the developing countries. Epilepsy is a disorder of the brain distinguished by unforeseeable and regular occurrences of a temporary alteration of performance due to dysfunctional, simultaneous and repeated firing of numerous brain neurons.[1]

Lamentably, the drugs obtainable in present day medicine first they are unsuccessful to manage the seizure activity in some patients next quite commonly generate undesirable effects like neurotoxicity, hepatic failure and sometimes expose to risk of drug interactions. There are many treatment options other than medication, one among them is Ketone diet and it is beneficial for people who don't respond to medication. Ketogenic diet (KD) is a medically supervised moderate- protein diet, high cholesterol and low carbohydrate, which was used successfully in patients with pharmaco resistant epilepsy.[1,2] The classic KD consists of a very high amount of fat combined with protein and carbohydrate.[3,4] KD was developed in 1920 in response to the survey that fasting had anti-seizure activity.[5,6] At the time of fasting, body metabolizes the fat stores by lipolysis and next the fatty acids

Submission Date: 07-04-2020;
Revision Date: 17-07-2020;
Accepted Date: 09-09-2020

DOI: 10.5530/ijper.54.4.196

Correspondence:
Dr. S Ramachandran
Professor and Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry-533296, Andhra Pradesh, INDIA.
Phone no: +91 9949261973
Email id: ramsnetin@yahoo.com

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

Phytochemical and Pharmacological evaluation of hibiscus *hispidissimus griff*

Alekhya V*[1,2], Ganapaty S[1], Deepan T[2]

[1]Department of Pharmacognosy, GITAM Institute of Pharmacy, Gandhinagar, Rushikonda, Visakhapatnam-530045, Andhra Pradesh, India

[2]Department of Pharmacognosy, GIET School of Pharmacy, NH-16, Chaitanya knowledge city, Rajamahendravaram-533296, Andhra Pradesh, India

Article History:

Received on: 08 Sep 2020
Revised on: 08 Oct 2020
Accepted on: 10 Oct 2020

Keywords:

Anti-bacterial, Antifungal, Anti-inflammatory, Phytochemical studies

ABSTRACT

To assess phytochemical with pharmacological studies of *Hibiscus hispidissimus griff* belong to family malavaceae. Preliminary phytochemical analysis reveals the presence of steroids, triterpenes, saponins, steroidal saponins and phenols. Evaluation of anti-inflammatory, anti-microbial with antioxidant action were performed on aerial parts of methanolic extract of *Hibiscus hispidissimus.* Invitro antioxidant activity was performed by 2, 2 -diphenyl-1- picrylhydrazyl (DPPH) assay, hydroxy radical scavenging method and superoxide radical scavenging activity.The results of invitro antioxidant study reveal that % inhibition of *H. hispidissimus* was higher compared to ascorbic acid. Anti-inflammatory studies were performed using carrageenan-induced rat paw oedema animal model, for anti-inflammatory studies, the extracts were compared with standards like indomethacin, and it shows a remarkable zone of inhibition ranging from 58.97 to 71.73 respectively. The anti-bacterial and antifungal activity of plant extracts were studied for the occurrence of inhibition zones. The activity was performed by the cup plate method. Ethanolic extract of *H. Hispidissimus* shows significant anti-bacterial effect against *S. Aureus, B. Subtilis, P. Vulgaris* and *E. coli* using ciprofloxacin (50μg/ml) as standard.The extracts show remarkable inhibition of zone of inhibition, and results were compared with that of standard drugs against the organism tested. In conclusion, the ethanolic extract of *H. hispidissimus* shows significant antioxidant, anti-inflammatory and anti-bacterial properties.

*Corresponding Author

Name: Alekhya V
Phone: 9032423723
Email: alekhya.veramaneni@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4420

Production and Hosted by

Pharmascope.org

INTRODUCTION

Plants have been used for medicinal purpose long before prehistoric period. Traditional system of medicine continues to be widely precised on many accounts. Drugs obtained from natural sources are used as a reservoir for many biochemical products which are used as extractions for development of many formulations which are non-reactive, nontoxic and free from side effects. Drug resistance for transmittable ailments have directed to enlarged importance in the use of natural product as medicine for diverse human illnesses (Das, 2016). Hibiscus hispidissimus Griffith (synonym Hibiscus furcatus DC. non wild., Hibiscus aculcatus Roxb.non walter), locally as 'coffort root' or 'Big thicket Hibiscus' or 'Pine Hibiscus' in English and "Uppancham" in Malayalam. Has another name wild hibiscus (Hibiscus hispidissimus, 1854) belong to the family malavaceae shown in Figure 1 (India

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

Phytochemical and Pharmacological evaluation of hibiscus *hispidissimus griff*

Alekhya V*[1,2], Ganapaty S[1], Deepan T[2]

[1]Department of Pharmacognosy, GITAM Institute of Pharmacy, Gandhinagar, Rushikonda, Visakhapatnam-530045, Andhra Pradesh, India

[2]Department of Pharmacognosy, GIET School of Pharmacy, NH-16, Chaitanya knowledge city, Rajamahendravaram-533296, Andhra Pradesh, India

Article History:

Received on: 08 Sep 2020
Revised on: 08 Oct 2020
Accepted on: 10 Oct 2020

Keywords:

Anti-bacterial,
Antifungal,
Anti-inflammatory,
Phytochemical studies

ABSTRACT

To assess phytochemical with pharmacological studies of *Hibiscus hispidissimus griff* belong to family malavaceae. Preliminary phytochemical analysis reveals the presence of steroids, triterpenes, saponins, steroidal saponins and phenols. Evaluation of anti-inflammatory, anti-microbial with antioxidant action were performed on aerial parts of methanolic extract of *Hibiscus hispidissimus.* Invitro antioxidant activity was performed by 2, 2 -diphenyl-1- picrylhydrazyl (DPPH) assay, hydroxy radical scavenging method and superoxide radical scavenging activity.The results of invitro antioxidant study reveal that % inhibition of *H. hispidissimus* was higher compared to ascorbic acid. Anti-inflammatory studies were performed using carrageenan-induced rat paw oedema animal model, for anti-inflammatory studies, the extracts were compared with standards like indomethacin, and it shows a remarkable zone of inhibition ranging from 58.97 to 71.73 respectively. The antibacterial and antifungal activity of plant extracts were studied for the occurrence of inhibition zones. The activity was performed by the cup plate method. Ethanolic extract of *H. Hispidissimus* shows significant anti-bacterial effect against *S. Aureus, B. Subtilis, P. Vulgaris* and *E. coli* using ciprofloxacin (50μg/ml) as standard.The extracts show remarkable inhibition of zone of inhibition, and results were compared with that of standard drugs against the organism tested. In conclusion, the ethanolic extract of *H. hispidissimus* shows significant antioxidant, anti-inflammatory and anti-bacterial properties.

*Corresponding Author

Name: Alekhya V
Phone: 9032423723
Email: alekhya.veramaneni@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11iSPL4.4420

Production and Hosted by

Pharmascope.org

INTRODUCTION

Plants have been used for medicinal purpose long before prehistoric period. Traditional system of medicine continues to be widely precised on many accounts. Drugs obtained from natural sources are used as a reservoir for many biochemical products which are used as extractions for development of many formulations which are non-reactive, nontoxic and free from side effects. Drug resistance for transmittable ailments have directed to enlarged importance in the use of natural product as medicine for diverse human illnesses (Das, 2016). Hibiscus hispidissimus Griffith (synonym Hibiscus furcatus DC. non wild., Hibiscus aculcatus Roxb.non walter), locally as 'coffort root' or 'Big thicket Hibiscus' or 'Pine Hibiscus' in English and "Uppancham" in Malayalam. Has another name wild hibiscus (Hibiscus hispidissimus, 1854) belong to the family malavaceae shown in Figure 1 (India

WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES

SJIF Impact Factor 7.632

Volume 9, Issue 12, 1029-1040 Review Article ISSN 2278 – 4357

HERBAL HOME REMEDIES TO SUPPORT IMMUNITY COVID19 PANDEMIC -AWAKE UP CALL

*[1]Anilkumar V., [2]Ch. Gowri Shankar, [3]M.D.Dhanaraj

Assistant Professor, Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, East Godavari, Andhra Pradesh.

Assistant Professor, Department of Pharmaceutical technology, Jeypore College of Pharmacy, Koraput, Jeypore, Odisha.

Research Director, Principal of GIET School of Pharmacy, Rajahmumdry, East Godavari, Andhra Pradesh.

Article Received on
14 October 2020,

Revised on 03 Nov. 2020,
Accepted on 24 Nov. 2020

DOI: 10.20959/wjpps202012-17933

***Corresponding Author**
Anilkumar V.
Assistant Professor, Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, East Godavari, Andhra Pradesh.

ABSTRACT

The COVID19 Pandemic is spreading throughout the world in the blink of eyes. Infecting thousands of people everyday. This public health emergency has got world wide in this time everyone realise the policy of "Prevention is better than cure" as the best way to fight this pandemic many guidelines for common people, issued by many respected health organisation, but most of them are focused on personal hygiene and prevention of the spread the virus, and increase Immunity. In this article, it has been attempted to describes the term home herbal remedies and discuss in detail a few herbal constituents which are well documented to support immune functions of the body." The idea is that if you don't have a potent weapon to combat the enemy, a strong and effective shield is the best bet to protect yourself ".

KEYWORDS: COVID19, herbal, hygiene, pandemic, corona virus, immunity.

INTRODUCTION

This Pandemic is not only affecting human life but also has questioned the world wide status of healthcare facilities and resulted in a slowdown of the economy but the fact of SARS-CoV-2 virus, which causes COVID19, has less virulence but a high infection rate than SARS-CoV-1, which caused an outbreak of SARS in 2003. The diseases is mainly transmitted either

WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES

SJIF Impact Factor 7.632

Volume 9, Issue 12, 1029-1040 Review Article ISSN 2278 – 4357

HERBAL HOME REMEDIES TO SUPPORT IMMUNITY COVID19 PANDEMIC -AWAKE UP CALL

*[1]Anilkumar V., [2]Ch. Gowri Shankar, [3]M.D.Dhanaraj

Assistant Professor, Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, East Godavari, Andhra Pradesh.

Assistant Professor, Department of Pharmaceutical technology, Jeypore College of Pharmacy, Koraput, Jeypore, Odisha.

Research Director, Principal of GIET School of Pharmacy, Rajahmumdry, East Godavari, Andhra Pradesh.

Article Received on
14 October 2020,

Revised on 03 Nov. 2020,
Accepted on 24 Nov. 2020

DOI: 10.20959/wjpps202012-17933

***Corresponding Author**
Anilkumar V.
Assistant Professor,
Department of
Pharmaceutical Technology,
GIET School of Pharmacy,
Rajahmundry, East Godavari,
Andhra Pradesh.

ABSTRACT

The COVID19 Pandemic is spreading throughout the world in the blink of eyes. Infecting thousands of people everyday. This public health emergency has got world wide in this time everyone realise the policy of "Prevention is better than cure" as the best way to fight this pandemic many guidelines for common people, issued by many respected health organisation, but most of them are focused on personal hygiene and prevention of the spread the virus, and increase Immunity. In this article, it has been attempted to describes the term home herbal remedies and discuss in detail a few herbal constituents which are well documented to support immune functions of the body." The idea is that if you don't have a potent weapon to combat the enemy, a strong and effective shield is the best bet to protect yourself ".

KEYWORDS: COVID19, herbal, hygiene, pandemic, corona virus, immunity.

INTRODUCTION

This Pandemic is not only affecting human life but also has questioned the world wide status of healthcare facilities and resulted in a slowdown of the economy but the fact of SARS-CoV-2 virus, which causes COVID19, has less virulence but a high infection rate than SARS-CoV-1, which caused an outbreak of SARS in 2003. The diseases is mainly transmitted either

Biomedical & Pharmacology Journal, December 2020. Vol. **13**(4), p. 1839-1844

Drug Utilization Evaluation On Antidiabetic, Thyroid And Antithyroid Drugs

S Ramachandran[1]*, D Swethanjali[2], M Hima Bindu[2], K Devaki[2], Ramam Sripada[2], E Deepak Srinivas[2], Mithun Chakravarthy[3] and M Dasaratha Dhanaraju[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[3]Lalitha Endocare & Skincare Hospital, Rajahmundry, Andhra Pradesh, India.
*Corresponding Author E-mail: ramsnetin@yahoo.com

https://dx.doi.org/10.13005/bpj/2059

(Received: 28 April 2020; accepted: 24 November 2020)

To evaluate the drug utilization of antidiabetic, thyroid and antithyroid drugs at an endocrinology speciality hospital among the ambulatory patients. This was a prospective observational study conducted for a period of 6 months. Patients who were diagnosed with either diabetes mellitus (both type-I & type-II) or thyroid disorders and receiving their respective pharmacological therapy irrespective of age and gender were included in this study. Pregnant, lactating women and patients with endocrine problems other than diabetes mellitus and thyroid disorders were excluded from this study. The total number of cases collected and analyzed during a period of 6 months was 246 in which 139 (56.5%) were diabetes mellitus and 107 (43.5%) were thyroid disorders. Among the parenteral hypoglycaemic agents, long acting-insulin glargine and intermediate acting + short acting- NPH + regular insulin were prescribed in almost similar frequency. In case of mono therapy, teneligliptin was the most commonly prescribed medication and this was the unique finding in this study which signified that the trend in prescribing pattern is changing and updating from time to time. In dual combination therapy Glimepiride + Metformin and in triple combination Glimepiride + Metformin + Voglibose combinations were the most commonly prescribed medication. In hypothyroidism, supplementation with levothyroxine was the only treatment alternative as it is related to the underactive thyroid, secreting insufficient amount of hormone. Irrespective of many classes of drugs available in treating hyperthyroidism carbimazole was the most frequently prescribed drug in this study. It was observed that some changes in the prescribing pattern of antidiabetic drugs that signified the trend in drug utilization pattern. Clinical pharmacists should play a key role in observing and identifying the trends in prescribing patterns by performing the drug utilization evaluation studies thereby providing a better pharmaceutical care in collaboration with the other health care professionals.

Keywords: Diabetes, Endocrinology, Teneligliptin, Thyroidism.

Diabetes mellitus and thyroid dysfunction are the common conditions among the endocrine disorders with potentially devastating health consequences that affect all populations worldwide, which would be a significant health burden to the present society (Ramachandran A *et al.,* 2009). The epidemic status of Diabetes mellitus states that in the year 2018, a total of 406 million people were living with diabetes worldwide. Among them half of the population belong to the three countries that include China [130 million], India [98 million] and US [38 million]. Compared to 2015 WHO statistics

Biomedical & Pharmacology Journal, December 2020. Vol. 13(4), p. 1839-1844

Drug Utilization Evaluation On Antidiabetic, Thyroid And Antithyroid Drugs

S Ramachandran[1]*, D Swethanjali[2], M Hima Bindu[2], K Devaki[2], Ramam Sripada[2], E Deepak Srinivas[2], Mithun Chakravarthy[3] and M Dasaratha Dhanaraju[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[3]Lalitha Endocare & Skincare Hospital, Rajahmundry, Andhra Pradesh, India.
*Corresponding Author E-mail: ramsnetin@yahoo.com

https://dx.doi.org/10.13005/bpj/2059

(Received: 28 April 2020; accepted: 24 November 2020)

To evaluate the drug utilization of antidiabetic, thyroid and antithyroid drugs at an endocrinology speciality hospital among the ambulatory patients. This was a prospective observational study conducted for a period of 6 months. Patients who were diagnosed with either diabetes mellitus (both type-I & type-II) or thyroid disorders and receiving their respective pharmacological therapy irrespective of age and gender were included in this study. Pregnant, lactating women and patients with endocrine problems other than diabetes mellitus and thyroid disorders were excluded from this study. The total number of cases collected and analyzed during a period of 6 months was 246 in which 139 (56.5%) were diabetes mellitus and 107 (43.5%) were thyroid disorders. Among the parenteral hypoglycaemic agents, long acting-insulin glargine and intermediate acting + short acting- NPH + regular insulin were prescribed in almost similar frequency. In case of mono therapy, teneligliptin was the most commonly prescribed medication and this was the unique finding in this study which signified that the trend in prescribing pattern is changing and updating from time to time. In dual combination therapy Glimepiride + Metformin and in triple combination Glimepiride + Metformin + Voglibose combinations were the most commonly prescribed medication. In hypothyroidism, supplementation with levothyroxine was the only treatment alternative as it is related to the underactive thyroid, secreting insufficient amount of hormone. Irrespective of many classes of drugs available in treating hyperthyroidism carbimazole was the most frequently prescribed drug in this study. It was observed that some changes in the prescribing pattern of antidiabetic drugs that signified the trend in drug utilization pattern. Clinical pharmacists should play a key role in observing and identifying the trends in prescribing patterns by performing the drug utilization evaluation studies thereby providing a better pharmaceutical care in collaboration with the other health care professionals.

Keywords: Diabetes, Endocrinology, Teneligliptin, Thyroidism.

Diabetes mellitus and thyroid dysfunction are the common conditions among the endocrine disorders with potentially devastating health consequences that affect all populations worldwide, which would be a significant health burden to the present society (Ramachandran A *et al.*, 2009). The epidemic status of Diabetes mellitus states that in the year 2018, a total of 406 million people were living with diabetes worldwide. Among them half of the population belong to the three countries that include China [130 million], India [98 million] and US [38 million]. Compared to 2015 WHO statistics

Biomedical & Pharmacology Journal, December 2020. Vol. 13(4), p. 1839-1844

Drug Utilization Evaluation On Antidiabetic, Thyroid And Antithyroid Drugs

S Ramachandran[1]*, D Swethanjali[2], M Hima Bindu[2], K Devaki[2], Ramam Sripada[2], E Deepak Srinivas[2], Mithun Chakravarthy[3] and M Dasaratha Dhanaraju[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
[3]Lalitha Endocare & Skincare Hospital, Rajahmundry, Andhra Pradesh, India.
*Corresponding Author E-mail: ramsnetin@yahoo.com

https://dx.doi.org/10.13005/bpj/2059

(Received: 28 April 2020; accepted: 24 November 2020)

To evaluate the drug utilization of antidiabetic, thyroid and antithyroid drugs at an endocrinology speciality hospital among the ambulatory patients. This was a prospective observational study conducted for a period of 6 months. Patients who were diagnosed with either diabetes mellitus (both type-I & type-II) or thyroid disorders and receiving their respective pharmacological therapy irrespective of age and gender were included in this study. Pregnant, lactating women and patients with endocrine problems other than diabetes mellitus and thyroid disorders were excluded from this study. The total number of cases collected and analyzed during a period of 6 months was 246 in which 139 (56.5%) were diabetes mellitus and 107 (43.5%) were thyroid disorders. Among the parenteral hypoglycaemic agents, long acting-insulin glargine and intermediate acting + short acting- NPH + regular insulin were prescribed in almost similar frequency. In case of mono therapy, teneligliptin was the most commonly prescribed medication and this was the unique finding in this study which signified that the trend in prescribing pattern is changing and updating from time to time. In dual combination therapy Glimepiride + Metformin and in triple combination Glimepiride + Metformin + Voglibose combinations were the most commonly prescribed medication. In hypothyroidism, supplementation with levothyroxine was the only treatment alternative as it is related to the underactive thyroid, secreting insufficient amount of hormone. Irrespective of many classes of drugs available in treating hyperthyroidism carbimazole was the most frequently prescribed drug in this study. It was observed that some changes in the prescribing pattern of antidiabetic drugs that signified the trend in drug utilization pattern. Clinical pharmacists should play a key role in observing and identifying the trends in prescribing patterns by performing the drug utilization evaluation studies thereby providing a better pharmaceutical care in collaboration with the other health care professionals.

Keywords: Diabetes, Endocrinology, Teneligliptin, Thyroidism.

Diabetes mellitus and thyroid dysfunction are the common conditions among the endocrine disorders with potentially devastating health consequences that affect all populations worldwide, which would be a significant health burden to the present society (Ramachandran A *et al.*, 2009). The epidemic status of Diabetes mellitus states that in the year 2018, a total of 406 million people were living with diabetes worldwide. Among them half of the population belong to the three countries that include China [130 million], India [98 million] and US [38 million]. Compared to 2015 WHO statistics

Padala et al. Future Journal of Pharmaceutical Sciences (2020) 6:38
https://doi.org/10.1186/s43094-020-00058-6

Future Journal of Pharmaceutical Sciences

RESEARCH Open Access

A comparative study on the efficacy of brinzolamide/timolol versus brinzolamide/brimonidine fixed drug combinations in primary open-angle glaucoma

Sudeepthi Padala[1], Ramam Sripada[1*], Srivalli Bhaskari Padmavathi Gundabattula[1], Krishna Jyothi Tadi[2], Prabhakar Rao Nallamothula[2], Farzaneh Raveshi[1] and Dasaratha Dhanaraju Magharla[1]

Abstract

Background: To compare the efficacy of brinzolamide 1%/timolol 0.5% fixed drug combination (BTFC) with brinzolamide 1%/brimonidine 0.2% fixed drug combination (BBFC) among the patients with primary open-angle glaucoma (POAG).

Results: The treatment with BTFC in the Group A subjects showed a significant decrease in the intraocular pressure ($p = 0.0355$*) and a significant increase in the central corneal thickness ($p = 0.0087$*). Similarly, in the Group B subjects, the treatment with BBFC showed a significant decrease in the intraocular pressure ($p = 0.0327$*) and a significant increase in the central corneal thickness ($p = 0.0227$*). In the process of comparing both the fixed drug combinations, there was no significant difference observed in the aspect of efficacy between both the groups in the decrease of intraocular pressure ($p = 0.7100$) and in the increase of central corneal thickness ($p = 0.4077$).

Conclusion: Both the fixed drug combinations almost showed a similar efficacy in treating the respective groups, and there is no significant difference observed in the aspect of efficacy between both the fixed drug combinations in decreasing the intraocular pressure and in increasing the central corneal thickness.

Keywords: Brimonidine, Brinzolamide, Glaucoma, Pachymeter, Timolol

Background

Glaucoma refers to a collection of diseases where increased intraocular pressure (IOP) adversely impacts the optic nerve and subsequently the visual field. It was observed as the second leading cause of global blindness (12.3%) after cataract [1]. According to the National Eye Institute, approximately more than 3 million people in the USA are suffering from glaucoma and this number may reach up to 4.2 million by the year 2030. World Health Organization (WHO) estimates that around 4.5 million people in the world became blind due to glaucoma [2–4]. Approximately, 60 million people were affected globally by glaucoma, and India was the second most affected country as per the statistics of WHO with a share of 12 million cases. Advanced age, diabetes, hypertension, and thyroid disorders were some of the major risk factors of glaucoma. Andhra Pradesh Eye Diseases Survey estimated that glaucoma was more prevalent (3%) in Andhra Pradesh when compared to Tamil Nadu (2%). The prevalence of glaucoma is expected to reach 79.6 million by 2020 impacting all countries, while the highest increase is expected to be in China and India which together may comprise around 40% of the cases globally [5].

Primary open-angle glaucoma (POAG) is a chronic, progressive, and irreversible multifactorial optic neuropathy that is characterized by an open angle of the

* Correspondence: ramampharmd7@gmail.com
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296, (AP)

Padala et al. Future Journal of Pharmaceutical Sciences (2020) 6:38
https://doi.org/10.1186/s43094-020-00058-6

Future Journal of Pharmaceutical Sciences

RESEARCH Open Access

A comparative study on the efficacy of brinzolamide/timolol versus brinzolamide/brimonidine fixed drug combinations in primary open-angle glaucoma

Sudeepthi Padala[1], Ramam Sripada[1*], Srivalli Bhaskari Padmavathi Gundabattula[1], Krishna Jyothi Tadi[2], Prabhakar Rao Nallamothula[2], Farzaneh Raveshi[1] and Dasaratha Dhanaraju Magharla[1]

Abstract

Background: To compare the efficacy of brinzolamide 1%/timolol 0.5% fixed drug combination (BTFC) with brinzolamide 1%/brimonidine 0.2% fixed drug combination (BBFC) among the patients with primary open-angle glaucoma (POAG).

Results: The treatment with BTFC in the Group A subjects showed a significant decrease in the intraocular pressure ($p = 0.0355$*) and a significant increase in the central corneal thickness ($p = 0.0087$*). Similarly, in the Group B subjects, the treatment with BBFC showed a significant decrease in the intraocular pressure ($p = 0.0327$*) and a significant increase in the central corneal thickness ($p = 0.0227$*). In the process of comparing both the fixed drug combinations, there was no significant difference observed in the aspect of efficacy between both the groups in the decrease of intraocular pressure ($p = 0.7100$) and in the increase of central corneal thickness ($p = 0.4077$).

Conclusion: Both the fixed drug combinations almost showed a similar efficacy in treating the respective groups, and there is no significant difference observed in the aspect of efficacy between both the fixed drug combinations in decreasing the intraocular pressure and in increasing the central corneal thickness.

Keywords: Brimonidine, Brinzolamide, Glaucoma, Pachymeter, Timolol

Background

Glaucoma refers to a collection of diseases where increased intraocular pressure (IOP) adversely impacts the optic nerve and subsequently the visual field. It was observed as the second leading cause of global blindness (12.3%) after cataract [1]. According to the National Eye Institute, approximately more than 3 million people in the USA are suffering from glaucoma and this number may reach up to 4.2 million by the year 2030. World Health Organization (WHO) estimates that around 4.5 million people in the world became blind due to glaucoma [2–4]. Approximately, 60 million people were affected globally by glaucoma, and India was the second most affected country as per the statistics of WHO with a share of 12 million cases. Advanced age, diabetes, hypertension, and thyroid disorders were some of the major risk factors of glaucoma. Andhra Pradesh Eye Diseases Survey estimated that glaucoma was more prevalent (3%) in Andhra Pradesh when compared to Tamil Nadu (2%). The prevalence of glaucoma is expected to reach 79.6 million by 2020 impacting all countries, while the highest increase is expected to be in China and India which together may comprise around 40% of the cases globally [5].

Primary open-angle glaucoma (POAG) is a chronic, progressive, and irreversible multifactorial optic neuropathy that is characterized by an open angle of the

* Correspondence: ramampharmd7@gmail.com
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
Full list of author information is available at the end of the article

Future Journal of Pharmaceutical Sciences

RESEARCH Open Access

Synthesis and antioxidant properties of 2-(3-(hydroxyimino)methyl)-1*H*-indol-1-yl)acetamide derivatives

Chandravadivelu Gopi[1*] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: The main aim of this work was to synthesise a novel *N*-(substituted phenyl)-2-(3-(hydroxyimino) methyl)-1*H*-indol-1-yl) acetamide derivatives and evaluate their antioxidant activity. These compounds were prepared by a condensation reaction between 1*H*-indole carbaldehyde oxime and 2-chloro acetamide derivatives. The newly synthesised compound structures were characterised by FT-IR, ^{1}H-NMR, mass spectroscopy and elemental analysis. Furthermore, the above-mentioned compounds were screened for antioxidant activity by using ferric reducing antioxidant power (FRAP) and 1,1-diphenyl-2-picrylhydrazyl (DPPH) methods.

Result: The antioxidant activity result reveals that most of the compounds were exhibiting considerable activity in both methods and the values are very closer to the standards. Among the synthesised compounds, compound 3j, 3a and 3k were shown remarkable activity at low concentration.

Conclusion: Compounds 3j, 3a and 3k were shown highest activity among the prepared analogues due to the attachment of halogens connected at the appropriate place in the phenyl ring. Hence, these substituted phenyl rings considered as a perfect side chain for the indole nucleus for the development of the new antioxidant agents.

Keywords: Indole, Acetamides, Antioxidant activity, FRAP and DPPH method

Background

The indole framework is one of the most widely distributed heterocyclic nuclei in both natural and synthetic compounds in which benzene and pyrrole are fused in 2, 3 positions [1]. The name indole is derived from the word indigo and oleum [2]. In 1986, Adolf von Bayer prepared indole from oxindole by a simple chemical reaction using zinc dust [3]. Indole and their derivatives are identified as a non-basic nitrogenous pharmacophore exhibiting a broad range of useful biological activities such as anti-inflammatory [4], anti-depressant [5], anti-fungal [6], anti-cancer [7], antihypertensive [8], antibiotic [9], anti-microbial agent [10], anti-viral [11], chelating agents [12], antimalarial [13], anti-HIV [14], anti-diabetic [15], anti-tuberculosis [16], insecticidal [17] and analgesic activity [18]. Because of the dynamic properties, they have been placed in a unique platform of nitrogenous heterocyclic compounds and enhance the interest of the scientist all over the world towards the preparation of the novel indole derivatives. Amide and their analogues are also found in many naturally occurring compounds and received much attention due to their high chemotherapeutic profile and easy way of developing a novel compound through the simple chemical reaction [19]. It has been prepared by the reaction of substituted acid with various aliphatic or aromatic amines. These derivatives are associated with a board spectrum of biological activities such as anti-fungal [20], insecticides [21], anticonvulsant [22], analgesic [23], anti-inflammatory [24], anti-tuberculosis [25] and anti-tumour [26] properties. As a result of a continuous search for the above-mentioned area, a series of novel

* Correspondence: gopi@giet.ac.in
[1]Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Gopi and Dhanaraju Future Journal of Pharmaceutical Sciences (2020) 6:93
https://doi.org/10.1186/s43094-020-00090-6

Future Journal of Pharmaceutical Sciences

RESEARCH Open Access

Synthesis and antioxidant properties of 2-(3-(hydroxyimino)methyl)-1*H*-indol-1-yl)acetamide derivatives

Chandravadivelu Gopi[1*] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: The main aim of this work was to synthesise a novel *N*-(substituted phenyl)-2-(3-(hydroxyimino) methyl)-1*H*-indol-1-yl) acetamide derivatives and evaluate their antioxidant activity. These compounds were prepared by a condensation reaction between 1*H*-indole carbaldehyde oxime and 2-chloro acetamide derivatives. The newly synthesised compound structures were characterised by FT-IR, ^{1}H-NMR, mass spectroscopy and elemental analysis. Furthermore, the above-mentioned compounds were screened for antioxidant activity by using ferric reducing antioxidant power (FRAP) and 1,1-diphenyl-2-picrylhydrazyl (DPPH) methods.

Result: The antioxidant activity result reveals that most of the compounds were exhibiting considerable activity in both methods and the values are very closer to the standards. Among the synthesised compounds, compound 3j, 3a and 3k were shown remarkable activity at low concentration.

Conclusion: Compounds 3j, 3a and 3k were shown highest activity among the prepared analogues due to the attachment of halogens connected at the appropriate place in the phenyl ring. Hence, these substituted phenyl rings considered as a perfect side chain for the indole nucleus for the development of the new antioxidant agents.

Keywords: Indole, Acetamides, Antioxidant activity, FRAP and DPPH method

Background

The indole framework is one of the most widely distributed heterocyclic nuclei in both natural and synthetic compounds in which benzene and pyrrole are fused in 2, 3 positions [1]. The name indole is derived from the word indigo and oleum [2]. In 1986, Adolf von Bayer prepared indole from oxindole by a simple chemical reaction using zinc dust [3]. Indole and their derivatives are identified as a non-basic nitrogenous pharmacophore exhibiting a broad range of useful biological activities such as anti-inflammatory [4], anti-depressant [5], anti-fungal [6], anti-cancer [7], antihypertensive [8], antibiotic [9], anti-microbial agent [10], anti-viral [11], chelating agents [12], antimalarial [13], anti-HIV [14], anti-diabetic [15], anti-tuberculosis [16], insecticidal [17] and analgesic activity [18]. Because of the dynamic properties, they have been placed in a unique platform of nitrogenous heterocyclic compounds and enhance the interest of the scientist all over the world towards the preparation of the novel indole derivatives. Amide and their analogues are also found in many naturally occurring compounds and received much attention due to their high chemotherapeutic profile and easy way of developing a novel compound through the simple chemical reaction [19]. It has been prepared by the reaction of substituted acid with various aliphatic or aromatic amines. These derivatives are associated with a board spectrum of biological activities such as anti-fungal [20], insecticides [21], anticonvulsant [22], analgesic [23], anti-inflammatory [24], anti-tuberculosis [25] and anti-tumour [26] properties. As a result of a continuous search for the above-mentioned area, a series of novel

* Correspondence: gopi@giet.ac.in
[1]Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City,
RAJAHMUNDRY-533 296: (AP)

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2020) 9:57
https://doi.org/10.1186/s43088-020-00083-7

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW

Open Access

An overview of recent progress in modern synthetic approach—combinatorial synthesis

Chandravadivelu Gopi[1*], Gudapati Krupamai[1], Chitikina Satya Sri[1] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: In recent times, a powerful tool of combinatorial synthesis has been used for the preparation of large chemical entities through a small set up of reactions between different building blocks using solid-phase and solution-phase techniques. This method reduced the time and cost of the drug discovery process substantially.

Main text: Thousands of compounds are synthesised in a few reactions through combinatorial synthesis instead of getting a few compounds in the traditional method. This method also helps to identify chemical lead of the compounds and optimise them through the biological screening using a high-throughput method. There is no review concerning the recent research finding of combinatorial synthesis. Hence, an attempt had been made on the latest research findings (2002–2020) of newly synthesised compounds using combinatorial synthesis and their biological activities.

Conclusion: To the best of our knowledge, the current review has completely analysed the importance of combinatorial synthesis and furnished an overview of solid-phase and solution-phase techniques as well as helped mankind by improving higher productivity at low cost, lead identification and optimization and preventing environmental pollution.

Keywords: Combinatorial synthesis, Solid phase, Solution phase, Higher productivity

* Correspondence: gopi@giet.ac.in
[1]Department of pharmaceutical chemistry, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU, M.Pharm., Ph.D
Principal.
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296: (AP)

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2020) 9:57
https://doi.org/10.1186/s43088-020-00083-7

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW

Open Access

An overview of recent progress in modern synthetic approach—combinatorial synthesis

Chandravadivelu Gopi[1*], Gudapati Krupamai[1], Chitikina Satya Sri[1] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: In recent times, a powerful tool of combinatorial synthesis has been used for the preparation of large chemical entities through a small set up of reactions between different building blocks using solid-phase and solution-phase techniques. This method reduced the time and cost of the drug discovery process substantially.

Main text: Thousands of compounds are synthesised in a few reactions through combinatorial synthesis instead of getting a few compounds in the traditional method. This method also helps to identify chemical lead of the compounds and optimise them through the biological screening using a high-throughput method. There is no review concerning the recent research finding of combinatorial synthesis. Hence, an attempt had been made on the latest research findings (2002–2020) of newly synthesised compounds using combinatorial synthesis and their biological activities.

Conclusion: To the best of our knowledge, the current review has completely analysed the importance of combinatorial synthesis and furnished an overview of solid-phase and solution-phase techniques as well as helped mankind by improving higher productivity at low cost, lead identification and optimization and preventing environmental pollution.

Keywords: Combinatorial synthesis, Solid phase, Solution phase, Higher productivity

* Correspondence: gopi@giet.ac.in
[1]Department of pharmaceutical chemistry, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296: (A.P.)

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2020) 9:57
https://doi.org/10.1186/s43088-020-00083-7

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW Open Access

An overview of recent progress in modern synthetic approach—combinatorial synthesis

Chandravadivelu Gopi[1*], Gudapati Krupamai[1], Chitikina Satya Sri[1] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: In recent times, a powerful tool of combinatorial synthesis has been used for the preparation of large chemical entities through a small set up of reactions between different building blocks using solid-phase and solution-phase techniques. This method reduced the time and cost of the drug discovery process substantially.

Main text: Thousands of compounds are synthesised in a few reactions through combinatorial synthesis instead of getting a few compounds in the traditional method. This method also helps to identify chemical lead of the compounds and optimise them through the biological screening using a high-throughput method. There is no review concerning the recent research finding of combinatorial synthesis. Hence, an attempt had been made on the latest research findings (2002–2020) of newly synthesised compounds using combinatorial synthesis and their biological activities.

Conclusion: To the best of our knowledge, the current review has completely analysed the importance of combinatorial synthesis and furnished an overview of solid-phase and solution-phase techniques as well as helped mankind by improving higher productivity at low cost, lead identification and optimization and preventing environmental pollution.

Keywords: Combinatorial synthesis, Solid phase, Solution phase, Higher productivity

* Correspondence: gopi@giet.ac.in
[1]Department of pharmaceutical chemistry, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2020) 9:57
https://doi.org/10.1186/s43088-020-00083-7

Beni-Suef University Journal of Basic and Applied Sciences

REVIEW

Open Access

An overview of recent progress in modern synthetic approach—combinatorial synthesis

Chandravadivelu Gopi[1*], Gudapati Krupamai[1], Chitikina Satya Sri[1] and Magharla Dasaratha Dhanaraju[2]

Abstract

Background: In recent times, a powerful tool of combinatorial synthesis has been used for the preparation of large chemical entities through a small set up of reactions between different building blocks using solid-phase and solution-phase techniques. This method reduced the time and cost of the drug discovery process substantially.

Main text: Thousands of compounds are synthesised in a few reactions through combinatorial synthesis instead of getting a few compounds in the traditional method. This method also helps to identify chemical lead of the compounds and optimise them through the biological screening using a high-throughput method. There is no review concerning the recent research finding of combinatorial synthesis. Hence, an attempt had been made on the latest research findings (2002–2020) of newly synthesised compounds using combinatorial synthesis and their biological activities.

Conclusion: To the best of our knowledge, the current review has completely analysed the importance of combinatorial synthesis and furnished an overview of solid-phase and solution-phase techniques as well as helped mankind by improving higher productivity at low cost, lead identification and optimization and preventing environmental pollution.

Keywords: Combinatorial synthesis, Solid phase, Solution phase, Higher productivity

* Correspondence: gopi@giet.ac.in
[1]Department of pharmaceutical chemistry, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296: (AP

Original Article

Design Development and Characterisation of Tramadol Hydrochloride Loaded Transethosomal Gel Formulation for Effective Pain Management

Vankayala Devendiran Sundar*, **Pamu Divya, Magharla Dasaratha Dhanaraju**

Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Introduction: The purpose of the present study was to design develop and characterize the tramadol hydrochloride loaded transethosomal gel formulation for effective pain management. **Materials and Methods:** The transethosomes were prepared by simple cold method. Total 12 formulations were prepared using different concentrations of phospholipid (Soya lecithin and L-α Phosphatidylcholine from egg yolk) and edge activator (Span 20 and Cremophor EL 35).The developed transethosomes were characterized for FTIR, drug content, EE, particle size, zeta potential, TEM, *in vitro* drug release and release kinetics. The optimised formulation was selected for preparation of transethosomal gel. The formulated gel was estimated for viscosity, drug content, EE and stability study for 28 days. **Results and Discussion:** The zeta potential of best formulation was -22mV, the particle size was at the range of 149.34 nm to 278 nm. Span 20 formulations exhibit a faster drug release (91.91to 95.7%) than the Cremophor formulations, whose release exhibits an extended pattern (78.96% to 79.34%) at the end of 8th hr. Optimised formulation follows first order kinetics and its R2 value is 0.991. **Conclusion:** The study supports the development of optimised transethosome formulation into a topical gel using carbopol 934 as gelling agent. The viscosity of the gel formulation was 30168 cps. The drug content and EE was found to be 91.52% and 79.37% respectively. Stability studies prove that there is very less change in the EE, hence the formulation was found to be stable.

Key words: Transethosomes, Tramadol hydrochloride, Phospholipid, Edge activator, Entrapment efficiency.

Submission Date: 20-07-2019;
Revision Date: 06-02-2020;
Accepted Date: 12-03-2020

DOI: 10.5530/ijper.54.2s.65

Correspondence:
Dr. Vankayala Devendiran Sundar
Professor, Department of Pharmaceutical Technology, GIET School of Pharmacy, NH –16, Chaitanya Knowledge City, Rajah-mundry-533296, Andhra Pradesh, INDIA.
Phone: +91 9959212600
E-mail: sundarvd@yahoo.co.in

INTRODUCTION

Topical drug delivery of active pharmaceutical carriers, which a drug is delivered in the targeted area under controlled system can have a significant effect on efficacy.[1] The main advantage of the topical drug delivery is to bypass first pass metabolism. Topical drug carriers are used for the localized effect of application and deliver the drug into underlying percutaneous layers of the skin.[2] These systems can be characterized as controlled and targeted drug delivery systems. The systems raise the efficacy of the drug and dominate the side effects for the improved patient compliance. The polar drug molecules are encapsulated into the hydrophobic channel carrier which is prevented from hydrolysis and enzymatic degradation[3,4] The ethosomal carriers are vesicular systems that comprise phospholipids, water and a moderately increased concentration of ethanol. Ethosomal systems are of three type's namely classical ethosomes, binary ethosomes and transethosomes (TEs).[5] These are of novel generation and developed in 2012.[6] They usually comprises of ethosomes and an edge activator or a penetration enhancer. The transethosomes improves the physical and chemical qualities of the therapeutic drug enclosed in dermal

www.ijper.org

Original Article

Design Development and Characterisation of Tramadol Hydrochloride Loaded Transethosomal Gel Formulation for Effective Pain Management

Vankayala Devendiran Sundar*, Pamu Divya, Magharla Dasaratha Dhanaraju

Department of Pharmaceutical Technology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Introduction: The purpose of the present study was to design develop and characterize the tramadol hydrochloride loaded transethosomal gel formulation for effective pain management. **Materials and Methods:** The transethosomes were prepared by simple cold method. Total 12 formulations were prepared using different concentrations of phospholipid (Soya lecithin and L-α Phosphatidylcholine from egg yolk) and edge activator (Span 20 and Cremophor EL 35).The developed transethosomes were characterized for FTIR, drug content, EE, particle size, zeta potential, TEM, *in vitro* drug release and release kinetics. The optimised formulation was selected for preparation of transethosomal gel. The formulated gel was estimated for viscosity, drug content, EE and stability study for 28 days. **Results and Discussion:** The zeta potential of best formulation was -22mV, the particle size was at the range of 149.34 nm to 278 nm. Span 20 formulations exhibit a faster drug release (91.91to 95.7%) than the Cremophor formulations, whose release exhibits an extended pattern (78.96% to 79.34%) at the end of 8th hr. Optimised formulation follows first order kinetics and its R2 value is 0.991. **Conclusion:** The study supports the development of optimised transethosome formulation into a topical gel using carbopol 934 as gelling agent. The viscosity of the gel formulation was 30168 cps. The drug content and EE was found to be 91.52% and 79.37% respectively. Stability studies prove that there is very less change in the EE, hence the formulation was found to be stable.

Key words: Transethosomes, Tramadol hydrochloride, Phospholipid, Edge activator, Entrapment efficiency.

INTRODUCTION

Topical drug delivery of active pharmaceutical carriers, which a drug is delivered in the targeted area under controlled system can have a significant effect on efficacy.[1] The main advantage of the topical drug delivery is to bypass first pass metabolism. Topical drug carriers are used for the localized effect of application and deliver the drug into underlying percutaneous layers of the skin.[2] These systems can be characterized as controlled and targeted drug delivery systems. The systems raise the efficacy of the drug and dominate the side effects for the improved patient compliance. The polar drug molecules are encapsulated into the hydrophobic channel carrier which is prevented from hydrolysis and enzymatic degradation[3,4] The ethosomal carriers are vesicular systems that comprise phospholipids, water and a moderately increased concentration of ethanol. Ethosomal systems are of three type's namely classical ethosomes, binary ethosomes and transethosomes (TEs).[5] These are of novel generation and developed in 2012.[6] They usually comprises of ethosomes and an edge activator or a penetration enhancer. The transethosomes improves the physical and chemical qualities of the therapeutic drug enclosed in dermal

Submission Date: 20-07-2019;
Revision Date: 06-02-2020;
Accepted Date: 12-03-2020

DOI: 10.5530/ijper.54.2s.65

Correspondence:
Dr. Vankayala Devendiran Sundar
Professor, Department of Pharmaceutical Technology, GIET School of Pharmacy, NH –16, Chaitanya Knowledge City, Rajah-mundry-533296, Andhra Pradesh, INDIA.
Phone: +91 9959212600
E-mail: sundarvd@yahoo.co.in

www.ijper.org

Research Article

Evaluation and Management of Atopic Dermatitis

J John Kirubakaran[1]*, Khandavilli Lakshmi Surekha[1], Saka Manasa[1], Amarthi Naga Venkata Chakra Satyanarayana[1], KV Srilakshmi[1], Harinath Palivela[2], Praveen Kumar[3], Magharla Dasaratha Dhanaraju[4]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
[2]DVL, Dermatologist, Bhavya Clinic, Rajahmundry, Andhra Pradesh, INDIA.
[3]Pediatrist, Vijay Sai Pediatrics Hospital, Rajahmundry, Andhra Pradesh, INDIA.
[4]Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Background: Atopic dermatitis is the most predominant disease seen mostly in children and the prevalence of disease is 10% to 20%. The pathogenesis of the disease includes immunological, food allergies, pollen grains, breast feeding and secondary infections. **Objectives:** To identify the cause and to evaluate the appropriate treatment of the patients with atopic dermatitis. **Methods:** A total of 116 patients are included in the study conducted in skin care and paediatric hospital in the area of Rajahmundry, India. **Results:** From the study conducted, we observed that the occurrence of the disease is in different age groups and most of the patients are affected by pollen grains (10%) followed by pets and respiratory illness (5.3%), allergies (5%) and pollutants (4.6%) and family history (3.3%) respectively. On evaluation, the treatment topical steroids are found to be more prominently used followed by emollients, antibiotics, antihistamines and immunomodulators. **Conclusion:** As per the study, we conclude that the occurrence of the disease is mainly due to pollen grains followed by other determined causes as seen in the area of Rajahmundry.

Key words: Atopic dermatitis, Aetiology, Pollen grains, Topical steroids, Emollients.

INTRODUCTION

Atopic dermatitis (AD), commonly referred as eczema. It is a chronic, relapsing and often intensely pruritic inflammatory disorder of skin allergy.[1] In infants AD is often the initial indication of 'atopic march' which leads to asthma, food allergy and allergic rhinitis.[2] It is the most common childhood disorder with a prevalence of 10% to 20% which is increased up to two to three-fold since the 1970's.[3]

AD is the chronic inflammatory disease which is mainly caused due to triggering due to imbalance of T-helper cells,[4] pollen grains mainly causes hypersensitivity reaction due to aeroallergens of Dactylisglomerata or pyrethrum plants,[5,6] foods like milk, eggs, peanuts etc. can provoke allergies,[7] breastfeeding on the mother with any known respiratory illness causes atopic dermatitis in children[8] and secondary infections by bacteria (for eg. *S. aureus*) leads to lesions by altering the sebum and sweat secretion.[9,10]

The American Academy of Dermatology has suggested some universal diagnostic criteria for atopic dermatitis which includes essential features like pruritus, atopy, eczematous changes that are acute, sub-acute and chronic.[11] Clinically, the morphology and distribution of eczema in AD patients varied based on the age of infants (birth to below 2 years of age) typically present with erythematous papules and vesicles on the cheeks, forehead and scalp, whereas children (above 2 years of age) exhibit dry skin and lichenified papules and plaques in flexural areas of the limbs. In adulthood, the predominant areas of eczema are the flexural folds, the face and neck, the upper arms and back, hands, feet, fingers and toes.[2]

Skin-directed therapies should be the first approach to the management. AD results from an abnormality of the skin barriers which includes drying of the skin due to filaggrin deficiency and reduce natural skin lipids. Emollients[4,12] are used to repair and maintain healthy skin barriers by retaining

DOI: 10.5530/ijopp.13.2.22

Address for correspondence:
Mr. J. John Kirubakaran
Associate Professor,
Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
Phone no: +91 7893277176
Email Id: john.mpharm@gmail.com

www.ijopp.org

Evaluation and Management of Atopic Dermatitis

J John Kirubakaran[1]*, Khandavilli Lakshmi Surekha[1], Saka Manasa[1], Amarthi Naga Venkata Chakra Satyanarayana[1], KV Srilakshmi[1], Harinath Palivela[2], Praveen Kumar[3], Magharla Dasaratha Dhanaraju[4]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
[2]DVL, Dermatologist, Bhavya Clinic, Rajahmundry, Andhra Pradesh, INDIA.
[3]Pediatrist, Vijay Sai Pediatrics Hospital, Rajahmundry, Andhra Pradesh, INDIA.
[4]Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.

ABSTRACT

Background: Atopic dermatitis is the most predominant disease seen mostly in children and the prevalence of disease is 10% to 20%. The pathogenesis of the disease includes immunological, food allergies, pollen grains, breast feeding and secondary infections. **Objectives:** To identify the cause and to evaluate the appropriate treatment of the patients with atopic dermatitis. **Methods:** A total of 116 patients are included in the study conducted in skin care and paediatric hospital in the area of Rajahmundry, India. **Results:** From the study conducted, we observed that the occurrence of the disease is in different age groups and most of the patients are affected by pollen grains (10%) followed by pets and respiratory illness (5.3%), allergies (5%) and pollutants (4.6%) and family history (3.3%) respectively. On evaluation, the treatment topical steroids are found to be more prominently used followed by emollients, antibiotics, antihistamines and immunomodulators. **Conclusion:** As per the study, we conclude that the occurrence of the disease is mainly due to pollen grains followed by other determined causes as seen in the area of Rajahmundry.

Key words: Atopic dermatitis, Aetiology, Pollen grains, Topical steroids, Emollients.

INTRODUCTION

Atopic dermatitis (AD), commonly referred as eczema. It is a chronic, relapsing and often intensely pruritic inflammatory disorder of skin allergy.[1] In infants AD is often the initial indication of 'atopic march' which leads to asthma, food allergy and allergic rhinitis.[2] It is the most common childhood disorder with a prevalence of 10% to 20% which is increased up to two to three-fold since the 1970's.[3]

AD is the chronic inflammatory disease which is mainly caused due to triggering due to imbalance of T-helper cells,[4] pollen grains mainly causes hypersensitivity reaction due to aeroallergens of Dactylisglomerata or pyrethrum plants,[5,6] foods like milk, eggs, peanuts etc. can provoke allergies,[7] breastfeeding on the mother with any known respiratory illness causes atopic dermatitis in children[8] and secondary infections by bacteria (for eg. *S. aureus*) leads to lesions by altering the sebum and sweat secretion.[9,10]

The American Academy of Dermatology has suggested some universal diagnostic criteria for atopic dermatitis which includes essential features like pruritus, atopy, eczematous changes that are acute, sub-acute and chronic.[11] Clinically, the morphology and distribution of eczema in AD patients varied based on the age of infants (birth to below 2 years of age) typically present with erythematous papules and vesicles on the cheeks, forehead and scalp, whereas children (above 2 years of age) exhibit dry skin and lichenified papules and plaques in flexural areas of the limbs. In adulthood, the predominant areas of eczema are the flexural folds, the face and neck, the upper arms and back, hands, feet, fingers and toes.[2]

Skin-directed therapies should be the first approach to the management. AD results from an abnormality of the skin barriers which includes drying of the skin due to filaggrin deficiency and reduce natural skin lipids. Emollients[4,12] are used to repair and maintain healthy skin barriers by retaining

DOI: 10.5530/ijopp.13.2.22

Address for correspondence:
Mr. J. John Kirubakaran
Associate Professor,
Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, INDIA.
Phone no: +91 7893277176
Email Id: john.mpharm@gmail.com

www.ijopp.org

REVIEW ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation

Journal Home Page: www.ijrps.com

Huntington's Disease- An Updated Review

Hima Bindu Mylapalli[1], Ramam Sripada[*2], Sireesha Maram[1], Sudeepthi Padala[1], Aksha Susmitha Jangam[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 05 May 2020
Revised on: 05 Jun 2020
Accepted on: 10 Jun 2020

Keywords:

Chorea,
Dystonia,
Huntington's disease

ABSTRACT

Huntington's disease (HD) is a rare autosomal dominant, fatal neurodegenerative disorder of the central nervous system characterized by unwanted choreatic movements, behavioural disruption, psychiatric disturbances and dementia. This condition is characterized by progressive degeneration of neurons within the basal ganglia, primarily the caudate and the putamen. As the disease progresses, neuronal losses occur in the white matter, cerebral cortex and thalamus. In this article, the authors reviewed the genetic aspects, etiological factors, stages of the disease condition along with the signs and symptoms, various diagnostic procedures besides with the pharmacological and non-pharmacological management of the Huntington's disease. This disease is inherited within the families, and the pathophysiology of Huntington disease is restricted to the brain, where degeneration begins initially in the striatum, spreads to the cortex and eventually appears throughout the brain. The pathogenesis of this disease is still unrevealed, and there is no treatment available for the cure of the disease. There were many drugs of choices available for symptomatic treatment aiming to improve the quality of life in the patient. The non-pharmacological therapy for managing Huntington's disease includes physiotherapy, speech therapy and psychotherapy. At a therapeutic setting, all the needs of the patients are to be addressed as the advancement in the development of new therapeutic agents are paving the way for the better outcomes in the management of Huntington's disease and thereby promising better healthcare for these patients.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2545

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

Huntington's disease (HD) is a rare autosomal dominant, fatal neurodegenerative disorder of the central nervous system characterized by unwanted choreatic movements, behavioural and psychiatric disturbances and dementia (Raymund, 2010). This condition is characterized by progressive degeneration of neurons within the basal ganglia, primarily the caudate and the putamen (Bilney *et al.*, 2003). As the disease progresses, neuronal losses occur in the white matter, cerebral cortex and thalamus (Vonsattel *et al.*, 1985). Huntington's disease is characterized by both voluntary as well as involuntary movement disorders. Voluntary movements can be affected by bradykinesia and akinesia, resulting in difficulty in initiating movements. Postural stability may also be impaired due to loss of balance during movements resulting in sudden and frequent falls (Kirkwood *et al.*, 2001). Involuntary move-

Dr. M.D. PRASADA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City,
RAJAHMUNDRY-533 296, (A.P.)

REVIEW ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation

Journal Home Page: www.ijrps.com

Huntington's Disease- An Updated Review

Hima Bindu Mylapalli[1], Ramam Sripada[*2], Sireesha Maram[1], Sudeepthi Padala[1], Aksha Susmitha Jangam[1], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 05 May 2020
Revised on: 05 Jun 2020
Accepted on: 10 Jun 2020

Keywords:

Chorea,
Dystonia,
Huntington's disease

ABSTRACT

Huntington's disease (HD) is a rare autosomal dominant, fatal neurodegenerative disorder of the central nervous system characterized by unwanted choreatic movements, behavioural disruption, psychiatric disturbances and dementia. This condition is characterized by progressive degeneration of neurons within the basal ganglia, primarily the caudate and the putamen. As the disease progresses, neuronal losses occur in the white matter, cerebral cortex and thalamus. In this article, the authors reviewed the genetic aspects, etiological factors, stages of the disease condition along with the signs and symptoms, various diagnostic procedures besides with the pharmacological and non-pharmacological management of the Huntington's disease. This disease is inherited within the families, and the pathophysiology of Huntington disease is restricted to the brain, where degeneration begins initially in the striatum, spreads to the cortex and eventually appears throughout the brain. The pathogenesis of this disease is still unrevealed, and there is no treatment available for the cure of the disease. There were many drugs of choices available for symptomatic treatment aiming to improve the quality of life in the patient. The non-pharmacological therapy for managing Huntington's disease includes physiotherapy, speech therapy and psychotherapy. At a therapeutic setting, all the needs of the patients are to be addressed as the advancement in the development of new therapeutic agents are paving the way for the better outcomes in the management of Huntington's disease and thereby promising better healthcare for these patients.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2545

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

Huntington's disease (HD) is a rare autosomal dominant, fatal neurodegenerative disorder of the central nervous system characterized by unwanted choreatic movements, behavioural and psychiatric disturbances and dementia (Raymund, 2010). This condition is characterized by progressive degeneration of neurons within the basal ganglia, primarily the caudate and the putamen (Bilney *et al.*, 2003). As the disease progresses, neuronal losses occur in the white matter, cerebral cortex and thalamus (Vonsattel *et al.*, 1985). Huntington's disease is characterized by both voluntary as well as involuntary movement disorders. Voluntary movements can be affected by bradykinesia and akinesia, resulting in difficulty in initiating movements. Postural stability may also be impaired due to loss of balance during movements resulting in sudden and frequent falls (Kirkwood *et al.*, 2001). Involuntary move-

Multidisciplinary Review Journal

Journal of Critical Reviews

ISSN- 2394-5125 Vol 7, Issue 7, 2020

A REVIEW ON PHYTOCHEMICALS AND BIOLOGICAL ACTIVITIES OF SEAGRASS

Kavitha D[1,2], Kalaivani P[1], Vanitha V[1]*

[1]Department of Biochemistry, Vels Institute of Science, Technology and Advanced Studies, Pallavaram, Chennai-600117, Tamil Nadu, India

[2]GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry -533296, Andhra Pradesh, India

Corresponding author E-mail ID: vanitha.sls@velsuniv.ac.in

Received: 01.02.2020 *Revised: 05.03.2020* *Accepted: 07.04.2020*

Abstract

Seagrasses are the residents of the coastal waters, globally which are rated as one of the most valuable ecosystems. During photosynthesis, they release oxygen to the water column and also pumps oxygen into the sediments through their roots to create an anoxic environment around roots to support extensive nutrient uptake. They are represented as one of the highly productive coastal ecosystem as well as of protects the shorelines against the erosion in the middle, lower intertidal and subtidal zones of the world. In folk medicine, seagrasses have been used for a variety of remedial purposes. But there is no review concerning various uses of seagrasses. In the presented study, an attempt had been made on various species of seagrass and find out the different phytochemicals and pharmacological uses.

Keywords: Seagrasses; Phytochemicals; Pharmacological uses; Anti cancer activity

DOI: http://dx.doi.org/10.31838/jcr.07.07.42

INTRODUCTION:

An ecosystem is a geographic area where plants, animals, and other organisms together to form a bubble of life [1]. There is plenty of ecosystems is existing in the galaxy [2]. The marine ecosystem is one of a vital and complex ecosystem in the world [3]. In the marine, Seagrasses are primary producer where most of the fish's feeds [4]. When compared to the coral and mangrove ecosystems, Sea grasses are one of the most widespread types of coastal vegetation [5]. It is a ribbon-like grassy leaf and not a terrestrial *Poaceae* [6]. It is a flowering plant and completes its life cycle when they are submerged in seawater [7]. Seagrass is a hydrophyte that lives in tropical or subtropical coastal areas [8]. These plants have developed unique physiological, morphological and ecological adaptations for a completely submerged existence, which include submarine pollution, internal gas transport, marine dispersal and epidermal chloroplasts which provide with important ecological services to the marine environment [9]. It is the lagoons around the islands and extends a depth of 10-15 m along the open shores. They are critical aquatic plants as they maintain the quality of the water by removing pollutant effectively from marine waters and sediments in the coastal areas [10]. Around the world, there are fifty-two species of seagrasses were found so far in which 14 species were identified in the east and west coastal part of India. These are belonging to the families of Zoseraceae, Cymodoceaceae, Posidoniaceae and Hydrocharitaceae [11]. Biomass of seagrass has been used often as food and medicine by coastal indigenous society [12]. It has been known as marine forms can be used against microbial attack [13]. In addition to that, they have been used for traditional medicine such as fever [14], anti-inflammatory [15], muscle pain, anti-oxidant [16], skin disease [17], anti-viral [18], stomach problems [19], anti-diabetic [20], wounds [21], tranquillizer [22] and anti-cancer activities [23] etc., However, many seagrasses are vulnerable to degradation due to developmental activities in the coastal areas. If it is not properly protected, may not available to the next generation. Therefore, there is a need to take some measurement to safeguard the seagrass and ensure the availability of therapeutic effects of seagrass to the needy in future. In the last two decades, several scientists all over the world had paid much interest in seagrass and found with different therapeutic activities. But there is no review on seagrass of the latest finding.

This review work provides an adequate knowledge about seagrasses, their phytochemical constituents, the biological effect of recent findings such as antibacterial, anti-inflammatory, anti-cancer, anti-viral, anti-oxidant, tranquillizer and their future perspectives.

In the present review, we discussed about species of sea grasses available around the world and their biological activities along with phytochemical constituents. From the literature survey much information was not found regarding biological activity. So, we focussed on biological activities and prolonged to current and future scope of work on sea grass in order to step forward for researches to focus towards commercialization of natural products from sea grass.

Various species of seagrasses in India

Scientific communities and environmentalists have shown less priority on seagrass research in olden days. In the recent times, alot of interest had been given on the seagrass researchdue to the different therapeutic activities were found in the seagrass. Six genera and thirteen species of seagrass were seen in India [24], in which maximum number of species were identified in the gulf of mannar, palle bay harbor than Andaman and Nicobar Lakshadweep islands.

Seagrass in India

Class - Monocotyledons
Order - Helobiae

Genera and Species

Family-Hydrocharitaceae

1. Enhalus acoroides
2. Halophila ovalis
3. Halophila ovata
4. Halophila stipulacea
5. Halophila beccarii
6. Halophila decipiens
7. Thalassia hemprichii

Family –Polamogetanaceae

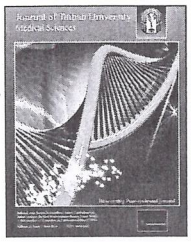
8. Cymodocea rotundata
9. Cymodocea serrulata
10. Halodule univervis
11. Halodule pinifolia

Journal of Taibah University Medical Sciences (2020) 15(2), 122–128

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

Effect of *Prunus dulcis* and *Salvia hispenica* in the management of polycystic ovary syndrome in Wistar rats

Somasundaram Ramachandran, PhD [a,*], Jasthi Nikitha, M.Pharm [a], Chandravadivelu Gopi, PhD [b], Masa Amala, M.Pharm [a] and Magharla D. Dhanaraju, PhD [c]

[a] *Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, India*
[b] *Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, India*
[c] *Research Lab, GIET School of Pharmacy, Rajahmundry, India*

Received 13 September 2019; revised 30 January 2020; accepted 2 February 2020; Available online 19 March 2020

الملخص

أهداف البحث: أظهرت الأبحاث أن معظم السيدات يعانين من العقم بسبب متلازمة المبيض المتعدد الأكياس. الأدوية المستخدمة لعلاج متلازمة المبيض المتعدد الأكياس تميل أساسا لعلاج الأعراض بدلا من علاج المرض. إضافة إلى ذلك، تؤدي الأدوية إلى آثار جانبية حادة. هذه الآثار الضارة لها تأثير على جودة الحياة للمريضات أيضا. مما يستلزم الحاجة إلى دواء طبيعي يعالج بفاعلية متلازمة المبيض المتعدد الأكياس من دون آثار جانبية.

طرق البحث: تم تحريض فئران ويستر البالغة بمتلازمة المبيض المتعدد الأكياس عن طريق إعطائهم ليتروزول ١ مجم/كجم لمدة ٢١ يوما عن طريق الفم. كما تم إعطاء برقوق دولسيز (الجوز) والقصعين الإسباني (بذور الشيا)، بشكل فردي ومعا، لفئران التجارب لمدة ١٥ يوما. أي من يوم ٢٢ إلى ٣٦ بعد إحداث متلازمة المبيض المتعدد الأكياس. بعد ذلك، تم فحص الفئران للخصائص الشكلية، والبيوكيميائية والمرضية.

النتائج: كان هناك انخفاض كبير في وزن الجسم ووزن المبيضين. وتم الحفاظ على الهرمونات على مستويات مطلوبة بعد استهلاك برقوق دولسيز والقصعين الإسباني بشكل فردي ومع بعضهم. حثت هذه المواد على الإباضة لدى حيوانات التجارب بواسطة منع ضعف خلايا المبيض بسبب وجود مركبات البوليفينول. تمت مقارنة هذه النتائج بمجموعات التحكم والمجموعات القياسية.

الاستنتاجات: تشير هذه الدراسة إلى أن الحيوانات التي تم تغذيتها ببرقوق دولسيز والقصعين الإسباني بشكل فردي ومعا منعا العقم. كما تمت استعادة مستويات الهرمون واضطرابات الأيض عند حيوانات التجارب. لذلك، يمكن استخدام برقوق دولسيز والقصعين الإسباني كعوامل علاجية لعلاج مرضى العقم بسبب ضعف البويضة والإباضة.

الكلمات المفتاحية: متلازمة المبيض المتعدد الأكياس؛ تشكل المبيض المتعدد الأكياس؛ ليتروزول؛ سترات الكلوميفين؛ مركبات البوليفينول

Abstract

Objective: Research has shown that polycystic ovary syndrome (PCOS) is a common cause of infertility in women. The drugs used to treat PCOS tend to manage the symptoms rather than cure the disease. Furthermore, these drugs have severe side-effects and influence the quality of life for the patients. There is therefore a need for natural medicine that can effectively treat PCOS without side-effects.

Method: PCOS was induced in adult female Wistar rats by daily oral administration of letrozole (1 mg/kg) for 21 days. From day 22 until the end of the experiment (day 36), these rats were given a daily oral dose of either *Prunus dulcis* (walnut) or *Salvia hispenica* (chia seed) alone, or in combination. Animals were subsequently examined for morphological, biochemical, and histopathological changes.

Result: When compared with the control and standard groups, rats who had consumed *P. dulcis* and *S. hispenica*, either as individual agents or in combination, had significantly lower body and ovarian weights, and hormone concentrations were maintained at healthy levels. The presence of polyphenolic compounds in these substances induced ovulation in the PCOS model animals.

* Corresponding address: Department of Pharmacology, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533 296, India.
E-mail: ramsnetin@yahoo.com (S. Ramachandran)

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

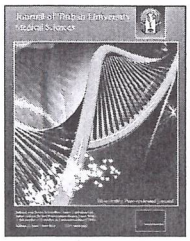
https://doi.org/10.1016/j.jtumed.2020.02.002

Journal of Taibah University Medical Sciences (2020) 15(2), 122–128

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

Effect of *Prunus dulcis* and *Salvia hispenica* in the management of polycystic ovary syndrome in Wistar rats

Somasundaram Ramachandran, PhD [a,*], Jasthi Nikitha, M.Pharm [a], Chandravadivelu Gopi, PhD [b], Masa Amala, M.Pharm [a] and Magharla D. Dhanaraju, PhD [c]

[a] *Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, India*
[b] *Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, India*
[c] *Research Lab, GIET School of Pharmacy, Rajahmundry, India*

Received 13 September 2019; revised 30 January 2020; accepted 2 February 2020; Available online 19 March 2020

الملخص

أهداف البحث: أظهرت الأبحاث أن معظم السيدات يعانين من العقم بسبب متلازمة المبيض المتعدد الأكياس. الأدوية المستخدمة لعلاج متلازمة المبيض المتعدد الأكياس تميل أساسا لعلاج الأعراض بدلا من علاج المرض. إضافة إلى ذلك، تؤدي الأدوية إلى آثار جانبية حادة. هذه الآثار الضارة لها تأثير على جودة الحياة للمريضات أيضا. مما يستلزم الحاجة إلى دواء طبيعي يعالج بفاعلية متلازمة المبيض المتعدد الأكياس من دون آثار جانبية.

طرق البحث: تم تحريض فئران ويستر البالغة بمتلازمة المبيض المتعدد الأكياس عن طريق إعطائهم ليتروزول ١ مجم/كجم لمدة ٢١ يوما عن طريق الفم. كما تم إعطاء برقوق دولسيز (الجوز) والقصعين الإسباني (بذور الشيا)، بشكل فردي ومعا، لفئران التجارب لمدة ١٥ يوما. أي من يوم ٢٢ إلى ٣٦ بعد إحداث متلازمة المبيض المتعدد الأكياس. بعد ذلك، تم فحص الفئران للخصائص الشكلية، والبيوكيميائية والمرضية.

النتائج: كان هناك انخفاض كبير في وزن الجسم ووزن المبيضين. وتم الحفاظ على الهرمونات على مستويات مطلوبة بعد استهلاك برقوق دولسيز والقصعين الإسباني بشكل فردي ومع بعضهم. حتت هذه المواد على الإباضة لدى حيوانات التجارب بواسطة منع ضعف خلايا المبيض بسبب وجود مركبات البوليفينول. تمت مقارنة هذه النتائج بمجموعات التحكم والمجموعات القياسية.

الاستنتاجات: تشير هذه الدراسة إلى أن الحيوانات التي تم تغذيتها ببرقوق دولسيز والقصعين الإسباني بشكل فردي ومعا منعا العقم. كما تمت استعادة مستويات الهرمون واضطرابات الأيض عند حيوانات التجارب. لذلك، يمكن استخدام برقوق دولسيز والقصعين الإسباني كعوامل علاجية لعلاج مرضى العقم بسبب ضعف البويضة والإباضة.

الكلمات المفتاحية: متلازمة المبيض المتعدد الأكياس؛ تشكل المبيض المتعدد الأكياس؛ ليتروزول؛ سترات الكلوميفين؛ مركبات البوليفينول

Abstract

Objective: Research has shown that polycystic ovary syndrome (PCOS) is a common cause of infertility in women. The drugs used to treat PCOS tend to manage the symptoms rather than cure the disease. Furthermore, these drugs have severe side-effects and influence the quality of life for the patients. There is therefore a need for natural medicine that can effectively treat PCOS without side-effects.

Method: PCOS was induced in adult female Wistar rats by daily oral administration of letrozole (1 mg/kg) for 21 days. From day 22 until the end of the experiment (day 36), these rats were given a daily oral dose of either *Prunus dulcis* (walnut) or *Salvia hispenica* (chia seed) alone, or in combination. Animals were subsequently examined for morphological, biochemical, and histopathological changes.

Result: When compared with the control and standard groups, rats who had consumed *P. dulcis* and *S. hispenica*, either as individual agents or in combination, had significantly lower body and ovarian weights, and hormone concentrations were maintained at healthy levels. The presence of polyphenolic compounds in these substances induced ovulation in the PCOS model animals.

* Corresponding address: Department of Pharmacology, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533 296, India.
E-mail: ramsnetin@yahoo.com (S. Ramachandran)

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

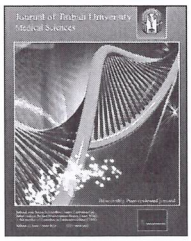
 https://doi.org/10.1016/j.jtumed.2020.02.002

Journal of Taibah University Medical Sciences (2020) 15(2), 122–128

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

Effect of *Prunus dulcis* and *Salvia hispenica* in the management of polycystic ovary syndrome in Wistar rats

Somasundaram Ramachandran, PhD [a,*], Jasthi Nikitha, M.Pharm [a], Chandravadivelu Gopi, PhD [b], Masa Amala, M.Pharm [a] and Magharla D. Dhanaraju, PhD [c]

[a] *Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, India*
[b] *Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, India*
[c] *Research Lab, GIET School of Pharmacy, Rajahmundry, India*

Received 13 September 2019; revised 30 January 2020; accepted 2 February 2020; Available online 19 March 2020

الملخص

أهداف البحث: أظهرت الأبحاث أن معظم السيدات يعانين من العقم بسبب متلازمة المبيض المتعدد الأكياس. الأدوية المستخدمة لعلاج متلازمة المبيض المتعدد الأكياس تميل أساسا لعلاج الأعراض بدلا من علاج المرض. إضافة إلى ذلك، تؤدي الأدوية إلى آثار جانبية حادة. هذه الآثار الضارة لها تأثير على جودة الحياة للمريضات أيضا. مما يستلزم الحاجة إلى دواء طبيعي يعالج بفاعلية متلازمة المبيض المتعدد الأكياس من دون آثار جانبية.

طرق البحث: تم تحريض فئران ويستر البالغة بمتلازمة المبيض المتعدد الأكياس عن طريق إعطائهم ليتروزول ١ مجم/كجم لمدة ٢١ يوما عن طريق الفم. كما تم إعطاء برقوق دولسيز (الجوز) والقصعين الإسباني (بذور الشيا)، بشكل فردي ومعا، لفئران التجارب لمدة ١٥ يوما. أي من يوم ٢٢ إلى ٣٦ بعد إحداث متلازمة المبيض المتعدد الأكياس. بعد ذلك، تم فحص الفئران للخصائص الشكلية، والبيوكيميائية والمرضية.

النتائج: كان هناك انخفاض كبير في وزن الجسم ووزن المبيضين. وتم الحفاظ على الهرمونات على مستويات مطلوبة بعد استهلاك برقوق دولسيز والقصعين الإسباني بشكل فردي ومع بعضهم. حثت هذه المواد على الإباضة لدى حيوانات التجارب بواسطة منع ضعف خلايا المبيض بسبب وجود مركبات البوليفينول. تمت مقارنة هذه النتائج بمجموعات التحكم والمجموعات القياسية.

الاستنتاجات: تشير هذه الدراسة إلى أن الحيوانات التي تم تغذيتها ببرقوق دولسيز والقصعين الإسباني بشكل فردي ومعا منعا العقم. كما تمت استعادة مستويات الهرمون واضطرابات الأيض عند حيوانات التجارب. لذلك، يمكن استخدام برقوق دولسيز والقصعين الإسباني كعوامل علاجية لعلاج مرضى العقم بسبب ضعف البويضة والإباضة.

الكلمات المفتاحية: متلازمة المبيض المتعدد الأكياس؛ تشكل المبيض المتعدد الأكياس؛ ليتروزول؛ سترات الكلوميفين؛ مركبات البوليفينول

Abstract

Objective: Research has shown that polycystic ovary syndrome (PCOS) is a common cause of infertility in women. The drugs used to treat PCOS tend to manage the symptoms rather than cure the disease. Furthermore, these drugs have severe side-effects and influence the quality of life for the patients. There is therefore a need for natural medicine that can effectively treat PCOS without side-effects.

Method: PCOS was induced in adult female Wistar rats by daily oral administration of letrozole (1 mg/kg) for 21 days. From day 22 until the end of the experiment (day 36), these rats were given a daily oral dose of either *Prunus dulcis* (walnut) or *Salvia hispenica* (chia seed) alone, or in combination. Animals were subsequently examined for morphological, biochemical, and histopathological changes.

Result: When compared with the control and standard groups, rats who had consumed *P. dulcis* and *S. hispenica*, either as individual agents or in combination, had significantly lower body and ovarian weights, and hormone concentrations were maintained at healthy levels. The presence of polyphenolic compounds in these substances induced ovulation in the PCOS model animals.

* Corresponding address: Department of Pharmacology, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533 296, India.
E-mail: ramsnetin@yahoo.com (S. Ramachandran)

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

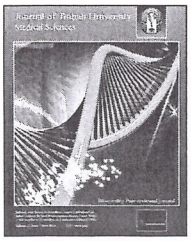
 https://doi.org/10.1016/j.jtumed.2020.02.002

Journal of Taibah University Medical Sciences (2020) 15(2), 122–128

Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

Effect of *Prunus dulcis* and *Salvia hispenica* in the management of polycystic ovary syndrome in Wistar rats

Somasundaram Ramachandran, PhD [a,*], Jasthi Nikitha, M.Pharm [a], Chandravadivelu Gopi, PhD [b], Masa Amala, M.Pharm [a] and Magharla D. Dhanaraju, PhD [c]

[a] *Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, India*
[b] *Department of Pharmaceutical Chemistry, GIET School of Pharmacy, Rajahmundry, India*
[c] *Research Lab, GIET School of Pharmacy, Rajahmundry, India*

Received 13 September 2019; revised 30 January 2020; accepted 2 February 2020; Available online 19 March 2020

الملخص

أهداف البحث: أظهرت الأبحاث أن معظم السيدات يعانين من العقم بسبب متلازمة المبيض المتعدد الأكياس. الأدوية المستخدمة لعلاج متلازمة المبيض المتعدد الأكياس تميل أساسا لعلاج الأعراض بدلا من علاج المرض. إضافة إلى ذلك، تؤدي الأدوية إلى آثار جانبية حادة. هذه الآثار الضارة لها تأثير على جودة الحياة للمريضات أيضا. مما يستلزم الحاجة إلى دواء طبيعي يعالج بفاعلية متلازمة المبيض المتعدد الأكياس من دون آثار جانبية.

طرق البحث: تم تحريض فئران ويستر البالغة بمتلازمة المبيض المتعدد الأكياس عن طريق إعطائهم ليتروزول ١ مجم/كجم لمدة ٢١ يوما عن طريق الفم. كما تم إعطاء برقوق دولسيز(الجوز) والقصعين الإسباني (بذور الشيا)، بشكل فردي ومعا، لفئران التجارب لمدة ١٥ يوما. أي من يوم ٢٢ إلى ٣٦ بعد إحداث متلازمة المبيض المتعدد الأكياس. بعد ذلك، تم فحص الفئران للخصائص الشكلية، والبيوكيميائية والمرضية.

النتائج: كان هناك انخفاض كبير في وزن الجسم ووزن المبيضين. وتم الحفاظ على الهرمونات على مستويات مطلوبة بعد استهلاك برقوق دولسيز والقصعين الإسباني بشكل فردي ومع بعضهم. حثت هذه المواد على الإباضة لدى حيوانات التجارب بواسطة منع ضعف خلايا المبيض بسبب وجود مركبات البوليفينول. تمت مقارنة هذه النتائج بمجموعات التحكم والمجموعات القياسية.

الاستنتاجات: تشير هذه الدراسة إلى أن الحيوانات التي تم تغذيتها ببرقوق دولسيز والقصعين الإسباني بشكل فردي ومعا منعا العقم. كما تمت استعادة مستويات الهرمون واضطرابات الأيض عند حيوانات التجارب. لذلك، يمكن استخدام برقوق دولسيز والقصعين الإسباني كعوامل علاجية لعلاج مرضى العقم بسبب ضعف البويضة والإباضة.

الكلمات المفتاحية: متلازمة المبيض المتعدد الأكياس؛ تشكل المبيض المتعدد الأكياس؛ ليتروزول؛ سترات الكلوميفين؛ مركبات البوليفينول

Abstract

Objective: Research has shown that polycystic ovary syndrome (PCOS) is a common cause of infertility in women. The drugs used to treat PCOS tend to manage the symptoms rather than cure the disease. Furthermore, these drugs have severe side-effects and influence the quality of life for the patients. There is therefore a need for natural medicine that can effectively treat PCOS without side-effects.

Method: PCOS was induced in adult female Wistar rats by daily oral administration of letrozole (1 mg/kg) for 21 days. From day 22 until the end of the experiment (day 36), these rats were given a daily oral dose of either *Prunus dulcis* (walnut) or *Salvia hispenica* (chia seed) alone, or in combination. Animals were subsequently examined for morphological, biochemical, and histopathological changes.

Result: When compared with the control and standard groups, rats who had consumed *P. dulcis* and *S. hispenica,* either as individual agents or in combination, had significantly lower body and ovarian weights, and hormone concentrations were maintained at healthy levels. The presence of polyphenolic compounds in these substances induced ovulation in the PCOS model animals.

* Corresponding address: Department of Pharmacology, GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533 296, India.
E-mail: ramsnetin@yahoo.com (S. Ramachandran)

Peer review under responsibility of Taibah University.

ELSEVIER Production and hosting by Elsevier

https://doi.org/10.1016/j.jtumed.2020.02.002

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation

Journal Home Page: www.ijrps.com

A Prospective Study On The Prevalence Of Retinal Lesions Among The Hypertensive Patients

Ramachandran S*[1], Sahithi Kiran T[2], Ramam Sripada[2], Supriya M[2], Sudeepthi Padala[2], Prabhakara Rao N[3], Geeth Sai V[2], Dasaratha Dhanaraju Magharla[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[3]Akira Eye Hospitals, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 15 Feb 2020
Revised on: 10 Mar 2020
Accepted on: 16 Mar 2020

Keywords:

Hypertension,
Ophthalmoscope,
Retinal lesion,
Slit lamp

ABSTRACT

To estimate the prevalence of retinal lesions among patients with hypertension. Hypertensive patients of both the genders above 18 years of age, who were willing to participate in the study, were included and patients who were having diabetes, previous retinal abnormalities and below 18 years of age were excluded from this study. The hypertensive patients were screened for the presence of retinal lesions and were categorised based on the severity of damage to the retinal arterioles and veins. In this study, about 876 patients who were diagnosed with hypertension were recruited and screened for retinal lesions. After screening, around 125 (14.3%) patients were observed with retinal lesions. In case of severity of retinal lesions in the hypertensive patients, most of the patients were found to be in Grade-I (40.8%) followed by Grade-II (37.6%). After treating with various types of treatment approaches, about 40 patients who were observed with retinal lesions of Grade-I severity were returned to a healthy state, and about 27 patients who were with retinal lesions of Grade-II severity were recovered to Grade-I. About six patients with retinal lesions of Grade-III was improved to Grade-II, and no patient recovered with the retinal lesions of Grade-IV severity. In this study, the prevalence of retinal lesions among the hypertensive patients was observed to be 14.3%, and the males were found to be more predominant with retinal lesions when compared to the females. It is the responsibility of the clinical pharmacist to create awareness among the hypertensive patients regarding the occurrence of hypertensive retinopathy as it may cause severe complications if left untreated. Hence, regular follow-ups are required for hypertensive patients, which may help to prevent retinal complications.

*Corresponding Author

Name: Ramachandran S
Phone: 9949261973
Email: ramsnetin@yahoo.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2383

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

Hypertension (HTN) affects several systems such as cardiovascular, renal, cerebrovascular, and ocular when it is uncontrolled (Modi and Arsiwalla, 2020; Kabedi *et al.*, 2014). It usually affects the eyes, causing three types of ocular damage that includes choroidopathy, retinopathy and optic neuropathy (Henderson *et al.*, 2011). Among these visual damages, hypertensive retinopathy is more prominent due to the poorly controlled systemic hypertension that causes damage to the retinal

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.ijrps.com

A Prospective Study On The Prevalence Of Retinal Lesions Among The Hypertensive Patients

Ramachandran S*[1], Sahithi Kiran T[2], Ramam Sripada[2], Supriya M[2], Sudeepthi Padala[2], Prabhakara Rao N[3], Geeth Sai V[2], Dasaratha Dhanaraju Magharla[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[3]Akira Eye Hospitals, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 15 Feb 2020
Revised on: 10 Mar 2020
Accepted on: 16 Mar 2020

Keywords:

Hypertension,
Ophthalmoscope,
Retinal lesion,
Slit lamp

ABSTRACT

To estimate the prevalence of retinal lesions among patients with hypertension. Hypertensive patients of both the genders above 18 years of age, who were willing to participate in the study, were included and patients who were having diabetes, previous retinal abnormalities and below 18 years of age were excluded from this study. The hypertensive patients were screened for the presence of retinal lesions and were categorised based on the severity of damage to the retinal arterioles and veins. In this study, about 876 patients who were diagnosed with hypertension were recruited and screened for retinal lesions. After screening, around 125 (14.3%) patients were observed with retinal lesions. In case of severity of retinal lesions in the hypertensive patients, most of the patients were found to be in Grade-I (40.8%) followed by Grade-II (37.6%). After treating with various types of treatment approaches, about 40 patients who were observed with retinal lesions of Grade-I severity were returned to a healthy state, and about 27 patients who were with retinal lesions of Grade-II severity were recovered to Grade-I. About six patients with retinal lesions of Grade-III was improved to Grade-II, and no patient recovered with the retinal lesions of Grade-IV severity. In this study, the prevalence of retinal lesions among the hypertensive patients was observed to be 14.3%, and the males were found to be more predominant with retinal lesions when compared to the females. It is the responsibility of the clinical pharmacist to create awareness among the hypertensive patients regarding the occurrence of hypertensive retinopathy as it may cause severe complications if left untreated. Hence, regular follow-ups are required for hypertensive patients, which may help to prevent retinal complications.

*Corresponding Author

Name: Ramachandran S
Phone: 9949261973
Email: ramsnetin@yahoo.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2383

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

Hypertension (HTN) affects several systems such as cardiovascular, renal, cerebrovascular, and ocular when it is uncontrolled (Modi and Arsiwalla, 2020; Kabedi *et al.*, 2014). It usually affects the eyes, causing three types of ocular damage that includes choroidopathy, retinopathy and optic neuropathy (Henderson *et al.*, 2011). Among these visual damages, hypertensive retinopathy is more prominent due to the poorly controlled systemic hypertension that causes damage to the retinal

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation

Journal Home Page: www.ijrps.com

A Prospective Study On The Prevalence Of Retinal Lesions Among The Hypertensive Patients

Ramachandran S*[1], Sahithi Kiran T[2], Ramam Sripada[2], Supriya M[2], Sudeepthi Padala[2], Prabhakara Rao N[3], Geeth Sai V[2], Dasaratha Dhanaraju Magharla[2]

[1]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[3]Akira Eye Hospitals, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 15 Feb 2020
Revised on: 10 Mar 2020
Accepted on: 16 Mar 2020

Keywords:

Hypertension,
Ophthalmoscope,
Retinal lesion,
Slit lamp

ABSTRACT

To estimate the prevalence of retinal lesions among patients with hypertension. Hypertensive patients of both the genders above 18 years of age, who were willing to participate in the study, were included and patients who were having diabetes, previous retinal abnormalities and below 18 years of age were excluded from this study. The hypertensive patients were screened for the presence of retinal lesions and were categorised based on the severity of damage to the retinal arterioles and veins. In this study, about 876 patients who were diagnosed with hypertension were recruited and screened for retinal lesions. After screening, around 125 (14.3%) patients were observed with retinal lesions. In case of severity of retinal lesions in the hypertensive patients, most of the patients were found to be in Grade-I (40.8%) followed by Grade-II (37.6%). After treating with various types of treatment approaches, about 40 patients who were observed with retinal lesions of Grade-I severity were returned to a healthy state, and about 27 patients who were with retinal lesions of Grade-II severity were recovered to Grade-I. About six patients with retinal lesions of Grade-III was improved to Grade-II, and no patient recovered with the retinal lesions of Grade-IV severity. In this study, the prevalence of retinal lesions among the hypertensive patients was observed to be 14.3%, and the males were found to be more predominant with retinal lesions when compared to the females. It is the responsibility of the clinical pharmacist to create awareness among the hypertensive patients regarding the occurrence of hypertensive retinopathy as it may cause severe complications if left untreated. Hence, regular follow-ups are required for hypertensive patients, which may help to prevent retinal complications.

*Corresponding Author

Name: Ramachandran S
Phone: 9949261973
Email: ramsnetin@yahoo.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2383

Production and Hosted by

IJRPS | www.ijrps.com

INTRODUCTION

Hypertension (HTN) affects several systems such as cardiovascular, renal, cerebrovascular, and ocular when it is uncontrolled (Modi and Arsiwalla, 2020; Kabedi *et al.*, 2014). It usually affects the eyes, causing three types of ocular damage that includes choroidopathy, retinopathy and optic neuropathy (Henderson *et al.*, 2011). Among these visual damages, hypertensive retinopathy is more prominent due to the poorly controlled systemic hypertension that causes damage to the retinal

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

Drug Utilization Evaluation in Dermatology Department: A Study in the Ambulatory Care Settings

Ramam Sripada[*1], Mounika P[1], Vineesha G[1], Hemanth Kumar V[1], Gandhi P S T N[1], Usha Kiran P[2], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Lalitha Endocare and Skincare Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 08 Jan 2020
Revised on: 14 Feb 2020
Accepted on: 04 Mar 2020

Keywords:

Antibacterials, Antifungals, Corticosteroids

ABSTRACT

The main aim of the study is to evaluate the prescribing pattern of drugs prescribed in the ambulatory patients attending the dermatology department. This was a prospective observational study conducted for a period of 6 months. Patients who were receiving treatment in the dermatological outpatient department and willing to participate were included in the study and patients in the inpatient dermatology department and also with other co morbid conditions were excluded from the study. A total of 306 cases were collected and among them, about 112 (36.6%) were males and 194 (63.4%) were females. During the study period, majority of the patients were in the age group of 21-30 years (41.2%). The most commonly prescribed classes were found to be Antibacterial drugs 312 (22.1%) followed by Antifungal drugs 258 (18.3%) and Anti-histamines 206 (14.6%). Among the antibacterial, Antibacterial soaps (35.3%) were more commonly prescribed followed by the antibiotics Mupirocin (12.8%) and Clindamycin (11.9%). In case of Antifungals, Ketoconazole (25.2%) was most commonly prescribed drug followed by Fluconazole (14%) and Clotrimazole (14%). Among the Antihistamine drug class, Levocetrizine (76.2%) was most commonly prescribed followed by Hydroxyzine (12.2%). The drug Prednisolone (26.4%) was most commonly prescribed among Corticosteroids, followed by Mometasone furoate (23.6%) and Hydroquinone (13.1%). Periodic evaluation of the prescribing pattern of the drugs can improve the quality of prescriptions. It is the responsibility of the clinical pharmacist to perform the drug utilization studies in order to know the drug prescribing patterns and also to know the prevalent disease conditions at a particular point of time. Clinical pharmacist should create awareness regarding the personal and community hygiene which would result in the prevention of dermatological diseases.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2577

Production and Hosted by

Pharmascope.org

INTRODUCTION

Dermatology is the branch of medicine which deals with the diseases pertaining to skin, nails and hair (Zhen *et al.*, 2014). Skin diseases are the most common disease that burden globally. These are usually chronic and require a life time treatment. In the clinical literature about 3000 varieties of skin diseases were identified while most of them are rarely found (Gupta *et al.*, 2016). They vary from one country to another country and also in different regions within the country. Altogether the skin

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

Drug Utilization Evaluation in Dermatology Department: A Study in the Ambulatory Care Settings

Ramam Sripada*[1], Mounika P[1], Vineesha G[1], Hemanth Kumar V[1], Gandhi P S T N[1], Usha Kiran P[2], Dasaratha Dhanaraju Magharla[1]

[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Lalitha Endocare and Skincare Hospital, Rajahmundry, Andhra Pradesh, India

Article History:

Received on: 08 Jan 2020
Revised on: 14 Feb 2020
Accepted on: 04 Mar 2020

Keywords:

Antibacterials, Antifungals, Corticosteroids

ABSTRACT

The main aim of the study is to evaluate the prescribing pattern of drugs prescribed in the ambulatory patients attending the dermatology department. This was a prospective observational study conducted for a period of 6 months. Patients who were receiving treatment in the dermatological outpatient department and willing to participate were included in the study and patients in the inpatient dermatology department and also with other co morbid conditions were excluded from the study. A total of 306 cases were collected and among them, about 112 (36.6%) were males and 194 (63.4%) were females. During the study period, majority of the patients were in the age group of 21-30 years (41.2%). The most commonly prescribed classes were found to be Antibacterial drugs 312 (22.1%) followed by Antifungal drugs 258 (18.3%) and Anti-histamines 206 (14.6%). Among the antibacterial, Antibacterial soaps (35.3%) were more commonly prescribed followed by the antibiotics Mupirocin (12.8%) and Clindamycin (11.9%). In case of Antifungals, Ketoconazole (25.2%) was most commonly prescribed drug followed by Fluconazole (14%) and Clotrimazole (14%). Among the Antihistamine drug class, Levocetrizine (76.2%) was most commonly prescribed followed by Hydroxyzine (12.2%). The drug Prednisolone (26.4%) was most commonly prescribed among Corticosteroids, followed by Mometasone furoate (23.6%) and Hydroquinone (13.1%). Periodic evaluation of the prescribing pattern of the drugs can improve the quality of prescriptions. It is the responsibility of the clinical pharmacist to perform the drug utilization studies in order to know the drug prescribing patterns and also to know the prevalent disease conditions at a particular point of time. Clinical pharmacist should create awareness regarding the personal and community hygiene which would result in the prevention of dermatological diseases.

*Corresponding Author

Name: Ramam Sripada
Phone: 8374214213
Email: ramampharmd7@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v11i3.2577

Production and Hosted by

Pharmascope.org

INTRODUCTION

Dermatology is the branch of medicine which deals with the diseases pertaining to skin, nails and hair (Zhen *et al.*, 2014). Skin diseases are the most common disease that burden globally. These are usually chronic and require a life time treatment. In the clinical literature about 3000 varieties of skin diseases were identified while most of them are rarely found (Gupta *et al.*, 2016). They vary from one country to another country and also in different regions within the country. Altogether the skin

ISSN NO. 2320-5407

Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/10387

DOI URL: http://dx.doi.org/10.21474/IJAR01/10387

RESEARCH ARTICLE

CARBAMAZEPINE INDUCED DRESS SYNDROME : A CASE REPORT

Sireesha Maram[1], Ramam Sripada[1], Himabindu Mylapalli[1], Sudeepthi Padala[1], Subhashini Konala[2], Satya Saka[2], Vamsi Bhukya[1] and Dasaratha Dhanaraju Magharla[1]

1. Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
2. Department of Dermatology, GSL General Hospital, Rajahmundry, Andhra Pradesh, India.

Manuscript Info

Manuscript History
Received: 30 November 2019
Final Accepted: 31 December 2019
Published: January 2020

Key words:-
Allopurinol, Carbamazepine, Dress Syndrome

Abstract

The Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) presents clinically as an extensive mucocutaneous rash, accompanied by fever, lymphadenopathy, hepatitis and hematological abnormalities with eosinophilia & atypical lymphocytes. It may cause damage to several organs, especially to the kidneys, heart, lungs and pancreas. The mortality rate is approximately 10% and the rate of incidence of dress syndrome ranges from 1 in 1,000 to 1 in 10,000 drug exposures. There are around 50 culprit drugs which can induce dress syndrome. Among these, Carbamazepine and Allopurinol are the most commonly observed drugs that induce this syndrome. In this case report, we discussed regarding a 56 years old female patient who was diagnosed with Carbamazepine induced Dress Syndrome. The clinical manifestations of this disease are quite similar to many disease conditions which might lead to misconception. Along with the prevailing manifestations, it is essential to correlate the past medical & medication history and laboratory findings to make an accurate diagnosis. A multidisciplinary approach must be required for early cessation of the suspected drug and initiation of the symptomatic therapy in order to provide a better supportive care to the patient in the clinical scenario. This prevents the further complications thus paving a way for the improvement of the quality of life in the patients.

Introduction:-

The Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) presents clinically as an extensive mucocutaneous rash, accompanied by fever, lymphadenopathy, hepatitis and hematological abnormalities with eosinophilia & atypical lymphocytes. It may cause damage to several organs, especially to the kidneys, heart, lungs and pancreas. The mortality rate is approximately 10% and the rate of incidence of dress syndrome ranges from 1 in 1,000 to 1 in 10,000 drug exposures.[1-4] Adults are more prone to dress syndrome when compared to children. There are around 50 culprit drugs which can induce dress syndrome. Among these, Carbamazepine and Allopurinol are the most commonly observed drugs that induce this syndrome.[5] Carbamazepine is a chemical derivative obtained from iminostillbene that belongs to the class of tricyclic antidepressants. It was synthesized by Walter Schindler in the year 1953. In 1962, Carbamazepine was the first marketed drug in Europe to treat trigeminal neuralgia and a few years later it was approved as an antiepileptic drug.[6] Now a days, Carbamazepine is indicated for conditions like partial seizures, generalized tonic-clonic seizures, mixed seizure patterns and for the treatment of trigeminal &

Corresponding Author:- Dr. Ramam Sripada
Address:- Associate Professor, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

ISSN: 2320-5407 Int. J. Adv. Res. 8(01), 960-962

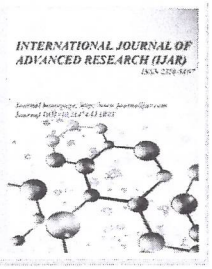
ISSN NO. 2320-5407

Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/10387

DOI URL: http://dx.doi.org/10.21474/IJAR01/10387



RESEARCH ARTICLE

CARBAMAZEPINE INDUCED DRESS SYNDROME : A CASE REPORT

Sireesha Maram[1], Ramam Sripada[1], Himabindu Mylapalli[1], Sudeepthi Padala[1], Subhashini Konala[2], Satya Saka[2], Vamsi Bhukya[1] and Dasaratha Dhanaraju Magharla[1]

1. Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
2. Department of Dermatology, GSL General Hospital, Rajahmundry, Andhra Pradesh, India.

Manuscript Info

Manuscript History
Received: 30 November 2019
Final Accepted: 31 December 2019
Published: January 2020

Key words:-
Allopurinol, Carbamazepine, Dress Syndrome

Abstract

The Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) presents clinically as an extensive mucocutaneous rash, accompanied by fever, lymphadenopathy, hepatitis and hematological abnormalities with eosinophilia & atypical lymphocytes. It may cause damage to several organs, especially to the kidneys, heart, lungs and pancreas. The mortality rate is approximately 10% and the rate of incidence of dress syndrome ranges from 1 in 1,000 to 1 in 10,000 drug exposures. There are around 50 culprit drugs which can induce dress syndrome. Among these, Carbamazepine and Allopurinol are the most commonly observed drugs that induce this syndrome. In this case report, we discussed regarding a 56 years old female patient who was diagnosed with Carbamazepine induced Dress Syndrome. The clinical manifestations of this disease are quite similar to many disease conditions which might lead to misconception. Along with the prevailing manifestations, it is essential to correlate the past medical & medication history and laboratory findings to make an accurate diagnosis. A multidisciplinary approach must be required for early cessation of the suspected drug and initiation of the symptomatic therapy in order to provide a better supportive care to the patient in the clinical scenario. This prevents the further complications thus paving a way for the improvement of the quality of life in the patients.

Introduction:-

The Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS) presents clinically as an extensive mucocutaneous rash, accompanied by fever, lymphadenopathy, hepatitis and hematological abnormalities with eosinophilia & atypical lymphocytes. It may cause damage to several organs, especially to the kidneys, heart, lungs and pancreas. The mortality rate is approximately 10% and the rate of incidence of dress syndrome ranges from 1 in 1,000 to 1 in 10,000 drug exposures.[1-4] Adults are more prone to dress syndrome when compared to children. There are around 50 culprit drugs which can induce dress syndrome. Among these, Carbamazepine and Allopurinol are the most commonly observed drugs that induce this syndrome.[5] Carbamazepine is a chemical derivative obtained from iminostillbene that belongs to the class of tricyclic antidepressants. It was synthesized by Walter Schindler in the year 1953. In 1962, Carbamazepine was the first marketed drug in Europe to treat trigeminal neuralgia and a few years later it was approved as an antiepileptic drug.[6] Now a days, Carbamazepine is indicated for conditions like partial seizures, generalized tonic-clonic seizures, mixed seizure patterns and for the treatment of trigeminal &

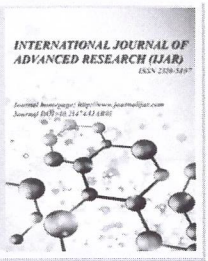
Corresponding Author:- Dr. Ramam Sripada
Address:- Associate Professor, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

ISSN NO. 2320-5407

Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/10342
DOI URL: http://dx.doi.org/10.21474/IJAR01/10342



RESEARCH ARTICLE

A BRIEF REVIEW ON TAFENOQUINE IN RELAPSE MALARIA

Mounika Puppala[1], Ramam Sripada[2], Keerthi Chowdary Yelavarthy[1], Himabindu Mylapalli[2], Sudeepthi Padala[2], Sireesha Maram[2], Visalakshi Kasilanka[2] and Dasaratha Dhanaraju Magharla[2]

1. Scientific analysts, Molecular connections private limited, Bangalore, Karnataka, India.
2. Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

Manuscript Info

Manuscript History
Received: 27 November 2019
Final Accepted: 30 December 2019
Published: January 2020

Key words:-
Malaria, Primaquine, Tafenoquine

Abstract

Malarial relapse is the reactivation of the hypnozoite form of parasite in the liver cells. It is the reappearance of the symptoms after elimination of the parasite from the blood where the parasite still persists as the dormant hypnozoites in the liver cells. It usually occurs between 8-24 weeks after the elimination of parasite from the blood and is most common among the individuals with P.vivax and P.ovale infections. Drugs having both hypnozoiticidal and schizonticidal effects are used in the treatment of relapse malaria. Primaquine is the only drug which shows both schizonticidal and hypnozoiticidal effect in treating the relapse malaria. Primaquine has a long term chemoprophylaxis with adverse effect profile hence, there is a requirement for a drug with long acting hypnozoiticidal action in a single dose where, tafenoquine serves the need in providing a short-course treatment regimen for the radical cure instead of prescribing a 14-day course of primaquine. In this article, we mainly reviewed the approval, adverse effects profile, contraindications and precautions to be taken during the usage of Tafenoquine. In India, clinical trials are still under progress and yet to be approved to replace the current 14 day treatment regimen of primaquine. In order to cope up with the challenge in the treatment of relapse malaria, tafenoquine offers a ray of hope in dealing the relapse malaria effectively.

Introduction:-

Malaria is a life threatening disease caused by parasites that are transmitted to the people through the bite of infected female anopheles mosquito. It usually occurs due to Plasmodium species that include P.vivax, P.falciparum, P.malariae & P.ovale and among these species, P.falciparum & P.ovale are predominant. About 99.7% of malaria cases in African region, 62.8% in South-East Asia, 69% in Eastern Mediterranean and 71.9% in Western Pacific were caused due to Plasmodium falciparum. Plasmodium vivax is the most prominent parasite in America causing 74% of the total malaria cases. In the year 2017, it was estimated that there were about 219 million malarial cases and 4,35,000 deaths occurred due to malaria among 87 countries.[1]

The parasite which enters into the blood stream of a healthy individual attacks the liver cells and the red blood cells. The signs & symptoms usually may appear after 10-15 days of the bite of the infected mosquito. The most common signs & symptoms of malaria are headache, fever, chills, muscle pain, fatigue, nausea, vomiting, cough, abdominal

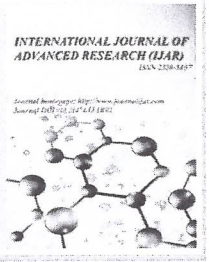
Corresponding Author:-Ramam Sripada
Address:-Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

ISSN NO. 2320-5407

Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/10342
DOI URL: http://dx.doi.org/10.21474/IJAR01/10342



RESEARCH ARTICLE

A BRIEF REVIEW ON TAFENOQUINE IN RELAPSE MALARIA

Mounika Puppala[1], Ramam Sripada[2], Keerthi Chowdary Yelavarthy[1], Himabindu Mylapalli[2], Sudeepthi Padala[2], Sireesha Maram[2], Visalakshi Kasilanka[2] and Dasaratha Dhanaraju Magharla[2]

1. Scientific analysts, Molecular connections private limited, Bangalore, Karnataka, India.
2. Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

Manuscript Info

Manuscript History
Received: 27 November 2019
Final Accepted: 30 December 2019
Published: January 2020

Key words:-
Malaria, Primaquine, Tafenoquine

Abstract

Malarial relapse is the reactivation of the hypnozoite form of parasite in the liver cells. It is the reappearance of the symptoms after elimination of the parasite from the blood where the parasite still persists as the dormant hypnozoites in the liver cells. It usually occurs between 8-24 weeks after the elimination of parasite from the blood and is most common among the individuals with P.vivax and P.ovale infections. Drugs having both hypnozoiticidal and schizonticidal effects are used in the treatment of relapse malaria. Primaquine is the only drug which shows both schizonticidal and hypnozoiticidal effect in treating the relapse malaria. Primaquine has a long term chemoprophylaxis with adverse effect profile hence, there is a requirement for a drug with long acting hypnozoiticidal action in a single dose where, tafenoquine serves the need in providing a short-course treatment regimen for the radical cure instead of prescribing a 14-day course of primaquine. In this article, we mainly reviewed the approval, adverse effects profile, contraindications and precautions to be taken during the usage of Tafenoquine. In India, clinical trials are still under progress and yet to be approved to replace the current 14 day treatment regimen of primaquine. In order to cope up with the challenge in the treatment of relapse malaria, tafenoquine offers a ray of hope in dealing the relapse malaria effectively.

Introduction:-

Malaria is a life threatening disease caused by parasites that are transmitted to the people through the bite of infected female anopheles mosquito. It usually occurs due to Plasmodium species that include P.vivax, P.falciparum, P.malariae & P.ovale and among these species, P.falciparum & P.ovale are predominant. About 99.7% of malaria cases in African region, 62.8% in South-East Asia, 69% in Eastern Mediterranean and 71.9% in Western Pacific were caused due to Plasmodium falciparum. Plasmodium vivax is the most prominent parasite in America causing 74% of the total malaria cases. In the year 2017, it was estimated that there were about 219 million malarial cases and 4,35,000 deaths occurred due to malaria among 87 countries.[1]

The parasite which enters into the blood stream of a healthy individual attacks the liver cells and the red blood cells. The signs & symptoms usually may appear after 10-15 days of the bite of the infected mosquito. The most common signs & symptoms of malaria are headache, fever, chills, muscle pain, fatigue, nausea, vomiting, cough, abdominal

Corresponding Author:-Ramam Sripada
Address:-Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.

CASE REPORT

inventi | Spreading Knowledge

A Case Report on Prednisolone Induced Hypokalemia

Aksha Susmitha Jangam[1], Ramam Sripada[1]*, Himabindu Mylapalli[1], Subhashini Konala[2], Satya Saka[2], Sudeepthi Padala[1], Sireesha Maram[1], Dasaratha Dhanaraju Magharla[1]

Abstract: Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics, antimicrobials, laxatives, beta 2 receptor agonists, high dose of insulin, xanthines over dose of verapamil, glucocorticoids and mineralocorticoids. In this case report we discussed regarding the management of prednisolone induced hypokalemia condition in a 40 year old female patient who was under the treatment for Pemphigus Vulgaris in the department of dermatology. Hypokalemia is occasionally confronted adverse reaction in the clinical setting where physicians and clinical pharmacists should be attentive while treating the patients. Early diagnosis and treatment may avoid the life threatening complications. As most of the hypokalemia incidences are drug induced, clinical pharmacists who monitor the patient's drug therapy should be cautious in finding out the etiology of hypokalemia thereby aiding the patient wellness by decreasing the hospital stay and economic burden of the patient.

INTRODUCTION

Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). It can be classified into mild (3-3.5 mEq/L), moderate (2.5-3 mEq/L) and severe (<2.5 mEq/L) hypokalemia. The incidence of hypokalemia is higher in case of elderly when compared to younger generations. Females are more prone to have hypokalemia when compared to the males. [1-11] It is due to the differences in body mass composition resulting in low exchange of potassium. [8, 12]

Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics (thiazides, furosemide, chlorthalidone, acetazolamide, metolazone, indapamide, bumetanide, ethacrynic acid), antimicrobials (amphotericin B, pencillins, aminoglycosides, ampicillin, nafcillin, foscarnet), laxatives (sorbitol, sodium polystyrene sulfonate, phenolpthalein), beta 2 receptor agonists (formoterol, terbutaline, ephedrine, albuterol, epinephrine, pseudoephedrine, isoproterenol, salmeterol), high dose of insulin, xanthines (caffeine, theophylline), over dose of verapamil, glucocorticoids and mineralocorticoids (prednisolone, hydrocortisone, fludrocortisone). [1, 7, 13] Out of these, prednisolone induced hypokalemia is the most commonly seen electrolyte imbalance in the clinical scenario. The common adverse effects of prednisolone are hypertension, ecchymosis, hyperglycemia, muscle weakness, osteoporosis, cataract, glaucoma, euphoria and hypokalemia. While serious adverse effects include, congestive heart failure, Kaposis's sarcoma, pulmonary tuberculosis, seizures, pancreatitis, Cushing syndrome, drug induced myopathy and diabetes mellitus. [14]

[1]GIET School of Pharmacy, Rajahmundry-533294, Andhra Pradesh, India.
E-mail: ramampharmd7@gmail.com
*Corresponding author

[2]GSL General Hospital, Rajahmundry-533296, Andhra Pradesh, India.

CASE REPORT

A 40 year old female patient came to the GSL General Hospital, Rajahmundry, East Godawari district of Andhra Pradesh. Since three days the patient had the chief complaints of burning sensation all over the mouth, myalgia and dizziness. On examination, Whitish lesions were seen over the tongue. Multiple erosions were observed over the buccal mucosa and on the lower lip. She was a known case of "Pemphigus Vulgaris" since 3 months and was under the treatment with prednisolone 20 mg/day for the past 2 months and the dose was increased to 30 mg/day during the last follow up as the progress of the patient was not optimal.

Investigations

After performing clinical examinations and considering the symptoms, the patient was advised to undergo complete blood picture, complete urine examination, renal function tests, serum electrolytes and liver function tests. The abnormal findings in the laboratory investigations are Haemoglobin - 10.4gm/dl% (↓), PCV - 33.6% (↓), TC (WBC) - 11,400 cells/cumm (↑), MCV - 79.4 fl (↓), MCH - 24.6 pg (↓), Platelets - 5.4 lakshs/cumm (↑), Total Proteins - 5.8 g/dl (↓), Albumin - 3.3g/dl (↓) and Serum Potassium level - 2.7 mEq/L (↓).

Diagnosis

At the time of admission, the patient was diagnosed as "Pemphigus Vulgaris with Oral Candidiasis". On analyzing the laboratory reports and patient medication history, this case is confirmed as "Prednisolone induced Hypokalemia" of moderate grade as the patient is on prednisolone therapy since 3 months. Naranjo scale was used for the causality assessment of this adverse drug reaction (ADR) and found that it was a probable ADR.

Treatment

After the final diagnosis, the dermatologist advised Potklor syrup (Potassium chloride supplement) thrice daily and also suggested to take tender coconut water which is a natural way of treating hypokalemia as it is a good source of potassium. As the patient was suffering from Oral

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296. (A.P.)

2020 ppp 30111 © Inventi Journals (P) Ltd
Published on Web 28/11/2019, www.inventi.in

CASE REPORT

inventi | Spreading Knowledge

A Case Report on Prednisolone Induced Hypokalemia

Aksha Susmitha Jangam[1], Ramam Sripada[1*], Himabindu Mylapalli[1], Subhashini Konala[2], Satya Saka[2], Sudeepthi Padala[1], Sireesha Maram[1], Dasaratha Dhanaraju Magharla[1]

Abstract: Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics, antimicrobials, laxatives, beta 2 receptor agonists, high dose of insulin, xanthines over dose of verapamil, glucocorticoids and mineralocorticoids. In this case report we discussed regarding the management of prednisolone induced hypokalemia condition in a 40 year old female patient who was under the treatment for Pemphigus Vulgaris in the department of dermatology. Hypokalemia is occasionally confronted adverse reaction in the clinical setting where physicians and clinical pharmacists should be attentive while treating the patients. Early diagnosis and treatment may avoid the life threatening complications. As most of the hypokalemia incidences are drug induced, clinical pharmacists who monitor the patient's drug therapy should be cautious in finding out the etiology of hypokalemia thereby aiding the patient wellness by decreasing the hospital stay and economic burden of the patient.

INTRODUCTION

Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). It can be classified into mild (3-3.5 mEq/L), moderate (2.5-3 mEq/L) and severe (<2.5 mEq/L) hypokalemia. The incidence of hypokalemia is higher in case of elderly when compared to younger generations. Females are more prone to have hypokalemia when compared to the males. [1-11] It is due to the differences in body mass composition resulting in low exchange of potassium. [8, 12]

Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics (thiazides, furosemide, chlorthalidone, acetazolamide, metolazone, indapamide, bumetanide, ethacrynic acid), antimicrobials (amphotericin B, pencillins, aminoglycosides, ampicillin, nafcillin, foscarnet), laxatives (sorbitol, sodium polystyrene sulfonate, phenolpthalein), beta 2 receptor agonists (formoterol, terbutaline, ephedrine, albuterol, epinephrine, pseudoephedrine, isoproterenol, salmeterol), high dose of insulin, xanthines (caffeine, theophylline), over dose of verapamil, glucocorticoids and mineralocorticoids (prednisolone, hydrocortisone, fludrocortisone). [1, 7, 13] Out of these, prednisolone induced hypokalemia is the most commonly seen electrolyte imbalance in the clinical scenario. The common adverse effects of prednisolone are hypertension, ecchymosis, hyperglycemia, muscle weakness, osteoporosis, cataract, glaucoma, euphoria and hypokalemia. While serious adverse effects include, congestive heart failure, Kaposis's sarcoma, pulmonary tuberculosis, seizures, pancreatitis, Cushing syndrome, drug induced myopathy and diabetes mellitus. [14]

[1]GIET School of Pharmacy, Rajahmundry-533294, Andhra Pradesh, India.
E-mail: ramampharmd7@gmail.com
*Corresponding author

[2]GSL General Hospital, Rajahmundry-533296, Andhra Pradesh, India.

CASE REPORT

A 40 year old female patient came to the GSL General Hospital, Rajahmundry, East Godawari district of Andhra Pradesh. Since three days the patient had the chief complaints of burning sensation all over the mouth, myalgia and dizziness. On examination, Whitish lesions were seen over the tongue. Multiple erosions were observed over the buccal mucosa and on the lower lip. She was a known case of "Pemphigus Vulgaris" since 3 months and was under the treatment with prednisolone 20 mg/day for the past 2 months and the dose was increased to 30 mg/day during the last follow up as the progress of the patient was not optimal.

Investigations

After performing clinical examinations and considering the symptoms, the patient was advised to undergo complete blood picture, complete urine examination, renal function tests, serum electrolytes and liver function tests. The abnormal findings in the laboratory investigations are Haemoglobin - 10.4gm/dl% (↓), PCV - 33.6% (↓), TC (WBC) - 11,400 cells/cumm (↑), MCV - 79.4 fl (↓), MCH - 24.6 pg (↓), Platelets - 5.4 lakshs/cumm (↑), Total Proteins - 5.8 g/dl (↓), Albumin - 3.3g/dl (↓) and Serum Potassium level - 2.7 mEq/L (↓).

Diagnosis

At the time of admission, the patient was diagnosed as "Pemphigus Vulgaris with Oral Candidiasis". On analyzing the laboratory reports and patient medication history, this case is confirmed as "Prednisolone induced Hypokalemia" of moderate grade as the patient is on prednisolone therapy since 3 months. Naranjo scale was used for the causality assessment of this adverse drug reaction (ADR) and found that it was a probable ADR.

Treatment

After the final diagnosis, the dermatologist advised Potklor syrup (Potassium chloride supplement) thrice daily and also suggested to take tender coconut water which is a natural way of treating hypokalemia as it is a good source of potassium. As the patient was suffering from Oral

2020 ppp 30111 © Inventi Journals (P) Ltd
Published on Web 28/11/2019, www.inventi.in

CASE REPORT

inventi | Spreading Knowledge

A Case Report on Prednisolone Induced Hypokalemia

Aksha Susmitha Jangam[1], Ramam Sripada[1*], Himabindu Mylapalli[1], Subhashini Konala[2], Satya Saka[2], Sudeepthi Padala[1], Sireesha Maram[1], Dasaratha Dhanaraju Magharla[1]

Abstract: Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics, antimicrobials, laxatives, beta 2 receptor agonists, high dose of insulin, xanthines over dose of verapamil, glucocorticoids and mineralocorticoids. In this case report we discussed regarding the management of prednisolone induced hypokalemia condition in a 40 year old female patient who was under the treatment for Pemphigus Vulgaris in the department of dermatology. Hypokalemia is occasionally confronted adverse reaction in the clinical setting where physicians and clinical pharmacists should be attentive while treating the patients. Early diagnosis and treatment may avoid the life threatening complications. As most of the hypokalemia incidences are drug induced, clinical pharmacists who monitor the patient's drug therapy should be cautious in finding out the etiology of hypokalemia thereby aiding the patient wellness by decreasing the hospital stay and economic burden of the patient.

INTRODUCTION

Hypokalemia is one of the most commonly seen electrolyte imbalance in the clinical settings in which the serum potassium levels are less than 3.5 mEq/L (normal range: 3.5 to 5 mEq/L). It can be classified into mild (3-3.5 mEq/L), moderate (2.5-3 mEq/L) and severe (<2.5 mEq/L) hypokalemia. The incidence of hypokalemia is higher in case of elderly when compared to younger generations. Females are more prone to have hypokalemia when compared to the males. [1-11] It is due to the differences in body mass composition resulting in low exchange of potassium. [8, 12]

Hypokalemia usually occurs in conditions such as renal tubular acidosis, villous adenoma of colon, hypomagnesemia, Zollinger Ellison syndrome, cardiovascular disorders, cancer, poisoning and often drug induced. Hypokalemia can be caused by the diuretics (thiazides, furosemide, chlorthalidone, acetazolamide, metolazone, indapamide, bumetanide, ethacrynic acid), antimicrobials (amphotericin B, pencillins, aminoglycosides, ampicillin, nafcillin, foscarnet), laxatives (sorbitol, sodium polystyrene sulfonate, phenolpthalein), beta 2 receptor agonists (formoterol, terbutaline, ephedrine, albuterol, epinephrine, pseudoephedrine, isoproterenol, salmeterol), high dose of insulin, xanthines (caffeine, theophylline), over dose of verapamil, glucocorticoids and mineralocorticoids (prednisolone, hydrocortisone, fludrocortisone). [1, 7, 13] Out of these, prednisolone induced hypokalemia is the most commonly seen electrolyte imbalance in the clinical scenario. The common adverse effects of prednisolone are hypertension, ecchymosis, hyperglycemia, muscle weakness, osteoporosis, cataract, glaucoma, euphoria and hypokalemia. While serious adverse effects include, congestive heart failure, Kaposis's sarcoma, pulmonary tuberculosis, seizures, pancreatitis, Cushing syndrome, drug induced myopathy and diabetes mellitus. [14]

[1]GIET School of Pharmacy, Rajahmundry-533294, Andhra Pradesh, India.
E-mail: ramampharmd7@gmail.com
*Corresponding author

[2]GSL General Hospital, Rajahmundry-533296, Andhra Pradesh, India.

CASE REPORT

A 40 year old female patient came to the GSL General Hospital, Rajahmundry, East Godawari district of Andhra Pradesh. Since three days the patient had the chief complaints of burning sensation all over the mouth, myalgia and dizziness. On examination, Whitish lesions were seen over the tongue. Multiple erosions were observed over the buccal mucosa and on the lower lip. She was a known case of "Pemphigus Vulgaris" since 3 months and was under the treatment with prednisolone 20 mg/day for the past 2 months and the dose was increased to 30 mg/day during the last follow up as the progress of the patient was not optimal.

Investigations

After performing clinical examinations and considering the symptoms, the patient was advised to undergo complete blood picture, complete urine examination, renal function tests, serum electrolytes and liver function tests. The abnormal findings in the laboratory investigations are Haemoglobin - 10.4gm/dl% (↓), PCV - 33.6% (↓), TC (WBC) - 11,400 cells/cumm (↑), MCV - 79.4 fl (↓), MCH - 24.6 pg (↓), Platelets - 5.4 lakshs/cumm (↑), Total Proteins - 5.8 g/dl (↓), Albumin - 3.3g/dl (↓) and Serum Potassium level - 2.7 mEq/L (↓).

Diagnosis

At the time of admission, the patient was diagnosed as "Pemphigus Vulgaris with Oral Candidiasis". On analyzing the laboratory reports and patient medication history, this case is confirmed as "Prednisolone induced Hypokalemia" of moderate grade as the patient is on prednisolone therapy since 3 months. Naranjo scale was used for the causality assessment of this adverse drug reaction (ADR) and found that it was a probable ADR.

Treatment

After the final diagnosis, the dermatologist advised Potklor syrup (Potassium chloride supplement) thrice daily and also suggested to take tender coconut water which is a natural way of treating hypokalemia as it is a good source of potassium. As the patient was suffering from Oral

Dr. M.D. DHANA RAJU,
Principal. M.Pharm. Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296. (A.P.)

2020 ppp 30111 © Inventi Journals (P) Ltd
Published on Web 28/11/2019, www.inventi.in

The Journal of Obstetrics and Gynecology of India (November–December 2020) 70(6):479–484
https://doi.org/10.1007/s13224-020-01351-3

THE JOURNAL OF OBSTETRICS AND GYNECOLOGY OF INDIA

ORIGINAL ARTICLE

Efficacy of Tranexamic Acid in Reducing Blood Loss in Lower Segment Cesearean Section: A Randomised Controlled Study

L. Hemapriya[1] · Greeshma More[1] · Anil Kumar[2]

Received: 11 December 2019 / Accepted: 27 June 2020 / Published online: 3 September 2020

Abstract

Objectives To determine the efficacy of tranexamic acid in decreasing blood loss in elective/emergency LSCS.

Materials and Methods A prospective randomised case control study was done in 200 pregnant women undergoing elective/emergency LSCS in the Department of Obstetrics and Gynaecology, at a tertiary care teaching hospital in Mysuru, from December 2018 to September 2019. Women in the age group of 18–35 years were included in the study. Those with anaemia (Hb < 10 gm%), hypertension in pregnancy, bleeding diathesis, GDM on insulin, polyhydramnios, oligohydramnios, cardiac and chronic liver disorders were excluded from the study. Two hundred women undergoing emergency/elective LSCS were divided into case (group 1) or control (group 2) groups using a computer-generated random number table. Tranexamic acid (10 mg/Kg) was given in 100 ml Normal Saline 10 mins prior to skin incision to women in the first group, along with routine care (10 Units of Oxytocin IM soon after extraction of the baby). Routine care, as per institutional protocol, was followed in the second group. The primary outcome was to estimate the intraoperative blood loss. Blood loss was measured by weighing pads, mops, drapes before and after surgery and blood in the suction container after surgery. Two separate suction catheters and containers were used, in order to minimise mixing of blood and amniotic fluid. Total blood loss was calculated as the difference in the weight of the pads, mops and drapes before and after surgery and the sum of the amount of blood in suction container. The difference between the pre-operative and post-operative haemoglobin and haematocrit was compared. The pre-operative, intra-operative and post-operative hemodynamics were also compared.

Results Statistical analysis was done using MS Excel and R-3.5.1 software. Unpaired and paired *t* test were used. In our study, there was a significant decrease in intraoperative bleeding in women receiving tranexamic acid. Women in the control group had a significant fall in the postoperative hemoglobin when compared to women who received tranexamic acid. Also, women who received tranexamic acid did not develop any significant hemodynamic changes during or immediately after the surgery.

Conclusion Tranexamic acid can be safely used as a prophylactic agent to reduce bleeding during elective and emergency LSCS.

Keywords Tranexamic acid · Elective/emergency LSCS · Blood loss · Haemoglobin

Introduction

Obstetric haemorrhage, especially post-partum haemorrhage, is, perhaps one of the most common causes of maternal mortality and severe morbidity like anaemia, need for blood transfusion, prolonged hospital stay and puerperal sepsis [1]. The average blood loss during LSCS is around 800–1000 ml and in normal delivery, it is around 500 ml. Lower segment Caesarean section is the most common surgery performed in obstetrics. Intraoperative blood loss during LSCS causes significant reduction in haemoglobin postoperatively and the need for blood transfusions or intravenous iron therapy was found to be more during postoperative care. Various

L. Hemapriya is a Associate Professor, Department of Obstetrics and Gynaecology, JSS Medical College and Hospital, JSSAHER, Mysore, India, Greeshma More is a Junior resident, Department of Obstetrics and Gynaecology, JSS Medical College and Hospital, JSSAHER, Mysore, India. Anil Kumar is a Associate Professor, Department of Anaesthesiology, JSS Medical College and Hospital, JSSAHER, Mysore, India.

✉ Anil Kumar
dranilkumarmr@gmail.com

1 Department of Obstetrics and Gynaecology, JSS Medical College and Hospital, JSSAHER, Mysore, India

2 Department of Anaesthesiology, JSS Medical College and Hospital, JSSAHER, Mysore, India

DOI:10.31557/APJCP.2019.20.8.2353
Biomedical Activities of Nannochloropsis-Mediated AgNPs

RESEARCH ARTICLE

Editorial Process: Submission:02/12/2019 Acceptance:08/08/2019

Nannochloropsis Extract–Mediated Synthesis of Biogenic Silver Nanoparticles, Characterization and *In Vitro* Assessment of Antimicrobial, Antioxidant and Cytotoxic Activities

Princely Ebenezer Gnanakani[1,2], Perumal Santhanam[3], Kumpati Premkumar[4], Kilari Eswar Kumar[5], Magharla Dasaratha Dhanaraju[2]*

Abstract

Objective: To investigate the biogenic synthesis of silver nanoparticles (AgNPs) using partially purified ethyl acetate extract of *Nannochloropsis* sp. hexane (EAENH) fraction of microalga. **Methods:** The green synthesis of AgNPs was confirmed with UV-Vis spectrum which shows the surface plasmon resonance (SPR) at 421 nm. Fourier Transform Infrared Spectra (FTIR) presented the involvement of functional groups like carboxyl groups of fatty acids, tetraterpenoids of xanthophylls, hydroxyl groups of polyphenols, carbonyl and amide linkage of proteins in the AgNP synthesis. Gas Chromatography-Mass Spectrometry analysis (GCMS) revealed that phytochemicals like octadecanoic acid and hexadecanoic acid imply in capping, bioreduction, and stabilization of AgNps. **Result:** High-resolution Transmission electron microscope (HRTEM), Dynamic light scattering (DLS), X-ray diffraction (XRD) and EDX analysis showed the crystalline form of the AgNPs with Z-average size 57.25 nm. The zeta potential value of -25.7 mV demonstrated the negative surface charge and colloidal stability of AgNPs. The antimicrobial activity of AgNPs displayed effective inhibition zone against selected bacterial and fungal pathogens. In vitro, antioxidant effects were assessed by 1,1-diphenyl-2-picryl-hydrazyl (DPPH), hydrogen peroxide and reducing power assays which revealed excellent scavenging potential for AgNPs than the extracts. The anti-proliferative potential of biofabricated AgNPs and extracts on Human Non-small lung cancer cell line (A549) was assessed using 3–(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (MTT) assay with IC_{50} values of 15 µgmL-1 and 175 µgmL-1 respectively. **Conclusion:** The study reveals that the microalgae-mediated AgNPs possesses potent antimicrobial and antioxidant activity along with the ability to stimulate apoptosis in A-549 cell line.

Keywords: *Nannochloropsis*- silver nanoparticles-antioxidant activity- cytotoxic activity

Asian Pac J Cancer Prev, **20 (8)**, 2353-2364

Introduction

Cancer is one of the leading causes of death accounting for 9.6 million deaths worldwide annually (Bray et al., 2018). Lung cancer is the most common cause of cancer deaths with about 1.7 million deaths per year, having a poor prognosis (Murray, 2016). At present chemotherapy, radiotherapy and surgery are used for cancer therapy, which is capable of destroying both the normal and cancer cells producing unwanted adverse effects thus weakening the immune system (Rao et al., 2016). To overcome this challenge, it is prudent to formulate a drug that is safe, non-toxic, eco-friendly, biocompatible and cost-effective for cancer therapy that is selectively toxic to cancer cells with less or no side effects. Thus, the discovery of new natural cytotoxic agents has, therefore, become a key global strategy in preventing cancer (El-Baz et al., 2014). The application of nano-biotechnology plays an important role in the development of nanomedicine as an alternative and effective therapy for cancer (Barabadi et al., 2017).

Recently, biofabricated nanoparticle synthesis from plants and microbial sources has become an evolving strategy in the nanomedicine due to their eco-friendly, inexpensive and less toxic nature (Borase et al., 2014). The green NPs are recognized as valuable therapeutic agents since they have a unique size with crystalline form (1–100 nm), larger surface area to volume ratio, drug encapsulation, biocompatibility and thermal conductivity (Moteriya and Chanda, 2017). The bionanomaterial synthesis involves metals like gold, silver, iron, zinc, titanium, and copper produced from various bio-sources as stated (Borase et al., 2014). Nanoparticle research is

[1]*Department of Pharmaceutical Biotechnology, Research Scholar, JNTUK,* [2]*Department of Pharmaceutical Sciences, Research Director, GIET School of Pharmacy, Rajahmundry,* [5]*Department of Pharmacology, AU College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam, Andhra Pradesh,* [3]*Department of Marine Science,* [4]*Department of Biomedical Science, Bharathidasan University, Tiruchirappalli, Tamilnadu, India. *For Correspondence: mddhanaraju@yahoo.com*

RESEARCH ARTICLE

Editorial Process: Submission:02/12/2019 Acceptance:08/08/2019

Nannochloropsis Extract–Mediated Synthesis of Biogenic Silver Nanoparticles, Characterization and *In Vitro* Assessment of Antimicrobial, Antioxidant and Cytotoxic Activities

Princely Ebenezer Gnanakani[1,2], Perumal Santhanam[3], Kumpati Premkumar[4], Kilari Eswar Kumar[5], Magharla Dasaratha Dhanaraju[2]*

Abstract

Objective: To investigate the biogenic synthesis of silver nanoparticles (AgNPs) using partially purified ethyl acetate extract of *Nannochloropsis* sp. hexane (EAENH) fraction of microalga. **Methods:** The green synthesis of AgNPs was confirmed with UV-Vis spectrum which shows the surface plasmon resonance (SPR) at 421 nm. Fourier Transform Infrared Spectra (FTIR) presented the involvement of functional groups like carboxyl groups of fatty acids, tetraterpenoids of xanthophylls, hydroxyl groups of polyphenols, carbonyl and amide linkage of proteins in the AgNP synthesis. Gas Chromatography-Mass Spectrometry analysis (GCMS) revealed that phytochemicals like octadecanoic acid and hexadecanoic acid imply in capping, bioreduction, and stabilization of AgNps. **Result:** High-resolution Transmission electron microscope (HRTEM), Dynamic light scattering (DLS), X-ray diffraction (XRD) and EDX analysis showed the crystalline form of the AgNPs with Z-average size 57.25 nm. The zeta potential value of -25.7 mV demonstrated the negative surface charge and colloidal stability of AgNPs. The antimicrobial activity of AgNPs displayed effective inhibition zone against selected bacterial and fungal pathogens. In vitro, antioxidant effects were assessed by 1,1-diphenyl-2-picryl-hydrazyl (DPPH), hydrogen peroxide and reducing power assays which revealed excellent scavenging potential for AgNPs than the extracts. The anti-proliferative potential of biofabricated AgNPs and extracts on Human Non-small lung cancer cell line (A549) was assessed using 3–(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (MTT) assay with IC_{50} values of 15 µgmL-1 and 175 µgmL-1 respectively. **Conclusion:** The study reveals that the microalgae-mediated AgNPs possesses potent antimicrobial and antioxidant activity along with the ability to stimulate apoptosis in A-549 cell line.

Keywords: *Nannochloropsis*- silver nanoparticles-antioxidant activity- cytotoxic activity

Asian Pac J Cancer Prev, **20 (8)**, 2353-2364

Introduction

Cancer is one of the leading causes of death accounting for 9.6 million deaths worldwide annually (Bray et al., 2018). Lung cancer is the most common cause of cancer deaths with about 1.7 million deaths per year, having a poor prognosis (Murray, 2016). At present chemotherapy, radiotherapy and surgery are used for cancer therapy, which is capable of destroying both the normal and cancer cells producing unwanted adverse effects thus weakening the immune system (Rao et al., 2016). To overcome this challenge, it is prudent to formulate a drug that is safe, non-toxic, eco-friendly, biocompatible and cost-effective for cancer therapy that is selectively toxic to cancer cells with less or no side effects. Thus, the discovery of new natural cytotoxic agents has, therefore, become a key global strategy in preventing cancer (El-Baz et al., 2014). The application of nano-biotechnology plays an important role in the development of nanomedicine as an alternative and effective therapy for cancer (Barabadi et al., 2017).

Recently, biofabricated nanoparticle synthesis from plants and microbial sources has become an evolving strategy in the nanomedicine due to their eco-friendly, inexpensive and less toxic nature (Borase et al., 2014). The green NPs are recognized as valuable therapeutic agents since they have a unique size with crystalline form (1–100 nm), larger surface area to volume ratio, drug encapsulation, biocompatibility and thermal conductivity (Moteriya and Chanda, 2017). The bionanomaterial synthesis involves metals like gold, silver, iron, zinc, titanium, and copper produced from various bio-sources as stated (Borase et al., 2014). Nanoparticle research is

[1]*Department of Pharmaceutical Biotechnology, Research Scholar, JNTUK,* [2]*Department of Pharmaceutical Sciences, Research Director, GIET School of Pharmacy, Rajahmundry,* [5]*Department of Pharmacology, AU College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam, Andhra Pradesh,* [3]*Department of Marine Science,* [4]*Department of Biomedical Science, Bharathidasan University, Tiruchirappalli, Tamilnadu, India. *For Correspondence: mddhanaraju@yahoo.com*

2019-20

Asian Journal of Biochemical and Pharmaceutical Research *Issue 2(Vol. 9)* 2019 ISSN: 2231-2560
10.24214/AJBPR/9/2/3844 CODEN (USA): AJBPAD

Research Article

Asian Journal of Biochemical and Pharmaceutical Research

Approach of Spectrophotometric Methods for Quantitative Estimation of Jenadueto Tablets

R Vijayalakshmi* & Vadapalli S H Naveena

*Department of Pharmaceutical Analysis, GIET School of Pharmacy, NH-16 Chaitanya Knowledge city, Rajahmundry-533296. Andhra Pradesh, INDIA.

Received: 14 May 2019; Revised: 28 May 2019; Accepted: 4 June 2019

Abstract: The present work was aimed to develop rapid UV spectrophotometric method for the estimation of Linagliptin and Metformin in combined dosage forms. In the present study simultaneous equations technique (Method A) and absorbance ratio technique (Method B) has been employed to estimate and validate Metformin (MET) and Linagliptin (LGN) for their spectrophotometric analysis. Both drugs were estimated by applying simultaneous equations method and absorbance ratio method by using methanol as solvent. Linearity was accessed in the range of 5-40 µg/mL and 4-32 µg/mL for MET and LGN, respectively for both the methods. Spectral study was carried at 236 nm and 298 nm for MET and LGN, respectively by method A and 236 nm and 232 nm for MET and LGN by method B, respectively. The linear regression parameters were within limits with correlation coefficient of 0.999 and % RSD < 2 for both the drugs. All the analytical validation parameters for the optimized methods were validated and proved to be specific, robust, precise and accurate for the quality control of the drugs in their pharmaceutical preparation.

Key words: Metformin, Lingliptin, Simultaneous equations method, Absorbance ratio technique.

INTRODUCTION:

MET is chemically *N,N*-Dimethylimidodicarbonimidic diamide (Fig.1a) used as Oral anti-hyperglycemic drug in the intervention of type 2 diabetes. Its molecular weight is 129.16 g/mol. It improves glucose tolerance in patients with type II diabetes, lowering both basal and postprandial plasma glucose. Its solubility is high in water than alcohol and insoluble in acetone and methylene chloride.

LGN (Fig. 1b) is chemically 8-[(3*R*)-3-aminopiperidin-1-yl]-7-(but-2-yn-1-yl)-3-methyl-1-[(4-methylquinazolin-2-yl)methyl]-3,7-dihydro-1*H*-purine-2,6-dione (Fig.2) used in the management of type 2 diabetes mellitus with a molecular weight of 472.54 g/mol. It is apparently soluble in methanol. LGN is a competitive and reversible dipeptidyl peptidase (DPP)-4 enzyme inhibitor that slows the breakdown of insulinotropic hormone glucagon-like peptide (GLP)-1.

Literature survey revealed that there were few spectrophotometric methods [1-6] and HPLC methods [7-13] developed for estimation of these drugs individually or in combination.

The present study deals with development of simple, accurate spectrophotometric methods for the estimation of MET and LGN by simultaneous equations technique and absorbance ratio technique

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 12, Issue 8, 2019

Online - 2455-3891
Print - 0974-2441

Research Article

BIOANALYTICAL METHOD DEVELOPMENT AND VALIDATION OF CANAGLIFLOZIN IN HUMAN PLASMA BY LIQUID CHROMATOGRAPHY–TANDEM MASS SPECTROMETRY

DEEPAN T[1,2], BASAVESWARA RAO MV[1], DHANARAJU MD[2]*

[1]Department of Pharmacy, Krishna University, Machilipatnam, Andhra Pradesh, India. [2]Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India. Email: mddhanaraju@yahoo.com

Received: 12 April 2019, Revised and Accepted: 10 June 2019

ABSTRACT

Objective: A validated liquid chromatography–tandem mass spectrometry (LC–MS/MS) method was developed for canagliflozin in human plasma along with stability studies.

Methods: The chromatographic separation of canagliflozin was performed on Zorbax XDB phenyl (75 × 4.6 mm, 3.5 mm) using methanol:acetate buffer (80:20 v/v) at a flow rate of 1.0 ml/min. The LC–MS/MS system consists of API 4000 triple quadrupole mass spectrometer equipped with turbospray ionization and an AS8020 automatic sample injector.

Results: The retention time of canagliflozin was 1.15 min and total runtime was 2 min. The multiple reaction monitoring was 462.5/267.1 (m/z) for canagliflozin and 466.4/267.2 (m/z) for internal standard (canagliflozin D_4), respectively. The method was linear over the range of 10–7505 ng/ml. The calculated slope ranged from 0.0451 to 0.0502 and intercepts from 0.0102 to 0.0456 with coefficients of the determination of 0.9970. The overall mean recovery of internal standard and canagliflozin was 76.66 and 79.77, respectively.

Conclusion: The method was successfully validated and it was found to be within the limits for accuracy, precision, and linearity and it is stable under analytical conditions used.

Keywords: Canagliflozin, Liquid chromatography–tandem mass spectrometry, Human plasma, Liquid–liquid extraction, Validation, Stability studies.

 DOI: http://dx.doi.org/10.22159/ajpcr.2019.v12i8.33228

INTRODUCTION

Canagliflozin chemically is (2S.3R, 4R, 5S, 6R)-2-(3-{[5-(4-flurophenyl) thiophenyl) thiopen-2-yl] methyl}-4 methyl phenyl)-6-(hydroxy methyl) oxane-3, 4, 5,-triol represented in Fig. 1 (Drug bank) [1]. The molecular formula is $C_{24}H_{25}FO_5S$ and molecular weight is 444.52 g/mol. Canagliflozin is classified as SGLT-2 inhibitor, a new class of antidiabetic drug having an insulin-dependent mechanism that offers a considerable advantage of increasing urinary glucose excretion without inducing hypoglycemia [2]. Several analytical methods such as ultraviolet [3], high-performance liquid chromatography (HPLC) [4-7], high-performance thin-layer chromatography [8], liquid chromatography–tandem mass spectrometry (LC–MS/MS) [9-11] have been developed for analysis of canagliflozin. There are methods developed for canagliflozin in rat plasma. However, there is no method reported for canagliflozin in human plasma along with stability studies. This study describes that a validated LC–MS/MS method was developed for canagliflozin in human plasma along with stability studies.

METHODS

Chemicals and reagents

Canagliflozin and internal standard (canagliflozin D_4) were obtained from Piramal Healthcare. K3EDTA plasma was from local suppliers, acetonitrile and methanol were of HPLC grade, ammonium acetate (GR grade) was used, and water was from Milli Q system.

Instrumentation

The HPLC separation was achieved on Zorbax XDB phenyl (75×4.6 mm, 3.5 mm) using methanol:acetate buffer (80:20 v/v) at a flow rate of 1.0 ml/min. The injection volume was 10 µl and the column temperature was 30°C. The samples were held at 5±3°C in an autosampler. The runtime was 2.0 min. The LC–MS/MS system consists of API 4000 triple quadrupole mass spectrometer equipped with turbospray ionization and an AS8020 automatic sample injector. The multiple reaction monitoring (MRM) was 462.5/267.1 (m/z) for canagliflozin and 466.4/267.2 (m/z) for internal standard (canagliflozin D_4), respectively. The temperature of the capillary was 50°C and the dwell time was 100 millisecond or ms.

Preparation of standards and quality control (QC) samples

Stock solution of canagliflozin was prepared in methanol to get concentration of 5 µg/ml. The calibration curve standard solution was prepared by further diluting the stock solution in methanol to the following analytical condition (10, 25, 150, 375, 750, 1875, 3750, 6000, and 7500 ng/ml) for canagliflozin. The internal standard working solution was prepared by diluting stock solution in methanol to 5000 ng/ml. QC samples were prepared in the same manner from the QC stock to get final concentration of 28 (LQC), 706 middle QC (MQC), and 5700 high QC (HQC) in plasma. QC samples were stored in deep freezer with study samples and include with all validation and sample analysis runs.

Extraction procedure

To a glass tube containing 300 µl of plasma sample, added 50 µl of 2000 ng/ml internal standard working solution. The sample was mixed on a vortex mixer for approximately 5 s. Then, 2.0 µl of tertiary butyl methyl ether was added to the vials and extracted for a period of 15 min or rotospin at 40 rpm. The vials were centrifuged at 4500 rpm at 4±1°C for 5 min. Finally, the samples (1.8 µl) were eluted into a deep well collection plate evaporated to dryness under nitrogen at 40±5°C and reconstituted in 300 µl of solution of mixture of acetonitrile:phosphate buffer (80:20%) vortexed for about 10 s, and finally, 10 µl of each reconstituted sample extract was injected into LC–MS/MS.

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Online - 2455-3891
Print - 0974-2441

Vol 12, Issue 8, 2019

Research Article

BIOANALYTICAL METHOD DEVELOPMENT AND VALIDATION OF CANAGLIFLOZIN IN HUMAN PLASMA BY LIQUID CHROMATOGRAPHY–TANDEM MASS SPECTROMETRY

DEEPAN T[1,2], BASAVESWARA RAO MV[1], DHANARAJU MD[2]*

[1]Department of Pharmacy, Krishna University, Machilipatnam, Andhra Pradesh, India. [2]Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India. Email: mddhanaraju@yahoo.com

Received: 12 April 2019, Revised and Accepted: 10 June 2019

ABSTRACT

Objective: A validated liquid chromatography–tandem mass spectrometry (LC–MS/MS) method was developed for canagliflozin in human plasma along with stability studies.

Methods: The chromatographic separation of canagliflozin was performed on Zorbax XDB phenyl (75 × 4.6 mm, 3.5 mm) using methanol:acetate buffer (80:20 v/v) at a flow rate of 1.0 ml/min. The LC–MS/MS system consists of API 4000 triple quadrupole mass spectrometer equipped with turbospray ionization and an AS8020 automatic sample injector.

Results: The retention time of canagliflozin was 1.15 min and total runtime was 2 min. The multiple reaction monitoring was 462.5/267.1 (m/z) for canagliflozin and 466.4/267.2 (m/z) for internal standard (canagliflozin D_4), respectively. The method was linear over the range of 10–7505 ng/ml. The calculated slope ranged from 0.0451 to 0.0502 and intercepts from 0.0102 to 0.0456 with coefficients of the determination of 0.9970. The overall mean recovery of internal standard and canagliflozin was 76.66 and 79.77, respectively.

Conclusion: The method was successfully validated and it was found to be within the limits for accuracy, precision, and linearity and it is stable under analytical conditions used.

Keywords: Canagliflozin, Liquid chromatography–tandem mass spectrometry, Human plasma, Liquid–liquid extraction, Validation, Stability studies.

 DOI: http://dx.doi.org/10.22159/ajpcr.2019.v12i8.33228

INTRODUCTION

Canagliflozin chemically is (2S.3R, 4R, 5S, 6R)-2-(3-{[5-(4-flurophenyl) thiophenyl) thiopen-2-yl] methyl}-4 methyl phenyl)-6-(hydroxy methyl) oxane-3, 4, 5,-triol represented in Fig. 1 (Drug bank) [1]. The molecular formula is $C_{24}H_{25}FO_5S$ and molecular weight is 444.52 g/mol. Canagliflozin is classified as SGLT-2 inhibitor, a new class of antidiabetic drug having an insulin-dependent mechanism that offers a considerable advantage of increasing urinary glucose excretion without inducing hypoglycemia [2]. Several analytical methods such as ultraviolet [3], high-performance liquid chromatography (HPLC) [4-7], high-performance thin-layer chromatography [8], liquid chromatography–tandem mass spectrometry (LC–MS/MS) [9-11] have been developed for analysis of canagliflozin. There are methods developed for canagliflozin in rat plasma. However, there is no method reported for canagliflozin in human plasma along with stability studies. This study describes that a validated LC–MS/MS method was developed for canagliflozin in human plasma along with stability studies.

METHODS

Chemicals and reagents

Canagliflozin and internal standard (canagliflozin D_4) were obtained from Piramal Healthcare. K3EDTA plasma was from local suppliers, acetonitrile and methanol were of HPLC grade, ammonium acetate (GR grade) was used, and water was from Milli Q system.

Instrumentation

The HPLC separation was achieved on Zorbax XDB phenyl (75×4.6 mm, 3.5 mm) using methanol:acetate buffer (80:20 v/v) at a flow rate of 1.0 ml/min. The injection volume was 10 µl and the column temperature was 30°C. The samples were held at 5±3°C in an autosampler. The runtime was 2.0 min. The LC–MS/MS system consists of API 4000 triple quadrupole mass spectrometer equipped with turbospray ionization and an AS8020 automatic sample injector. The multiple reaction monitoring (MRM) was 462.5/267.1 (m/z) for canagliflozin and 466.4/267.2 (m/z) for internal standard (canagliflozin D_4), respectively. The temperature of the capillary was 50°C and the dwell time was 100 millisecond or ms.

Preparation of standards and quality control (QC) samples

Stock solution of canagliflozin was prepared in methanol to get concentration of 5 µg/ml. The calibration curve standard solution was prepared by further diluting the stock solution in methanol to the following analytical condition (10, 25, 150, 375, 750, 1875, 3750, 6000, and 7500 ng/ml) for canagliflozin. The internal standard working solution was prepared by diluting stock solution in methanol to 5000 ng/ml. QC samples were prepared in the same manner from the QC stock to get final concentration of 28 (LQC), 706 middle QC (MQC), and 5700 high QC (HQC) in plasma. QC samples were stored in deep freezer with study samples and include with all validation and sample analysis runs.

Extraction procedure

To a glass tube containing 300 µl of plasma sample, added 50 µl of 2000 ng/ml internal standard working solution. The sample was mixed on a vortex mixer for approximately 5 s. Then, 2.0 µl of tertiary butyl methyl ether was added to the vials and extracted for a period of 15 min or rotospin at 40 rpm. The vials were centrifuged at 4500 rpm at 4±1°C for 5 min. Finally, the samples (1.8 µl) were eluted into a deep well collection plate evaporated to dryness under nitrogen at 40±5°C and reconstituted in 300 µl of solution of mixture of acetonitrile:phosphate buffer (80:20%) vortexed for about 10 s, and finally, 10 µl of each reconstituted sample extract was injected into LC–MS/MS.

Indian Journal of Science and Technology, Vol 12(21), DOI: 10.17485/ijst/2019/v12i21/144520, June 2019
ISSN (Print) : 0974-6846
ISSN (Online) : 0974-5645

Cytotoxic Efficacy of Nannochloropsis Extracts on Lung Carcinoma in Mice

Princely Ebenezer Gnanakani[1], Perumal Santhanam[2], Kumpati Premkumar[3], Kilari Eswar Kumar[4] and Magharla Dasaratha Dhanaraju[5*]

[1]Department of Pharmaceutical Biotechnology, Jawaharlal Nehru Technological University, Kakinada – 533003, Andhra Pradesh, India; sprincelympharm@gmail.com
[2]Department of Marine Science, Bharathidasan University, Palkalaiperur, Tiruchirappalli – 620024, Tamil Nadu, India; santhanam@bdu.ac.in
[3]Department of Biomedical Science, Bharathidasan University, Palkalaiperur, Tiruchirappalli – 620024, Tami Nadu, India; prems@bdu.ac.in
[4]Department of Pharmacology, Andhra University College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam – 530003, Andhra Pradesh, India; ekilari@gmail.com
[5]Department of Pharmaceutical Science, GIET School of Pharmacy, Rajahmundry – 533294, Andhra Pradesh, India; mddhanaraju@yahoo.com,

Abstract

Objectives: The natural biomolecules from microalgae were renowned for their biomedical and pharmacological applications. In this study, cytotoxic efficacy of *Nannochloropsis* extracts was investigated on lung cancer induced by benzo(a)pyrene (BaP) in mice. **Methods/Statistical Analysis:** Acute toxicity studies using Ethyl Acetate Extract *Nannochloropsis* Hexane (EAENH) fractionated extract (5 mg/kg, 50 mg/Kg, 300 mg/kg and 2000 mg/kg) were carried out in mice. The*in vivo* study was accomplished in mice generated with lung cancer. **Findings:** The acute toxicity showed EAENH was non-toxic up to 2000 mg/kg devoid of any deaths throughout the study. The *in vivo* study demonstrates upsurge in the final body weight than the tumour-bearing mice group with reduced lung weight in EAENH-treated mice. The haematological and biochemical parameters of EAENH-treated animals gradually reversed to standard values. The antioxidant enzymes generated in EAENH-treated animals initiated apoptosis by oxidative stress. The histopathology of lungs displayed protective efficiency in the EAENH treated groups. It was evident through Western Blot analysis, EAENH turned on caspase 3, up-regulated CYP1A1 and Bax proapoptotic protein, down-regulated Bcl2 antiapoptotic protein in EAENH-treated animals suggesting EAENH promotes apoptosis via Caspase-dependent pathway. RT-PCR involves EAENH-induced apoptotic activity by instigating caspase and impeding phosphorylation of *ERK/Akt* in tumour cells. EAENH repressed the tumour growth in a dose-dependent manner. **Application/Improvements:** The findings suggested that phytochemicals in EAENH could be used successfully as cytotoxic agent for lung cancer.

Keywords: Benzo(a)pyrene, Mice, *Nannochloropsis,* Real Time-Polymerase Chain Reaction (RT-PCR), Western Blot

1. Introduction

Lung cancer is the second most widespread one in men and women equally worldwide[1]. Chemotherapy, photodynamic therapy and surgery are the current treatment lines for advanced phases[2,3]. Metastasis occurs in most of the cases during the diagnosis period, thus severely restricting therapeutic possibilities[4]. Phytochemicals identified in microalgae have a high biological demand and considered as alternatives to chemo preventive agents[5].

In tobacco smoke more than 60 carcinogens have been identified. Benzo(a)Pyrene (BaP), a key component

*Author for correspondence

ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, Vol 12(21), DOI: 10.17485/ijst/2019/v12i21/144520, June 2019 ISSN (Online) : 0974-5645

Cytotoxic Efficacy of Nannochloropsis Extracts on Lung Carcinoma in Mice

Princely Ebenezer Gnanakani[1], Perumal Santhanam[2], Kumpati Premkumar[3], Kilari Eswar Kumar[4] and Magharla Dasaratha Dhanaraju[5*]

[1]Department of Pharmaceutical Biotechnology, Jawaharlal Nehru Technological University, Kakinada – 533003, Andhra Pradesh, India; sprincelympharm@gmail.com
[2]Department of Marine Science, Bharathidasan University, Palkalaiperur, Tiruchirappalli – 620024, Tamil Nadu, India; santhanam@bdu.ac.in
[3]Department of Biomedical Science, Bharathidasan University, Palkalaiperur, Tiruchirappalli – 620024, Tami Nadu, India; prems@bdu.ac.in
[4]Department of Pharmacology, Andhra University College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam – 530003, Andhra Pradesh, India; ekilari@gmail.com
[5]Department of Pharmaceutical Science, GIET School of Pharmacy, Rajahmundry – 533294, Andhra Pradesh, India; mddhanaraju@yahoo.com,

Abstract

Objectives: The natural biomolecules from microalgae were renowned for their biomedical and pharmacological applications. In this study, cytotoxic efficacy of *Nannochloropsis* extracts was investigated on lung cancer induced by benzo(a)pyrene (BaP) in mice. **Methods/Statistical Analysis:** Acute toxicity studies using Ethyl Acetate Extract *Nannochloropsis* Hexane (EAENH) fractionated extract (5 mg/kg, 50 mg/Kg, 300 mg/kg and 2000 mg/kg) were carried out in mice. The*in vivo* study was accomplished in mice generated with lung cancer. **Findings:** The acute toxicity showed EAENH was non-toxic up to 2000 mg/kg devoid of any deaths throughout the study. The *in vivo* study demonstrates upsurge in the final body weight than the tumour-bearing mice group with reduced lung weight in EAENH-treated mice. The haematological and biochemical parameters of EAENH-treated animals gradually reversed to standard values. The antioxidant enzymes generated in EAENH-treated animals initiated apoptosis by oxidative stress. The histopathology of lungs displayed protective efficiency in the EAENH treated groups. It was evident through Western Blot analysis, EAENH turned on caspase 3, up-regulated CYP1A1 and Bax proapoptotic protein, down-regulated Bcl2 antiapoptotic protein in EAENH-treated animals suggesting EAENH promotes apoptosis via Caspase-dependent pathway. RT-PCR involves EAENH-induced apoptotic activity by instigating caspase and impeding phosphorylation of *ERK/Akt* in tumour cells. EAENH repressed the tumour growth in a dose-dependent manner. **Application/Improvements:** The findings suggested that phytochemicals in EAENH could be used successfully as cytotoxic agent for lung cancer.

Keywords: Benzo(a)pyrene, Mice, *Nannochloropsis,* Real Time-Polymerase Chain Reaction (RT-PCR), Western Blot

1. Introduction

Lung cancer is the second most widespread one in men and women equally worldwide[1]. Chemotherapy, photodynamic therapy and surgery are the current treatment lines for advanced phases[2,3]. Metastasis occurs in most of the cases during the diagnosis period, thus severely restricting therapeutic possibilities[4]. Phytochemicals identified in microalgae have a high biological demand and considered as alternatives to chemo preventive agents[5].

In tobacco smoke more than 60 carcinogens have been identified. Benzo(a)Pyrene (BaP), a key component

*Author for correspondence

INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Review Article

DIPEPTIDYL PEPTIDASE - 4 INHIBITORS IN REGALING TYPE 2 DIABETES MELLITUS: A REVIEW

Revathi S *[1], Gopal V [2], Jeyabalan G [1], Dhanaraju M D [3]
[1]Sunrise University, Alwar, Rajasthan, India
[2]College of Pharmacy, Mother Theresa Postgraduate & Research Institute of Health Sciences, Puducherry, India
[3]GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
*Corresponding Author Email: revathigsp@gmail.com

Article Received on: 12/11/18 Approved for publication: 22/01/19

DOI: 10.7897/2230-8407.100235

ABSTRACT

A novel class of antidiabetic drugs which were explicated for the treatment of type 2 diabetes mellitus is the dipeptidyl peptidase (DPP) - 4 inhibitors. The DPP-4 inhibitors foreclose the metabolism of the incretin hormones glucagon-like peptide-1 and gastric inhibitory polypeptide, advancing the combination and discharge of insulin when blood levels of glucose are elevated. There are more or less divergences between them as far as their absorption, distribution, metabolism & excretion and additionally in their strength and span of activity. However, their efficaciousness seems to be alike. They enhance glycemic control, decreasing both fasting and postprandial glucose levels to bring down HbA1c levels, without weight gain. The available DPP-4 inhibitors for the treatment of type 2 diabetes are saxagliptin, sitagliptin linagliptin, alogliptin, and vildagliptin.

Keywords: Diabetes mellitus, DPP-4, incretin, sitagliptin.

INTRODUCTION

Type 2 diabetes which is a non-in reverse ailment is hugely proliferating all through the world. Impairment of the pancreatic β-cells and perverted downsizing of glucagon generation of pancreatic α-cells stipulate the type 2 diabetes by inducing insulin resistance. Various prospects are ought to be claimed for consideration such as present complications, obesity of patient, normal body weight, age, and side effects. The rates of diabetes-linked microvascular and possibly macrovascular ramifications can be brought down by an effective drug control. Intended for minifying the aerobic hazard it is indispensable to modify the consorted risk factors such as consequences related to obesity and dyslipidemia. Medications that can amend glycemia without weight pick up could be an advantage for the hefty patients with type 2 diabetes. Directly, a considerable measure of novel medications are in development for the intercession of diabetes conceding items with a crude component of activity, for example, dipeptidyl peptidase - 4 inhibitors.[1]

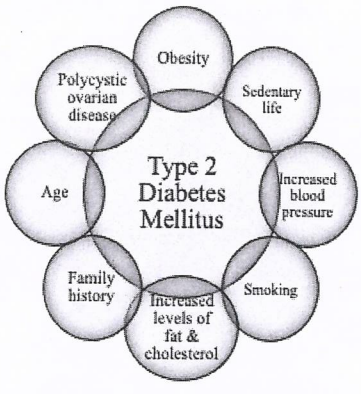


Fig 1: Risk factors of Type 2 diabetes mellitus

To reduce the blood glucose levels, apart from the intake of drugs, patients must execute steady exercises and should follow apprehensive diet. Metformin, α-glucosidase inhibitors, insulin, sulphonylureas, and thiazolidinedione are the current pharmacologically categorized drug of choice in the intervention of type 2 diabetes. Hypoglycemia level ascent was seen with sulphonylurea and insulin, weight pick up caused by insulin, sulphonylurea, and thiazolidinediones, and gastrointestinal bigotry issue was seen with metformin. These above undesirable adverse issues are the barricades to control glycemia optimally. As a result, a novel and secure treatment choices, for example, glucagon-like peptide 1 agonists and dipeptidyl peptidase-4 inhibitors are unendingly being investigated and advanced for ideal glycemic control.[2]

ABOUT DPP4

The newfangled category in pharmacology for oral antihyperglycemic drugs that pioneer a raw view for handling the type 2 diabetes mellitus is dipeptidyl peptidase-4 inhibitors. The mechanization of DPP-4 inhibitors is newly trenchant from any subsisting division for oral antihyperglycemic agents[3]. When blood levels of glucose are elevated, the dipeptidyl peptidase-4 inhibitors selectively forbid the metabolism of two major incretin hormones glucagon-like peptide-1 and glucose-dependent insulinotropic polypeptide which are boosting the synthesis and secretion of insulin[4, 5].

Even though they are not more virile, the DPP-4 inhibitors nonetheless offer many clinically pertinent merits in lowering blood glucose concentrations and reducing glycated hemoglobin levels. A substantial merit of DPP-4 is that it lessens the miserable risk than those are ascertained with sulphonylurea. Also, the weight-inert profile in opposition to the weight gain which is ascertained with sulphonylurea and thiazolidinedione is a positive merit of these drugs. These drugs have been assessed in various combinings with other antihyperglycemic agents and as

INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Review Article

DIPEPTIDYL PEPTIDASE - 4 INHIBITORS IN REGALING TYPE 2 DIABETES MELLITUS: A REVIEW

Revathi S *[1], Gopal V [2], Jeyabalan G [1], Dhanaraju M D [3]
[1]Sunrise University, Alwar, Rajasthan, India
[2]College of Pharmacy, Mother Theresa Postgraduate & Research Institute of Health Sciences, Puducherry, India
[3]GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
*Corresponding Author Email: revathigsp@gmail.com

Article Received on: 12/11/18 Approved for publication: 22/01/19

DOI: 10.7897/2230-8407.100235

ABSTRACT

A novel class of antidiabetic drugs which were explicated for the treatment of type 2 diabetes mellitus is the dipeptidyl peptidase (DPP) - 4 inhibitors. The DPP-4 inhibitors foreclose the metabolism of the incretin hormones glucagon-like peptide-1 and gastric inhibitory polypeptide, advancing the combination and discharge of insulin when blood levels of glucose are elevated. There are more or less divergences between them as far as their absorption, distribution, metabolism & excretion and additionally in their strength and span of activity. However, their efficaciousness seems to be alike. They enhance glycemic control, decreasing both fasting and postprandial glucose levels to bring down HbA1c levels, without weight gain. The available DPP-4 inhibitors for the treatment of type 2 diabetes are saxagliptin, sitagliptin linagliptin, alogliptin, and vildagliptin.

Keywords: Diabetes mellitus, DPP-4, incretin, sitagliptin.

INTRODUCTION

Type 2 diabetes which is a non-in reverse ailment is hugely proliferating all through the world. Impairment of the pancreatic β-cells and perverted downsizing of glucagon generation of pancreatic α-cells stipulate the type 2 diabetes by inducing insulin resistance. Various prospects are ought to be claimed for consideration such as present complications, obesity of patient, normal body weight, age, and side effects. The rates of diabetes-linked microvascular and possibly macrovascular ramifications can be brought down by an effective drug control. Intended for minifying the aerobic hazard it is indispensable to modify the consorted risk factors such as consequences related to obesity and dyslipidemia. Medications that can amend glycemia without weight pick up could be an advantage for the hefty patients with type 2 diabetes. Directly, a considerable measure of novel medications are in development for the intercession of diabetes conceding items with a crude component of activity, for example, dipeptidyl peptidase - 4 inhibitors.[1]

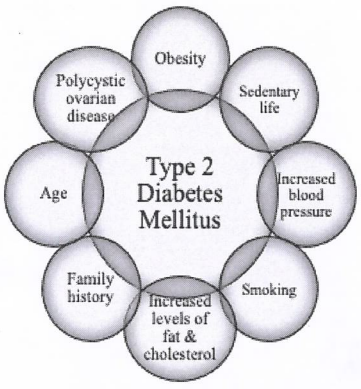


Fig 1: Risk factors of Type 2 diabetes mellitus

To reduce the blood glucose levels, apart from the intake of drugs, patients must execute steady exercises and should follow apprehensive diet. Metformin, α-glucosidase inhibitors, insulin, sulphonylureas, and thiazolidinedione are the current pharmacologically categorized drug of choice in the intervention of type 2 diabetes. Hypoglycemia level ascent was seen with sulphonylurea and insulin, weight pick up caused by insulin, sulphonylurea, and thiazolidinediones, and gastrointestinal bigotry issue was seen with metformin. These above undesirable adverse issues are the barricades to control glycemia optimally. As a result, a novel and secure treatment choices, for example, glucagon-like peptide 1 agonists and dipeptidyl peptidase-4 inhibitors are unendingly being investigated and advanced for ideal glycemic control.[2]

ABOUT DPP4

The newfangled category in pharmacology for oral antihyperglycemic drugs that pioneer a raw view for handling the type 2 diabetes mellitus is dipeptidyl peptidase-4 inhibitors. The mechanization of DPP-4 inhibitors is newly trenchant from any subsisting division for oral antihyperglycemic agents[3]. When blood levels of glucose are elevated, the dipeptidyl peptidase-4 inhibitors selectively forbid the metabolism of two major incretin hormones glucagon-like peptide-1 and glucose-dependent insulinotropic polypeptide which are boosting the synthesis and secretion of insulin[4, 5].

Even though they are not more virile, the DPP-4 inhibitors nonetheless offer many clinically pertinent merits in lowering blood glucose concentrations and reducing glycated hemoglobin levels. A substantial merit of DPP-4 is that it lessens the miserable risk than those are ascertained with sulphonylurea. Also, the weight-inert profile in opposition to the weight gain which is ascertained with sulphonylurea and thiazolidinedione is a positive merit of these drugs. These drugs have been assessed in various combinings with other antihyperglycemic agents and as

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296: (A.P.)

ISSN 0975-2366
https://doi.org/10.31838/ijpr/2019.11.01.013

Research Article

DESIGN, FORMULATION AND EVALUATION OF NANOSUSPENSION FOR DRUG DELIVERY OF CELECOXIB

SUNDAR V. D*, DIVYA P, SRIDEVI P, AKHILA K, DHANARAJU M. D.
Department of Pharmaceutical Technology. GIET School of pharmacy, Rajahmundry, AP, India.
Received: 12.10.18, Revised: 18.12.18, Accepted: 23.01.19

ABSTRACT
The present study is aimed to formulate and evaluate celecoxib oral nanosuspension to improve the bioavailability of the drug with varying concentrations of surfactants and co surfactants. The celecoxib nanosuspension was prepared by nanoprecipitation method using blend of surfactants Tween 80, Tween 20, PEG 200, Propylene glycol along with suitable excipients etc. The developed formulations were characterized for particle size and polydispersity index, total drug content, SEM, Zeta Potential and FTIR. The invitro drug release studies and invitro drug release kinetics were performed for all formulations. FTIR studies revealed that drug is compatible with the excipients. The particle size and polydispersity index of optimized formulation was found to be 98nm and the zeta potential was found to be -20 mV and concluded that the system had sufficient stability. The invitro drug release was found within their acceptable ranges. The rate of dissolution of best batch was enhanced to 99.22% in 30min. Stability studies proved that nanosuspensions were more stable with no significant changes in particle size distribution. Thus the formulated oral nanosuspension of celecoxib offers a superior conventional dosage forms for drug release.

Key Words: *Celecoxib, nonosuspension, nonopercipitation, polydispersity index*

INTRODUCTION
Drug delivery system is the device that enables the introduction of the therapeutic substance in the body and improves its efficacy and safety by controlling the rate, time, place release of the body (1). It is typically concerned with the quantity and duration of the drug presence (2). Improved method of the drug delivery system would be advantageous and more convenient to maintain a dosing frequency. The problem associated with poorly soluble drugs is too low bioavailability.(3) Oral drug delivery system has been known for decades as the most widely utilized route of administration among all route of administration that have been employed for the systemic delivery of drug via and various pharmaceutical products of different dosage forms. Compared to conventional dosage forms oral liquid drug delivery system offers a unique advantage to patient compliance. Conventional drug delivery is convenient and non invasive unit dosage form with higher compliance. The challenges for oral liquid dosage forms are they have better dose adaptability, rapid absorption from the stomach and intestine compared to conventional dosage forms and stability of drugs in liquid form (4). It provides benefits to BCS Class II, III, IV candidates, which exhibit poor aqueous, or lipid solubility and also drugs having a log P value greater than 2 (5). In the process of overcoming issues involving solubility and pharmacokinetic benefits of the drugs, nanosuspensions have revealed potential advantage to tackle the problem. A nanosuspension is a submicron colloidal dispersion of drug particles. The dispersion medium can be water, aqueous solutions or non-aqueous media. Nanosuspension is also called as (nanocrystals) (6) are nanoscopic crystals of the compound with the particle size below 1 μm. Nanotechnology can be used to improve the solubility as well as the bioavailability of poorly soluble drugs. Reduction of the particles to nanometer range leads to the enhanced dissolution rate and increased surface area. Surfactants and polymeric stabilizers are used for the stabilization of the system. A nanosized particle increases dissolution velocity and saturation solubility because of the vapor pressure effect (7). Drugs encapsulated with nanosuspensions exist in pharmaceutically accepted crystalline or amorphous state. Nanosuspensions can be given by any route (8). Oral administration of the nanosuspension provides rapid onset and improved bioavailability, possibility of large-scale production for the introduction of delivery system to the market (9). The techniques (10) used in the preparation of the nanosuspensions are Homogenization, Nanoprecipitation, Homogenization in Non Aqueous Media, Combined Precipitation and Homogenization, Nanojet Technology etc. Nanosuspension prepared by nanoprecipitation (solvent – antisolvent method) process involves two phases namely i) nuclei formation and ii) crystal growth (11). The nucleation and the growth rate depend on temperature. In order to produce small particle size, often a high-speed homogenization

ISSN 0975-2366
https://doi.org/10.31838/ijpr/2019.11.01.013

Research Article

DESIGN, FORMULATION AND EVALUATION OF NANOSUSPENSION FOR DRUG DELIVERY OF CELECOXIB

SUNDAR V. D*, DIVYA P, SRIDEVI P, AKHILA K, DHANARAJU M. D.
Department of Pharmaceutical Technology. GIET School of pharmacy, Rajahmundry, AP, India.
Received: 12.10.18, Revised: 18.12.18, Accepted: 23.01.19

ABSTRACT
The present study is aimed to formulate and evaluate celecoxib oral nanosuspension to improve the bioavailability of the drug with varying concentrations of surfactants and co surfactants. The celecoxib nanosuspension was prepared by nanoprecipitation method using blend of surfactants Tween 80, Tween 20, PEG 200, Propylene glycol along with suitable excipients etc. The developed formulations were characterized for particle size and polydispersity index, total drug content, SEM, Zeta Potential and FTIR. The invitro drug release studies and invitro drug release kinetics were performed for all formulations. FTIR studies revealed that drug is compatible with the excipients. The particle size and polydispersity index of optimized formulation was found to be 98nm and the zeta potential was found to be -20 mV and concluded that the system had sufficient stability. The invitro drug release was found within their acceptable ranges. The rate of dissolution of best batch was enhanced to 99.22% in 30min. Stability studies proved that nanosuspensions were more stable with no significant changes in particle size distribution. Thus the formulated oral nanosuspension of celecoxib offers a superior conventional dosage forms for drug release.

Key Words: *Celecoxib, nonosuspension, nonopercipitation, polydispersity index*

INTRODUCTION
Drug delivery system is the device that enables the introduction of the therapeutic substance in the body and improves its efficacy and safety by controlling the rate, time, place release of the body (1). It is typically concerned with the quantity and duration of the drug presence (2). Improved method of the drug delivery system would be advantageous and more convenient to maintain a dosing frequency. The problem associated with poorly soluble drugs is too low bioavailability.(3) Oral drug delivery system has been known for decades as the most widely utilized route of administration among all route of administration that have been employed for the systemic delivery of drug via and various pharmaceutical products of different dosage forms. Compared to conventional dosage forms oral liquid drug delivery system offers a unique advantage to patient compliance. Conventional drug delivery is convenient and non invasive unit dosage form with higher compliance. The challenges for oral liquid dosage forms are they have better dose adaptability, rapid absorption from the stomach and intestine compared to conventional dosage forms and stability of drugs in liquid form (4). It provides benefits to BCS Class II, III, IV candidates, which exhibit poor aqueous, or lipid solubility and also drugs having a log P value greater than 2 (5). In the process of overcoming issues involving solubility and pharmacokinetic benefits of the drugs, nanosuspensions have revealed potential advantage to tackle the problem. A nanosuspension is a submicron colloidal dispersion of drug particles. The dispersion medium can be water, aqueous solutions or non-aqueous media. Nanosuspension is also called as (nanocrystals) (6) are nanoscopic crystals of the compound with the particle size below 1 μm. Nanotechnology can be used to improve the solubility as well as the bioavailability of poorly soluble drugs. Reduction of the particles to nanometer range leads to the enhanced dissolution rate and increased surface area. Surfactants and polymeric stabilizers are used for the stabilization of the system. A nanosized particle increases dissolution velocity and saturation solubility because of the vapor pressure effect (7). Drugs encapsulated with nanosuspensions exist in pharmaceutically accepted crystalline or amorphous state. Nanosuspensions can be given by any route (8). Oral administration of the nanosuspension provides rapid onset and improved bioavailability, possibility of large-scale production for the introduction of delivery system to the market (9). The techniques (10) used in the preparation of the nanosuspensions are Homogenization, Nanoprecipitation, Homogenization in Non Aqueous Media, Combined Precipitation and Homogenization, Nanojet Technology etc. Nanosuspension prepared by nanoprecipitation (solvent – antisolvent method) process involves two phases namely i) nuclei formation and ii) crystal growth (11). The nucleation and the growth rate depend on temperature. In order to produce small particle size, often a high-speed homogenization

ISSN 0975-2366
https://doi.org/10.31838/ijpr/2019.11.01.012

Research Article

A STUDY OF TREATMENT PATTERN ON ENVENOM IN TWO TERTIARY CARE TEACHING HOSPITAL IN SOUTH INDIA

J. JOHN KIRUBAKARAN[1,2], M. V. BASAVESWARA RAO [3], M D DHANARAJU*[4]

[1] Research Scholar, Krishna University, Andhra Pradesh, India.
[2] Department of Pharmacy Practice, GIET School of Pharmacy, Andhra Pradesh, India
[3] Department of Chemistry, Krishna University, Andhra Pradesh, India
[4] Principal & Director (Research), GIET School of Pharmacy, Andhra Pradesh, India
Email: mddhanaraju@yahoo.com (m) :9440677600
Received: 08.09.18, Revised: 17.12.18, Accepted: 27.01.19

ABSTRACT

Envenom otherwise called as poisoning is becoming a pestilence worldwide. It is the reason for premature mortality for about 800,000 throughout the world, this tragedy which affects the families, communities and entire country also. The study aims at analysing the pattern, cause, mortality rate of poisoning and treatment of poisoning in East Godavari district which is in Andhra Pradesh, India. This retrospective hospital record-based study was conducted in two tertiary care hospitals attached to teaching institution in East Godavari district. The data was analysed using descriptive statistics.A total of 285 cases were included in our study. Male to female ratio was 11:8. The age range from 4-78 years. The main occupation was manual labour 27.02% and farmers 25.96%. Rural residence was about 70.05%. The agents used for envenom are Organophosphorus compounds (OPC) 35.79%. The OPC patients were treated with Atropine 10.88%, Atropine + Pralidoxime 15.44%, Atropine + activated charcoal 13.63% and Atropine + Pralidoxime + activated charcoal 7.02% mainly. Only 3% population was accidental poisoning. Imposing stringent rules and regulations against the use of pesticides and Pharmaceutical products. Conducting prevention program using World Health Organization toolkit.

Keywords: Suicide; Envenom; Organophosphates; Seasonality; Acute poisoning

INTRODUCTION

All substances are poisons; there is no such thing as a non-poison. It is the amount that distinguishes a poison from a remedy *"Paracelsus"*, Wrote this statement before 480 years. Envenom otherwise called as poisoning is becoming a pestilence worldwide. Agricultural pesticide is used as envenom which is a major clinical and public-health problem across rural Asia[1–3]. About 500,000 deaths are due to deliberate envenom in Asia each year[4], envenom accounts about one third of the world's death[5]. A total number of persons killed due to poisoning in India is 7750 in the year 2015, Madhya Pradesh was leading with 2374 cases[6]. In the same year the total number of accidental intake of Insecticide is 7060[7]. Major cause-wise medically certified deaths by injury, poisoning and other consequences of external causes in India was 1.1% in the year 2015[8]. The age group 25 to 34 years are more numbered in medically certified deaths by injury, poisoning and other consequences of external causes in India in 2015[9]. In the year 2006-07 the number of death due to poisoning are 2989, which was the highest comparing to other year, 2010-11, 2011-12, 2012-13, the death rate was 1049, 1314, 1027 respectively, as on September 2014 it is 733 deaths based on the data released by the ministry of agricultural, Govt, of India [6]. In country like Sri Lanka the (Class 1) highly hazardous pesticides are banned for sales, which has reduced the death due to envenom[3]. In India 66 pesticides are identified to banned which are classified under extremely/highly hazardous, out of which 12 compounds were banned from manufacture, import, formulate, transport, sell and use from January 2018. Another 6 compounds will be removed from India by December 2020[10–12]. Based on the report from the Ministry of Home Affairs, Govt. of India, in Andhra Pradesh a total of 365 persons killed by accidental intake of poison[7]. The present study deals with the pattern and treatment of envenom in the district of East Godavari, Andhra Pradesh, major revenue of this district is from farming, and so the availability of pesticide is very easy. The main objective to investigate the treatment pattern of envenom cases in two tertiary care teaching hospital in East Godavari district.

Methodology

This retrospective hospital record-based study was conducted in two tertiary care teaching hospitals in East Godavari district, Andhra Pradesh, India. A Total of 356 case ware identified in the medico legal cases. A total of 285 cases was keyed out based on

ISSN 0975-2366
https://doi.org/10.31838/ijpr/2019.11.01.012

Research Article

A STUDY OF TREATMENT PATTERN ON ENVENOM IN TWO TERTIARY CARE TEACHING HOSPITAL IN SOUTH INDIA

J. JOHN KIRUBAKARAN[1,2], M. V. BASAVESWARA RAO [3], M D DHANARAJU*[4]
[1] Research Scholar, Krishna University, Andhra Pradesh, India.
[2] Department of Pharmacy Practice, GIET School of Pharmacy, Andhra Pradesh, India
[3] Department of Chemistry, Krishna University, Andhra Pradesh, India
[4] Principal & Director (Research), GIET School of Pharmacy, Andhra Pradesh, India
Email: mddhanaraju@yahoo.com (m) :9440677600
Received: 08.09.18, Revised: 17.12.18, Accepted: 27.01.19

ABSTRACT
Envenom otherwise called as poisoning is becoming a pestilence worldwide. It is the reason for premature mortality for about 800,000 throughout the world, this tragedy which affects the families, communities and entire country also. The study aims at analysing the pattern, cause, mortality rate of poisoning and treatment of poisoning in East Godavari district which is in Andhra Pradesh, India. This retrospective hospital record-based study was conducted in two tertiary care hospitals attached to teaching institution in East Godavari district. The data was analysed using descriptive statistics.A total of 285 cases were included in our study. Male to female ratio was 11:8. The age range from 4-78 years. The main occupation was manual labour 27.02% and farmers 25.96%. Rural residence was about 70.05%. The agents used for envenom are Organophosphorus compounds (OPC) 35.79%. The OPC patients were treated with Atropine 10.88%, Atropine + Pralidoxime 15.44%, Atropine + activated charcoal 13.63% and Atropine + Pralidoxime + activated charcoal 7.02% mainly. Only 3% population was accidental poisoning. Imposing stringent rules and regulations against the use of pesticides and Pharmaceutical products. Conducting prevention program using World Health Organization toolkit.

Keywords: Suicide; Envenom; Organophosphates; Seasonality; Acute poisoning

INTRODUCTION
All substances are poisons; there is no such thing as a non-poison. It is the amount that distinguishes a poison from a remedy *"Paracelsus"*, Wrote this statement before 480 years. Envenom otherwise called as poisoning is becoming a pestilence worldwide. Agricultural pesticide is used as envenom which is a major clinical and public-health problem across rural Asia[1–3]. About 500,000 deaths are due to deliberate envenom in Asia each year[4], envenom accounts about one third of the world's death[5]. A total number of persons killed due to poisoning in India is 7750 in the year 2015, Madhya Pradesh was leading with 2374 cases[6]. In the same year the total number of accidental intake of Insecticide is 7060[7]. Major cause-wise medically certified deaths by injury, poisoning and other consequences of external causes in India was 1.1% in the year 2015[8]. The age group 25 to 34 years are more numbered in medically certified deaths by injury, poisoning and other consequences of external causes in India in 2015[9]. In the year 2006-07 the number of death due to poisoning are 2989, which was the highest comparing to other year, 2010-11, 2011-12, 2012-13, the death rate was 1049, 1314, 1027 respectively, as on September 2014 it is 733 deaths based on the data released by the ministry of agricultural, Govt, of India [6]. In country like Sri Lanka the (Class 1) highly hazardous pesticides are banned for sales, which has reduced the death due to envenom[3]. In India 66 pesticides are identified to banned which are classified under extremely/highly hazardous, out of which 12 compounds were banned from manufacture, import, formulate, transport, sell and use from January 2018. Another 6 compounds will be removed from India by December 2020[10–12]. Based on the report from the Ministry of Home Affairs, Govt. of India, in Andhra Pradesh a total of 365 persons killed by accidental intake of poison[7]. The present study deals with the pattern and treatment of envenom in the district of East Godavari, Andhra Pradesh, major revenue of this district is from farming, and so the availability of pesticide is very easy. The main objective to investigate the treatment pattern of envenom cases in two tertiary care teaching hospital in East Godavari district.

Methodology
This retrospective hospital record-based study was conducted in two tertiary care teaching hospitals in East Godavari district, Andhra Pradesh, India. A Total of 356 case ware identified in the medico legal cases. A total of 285 cases was keyed out based on

OPEN ACCESS
Saudi Journal of Biomedical Research
Abbreviated Key Title: Saudi J Biomed Res
ISSN 2518-3214 (Print) |ISSN 2518-3222 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjbr/

Original Research Article

Cost Analysis of Anti-Hypertensive Drugs in India

K. Harika[1*], S. Subha Sri[1], J. John Kirubakaran[1], S. Princely[2], M. D. Dhanaraju[2]
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
*Corresponding author: K. Harika
| Received: 15.01.2019 | Accepted: 26.01.2019 | Published: 30.01.2019
DOI:10.21276/sjbr.2019.4.1.7

Abstract

Hypertension can be defined as a condition in which the force of blood against the artery walls is too high. This study was planned to analyses cost variations of anti-hypertensive drugs available in Indian market. There is a wide range of variations as the price of drug marketing in India. This study was conducted by taking the maximum and minimum cost of anti- hypertensive agents manufactured by different brands of same drug, strength and dosage forms. The data is obtained from the current index of medical specialties [CIMS] April-July 2018. The cost ratio and percentage cost variations were calculated for each anti-hypertensive drug. The average percentage price variation of different brands of the same oral anti-hypertensive drugs in Indian market is very wide.

Keywords: Anti-hypertensive, price comparison, CIMS, cost ratio, percentage price variation, Indian market.

INTRODUCTION

Hypertension is another name for high blood pressure. It can lead to severe complications and increase the risk of cardiac disease, stroke, and death [1]. Hypertension is usually higher when you wake up, after exercise, when you are under stress [2]. Blood pressure is the force exerted by the blood against the walls of the blood vessels. When the blood pressure raised above 140/90mmHg is stated as Hypertension [1].

According to WHO the prevalence of hypertension was highest in Africa with 46% and the lowest prevalence was in America with 35% in both genders. Men have the higher prevalence than women (39% for men and 32% for women) [3]. Globally, the overall prevalence of hypertension in adults over 25 years of age was 40% in 2008. However, because of population growth and aging, the number of people with uncontrolled hypertension rise from 600 million in 1980 to nearly 1 billion in 2008 [4].

For primary/ essential hypertension the caused is not known. When a cause can be identified (eg: a disorder of the adrenal glands, kidneys (or) arteries) the condition is known as secondary hypertension. Factors such as heredity, obesity, smoking and emotional stress are thought to play a role. Hypertension results in damage to the heart, eyes, kidneys (or) brain and ultimately lead to congestive heart failure, heart attack, kidney failure (or) stroke [1].

In patients with uncomplicated/mild hypertension, antihypertensive therapy can be can be initiated after dietary and lifestyle modifications. Which includes maintenance of healthy diet, restriction of salt and alcohol intake, increased exercise (walking, jogging, swimming etc), quit smoking for 3-6 months [5]. Research confirmed that the uptake of excess dietary salt can be the major contributor to hypertension. some studies also have shown that low calcium intake can be a cause[4]. Anti-hypertensive is prescribed based on the co-morbidities and individual patient characteristics [5]. Systolic hypertension is more prevalent in elderly people due to large vessel stiffness associated with ageing [6] and usually have lower plasma renin activity than younger patients, therefore ACE inhibitors and beta-blockers may not be as effective [7].

Monotherapy is recommended initially, especially for patients with mild hypertension (140-159/ 90-99mmHg) and people with low to moderate total cardiovascular risk [5]. Treatment guidelines from the United Kingdom recommend that ACE inhibitors/ Angiotensin Receptor Blockers are initiated for patients (<55yrs) with hypertension. Some studies have found ACE inhibitors and beta-blockers to be more effective in younger people compared to calcium channel blockers/ thiazide diuretics [8]. Diuretics or calcium channel blockers are prescribed for older patients (55yrs/ older) with hypertension [9]. Australian guidelines recommended thiazide diuretics as a first-line therapy in patients aged 65yrs and older [10]. The

OPEN ACCESS
Saudi Journal of Biomedical Research
Abbreviated Key Title: Saudi J Biomed Res
ISSN 2518-3214 (Print) |ISSN 2518-3222 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjbr/

Original Research Article

Cost Analysis of Anti-Hypertensive Drugs in India

K. Harika[1]*, S. Subha Sri[1], J. John Kirubakaran[1], S. Princely[2], M. D. Dhanaraju[2]
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
*Corresponding author: K. Harika
| Received: 15.01.2019 | Accepted: 26.01.2019 | Published: 30.01.2019
DOI:10.21276/sjbr.2019.4.1.7

Abstract

Hypertension can be defined as a condition in which the force of blood against the artery walls is too high. This study was planned to analyses cost variations of anti-hypertensive drugs available in Indian market. There is a wide range of variations as the price of drug marketing in India. This study was conducted by taking the maximum and minimum cost of anti- hypertensive agents manufactured by different brands of same drug, strength and dosage forms. The data is obtained from the current index of medical specialties [CIMS] April-July 2018. The cost ratio and percentage cost variations were calculated for each anti-hypertensive drug. The average percentage price variation of different brands of the same oral anti-hypertensive drugs in Indian market is very wide.

Keywords: Anti-hypertensive, price comparison, CIMS, cost ratio, percentage price variation, Indian market.

INTRODUCTION

Hypertension is another name for high blood pressure. It can lead to severe complications and increase the risk of cardiac disease, stroke, and death [1]. Hypertension is usually higher when you wake up, after exercise, when you are under stress [2]. Blood pressure is the force exerted by the blood against the walls of the blood vessels. When the blood pressure raised above 140/90mmHg is stated as Hypertension [1].

According to WHO the prevalence of hypertension was highest in Africa with 46% and the lowest prevalence was in America with 35% in both genders. Men have the higher prevalence than women (39% for men and 32% for women) [3]. Globally, the overall prevalence of hypertension in adults over 25 years of age was 40% in 2008. However, because of population growth and aging, the number of people with uncontrolled hypertension rise from 600 million in 1980 to nearly 1 billion in 2008 [4].

For primary/ essential hypertension the caused is not known. When a cause can be identified (eg: a disorder of the adrenal glands, kidneys (or) arteries) the condition is known as secondary hypertension. Factors such as heredity, obesity, smoking and emotional stress are thought to play a role. Hypertension results in damage to the heart, eyes, kidneys (or) brain and ultimately lead to congestive heart failure, heart attack, kidney failure (or) stroke [1].

In patients with uncomplicated/mild hypertension, antihypertensive therapy can be can be initiated after dietary and lifestyle modifications. Which includes maintenance of healthy diet, restriction of salt and alcohol intake, increased exercise (walking, jogging, swimming etc), quit smoking for 3-6 months [5]. Research confirmed that the uptake of excess dietary salt can be the major contributor to hypertension. some studies also have shown that low calcium intake can be a cause[4]. Anti-hypertensive is prescribed based on the co-morbidities and individual patient characteristics [5]. Systolic hypertension is more prevalent in elderly people due to large vessel stiffness associated with ageing [6] and usually have lower plasma renin activity than younger patients, therefore ACE inhibitors and beta-blockers may not be as effective [7].

Monotherapy is recommended initially, especially for patients with mild hypertension (140-159/ 90-99mmHg) and people with low to moderate total cardiovascular risk [5]. Treatment guidelines from the United Kingdom recommend that ACE inhibitors/ Angiotensin Receptor Blockers are initiated for patients (<55yrs) with hypertension. Some studies have found ACE inhibitors and beta-blockers to be more effective in younger people compared to calcium channel blockers/ thiazide diuretics [8]. Diuretics or calcium channel blockers are prescribed for older patients (55yrs/ older) with hypertension [9]. Australian guidelines recommended thiazide diuretics as a first-line therapy in patients aged 65yrs and older [10]. The

OPEN ACCESS
Saudi Journal of Biomedical Research
Abbreviated Key Title: Saudi J Biomed Res
ISSN 2518-3214 (Print) |ISSN 2518-3222 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjbr/

Original Research Article

Cost Analysis of Anti-Hypertensive Drugs in India

K. Harika[1*], S. Subha Sri[1], J. John Kirubakaran[1], S. Princely[2], M. D. Dhanaraju[2]
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

***Corresponding author:** K. Harika
| **Received:** 15.01.2019 | **Accepted:** 26.01.2019 | **Published:** 30.01.2019
DOI:10.21276/sjbr.2019.4.1.7

Abstract

Hypertension can be defined as a condition in which the force of blood against the artery walls is too high. This study was planned to analyses cost variations of anti-hypertensive drugs available in Indian market. There is a wide range of variations as the price of drug marketing in India. This study was conducted by taking the maximum and minimum cost of anti- hypertensive agents manufactured by different brands of same drug, strength and dosage forms. The data is obtained from the current index of medical specialties [CIMS] April-July 2018. The cost ratio and percentage cost variations were calculated for each anti-hypertensive drug. The average percentage price variation of different brands of the same oral anti-hypertensive drugs in Indian market is very wide.

Keywords: Anti-hypertensive, price comparison, CIMS, cost ratio, percentage price variation, Indian market.

INTRODUCTION

Hypertension is another name for high blood pressure. It can lead to severe complications and increase the risk of cardiac disease, stroke, and death [1]. Hypertension is usually higher when you wake up, after exercise, when you are under stress [2]. Blood pressure is the force exerted by the blood against the walls of the blood vessels. When the blood pressure raised above 140/90mmHg is stated as Hypertension [1].

According to WHO the prevalence of hypertension was highest in Africa with 46% and the lowest prevalence was in America with 35% in both genders. Men have the higher prevalence than women (39% for men and 32% for women) [3]. Globally, the overall prevalence of hypertension in adults over 25 years of age was 40% in 2008. However, because of population growth and aging, the number of people with uncontrolled hypertension rise from 600 million in 1980 to nearly 1 billion in 2008 [4].

For primary/ essential hypertension the caused is not known. When a cause can be identified (eg: a disorder of the adrenal glands, kidneys (or) arteries) the condition is known as secondary hypertension. Factors such as heredity, obesity, smoking and emotional stress are thought to play a role. Hypertension results in damage to the heart, eyes, kidneys (or) brain and ultimately lead to congestive heart failure, heart attack, kidney failure (or) stroke [1].

In patients with uncomplicated/mild hypertension, antihypertensive therapy can be can be initiated after dietary and lifestyle modifications. Which includes maintenance of healthy diet, restriction of salt and alcohol intake, increased exercise (walking, jogging, swimming etc), quit smoking for 3-6 months [5]. Research confirmed that the uptake of excess dietary salt can be the major contributor to hypertension. some studies also have shown that low calcium intake can be a cause[4]. Anti-hypertensive is prescribed based on the co-morbidities and individual patient characteristics [5]. Systolic hypertension is more prevalent in elderly people due to large vessel stiffness associated with ageing [6] and usually have lower plasma renin activity than younger patients, therefore ACE inhibitors and beta-blockers may not be as effective [7].

Monotherapy is recommended initially, especially for patients with mild hypertension (140-159/ 90-99mmHg) and people with low to moderate total cardiovascular risk [5]. Treatment guidelines from the United Kingdom recommend that ACE inhibitors/ Angiotensin Receptor Blockers are initiated for patients (<55yrs) with hypertension. Some studies have found ACE inhibitors and beta-blockers to be more effective in younger people compared to calcium channel blockers/ thiazide diuretics [8]. Diuretics or calcium channel blockers are prescribed for older patients (55yrs/ older) with hypertension [9]. Australian guidelines recommended thiazide diuretics as a first-line therapy in patients aged 65yrs and older [10]. The

OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences

Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Review Article

"Toxidrome" A Review

J. John Kirubakaran[1, 2], M. D Dhanaraju[3]*

[1]Research Scholar, Krishna University, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Andhra Pradesh, India
[3]Principal and Research Director, Department of Pharmaceutical Sciences, GIET School of Pharmacy, Rajahmundry - 533 296, Andhra Pradesh, India

*Corresponding author: Dr. M.D. Dhanaraju
| Received: 16.02.2019 | Accepted: 04.03.2019 | Published: 30.03.2019
DOI:10.21276/sjmps.2019.5.3.7

Abstract

For many years medical community has attempted to standardize its approach to the assessment of patients. The vital signs are a valuable parameter with which to assess and monitor a patient's response to supportive treatment and antidote therapy. Vital signs play an important role in the practice of medical toxicology beyond evaluating and monitoring a patient's overall status as they are frequently valuable physiological clues to toxicology and disease gravity. In 1970's two paediatric physicians Howard C Mortenson and Joseph Greensher, coined a term "Toxidromes" which is a combination word of toxic syndromes. They have quoted "Some common combination of manifestation which we have termed toxidromes can give a clue to the drug involved" in an article "The unknown Poison". ***Aim:*** This paper aims to provide an understanding on the various vital signs and symptoms which is observed during poison treatment. ***Methodology:*** An extensive review of literature was carried out to elicit information on various vital signs and toxic syndromes. ***Results:*** The study revealed that the health care professionals on understanding various toxidromes can help them to identify the type of poison, its antidote and the can provide a better treatment. ***Conclusion:*** The healthcare professionals has to undergo training on toxidromes. Which can improve the treatment and outcome in any poisoning case.

Keywords: Toxidromes, Poisoning, Overdose, ABCDE assessment, Decontamination.

INTRODUCTION

When dealing with a poisoned patient there are four steps to go through. The most important thing to remember is to treat the patient first, not the poison.

Step-I

The assessment of poisoning with start with ABCDE [1] (Airway, breathing, circulation, disability, exposure) approach which can determine their general condition and to treat. The next step is to try to name the toxidrome.

Step-II

Toxidrome are collection of symptoms that reflect drug class effect. Toxidromes help in figuring out what type of poison the patient has ingested.

Step-III

Risk assessment has to be assessed concerning the specific drugs. To do a better assessment, the following points are mandatory.

1. What did they take?
2. How much did they take?
3. When did they take?
4. How did they ingest the drug?
5. What's their body weight?
6. Are they on other medication?
7. Do they have any liver or kidney problem?

For the above questions the patient not be able to answer or they won't answer truthfully.

Step-IV

General treatment we can easily remember by using DEAD [2] (Decontamination, Enhanced elimination, Antidotes disposition).

DECONTAMINATION

The goal of decontamination is to decrease or delay absorption If its topical like skin or the eye, then rigorous rinsing for oral ingested drugs. This includes gastric lavage, the administration of active charcoal and whole bowel irrigation [3].

Gastric lavage [4] is performed by inserting a gastric tube placing the patient on to their left -side (pylorus pointing up) and flushing the tube with 300c of

Dr. M.D. DHANA RAJU, M.Pharm., Ph.D
Principal
GIET SCHOOL OF PHARMACY,
NH 16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296, (A.P.)

OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences

Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) |ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Review Article

"Toxidrome" A Review

J. John Kirubakaran[1, 2], M. D Dhanaraju[3]*

[1]Research Scholar, Krishna University, Andhra Pradesh, India
[2]Department of Pharmacy Practice, GIET School of Pharmacy, Andhra Pradesh, India
[3]Principal and Research Director, Department of Pharmaceutical Sciences, GIET School of Pharmacy, Rajahmundry - 533 296, Andhra Pradesh, India

*Corresponding author: Dr. M.D. Dhanaraju
| Received: 16.02.2019 | Accepted: 04.03.2019 | Published: 30.03.2019
DOI:10.21276/sjmps.2019.5.3.7

Abstract

For many years medical community has attempted to standardize its approach to the assessment of patients. The vital signs are a valuable parameter with which to assess and monitor a patient's response to supportive treatment and antidote therapy. Vital signs play an important role in the practice of medical toxicology beyond evaluating and monitoring a patient's overall status as they are frequently valuable physiological clues to toxicology and disease gravity. In 1970's two paediatric physicians Howard C Mortenson and Joseph Greensher, coined a term "Toxidromes" which is a combination word of toxic syndromes. They have quoted "Some common combination of manifestation which we have termed toxidromes can give a clue to the drug involved" in an article "The unknown Poison". ***Aim:*** This paper aims to provide an understanding on the various vital signs and symptoms which is observed during poison treatment. ***Methodology:*** An extensive review of literature was carried out to elicit information on various vital signs and toxic syndromes. ***Results:*** The study revealed that the health care professionals on understanding various toxidromes can help them to identify the type of poison, its antidote and the can provide a better treatment. ***Conclusion:*** The healthcare professionals has to undergo training on toxidromes. Which can improve the treatment and outcome in any poisoning case.

Keywords: Toxidromes, Poisoning, Overdose, ABCDE assessment, Decontamination.

INTRODUCTION

When dealing with a poisoned patient there are four steps to go through. The most important thing to remember is to treat the patient first, not the poison.

Step-I

The assessment of poisoning with start with ABCDE [1] (Airway, breathing, circulation, disability, exposure) approach which can determine their general condition and to treat. The next step is to try to name the toxidrome.

Step-II

Toxidrome are collection of symptoms that reflect drug class effect. Toxidromes help in figuring out what type of poison the patient has ingested.

Step-III

Risk assessment has to be assessed concerning the specific drugs. To do a better assessment, the following points are mandatory.

1. What did they take?
2. How much did they take?
3. When did they take?
4. How did they ingest the drug?
5. What's their body weight?
6. Are they on other medication?
7. Do they have any liver or kidney problem?

For the above questions the patient not be able to answer or they won't answer truthfully.

Step-IV

General treatment we can easily remember by using DEAD [2] (Decontamination, Enhanced elimination, Antidotes disposition).

DECONTAMINATION

The goal of decontamination is to decrease or delay absorption If its topical like skin or the eye, then rigorous rinsing for oral ingested drugs. This includes gastric lavage, the administration of active charcoal and whole bowel irrigation [3].

Gastric lavage [4] is performed by inserting a gastric tube placing the patient on to their left -side (pylorus pointing up) and flushing the tube with 300c of

Dr. M.D. DHANA RAJU, M.Pharm., Ph.D
Principal
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296. (AP)

OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences

Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Original Research Article

Evaluation of Sardine Fish Extract Meal on Papain Induced Osteoarthritis in Experimental Rats

S. Ramachandran[1*], K. Shivaram[2], B. S Nagalakshmi[2], T. Manasa[2], M. D Dhanaraju[2]

[1]Professor & Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India
[2]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India

*Corresponding author: S Ramachandran
| Received: 07.04.2019 | Accepted: 16.04.2019 | Published: 30.04.2019

DOI:10.21276/sjmps.2019.5.4.3

Abstract

Aim: The aim of the present study was to evaluate the effect of sardine (*Sardinella gibbosa)* fish extract on papain induced osteoarthritis in rats. ***Methodology:*** In this study 30 wistar rats were randomly selected and divided into five groups. Group-1 (-ve Control), Group 2 (+ve control), Group 3 (Calcium 75 mg/kg as standard), Group 4 (Sardine extract 30 gms/kg), Group 5 (15 gms/kg sardine extract). Osteoarthritis was induced in the right knees of all the groups of rats except negative control by injecting 0.2 ml (4%) of papain solution with 0.1 ml (0.03M) of cystein as activator. All groups were left for development of osteoarthritis. Rats were sacrificed on day 1, 2, 7, 14, 21 & 28 days of post papain injection. ***Results:*** Estimation of calcium and phosphorus in fish extract was carried out by Atomic absorption spectrophotometer. The percentage inhibition of knee thickness of sardine fish extract and Calcium groups were found to be 68% and 77% respectively. Various haematological parameters like RBC count and Hb, WBC count and ESR were recorded. Parameters like blood glucose, urea, globulin, creatinine, total protein, and albumin were calculated. Histopathological studies of knee joints of rats were also carried out. ***Conclusion:*** *Sardinella gibbosa* fish extract at a dose level of 30 gm/kg p.o., exhibited reduction in osteoarthritis due to the rich source of Ca & selenium and maintained the normal haematological and biochemical parameters in papain induced osteoarthritic rats.

Keywords: Sardinella gibbosa, Sardines, Papain, Osteo arthritis, Selenium.

INTRODUCTION

Osteoarthritis (OA) is a disorder affecting 250 million people worldwide [1-3]. Even though there is a development in the field of OA treatment many people still suffer and we are still in need of efficient treatment [4]. In India Natural compounds are commonly used for the treatment of Osteoarthritis and the World Health Organization (WHO) recommends the international community to use traditional ayurvedic system of medicine in the management of OA [5].

Marine resources give us good number of specific and potent bioactive substances like proteins, enzymes, polyether, fatty acids, polysaccharides and lectins. Proteins that are obtained from marine sources possess unique properties like foaming capacity, gelling nature, film formation and antimicrobial activity [6]. Bioactive peptides generally contain 3–20 amino acid residues and based on their amino acid composition and sequence its activity differs. Some of the reported peptides have different biological activities like antioxidant, antimicrobial, antihypertensive, immunomodulatory, antithrombotic, anticancer activities, along with nutritional value [7].

In general fish is the major source of various bioactive substances like antioxidants, Vitamins, polyunsaturated fatty acids, polysaccharides, minerals, enzymes etc. Fish is a rich source of lipids, protein, vitamins and minerals. [15]These important source of substances exert different pharmacological activities, and that can be added in diet for the treatment of various ailments [8].

Sardines (*Sardinella gibbosa)* are small variety of oily fishes that belongs to the family Clupeidea. They are known as pilchard in some areas. They are generally packed in cans and are commonly identified as canned sardines. There are 21 types of fish that can come under the Sardines category. Sardina, sardinops, sardinella and dussumieria are the familiar species of Sardines [9].

The chemical constituents of *Sardinella gibbosa* [10] consists of rich source of vitamins. It contains high concentration of Vitamin-A, D, B_{12}, C, K, E, B_6, thiamine, niacin, pantothenic acid, riboflavin, folate, choline, and betaine. *Sardinella gibbosa* has high

OPEN ACCESS
Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Original Research Article

Evaluation of Sardine Fish Extract Meal on Papain Induced Osteoarthritis in Experimental Rats

S. Ramachandran[1*], K. Shivaram[2], B. S Nagalakshmi[2], T. Manasa[2], M. D Dhanaraju[2]
[1]Professor & Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India
[2]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India

*Corresponding author: S Ramachandran
| Received: 07.04.2019 | Accepted: 16.04.2019 | Published: 30.04.2019
DOI:10.21276/sjmps.2019.5.4.3

Abstract

Aim: The aim of the present study was to evaluate the effect of sardine (*Sardinella gibbosa)* fish extract on papain induced osteoarthritis in rats. ***Methodology:*** In this study 30 wistar rats were randomly selected and divided into five groups. Group-1 (-ve Control), Group 2 (+ve control), Group 3 (Calcium 75 mg/kg as standard), Group 4 (Sardine extract 30 gms/kg), Group 5 (15 gms/kg sardine extract). Osteoarthritis was induced in the right knees of all the groups of rats except negative control by injecting 0.2 ml (4%) of papain solution with 0.1 ml (0.03M) of cystein as activator. All groups were left for development of osteoarthritis. Rats were sacrificed on day 1, 2, 7, 14, 21 & 28 days of post papain injection. ***Results:*** Estimation of calcium and phosphorus in fish extract was carried out by Atomic absorption spectrophotometer. The percentage inhibition of knee thickness of sardine fish extract and Calcium groups were found to be 68% and 77% respectively. Various haematological parameters like RBC count and Hb, WBC count and ESR were recorded. Parameters like blood glucose, urea, globulin, creatinine, total protein, and albumin were calculated. Histopathological studies of knee joints of rats were also carried out. ***Conclusion:*** *Sardinella gibbosa* fish extract at a dose level of 30 gm/kg p.o., exhibited reduction in osteoarthritis due to the rich source of Ca & selenium and maintained the normal haematological and biochemical parameters in papain induced osteoarthritic rats.

Keywords: Sardinella gibbosa, Sardines, Papain, Osteo arthritis, Selenium.

INTRODUCTION

Osteoarthritis (OA) is a disorder affecting 250 million people worldwide [1-3]. Even though there is a development in the field of OA treatment many people still suffer and we are still in need of efficient treatment [4]. In India Natural compounds are commonly used for the treatment of Osteoarthritis and the World Health Organization (WHO) recommends the international community to use traditional ayurvedic system of medicine in the management of OA [5].

Marine resources give us good number of specific and potent bioactive substances like proteins, enzymes, polyether, fatty acids, polysaccharides and lectins. Proteins that are obtained from marine sources possess unique properties like foaming capacity, gelling nature, film formation and antimicrobial activity [6]. Bioactive peptides generally contain 3–20 amino acid residues and based on their amino acid composition and sequence its activity differs. Some of the reported peptides have different biological activities like antioxidant, antimicrobial, antihypertensive, immunomodulatory, antithrombotic, anticancer activities, along with nutritional value [7].

In general fish is the major source of various bioactive substances like antioxidants, Vitamins, polyunsaturated fatty acids, polysaccharides, minerals, enzymes etc. Fish is a rich source of lipids, protein, vitamins and minerals. [15]These important source of substances exert different pharmacological activities, and that can be added in diet for the treatment of various ailments [8].

Sardines (*Sardinella gibbosa)* are small variety of oily fishes that belongs to the family Clupeidea. They are known as pilchard in some areas. They are generally packed in cans and are commonly identified as canned sardines. There are 21 types of fish that can come under the Sardines category. Sardina, sardinops, sardinella and dussumieria are the familiar species of Sardines [9].

The chemical constituents of *Sardinella gibbosa* [10] consists of rich source of vitamins. It contains high concentration of Vitamin-A, D, B_{12}, C, K, E, B_6, thiamine, niacin, pantothenic acid, riboflavin, folate, choline, and betaine. *Sardinella gibbosa* has high

OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences

Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Original Research Article

Evaluation of Sardine Fish Extract Meal on Papain Induced Osteoarthritis in Experimental Rats

S. Ramachandran[1*], K. Shivaram[2], B. S Nagalakshmi[2], T. Manasa[2], M. D Dhanaraju[2]

[1]Professor & Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India

[2]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India

***Corresponding author:** S Ramachandran

| **Received:** 07.04.2019 | **Accepted:** 16.04.2019 | **Published:** 30.04.2019

DOI:10.21276/sjmps.2019.5.4.3

Abstract

Aim: The aim of the present study was to evaluate the effect of sardine (*Sardinella gibbosa)* fish extract on papain induced osteoarthritis in rats. ***Methodology:*** In this study 30 wistar rats were randomly selected and divided into five groups. Group-1 (-ve Control), Group 2 (+ve control), Group 3 (Calcium 75 mg/kg as standard), Group 4 (Sardine extract 30 gms/kg), Group 5 (15 gms/kg sardine extract). Osteoarthritis was induced in the right knees of all the groups of rats except negative control by injecting 0.2 ml (4%) of papain solution with 0.1 ml (0.03M) of cystein as activator. All groups were left for development of osteoarthritis. Rats were sacrificed on day 1, 2, 7, 14, 21 & 28 days of post papain injection. ***Results:*** Estimation of calcium and phosphorus in fish extract was carried out by Atomic absorption spectrophotometer. The percentage inhibition of knee thickness of sardine fish extract and Calcium groups were found to be 68% and 77% respectively. Various haematological parameters like RBC count and Hb, WBC count and ESR were recorded. Parameters like blood glucose, urea, globulin, creatinine, total protein, and albumin were calculated. Histopathological studies of knee joints of rats were also carried out. ***Conclusion:*** *Sardinella gibbosa* fish extract at a dose level of 30 gm/kg p.o., exhibited reduction in osteoarthritis due to the rich source of Ca & selenium and maintained the normal haematological and biochemical parameters in papain induced osteoarthritic rats.

Keywords: Sardinella gibbosa, Sardines, Papain, Osteo arthritis, Selenium.

INTRODUCTION

Osteoarthritis (OA) is a disorder affecting 250 million people worldwide [1-3]. Even though there is a development in the field of OA treatment many people still suffer and we are still in need of efficient treatment [4]. In India Natural compounds are commonly used for the treatment of Osteoarthritis and the World Health Organization (WHO) recommends the international community to use traditional ayurvedic system of medicine in the management of OA [5].

Marine resources give us good number of specific and potent bioactive substances like proteins, enzymes, polyether, fatty acids, polysaccharides and lectins. Proteins that are obtained from marine sources possess unique properties like foaming capacity, gelling nature, film formation and antimicrobial activity [6]. Bioactive peptides generally contain 3–20 amino acid residues and based on their amino acid composition and sequence its activity differs. Some of the reported peptides have different biological activities like antioxidant, antimicrobial, antihypertensive, immunomodulatory, antithrombotic, anticancer activities, along with nutritional value [7].

In general fish is the major source of various bioactive substances like antioxidants, Vitamins, polyunsaturated fatty acids, polysaccharides, minerals, enzymes etc. Fish is a rich source of lipids, protein, vitamins and minerals. [15]These important source of substances exert different pharmacological activities, and that can be added in diet for the treatment of various ailments [8].

Sardines (*Sardinella gibbosa)* are small variety of oily fishes that belongs to the family Clupeidea. They are known as pilchard in some areas. They are generally packed in cans and are commonly identified as canned sardines. There are 21 types of fish that can come under the Sardines category. Sardina, sardinops, sardinella and dussumieria are the familiar species of Sardines [9].

The chemical constituents of *Sardinella gibbosa* [10] consists of rich source of vitamins. It contains high concentration of Vitamin-A, D, B_{12}, C, K, E, B_6, thiamine, niacin, pantothenic acid, riboflavin, folate, choline, and betaine. *Sardinella gibbosa* has high

OPEN ACCESS
Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjmps/

Original Research Article

Evaluation of Sardine Fish Extract Meal on Papain Induced Osteoarthritis in Experimental Rats

S. Ramachandran[1*], K. Shivaram[2], B. S Nagalakshmi[2], T. Manasa[2], M. D Dhanaraju[2]
[1]Professor & Head, Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India
[2]Department of Pharmacology, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh-533296, India

*Corresponding author: S Ramachandran
| Received: 07.04.2019 | Accepted: 16.04.2019 | Published: 30.04.2019
DOI:10.21276/sjmps.2019.5.4.3

Abstract

Aim: The aim of the present study was to evaluate the effect of sardine (*Sardinella gibbosa)* fish extract on papain induced osteoarthritis in rats. ***Methodology:*** In this study 30 wistar rats were randomly selected and divided into five groups. Group-1 (-ve Control), Group 2 (+ve control), Group 3 (Calcium 75 mg/kg as standard), Group 4 (Sardine extract 30 gms/kg), Group 5 (15 gms/kg sardine extract). Osteoarthritis was induced in the right knees of all the groups of rats except negative control by injecting 0.2 ml (4%) of papain solution with 0.1 ml (0.03M) of cystein as activator. All groups were left for development of osteoarthritis. Rats were sacrificed on day 1, 2, 7, 14, 21 & 28 days of post papain injection. ***Results:*** Estimation of calcium and phosphorus in fish extract was carried out by Atomic absorption spectrophotometer. The percentage inhibition of knee thickness of sardine fish extract and Calcium groups were found to be 68% and 77% respectively. Various haematological parameters like RBC count and Hb, WBC count and ESR were recorded. Parameters like blood glucose, urea, globulin, creatinine, total protein, and albumin were calculated. Histopathological studies of knee joints of rats were also carried out. ***Conclusion:*** *Sardinella gibbosa* fish extract at a dose level of 30 gm/kg p.o., exhibited reduction in osteoarthritis due to the rich source of Ca & selenium and maintained the normal haematological and biochemical parameters in papain induced osteoarthritic rats.

Keywords: Sardinella gibbosa, Sardines, Papain, Osteo arthritis, Selenium.

INTRODUCTION

Osteoarthritis (OA) is a disorder affecting 250 million people worldwide [1-3]. Even though there is a development in the field of OA treatment many people still suffer and we are still in need of efficient treatment [4]. In India Natural compounds are commonly used for the treatment of Osteoarthritis and the World Health Organization (WHO) recommends the international community to use traditional ayurvedic system of medicine in the management of OA [5].

Marine resources give us good number of specific and potent bioactive substances like proteins, enzymes, polyether, fatty acids, polysaccharides and lectins. Proteins that are obtained from marine sources possess unique properties like foaming capacity, gelling nature, film formation and antimicrobial activity [6]. Bioactive peptides generally contain 3–20 amino acid residues and based on their amino acid composition and sequence its activity differs. Some of the reported peptides have different biological activities like antioxidant, antimicrobial, antihypertensive, immunomodulatory, antithrombotic, anticancer activities, along with nutritional value [7].

In general fish is the major source of various bioactive substances like antioxidants, Vitamins, polyunsaturated fatty acids, polysaccharides, minerals, enzymes etc. Fish is a rich source of lipids, protein, vitamins and minerals. [15]These important source of substances exert different pharmacological activities, and that can be added in diet for the treatment of various ailments [8].

Sardines (*Sardinella gibbosa)* are small variety of oily fishes that belongs to the family Clupeidea. They are known as pilchard in some areas. They are generally packed in cans and are commonly identified as canned sardines. There are 21 types of fish that can come under the Sardines category. Sardina, sardinops, sardinella and dussumieria are the familiar species of Sardines [9].

The chemical constituents of *Sardinella gibbosa* [10] consists of rich source of vitamins. It contains high concentration of Vitamin-A, D, B_{12}, C, K, E, B_6, thiamine, niacin, pantothenic acid, riboflavin, folate, choline, and betaine. *Sardinella gibbosa* has high

The Pharma Innovation Journal 2019; 8(7): 61-67

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2019; 8(7): 61-67

www.thepharmajournal.com
Received: 05-05-2019
Accepted: 10-06-2019

R Vijayalakshmi
GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India

VSH Naveena
GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India

K Rajasekhar
GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India

A Aishwarya Maithili
GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India

Correspondence
R Vijayalakshmi
GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India

Method development and validation of Prevpac combination therapy drugs in spiked human plasma, Deplin and Spasmonal in pharmaceutical dosage forms by Rp-hplc methods

R Vijayalakshmi, VSH Naveena, K Rajasekhar and A Aishwarya Maithili

Abstract
The intention of the present work is to develop simple, precise and accurate RP-HPLC methods for the estimation of Prevpac combination therapy drugs (30 mg capsules of lansoprazole; LAN, 500 mg capsules of amoxicillin; AMX and 500 mg tablets of clarithromycin; CLM) in spiked human plasma, Method A; Deplin tablets (15 mg levomefolate calcium; LMF) in pharmaceutical formulation, Method B and Spasmonal (60 mg capsules of alverine citrate; ALV) in marketed formulation, Method C. Prevpac combination therapy is employed to treat ulcer effectively, since the dosages being given separately, there is need to study the protein binding of these drugs in plasma to estimate their absorbance in plasma. The effective chromatographic separation was accomplished on phenomenex C18 (250 x 4.6 mm, 5 µm particle size) column for all the methods. The methods were optimized by isocratic elution of mobile phase constituting Acetonitrile and phosphate buffer (pH 6) in the ratio of 70:30 set at a flow rate of 0.6 mL/min monitored at 227 nm for Method A, methanol : acetate buffer (pH4.4) in a ratio of 80:20 %v/v and studied at 290 nm, Acetonitrile: Buffer pH (5) in the ratio of 80:20, %v/v for method B and Acetonitrile: Buffer pH (5) in the ratio of 80:20, %v/v and monitored at 215 nm for Method C, respectively. The liquid chromatography methods were extensively validated and all the parameters were within the acceptance criteria with correlation of 0.999, retention time less than 6 min and percentage RSD less than 2 for all the three methods. The methods were proved to be more accurate, simple, precise and rapid by statistical validation, recovery studies.

Keywords: Amoxicillin (AMX), Lansopraxole (LAN), Clarithromycin (CLM), Levomefolate calcium (LMF), Alverine citrate (ALV), Method A/B/C

Introduction
Pharmaceutical combination therapy is multiple therapies employed to treat a *single* disease achieved by prescribing/administering separate drugs, or dosage forms that contain more than one active ingredient. PREVPAC combination therapy comprise 500 mg capsules of AMX, 30 mg capsules of LAN and 500 mg tablets of CLM, employed to treat ulcer effectively. AMX is moderate-spectrum, bacteriolytic, β-lactam antibiotic used to treat bacterial infections caused by susceptible microorganisms. Lansoprazole, proton-pump inhibitor (PPI) which inhibits the stomach's production of gastric acids while Clarithromycin is used in the treatment of bacterial infections caused in middle ear. Deplin tablets constitute L-Methylfolate, Levomefolate calcium are prescribed treat low folate levels whereas Spasmonal capsules are administered as antispasmodic and an adrenergic-β3 receptor agonist.
Literature survey revealed that there were few LC methods for the estimation AMX [1-14], LAN [15-19] and CLM [20, 21] individually and in combination with other drugs but no method has been far developed for the estimation of these three drugs; no analytical methods has been developed for estimation of LMF while few LC/MS and colorimetric methods have been reported for the estimation of ALV [22, 23].
Since the Prevpac combination therapy drugs are administered separately as different dosage forms by oral route, there is necessity to study the additive effect of the drugs by studying protein binding and absorbance of these drugs in plasma. Deplin tablets and Spasmonal capsules being newer pharmaceutical agents, call for the newer method development is indeed. The resolution of the present work is to develop simple, precise, accurate and economical RP-HPLC methods for the estimation of Prevpac combination therapy drugs in spiked human plasma; Deplin and Spasmonal in pharmaceutical formulations and to validate the method according with ICH guidelines.

Original Article

Chemical Composition, Antioxidant, and Cytotoxic Potential of *Nannochloropsis* Species Extracts

Princely Ebenezer Gnanakani[1], Perumal Santhanam[2], Kilari Eswar Kumar[3], Magharla Dasaratha Dhanaraju[1,4]

[1]Department of Pharmaceutical Biotechnology, Research Scholar, JNTUK, [3]Department of Pharmacology, AU College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam, [4]Department of Pharmaceutics, Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, [2]Department of Marine Science, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

Abstract

Context: Screening of natural biomolecules from microalgae. **Background:** The microalgae were recognized for their biological and pharmacological importance of active natural products with high antioxidant and antiproliferative profile. In the preliminary screening, three species *Nannochloropsis* sp. (NC) (green algae), *Amphora* sp. (diatom), and *Nostoc* sp. (blue-green algae) were tested and *Nannochloropsis* was selected based on their scavenging properties. **Objective:** The objective of the study is to explore the biological information of microalgal species where the clinical investigation is still quite limited. **Materials and Methods:** The phytochemical screening of selected NC. primarily comprises saponins, terpenoids, flavonoids, and phenols which were confirmed by high-performance thin-layer chromatography, Fourier transform infrared, and gas chromatography–mass spectra analysis. **Results:** The ethyl acetate extract *Nannochloropsis* hexane (EAENH) fraction showed 40.61 mg GAE/g, 68.77 mg QE/g, 5.73 mg/g, and 57.38 mg CHL/g for total phenolic, flavonoid, carotenoid, and sterol content, respectively. Moreover, antioxidant activities were evaluated for the extract showing high flavonoid and phenolic contents after partial purification with hexane. The half inhibitory concentration (IC_{50}) values for EAENH was found to be 13.9, 21.22, and 14.58 µg/mL for 1,1-diphenyl-2-picrylhydrazyl radical, hydrogen peroxide, and reducing power assays, respectively. The antiproliferative activity of EAENH on human non-small lung cancer cell line (A549) IC_{50} value was 175 µg/mL using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay. **Conclusion:** The present study confirmed that the bioactive components present in the EAENH were accountable for excellent antioxidant and cytotoxic properties.

Keywords: Antioxidant, cytotoxic, gas chromatography–mass spectra, high-performance thin-layer chromatography, *Nannochloropsis*

Introduction

Microalgae are photosynthetic eukaryotes which comprise prime elements of freshwater and marine phytoplankton. They primarily act as a food source for other marine organisms and an excellent source of lipids, pigments, carotenoids, omega-3-fatty acids, and surplus biochemical.[1] In living schemes beneath stress conditions, the excessive generation of hydroxyl (OH) and alternative extremely reactive oxygen species (ROS) generates oxidative injury through the several biomolecules with ROS as well as DNA.[2] Very few studies were undergone to explore the quantification and documentation of antioxidant compounds of microalgae even though more antioxidant profile in microalgae have been affected[3] including the impact of phenolic in microalgae resistance systems opposing ROS accumulation.[4]

Access this article online

Quick Response Code:

Website: www.jnsbm.org

DOI: 10.4103/jnsbm.JNSBM_208_18

Carotenoids are the principal antioxidant compounds from microalgae. They can be divided into two groups: carotenes and xanthophylls. Acetylenic and allenic carotenoids, such as fucoxanthin, neoxanthin, and violaxanthin correspondingly,[5] are vastly epitomized in red and green algae, and thirty various carotenoids as a minimum had been recognized in this class.[6] It has been stated that carotenoids have diverse biological properties such as antioxidant, anti-inflammatory, antiproliferative, antiatherogenic, and chemotherapeutic agent to treat several types of cancer such as stomach, lung, liver, breast, colon, and prostate.

Address for correspondence: Dr. Magharla Dasaratha Dhanaraju, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry - 533 296, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

How to cite this article: Gnanakani PE, Santhanam P, Kumar KE, Dhanaraju MD. Chemical composition, antioxidant, and cytotoxic potential of *Nannochloropsis* species extracts. J Nat Sc Biol Med 2019;10:167-77.

Chemical Composition, Antioxidant, and Cytotoxic Potential of *Nannochloropsis* Species Extracts

Princely Ebenezer Gnanakani[1], Perumal Santhanam[2], Kilari Eswar Kumar[3], Magharla Dasaratha Dhanaraju[1,4]

[1]Department of Pharmaceutical Biotechnology, Research Scholar, JNTUK, [3]Department of Pharmacology, AU College of Pharmaceutical Sciences, Andhra University, Vishakhapatnam, [4]Department of Pharmaceutics, Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, [2]Department of Marine Science, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

Abstract

Context: Screening of natural biomolecules from microalgae. **Background:** The microalgae were recognized for their biological and pharmacological importance of active natural products with high antioxidant and antiproliferative profile. In the preliminary screening, three species *Nannochloropsis* sp. (NC) (green algae), *Amphora* sp. (diatom), and *Nostoc* sp. (blue-green algae) were tested and *Nannochloropsis* was selected based on their scavenging properties. **Objective:** The objective of the study is to explore the biological information of microalgal species where the clinical investigation is still quite limited. **Materials and Methods:** The phytochemical screening of selected NC. primarily comprises saponins, terpenoids, flavonoids, and phenols which were confirmed by high-performance thin-layer chromatography, Fourier transform infrared, and gas chromatography–mass spectra analysis. **Results:** The ethyl acetate extract *Nannochloropsis* hexane (EAENH) fraction showed 40.61 mg GAE/g, 68.77 mg QE/g, 5.73 mg/g, and 57.38 mg CHL/g for total phenolic, flavonoid, carotenoid, and sterol content, respectively. Moreover, antioxidant activities were evaluated for the extract showing high flavonoid and phenolic contents after partial purification with hexane. The half inhibitory concentration (IC_{50}) values for EAENH was found to be 13.9, 21.22, and 14.58 µg/mL for 1,1-diphenyl-2-picrylhydrazyl radical, hydrogen peroxide, and reducing power assays, respectively. The antiproliferative activity of EAENH on human non-small lung cancer cell line (A549) IC_{50} value was 175 µg/mL using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay. **Conclusion:** The present study confirmed that the bioactive components present in the EAENH were accountable for excellent antioxidant and cytotoxic properties.

Keywords: Antioxidant, cytotoxic, gas chromatography–mass spectra, high-performance thin-layer chromatography, *Nannochloropsis*

Introduction

Microalgae are photosynthetic eukaryotes which comprise prime elements of freshwater and marine phytoplankton. They primarily act as a food source for other marine organisms and an excellent source of lipids, pigments, carotenoids, omega-3-fatty acids, and surplus biochemical.[1] In living schemes beneath stress conditions, the excessive generation of hydroxyl (OH) and alternative extremely reactive oxygen species (ROS) generates oxidative injury through the several biomolecules with ROS as well as DNA.[2] Very few studies were undergone to explore the quantification and documentation of antioxidant compounds of microalgae even though more antioxidant profile in microalgae have been affected[3] including the impact of phenolic in microalgae resistance systems opposing ROS accumulation.[4]

Carotenoids are the principal antioxidant compounds from microalgae. They can be divided into two groups: carotenes and xanthophylls. Acetylenic and allenic carotenoids, such as fucoxanthin, neoxanthin, and violaxanthin correspondingly,[5] are vastly epitomized in red and green algae, and thirty various carotenoids as a minimum had been recognized in this class.[6] It has been stated that carotenoids have diverse biological properties such as antioxidant, anti-inflammatory, antiproliferative, antiatherogenic, and chemotherapeutic agent to treat several types of cancer such as stomach, lung, liver, breast, colon, and prostate.

Address for correspondence: Dr. Magharla Dasaratha Dhanaraju, GIET School of Pharmacy, NH-I6 Chaitanya Knowledge City, Rajahmundry - 533 296, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online

Quick Response Code:

Website: www.jnsbm.org

DOI: 10.4103/jnsbm.JNSBM_208_18

How to cite this article: Gnanakani PE, Santhanam P, Kumar KE, Dhanaraju MD. Chemical composition, antioxidant, and cytotoxic potential of *Nannochloropsis* species extracts. J Nat Sc Biol Med 2019;10:167-77.

Available online on 15.05.2019 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Research Article

Optimization and Characterization Ezogabine-Loaded Nanosuspension for Enhancement of Bioavailability by "Bottom-Up" Technology Using 3^2 Factorial Design

S Revathi*, MD Dhanaraju

GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

Ezogabine, an antiepileptic drug used for treating partial epilepsies. It is poorly soluble in water. The dose ranges from 50 mg to 400 mg and the oral bioavailability is 60%. The aim of this research work was to formulate and characterize nanosuspensions of ezogabine with an intention to enhance the oral bioavailability using 3^2 factorial design. Nanosuspensions were prepared by the "bottom-up" nanoprecipitation method using 3^2 factorial design and evaluation for particle size, saturation solubility, zeta potential, entrapment efficiency, and in-vitro drug release was done. The FTIR was used to confirm compatibility and to rule out any possible interactions between drug and carriers. The optimal nanosuspension was obtained with particle size of 510.4 nm, saturation solubility of 557 µg/ml, zeta potential of - 4.49 mV, entrapment efficiency of 96.82%, and in-vitro drug release of 100.14%. Also, the optimal formulation was found to be stable in the accelerated conditions. Data of nanosuspensions were fit in to different equations and kinetic models and found to exhibit first order release kinetics with class II transport mechanism of diffusion. The scanning electron microscopy studies showed elongated nanoparticles with porous surface. The "Bottom up" method can be successfully employed to produce ezogabine nanosuspensions achieving reduced particle size and enhancing dissolution rate by increasing the saturation solubility and remained stable at 25 °C.

Keywords: Nanosuspension, saturation solubility, bottom up.

Article Info: Received 22 March 2019; Review Completed 04 May 2019; Accepted 06 May 2019; Available online 15 May 2019

Cite this article as:

Revathi S, Dhanaraju MD, Optimization and Characterization Ezogabine-Loaded Nanosuspension for Enhancement of Bioavailability by "Bottom-Up" Technology Using 3^2 Factorial Design, Journal of Drug Delivery and Therapeutics. 2019; 9(3):227-237 http://dx.doi.org/10.22270/jddt.v9i3.2860

***Address for Correspondence:**

S Revathi, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

INTRODUCTION

Among the total populace, the most predominant of the unfeigned neurological unhinge is epilepsy which is most feigning about 0.5 to 1%. A seizure is a clinical denotation, ensuing about because of a remit sequence of unnatural extravagant or synchronous neuronal movement in the brain. Epilepsy is a brain unhinge described by an inveterate sensitivity to create epileptic seizures with optional neurobiological, intellectual, mental, and social outcomes.

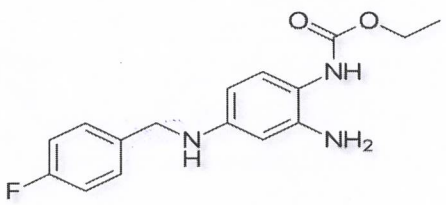


Fig. 1: Chemical structure of Ezogabine

Patients with epilepsy are at an expanded danger of untimely demise with a mortality danger of 1.2 to 9.3 of all reasons for demise and a 24% long term casualty rate [1,2]

Ezogabine deeds as a neuronal KCNQ/Kv7 potassium channel opener. It is an antiepileptic drug practised for the intervention of partial epilepsies. Its primary mechanism of action as a positive allosteric modulator of KCNQ2-5 ion channels defines ezogabine as the first neuronal potassium channel opener for the treatment of epilepsy. KCNQ2-5 channels are predominantly expressed in neurons and are important determinants of cellular excitability, as indicated by the occurrence of human genetic mutations in KCNQ channels that underlie inheritable disorders including, in the case of KCNQ2/3, the syndrome of benign familial neonatal convulsions. At present commercialized potassium channel opener is established completely in oral dosage frame. Be that as it may, elective and specifically, intranasal route may give more benefits when compared to oral route. The fallouts of oral route of potassium channel opener admits gastrointestinal disorderlinesses, urinary perturbs etc. [3] Intranasal route conveyance is debated as a feasible and captivating route for versatile drugs. [4]

Common methodology for solvability melioration is micronization of medication. The process of micronization expands the dissolution rate the medication because of surface area expansion, however it does not alter the

Available online on 15.05.2019 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access

Research Article

Optimization and Characterization Ezogabine-Loaded Nanosuspension for Enhancement of Bioavailability by "Bottom-Up" Technology Using 3^2 Factorial Design

S Revathi*, MD Dhanaraju

GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

Ezogabine, an antiepileptic drug used for treating partial epilepsies. It is poorly soluble in water. The dose ranges from 50 mg to 400 mg and the oral bioavailability is 60%. The aim of this research work was to formulate and characterize nanosuspensions of ezogabine with an intention to enhance the oral bioavailability using 3^2 factorial design. Nanosuspensions were prepared by the "bottom-up" nanoprecipitation method using 3^2 factorial design and evaluation for particle size, saturation solubility, zeta potential, entrapment efficiency, and in-vitro drug release was done. The FTIR was used to confirm compatibility and to rule out any possible interactions between drug and carriers. The optimal nanosuspension was obtained with particle size of 510.4 nm, saturation solubility of 557 µg/ml, zeta potential of - 4.49 mV, entrapment efficiency of 96.82%, and in-vitro drug release of 100.14%. Also, the optimal formulation was found to be stable in the accelerated conditions. Data of nanosuspensions were fit in to different equations and kinetic models and found to exhibit first order release kinetics with class II transport mechanism of diffusion. The scanning electron microscopy studies showed elongated nanoparticles with porous surface. The "Bottom up" method can be successfully employed to produce ezogabine nanosuspensions achieving reduced particle size and enhancing dissolution rate by increasing the saturation solubility and remained stable at 25 °C.

Keywords: Nanosuspension, saturation solubility, bottom up.

Article Info: Received 22 March 2019; Review Completed 04 May 2019; Accepted 06 May 2019; Available online 15 May 2019

Cite this article as:

Revathi S, Dhanaraju MD, Optimization and Characterization Ezogabine-Loaded Nanosuspension for Enhancement of Bioavailability by "Bottom-Up" Technology Using 3^2 Factorial Design, Journal of Drug Delivery and Therapeutics. 2019; 9(3):227-237 http://dx.doi.org/10.22270/jddt.v9i3.2860

***Address for Correspondence:**

S Revathi, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

INTRODUCTION

Among the total populace, the most predominant of the unfeigned neurological unhinge is epilepsy which is most feigning about 0.5 to 1%. A seizure is a clinical denotation, ensuing about because of a remit sequence of unnatural extravagant or synchronous neuronal movement in the brain. Epilepsy is a brain unhinge described by an inveterate sensitivity to create epileptic seizures with optional neurobiological, intellectual, mental, and social outcomes.

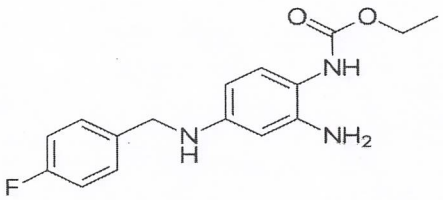


Fig. 1: Chemical structure of Ezogabine

Patients with epilepsy are at an expanded danger of untimely demise with a mortality danger of 1.2 to 9.3 of all reasons for demise and a 24% long term casualty rate. [1, 2]

Ezogabine deeds as a neuronal KCNQ/Kv7 potassium channel opener. It is an antiepileptic drug practised for the intervention of partial epilepsies. Its primary mechanism of action as a positive allosteric modulator of KCNQ2-5 ion channels defines ezogabine as the first neuronal potassium channel opener for the treatment of epilepsy. KCNQ2-5 channels are predominantly expressed in neurons and are important determinants of cellular excitability, as indicated by the occurrence of human genetic mutations in KCNQ channels that underlie inheritable disorders including, in the case of KCNQ2/3, the syndrome of benign familial neonatal convulsions. At present commercialized potassium channel opener is established completely in oral dosage frame. Be that as it may, elective and specifically, intranasal route may give more benefits when compared to oral route. The fallouts of oral route of potassium channel opener admits gastrointestinal disorderlinesses, urinary perturbs etc. [3] Intranasal route conveyance is debated as a feasible and captivating route for versatile drugs. [4]

Common methodology for solvability melioration is micronization of medication. The process of micronization expands the dissolution rate the medication because of surface area expansion however it does not alter the

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2019) 8:7
https://doi.org/10.1186/s43088-019-0007-y

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Effect of novel phenothiazine derivatives on brain dopamine in Wistar rats

Chandravadivelu Gopi[1], Vedula Girija Sastry[2] and Magharla Dasaratha Dhanaraju[1*]

Abstract

Background: Neurotransmitters are involved in several functions in the brain and the body of living things. Changes in the level of neurotransmitters in the brain are associated with several illnesses. Some of the drugs are controlling the neurotransmitter by adjusting the level in the brain and are exclusively used in the treatment of psychological disorders. The purpose of the study was to find out the effect of novel synthesised phenothiazine derivatives (GC1, GC2 and GC8) either alone (7.5 mg/kg or 15 mg/kg, oral) or in combination with amphetamine on the experimental animals.

Results: Dopamine level in rat brain was estimated by a spectroscopic method using the UV-visible double beam spectrophotometer at 735 nm. The results revealed that these derivatives blocked the brain dopamine level significantly. The compound GC8 (15 mg/kg) significantly reduced the level of dopamine (0.151 ± 0.04, 0.284 ± 0.03) as similar to that of a standard drug. Furthermore, compounds GC2 (15 mg/kg) and GC1 (15 mg/kg) exhibited a varying level of dopamine inhibition level and have been found at 0.203 ± 0.06 μg/ml, 0.302 ± 0.04 μg/ml, 0.234 ± 0.02 μg/ml and 0.318 ± 0.07 μg/ml, respectively, after the administration of these derivatives either alone or in combination with amphetamine.

Conclusions: The study revealed that the compound 2-amino-6-(3-hydroxy-4-methyl phenyl) pyrimidine-4-yl) (7-chloro-10-(3- (N, N-dimethylamino) propyl)-10H-phenothiazine-3-yl) methanone (GC8, 15 mg/kg) extensively reduced the dopamine level. The order of dopamine-inhibiting effect of the selected compound was found to be GC8 > GC2 > GC1. The increased body weight and relative brain-body weight were also observed in the tested animals due to more intake of food and fluid retention.

Keywords: Phenothiazine derivatives, Brain tissue, Homogenisation, UV spectrophotometer

1 Background

Neurotransmitters are endogenous chemicals that enable neurotransmission. These chemical substances are released from the neuron that carries the nerve impulse to other nerve cells in the nervous system. They allow the individual nerve fibres to communicate with each other [4] and involve a major role in shaping the everyday life of living things [34]. Changes in the level of neurotransmitters in the brain are linked to certain psychological illness, such as schizophrenia, psychomotor diseases, neurodegeneration, hallucinations and Parkinson's disease [36]. They are characterised by delusional thought processes, illogical thought patterns, muscle rigidity, tremors, lack of fine motor skill, etc., [27]. People with schizophrenia are at high risk of changes in the level of dopamine, serotonin, and other neurotransmitters [24]. It is a severe mental disorder that affects men with an age group of 16 to 30 years old than women [7]. Although many of the drugs are used to control dopamine, all of them are differing considerably in qualitative and quantitative with phenothiazine derivatives. Even though the parent molecule of phenothiazine has no uses, the derivatives of phenothiazine are employed in different pharmaceutical aids [14]. The research on phenothiazine found countless numbers of phenothiazine derivatives and increased their potency and specificity against different health hazards. A recent study stated that phenothiazine derivatives also exhibited

* Correspondence: mddhanaraju@gmail.com
[1]Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

Gopi et al. Beni-Suef University Journal of Basic and Applied Sciences (2019) 8:7
https://doi.org/10.1186/s43088-019-0007-y

Beni-Suef University Journal of Basic and Applied Sciences

RESEARCH Open Access

Effect of novel phenothiazine derivatives on brain dopamine in Wistar rats

Chandravadivelu Gopi[1], Vedula Girija Sastry[2] and Magharla Dasaratha Dhanaraju[1*]

Abstract

Background: Neurotransmitters are involved in several functions in the brain and the body of living things. Changes in the level of neurotransmitters in the brain are associated with several illnesses. Some of the drugs are controlling the neurotransmitter by adjusting the level in the brain and are exclusively used in the treatment of psychological disorders. The purpose of the study was to find out the effect of novel synthesised phenothiazine derivatives (GC1, GC2 and GC8) either alone (7.5 mg/kg or 15 mg/kg, oral) or in combination with amphetamine on the experimental animals.

Results: Dopamine level in rat brain was estimated by a spectroscopic method using the UV-visible double beam spectrophotometer at 735 nm. The results revealed that these derivatives blocked the brain dopamine level significantly. The compound GC8 (15 mg/kg) significantly reduced the level of dopamine (0.151 ± 0.04, 0.284 ± 0.03) as similar to that of a standard drug. Furthermore, compounds GC2 (15 mg/kg) and GC1 (15 mg/kg) exhibited a varying level of dopamine inhibition level and have been found at 0.203 ± 0.06 μg/ml, 0.302 ± 0.04 μg/ml, 0.234 ± 0.02 μg/ml and 0.318 ± 0.07 μg/ml, respectively, after the administration of these derivatives either alone or in combination with amphetamine.

Conclusions: The study revealed that the compound 2-amino-6-(3-hydroxy-4-methyl phenyl) pyrimidine-4-yl) (7-chloro-10-(3- (N, N-dimethylamino) propyl)-10H-phenothiazine-3-yl) methanone (GC8, 15 mg/kg) extensively reduced the dopamine level. The order of dopamine-inhibiting effect of the selected compound was found to be GC8 > GC2 > GC1. The increased body weight and relative brain-body weight were also observed in the tested animals due to more intake of food and fluid retention.

Keywords: Phenothiazine derivatives, Brain tissue, Homogenisation, UV spectrophotometer

1 Background

Neurotransmitters are endogenous chemicals that enable neurotransmission. These chemical substances are released from the neuron that carries the nerve impulse to other nerve cells in the nervous system. They allow the individual nerve fibres to communicate with each other [4] and involve a major role in shaping the everyday life of living things [34]. Changes in the level of neurotransmitters in the brain are linked to certain psychological illness, such as schizophrenia, psychomotor diseases, neurodegeneration, hallucinations and Parkinson's disease [36]. They are characterised by delusional thought processes, illogical thought patterns, muscle rigidity, tremors, lack of fine motor skill, etc., [27]. People with schizophrenia are at high risk of changes in the level of dopamine, serotonin, and other neurotransmitters [24]. It is a severe mental disorder that affects men with an age group of 16 to 30 years old than women [7]. Although many of the drugs are used to control dopamine, all of them are differing considerably in qualitative and quantitative with phenothiazine derivatives. Even though the parent molecule of phenothiazine has no uses, the derivatives of phenothiazine are employed in different pharmaceutical aids [14]. The research on phenothiazine found countless numbers of phenothiazine derivatives and increased their potency and specificity against different health hazards. A recent study stated that phenothiazine derivatives also exhibited

* Correspondence: mddhanaraju@gmail.com
[1]Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
Full list of author information is available at the end of the article

ISSN 2079-9780, Review Journal of Chemistry, 2019, Vol. 9, No. 4, pp. 255–289. © Pleiades Publishing, Ltd., 2019

A Recent Progress in Microwave-assisted Synthesis of Heterocyclic Compounds Containing Nitrogen, Sulphur and Oxygen

Chandravadivelu Gopi[a,*], **Gudapati Krupamai**[a,**], and **Magharla Dasaratha Dhanaraju**[a,***]

[a]*GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296 India*

**e-mail: gopi@giet.ac.in*

***e-mail: g.krupamai@gmail.com*

****e-mail: mddhanaraju@yahoo.com*

Received April 8, 2019; revised May 1, 2019; accepted July 2, 2019

Abstract—Synthesis of heterocyclic compounds has constituted a major part of research in medicinal chemistry. In the last two decades, many of the heterocyclic rings were prepared with appreciable yield by using microwave-assisted synthesis. These rings are central core in a heterocyclic compound that offers different pharmacological activities to the needy. In recent times, the majority of the heterocyclic compounds are synthesized by researchers using this technique and satisfied with the quality and quantity of the product obtained from the respective raw materials. But, there is no review concerning about recent preparation of heterocyclic compounds using microwave-assisted synthesis. In the presented study, an attempt had been made to found out the newer heterocyclic compounds using microwave-assisted synthesis and their biological activities. This review emphasizes the two decades of research work on the preparation of heterocyclic compounds by using microwave-assisted synthesis.

Keywords: Microwave assisted synthesis, heterocyclic compounds, heterocyclic ring synthesis, triazoles, pyrazoles

DOI: 10.1134/S2079978019040034

CONTENTS

INTRODUCTION

In the earlier days, most of the reactions had been conducted in the traditional way by using oil, sand and water bath etc., which provides a slow rate of reaction, fluctuation of heat at high temperature, less yield, least purity and highly selectivity [1–3]. It leads to decomposition of substrate, reagent and product while processing [4, 5]. Therefore, most of the scientists were looking into the alternative system of traditional heating and finally found a microwave irradiation technique [6]. This technique has been used in many of the inorganic, organic reactions that have been proved as a better replacement for thermal energy in the last four decades. It is considered as unconventional energy since in the late 1970s to conduct the inorganic reactions, whereas in organic chemistry had been employed since the mid of 1980s [7]. It is a one of the dynamic green chemistry technique has been used frequently in the different fields including pharmaceuticals for the generation of novel compounds [8]. The benefits of this method are easy handling, rapid and solvent-free synthesis, uniformity of heating process, generates the less hazardous sub-

ISSN 2079-9780, Review Journal of Chemistry, 2019, Vol. 9, No. 4, pp. 255–289. © Pleiades Publishing, Ltd., 2019

A Recent Progress in Microwave-assisted Synthesis of Heterocyclic Compounds Containing Nitrogen, Sulphur and Oxygen

Chandravadivelu Gopi[a],*, Gudapati Krupamai[a],, and Magharla Dasaratha Dhanaraju[a],*****

[a]*GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296 India*

**e-mail: gopi@giet.ac.in*

***e-mail: g.krupamai@gmail.com*

****e-mail: mddhanaraju@yahoo.com*

Received April 8, 2019; revised May 1, 2019; accepted July 2, 2019

Abstract—Synthesis of heterocyclic compounds has constituted a major part of research in medicinal chemistry. In the last two decades, many of the heterocyclic rings were prepared with appreciable yield by using microwave-assisted synthesis. These rings are central core in a heterocyclic compound that offers different pharmacological activities to the needy. In recent times, the majority of the heterocyclic compounds are synthesized by researchers using this technique and satisfied with the quality and quantity of the product obtained from the respective raw materials. But, there is no review concerning about recent preparation of heterocyclic compounds using microwave-assisted synthesis. In the presented study, an attempt had been made to found out the newer heterocyclic compounds using microwave-assisted synthesis and their biological activities. This review emphasizes the two decades of research work on the preparation of heterocyclic compounds by using microwave-assisted synthesis.

Keywords: Microwave assisted synthesis, heterocyclic compounds, heterocyclic ring synthesis, triazoles, pyrazoles

DOI: 10.1134/S2079978019040034

CONTENTS

INTRODUCTION

In the earlier days, most of the reactions had been conducted in the traditional way by using oil, sand and water bath etc., which provides a slow rate of reaction, fluctuation of heat at high temperature, less yield, least purity and highly selectivity [1–3]. It leads to decomposition of substrate, reagent and product while processing [4, 5]. Therefore, most of the scientists were looking into the alternative system of traditional heating and finally found a microwave irradiation technique [6]. This technique has been used in many of the inorganic, organic reactions that have been proved as a better replacement for thermal energy in the last four decades. It is considered as unconventional energy since in the late 1970s to conduct the inorganic reactions, whereas in organic chemistry had been employed since the mid of 1980s [7]. It is a one of the dynamic green chemistry technique has been used frequently in the different fields including pharmaceuticals for the generation of novel compounds [8]. The benefits of this method are easy handling, rapid and solvent-free synthesis, uniformity of heating process, generates the less hazardous sub-

ISSN 2079-9780, Review Journal of Chemistry, 2019, Vol. 9, No. 4, pp. 255–289. © Pleiades Publishing, Ltd., 2019

A Recent Progress in Microwave-assisted Synthesis of Heterocyclic Compounds Containing Nitrogen, Sulphur and Oxygen

Chandravadivelu Gopi[a],*, Gudapati Krupamai[a],, and Magharla Dasaratha Dhanaraju[a],*****

[a]*GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296 India*

**e-mail: gopi@giet.ac.in*

***e-mail: g.krupamai@gmail.com*

****e-mail: mddhanaraju@yahoo.com*

Received April 8, 2019; revised May 1, 2019; accepted July 2, 2019

Abstract—Synthesis of heterocyclic compounds has constituted a major part of research in medicinal chemistry. In the last two decades, many of the heterocyclic rings were prepared with appreciable yield by using microwave-assisted synthesis. These rings are central core in a heterocyclic compound that offers different pharmacological activities to the needy. In recent times, the majority of the heterocyclic compounds are synthesized by researchers using this technique and satisfied with the quality and quantity of the product obtained from the respective raw materials. But, there is no review concerning about recent preparation of heterocyclic compounds using microwave-assisted synthesis. In the presented study, an attempt had been made to found out the newer heterocyclic compounds using microwave-assisted synthesis and their biological activities. This review emphasizes the two decades of research work on the preparation of heterocyclic compounds by using microwave-assisted synthesis.

Keywords: Microwave assisted synthesis, heterocyclic compounds, heterocyclic ring synthesis, triazoles, pyrazoles

DOI: 10.1134/S2079978019040034

CONTENTS

INTRODUCTION

In the earlier days, most of the reactions had been conducted in the traditional way by using oil, sand and water bath etc., which provides a slow rate of reaction, fluctuation of heat at high temperature, less yield, least purity and highly selectivity [1–3]. It leads to decomposition of substrate, reagent and product while processing [4, 5]. Therefore, most of the scientists were looking into the alternative system of traditional heating and finally found a microwave irradiation technique [6]. This technique has been used in many of the inorganic, organic reactions that have been proved as a better replacement for thermal energy in the last four decades. It is considered as unconventional energy since in the late 1970s to conduct the inorganic reactions, whereas in organic chemistry had been employed since the mid of 1980s [7]. It is a one of the dynamic green chemistry technique has been used frequently in the different fields including pharmaceuticals for the generation of novel compounds [8]. The benefits of this method are easy handling, rapid and solvent-free synthesis, uniformity of heating process, generates the less hazardous sub-

ISSN 2079-9780, Review Journal of Chemistry, 2019, Vol. 9, No. 2, pp. 95–126. © Pleiades Publishing, Ltd., 2019

2018-2019

Recent Progress in Synthesis, Structure and Biological Activities of Phenothiazine Derivatives[1]

Chandravadivelu Gopi[a,b] and Magharla Dasaratha Dhanaraju[a,*]

[a] *GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296 India*

[b] *School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, 533003 India*

**e-mail: mddhanaraju@yahoo.com*

Received November 9, 2017; revised July 11, 2018; accepted July 11, 2018

Abstract—The phenothiazine nucleus is one of the most important and trusted heterocyclic ring, which is commonly found in natural products and medicinal agents. It was discovered during the 1940s, since many scientists were found various newer derivatives and established their biological activities. The recently developed phenothiazine derivatives were exhibiting significant activities such as tranquillizer, antibacterial, antiparkinsonian, antifungal, anticancer, antiviral, anti-inflammatory, antihistaminic, anti-malarial, anti-filarial, trypanocidal, anticonvulsant, analgesic, immunosuppressive and multidrug resistance reversal properties. In the presented study, an attempt had been made to systematize the recent research finding of many newer phenothiazine derivatives including method of synthesis, structure and evaluated in vitro and in vivo promising biological activities and pharmacological properties. This review emphasises the two decades of research work on newer synthesis, structure and biological activities of different phenothiazine derivatives.

Keywords: phenothiazines, synthesis, biological activities, anti-microbial agent, anti-tumor activity, anti-oxidants, enzymes inhibitors

DOI: 10.1134/S2079978019020018

CONTENTS

1. INTRODUCTION

In last two decades a considerable amount of interest has been paid towards the synthesis of nitrogen and sulphur-based heterocyclic compounds. To our knowledge, phenothiazine and its derivatives is one of the largest classes of tricyclic thiazine compound constituted with nitrogen and sulphur heteroatom and have been widely used in medicinal chemistry [1]. The first phenothiazine compound, 10*H*-dibenzo-1,4-thiazine has synthesised by Berntsen. Up till now so many compounds were prepared and are extensively used as a building block for the synthesis of different therapeutic agents. Over 5 thousand compounds have been prepared; nearly 100 compounds are in clinical practice. The phenothiazine derivatives were pre-

[1] The article is published in the original.

ISSN 2079-9780, Review Journal of Chemistry, 2019, Vol. 9, No. 2, pp. 95–126. © Pleiades Publishing, Ltd., 2019

Recent Progress in Synthesis, Structure and Biological Activities of Phenothiazine Derivatives[1]

Chandravadivelu Gopi[a,b] and Magharla Dasaratha Dhanaraju[a,*]

[a] *GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296 India*

[b] *School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, 533003 India*

**e-mail: mddhanaraju@yahoo.com*

Received November 9, 2017; revised July 11, 2018; accepted July 11, 2018

Abstract—The phenothiazine nucleus is one of the most important and trusted heterocyclic ring, which is commonly found in natural products and medicinal agents. It was discovered during the 1940s, since many scientists were found various newer derivatives and established their biological activities. The recently developed phenothiazine derivatives were exhibiting significant activities such as tranquillizer, antibacterial, antiparkinsonian, antifungal, anticancer, antiviral, anti-inflammatory, antihistaminic, anti-malarial, anti-filarial, trypanocidal, anticonvulsant, analgesic, immunosuppressive and multidrug resistance reversal properties. In the presented study, an attempt had been made to systematize the recent research finding of many newer phenothiazine derivatives including method of synthesis, structure and evaluated in vitro and in vivo promising biological activities and pharmacological properties. This review emphasises the two decades of research work on newer synthesis, structure and biological activities of different phenothiazine derivatives.

Keywords: phenothiazines, synthesis, biological activities, anti-microbial agent, anti-tumor activity, anti-oxidants, enzymes inhibitors

DOI: 10.1134/S2079978019020018

CONTENTS

1. INTRODUCTION

In last two decades a considerable amount of interest has been paid towards the synthesis of nitrogen and sulphur-based heterocyclic compounds. To our knowledge, phenothiazine and its derivatives is one of the largest classes of tricyclic thiazine compound constituted with nitrogen and sulphur heteroatom and have been widely used in medicinal chemistry [1]. The first phenothiazine compound, 10*H*-dibenzo-1,4-thiazine has synthesised by Berntsen. Up till now so many compounds were prepared and are extensively used as a building block for the synthesis of different therapeutic agents. Over 5 thousand compounds have been prepared; nearly 100 compounds are in clinical practice. The phenothiazine derivatives were pre-

[1] The article is published in the original.

18-19

Research Article

Application of Condensation technique for the estimation of Darunavir and Efavirenz in pure and tablet formulations

[1]R.VIJAYALAKSHMI*, [1]D. ANJANI, [1]M.D. DHANARAJU

*[1]Department of Pharmaceutical Analysis, GIET School of Pharmacy, NH-16 Chaitanaya Knowledge City, Rajahmahendravaram- 533296.Andhra Pradesh Email id: vijayalakshmigsp@gmail.com

(m) : +919492083483

Received: 13.04.18, Revised: 13.05.18, Accepted: 13.06.18

ABSTRACT

This proposed work describes two simple and fast visible spectrophotometric methods for the estimation of Darunavir with O-nitro benzaldehyde and Efavirenz with vanillin by the condensation process.Both the methods were developed on Perkin Elmer LAMBDA 25 UV –VIS spectrophotometer interfaced with UV Win lab software and 1cm quartz cells. The methods are based mainly on the reaction of the free amino group in the Darunavir with the ONB reagent and Efavirenz with the vanillin reagent undergoing condensation reaction to form colored Schiff's bases. The methods were optimized as per standard optimization parameters.By the optimized method the pinkish brown colored chromogen for condensed DARUNAVIR was measured at 486 nm and reddish pink colored chromogen for condensed EFZ was measured at 432 nm against the reagent blank. The linearity range of Darunavir is 40-240 µg/ml and Efavirenz is 20-100µg/ml; LOD and LOQ was found to be 2.66 and 8.87 µg/ml for Darunavir and 1.44 and 4.82 µg/ml for Efavirenz. The colorimetric methods were extensively validated as per ICH guidelines and all the parameters were within the acceptance criteria with the correlation of 0.9999 and % RSD less than 2 for both the methods. The results of the accuracy studies were nearer to 100%. The methods were proved to be more accurate, simple, precise and rapid by statistical validation as well as recovery studies and could be used for routine laboratory analysis.

Key words: Darunavir (DNV), Efavirenz (EFZ), O-nitro Benzaldehyde (ONB), Vanillin

INTRODUCTION

DNV[1], chemically is [1S, 2R]-3-[[(4aminophenyl)sulfonyl] (2-methylpropyl)amino]-2-hydroxy-1-(phenyl methyl)propyl]-carbamic acid (3R,3aS,6aR)hexahydrofuro[2,3-b]furan-3-yl ester mono ethanolate (fig.1). Its molecular formula is $C_{27}H_{37}N_3O_7S$. C_2H_5OH and its molecular weight is 593.73g/mol. It is a protease inhibitor which prevents HIV replication by binding to the enzyme's active site, thereby preventing the dimerization and the catalytic activity of the HIV-1 protease. It selectively inhibits the cleavage of HIV encoded Gag-Pol polyproteins in virus infected cells, which prevents the formation of mature infectious virus particles.

EFZ[2], chemically is 4*S*-6-chloro-4-(2-cyclopropylethynyl)-4- (trifluoromethyl)-2,4-dihydro-1*H*-3,1-benzoxazin-2-one (fig.2). Its molecular formula is $C_{14}H_9ClF_3NO_2$ and its molecular weight is 315.675 g/mol. EFZ falls in the NNRTI class of anti-retrovirals. Both nucleoside and non-nucleoside RTIs inhibit the same target, the reverse transcriptase enzyme, an essential viral enzyme which transcribes viral RNA into DNA. Unlike nucleoside RTIs, which bind at the enzyme's active site, NNRTIs act allosterically by binding to a distinct site away from the active site known as the NNRTI pocket.

Materials and Methods

Equipment

Double-beam Perkin Elmer (LAMBDA 25) UV-Vis spectrophotometer interfaced with UV WIN labsoftware and 1 cm quartz cuvettes was used for spectral measurements. Sartorius balance was used for weighing the samples.

Chemicals

Both DNVand EFZ were obtained as a gift sample from Aurobindo Pharma Ltd, Hyderabad. Ethanol, ONB, vanillin and sulfuric acid were used for the experimental work.

Preparation of stock solution for estimation of DNV/EFZ

25 mg of DNV/EFZ was accurately weighed and transferred to a 25 ml volumetric flask, dissolved and diluted to final volume with ethanol. The resulting solution has a concentration of 1mg/ml.

Preparation of reagents

Preparation of (0.5%W/V) ONB

500 mg of ONB was weighed and dissolved and final volume was made up to 100 ml with ethanol.

Preparation of (0.5%W/V) vanillin

500 mg of vanillin was precisely weighed and dissolved in 1:1 (water + H_2SO_4) and final volume was made up to 100 ml with the solvent.

Literature survey of this drug revealed that there are few methods available for the determination using spectrophotometric methods[3-12], RP-HPLC[13-23], HPTLC[24] for DNV and EFZ. For its simplicity,

Research Article

Application of Condensation technique for the estimation of Darunavir and Efavirenz in pure and tablet formulations

[1]R.VIJAYALAKSHMI*, [1]D. ANJANI, [1]M.D. DHANARAJU
*[1]Department of Pharmaceutical Analysis, GIET School of Pharmacy, NH-16 Chaitanaya Knowledge City, Rajahmahendravaram- 533296.Andhra Pradesh Email id: vijayalakshmigsp@gmail.com
(m) : +919492083483
Received: 13.04.18, Revised: 13.05.18, Accepted: 13.06.18

ABSTRACT
This proposed work describes two simple and fast visible spectrophotometric methods for the estimation of Darunavir with O-nitro benzaldehyde and Efavirenz with vanillin by the condensation process.Both the methods were developed on Perkin Elmer LAMBDA 25 UV –VIS spectrophotometer interfaced with UV Win lab software and 1cm quartz cells. The methods are based mainly on the reaction of the free amino group in the Darunavir with the ONB reagent and Efavirenz with the vanillin reagent undergoing condensation reaction to form colored Schiff's bases. The methods were optimized as per standard optimization parameters.By the optimized method the pinkish brown colored chromogen for condensed DARUNAVIR was measured at 486 nm and reddish pink colored chromogen for condensed EFZ was measured at 432 nm against the reagent blank. The linearity range of Darunavir is 40-240 µg/ml and Efavirenz is 20-100µg/ml; LOD and LOQ was found to be 2.66 and 8.87 µg/ml for Darunavir and 1.44 and 4.82 µg/ml for Efavirenz. The colorimetric methods were extensively validated as per ICH guidelines and all the parameters were within the acceptance criteria with the correlation of 0.9999 and % RSD less than 2 for both the methods. The results of the accuracy studies were nearer to 100%. The methods were proved to be more accurate, simple, precise and rapid by statistical validation as well as recovery studies and could be used for routine laboratory analysis.

Key words: Darunavir (DNV), Efavirenz (EFZ), O-nitro Benzaldehyde (ONB), Vanillin

INTRODUCTION

DNV[1], chemically is [1S, 2R]-3-[[(4aminophenyl)sulfonyl] (2-methylpropyl)amino]-2-hydroxy-1-(phenyl methyl)propyl]-carbamic acid (3R,3aS,6aR)hexahydrofuro[2,3-b]furan-3-yl ester mono ethanolate (fig.1). Its molecular formula is $C_{27}H_{37}N_3O_7S$. C_2H_5OH and its molecular weight is 593.73g/mol. It is a protease inhibitor which prevents HIV replication by binding to the enzyme's active site, thereby preventing the dimerization and the catalytic activity of the HIV-1 protease. It selectively inhibits the cleavage of HIV encoded Gag-Pol polyproteins in virus infected cells, which prevents the formation of mature infectious virus particles.

EFZ[2], chemically is 4*S*-6-chloro-4-(2-cyclopropylethynyl)-4- (trifluoromethyl)-2,4-dihydro-1*H*-3,1-benzoxazin-2-one (fig.2). Its molecular formula is $C_{14}H_9ClF_3NO_2$ and its molecular weight is 315.675 g/mol. EFZ falls in the NNRTI class of anti-retrovirals. Both nucleoside and non-nucleoside RTIs inhibit the same target, the reverse transcriptase enzyme, an essential viral enzyme which transcribes viral RNA into DNA. Unlike nucleoside RTIs, which bind at the enzyme's active site, NNRTIs act allosterically by binding to a distinct site away from the active site known as the NNRTI pocket.

Materials and Methods

Equipment

Double-beam Perkin Elmer (LAMBDA 25) UV-Vis spectrophotometer interfaced with UV WIN labsoftware and 1 cm quartz cuvettes was used for spectral measurements. Sartorius balance was used for weighing the samples.

Chemicals

Both DNVand EFZ were obtained as a gift sample from Aurobindo Pharma Ltd, Hyderabad. Ethanol, ONB, vanillin and sulfuric acid were used for the experimental work.

Preparation of stock solution for estimation of DNV/EFZ

25 mg of DNV/EFZ was accurately weighed and transferred to a 25 ml volumetric flask, dissolved and diluted to final volume with ethanol. The resulting solution has a concentration of 1mg/ml.

Preparation of reagents

Preparation of (0.5%W/V) ONB

500 mg of ONB was weighed and dissolved and final volume was made up to 100 ml with ethanol.

Preparation of (0.5%W/V) vanillin

500 mg of vanillin was precisely weighed and dissolved in 1:1 (water + H_2SO_4) and final volume was made up to 100 ml with the solvent.

Literature survey of this drug revealed that there are few methods available for the determination using spectrophotometric methods[3-12], RP-HPLC[13-23], HPTLC[24] for DNV and EFZ. For its simplicity,

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Online - 2455-3891
Print - 0974-2441

Vol 11, Issue 11, 2018

Research Article

ANALYTICAL METHOD DEVELOPMENT FOR THE ESTIMATION OF DARUNAVIR BY DIAZOTIZATION AND COUPLING BY VISIBLE SPECTROPHOTOMETRY

VIJAYALAKSHMI R*, ANJANI D, SRIRAMAMURTHY M, DHANARAJU M D

Research Lab, GIET School of Pharmacy, Rajahmahendravaram, Andhra Pradesh, India. Email: vijayalakshmigsp@gmail.com

Received: 08 June 2018, Revised and Accepted: 02 July 2018

ABSTRACT

Objectives: This proposed work describes simple and extraction free visible methods for the estimation of darunavir ethanolate (DNV) in bulk and tablet formulations. The methodology involves diazotization of DNV with nitrous acid followed by coupling with chromotropic acid (CA) (Method A)/ Bratton Marshall Reagent (Method B)/α-naphthol (Method C) to form colored products.

Methods: All the methods were developed using a PerkinElmer (LAMBDA 25) UV–Visible spectrophotometer interfaced with UV Win lab software and 1 cm quartz cells.

Results: Spectrophotometrically, DNV is estimated at 520 nm, 544 nm, and 464 nm for the reddish-pink color produced by CA, dark violet color with NED, and dark-greenish yellow with α-naphthol, respectively. The linear relationship was observed between absorbance and the corresponding concentration of drug in the range of 100–350 µg/mL, 10–100 µg/mL, and 10–60 µg/mL for Methods A, B, and C, respectively.

Conclusion: The colorimetric methods were extensively validated as per the ICH guidelines. The developed methods were proven to be more accurate and precise by the statistical analysis.

Keywords: Darunavir, Chromotropic acid, Bratton Marshall reagent, α-Naphthol.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i11.27830

INTRODUCTION

Darunavir (DNV) ethanolate is chemically [1S, 2R] -3-[[(4 amino phenyl) sulfonyl](2-methyl propyl) amino]-2-hydroxy-1-(phenyl methyl)propyl]-carbamic acid (3R,3aS,6aR) hexa hydro furo [2,3-b] furan-3-yl ester mono ethanolate (Fig. 1) used as an oral retroviral agent and an inhibitor of human immunodeficiency virus protease [1]. It prevents HIV replication by binding to the enzyme's active site, thereby preventing the dimerization and the catalytic activity of the HIV-1 protease. It selectively inhibits the cleavage of HIV-encoded Gag-Pol polyproteins in virus-infected cells, which prevents the formation of mature infectious virus particles and coadministered with ritonavir.

Few reversed-phase high-performance liquid chromatography methods [1-6], UV/visible methods [7-10], and high-performance thin-layer chromatography (HPTLC) methods [11] were found through the extensive literature search on the quantization of DNV in pure and dosage forms. The existing HPLC and HPTLC methods are laborious, time-consuming and need sample pretreatment. By virtue, spectrophotometry is the instrumental technique of choice eventually by its simplicity, sensitivity, and low cost for the underdeveloped and developing nations. The existing visible methods were based on oxidation or substitution reactions. Spectrophotometric methods based on diazotization and coupling method were not reported earlier. Based on the need for more simple analytical methods, the present work describes three simple, time-effective, and sensitive methods based on the diazotization and coupling process for the quantization of DNV in pure and tablet dosage forms.

METHODS

Equipment

Double-beam PerkinElmer (LAMBDA 25) UV-vis spectrophotometer interfaced with UV WIN lab software and 1 cm quartz cuvettes were used for spectral measurements. Sartorius balance was used for weighing the samples.

Chemicals

DNV was obtained as a gift sample from Aurobindo Pharma Ltd., Hyderabad. Ethanol, chromotropic acid (CA), Bratton–Marshall Reagent (BMR), α-naphthol, ammonium sulfamate, hydrochloric acid, and sodium nitrite were used for the experimental work. All the chemicals used in the experimental work were of AR Grade.

Preparation of stock solution of DNV

25 mg of DNV was accurately weighed and transferred to a 25 mL volumetric flask and dissolved and diluted to final volume with ethanol. The resulting solution has a concentration of 1 mg/mL.

Preparation of reagents

0.2%W/V BMR

200 mg of BMR was weighed and dissolved to make 100 mL with water.

0.5% W/V sodium nitrite

500 mg of sodium nitrite was weighed and dissolved to make 100 mL with water.

0.5% W/V ammonium sulfamate

500 mg of ammonium sulfamate was weighed and dissolved to make 100 mL with water.

0.2% W/V CA

200 mg of CA was weighed and dissolved in a mixture of 75 mL of concentrated sulfuric acid and 33 mL of distilled water.

0.2% W/V α-naphthol

200 mg of α-naphthol was weighed and dissolved to make 100 mL with ethanol.

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 11, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

ANALYTICAL METHOD DEVELOPMENT FOR THE ESTIMATION OF DARUNAVIR BY DIAZOTIZATION AND COUPLING BY VISIBLE SPECTROPHOTOMETRY

VIJAYALAKSHMI R*, ANJANI D, SRIRAMAMURTHY M, DHANARAJU M D

Research Lab, GIET School of Pharmacy, Rajahmahendravaram, Andhra Pradesh, India. Email: vijayalakshmigsp@gmail.com

Received: 08 June 2018, Revised and Accepted: 02 July 2018

ABSTRACT

Objectives: This proposed work describes simple and extraction free visible methods for the estimation of darunavir ethanolate (DNV) in bulk and tablet formulations. The methodology involves diazotization of DNV with nitrous acid followed by coupling with chromotropic acid (CA) (Method A)/ Bratton Marshall Reagent (Method B)/α-naphthol (Method C) to form colored products.

Methods: All the methods were developed using a PerkinElmer (LAMBDA 25) UV–Visible spectrophotometer interfaced with UV Win lab software and 1 cm quartz cells.

Results: Spectrophotometrically, DNV is estimated at 520 nm, 544 nm, and 464 nm for the reddish-pink color produced by CA, dark violet color with NED, and dark-greenish yellow with α-naphthol, respectively. The linear relationship was observed between absorbance and the corresponding concentration of drug in the range of 100–350 µg/mL, 10–100 µg/mL, and 10–60 µg/mL for Methods A, B, and C, respectively.

Conclusion: The colorimetric methods were extensively validated as per the ICH guidelines. The developed methods were proven to be more accurate and precise by the statistical analysis.

Keywords: Darunavir, Chromotropic acid, Bratton Marshall reagent, α-Naphthol.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i11.27830

INTRODUCTION

Darunavir (DNV) ethanolate is chemically [1S, 2R] -3-[[(4 amino phenyl) sulfonyl](2-methyl propyl) amino]-2-hydroxy-1-(phenyl methyl)propyl]-carbamic acid (3R,3aS,6aR) hexa hydro furo [2,3-b] furan-3-yl ester mono ethanolate (Fig. 1) used as an oral retroviral agent and an inhibitor of human immunodeficiency virus protease [1]. It prevents HIV replication by binding to the enzyme's active site, thereby preventing the dimerization and the catalytic activity of the HIV-1 protease. It selectively inhibits the cleavage of HIV-encoded Gag-Pol polyproteins in virus-infected cells, which prevents the formation of mature infectious virus particles and coadministered with ritonavir.

Few reversed-phase high-performance liquid chromatography methods [1-6], UV/visible methods [7-10], and high-performance thin-layer chromatography (HPTLC) methods [11] were found through the extensive literature search on the quantization of DNV in pure and dosage forms. The existing HPLC and HPTLC methods are laborious, time-consuming and need sample pretreatment. By virtue, spectrophotometry is the instrumental technique of choice eventually by its simplicity, sensitivity, and low cost for the underdeveloped and developing nations. The existing visible methods were based on oxidation or substitution reactions. Spectrophotometric methods based on diazotization and coupling method were not reported earlier. Based on the need for more simple analytical methods, the present work describes three simple, time-effective, and sensitive methods based on the diazotization and coupling process for the quantization of DNV in pure and tablet dosage forms.

METHODS

Equipment

Double-beam PerkinElmer (LAMBDA 25) UV-vis spectrophotometer interfaced with UV WIN lab software and 1 cm quartz cuvettes were used for spectral measurements. Sartorius balance was used for weighing the samples.

Chemicals

DNV was obtained as a gift sample from Aurobindo Pharma Ltd., Hyderabad. Ethanol, chromotropic acid (CA), Bratton–Marshall Reagent (BMR), α-naphthol, ammonium sulfamate, hydrochloric acid, and sodium nitrite were used for the experimental work. All the chemicals used in the experimental work were of AR Grade.

Preparation of stock solution of DNV

25 mg of DNV was accurately weighed and transferred to a 25 mL volumetric flask and dissolved and diluted to final volume with ethanol. The resulting solution has a concentration of 1 mg/mL.

Preparation of reagents

0.2%W/V BMR

200 mg of BMR was weighed and dissolved to make 100 mL with water.

0.5% W/V sodium nitrite

500 mg of sodium nitrite was weighed and dissolved to make 100 mL with water.

0.5% W/V ammonium sulfamate

500 mg of ammonium sulfamate was weighed and dissolved to make 100 mL with water.

0.2% W/V CA

200 mg of CA was weighed and dissolved in a mixture of 75 mL of concentrated sulfuric acid and 33 mL of distilled water.

0.2% W/V α-naphthol

200 mg of α-naphthol was weighed and dissolved to make 100 mL with ethanol.

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 12, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

IN VITRO ANTIOXIDANT ACTIVITY AND WOUND HEALING ACTIVITY OF WHEATGRASS BY 1,1- DIPHENYL, 2 PICRYLHYDRAZYL METHOD

VEERMANENI ALEKHYA*, THIYAGARAJAN DEEPAN, MAGHARLA DASARATHA DHANARAJU

Department of Pharmacognosy, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
Email: alekhya.veramaneni@gmail.com

Received: 05 June 2018, Revised and Accepted: 23 July 2018

ABSTRACT

Objective: This study was designed to evaluate *in vitro* antioxidant activity and wound healing activity in *Triticum aestivum* (wheat grass).

Methods: *T. aestivum* commonly known as Wheatgrass had a wide range of health benefits among the young grass of common wheat plant components includes chlorophyll, flavonoids, and Vitamins A, C, and E. Wheatgrass is used in Folklore medicine for treatment of skin diseases and wound healing. In our present study, petroleum ether, ethanol and aqueous extracts of *T. aestivum* have been evaluated for *in vitro* antioxidant activity and wound healing activity by 1,1- diphenyl, 2 Picrylhydrazyl radical scavenging activity, and Chick chorioallantoic method, respectively.

Results: The results of both the assay showed that all the extracts of *T. aestivum* have significant *antioxidant* and wound *healing* activity on dose-dependent manner.

Conclusion: The wheatgrass has antioxidant and wound healing activity.

Keywords: *Triticum aestivum*, Antioxidant, Wound healing activity, Wheatgrass.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i12.27705

INTRODUCTION

Young branch of *Triticum aestivum linn* (Hindi name – *gehun, kanak*), Sanskrit name *godhuma)* is termed as wheatgrass, belonging to the family (Gramineae) [1]. *Triticum* is the genus of yearly and periodic grasses, yielding numerous types of wheat, inborn to South West Asia and Mediterranean region. It comprises a substantial quantity of iron, phosphorous, magnesium, manganese, copper, and zinc. Wheatgrass is a rich source of tocopherols with high Vitamin E potency. Wheatgrass has a great property to stimulate and enhance body metabolism; restores alkalinity to the blood, due to its alkaline minerals it helps to reduce over acidity in the blood. Wheatgrass helps to restore healthy cells as it is a detoxificant [2]. An extensive scientific research on wheatgrass establishes its anticancer [3,4] and antioxidant potential [5].

In the current study, *in vitro* antioxidant and wound healing potentials for wheatgrass were assessed. The wound healing potential was estimated by chorioallantoic membrane (CAM) assay. It involves a methodical evolution of measures that establish the integrity of the injured tissue. The wound healing includes different stages including inflammation, granulation, fibrogenesis, neovascularization, wound contraction, and epithelialization [6]. The chick embryo CAM is an extraembryonic membrane. The main function is to exchange nutrients and gasses, which are buttressed by a dense capillary network [7- 9]. Due to its widespread vascularization and its ease to use, CAM is extensively utilized as a research tool.

Antioxidants are compounds that protect the cells against the destructive effects of reactive oxygen species such as singlet oxygen, superoxide, Peroxyl radicals, hydroxyl radicals, and Peroxyl nitrite. Cellular damage which is caused by the oxidative stress it is a consequence of inequity between reactive oxygen and antioxidants.

Due to oxidative stress and cellular damage it leads to neurodegenerative diseases (Parkinson's and Alzheimer's) [10] cancer, aging, atherosclerosis, ischemic injury, and inflammation.

Antioxidants are used to inhibit, delay or prevent the oxidation of oxidazole materials by scavenging free radicals and diminishing oxidative stress [11,12]. Natural antioxidants have been studied widely for compounds protecting against several diseases interrelated to oxidative stress and free radical-induced damage. Till date, numerous plants have been reported antioxidant properties. In the current study, *Tritium aestivum* was assessed for the antioxidant property based on the reputation in folklore medical practice [13-15].

METHODS

Plant collection and identification

Wheatgrass (*T. aestivum*) was cultivated and collected from the medicinal garden of Department of Pharmacognosy and Phytochemistry, GIET School of Pharmacy, during the month of June–July 2017 and identified by the botanist from Regional Forest Research Center Rajahmundry, East Godavari District, A.P.

Preparation of the extract

The collected wheatgrass was washed with water and dried in shade for about 7 days and powdered in a small-scale blender. About 500g of the powdered wheatgrass was subjected for Soxhlet extraction using different solvents such as petroleum ether, chloroform, ethanol, and water. Solvents selection was based on highly polar in nature. Continuous Sox halation was done for around 12 h for each solvent. The extracts obtained were evaporated at 50–60°C using a hot plate. The residues were stored in airtight containers for further research.

Preliminary phytochemical screening

Preliminary phytochemical screening of the extracts was carried out, and it shows the presence of following components in Table 1.

Antioxidant activity

1,1- diphenyl, 2 Picrylhydrazyl (DPPH) free radical scavenging assay method was used for the assessment of *in vitro* antioxidant activity for the plant extracts (petroleum ether, chloroform, ethanol, and water) *T. aestivum*

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 12, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

IN VITRO ANTIOXIDANT ACTIVITY AND WOUND HEALING ACTIVITY OF WHEATGRASS BY 1,1- DIPHENYL, 2 PICRYLHYDRAZYL METHOD

VEERMANENI ALEKHYA*, THIYAGARAJAN DEEPAN, MAGHARLA DASARATHA DHANARAJU

Department of Pharmacognosy, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
Email: alekhya.veramaneni@gmail.com

Received: 05 June 2018, Revised and Accepted: 23 July 2018

ABSTRACT

Objective: This study was designed to evaluate *in vitro* antioxidant activity and wound healing activity in *Triticum aestivum* (wheat grass).

Methods: *T. aestivum* commonly known as Wheatgrass had a wide range of health benefits among the young grass of common wheat plant components includes chlorophyll, flavonoids, and Vitamins A, C, and E. Wheatgrass is used in Folklore medicine for treatment of skin diseases and wound healing. In our present study, petroleum ether, ethanol and aqueous extracts of *T. aestivum* have been evaluated for *in vitro* antioxidant activity and wound healing activity by 1,1- diphenyl, 2 Picrylhydrazyl radical scavenging activity, and Chick chorioallantoic method, respectively.

Results: The results of both the assay showed that all the extracts of *T. aestivum* have significant *antioxidant* and wound *healing* activity on dose-dependent manner.

Conclusion: The wheatgrass has antioxidant and wound healing activity.

Keywords: *Triticum aestivum*, Antioxidant, Wound healing activity, Wheatgrass.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i12.27705

INTRODUCTION

Young branch of *Triticum aestivum linn* (Hindi name – *gehun, kanak*), Sanskrit name *godhuma)* is termed as wheatgrass, belonging to the family (Gramineae) [1]. *Triticum* is the genus of yearly and periodic grasses, yielding numerous types of wheat, inborn to South West Asia and Mediterranean region. It comprises a substantial quantity of iron, phosphorous, magnesium, manganese, copper, and zinc. Wheatgrass is a rich source of tocopherols with high Vitamin E potency. Wheatgrass has a great property to stimulate and enhance body metabolism; restores alkalinity to the blood, due to its alkaline minerals it helps to reduce over acidity in the blood. Wheatgrass helps to restore healthy cells as it is a detoxificant [2]. An extensive scientific research on wheatgrass establishes its anticancer [3,4] and antioxidant potential [5].

In the current study, *in vitro* antioxidant and wound healing potentials for wheatgrass were assessed. The wound healing potential was estimated by chorioallantoic membrane (CAM) assay. It involves a methodical evolution of measures that establish the integrity of the injured tissue. The wound healing includes different stages including inflammation, granulation, fibrogenesis, neovascularization, wound contraction, and epithelialization [6]. The chick embryo CAM is an extraembryonic membrane. The main function is to exchange nutrients and gasses, which are buttressed by a dense capillary network [7- 9]. Due to its widespread vascularization and its ease to use, CAM is extensively utilized as a research tool.

Antioxidants are compounds that protect the cells against the destructive effects of reactive oxygen species such as singlet oxygen, superoxide, Peroxyl radicals, hydroxyl radicals, and Peroxyl nitrite. Cellular damage which is caused by the oxidative stress it is a consequence of inequity between reactive oxygen and antioxidants.

Due to oxidative stress and cellular damage it leads to neurodegenerative diseases (Parkinson's and Alzheimer's) [10] cancer, aging, atherosclerosis, ischemic injury, and inflammation.

Antioxidants are used to inhibit, delay or prevent the oxidation of oxidazole materials by scavenging free radicals and diminishing oxidative stress [11,12]. Natural antioxidants have been studied widely for compounds protecting against several diseases interrelated to oxidative stress and free radical-induced damage. Till date, numerous plants have been reported antioxidant properties. In the current study, *Tritium aestivum* was assessed for the antioxidant property based on the reputation in folklore medical practice [13-15].

METHODS

Plant collection and identification

Wheatgrass (*T. aestivum*) was cultivated and collected from the medicinal garden of Department of Pharmacognosy and Phytochemistry, GIET School of Pharmacy, during the month of June–July 2017 and identified by the botanist from Regional Forest Research Center Rajahmundry, East Godavari District, A.P.

Preparation of the extract

The collected wheatgrass was washed with water and dried in shade for about 7 days and powdered in a small-scale blender. About 500g of the powdered wheatgrass was subjected for Soxhlet extraction using different solvents such as petroleum ether, chloroform, ethanol, and water. Solvents selection was based on highly polar in nature. Continuous Sox halation was done for around 12 h for each solvent. The extracts obtained were evaporated at 50–60°C using a hot plate. The residues were stored in airtight containers for further research.

Preliminary phytochemical screening

Preliminary phytochemical screening of the extracts was carried out, and it shows the presence of following components in Table 1.

Antioxidant activity

1,1- diphenyl, 2 Picrylhydrazyl (DPPH) free radical scavenging assay method was used for the assessment of *in vitro* antioxidant activity for the plant extracts (petroleum ether, chloroform, ethanol, and water) *T. aestivum*

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 12, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

IN VITRO ANTIOXIDANT ACTIVITY AND WOUND HEALING ACTIVITY OF WHEATGRASS BY 1,1- DIPHENYL, 2 PICRYLHYDRAZYL METHOD

VEERMANENI ALEKHYA*, THIYAGARAJAN DEEPAN, MAGHARLA DASARATHA DHANARAJU

Department of Pharmacognosy, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India.
Email: alekhya.veramaneni@gmail.com

Received: 05 June 2018, Revised and Accepted: 23 July 2018

ABSTRACT

Objective: This study was designed to evaluate *in vitro* antioxidant activity and wound healing activity in *Triticum aestivum* (wheat grass).

Methods: *T. aestivum* commonly known as Wheatgrass had a wide range of health benefits among the young grass of common wheat plant components includes chlorophyll, flavonoids, and Vitamins A, C, and E. Wheatgrass is used in Folklore medicine for treatment of skin diseases and wound healing. In our present study, petroleum ether, ethanol and aqueous extracts of *T. aestivum* have been evaluated for *in vitro* antioxidant activity and wound healing activity by 1,1- diphenyl, 2 Picrylhydrazyl radical scavenging activity, and Chick chorioallantoic method, respectively.

Results: The results of both the assay showed that all the extracts of *T. aestivum* have significant *antioxidant* and wound *healing* activity on dose-dependent manner.

Conclusion: The wheatgrass has antioxidant and wound healing activity.

Keywords: *Triticum aestivum*, Antioxidant, Wound healing activity, Wheatgrass.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i12.27705

INTRODUCTION

Young branch of *Triticum aestivum linn* (Hindi name – *gehun*, *kanak*), Sanskrit name *godhuma)* is termed as wheatgrass, belonging to the family (Gramineae) [1]. *Triticum* is the genus of yearly and periodic grasses, yielding numerous types of wheat, inborn to South West Asia and Mediterranean region. It comprises a substantial quantity of iron, phosphorous, magnesium, manganese, copper, and zinc. Wheatgrass is a rich source of tocopherols with high Vitamin E potency. Wheatgrass has a great property to stimulate and enhance body metabolism; restores alkalinity to the blood, due to its alkaline minerals it helps to reduce over acidity in the blood. Wheatgrass helps to restore healthy cells as it is a detoxificant [2]. An extensive scientific research on wheatgrass establishes its anticancer [3,4] and antioxidant potential [5].

In the current study, *in vitro* antioxidant and wound healing potentials for wheatgrass were assessed. The wound healing potential was estimated by chorioallantoic membrane (CAM) assay. It involves a methodical evolution of measures that establish the integrity of the injured tissue. The wound healing includes different stages including inflammation, granulation, fibrogenesis, neovascularization, wound contraction, and epithelialization [6]. The chick embryo CAM is an extraembryonic membrane. The main function is to exchange nutrients and gasses, which are buttressed by a dense capillary network [7- 9]. Due to its widespread vascularization and its ease to use, CAM is extensively utilized as a research tool.

Antioxidants are compounds that protect the cells against the destructive effects of reactive oxygen species such as singlet oxygen, superoxide, Peroxyl radicals, hydroxyl radicals, and Peroxyl nitrite. Cellular damage which is caused by the oxidative stress it is a consequence of inequity between reactive oxygen and antioxidants.

Due to oxidative stress and cellular damage it leads to neurodegenerative diseases (Parkinson's and Alzheimer's) [10] cancer, aging, atherosclerosis, ischemic injury, and inflammation.

Antioxidants are used to inhibit, delay or prevent the oxidation of oxidazole materials by scavenging free radicals and diminishing oxidative stress [11,12]. Natural antioxidants have been studied widely for compounds protecting against several diseases interrelated to oxidative stress and free radical-induced damage. Till date, numerous plants have been reported antioxidant properties. In the current study, *Tritium aestivum* was assessed for the antioxidant property based on the reputation in folklore medical practice [13-15].

METHODS

Plant collection and identification

Wheatgrass (*T. aestivum*) was cultivated and collected from the medicinal garden of Department of Pharmacognosy and Phytochemistry, GIET School of Pharmacy, during the month of June–July 2017 and identified by the botanist from Regional Forest Research Center Rajahmundry, East Godavari District, A.P.

Preparation of the extract

The collected wheatgrass was washed with water and dried in shade for about 7 days and powdered in a small-scale blender. About 500g of the powdered wheatgrass was subjected for Soxhlet extraction using different solvents such as petroleum ether, chloroform, ethanol, and water. Solvents selection was based on highly polar in nature. Continuous Sox halation was done for around 12 h for each solvent. The extracts obtained were evaporated at 50–60°C using a hot plate. The residues were stored in airtight containers for further research.

Preliminary phytochemical screening

Preliminary phytochemical screening of the extracts was carried out, and it shows the presence of following components in Table 1.

Antioxidant activity

1,1- diphenyl, 2 Picrylhydrazyl (DPPH) free radical scavenging assay method was used for the assessment of *in vitro* antioxidant activity for the plant extracts (petroleum ether, chloroform, ethanol, and water) *T. aestivum*

IJPSR (2018), Volume 9, Issue 11 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 04 March, 2018; received in revised form, 13 May, 2018; accepted, 31 May, 2018; published 01 November, 2018

DESIGN DEVELOPMENT AND EVALUATION OF GASTRO RETENTIVE FLOATING MICROSPHERES OF ATAZANAVIR SULFATE

V. D. Sundar *, P. Divya, G. Suneendra and M. D. Dhanaraju

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry - 533296, Andhra Pradesh, India.

Keywords:

Atazanavir sulfate, Floating microspheres, Hydroxyl propyl methyl cellulose, Propylene glycol, Eudragit E 100

Correspondence to Author:
Dr. V. D. Sundar

Professor,
Department of Pharmaceutics,
GIET School of Pharmacy,
NH -16, Chaitanya Knowledge City, Rajahmundry - 533296,
Andhra Pradesh, India.

E-mail: sundarvd@yahoo.co.in

ABSTRACT: The purpose of present study was to formulate the gastro-retentive floating microspheres of atazanavir sulfate to be retentive in the stomach for prolonged period of time. The gastro-retentive floating microspheres were prepared by double emulsion $w_1/o/w_2$ solvent evaporation technique and characterization for particle size, SEM, floating time, FTIR, DSC, and entrapment efficiency. The *in-vitro* drug release studies and *in-vitro* drug kinetics were performed for different formulations. FTIR and DSC studies revealed that the drug is compatible with excipients. The floating time of the floating microspheres was found to be > 12h. The particle size of all the formulations was evaluated by optical microscopy method. Formulation F1 - F4 comprising HPMC as rate retarding polymer exhibits an average particle size of about 515.25µm and microspheres F5 – F8 prepared with eudragit exhibit a mean particle of about 611.4 µm. Eudragit formulations exhibit an increased entrapment efficiency which is due to its large particle size and increased viscosity. All batches prepared show an initial burst release followed by sustained release. Formulation F 1 to F4 exhibits an *in vitro* release of 67.8%, 70.9%, 77.8% and 87% respectively at the end of 10^{th} h. Formulation F5 to F8 exhibits a release of 36.1%, 54.6%, 57.6% and 67.8% respectively at the end of 10^{th} h. Among all the formulations, F4 prepared with combination of HPMC and ethyl cellulose exhibits sustained release behavior. The developed floating microspheres assure the delivery of drug for a prolonged period of time.

INTRODUCTION: Gastro retentive floating microspheres are low density systems that have sufficient buoyancy to float over gastric contents and remain in stomach for prolonged period. As the system floats over the gastric contents the drug is released slowly at desired rate resulting in increased gastric retention with reduced fluctuations in plasma drug concentration.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(11).4642-50

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(11).4642-50

Prolonged retention in the upper GIT tract can greatly improve the oral bioavailability and their therapeutic outcome. The pH dependent solubility and stability level plays an important role in its absorption. Microencapsulation has been used as a one of the methods to deliver drug in control and sustained manner therefore it is evident that a gastric floating based drug delivery system will be best suit the purpose of our dosage form design[1].

Various approaches have been pursued to increase the retention of the dosage form in the gastrointestinal tract. These techniques make use of the various physiological and anatomical characteristics of the stomach. Expandable systems, bio-muco adhesive system, floating drug delivery

IJPSR (2018), Volume 9, Issue 11 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 04 March, 2018; received in revised form, 13 May, 2018; accepted, 31 May, 2018; published 01 November, 2018

DESIGN DEVELOPMENT AND EVALUATION OF GASTRO RETENTIVE FLOATING MICROSPHERES OF ATAZANAVIR SULFATE

V. D. Sundar*, P. Divya, G. Suneendra and M. D. Dhanaraju

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry - 533296, Andhra Pradesh, India.

Keywords:

Atazanavir sulfate, Floating microspheres, Hydroxyl propyl methyl cellulose, Propylene glycol, Eudragit E 100

Correspondence to Author:
Dr. V. D. Sundar

Professor,
Department of Pharmaceutics,
GIET School of Pharmacy,
NH -16, Chaitanya Knowledge City, Rajahmundry - 533296,
Andhra Pradesh, India.

E-mail: sundarvd@yahoo.co.in

ABSTRACT: The purpose of present study was to formulate the gastro-retentive floating microspheres of atazanavir sulfate to be retentive in the stomach for prolonged period of time. The gastro-retentive floating microspheres were prepared by double emulsion $w_1/o/w_2$ solvent evaporation technique and characterization for particle size, SEM, floating time, FTIR, DSC, and entrapment efficiency. The *in-vitro* drug release studies and *in-vitro* drug kinetics were performed for different formulations. FTIR and DSC studies revealed that the drug is compatible with excipients. The floating time of the floating microspheres was found to be > 12h. The particle size of all the formulations was evaluated by optical microscopy method. Formulation F1 - F4 comprising HPMC as rate retarding polymer exhibits an average particle size of about 515.25µm and microspheres F5 – F8 prepared with eudragit exhibit a mean particle of about 611.4 µm. Eudragit formulations exhibit an increased entrapment efficiency which is due to its large particle size and increased viscosity. All batches prepared show an initial burst release followed by sustained release. Formulation F 1 to F4 exhibits an *in vitro* release of 67.8%, 70.9%, 77.8% and 87% respectively at the end of 10^{th} h. Formulation F5 to F8 exhibits a release of 36.1%, 54.6%, 57.6% and 67.8% respectively at the end of 10^{th} h. Among all the formulations, F4 prepared with combination of HPMC and ethyl cellulose exhibits sustained release behavior. The developed floating microspheres assure the delivery of drug for a prolonged period of time.

INTRODUCTION: Gastro retentive floating microspheres are low density systems that have sufficient buoyancy to float over gastric contents and remain in stomach for prolonged period. As the system floats over the gastric contents the drug is released slowly at desired rate resulting in increased gastric retention with reduced fluctuations in plasma drug concentration.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(11).4642-50

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(11).4642-50

Prolonged retention in the upper GIT tract can greatly improve the oral bioavailability and their therapeutic outcome. The pH dependent solubility and stability level plays an important role in its absorption. Microencapsulation has been used as a one of the methods to deliver drug in control and sustained manner therefore it is evident that a gastric floating based drug delivery system will be best suit the purpose of our dosage form design[1].

Various approaches have been pursued to increase the retention of the dosage form in the gastrointestinal tract. These techniques make use of the various physiological and anatomical characteristics of the stomach. Expandable systems, bio-muco adhesive system, floating drug delivery

Saudi Journal of Medical and Pharmaceutical Sciences
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2413-4929 (Print)
ISSN 2413-4910 (Online)

Cost Analysis of Anti- Diabetic Drugs in India

Rabiya Ahamedi[1*], K. Dileep[1], J. John Kirubakaran[1], M.D Dhanaraju[2]
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

Original Research Article

***Corresponding author**
Rabiya Ahamedi

Article History
Received: 04.11.2018
Accepted: 12.11.2018
Published: 30.11.2018

DOI:
10.21276/sjmps.2018.4.11.4

Abstract: Diabetes is a chronic condition that occurs extremely due to a combination of sedentary lifestyle and following an imbalanced diet. Thus the medications are to be taken for life time. So there is a need for the prescribers to prescribe the medication which would be cost effective to the patients. This study was planned to analyse cost variations of antidiabetic drugs available in Indian market. There is a wide range of variations as the price of drug marketing in India. This paper gives the information regarding the drugs available for diabetes, their available brands, average cost and cost variations. Which help the physician in giving the drugs to the respective patient which are effective to them as well as which are cost efficient and are afforded easily by the patient. As a result of which there will less medication non-adherence and increased patient compliance. It was conducted by taking the maximum and minimum cost of anti- diabetic agents manufactured by different brands of same drug, strength and dosage forms. The data is obtained from the current index of medical specialties [CIMS] April-July 2018. The cost ratio and percentage cost variations were calculated for each anti-diabetic drug. The average percentage price variation of different brands of the same oral anti-diabetic drugs in Indian market is very wide.

Keywords: anti-diabetic drugs, price comparison, CIMS, cost ratio, percentage price variation, non-adherence, compliance.

INTRODUCTION

India is amongst the top three countries where diabetes is prevalent according to the study carried out in 2015 [1]. It further shows that the rate has escalated four folds from 108 million in 1980 to a staggering 422 million by the end of 2015, 8.7 percent, which accounts for 36 million are from India.

The pressing issue is that close to 90 percent of these cases can be controlled but not cured completely [2].

According to the data collected by the World Health Organisation, about 1.5 million fatalities were reported, making it the eighth leading cause of death. It should also be noted that about 2.2 million deaths are attributed to diabetes and associated complications like the cardiac failure, renal failure [3].

Prevalence percentage of diabetes and pre-diabetes according to their age can be, at age 30-39 it is 11%, 19%; age 40-49 it is 22%, 21%; age 50-59 it is 33%, 19%; age 60-69 it is 41%, 20%. It is speculated that the type of diabetes might be associated with the Socio-Economic factors [4].

Preliminary studies conducted by Indian council of medical research (ICMR) revealed the number of people affected with diabetes in the India is as follows Chandigarh-0.12 millions, Jharkhand-0.96 million, Maharashtra-9.2 million, Tamil Nadu-4.8 million [2]. National urban survey conducted across metropolitan cites of India reported 11.7% in Kolkata, 6.1% in Kashmir, 11.6% in New Delhi, 9.3% in Mumbai, 13.5% in Chennai, 16.6% in Hyderabad [2].

People whose pancreas does not produce enough Insulin (a hormone produced by the beta cells of Langerhans of the pancreas) or those who cannot effectively use the insulin produced are prone to diabetes [2].

There are three major types of Diabetes, namely the Type- I, Type-II and gestational. There are a few uncommon types like monogenic diabetes, cystic fibrosis-related diabetes.

In the case of type- I diabetes, one's own immune system attacks the beta cells which produce insulin. This is common in children and young adults between 10-15 years of age. In the case of type-II, the Beta cells will not be able to produce insulin or the cells are unable to uptake insulin. This is the most common type of diabetes in middle-aged and old people. The Gestational Diabetes affects some women during pregnancy, which in turn leads to type-II in later stages

Saudi Journal of Medical and Pharmaceutical Sciences
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

ISSN 2413-4929 (Print)
ISSN 2413-4910 (Online)

Cost Analysis of Anti- Diabetic Drugs in India

Rabiya Ahamedi[1*], K. Dileep[1], J. John Kirubakaran[1], M.D Dhanaraju[2]
[1]Department of Pharmacy Practice, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India
[2]Principal and Research Director, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

Original Research Article

***Corresponding author**
Rabiya Ahamedi

Article History
Received: 04.11.2018
Accepted: 12.11.2018
Published: 30.11.2018

DOI:
10.21276/sjmps.2018.4.11.4

Abstract: Diabetes is a chronic condition that occurs extremely due to a combination of sedentary lifestyle and following an imbalanced diet. Thus the medications are to be taken for life time. So there is a need for the prescribers to prescribe the medication which would be cost effective to the patients. This study was planned to analyse cost variations of antidiabetic drugs available in Indian market. There is a wide range of variations as the price of drug marketing in India. This paper gives the information regarding the drugs available for diabetes, their available brands, average cost and cost variations. Which help the physician in giving the drugs to the respective patient which are effective to them as well as which are cost efficient and are afforded easily by the patient. As a result of which there will less medication non-adherence and increased patient compliance. It was conducted by taking the maximum and minimum cost of anti- diabetic agents manufactured by different brands of same drug, strength and dosage forms. The data is obtained from the current index of medical specialties [CIMS] April-July 2018. The cost ratio and percentage cost variations were calculated for each anti-diabetic drug. The average percentage price variation of different brands of the same oral anti-diabetic drugs in Indian market is very wide.

Keywords: anti-diabetic drugs, price comparison, CIMS, cost ratio, percentage price variation, non-adherence, compliance.

INTRODUCTION

India is amongst the top three countries where diabetes is prevalent according to the study carried out in 2015 [1]. It further shows that the rate has escalated four folds from 108 million in 1980 to a staggering 422 million by the end of 2015, 8.7 percent, which accounts for 36 million are from India.

The pressing issue is that close to 90 percent of these cases can be controlled but not cured completely [2].

According to the data collected by the World Health Organisation, about 1.5 million fatalities were reported, making it the eighth leading cause of death. It should also be noted that about 2.2 million deaths are attributed to diabetes and associated complications like the cardiac failure, renal failure [3].

Prevalence percentage of diabetes and pre-diabetes according to their age can be, at age 30-39 it is 11%, 19%; age 40-49 it is 22%, 21%; age 50-59 it is 33%, 19%; age 60-69 it is 41%, 20%. It is speculated that the type of diabetes might be associated with the Socio-Economic factors [4].

Preliminary studies conducted by Indian council of medical research (ICMR) revealed the number of people affected with diabetes in the India is as follows Chandigarh-0.12 millions, Jharkhand-0.96 million, Maharashtra-9.2 million, Tamil Nadu-4.8 million [2]. National urban survey conducted across metropolitan cites of India reported 11.7% in Kolkata, 6.1% in Kashmir, 11.6% in New Delhi, 9.3% in Mumbai, 13.5% in Chennai, 16.6% in Hyderabad [2].

People whose pancreas does not produce enough Insulin (a hormone produced by the beta cells of Langerhans of the pancreas) or those who cannot effectively use the insulin produced are prone to diabetes [2].

There are three major types of Diabetes, namely the Type- I, Type-II and gestational. There are a few uncommon types like monogenic diabetes, cystic fibrosis-related diabetes.

In the case of type- I diabetes, one's own immune system attacks the beta cells which produce insulin. This is common in children and young adults between 10-15 years of age. In the case of type-II, the Beta cells will not be able to produce insulin or the cells are unable to uptake insulin. This is the most common type of diabetes in middle-aged and old people. The Gestational Diabetes affects some women during pregnancy, which in turn leads to type-II in later stages

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 4, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

FABRICATION AND EFFECT OF PROCESS VARIABLES OF SITAGLIPTIN MICROSPHERES

REVATHI S*, DHANARAJU MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India. Email: revathis79@gmail.com

Received: 01 December 2017, Revised and Accepted: 11 January 2018

ABSTRACT

Objective: The study is to formulate and assess the effects of different variables on the release profile of sitagliptin microspheres.

Methods: The microspheres were prepared by emulsion-solvent diffusion method and ionotropic gelation method using ethyl cellulose and sodium alginate as the polymers, respectively. The formulations are optimized by applying 2^3 factorial design based on the drug-polymer ratio, stirring speed, and method of preparation.

Results: The drug-polymer interaction was checked by the Fourier-transform infrared spectroscopy and differential scanning calorimetry the results of which indicated no incompatibility. The formulated sitagliptin microspheres were evaluated for shape, morphology, particle size, the degree of swelling, encapsulation efficiency, *in vitro* drug release studies for 12 h, and kinetics of drug release.

Conclusion: The results showed that the drug-polymer ratio and stirring speed affected the particle size and drug release. The release of the drug was found to be sustained, and diffusion path is following cube root law of Hixson-Crowell kinetics. The batch F3 was found to be desirable and was further characterized by scanning electron microscope for morphology.

Keywords: Sitagliptin, Factorial, Ethyl cellulose, Solvent diffusion.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i4.24068

INTRODUCTION

Microspheres are impregnable particles ranging from 1 μm to 1 mm containing dispersed medication in either solution or microcrystalline contour. Microcapsules are belittled particles that contain a dynamic agent as a gist material and coating agent as a shell. At present, there is no generally acknowledged size range that particle must have to be named as microcapsules. Commercial microcapsules ordinarily have a width between 3 and 80 μm and contain 10–90 weight % cores. The microsphere is a quickly extending innovation. It is the way of applying moderately thin coatings to little particles of solids or droplets of fluids and dispersions [1]. The microsphere is accepting impressive consideration generally, formative and industrially. The microspheres comprise proteins or biodegradable polymers in nature which are usually free streaming powders. Strong biodegradable microcapsules consolidating a medication dispelled or dethawed all through the molecule framework have the potential for the controlled arrival of medication [2].

The World Health Organization stated that more than 180 million persons are suffering from abnormal high glucose level globally. The predominance of diabetes is anticipated to two-fold in next 15 years, goaded by untoward way of life changes. Sitagliptin is the new and foremost drug in this new class of medications to be sanctioned by Food and Drug Administration. For the patients who are not able to maintain the control over blood glucose, sitagliptin helps in keeping them in control. Sitagliptin has been affirmed as a monotherapy and as an extra treatment to two different sorts of oral diabetes meds, metformin, and thiazolidinediones. perhaps, sitagliptin is useful in averting diabetes in those patients with prediabetes [3].

MATERIALS

Sitagliptin is obtained as gift sample from Richer Pharmaceuticals, Hyderabad. Ethyl cellulose and sodium alginate are obtained as gift samples from Maan Pharmaceuticals, Ahmedabad. All other chemicals used were of analytical grade.

Compatibility study of drug and the polymer

Fourier-transform infrared absorption spectra: 2 mg of the substance being examined was triturated with 300–400 mg of finely powdered and dried potassium bromide. This quantity was usually sufficient to give a disc of 13 mm diameter and a spectrum of suitable intensity. The mixture was ground carefully, spread it uniformly in a suitable die, and submit in a vacuum to a pressure of about 800 MPa ($8t.cm^{-2}$) [4].

Differential scanning calorimetry (DSC)

Thermal analyses of sitagliptin, ethyl cellulose, sodium alginate, calcium chloride, and physical mixture were performed using a DSC to study the thermal behavior of samples. All samples were heated in hermetically sealed aluminum pans at a constant scanning rate of 10°C/min from 40 to 260°C applying the minimum possible pressure under a nitrogen atmosphere. An empty aluminum pan was used as reference [5].

Formulation of sitagliptin microspheres

The sitagliptin microspheres are prepared by emulsion solvent diffusion method (ESD) and ionotropic gelation (IG) method.

ESD method

The drug sitagliptin was dissolved in 15 ml of acetone. Ethyl cellulose is dissolved in the solvent mixture of ethanol and dichloromethane (1:1). The drug is then dispersed in the polymer solution and stirred well for uniform dispersion. The polymer solution containing drug was then emulsified in an aqueous phase containing 100 ml of 0.1% Tween 80 and stirred well with a mechanical stirrer for 2 h at room temperature to allow the volatile solvent to evaporate. The prepared microspheres were then collected on Whatman filter paper, dried and stored in desiccator [6,7].

IG method

Sodium alginate was dissolved in distilled water, and the drug was dispersed in the polymer solution with vigorous agitation. The

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296, (A.P.)

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Online - 2455-3891
Print - 0974-2441

Vol 11, Issue 4, 2018

Research Article

FABRICATION AND EFFECT OF PROCESS VARIABLES OF SITAGLIPTIN MICROSPHERES

REVATHI S*, DHANARAJU MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India. Email: revathis79@gmail.com

Received: 01 December 2017, Revised and Accepted: 11 January 2018

ABSTRACT

Objective: The study is to formulate and assess the effects of different variables on the release profile of sitagliptin microspheres.

Methods: The microspheres were prepared by emulsion-solvent diffusion method and ionotropic gelation method using ethyl cellulose and sodium alginate as the polymers, respectively. The formulations are optimized by applying 2^3 factorial design based on the drug-polymer ratio, stirring speed, and method of preparation.

Results: The drug-polymer interaction was checked by the Fourier-transform infrared spectroscopy and differential scanning calorimetry the results of which indicated no incompatibility. The formulated sitagliptin microspheres were evaluated for shape, morphology, particle size, the degree of swelling, encapsulation efficiency, *in vitro* drug release studies for 12 h, and kinetics of drug release.

Conclusion: The results showed that the drug-polymer ratio and stirring speed affected the particle size and drug release. The release of the drug was found to be sustained, and diffusion path is following cube root law of Hixson-Crowell kinetics. The batch F3 was found to be desirable and was further characterized by scanning electron microscope for morphology.

Keywords: Sitagliptin, Factorial, Ethyl cellulose, Solvent diffusion.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i4.24068

INTRODUCTION

Microspheres are impregnable particles ranging from 1 μm to 1 mm containing dispersed medication in either solution or microcrystalline contour. Microcapsules are belittled particles that contain a dynamic agent as a gist material and coating agent as a shell. At present, there is no generally acknowledged size range that particle must have to be named as microcapsules. Commercial microcapsules ordinarily have a width between 3 and 80 μm and contain 10–90 weight % cores. The microsphere is a quickly extending innovation. It is the way of applying moderately thin coatings to little particles of solids or droplets of fluids and dispersions [1]. The microsphere is accepting impressive consideration generally, formative and industrially. The microspheres comprise proteins or biodegradable polymers in nature which are usually free streaming powders. Strong biodegradable microcapsules consolidating a medication dispelled or dethawed all through the molecule framework have the potential for the controlled arrival of medication [2].

The World Health Organization stated that more than 180 million persons are suffering from abnormal high glucose level globally. The predominance of diabetes is anticipated to two-fold in next 15 years, goaded by untoward way of life changes. Sitagliptin is the new and foremost drug in this new class of medications to be sanctioned by Food and Drug Administration. For the patients who are not able to maintain the control over blood glucose, sitagliptin helps in keeping them in control. Sitagliptin has been affirmed as a monotherapy and as an extra treatment to two different sorts of oral diabetes meds, metformin, and thiazolidinediones. perhaps, sitagliptin is useful in averting diabetes in those patients with prediabetes [3].

MATERIALS

Sitagliptin is obtained as gift sample from Richer Pharmaceuticals, Hyderabad. Ethyl cellulose and sodium alginate are obtained as gift samples from Maan Pharmaceuticals, Ahmedabad. All other chemicals used were of analytical grade.

Compatibility study of drug and the polymer

Fourier-transform infrared absorption spectra: 2 mg of the substance being examined was triturated with 300–400 mg of finely powdered and dried potassium bromide. This quantity was usually sufficient to give a disc of 13 mm diameter and a spectrum of suitable intensity. The mixture was ground carefully, spread it uniformly in a suitable die, and submit in a vacuum to a pressure of about 800 MPa ($8t.cm^{-2}$) [4].

Differential scanning calorimetry (DSC)

Thermal analyses of sitagliptin, ethyl cellulose, sodium alginate, calcium chloride, and physical mixture were performed using a DSC to study the thermal behavior of samples. All samples were heated in hermetically sealed aluminum pans at a constant scanning rate of 10°C/min from 40 to 260°C applying the minimum possible pressure under a nitrogen atmosphere. An empty aluminum pan was used as reference [5].

Formulation of sitagliptin microspheres

The sitagliptin microspheres are prepared by emulsion solvent diffusion method (ESD) and ionotropic gelation (IG) method.

ESD method

The drug sitagliptin was dissolved in 15 ml of acetone. Ethyl cellulose is dissolved in the solvent mixture of ethanol and dichloromethane (1:1). The drug is then dispersed in the polymer solution and stirred well for uniform dispersion. The polymer solution containing drug was then emulsified in an aqueous phase containing 100 ml of 0.1% Tween 80 and stirred well with a mechanical stirrer for 2 h at room temperature to allow the volatile solvent to evaporate. The prepared microspheres were then collected on Whatman filter paper, dried and stored in desiccator [6,7].

IG method

Sodium alginate was dissolved in distilled water, and the drug was dispersed in the polymer solution with vigorous agitation. The

DOI: 10.1515/cipms-2018-0009

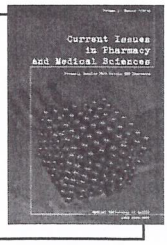
Curr. Issues Pharm. Med. Sci., Vol. 31, No. 1, Pages 39-43

DE GRUYTER OPEN

Current Issues in Pharmacy and Medical Sciences

Formerly ANNALES UNIVERSITATIS MARIAE CURIE-SKLODOWSKA, SECTIO DDD, PHARMACIA

journal homepage: http://www.curipms.umlub.pl/



Stability indicating HPLC method for the simultaneous determination of dapagliflozin and saxagliptin in bulk and tablet dosage form

THIYAGARAJAN DEEPAN[1,2], MAGHARLA DASARATHA DHANARAJU[2*]

[1] Research Scholar, Krishna University, Andhra Pradesh, India

[2] Research Lab., GIET School of Pharmacy, Chaitanya Knowledge City, Rajahmundry, 533294 Andhra Pradesh, India

ARTICLE INFO

Received 09 October 2017
Accepted 08 January 2018

Keywords:
Dapagliflozin,
Saxagliptin,
HPLC,
degradation studies,
stability indicating.

ABSTRACT

A simple, fast, and highly selective RP-HPLC method was developed for the determination of Dapagliflozin (DAP) and Saxagliptin (SAX) in API and tablet dosage form. The separation was done using a Xterra RP18 (4.6×150 mm, 5 µm particle size) column with Acetonitrile: water (60:40). The isocratic elution mode at a flow rate of 1 mL/min, and the analytes were measured at 248 nm. The retention time for DAP and SAX were about 2.091 and 3.249 min, respectively. Calibration curves were found to be linear in the ranges of 100-500 µg/ml for DAP and 50-250 µg/ml for SAX, with correlation coefficients of 0.9998. The detection and quantification values for DAP was 3.0 and 9.98 µg/ml and SAX was 3.02 and 10 µg/ml respectively.

INTRODUCTION

Dapagliflozin is chemically known as (1S)-1, 5-anhydro-1-C-[4-chloro-3-[(4-ethoxyphenyl) methyl] phenyl]-D-glucitol (Fig. 1a). Saxagliptin is chemically known as (1S,3S,5S)-2-{(2S)-2Amino-2-[(1r,3R,5R,7S)-3-hydroxyadamantan-1-yl]acetyl}-2-azabicyclo[3.1.0] hexane-3 carbonitrile [1,2] (Fig. 1b). A Literature survey shows that numerous analytical methods are reported for the individual estimation of DAP and SAX or with other pharmaceutical preparations, by various methods such as UV spectrophotometry [3] HPLC [4-8], HPTLC [10,11], UPLC [12], LC MS [13-15]. On the other hand, there is no method reported for dapagliflozin and saxagliptin by HPLC. Hence there is a need for a sensitive HPLC method which is stable and indicating for DAP and SAX. Stability studies was carried out by forcing the drug under variety of stress conditions such as thermal, oxidative, light and hydrolysis (acid and base), The established HPLC method was validated as per ICH guidelines [16].

MATERIALS AND METHODS

Chemicals

DAP and SAX were obtained as a gift from Glenmark Pharma&Piramal healthcare (India). Fixed dose combination of tablet formulation Qtern tablets (AstraZeneca) containing 10 mg/5 mg of DAP and SAX were procured form local market. HPLC grade acetonitrile and water were procured from Merck, India. A membrane filter of 0.45 µm porosity was used to filter and degassed the mobile phase. Chemicals used were of analytical or HPLC grade.

Instrumentation and materials

Waters HPLC 2695 was used for analysis. The separation was done on a UV detector and sampling was done by auto sampler. Data collection for chromatogram was done by empower software 2. The column used was Xterra column (150×4.6 mm) with mobile phase composition of

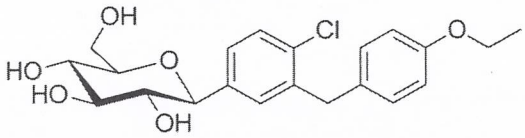


Figure 1a. Structure of Dapagliflozin

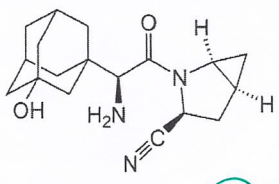


Figure 1b. Structure of Saxagliptin

* Corresponding author
e-mail: mddhanaraju@yahoo.com; mddhanaraju@gmail.com

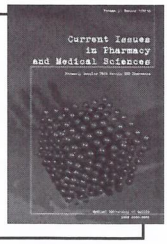
DOI: 10.1515/cipms-2018-0009 Curr. Issues Pharm. Med. Sci., Vol. 31, No. 1, Pages 39-43

DE GRUYTER OPEN

Current Issues in Pharmacy and Medical Sciences

Formerly ANNALES UNIVERSITATIS MARIAE CURIE-SKLODOWSKA, SECTIO DDD, PHARMACIA

journal homepage: http://www.curipms.umlub.pl/



Stability indicating HPLC method for the simultaneous determination of dapagliflozin and saxagliptin in bulk and tablet dosage form

THIYAGARAJAN DEEPAN[1,2], MAGHARLA DASARATHA DHANARAJU[2*]

[1] Research Scholar, Krishna University, Andhra Pradesh, India

[2] Research Lab., GIET School of Pharmacy, Chaitanya Knowledge City, Rajahmundry, 533294 Andhra Pradesh, India

ARTICLE INFO

Received 09 October 2017
Accepted 08 January 2018

Keywords:
Dapagliflozin,
Saxagliptin,
HPLC,
degradation studies,
stability indicating.

ABSTRACT

A simple, fast, and highly selective RP-HPLC method was developed for the determination of Dapagliflozin (DAP) and Saxagliptin (SAX) in API and tablet dosage form. The separation was done using a Xterra RP18 (4.6×150 mm, 5 µm particle size) column with Acetonitrile: water (60:40). The isocratic elution mode at a flow rate of 1 mL/min, and the analytes were measured at 248 nm. The retention time for DAP and SAX were about 2.091 and 3.249 min, respectively. Calibration curves were found to be linear in the ranges of 100-500 µg/ml for DAP and 50-250 µg/ml for SAX, with correlation coefficients of 0.9998. The detection and quantification values for DAP was 3.0 and 9.98 µg/ml and SAX was 3.02 and 10 µg/ml respectively.

INTRODUCTION

Dapagliflozin is chemically known as (1S)-1, 5-anhydro-1-C-[4-chloro-3-[(4-ethoxyphenyl) methyl] phenyl]-D-glucitol (Fig. 1a). Saxagliptin is chemically known as (1S,3S,5S)-2-{(2S)-2Amino-2-[(1r,3R,5R,7S)-3-hydroxyadamantan-1-yl]acetyl}-2-azabicyclo[3.1.0] hexane-3 carbonitrile [1,2] (Fig. 1b). A Literature survey shows that numerous analytical methods are reported for the individual estimation of DAP and SAX or with other pharmaceutical preparations, by various methods such as UV spectrophotometry [3] HPLC [4-8], HPTLC [10,11], UPLC [12], LC MS [13-15]. On the other hand, there is no method reported for dapagliflozin and saxagliptin by HPLC. Hence there is a need for a sensitive HPLC method which is stable and indicating for DAP and SAX. Stability studies was carried out by forcing the drug under variety of stress conditions such as thermal, oxidative, light and hydrolysis (acid and base), The established HPLC method was validated as per ICH guidelines [16].

MATERIALS AND METHODS

Chemicals

DAP and SAX were obtained as a gift from Glenmark Pharma&Piramal healthcare (India). Fixed dose combination of tablet formulation Qtern tablets (AstraZeneca) containing 10 mg/5 mg of DAP and SAX were procured form local market. HPLC grade acetonitrile and water were procured from Merck, India. A membrane filter of 0.45 µm porosity was used to filter and degassed the mobile phase. Chemicals used were of analytical or HPLC grade.

Instrumentation and materials

Waters HPLC 2695 was used for analysis. The separation was done on a UV detector and sampling was done by auto sampler. Data collection for chromatogram was done by empower software 2. The column used was Xterra column (150×4.6 mm) with mobile phase composition of

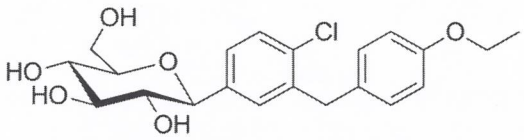


Figure 1a. Structure of Dapagliflozin

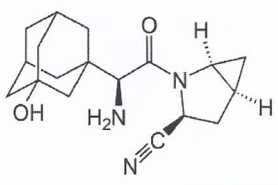


Figure 1b. Structure of Saxagliptin

* **Corresponding author**
e-mail: mddhanaraju@yahoo.com; mddhanaraju@gmail.com

Beni-Suef University Journal of Basic and Applied Sciences 7 (2018) 291–298

HOSTED BY

ELSEVIER

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Full Length Article

Synthesis, spectroscopy characterization and biological activities of some novel 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl) propylidene semicarbazone Mannich base derivatives

Chandravadivelu Gopi*, Magharla Dasaratha Dhanaraju

Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

ARTICLE INFO

Keywords:
Thiophene
Mannich base
Condensation reaction
Anti-inflammatory agent
Anti-diabetic agent

ABSTRACT

The main aim of this work was to synthesise a novel 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl) propylidene semicarbazone Mannich base derivatives and examine the anti-diabetic and anti-inflammatory activities using alloxan-induced diabetic and carrageenan-induced paw oedema methods. These analogues were prepared by performing a condensation reaction between 1-(thiophen 2-yl) ethanone, formaldehyde, *N*,*N*-dimethyl amine hydrochloride and semicarbazide. The prepared analogues were characterised by FT-IR, ^{1}H NMR, ^{13}C NMR, mass spectroscopy and elemental analysis. The result reveals that most of the compounds were significantly reduced in the blood glucose level and inflammation of paw volume of experimental animals as compared to the standard drugs.

1. Introduction

The Mannich base is prepared from the condensation reaction of aromatic ketone, aldehyde and primary or secondary amine in alcohol. It deals with an amino alkylation of an acidic proton placed next to a carbonyl functional group of the aromatic ketone by formaldehyde and a primary or secondary amine. The reaction is named as a Mannich reaction after Carl Mannich, who first discovered it in 1912. The literature study reveals that the Mannich base can be modified into their derivative by simple chemical reactions and they are the key intermediate for the preparation of various bioactive molecules. They are responsible for different pharmacological activities, such as anti-inflammatory (Prasanna and Saleel, 2015), anticancer (Bhupendra et al., 2016), antipyretic (Kumar et al., 2016), antibacterial (Bogdanov et al., 2016), antifungal (Idhayadhulla et al., 2014), anticonvulsant (Rybka et al., 2016), anthelmintic (Joshi et al., 2004), antitubercular (Lahbib et al., 2013), analgesic (Datar and Limaye, 2015), anti-HIV (Sah et al., 2014), anti-malarial (Francisca et al., 2004), antipsychotic (Shaw et al., 2010), antiviral (Roman, 2015) agent etc.

Thiophene and their derivatives have been widely distributed in many of the naturally occurring compounds and are employed in different health hazards. They are responsible for varying biological activity such as anti-inflammatory (Molvi et al., 2008), antipyretic (Gouda et al., 2016), anti-hypotensive (Desai et al., 2014), anti-convulsant (Deep et al., 2016), anti-viral (Fathima et al., 2011), antitumour (Pulipati et al., 2016), fungicidal (Wang et al., 2015), herbicidal (Benachenhou et al., 2013), anti-microbial (Rani and Mohamad, 2014) and plant-growth regulator (Baert et al., 2016). In the present study, aforesaid benefits of a Mannich base and thiophene heterocyclic nucleus promoted us to prepare a series of novel 4-(dimethylamino)-1-(thiophen-2-yl) butan-1-one derivatives holding both pharmacophore and evaluate for anti-diabetic, anti-inflammatory activities. These analogues were prepared from appropriate raw materials and structures were elucidated by FT-IR, ^{1}H NMR, ^{13}C NMR, mass spectroscopy and X-ray crystallography studies. The experimental result suggested that most of the test compounds are possessing admirable anti-diabetic and anti-inflammatory activities. The potency of new series of 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl)propylidene semicarbazone Mannich base derivatives [**4a–f**] based on the modification of side chain groups in the thiophene nucleus. Accordingly, *in vitro* anti-inflammatory and anti-diabetic activities of these derivatives as a thiophene analogue [**4a–f**] in which (i) bromo, nitro, chloro, sulphonic acid substitution at 5 position of thiophene ring are important for anti-inflammatory and anti-diabetic activities, were maintained in compounds (**4f**, **4a**, **4e**, **4b**); (ii) whereas, CH_3 and C_2H_5 group at 5 position of thiophene ring (**4c** and **4d**) would be favourable for the mentioned activity; (iii) semicarbazone Mannich base group at 2 position of thiophene ring is expected to offer better anti-inflammatory and anti-diabetic activity (Fig. 1).

* Corresponding author at: GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533 296, India.
E-mail address: gopi@giet.ac.in (C. Gopi).

https://doi.org/10.1016/j.bjbas.2018.02.004
Received 12 December 2017; Received in revised form 13 February 2018; Accepted 19 February 2018
Available online 22 February 2018

Beni-Suef University Journal of Basic and Applied Sciences 7 (2018) 291–298

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Full Length Article

Synthesis, spectroscopy characterization and biological activities of some novel 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl) propylidene semicarbazone Mannich base derivatives

Chandravadivelu Gopi*, Magharla Dasaratha Dhanaraju

Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India

ARTICLE INFO

Keywords:
Thiophene
Mannich base
Condensation reaction
Anti-inflammatory agent
Anti-diabetic agent

ABSTRACT

The main aim of this work was to synthesise a novel 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl) propylidene semicarbazone Mannich base derivatives and examine the anti-diabetic and anti-inflammatory activities using alloxan-induced diabetic and carrageenan-induced paw oedema methods. These analogues were prepared by performing a condensation reaction between 1-(thiophen 2-yl) ethanone, formaldehyde, *N*,*N*-dimethyl amine hydrochloride and semicarbazide. The prepared analogues were characterised by FT-IR, ^{1}H NMR, ^{13}C NMR, mass spectroscopy and elemental analysis. The result reveals that most of the compounds were significantly reduced in the blood glucose level and inflammation of paw volume of experimental animals as compared to the standard drugs.

1. Introduction

The Mannich base is prepared from the condensation reaction of aromatic ketone, aldehyde and primary or secondary amine in alcohol. It deals with an amino alkylation of an acidic proton placed next to a carbonyl functional group of the aromatic ketone by formaldehyde and a primary or secondary amine. The reaction is named as a Mannich reaction after Carl Mannich, who first discovered it in 1912. The literature study reveals that the Mannich base can be modified into their derivative by simple chemical reactions and they are the key intermediate for the preparation of various bioactive molecules. They are responsible for different pharmacological activities, such as anti-inflammatory (Prasanna and Saleel, 2015), anticancer (Bhupendra et al., 2016), antipyretic (Kumar et al., 2016), antibacterial (Bogdanov et al., 2016), antifungal (Idhayadhulla et al., 2014), anticonvulsant (Rybka et al., 2016), anthelmintic (Joshi et al., 2004), antitubercular (Lahbib et al., 2013), analgesic (Datar and Limaye, 2015), anti-HIV (Sah et al., 2014), anti-malarial (Francisca et al., 2004), antipsychotic (Shaw et al., 2010), antiviral (Roman, 2015) agent etc.

Thiophene and their derivatives have been widely distributed in many of the naturally occurring compounds and are employed in different health hazards. They are responsible for varying biological activity such as anti-inflammatory (Molvi et al., 2008), antipyretic (Gouda et al., 2016), anti-hypotensive (Desai et al., 2014), anti-convulsant (Deep et al., 2016), anti-viral (Fathima et al., 2011), antitumour (Pulipati et al., 2016), fungicidal (Wang et al., 2015), herbicidal (Benachenhou et al., 2013), anti-microbial (Rani and Mohamad, 2014) and plant-growth regulator (Baert et al., 2016). In the present study, aforesaid benefits of a Mannich base and thiophene heterocyclic nucleus promoted us to prepare a series of novel 4-(dimethylamino)-1-(thiophen-2-yl) butan-1-one derivatives holding both pharmacophore and evaluate for anti-diabetic, anti-inflammatory activities. These analogues were prepared from appropriate raw materials and structures were elucidated by FT-IR, ^{1}H NMR, ^{13}C NMR, mass spectroscopy and X-ray crystallography studies. The experimental result suggested that most of the test compounds are possessing admirable anti-diabetic and anti-inflammatory activities. The potency of new series of 1-(3-(*N*,*N*-dimethylamino)-1-(5-substituted thiophene-2-yl)propylidene semicarbazone Mannich base derivatives [**4a–f**] based on the modification of side chain groups in the thiophene nucleus. Accordingly, *in vitro* anti-inflammatory and anti-diabetic activities of these derivatives as a thiophene analogue [**4a–f**] in which (i) bromo, nitro, chloro, sulphonic acid substitution at 5 position of thiophene ring are important for anti-inflammatory and anti-diabetic activities, were maintained in compounds (**4f, 4a, 4e, 4b**); (ii) whereas, CH_3 and C_2H_5 group at 5 position of thiophene ring (**4c** and **4d**) would be favourable for the mentioned activity; (iii) semicarbazone Mannich base group at 2 position of thiophene ring is expected to offer better anti-inflammatory and anti-diabetic activity (Fig. 1).

* Corresponding author at: GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh 533 296, India.
E-mail address: gopi@giet.ac.in (C. Gopi).

https://doi.org/10.1016/j.bjbas.2018.02.004
Received 12 December 2017; Received in revised form 13 February 2018; Accepted 19 February 2018
Available online 22 February 2018

IJPSR (2018), Volume 9, Issue 11 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 04 March, 2018; received in revised form, 13 May, 2018; accepted, 31 May, 2018; published 01 November, 2018

DESIGN DEVELOPMENT AND EVALUATION OF GASTRO RETENTIVE FLOATING MICROSPHERES OF ATAZANAVIR SULFATE

V. D. Sundar *, P. Divya, G. Suneendra and M. D. Dhanaraju

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry - 533296, Andhra Pradesh, India.

Keywords:

Atazanavir sulfate, Floating microspheres, Hydroxyl propyl methyl cellulose, Propylene glycol, Eudragit E 100

Correspondence to Author:
Dr. V. D. Sundar

Professor,
Department of Pharmaceutics,
GIET School of Pharmacy,
NH -16, Chaitanya Knowledge City, Rajahmundry - 533296,
Andhra Pradesh, India.

E-mail: sundarvd@yahoo.co.in

ABSTRACT: The purpose of present study was to formulate the gastro-retentive floating microspheres of atazanavir sulfate to be retentive in the stomach for prolonged period of time. The gastro-retentive floating microspheres were prepared by double emulsion $w_1/o/w_2$ solvent evaporation technique and characterization for particle size, SEM, floating time, FTIR, DSC, and entrapment efficiency. The *in-vitro* drug release studies and *in-vitro* drug kinetics were performed for different formulations. FTIR and DSC studies revealed that the drug is compatible with excipients. The floating time of the floating microspheres was found to be > 12h. The particle size of all the formulations was evaluated by optical microscopy method. Formulation F1 - F4 comprising HPMC as rate retarding polymer exhibits an average particle size of about 515.25µm and microspheres F5 – F8 prepared with eudragit exhibit a mean particle of about 611.4 µm. Eudragit formulations exhibit an increased entrapment efficiency which is due to its large particle size and increased viscosity. All batches prepared show an initial burst release followed by sustained release. Formulation F 1 to F4 exhibits an *in vitro* release of 67.8%, 70.9%, 77.8% and 87% respectively at the end of 10^{th} h. Formulation F5 to F8 exhibits a release of 36.1%, 54.6%, 57.6% and 67.8% respectively at the end of 10^{th} h. Among all the formulations, F4 prepared with combination of HPMC and ethyl cellulose exhibits sustained release behavior. The developed floating microspheres assure the delivery of drug for a prolonged period of time.

INTRODUCTION: Gastro retentive floating microspheres are low density systems that have sufficient buoyancy to float over gastric contents and remain in stomach for prolonged period. As the system floats over the gastric contents the drug is released slowly at desired rate resulting in increased gastric retention with reduced fluctuations in plasma drug concentration.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(11).4642-50

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(11).4642-50

Prolonged retention in the upper GIT tract can greatly improve the oral bioavailability and their therapeutic outcome. The pH dependent solubility and stability level plays an important role in its absorption. Microencapsulation has been used as a one of the methods to deliver drug in control and sustained manner therefore it is evident that a gastric floating based drug delivery system will be best suit the purpose of our dosage form design[1].

Various approaches have been pursued to increase the retention of the dosage form in the gastrointestinal tract. These techniques make use of the various physiological and anatomical characteristics of the stomach. Expandable systems, bio-muco adhesive system, floating drug delivery

IJPSR (2018), Volume 9, Issue 11 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 04 March, 2018; received in revised form, 13 May, 2018; accepted, 31 May, 2018; published 01 November, 2018

DESIGN DEVELOPMENT AND EVALUATION OF GASTRO RETENTIVE FLOATING MICROSPHERES OF ATAZANAVIR SULFATE

V. D. Sundar *, P. Divya, G. Suneendra and M. D. Dhanaraju

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry - 533296, Andhra Pradesh, India.

Keywords:

Atazanavir sulfate, Floating microspheres, Hydroxyl propyl methyl cellulose, Propylene glycol, Eudragit E 100

Correspondence to Author:
Dr. V. D. Sundar

Professor,
Department of Pharmaceutics,
GIET School of Pharmacy,
NH -16, Chaitanya Knowledge City, Rajahmundry - 533296,
Andhra Pradesh, India.

E-mail: sundarvd@yahoo.co.in

ABSTRACT: The purpose of present study was to formulate the gastro-retentive floating microspheres of atazanavir sulfate to be retentive in the stomach for prolonged period of time. The gastro-retentive floating microspheres were prepared by double emulsion $w_1/o/w_2$ solvent evaporation technique and characterization for particle size, SEM, floating time, FTIR, DSC, and entrapment efficiency. The *in-vitro* drug release studies and *in-vitro* drug kinetics were performed for different formulations. FTIR and DSC studies revealed that the drug is compatible with excipients. The floating time of the floating microspheres was found to be > 12h. The particle size of all the formulations was evaluated by optical microscopy method. Formulation F1 - F4 comprising HPMC as rate retarding polymer exhibits an average particle size of about 515.25µm and microspheres F5 – F8 prepared with eudragit exhibit a mean particle of about 611.4 µm. Eudragit formulations exhibit an increased entrapment efficiency which is due to its large particle size and increased viscosity. All batches prepared show an initial burst release followed by sustained release. Formulation F 1 to F4 exhibits an *in vitro* release of 67.8%, 70.9%, 77.8% and 87% respectively at the end of 10th h. Formulation F5 to F8 exhibits a release of 36.1%, 54.6%, 57.6% and 67.8% respectively at the end of 10th h. Among all the formulations, F4 prepared with combination of HPMC and ethyl cellulose exhibits sustained release behavior. The developed floating microspheres assure the delivery of drug for a prolonged period of time.

INTRODUCTION: Gastro retentive floating microspheres are low density systems that have sufficient buoyancy to float over gastric contents and remain in stomach for prolonged period. As the system floats over the gastric contents the drug is released slowly at desired rate resulting in increased gastric retention with reduced fluctuations in plasma drug concentration.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(11).4642-50

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(11).4642-50

Prolonged retention in the upper GIT tract can greatly improve the oral bioavailability and their therapeutic outcome. The pH dependent solubility and stability level plays an important role in its absorption. Microencapsulation has been used as a one of the methods to deliver drug in control and sustained manner therefore it is evident that a gastric floating based drug delivery system will be best suit the purpose of our dosage form design[1].

Various approaches have been pursued to increase the retention of the dosage form in the gastrointestinal tract. These techniques make use of the various physiological and anatomical characteristics of the stomach. Expandable systems, bio-muco adhesive system, floating drug delivery

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 8, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

DESIGN, FORMULATION, AND CHARACTERIZATION OF LIPOSOMAL-ENCAPSULATED GEL FOR TRANSDERMAL DELIVERY OF FLUCONAZOLE

PRINCELY S*, DHANARAJU MD

Department of Pharmaceutical Biotechnology, Research Laboratory, GIET School of Pharmacy, Rajahmundry - 533 296, Andhra Pradesh, India. Email: sprincelympharm@gmail.com

Received: 03 March 2018, Revised and Accepted: 09 May 2018

ABSTRACT

Objectives: The present objective for the study was to prepare proliposomal gel bearing an antifungal agent, fluconazole (FLZ) intended for topical application.

Methods: Various proliposome formulations were prepared using thin-film hydration technique by varying the lipid phase composition (phosphatidylcholine/cholesterol). Proliposome formulations were characterized for vesicle size, vesicle size distribution, vesicle morphology, drug content, entrapment efficiency, percentage yield value, storage stability analysis, Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), *in vitro* diffusion study, release kinetic studies, and antifungal activity. Topical proliposomal gels were prepared by incorporation of lyophilized proliposome into a structured vehicle carbopol 934 (2.5%).

Results: A spherical shape of reconstituted FLZ liposome with an average vesicle about 5–8 μm was observed in photomicrographs. The percentage entrapment of drug was increased with increase in phospholipid composition in the range of 55.13–69.61%. The FTIR and DSC studies showed no possible drug-excipient interaction. Proliposomal gel showed the prolonged release of FLZ than the lyophilized liposomes. The release kinetic values of regression coefficients confirmed the diffusion-dependent release of the drug. Stability studies indicated that product is stable and should be stored at low temperature.

Conclusion: The proposed FLZ proliposomal gel showed sustained release with enhanced antifungal activity implicating its potential in effective transdermal delivery for the topical pharmacotherapy.

Keywords: Fluconazole (FLZ), Proliposome, Gel, Release kinetics, Transdermal delivery.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i8.25621

INTRODUCTION

Liposome is a microparticulate colloidal vesicle, in which aqueous medium is surrounded by single or multiple concentric layers of phospholipids. Due to their size, both hydrophilic and hydrophobic drugs (besides biocompatibility) can be incorporated, water-soluble drug being entrapped in aqueous core and fat-soluble drug in phospholipids [1,2]. It offers controlled release, targeted drug delivery, thus enhancing therapeutic efficacy, and reduced dosing frequency. Therapeutically, these are used as a carrier for drugs, viruses, bacteria, antigen, peptides, antibiotics, vaccines, genes, and diagnostic agents [3,4].

Liposomes are small artificial vesicles of spherical shape that can be created from cholesterol and natural nontoxic phospholipids. Liposome properties differ considerably with lipid composition, surface charge, size, and the method of preparation. Furthermore, the choice of bilayer components determines the "rigidity" or "fluidity" and the charge of the bilayer. For instance, unsaturated phosphatidylcholine (PC) species from natural sources (egg or soybean PC) give much more permeable and less stable bilayers, whereas the saturated phospholipids with long acyl chains (e.g., dipalmitoyl PC) form a rigid, rather impermeable bilayer structure [2].

In general, liposomes are definite as spherical vesicles with particle sizes ranging from 30 nm to several micrometers. They consist of one or more lipid bilayers surrounding aqueous units, where the polar head groups are oriented in the pathway of the interior and exterior aqueous phases. On the other hand, self-aggregation of polar lipids is not limited to conventional bilayer structures which rely on molecular shape, temperature, and environmental and preparation conditions but may self-assemble into various types of colloidal particles [5]. Liposomes are prepared using sonication, thin-film hydration, solvent dispersion method, and detergent removal methods. Drug loading can be attained either passively (i.e., the drug is encapsulated during liposome formation) or actively (i.e., after liposome formation) [6].

The liposome size can vary from very small (0.025 μm) to large (2.5 μm) vesicles. Moreover, liposomes may have one or bilayer membranes. The vesicle size is an acute parameter in determining the circulation half-life of liposomes, and both size and number of bilayers affect the amount of drug encapsulation in the liposomes. Liposomes can also be classified into one of two categories: (1) Multilamellar vesicles (MLV) and (2) unilamellar vesicles. Unilamellar vesicles can also be classified into two categories: (1) Large unilamellar vesicles and (2) small unilamellar vesicles. In unilamellar liposomes, the vesicle has a single phospholipid bilayer sphere enclosing the aqueous solution. In multilamellar liposomes, vesicles have an onion structure. Classically, several unilamellar vesicles will form on the inside of the other with smaller size, making a multilamellar structure of concentric phospholipid spheres separated by layers of water [7-9].

Liposomes are found to be suitable for localization of topically applied drugs at or near the site of application because they may act as slow-releasing vehicles. Topical drug delivery is a pleasing route for local and systemic treatment. The delivery of drug through topical route is the most effective treatment for the skin diseases [10]. Finally, liposomal drugs exhibit reduced toxicities and retain enhanced efficacy compared with free complements. However, based on the pharmaceutical

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Issue 8, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

DESIGN, FORMULATION, AND CHARACTERIZATION OF LIPOSOMAL-ENCAPSULATED GEL FOR TRANSDERMAL DELIVERY OF FLUCONAZOLE

PRINCELY S*, DHANARAJU MD

Department of Pharmaceutical Biotechnology, Research Laboratory, GIET School of Pharmacy, Rajahmundry - 533 296, Andhra Pradesh, India. Email: sprincelympharm@gmail.com

Received: 03 March 2018, Revised and Accepted: 09 May 2018

ABSTRACT

Objectives: The present objective for the study was to prepare proliposomal gel bearing an antifungal agent, fluconazole (FLZ) intended for topical application.

Methods: Various proliposome formulations were prepared using thin-film hydration technique by varying the lipid phase composition (phosphatidylcholine/cholesterol). Proliposome formulations were characterized for vesicle size, vesicle size distribution, vesicle morphology, drug content, entrapment efficiency, percentage yield value, storage stability analysis, Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), *in vitro* diffusion study, release kinetic studies, and antifungal activity. Topical proliposomal gels were prepared by incorporation of lyophilized proliposome into a structured vehicle carbopol 934 (2.5%).

Results: A spherical shape of reconstituted FLZ liposome with an average vesicle about 5–8 μm was observed in photomicrographs. The percentage entrapment of drug was increased with increase in phospholipid composition in the range of 55.13–69.61%. The FTIR and DSC studies showed no possible drug-excipient interaction. Proliposomal gel showed the prolonged release of FLZ than the lyophilized liposomes. The release kinetic values of regression coefficients confirmed the diffusion-dependent release of the drug. Stability studies indicated that product is stable and should be stored at low temperature.

Conclusion: The proposed FLZ proliposomal gel showed sustained release with enhanced antifungal activity implicating its potential in effective transdermal delivery for the topical pharmacotherapy.

Keywords: Fluconazole (FLZ), Proliposome, Gel, Release kinetics, Transdermal delivery.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i8.25621

INTRODUCTION

Liposome is a microparticulate colloidal vesicle, in which aqueous medium is surrounded by single or multiple concentric layers of phospholipids. Due to their size, both hydrophilic and hydrophobic drugs (besides biocompatibility) can be incorporated, water-soluble drug being entrapped in aqueous core and fat-soluble drug in phospholipids [1,2]. It offers controlled release, targeted drug delivery, thus enhancing therapeutic efficacy, and reduced dosing frequency. Therapeutically, these are used as a carrier for drugs, viruses, bacteria, antigen, peptides, antibiotics, vaccines, genes, and diagnostic agents [3,4].

Liposomes are small artificial vesicles of spherical shape that can be created from cholesterol and natural nontoxic phospholipids. Liposome properties differ considerably with lipid composition, surface charge, size, and the method of preparation. Furthermore, the choice of bilayer components determines the "rigidity" or "fluidity" and the charge of the bilayer. For instance, unsaturated phosphatidylcholine (PC) species from natural sources (egg or soybean PC) give much more permeable and less stable bilayers, whereas the saturated phospholipids with long acyl chains (e.g., dipalmitoyl PC) form a rigid, rather impermeable bilayer structure [2].

In general, liposomes are definite as spherical vesicles with particle sizes ranging from 30 nm to several micrometers. They consist of one or more lipid bilayers surrounding aqueous units, where the polar head groups are oriented in the pathway of the interior and exterior aqueous phases. On the other hand, self-aggregation of polar lipids is not limited to conventional bilayer structures which rely on molecular shape, temperature, and environmental and preparation conditions but may self-assemble into various types of colloidal particles [5]. Liposomes are prepared using sonication, thin-film hydration, solvent dispersion method, and detergent removal methods. Drug loading can be attained either passively (i.e., the drug is encapsulated during liposome formation) or actively (i.e., after liposome formation) [6].

The liposome size can vary from very small (0.025 μm) to large (2.5 μm) vesicles. Moreover, liposomes may have one or bilayer membranes. The vesicle size is an acute parameter in determining the circulation half-life of liposomes, and both size and number of bilayers affect the amount of drug encapsulation in the liposomes. Liposomes can also be classified into one of two categories: (1) Multilamellar vesicles (MLV) and (2) unilamellar vesicles. Unilamellar vesicles can also be classified into two categories: (1) Large unilamellar vesicles and (2) small unilamellar vesicles. In unilamellar liposomes, the vesicle has a single phospholipid bilayer sphere enclosing the aqueous solution. In multilamellar liposomes, vesicles have an onion structure. Classically, several unilamellar vesicles will form on the inside of the other with smaller size, making a multilamellar structure of concentric phospholipid spheres separated by layers of water [7-9].

Liposomes are found to be suitable for localization of topically applied drugs at or near the site of application because they may act as slow-releasing vehicles. Topical drug delivery is a pleasing route for local and systemic treatment. The delivery of drug through topical route is the most effective treatment for the skin diseases [10]. Finally, liposomal drugs exhibit reduced toxicities and retain enhanced efficacy compared with free complements. However, based on the pharmaceutical

ISSN 2349-7203

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals

HUMAN

Human Journals
Research Article
May 2018 Vol.:12, Issue:2

Analytical Method Development for the Estimation of Darunavir by Ion-Pair Complex Using Visible Spectrophotometry

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

R. Vijayalakshmi*[1], D. Anjani[1], M. D. Dhanaraju[1]

*[1]*Research Lab, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City Rajahmahendravaram-533296. Andhra Pradesh*

Submission: 22 April 2018
Accepted: 28 April 2018
Published: 31 May 2018

Keywords: Darunavir; Bromo cresol green; Bromothymol blue; Validation.

ABSTRACT

Objective: This proposed work describes two simple, fast and extractive colorimetric methods for the estimation of Darunavir ethanolate with BCG (method A)/BTB (method B) in both bulk and tablet formulations. **Methods:** Both the methods were developed on Perkin Elmer (LAMBDA 25) UV–Visible Spectrophotometer interfaced with UV Winlab software and 1cm quartz cells. These methods focus on the formation of colored ion pair complex of Darunavir with acidic dyes (BCG/BTB). The methods were optimized as per standard optimization parameters. **Results:** The yellow colored products of Darunavir were quantified at 418 nm and 411nm with BCG and BTB, respectively. The linear relationship was observed between absorbance and the corresponding concentration of drug in the range of 20-140µg/ml and 40-140µg/ml, respectively for method A and B. The colorimetric methods were extensively validated as per ICH guidelines and all the parameters were within the acceptance criteria, with the correlation coefficient of 0.9999 and % RSD less than 2 for both the methods. The results of the accuracy studies were nearer to 100%.**Conclusion:** The methods were proved to be more accurate, simple, precise and rapid by statistical validation as well as recovery studies and could be used for routine analysis.

ISSN 2349-7203

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals

HUMAN

Human Journals
Research Article
May 2018 Vol.:12, Issue:2

Analytical Method Development for the Estimation of Darunavir by Ion-Pair Complex Using Visible Spectrophotometry

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

R. Vijayalakshmi*[1], D. Anjani[1], M. D. Dhanaraju[1]

*[1]*Research Lab, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City Rajahmahendravaram-533296. Andhra Pradesh*

Submission: 22 April 2018
Accepted: 28 April 2018
Published: 31 May 2018

Keywords: Darunavir; Bromo cresol green; Bromothymol blue; Validation.

ABSTRACT

Objective: This proposed work describes two simple, fast and extractive colorimetric methods for the estimation of Darunavir ethanolate with BCG (method A)/BTB (method B) in both bulk and tablet formulations. **Methods:** Both the methods were developed on Perkin Elmer (LAMBDA 25) UV–Visible Spectrophotometer interfaced with UV Winlab software and 1cm quartz cells. These methods focus on the formation of colored ion pair complex of Darunavir with acidic dyes (BCG/BTB). The methods were optimized as per standard optimization parameters. **Results:** The yellow colored products of Darunavir were quantified at 418 nm and 411nm with BCG and BTB, respectively. The linear relationship was observed between absorbance and the corresponding concentration of drug in the range of 20-140µg/ml and 40-140µg/ml, respectively for method A and B. The colorimetric methods were extensively validated as per ICH guidelines and all the parameters were within the acceptance criteria, with the correlation coefficient of 0.9999 and % RSD less than 2 for both the methods. The results of the accuracy studies were nearer to 100%.**Conclusion:** The methods were proved to be more accurate, simple, precise and rapid by statistical validation as well as recovery studies and could be used for routine analysis.

Middle-East Journal of Scientific Research 25 (7): 1451-1457, 2017
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2017.1451.1457

Bioanalytical Method Development and Validation for Metformin and Canagliflozin Drugs in Human Plasma by RP-HPLC Method

[1,2]T. Deepan, *[2]M.V. Basaveswara Rao and* *[1]M.D. Dhanaraju*

[1]GIET School of Pharmacy andhra Pradesh, India
[2]Krishna University andhra Pradesh, India

Abstract: A simple, sensitive and selective HPLC method was developed for the simultaneous determination for metformin and canagliflozin in human plasma using a novel sample extraction procedure. Solid phase extraction of metformin, canagliflozin and pioglitazone (as internal standard) from plasma samples was performed with phosphate buffer: Acetonitrile (85:15, v/v) adjusting to pH 3.0 with sodium hydroxide using Inertsil ODS C_{18} (4.6 x 250mm, 5µm). The flow rate 1.0 ml/min and UV detection at 280 nm was employed. The retention time metformin, canagliflozin and internal standard (pioglitazone) was 4.62, 8.10 min and 10.64 min respectively. The linearity range for canagliflozin and metformin was found to be be 5-25µg/mL and 500-1250µg/mL respectively. The validation was successfully performed by means of accuracy and precision, selectivity and specificity, linearity, recovery under various conditions. This developed method can be successfully employed for the determination of metformin and canagliflozin in human plasma.

Key words: Metformin · Canagliflozin · Solid phase extraction · Human plasma · RP-HPLC

INTRODUCTION

Metformin HCl (1, 1-dimethylbiguanide HCl), is one of the most commonly used oral anti-hyperglycemic agents for the treatment of Type II diabetes mellitus. It is currently recommended as first-line therapy in overweight or obese patients. Metformin Hydrochloride is chemically known as 1, 1Dimethyl biguanide monohydrochloride [1] (Fig. 1).Canagliflozin is an oral selective Sodium-Glucose co-transporter 2 (SGLT2) inhibitor used for the management of type 2 Diabetes Mellitus. The chemical name (IUPAC) of Canagliflozin is (2S, 3R, 4R, 5S, 6R)-2-{3-[5-(4-fluoro-phenyl)-thiophen-2-ylmethyl]-4-methyl-phenyl}-6 hydroxy methyl tetrahydropyran3, 4, 5-triol with molecular formula C24H25FO5S (Fig. 2). The combination of metformin and canagliflozin is available as tablet formulation for oral use in diabetes [2].

Literature survey reveals several methods such as liquid chromatography for HPLC in human plasma [3-5] LC-MS/MS [6] methods have been reported for the determination of MET individually and for canagliflozin bio analytical methods such as HPLC [7, 8] have been reported individually. For combinations such as metformin with other drugs such as HPLC [9-12] and LC-MS/MS [13-16] in biological matrices were reported. No methods were traced for simultaneous determination of metformin and canagliflozin in biological matrices by HPLC. In this work, we proposed a bio analytical method for simultaneous determination of metformin and canagliflozin in human plasma by HPLC.

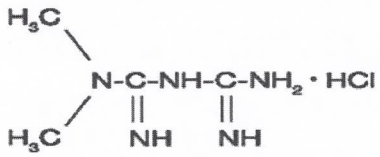


Fig. 1: Structure of metformin

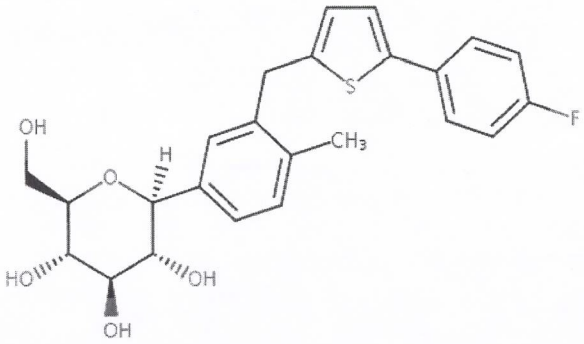


Fig. 2: Structure of canagliflozin

Corresponding Author: M.D. Dhanaraju, GIET School of Pharmacy Andhra Pradesh, India.

Middle-East Journal of Scientific Research 25 (7): 1451-1457, 2017
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2017.1451.1457

Bioanalytical Method Development and Validation for Metformin and Canagliflozin Drugs in Human Plasma by RP-HPLC Method

[1,2]T. Deepan, [2]M.V. Basaveswara Rao and [1]M.D. Dhanaraju

[1]GIET School of Pharmacy andhra Pradesh, India
[2]Krishna University andhra Pradesh, India

Abstract: A simple, sensitive and selective HPLC method was developed for the simultaneous determination for metformin and canagliflozin in human plasma using a novel sample extraction procedure. Solid phase extraction of metformin, canagliflozin and pioglitazone (as internal standard) from plasma samples was performed with phosphate buffer: Acetonitrile (85:15, v/v) adjusting to pH 3.0 with sodium hydroxide using Inertsil ODS C_{18} (4.6 x 250mm, 5µm). The flow rate 1.0 ml/min and UV detection at 280 nm was employed. The retention time metformin, canagliflozin and internal standard (pioglitazone) was 4.62, 8.10 min and 10.64 min respectively. The linearity range for canagliflozin and metformin was found to be be 5-25µg/mL and 500-1250µg/mL respectively. The validation was successfully performed by means of accuracy and precision, selectivity and specificity, linearity, recovery under various conditions. This developed method can be successfully employed for the determination of metformin and canagliflozin in human plasma.

Key words: Metformin · Canagliflozin · Solid phase extraction · Human plasma · RP-HPLC

INTRODUCTION

Metformin HCl (1, 1-dimethylbiguanide HCl), is one of the most commonly used oral anti-hyperglycemic agents for the treatment of Type II diabetes mellitus. It is currently recommended as first-line therapy in overweight or obese patients. Metformin Hydrochloride is chemically known as 1, 1Dimethyl biguanide monohydrochloride [1] (Fig. 1).Canagliflozin is an oral selective Sodium-Glucose co-transporter 2 (SGLT2) inhibitor used for the management of type 2 Diabetes Mellitus. The chemical name (IUPAC) of Canagliflozin is (2S, 3R, 4R, 5S, 6R)-2-{3-[5-(4-fluoro-phenyl)-thiophen-2-ylmethyl]-4-methyl-phenyl}-6 hydroxy methyl tetrahydropyran3, 4, 5-triol with molecular formula C24H25FO5S (Fig. 2). The combination of metformin and canagliflozin is available as tablet formulation for oral use in diabetes [2].

Literature survey reveals several methods such as liquid chromatography for HPLC in human plasma [3-5] LC-MS/MS [6] methods have been reported for the determination of MET individually and for canagliflozin bio analytical methods such as HPLC [7, 8] have been reported individually. For combinations such as metformin with other drugs such as HPLC [9-12] and LC-MS/MS [13-16] in biological matrices were reported. No methods were traced for simultaneous determination of metformin and canagliflozin in biological matrices by HPLC. In this work, we proposed a bio analytical method for simultaneous determination of metformin and canagliflozin in human plasma by HPLC.

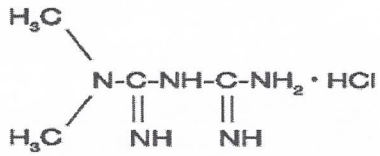


Fig. 1: Structure of metformin

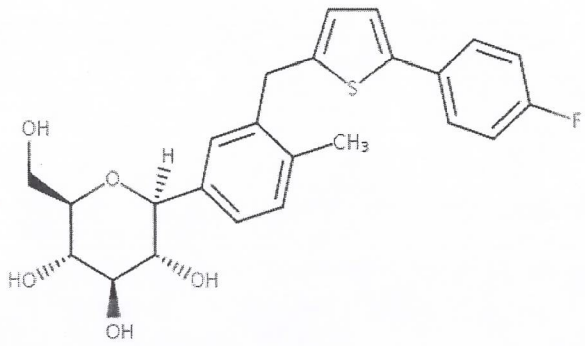


Fig. 2: Structure of canagliflozin

Corresponding Author: M.D. Dhanaraju, GIET School of Pharmacy Andhra Pradesh, India.

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

Vol 10, Issue 8, 2017

ASSESSMENT OF PHYTOCHEMICAL CONSTITUENTS, *IN VITRO* A ANTIOXIDANT POTENTIAL OF *ULVA* EXTRACTS FROM VISHAK

PRINCELY S*, DHANARAJU MD

Department of Pharmaceutical Biotechnology, Research Laboratory, GIET School of Pharmacy, Rajah India. Email: sprincelympharm@gmail.com

Received: 20 March 2017, Revised and Accepted: 24 April 2017

ABSTRACT

Objective: Antimicrobial drug resistance is the foremost problem faced worldwide with the current antibioti Marine algae were considered as a potential source of biologically active compounds with antibacterial, antifu

Materials and Methods: In the present investigation, the purified fractions of marine algal crude extracts of acetate (EtAc), and ethanol for antioxidant (1,1-diphenyl-2-picrylhydrazyl radical scavenging assay) and ant assay) were evaluated.

Results: The extracts of EtAc, ethanol, and water showed minimum inhibitory concentration values of 3.125 tested bacterial pathogens. The active fractions showed very little activity against *Klebsiella pneumonia* an observed against *Pseudomonas aeruginosa*. The results of our screening showed that the EtAc marine algal fr positive, Gram-negative bacteria and *Candida albicans*. The phytochemical analysis of aqueous, ethanolic, an the presence of the various phytochemical constituents such as carbohydrates, phenols, and amino acids. Th antioxidant activity as compared to aqueous and EtAc extracts.

Conclusion: This work can be extended further to isolate, characterize, and discover more bioactive metal exploited for the production of lead molecules in pharmaceuticals for the treatment of chronic diseases.

Keywords: Marine algae, Phytochemicals, Antimicrobial, Antioxidant, 1,1-diphenyl-2-picrylhydrazyl.

 DOI: http://dx.doi.org/10.22159/ajpcr.2017.v10i8.18582

INTRODUCTION

The term natural products commonly refer to herbs, herbal concoctions, dietary supplements, or alternative medicine. However, in general, natural products are chemical compounds or substances produced by living organisms, plants, or animal sources. Like chemicals, natural products includes various classes of compounds such as terpenoids, polyketides, amino acids, peptides, proteins, carbohydrates, lipids, nucleic acid bases, ribonucleic acid, and deoxyribonucleic acid among many others. It usually possesses pharmacological or biological activity suitable for use in pharmaceutical drug discovery and drug design [1,2].

The medicinal value of plant and animal extracts can be extensively correlated with the history of humankind. Focusing on bioproducts,

polysaccharides, phenolics, ter (McDermid and Stuercke, 2003;

Seaweeds or marine macroalgae are also used as food and fertili are of nutritional interest as minerals, proteins, polysacchar are present in very small amo protection against cardiovascul one of the most important bioac compounds such as carotenoi polysaccharides exhibit potent activities of these compounds ar against superoxide and hydrox

ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

Vol 10, Issue 8, 2017

ASSESSMENT OF PHYTOCHEMICAL CONSTITUENTS, *IN VITRO* A ANTIOXIDANT POTENTIAL OF *ULVA* EXTRACTS FROM VISHAK

PRINCELY S*, DHANARAJU MD

Department of Pharmaceutical Biotechnology, Research Laboratory, GIET School of Pharmacy, Rajah India. Email: sprincelympharm@gmail.com

Received: 20 March 2017, Revised and Accepted: 24 April 2017

ABSTRACT

Objective: Antimicrobial drug resistance is the foremost problem faced worldwide with the current antibioti Marine algae were considered as a potential source of biologically active compounds with antibacterial, antifu

Materials and Methods: In the present investigation, the purified fractions of marine algal crude extracts of acetate (EtAc), and ethanol for antioxidant (1,1-diphenyl-2-picrylhydrazyl radical scavenging assay) and ant assay) were evaluated.

Results: The extracts of EtAc, ethanol, and water showed minimum inhibitory concentration values of 3.125 tested bacterial pathogens. The active fractions showed very little activity against *Klebsiella pneumonia* an observed against *Pseudomonas aeruginosa*. The results of our screening showed that the EtAc marine algal fr positive, Gram-negative bacteria and *Candida albicans*. The phytochemical analysis of aqueous, ethanolic, an the presence of the various phytochemical constituents such as carbohydrates, phenols, and amino acids. Th antioxidant activity as compared to aqueous and EtAc extracts.

Conclusion: This work can be extended further to isolate, characterize, and discover more bioactive metal exploited for the production of lead molecules in pharmaceuticals for the treatment of chronic diseases.

Keywords: Marine algae, Phytochemicals, Antimicrobial, Antioxidant, 1,1-diphenyl-2-picrylhydrazyl.

 DOI: http://dx.doi.org/10.22159/ajpcr.2017.v10i8.18582

INTRODUCTION

The term natural products commonly refer to herbs, herbal concoctions, dietary supplements, or alternative medicine. However, in general, natural products are chemical compounds or substances produced by living microbes, plants, or animal sources. Like chemicals, natural products includes various classes of compounds such as terpenoids, polyketides, amino acids, peptides, proteins, carbohydrates, lipids, nucleic acid bases, ribonucleic acid, and deoxyribonucleic acid among many others. It usually possesses pharmacological or biological activity suitable for use in pharmaceutical drug discovery and drug design [1,2].

The medicinal value of plant and animal extracts can be extensively correlated with the history of humankind. Focusing on bioproducts,

polysaccharides, phenolics, ter [McDermid and Stuercke, 2003;

Seaweeds or marine macroalgae are also used as food and fertili are of nutritional interest as minerals, proteins, polysacchar are present in very small amo protection against cardiovascul one of the most important bioac compounds such as carotenoi polysaccharides exhibit potent activities of these compounds ar against superoxide and hydrox

Future Journal of Pharmaceutical Sciences 3 (2017) 79–89

Contents lists available at ScienceDirect

Future Journal of Pharmaceutical Sciences

journal homepage: http://www.journals.elsevier.com/future-journal-of-pharmaceutical-sciences/

Synthesis, spectroscopic characterization, X-ray crystallography, structural activity relationship and antimicrobial activity of some novel 4-(5-(10-(3-*N*, *N*-dimethylamino)propyl)-10*H*-phenothiazine-3-yl)-1, 3, 4-thiadiazole-2-yl) Azo dye/Schiff base derivatives

Chandravadivelu Gopi [a, b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a, *]

[a] Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh, 530017, India

ARTICLE INFO

Article history:
Received 12 August 2016
Received in revised form
19 February 2017
Accepted 3 April 2017
Available online 6 July 2017

Keywords:
Azodye
Schiff bases
Antimicrobial activity

ABSTRACT

In the present investigation, a series of novel 4 (5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3-yl)-1,3,4-thiadiazo-2-yl) Azo dye/Schiff base derivatives **(5a-e & 6a-j)** were synthesised by performing diazotization followed by coupling reaction between 4-(5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine, sodium nitrite, Con HCl and the different coupling reagent/condensation reaction of 4-(5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine and different aromatic aldehyde. The structures of these compounds were confirmed by FT-IR, ^{1}H NMR, Mass spectroscopy and elemental analysis. *In vitro* antibacterial and antifungal activities of these compounds were screened against the different strains such as *P. Aeruginosa (ATCC-2853), E. Coli (ATCC-25922), S. Epidermidis (ATCC-155), A. Fumigatus (ATCC-46645), S. Aureus (ATCC-9144), A. Niger (ATCC-9029)* by disc diffusion and minimum inhibitory concentrations (MIC) method. The results revealed that compound *N*-(4-chlorobenzylidene)-5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine **(6d)** showed promising anti-microbial activity against various pathogenic microorganisms as compared to the antibiotics Ciprofloxacin and Fluconazole.

1. Introduction

Thiadiazole is a trusted five-membered heterocyclic ring found in many naturally occurring compounds (plants and animals) consist of sulphur, a couple of nitrogen and two double bonds. It is known as a modified form of the cyclic thiosemicarbazide molecule bearing toxophoric linkage (N=C=S) and responsible for esteemed pharmacological activities such as antimicrobial [1–3], antiviral [4], antitubercular [5], anticonvulsant [6–8], anti-inflammatory [9,10], hypoglycaemic [11], CNS depressant [12], and anticancer [13–15] etc., Similarly, the presence of high therapeutic profile, well tolerated and relatively safe phenothiazine molecule is also extensively used in various pharmaceutical applications such as antibacterial [16], antifungal [17], anti-tubercular [18], schizophrenia [19], anxiety [20], anti-cancer [21], anti-inflammatory [22], antioxidant [23] and anti-malarial [24] etc., Generally, Schiff bases have been prepared by performing a condensation reaction between a primary aromatic amine and different aldehyde or ketone. They are an important class of bioactive molecule possessing azomethine group (N=CH), which plays a vital role in medicine and pharmaceutical field. Therefore, all the derivatives of Schiff bases are therapeutically active and have been reported in many publications. They possess a wide range of industrial and pharmacological application such as antibacterial [25], antifungal [26,27], anti-inflammatory, antimicrobial [28,29], anti-malarial [30], anti-cancer [31,32], antitubercular [33,34], and antiviral [35] etc., Furthermore, Azo dyes or Azo imine dyes are one of the most important and well-known molecules constituted with diamide group (R–N=N-R′). They are called as a natural biocide and have been synthesised by diazotization followed by coupling reaction [36,37]. They are responsible for different pharmacological activity, such as antifungal [38],

* Corresponding author. GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533296, India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).
Peer review under responsibility of Future University.

http://dx.doi.org/10.1016/j.fjps.2017.04.002

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City,
RAJAHMUNDRY-533 296. (A.P.)

Future Journal of Pharmaceutical Sciences 3 (2017) 79–89

HOSTED BY

Contents lists available at ScienceDirect

Future Journal of Pharmaceutical Sciences

journal homepage: http://www.journals.elsevier.com/future-journal-of-pharmaceutical-sciences/

Synthesis, spectroscopic characterization, X-ray crystallography, structural activity relationship and antimicrobial activity of some novel 4-(5-(10-(3-*N*, *N*-dimethylamino)propyl)-10*H*-phenothiazine-3-yl)-1, 3, 4-thiadiazole-2-yl) Azo dye/Schiff base derivatives

Chandravadivelu Gopi [a, b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a, *]

[a] Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh, 530017, India

ARTICLE INFO

Article history:
Received 12 August 2016
Received in revised form
19 February 2017
Accepted 3 April 2017
Available online 6 July 2017

Keywords:
Azodye
Schiff bases
Antimicrobial activity

ABSTRACT

In the present investigation, a series of novel 4 (5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3-yl)-1,3,4-thiadiazo-2-yl) Azo dye/Schiff base derivatives (**5a-e & 6a-j**) were synthesised by performing diazotization followed by coupling reaction between 4-(5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine, sodium nitrite, Con HCl and the different coupling reagent/condensation reaction of 4-(5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine and different aromatic aldehyde. The structures of these compounds were confirmed by FT-IR, ^{1}H NMR, Mass spectroscopy and elemental analysis. *In vitro* antibacterial and antifungal activities of these compounds were screened against the different strains such as *P. Aeruginosa (ATCC-2853), E. Coli (ATCC-25922), S. Epidermidis (ATCC-155), A. Fumigatus (ATCC-46645), S. Aureus (ATCC-9144), A. Niger (ATCC-9029)* by disc diffusion and minimum inhibitory concentrations (MIC) method. The results revealed that compound *N*-(4-chlorobenzylidene)-5-(10-(3-(*N*,*N*-dimethylamino)propyl)-10*H*-phenothiazine-3yl)-1,3,4-thiadiazole-2-amine (**6d**) showed promising anti-microbial activity against various pathogenic microorganisms as compared to the antibiotics Ciprofloxacin and Fluconazole.

1. Introduction

Thiadiazole is a trusted five-membered heterocyclic ring found in many naturally occurring compounds (plants and animals) consist of sulphur, a couple of nitrogen and two double bonds. It is known as a modified form of the cyclic thiosemicarbazide molecule bearing toxophoric linkage (N=C=S) and responsible for esteemed pharmacological activities such as antimicrobial [1–3], antiviral [4], antitubercular [5], anticonvulsant [6–8], anti-inflammatory [9,10], hypoglycaemic [11], CNS depressant [12], and anticancer [13–15] etc., Similarly, the presence of high therapeutic profile, well tolerated and relatively safe phenothiazine molecule is also extensively used in various pharmaceutical applications such as antibacterial [16], antifungal [17], anti-tubercular [18], schizophrenia [19], anxiety [20], anti-cancer [21], anti-inflammatory [22], antioxidant [23] and anti-malarial [24] etc., Generally, Schiff bases have been prepared by performing a condensation reaction between a primary aromatic amine and different aldehyde or ketone. They are an important class of bioactive molecule possessing azomethine group (N=CH), which plays a vital role in medicine and pharmaceutical field. Therefore, all the derivatives of Schiff bases are therapeutically active and have been reported in many publications. They possess a wide range of industrial and pharmacological application such as antibacterial [25], antifungal [26,27], anti-inflammatory, antimicrobial [28,29], anti-malarial [30], anti-cancer [31,32], antitubercular [33,34], and antiviral [35] etc., Furthermore, Azo dyes or Azo imine dyes are one of the most important and well-known molecules constituted with diamide group (R–N=N-R′). They are called as a natural biocide and have been synthesised by diazotization followed by coupling reaction [36,37]. They are responsible for different pharmacological activity, such as antifungal [38],

* Corresponding author. GIET School of Pharmacy, NH-16, Rajahmundry, Andhra Pradesh, 533296, India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).
Peer review under responsibility of Future University.

http://dx.doi.org/10.1016/j.fjps.2017.04.002

17-18

Beni-Suef University Journal of Basic and Applied Sciences 6 (2017) 362–373

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Optimization of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box Behnken design

Nandhakumar Sathyamoorthy [a], Dhanaraju Magharla [a,*], Pavankumar Chintamaneni [b], Sundar Vankayalu [a]

[a] Department of Pharmaceutics, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh 533296, India
[b] Department of Pharmacology, JSS College of Pharmacy, Ootacamund, Tamilnadu 643001, India

ARTICLE INFO

Article history:
Received 16 February 2017
Received in revised form 2 June 2017
Accepted 12 June 2017
Available online 16 June 2017

Keywords:
Nanoparticles
Poly (ε-caprolactone)
Box-Behnken design
Optimization
Characterization

ABSTRACT

Optimization is a critical process in the development of nanoparticles to apprehend the formulation variables and quality attributes. The purpose of this study was to evaluate the influence of formulation variables viz., drug/polymer ratio (A), surfactant concentration (B) and ratio of volume of internal to external phase (C) on the dependent variables (particle size, % EE and zeta potential) of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box-Behnken design. The nanoparticles were fabricated using emulsion-solvent evaporation technique. The generated polynomial equations, contour plots and response surface plots of the design space were used to analyze the relationship between independent variables and the observed response. An optimal batch was formulated with selected variables (A: +1 level, B: 0 level, C: −1 level) and the prepared nanoparticles were found to have particle size 215.6 μm, zeta potential −7.52 mV and % drug entrapment 86.78%. The observed responses are in close agreement with the predicted values. NPs were spherical with a smooth surface as revealed by morphological studies and the drug-polymer compatibility was established using FTIR and thermal analysis. The drug was released from the NPs in a biphasic pattern with an initial burst release (32.1 %) followed by sustained release (53 %) at the end of 5 d. The *in vitro* cell cytotoxicity studies on MCF-7 cells showed that the NPs held superior tumor inhibition ability. The results encourage the application of Box-Behnken design for the optimization of critical variables and fabrication of nanoparticles with desirable properties for drug delivery.

1. Introduction

Paclitaxel (PTX) is a natural diterpenoid with superior *anti*-neoplastic activity against a varied spectrum of malignancies, especially, ovarian and breast cancer (Baek and Cho, 2017). PTX inhibits mitosis and intracellular transport in cancer cells by promoting polymerization and stabilization of microtubules (Vishnu and Roy, 2011). PTX bonds with the inner surface of β-microtubule chain and arrest the cell cycle at G_2/M phase causing apoptosis. Despite the unique mechanism and efficacy, poor aqueous solubility and low therapeutic index deter its clinical utility (Wang et al., 2011). Thus, to improve the solubility of PTX for clinical applications, the dosage forms include Cremophor EL, a polyethoxylated castor oil solubilizer. Cremophor EL is associated with serious side effects such as neurotoxicity, nephrotoxicity and hypersensitivity reactions (Ahn et al., 2014; Wei et al., 2009). Treatment with solvent based formulations, therefore requires premedication with antihistamines and steroids to combat hypersensitive reactions (Lluch et al., 2014). Hence, alternative novel formulations, such as liposomes, nanoparticles, micelles and self-emulsions were investigated to improve the effective delivery of PTX to tumor cells with reduced side effects. Among those formulations, nanoparticles ascertain to be a promising delivery system that can take advantage of enhanced permeation and retention (EPR) effect for the passive targeting of PTX (Gaucher et al., 2010; Maeda et al., 2000). Nanoparticle (NP) retains the advantages apprehended by liposomes and in addition overcome its limitations, such as drug leakage, low entrapment and instability. Hence numerous attempts are being made by researchers for rationally designing *anti*-cancer drug loaded NP formulations intended for greater clinical outcomes. A polyelectrolyte multilayer NP based on poly-L-glutamic acid and poly-l-lysine containing PTX was formulated and stabilized using polyethylene glycol. The prepared NPs which were about 100 nm showed strong cytotoxic effects on mouse colon carcinoma cell line CT26-CEA and the mouse mammary carcinoma cell line 4T1 (Szczepanowicz et al., 2016). Poly (lactic-*co*-glycolic acid) (PLGA) NPs coated with hyaluronic acid

* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (D. Magharla).

http://dx.doi.org/10.1016/j.bjbas.2017.06.002
2314-8535/

Dr. M.D. DHANA RAJU,
Principal. M.Pharm., Ph.D.
GIET SCHOOL OF PHARMACY,
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533 296. (A.P.)

Beni-Suef University Journal of Basic and Applied Sciences 6 (2017) 362–373

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Optimization of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box Behnken design

Nandhakumar Sathyamoorthy [a], Dhanaraju Magharla [a,*], Pavankumar Chintamaneni [b], Sundar Vankayalu [a]

[a] Department of Pharmaceutics, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh 533296, India
[b] Department of Pharmacology, JSS College of Pharmacy, Ootacamund, Tamilnadu 643001, India

ARTICLE INFO

Article history:
Received 16 February 2017
Received in revised form 2 June 2017
Accepted 12 June 2017
Available online 16 June 2017

Keywords:
Nanoparticles
Poly (ε-caprolactone)
Box-Behnken design
Optimization
Characterization

ABSTRACT

Optimization is a critical process in the development of nanoparticles to apprehend the formulation variables and quality attributes. The purpose of this study was to evaluate the influence of formulation variables viz., drug/polymer ratio (A), surfactant concentration (B) and ratio of volume of internal to external phase (C) on the dependent variables (particle size, % EE and zeta potential) of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box-Behnken design. The nanoparticles were fabricated using emulsion-solvent evaporation technique. The generated polynomial equations, contour plots and response surface plots of the design space were used to analyze the relationship between independent variables and the observed response. An optimal batch was formulated with selected variables (A: +1 level, B: 0 level, C: −1 level) and the prepared nanoparticles were found to have particle size 215.6 μm, zeta potential −7.52 mV and % drug entrapment 86.78%. The observed responses are in close agreement with the predicted values. NPs were spherical with a smooth surface as revealed by morphological studies and the drug-polymer compatibility was established using FTIR and thermal analysis. The drug was released from the NPs in a biphasic pattern with an initial burst release (32.1 %) followed by sustained release (53 %) at the end of 5 d. The *in vitro* cell cytotoxicity studies on MCF-7 cells showed that the NPs held superior tumor inhibition ability. The results encourage the application of Box-Behnken design for the optimization of critical variables and fabrication of nanoparticles with desirable properties for drug delivery.

1. Introduction

Paclitaxel (PTX) is a natural diterpenoid with superior *anti*-neoplastic activity against a varied spectrum of malignancies, especially, ovarian and breast cancer (Baek and Cho, 2017). PTX inhibits mitosis and intracellular transport in cancer cells by promoting polymerization and stabilization of microtubules (Vishnu and Roy, 2011). PTX bonds with the inner surface of β-microtubule chain and arrest the cell cycle at G_2/M phase causing apoptosis. Despite the unique mechanism and efficacy, poor aqueous solubility and low therapeutic index deter its clinical utility (Wang et al., 2011). Thus, to improve the solubility of PTX for clinical applications, the dosage forms include Cremophor EL, a polyethoxylated castor oil solubilizer. Cremophor EL is associated with serious side effects such as neurotoxicity, nephrotoxicity and hypersensitivity reactions (Ahn et al., 2014; Wei et al., 2009). Treatment with solvent based formulations, therefore requires premedication with antihistamines and steroids to combat hypersensitive reactions (Lluch et al., 2014). Hence, alternative novel formulations, such as liposomes, nanoparticles, micelles and self-emulsions were investigated to improve the effective delivery of PTX to tumor cells with reduced side effects. Among those formulations, nanoparticles ascertain to be a promising delivery system that can take advantage of enhanced permeation and retention (EPR) effect for the passive targeting of PTX (Gaucher et al., 2010; Maeda et al., 2000). Nanoparticle (NP) retains the advantages apprehended by liposomes and in addition overcome its limitations, such as drug leakage, low entrapment and instability. Hence numerous attempts are being made by researchers for rationally designing *anti*-cancer drug loaded NP formulations intended for greater clinical outcomes. A polyelectrolyte multilayer NP based on poly-L-glutamic acid and poly-l-lysine containing PTX was formulated and stabilized using polyethylene glycol. The prepared NPs which were about 100 nm showed strong cytotoxic effects on mouse colon carcinoma cell line CT26-CEA and the mouse mammary carcinoma cell line 4T1 (Szczepanowicz et al., 2016). Poly (lactic-*co*-glycolic acid) (PLGA) NPs coated with hyaluronic acid

* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (D. Magharla).

http://dx.doi.org/10.1016/j.bjbas.2017.06.002

Beni-Suef University Journal of Basic and Applied Sciences 6 (2017) 362–373

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Optimization of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box Behnken design

Nandhakumar Sathyamoorthy [a], Dhanaraju Magharla [a,*], Pavankumar Chintamaneni [b], Sundar Vankayalu [a]

[a] Department of Pharmaceutics, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh 533296, India
[b] Department of Pharmacology, JSS College of Pharmacy, Ootacamund, Tamilnadu 643001, India

ARTICLE INFO

Article history:
Received 16 February 2017
Received in revised form 2 June 2017
Accepted 12 June 2017
Available online 16 June 2017

Keywords:
Nanoparticles
Poly (ε-caprolactone)
Box-Behnken design
Optimization
Characterization

ABSTRACT

Optimization is a critical process in the development of nanoparticles to apprehend the formulation variables and quality attributes. The purpose of this study was to evaluate the influence of formulation variables viz., drug/polymer ratio (A), surfactant concentration (B) and ratio of volume of internal to external phase (C) on the dependent variables (particle size, % EE and zeta potential) of paclitaxel loaded poly (ε-caprolactone) nanoparticles using Box-Behnken design. The nanoparticles were fabricated using emulsion-solvent evaporation technique. The generated polynomial equations, contour plots and response surface plots of the design space were used to analyze the relationship between independent variables and the observed response. An optimal batch was formulated with selected variables (A: +1 level, B: 0 level, C: −1 level) and the prepared nanoparticles were found to have particle size 215.6 μm, zeta potential −7.52 mV and % drug entrapment 86.78%. The observed responses are in close agreement with the predicted values. NPs were spherical with a smooth surface as revealed by morphological studies and the drug-polymer compatibility was established using FTIR and thermal analysis. The drug was released from the NPs in a biphasic pattern with an initial burst release (32.1 %) followed by sustained release (53 %) at the end of 5 d. The *in vitro* cell cytotoxicity studies on MCF-7 cells showed that the NPs held superior tumor inhibition ability. The results encourage the application of Box-Behnken design for the optimization of critical variables and fabrication of nanoparticles with desirable properties for drug delivery.

1. Introduction

Paclitaxel (PTX) is a natural diterpenoid with superior *anti*-neoplastic activity against a varied spectrum of malignancies, especially, ovarian and breast cancer (Baek and Cho, 2017). PTX inhibits mitosis and intracellular transport in cancer cells by promoting polymerization and stabilization of microtubules (Vishnu and Roy, 2011). PTX bonds with the inner surface of β-microtubule chain and arrest the cell cycle at G_2/M phase causing apoptosis. Despite the unique mechanism and efficacy, poor aqueous solubility and low therapeutic index deter its clinical utility (Wang et al., 2011). Thus, to improve the solubility of PTX for clinical applications, the dosage forms include Cremophor EL, a polyethoxylated castor oil solubilizer. Cremophor EL is associated with serious side effects such as neurotoxicity, nephrotoxicity and hypersensitivity reactions (Ahn et al., 2014; Wei et al., 2009). Treatment with solvent based formulations, therefore requires premedication with antihistamines and steroids to combat hypersensitive reactions (Lluch et al., 2014). Hence, alternative novel formulations, such as liposomes, nanoparticles, micelles and self-emulsions were investigated to improve the effective delivery of PTX to tumor cells with reduced side effects. Among those formulations, nanoparticles ascertain to be a promising delivery system that can take advantage of enhanced permeation and retention (EPR) effect for the passive targeting of PTX (Gaucher et al., 2010; Maeda et al., 2000). Nanoparticle (NP) retains the advantages apprehended by liposomes and in addition overcome its limitations, such as drug leakage, low entrapment and instability. Hence numerous attempts are being made by researchers for rationally designing *anti*-cancer drug loaded NP formulations intended for greater clinical outcomes. A polyelectrolyte multilayer NP based on poly-L-glutamic acid and poly-l-lysine containing PTX was formulated and stabilized using polyethylene glycol. The prepared NPs which were about 100 nm showed strong cytotoxic effects on mouse colon carcinoma cell line CT26-CEA and the mouse mammary carcinoma cell line 4T1 (Szczepanowicz et al., 2016). Poly (lactic-*co*-glycolic acid) (PLGA) NPs coated with hyaluronic acid

* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (D. Magharla).

http://dx.doi.org/10.1016/j.bjbas.2017.06.002
2314-8535/

Bulletin of Faculty of Pharmacy, Cairo University 55 (2017) 249–258

Cairo University
Faculty of Pharmacy

Contents lists available at ScienceDirect

Bulletin of Faculty of Pharmacy, Cairo University

journal homepage: www.sciencedirect.com

Original Article

Influence of surface charge on the *in vitro* protein adsorption and cell cytotoxicity of paclitaxel loaded poly(ε-caprolactone) nanoparticles

Sathyamoorthy Nandhakumar [a], Magharla Dasaratha Dhanaraju [a,*], Vankayalu Devendran Sundar [a], Battu Heera [b]

[a] Department of Pharmaceutics, School of Pharmacy, GIET, Rajahmundry, India
[b] University College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, India

ARTICLE INFO

Article history:
Received 18 January 2016
Received in revised form 11 March 2017
Accepted 21 June 2017
Available online 4 July 2017

Keywords:
Poly(ε-caprolactone)
Nanoparticles
Surface charge
Protein adsorption
Cytotoxicity

ABSTRACT

The biokinetic fate of polymeric nanoparticles in the physiological milieu is strongly influenced by its properties such as size, surface charge and surface affinity. The electrostatic properties of the polymeric nanoparticles and, thereby, the reliant properties such as cellular interactions, reactivity and toxicity, can be tailored by modulating the surface charge. Therefore, the present study aimed at studying the influence of surface charge on the physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity of poly(ε-caprolactone) (PCL) nanoparticles (NPs). Paclitaxel loaded PCL nanoparticles were obtained by emulsion solvent evaporation extraction technique and differently charged using ionic surfactants. The NPs were characterized for size, zeta potential, morphology, entrapment and release. *In vitro* protein adsorption and cytotoxicity of NPs with different surface charge was investigated. The prepared NPs were rounded with a smooth surface and had a particle size less than 250 nm with narrow distribution and high entrapment efficiency (>80%). The zeta potential of the particles varied between −22 mV and +16 mV depending on its composition. The *in vitro* protein adsorption studies revealed that positively charged NPs adsorbed more proteins than other formulations. The cytotoxicity studies on MCF-7 cells exhibited that positively charged NPs engender the highest cell inhibition due to preferential uptake based on electrostatic interactions with cell membranes. The results suggest that surface charge could be undeniably significant in determining the protein adsorption and cellular interactions and must be intently considered during the design of colloidal particles to impart better performance in the physiological system.

1. Introduction

Cancer is considered to be one of the most dreadful diseases endangering the mortality rate and morbidity of human population. The advent of nanotechnology has made its affirmative impact in improving the efficacy and safe transport of chemotherapeutic drugs to the tumour site. Nanoparticles (NPs) can deliver high payloads of low molecular weight drugs, macromolecules and nucleic acids by exploiting the enhanced retention and permeability (EPR) effect [1]. They passively extravasate the fenestrations of defective tumour vascular endothelium to transport the biomolecules [2]. To ensure this, NPs should remain in blood for a longer duration [3]. However, NPs are rapidly cleared from the systemic circulation by phagocytes of the reticuloendothelial system (RES) [4]. Hence, several restraints and challenges are involved in the design of nanoparticle based drug delivery to organs other than the RES system [5].

Long circulating NPs can be engineered to resist phagocytosis by preventing the surface adsorption of opsonin proteins. NP properties, such as, size, charge and surface affinity influence their interaction with the opsonins and cell membrane of macrophages [6]. Smaller NPs with hydrophilic surface and suitable charge can circumvent phagocytosis, circulate longer in blood and passively target tumour cells [7–9]. Thus, modifying the steric and electrostatic properties of the particles, may help them dodge the opsonization process and possibly will increase their biological stability and therapeutic effectiveness.

Though the effect of particle size and hydrophilicity on opsonization and phagocytosis are well established, the existing

Peer review under responsibility of Faculty of Pharmacy, Cairo University.
* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

http://dx.doi.org/10.1016/j.bfopcu.2017.06.003
1110-0931/

Bulletin of Faculty of Pharmacy, Cairo University 55 (2017) 249–258

Cairo University
Faculty of Pharmacy

Contents lists available at ScienceDirect

Bulletin of Faculty of Pharmacy, Cairo University

journal homepage: www.sciencedirect.com

Original Article

Influence of surface charge on the *in vitro* protein adsorption and cell cytotoxicity of paclitaxel loaded poly(ε-caprolactone) nanoparticles

Sathyamoorthy Nandhakumar [a], Magharla Dasaratha Dhanaraju [a,*], Vankayalu Devendran Sundar [a], Battu Heera [b]

[a] Department of Pharmaceutics, School of Pharmacy, GIET, Rajahmundry, India
[b] University College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, India

ARTICLE INFO

Article history:
Received 18 January 2016
Received in revised form 11 March 2017
Accepted 21 June 2017
Available online 4 July 2017

Keywords:
Poly(ε-caprolactone)
Nanoparticles
Surface charge
Protein adsorption
Cytotoxicity

ABSTRACT

The biokinetic fate of polymeric nanoparticles in the physiological milieu is strongly influenced by its properties such as size, surface charge and surface affinity. The electrostatic properties of the polymeric nanoparticles and, thereby, the reliant properties such as cellular interactions, reactivity and toxicity, can be tailored by modulating the surface charge. Therefore, the present study aimed at studying the influence of surface charge on the physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity of poly(ε-caprolactone) (PCL) nanoparticles (NPs). Paclitaxel loaded PCL nanoparticles were obtained by emulsion solvent evaporation extraction technique and differently charged using ionic surfactants. The NPs were characterized for size, zeta potential, morphology, entrapment and release. *In vitro* protein adsorption and cytotoxicity of NPs with different surface charge was investigated. The prepared NPs were rounded with a smooth surface and had a particle size less than 250 nm with narrow distribution and high entrapment efficiency (>80%). The zeta potential of the particles varied between −22 mV and +16 mV depending on its composition. The *in vitro* protein adsorption studies revealed that positively charged NPs adsorbed more proteins than other formulations. The cytotoxicity studies on MCF-7 cells exhibited that positively charged NPs engender the highest cell inhibition due to preferential uptake based on electrostatic interactions with cell membranes. The results suggest that surface charge could be undeniably significant in determining the protein adsorption and cellular interactions and must be intently considered during the design of colloidal particles to impart better performance in the physiological system.

1. Introduction

Cancer is considered to be one of the most dreadful diseases endangering the mortality rate and morbidity of human population. The advent of nanotechnology has made its affirmative impact in improving the efficacy and safe transport of chemotherapeutic drugs to the tumour site. Nanoparticles (NPs) can deliver high payloads of low molecular weight drugs, macromolecules and nucleic acids by exploiting the enhanced retention and permeability (EPR) effect [1]. They passively extravasate the fenestrations of defective tumour vascular endothelium to transport the biomolecules [2]. To ensure this, NPs should remain in blood for a longer duration [3]. However, NPs are rapidly cleared from the systemic circulation by phagocytes of the reticuloendothelial system (RES) [4]. Hence, several restraints and challenges are involved in the design of nanoparticle based drug delivery to organs other than the RES system [5].

Long circulating NPs can be engineered to resist phagocytosis by preventing the surface adsorption of opsonin proteins. NP properties, such as, size, charge and surface affinity influence their interaction with the opsonins and cell membrane of macrophages [6]. Smaller NPs with hydrophilic surface and suitable charge can circumvent phagocytosis, circulate longer in blood and passively target tumour cells [7–9]. Thus, modifying the steric and electrostatic properties of the particles, may help them dodge the opsonization process and possibly will increase their biological stability and therapeutic effectiveness.

Though the effect of particle size and hydrophilicity on opsonization and phagocytosis are well established, the existing

Peer review under responsibility of Faculty of Pharmacy, Cairo University.
* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

http://dx.doi.org/10.1016/j.bfopcu.2017.06.003
1110-0931/

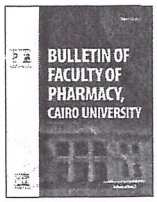
Bulletin of Faculty of Pharmacy, Cairo University 55 (2017) 249–258

Cairo University
Faculty of Pharmacy

Contents lists available at ScienceDirect

Bulletin of Faculty of Pharmacy, Cairo University

journal homepage: www.sciencedirect.com



Original Article

Influence of surface charge on the *in vitro* protein adsorption and cell cytotoxicity of paclitaxel loaded poly(ε-caprolactone) nanoparticles

Sathyamoorthy Nandhakumar [a], Magharla Dasaratha Dhanaraju [a,*], Vankayalu Devendran Sundar [a], Battu Heera [b]

[a] Department of Pharmaceutics, School of Pharmacy, GIET, Rajahmundry, India
[b] University College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, India

ARTICLE INFO

Article history:
Received 18 January 2016
Received in revised form 11 March 2017
Accepted 21 June 2017
Available online 4 July 2017

Keywords:
Poly(ε-caprolactone)
Nanoparticles
Surface charge
Protein adsorption
Cytotoxicity

ABSTRACT

The biokinetic fate of polymeric nanoparticles in the physiological milieu is strongly influenced by its properties such as size, surface charge and surface affinity. The electrostatic properties of the polymeric nanoparticles and, thereby, the reliant properties such as cellular interactions, reactivity and toxicity, can be tailored by modulating the surface charge. Therefore, the present study aimed at studying the influence of surface charge on the physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity of poly(ε-caprolactone) (PCL) nanoparticles (NPs). Paclitaxel loaded PCL nanoparticles were obtained by emulsion solvent evaporation extraction technique and differently charged using ionic surfactants. The NPs were characterized for size, zeta potential, morphology, entrapment and release. *In vitro* protein adsorption and cytotoxicity of NPs with different surface charge was investigated. The prepared NPs were rounded with a smooth surface and had a particle size less than 250 nm with narrow distribution and high entrapment efficiency (>80%). The zeta potential of the particles varied between −22 mV and +16 mV depending on its composition. The *in vitro* protein adsorption studies revealed that positively charged NPs adsorbed more proteins than other formulations. The cytotoxicity studies on MCF-7 cells exhibited that positively charged NPs engender the highest cell inhibition due to preferential uptake based on electrostatic interactions with cell membranes. The results suggest that surface charge could be undeniably significant in determining the protein adsorption and cellular interactions and must be intently considered during the design of colloidal particles to impart better performance in the physiological system.

1. Introduction

Cancer is considered to be one of the most dreadful diseases endangering the mortality rate and morbidity of human population. The advent of nanotechnology has made its affirmative impact in improving the efficacy and safe transport of chemotherapeutic drugs to the tumour site. Nanoparticles (NPs) can deliver high payloads of low molecular weight drugs, macromolecules and nucleic acids by exploiting the enhanced retention and permeability (EPR) effect [1]. They passively extravasate the fenestrations of defective tumour vascular endothelium to transport the biomolecules [2]. To ensure this, NPs should remain in blood for a longer duration [3]. However, NPs are rapidly cleared from the systemic circulation by phagocytes of the reticuloendothelial system (RES) [4]. Hence, several restraints and challenges are involved in the design of nanoparticle based drug delivery to organs other than the RES system [5].

Long circulating NPs can be engineered to resist phagocytosis by preventing the surface adsorption of opsonin proteins. NP properties, such as, size, charge and surface affinity influence their interaction with the opsonins and cell membrane of macrophages [6]. Smaller NPs with hydrophilic surface and suitable charge can circumvent phagocytosis, circulate longer in blood and passively target tumour cells [7–9]. Thus, modifying the steric and electrostatic properties of the particles, may help them dodge the opsonization process and possibly will increase their biological stability and therapeutic effectiveness.

Though the effect of particle size and hydrophilicity on opsonization and phagocytosis are well established, the existing

Peer review under responsibility of Faculty of Pharmacy, Cairo University.
* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533296, Andhra Pradesh, India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

http://dx.doi.org/10.1016/j.bfopcu.2017.06.003
1110-0931/

Original Article

Effect of Surface Modification on the *In vitro* Protein Adsorption and Cell Cytotoxicity of Vinorelbine Nanoparticles

Nandhakumar Sathyamoorthy, Dhanaraju Dasaratha Magharla, Sundar Devendaran Vankayalu

Department of Pharmaceutics, GIET School of Pharmacy, East Godavari, Andhra Pradesh, India

ABSTRACT

Context: Nanocarriers possessing long-circulating abilities could take advantage of the pathophysiology of tumor vasculature to achieve spatial placement. To attain such qualities, the drug carriers should possess suitable physicochemical properties such as size and surface hydrophilicity. **Aim:** The aim of this study was to prepare poly(ε-caprolactone) nanoparticles (NPs) loaded with vinorelbine bitartrate (VB) and to modify its steric properties using polyethylene glycol and poloxamer. Furthermore, the influence of surface modification of NPs on their physicochemical and cell interactive properties was evaluated. **Materials and Methods:** NPs were prepared by double emulsion solvent extraction–evaporation technique. The prepared NPs were evaluated for their physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity. **Results and Discussion:** The NPs were <250 nm with an entrapment efficiency ranging between 40% and 52%. The zeta potential of the NPs varied from −7.52 mV to −1.27 mV depending on the surface modification. The *in vitro* release studies exhibited a biphasic pattern with an initial burst release followed by controlled release of the drug over 72 h. The protein adsorption studies revealed that the ability to resist protein adsorption was influenced by the concentration of surface-modifying agents and the amount of proteins available for interaction. The surface-modified NPs produced cell cytotoxicity comparable to free VB at higher concentrations owing to sustained release of the drug into the cellular environment. **Conclusion:** The results emphasize that surface modification of nanocarriers is an essential and effective tool to dodge opsonization and phagocytosis in the physiological milieu.

Keywords: *Cell cytotoxicity, nanoparticles, protein adsorption, surface modification, vinorelbine*

Introduction

The clinical success of nanocarriers based on passive targeting depends on their capability to take advantage of the enhanced permeability and retention (EPR) effect, which is observed to occur unanimously in all types of fast-growing solid tumors with the exception of hypovascular tumors.[1,2] Unlike the normal blood vasculature, which is composed of a nonfenestrated, single layer of endothelial cells with tight junctions, the tumor vasculature shows a defective architecture with large fenestrations about 100–600 nm. The fenestrations are sufficiently large for the extravasation and accumulation of molecules into the vascular bed and the interstitial space.[3,4] Another important feature of solid tumors is the lack of lymphatic drainage that helps in retaining the macromolecules within the tumor tissue.[5]

To exploit the EPR effect, the nanocarriers should remain in the blood circulation long enough to reach the tumor site. However, the prevalence of nanoparticles (NPs) in

Address for correspondence: Dr. Dhanaraju Dasaratha Magharla, Department of Pharmaceutics, GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry, East Godavari - 533 296, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online

Quick Response Code:

Website: www.jpbsonline.org

DOI: 10.4103/jpbs.JPBS_258_16

How to cite this article: Sathyamoorthy N, Magharla DD, Vankayalu SD. Effect of surface modification on the *In vitro* protein adsorption and cell cytotoxicity of vinorelbine nanoparticles. J Pharm Bioall Sci 2017;9:135-43.

Original Article

Effect of Surface Modification on the *In vitro* Protein Adsorption and Cell Cytotoxicity of Vinorelbine Nanoparticles

Nandhakumar Sathyamoorthy, Dhanaraju Dasaratha Magharla, Sundar Devendaran Vankayalu

Department of Pharmaceutics, GIET School of Pharmacy, East Godavari, Andhra Pradesh, India

ABSTRACT

Context: Nanocarriers possessing long-circulating abilities could take advantage of the pathophysiology of tumor vasculature to achieve spatial placement. To attain such qualities, the drug carriers should possess suitable physicochemical properties such as size and surface hydrophilicity. **Aim:** The aim of this study was to prepare poly(ε-caprolactone) nanoparticles (NPs) loaded with vinorelbine bitartrate (VB) and to modify its steric properties using polyethylene glycol and poloxamer. Furthermore, the influence of surface modification of NPs on their physicochemical and cell interactive properties was evaluated. **Materials and Methods:** NPs were prepared by double emulsion solvent extraction–evaporation technique. The prepared NPs were evaluated for their physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity. **Results and Discussion:** The NPs were <250 nm with an entrapment efficiency ranging between 40% and 52%. The zeta potential of the NPs varied from −7.52 mV to −1.27 mV depending on the surface modification. The *in vitro* release studies exhibited a biphasic pattern with an initial burst release followed by controlled release of the drug over 72 h. The protein adsorption studies revealed that the ability to resist protein adsorption was influenced by the concentration of surface-modifying agents and the amount of proteins available for interaction. The surface-modified NPs produced cell cytotoxicity comparable to free VB at higher concentrations owing to sustained release of the drug into the cellular environment. **Conclusion:** The results emphasize that surface modification of nanocarriers is an essential and effective tool to dodge opsonization and phagocytosis in the physiological milieu.

KEYWORDS: *Cell cytotoxicity, nanoparticles, protein adsorption, surface modification, vinorelbine*

INTRODUCTION

The clinical success of nanocarriers based on passive targeting depends on their capability to take advantage of the enhanced permeability and retention (EPR) effect, which is observed to occur unanimously in all types of fast-growing solid tumors with the exception of hypovascular tumors.[1,2] Unlike the normal blood vasculature, which is composed of a nonfenestrated, single layer of endothelial cells with tight junctions, the tumor vasculature shows a defective architecture with large fenestrations about 100–600 nm. The fenestrations are sufficiently large for the extravasation and accumulation of molecules into the vascular bed and the interstitial space.[3,4] Another important feature of solid tumors is the lack of lymphatic drainage that helps in retaining the macromolecules within the tumor tissue.[5]

To exploit the EPR effect, the nanocarriers should remain in the blood circulation long enough to reach the tumor site. However, the prevalence of nanoparticles (NPs) in

Address for correspondence: Dr. Dhanaraju Dasaratha Magharla, Department of Pharmaceutics, GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry, East Godavari - 533 296, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online

Quick Response Code:

Website: www.jpbsonline.org

DOI: 10.4103/jpbs.JPBS_258_16

How to cite this article: Sathyamoorthy N, Magharla DD, Vankayalu SD. Effect of surface modification on the *In vitro* protein adsorption and cell cytotoxicity of vinorelbine nanoparticles. J Pharm Bioall Sci 2017;9:135-43.

Original Article

Effect of Surface Modification on the *In vitro* Protein Adsorption and Cell Cytotoxicity of Vinorelbine Nanoparticles

Nandhakumar Sathyamoorthy, Dhanaraju Dasaratha Magharla, Sundar Devendaran Vankayalu

Department of Pharmaceutics, GIET School of Pharmacy, East Godavari, Andhra Pradesh, India

ABSTRACT

Context: Nanocarriers possessing long-circulating abilities could take advantage of the pathophysiology of tumor vasculature to achieve spatial placement. To attain such qualities, the drug carriers should possess suitable physicochemical properties such as size and surface hydrophilicity. **Aim:** The aim of this study was to prepare poly(ε-caprolactone) nanoparticles (NPs) loaded with vinorelbine bitartrate (VB) and to modify its steric properties using polyethylene glycol and poloxamer. Furthermore, the influence of surface modification of NPs on their physicochemical and cell interactive properties was evaluated. **Materials and Methods:** NPs were prepared by double emulsion solvent extraction–evaporation technique. The prepared NPs were evaluated for their physicochemical properties, *in vitro* protein adsorption and cell cytotoxicity. **Results and Discussion:** The NPs were <250 nm with an entrapment efficiency ranging between 40% and 52%. The zeta potential of the NPs varied from −7.52 mV to −1.27 mV depending on the surface modification. The *in vitro* release studies exhibited a biphasic pattern with an initial burst release followed by controlled release of the drug over 72 h. The protein adsorption studies revealed that the ability to resist protein adsorption was influenced by the concentration of surface-modifying agents and the amount of proteins available for interaction. The surface-modified NPs produced cell cytotoxicity comparable to free VB at higher concentrations owing to sustained release of the drug into the cellular environment. **Conclusion:** The results emphasize that surface modification of nanocarriers is an essential and effective tool to dodge opsonization and phagocytosis in the physiological milieu.

KEYWORDS: *Cell cytotoxicity, nanoparticles, protein adsorption, surface modification, vinorelbine*

INTRODUCTION

The clinical success of nanocarriers based on passive targeting depends on their capability to take advantage of the enhanced permeability and retention (EPR) effect, which is observed to occur unanimously in all types of fast-growing solid tumors with the exception of hypovascular tumors.[1,2] Unlike the normal blood vasculature, which is composed of a nonfenestrated, single layer of endothelial cells with tight junctions, the tumor vasculature shows a defective architecture with large fenestrations about 100–600 nm. The fenestrations are sufficiently large for the extravasation and accumulation of molecules into the vascular bed and the interstitial space.[3,4] Another important feature of solid tumors is the lack of lymphatic drainage that helps in retaining the macromolecules within the tumor tissue.[5]

To exploit the EPR effect, the nanocarriers should remain in the blood circulation long enough to reach the tumor site. However, the prevalence of nanoparticles (NPs) in

Address for correspondence: Dr. Dhanaraju Dasaratha Magharla, Department of Pharmaceutics, GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry, East Godavari - 533 296, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online

Quick Response Code:

Website: www.jpbsonline.org

DOI: 10.4103/jpbs.JPBS_258_16

How to cite this article: Sathyamoorthy N, Magharla DD, Vankayalu SD. Effect of surface modification on the *In vitro* protein adsorption and cell cytotoxicity of vinorelbine nanoparticles. J Pharm Bioall Sci 2017;9:135-43.

Scientific Research Publishing

American Journal of Analytical Chemistry, 2017, 8, 742-751
http://www.scirp.org/journal/ajac
ISSN Online: 2156-8278
ISSN Print: 2156-8251

Simultaneous Determination of N-Acetyl Cysteine and Taurine by HPTLC Method in Active Pharmaceutical Ingredient and Pharmaceutical Dosage Form

A. R. Magesh, Magharla Dasaratha Dhanaraju*

GIET School of Pharmacy, Rajahmundry, India
Email: *armagesh@yahoo.co.in

How to cite this paper: Magesh, A.R. and Dhanaraju, M.D. (2017) Simultaneous Determination of N-Acetyl Cysteine and Taurine by HPTLC Method in Active Pharmaceutical Ingredient and Pharmaceutical Dosage Form. *American Journal of Analytical Chemistry*, **8**, 742-751.
https://doi.org/10.4236/ajac.2017.811054

Received: October 3, 2017
Accepted: November 11, 2017
Published: November 14, 2017

Abstract

Specific, precise and sensitive TLC-Densitometric method was developed and validated for the simultaneous estimation of N-Acetyl cysteine and Taurine in active pharmaceutical ingredient and pharmaceutical dosage form. An effective separation was achieved on pre-coated silica gel HPTLC plates by using n-butanol:acetic acid:water (8:0.5:1.5 v/v/v). The spots were scanned densitometrically at 295 nm. The RF values of N-Acetyl cysteine and Taurine were found to be 0.29 and 0.52, respectively. Calibration curves were linear in the range of 30 - 180 and 100 - 600 ng/band for N-Acetyl cysteine and Taurine, correspondingly with correlation coefficients of 0.999. The developed method was validated as per ICH guidelines. The limits of detection were 11.24 and 63.40 ng/spot for NAC and TAU respectively. The method developed was found to be precise and specific for the simultaneous analysis of N-Acetyl cysteine and Taurine in pure and tablet dosage form.

Keywords

High Performance Thin Layer Chromatography, N-Acetyl Cysteine, Taurine, Validation

1. Introduction

Acetyl cysteine is chemically known as (2R)-2-(acetyl amino)-3-sulfanyl propanoic acid, and is used as a mucolytic agent to reduce the viscosity of secretions probably by means of disulphide bond splitting in mucoproteins. Acetyl cysteine in addition is able to promote the detoxification of an intermediate paracetamol

Scientific Research Publishing

American Journal of Analytical Chemistry, 2017, 8, 742-751
http://www.scirp.org/journal/ajac
ISSN Online: 2156-8278
ISSN Print: 2156-8251

Simultaneous Determination of N-Acetyl Cysteine and Taurine by HPTLC Method in Active Pharmaceutical Ingredient and Pharmaceutical Dosage Form

A. R. Magesh, Magharla Dasaratha Dhanaraju*

GIET School of Pharmacy, Rajahmundry, India
Email: *armagesh@yahoo.co.in

How to cite this paper: Magesh, A.R. and Dhanaraju, M.D. (2017) Simultaneous Determination of N-Acetyl Cysteine and Taurine by HPTLC Method in Active Pharmaceutical Ingredient and Pharmaceutical Dosage Form. *American Journal of Analytical Chemistry*, **8**, 742-751.
https://doi.org/10.4236/ajac.2017.811054

Received: October 3, 2017
Accepted: November 11, 2017
Published: November 14, 2017

Abstract

Specific, precise and sensitive TLC-Densitometric method was developed and validated for the simultaneous estimation of N-Acetyl cysteine and Taurine in active pharmaceutical ingredient and pharmaceutical dosage form. An effective separation was achieved on pre-coated silica gel HPTLC plates by using n-butanol:acetic acid:water (8:0.5:1.5 v/v/v). The spots were scanned densitometrically at 295 nm. The RF values of N-Acetyl cysteine and Taurine were found to be 0.29 and 0.52, respectively. Calibration curves were linear in the range of 30 - 180 and 100 - 600 ng/band for N-Acetyl cysteine and Taurine, correspondingly with correlation coefficients of 0.999. The developed method was validated as per ICH guidelines. The limits of detection were 11.24 and 63.40 ng/spot for NAC and TAU respectively. The method developed was found to be precise and specific for the simultaneous analysis of N-Acetyl cysteine and Taurine in pure and tablet dosage form.

Keywords

High Performance Thin Layer Chromatography, N-Acetyl Cysteine, Taurine, Validation

1. Introduction

Acetyl cysteine is chemically known as (2R)-2-(acetyl amino)-3-sulfanyl propanoic acid, and is used as a mucolytic agent to reduce the viscosity of secretions probably by means of disulphide bond splitting in mucoproteins. Acetyl cysteine in addition is able to promote the detoxification of an intermediate paracetamol

Beni-Suef University Journal of Basic and Applied Sciences 6 (2017) 39–47

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Microwave-assisted synthesis, structural activity relationship and biological activity of some new quinoxaline Schiff base derivatives as highly potent spirochete bactericidal agents

Chandravadivelu Gopi [a,b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a,*]

[a] GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh 530017, India

ARTICLE INFO

Article history:
Received 14 September 2016
Received in revised form 30 December 2016
Accepted 31 December 2016
Available online 4 January 2017

Keywords:
Quinoxaline
Condensation reaction
Schiff bases
Anti-leptospiral activity
Leptospira icterohaemorrhagiae

ABSTRACT

The main aim of this work was to synthesise a new (E)-3-(4-or3-Aminophenylimino) quinoxaline-2(3*H*)-one oxime Schiff base derivatives and evaluate the anti-leptospiral activity against *Leptospira icterohaemorrhagiae*. The mentioned derivatives were prepared by performing microwave-assisted condensation reactions of (E)-3-(4-or3-Aminophenyl imino)quinoxaline-2(3*H*)-one and aromatic aldehydes. The structures of these interesting compounds were characterised by FT-IR, ^{1}H NMR and mass spectroscopy. Furthermore, these compounds were screened for spirocidal activity against *Leptospira icterohaemorrhagiae* by using *in vitro* and *in vivo* method. The anti-leptospiral activity result reveals that most of the compounds were exhibiting considerable activity against *Leptospira icterohaemorrhagiae*. Compound **6c** demonstrated remarkable activity at low concentration against the *Leptospira icterohaemorrhagiae* as compared to the standard drugs.

1. Introduction

Leptospirosis is an acute anthropo-zoonotic infection (transmitted from animal to animal and man) that occurs in many parts of the world, but most frequently in tropical and subtropical regions (Sambasiva et al., 2003). It is caused by spirochete bacteria of the genus *Leptospira* (Evangelista and Coburn, 2010). The bacteria spread mainly through the urine of infected animals (Rats, moles and mice) which can get into water or soil and survive there for weeks to months. It also transmitted through the semen of the infected animals (Sumanta et al., 2015). These microbes can enter the body through the skin or mucous membrane, especially if the skin is broken from a cut or scratch, swallowing contaminated water, splashing of contaminated water into the nose or eyes (Ko et al., 2009). Some of the research studies suggested that it is an occupational disease occurs worldwide, but is most common in China, Vietnam, Japan and Korea. This disease usually affects people living with health hazards in the workplace, such as sewer worker, slaughterhouse worker, veterinarian, surfers, swimmers and farmers etc., (Rafizah et al., 2013). Some of the symptoms of leptospirosis are high fever, headache, chills, joint pain, muscle aches, diarrhoea, jaundice and vomiting (Daher et al., 2010). In India, leptospirosis has been known to be endemic since in the early period of the 20th century and emerging health issues over the next three to four decades. It has been diagnosed by enzyme-linked immunosorbent assay (ELISA), microscopic agglutination test (MAT), polymerase chain reaction (PCR), serological test and dark field microscopy (DFM) (Musso and Scola, 2013). The microbial growth has been controlled by using the medication such as doxycycline, penicillin, ampicillin, amoxicillin and third generation cephalosporin (Jessica et al., 2006; Edwards, 1959) etc., There is a requirement of highly potent molecule to control this disease effectively.

Quinoxalines and their derivatives are nitrogen based six-membered heterocyclic compounds used in food and pharmaceutical industry (Soleymani et al., 2012). They also called as benzopyrine and widely employed in many pharmaceutical applications such as anti-inflammatory (Burguete et al., 2011), anti-oxidant (Hossain et al., 2012), anti-viral (Vieira et al., 2014), anti-bacterial (Shen et al., 2016), anti-malarial (Shekhar et al., 2014), anti-cancer (Alinezhad et al., 2013), anti-depressant (Vadhat and Baghery, 2013; Galal et al., 2011), anti-protozoal (Marella et al., 2013), hypolipidemic (Singh et al., 2011), anti-HIV (Ali et al., 2007), anti-convulsant (Elhelby et al., 2011) and anti-leptospiral agents (Natarajan et al., 2013). It's also found in many antibiotic as a part of the molecular structure such as actinoleutin,

* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533 296, A.P., India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

http://dx.doi.org/10.1016/j.bjbas.2016.12.007
2314-8535/

Beni-Suef University Journal of Basic and Applied Sciences 6 (2017) 39–47

HOSTED BY

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Microwave-assisted synthesis, structural activity relationship and biological activity of some new quinoxaline Schiff base derivatives as highly potent spirochete bactericidal agents

Chandravadivelu Gopi [a,b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a,*]

[a] GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh 530017, India

ARTICLE INFO

Article history:
Received 14 September 2016
Received in revised form 30 December 2016
Accepted 31 December 2016
Available online 4 January 2017

Keywords:
Quinoxaline
Condensation reaction
Schiff bases
Anti-leptospiral activity
Leptospira icterohaemorrhagiae

ABSTRACT

The main aim of this work was to synthesise a new (E)-3-(4-or3-Aminophenylimino) quinoxaline-2(3*H*)-one oxime Schiff base derivatives and evaluate the anti-leptospiral activity against *Leptospira icterohaemorrhagiae*. The mentioned derivatives were prepared by performing microwave-assisted condensation reactions of (E)-3-(4-or3-Aminophenyl imino)quinoxaline-2(3*H*)-one and aromatic aldehydes. The structures of these interesting compounds were characterised by FT-IR, ^{1}H NMR and mass spectroscopy. Furthermore, these compounds were screened for spirocidal activity against *Leptospira icterohaemorrhagiae* by using *in vitro* and *in vivo* method. The anti-leptospiral activity result reveals that most of the compounds were exhibiting considerable activity against *Leptospira icterohaemorrhagiae*. Compound **6c** demonstrated remarkable activity at low concentration against the *Leptospira icterohaemorrhagiae* as compared to the standard drugs.

1. Introduction

Leptospirosis is an acute anthropo-zoonotic infection (transmitted from animal to animal and man) that occurs in many parts of the world, but most frequently in tropical and subtropical regions (Sambasiva et al., 2003). It is caused by spirochete bacteria of the genus *Leptospira* (Evangelista and Coburn, 2010). The bacteria spread mainly through the urine of infected animals (Rats, moles and mice) which can get into water or soil and survive there for weeks to months. It also transmitted through the semen of the infected animals (Sumanta et al., 2015). These microbes can enter the body through the skin or mucous membrane, especially if the skin is broken from a cut or scratch, swallowing contaminated water, splashing of contaminated water into the nose or eyes (Ko et al., 2009). Some of the research studies suggested that it is an occupational disease occurs worldwide, but is most common in China, Vietnam, Japan and Korea. This disease usually affects people living with health hazards in the workplace, such as sewer worker, slaughterhouse worker, veterinarian, surfers, swimmers and farmers etc., (Rafizah et al., 2013). Some of the symptoms of leptospirosis are high fever, headache, chills, joint pain, muscle aches, diarrhoea, jaundice and vomiting (Daher et al., 2010). In India, leptospirosis has been known to be endemic since in the early period of the 20th century and emerging health issues over the next three to four decades. It has been diagnosed by enzyme-linked immunosorbent assay (ELISA), microscopic agglutination test (MAT), polymerase chain reaction (PCR), serological test and dark field microscopy (DFM) (Musso and Scola, 2013). The microbial growth has been controlled by using the medication such as doxycycline, penicillin, ampicillin, amoxicillin and third generation cephalosporin (Jessica et al., 2006; Edwards, 1959) etc., There is a requirement of highly potent molecule to control this disease effectively.

Quinoxalines and their derivatives are nitrogen based six-membered heterocyclic compounds used in food and pharmaceutical industry (Soleymani et al., 2012). They also called as benzopyrine and widely employed in many pharmaceutical applications such as anti-inflammatory (Burguete et al., 2011), anti-oxidant (Hossain et al., 2012), anti-viral (Vieira et al., 2014), anti-bacterial (Shen et al., 2016), anti-malarial (Shekhar et al., 2014), anti-cancer (Alinezhad et al., 2013), anti-depressant (Vadhat and Baghery, 2013; Galal et al., 2011), anti-protozoal (Marella et al., 2013), hypolipidemic (Singh et al., 2011), anti-HIV (Ali et al., 2007), anti-convulsant (Elhelby et al., 2011) and anti-leptospiral agents (Natarajan et al., 2013). It's also found in many antibiotic as a part of the molecular structure such as actinoleutin,

* Corresponding author at: GIET School of Pharmacy, NH-16, Chaitanya Knowledge City, Rajahmundry 533 296, A.P., India.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

http://dx.doi.org/10.1016/j.bjbas.2016.12.007

European Journal of Applied Sciences 9 (4): 189-199, 2017
ISSN 2079-2077

DOI: 10.5829/idosi.ejas.2017.189.199

Development of Validated Stability Indicating Assay Method for Simultaneous Estimation of Metformin and Dapagliflozin by RP- HPLC

[1,2]T. Deepan, [2]M.V. Basaveswara Rao and [1]M.D. Dhanaraju

[1]GIET School of Pharmacy, Andhra Pradesh, India
[2]Krishna University, Andhra Pradesh, India

Abstract: A simple, precise and stability indicating HPLC method was developed and validated for the simultaneous determination of Metformin hydrochloride (MET) and Dapagliflozin (DAP) in pharmaceutical dosage forms. The separation was achieved on an Inspire (4.6 x 150mm, 5µm)5micro column with isocratic flow. The mobilephase at a flow rate of 1.0mLmin consisted ofAcetonitrile and 0.1M orthophosphoric acid buffer (70:30, v/v). The UV detection was carried out at 260nm. The retention times for MET and DAP were 2.097min and 3.691min, respectively. Parameters such as linearity, precision, accuracy, specificity and ruggedness are studied as reported in the International Conference on Harmonization guidelines.A linear response was observed over the concentration range of 5-25?µg/ mL for DAP and 500-2500?µg/ mL for MET respectively. Limit of detection and limit of quantification for DAP were 2.98 and 9.95?µg/mL and for MET were 3.05?µg/mL and 10.07?µg/mL respectively. Individual drugs (MET and DAP) were exposed to thermal, photolytic, hydrolytic and oxidative stress conditions. The resultant stressed samples were analyzed by the proposed method. The method gave high resolution among the degradation products and the analytes. The analysis concluded that the method was selective for simultaneous estimation of Metformin and Dapagliflozin which will help to improve quality control and contribute to stability studies of pharmaceutical tablets containing these drugs.

Key words: Metformin · Dapagliflozin · Validation · Stability Studies · HPLC

INTRODUCTION

Metformin is chemically 1, 1-dimethyl biguanide hydrochloride (Fig. 1A). Dapagliflozin is chemically known as (1S)-1, 5-anhydro-1-C- [4-chloro-3-[(4-ethoxyphenyl) methyl] phenyl]-D-glucitol (Fig. 1B). Metformin and Dapagliflozin is a sodium glucose cotransporter 2 (SGLT 2) inhibitor and biguanide antidiabetic combination. The SGLT2 inhibitor works by decreasing the amount of sugarthe body absorbs and increasing the amount of sugar that leaves the body in the urine. A combination of 1000mg of Metformin and 10 mg of Dapagliflozinis available commercially as tablets indicated for the treatment of diabetes mellitus [1, 2].

Literature survey shows that numerous analytical methods are reported for the individual estimation of MET and DAP as well as metformin with other pharmaceutical preparations by various methods such as UV spectrophotometry [3, 4] HPLC [5-9] HPTLC [10] LC MS [11-14] and Capillary electrophoresis [15]. However there is no method reported for metformin and dapagliflozin by HPLC. Hence there is a need for sensitive HPLC method which is stability indicating for MET and DAP. Stability studies was carried out by forcing the drug under variety of stress conditions like thermal, oxidative, light and hydrolysis (Acid and base), The developed HPLC method was validated as per ICH guidelines [16]. The aim of the present study was to develop a HPLC method for Metformin and Dapagliflozin in API and marketed formulation and to perform the stability studies under various stress conditions.

Corresponding Author: M.D. Dhanaraju, GIET School of Pharmacy, Andhra Pradesh, India.

European Journal of Applied Sciences 9 (4): 189-199, 2017
ISSN 2079-2077

DOI: 10.5829/idosi.ejas.2017.189.199

Development of Validated Stability Indicating Assay Method for Simultaneous Estimation of Metformin and Dapagliflozin by RP- HPLC

[1,2]T. Deepan, [2]M.V. Basaveswara Rao and [1]M.D. Dhanaraju

[1]GIET School of Pharmacy, Andhra Pradesh, India
[2]Krishna University, Andhra Pradesh, India

Abstract: A simple, precise and stability indicating HPLC method was developed and validated for the simultaneous determination of Metformin hydrochloride (MET) and Dapagliflozin (DAP) in pharmaceutical dosage forms. The separation was achieved on an Inspire (4.6 x 150mm, 5µm)5micro column with isocratic flow. The mobilephase at a flow rate of 1.0mLmin consisted ofAcetonitrile and 0.1M orthophosphoric acid buffer (70:30, v/v). The UV detection was carried out at 260nm. The retention times for MET and DAP were 2.097min and 3.691min, respectively. Parameters such as linearity, precision, accuracy, specificity and ruggedness are studied as reported in the International Conference on Harmonization guidelines.A linear response was observed over the concentration range of 5-25?µg/ mL for DAP and 500-2500?µg/ mL for MET respectively. Limit of detection and limit of quantification for DAP were 2.98 and 9.95?µg/mL and for MET were 3.05?µg/mL and 10.07?µg/mL respectively. Individual drugs (MET and DAP) were exposed to thermal, photolytic, hydrolytic and oxidative stress conditions. The resultant stressed samples were analyzed by the proposed method. The method gave high resolution among the degradation products and the analytes. The analysis concluded that the method was selective for simultaneous estimation of Metformin and Dapagliflozin which will help to improve quality control and contribute to stability studies of pharmaceutical tablets containing these drugs.

Key words: Metformin · Dapagliflozin · Validation · Stability Studies · HPLC

INTRODUCTION

Metformin is chemically 1, 1-dimethyl biguanide hydrochloride (Fig. 1A). Dapagliflozin is chemically known as (1S)-1, 5-anhydro-1-C- [4-chloro-3-[(4-ethoxyphenyl) methyl] phenyl]-D-glucitol (Fig. 1B). Metformin and Dapagliflozin is a sodium glucose cotransporter 2 (SGLT 2) inhibitor and biguanide antidiabetic combination. The SGLT2 inhibitor works by decreasing the amount of sugarthe body absorbs and increasing the amount of sugar that leaves the body in the urine. A combination of 1000mg of Metformin and 10 mg of Dapagliflozinis available commercially as tablets indicated for the treatment of diabetes mellitus [1, 2].

Literature survey shows that numerous analytical methods are reported for the individual estimation of MET and DAP as well as metformin with other pharmaceutical preparations by various methods such as UV spectrophotometry [3, 4] HPLC [5-9] HPTLC [10] LC MS [11-14] and Capillary electrophoresis [15]. However there is no method reported for metformin and dapagliflozin by HPLC. Hence there is a need for sensitive HPLC method which is stability indicating for MET and DAP. Stability studies was carried out by forcing the drug under variety of stress conditions like thermal, oxidative, light and hydrolysis (Acid and base), The developed HPLC method was validated as per ICH guidelines [16]. The aim of the present study was to develop a HPLC method for Metformin and Dapagliflozin in API and marketed formulation and to perform the stability studies under various stress conditions.

Corresponding Author: M.D. Dhanaraju, GIET School of Pharmacy, Andhra Pradesh, India.

DOI:10.7598/cst2017.1355
ISSN:2278-3458

Chemical Science Transactions
2017, 6(2), 316-322

RESEARCH ARTICLE

Development and Validation of RP-HPLC Method for Simultaneous Estimation of Diethylcarbamazine Citrate and Chlorpheniramine Maleate in Pharmaceutical Preparations

A. R. MAGESH and M. D. DHANARAJU*

Research Lab, GIET School of Pharmacy,
NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India
mddhanaraju@yahoo.com

Received 7 December 2016 / Accepted 21 December 2016

Abstract: Simple, precise and accurate HPLC method for diethylcarbamazine citrate and chlorpheniramine maleate was developed. The combination of DEC and CPM used effectively used to treat filariasis, tropical eosinophilia without causing allergic manifestations and is existing in tablet dosage form. HPLC separation was performed with a hypersil ODS-C18 (5µ, 250 mm x 4.6 mm, i.d) as a stationary phase and methanol: buffer (55:45v/v) as mobile phase, at a flow rate of 1.0 mL/min, UV detection was performed at 254 nm. The retention time of chlorpheniramine maleate and diethylcarbamazine citrate were found to be 2.091 and 4.74 min respectively. Results of analysis were validated by recovery studies. Outcome of studies showed that the projected RP-HPLC method is simple, rapid, accurate and precise which can be used for regular determination of diethylcarbamazine citrate and chlorpheniramine maleate in bulk and its pharmaceutical dosage form.

Keywords: Diethylcarbamazine citrate, Chlorpheniramine maleate, HPLC

Introduction

Diethylcarbamazine citrate (DEC) chemically, *N,N*-dimethyl-4-methylpiperazine-1-carboxamide dihyhydrogen citrate (Figure 1). It is a piperazine anthelmintic agent indicated for the management of individual patients with lymphatic filariasis, tropical pulmonary eosinophilia and loiasis. It exerts the mechanism by inhibiting arachidonic acid metabolism.

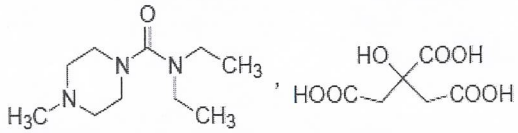


Figure 1. Chemical structure of diethylcarbamazine citrate (DEC)

DOI:10.7598/cst2017.1355
ISSN:2278-3458

Chemical Science Transactions
2017, 6(2), 316-322

RESEARCH ARTICLE

Development and Validation of RP-HPLC Method for Simultaneous Estimation of Diethylcarbamazine Citrate and Chlorpheniramine Maleate in Pharmaceutical Preparations

A. R. MAGESH and M. D. DHANARAJU*

Research Lab, GIET School of Pharmacy,
NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India
mddhanaraju@yahoo.com

Received 7 December 2016 / Accepted 21 December 2016

Abstract: Simple, precise and accurate HPLC method for diethylcarbamazine citrate and chlorpheniramine maleate was developed. The combination of DEC and CPM used effectively used to treat filariasis, tropical eosinophilia without causing allergic manifestations and is existing in tablet dosage form. HPLC separation was performed with a hypersil ODS-C18 (5µ, 250 mm x 4.6 mm, i.d) as a stationary phase and methanol: buffer (55:45v/v) as mobile phase, at a flow rate of 1.0 mL/min, UV detection was performed at 254 nm. The retention time of chlorpheniramine maleate and diethylcarbamazine citrate were found to be 2.091 and 4.74 min respectively. Results of analysis were validated by recovery studies. Outcome of studies showed that the projected RP-HPLC method is simple, rapid, accurate and precise which can be used for regular determination of diethylcarbamazine citrate and chlorpheniramine maleate in bulk and its pharmaceutical dosage form.

Keywords: Diethylcarbamazine citrate, Chlorpheniramine maleate, HPLC

Introduction

Diethylcarbamazine citrate (DEC) chemically, *N,N*-dimethyl-4-methylpiperazine-1-carboxamide dihyhydrogen citrate (Figure 1). It is a piperazine anthelmintic agent indicated for the management of individual patients with lymphatic filariasis, tropical pulmonary eosinophilia and loiasis. It exerts the mechanism by inhibiting arachidonic acid metabolism.

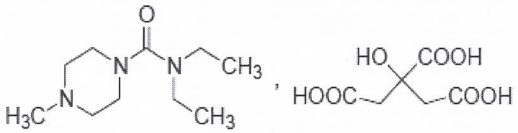


Figure 1. Chemical structure of diethylcarbamazine citrate (DEC)

ORIGINAL ARTICLE

Clinical Implications of Molecular PEGylation on Therapeutic Proteins

Nandhakumar Sathyamoorthy, Dhanaraju Dasaratha Magharla

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

Molecular PEGylation has redefined the clinical importance of many biomolecules by improving their pharmacodynamic and pharmacokinetic properties. From its inception, PEGylation has grown substantively into a well-established technology to facilitate the clinical translation of macromolecules by overcoming their limitations. PEGylation renders a number of benefits to therapeutic proteins, such as, increase in hydrodynamic size, extension of circulation half-life, prevention of proteolytic degradation and reduction of immunogenicity and antigenicity. The successful entrance of the PEGylated protein pharmaceuticals to the market, can be ascribed to the unique properties of poly (ethylene glycol) (PEG) conjugated to these proteins. This article aims to review the precise role of PEG in improving the therapeutic efficacy of PEG-protein conjugates approved by regulatory bodies. The data presented herein were extracted from articles published in peer reviewed journals, official websites of manufacturers and safety labeling and drug approval summary of the FDA Centre for Drug evaluation and Research (CDER).

Key words: PEGylation, proteins, poly(ethylene glycol), circulation half-life, immunogenicity

Correspondence:
Dr. Dhanaraju Dasaratha Magharla
Department of Pharmaceutics, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online
Website: www.jbclinpharm.org
Quick Response Code:

INTRODUCTION

The advent of molecule-altering technologies and improved synthetic methods has led to the finding of newer proteins and peptides that resemble human proteins and peptides.[1] Although, capable of producing potential therapeutic benefits, protein molecules have serious biopharmaceutical concerns such as, poor shelf- life, rapid degradation in the physiological environment, poor solubility, immunogenicity and antigenicity.[2] These concerns can be overcome by utilizing the beneficial properties of polyethylene glycols and PEGylation. 'PEGylation' is the process of chemical attachment of PEG to bioactive proteins and peptides, to modify their pharmacokinetic and pharmacodynamic properties. Here, we present a brief summary of molecular PEGylation and PEGylated proteins currently approved for the clinical management of various conditions including oncology, infectious diseases and metabolic disorders.

Background

The origin of PEGnology dates back to the 1960's, when Davis and his colleagues were looking for a solution to overcome the immunological reactions produced injection of foreign proteins into humans. Eventually, they found that coupling monomethoxy PEGs to therapeutic proteins yielded PEG-proteins which possessed low immunogenicity and longer circulating half-lives in comparison to their unpegylated equals.[3] Then onwards PEGylation has grown profoundly into a well-accepted and well-established technology to produce biomolecules with improved stability and potency.[4]

Molecular PEGylation

The attachment of PEG to drug molecule to alter its bio-distribution, pharmacokinetics and toxicity is termed as molecular PEGylation.[5] Molecular PEGylation is principally used to configure therapeutic proteins and enzymes, although seldom used on small drug molecules.[6] PEGylating a protein or a peptide by chemical linkage is generally intended at improving its water solubility, bioavailability, decreasing elimination rate, formation of stable linkage and augmenting the therapeutic activity.[7] The most important application of PEG conjugation is increasing the circulating half-life of proteins and peptides. Research has shown that biological half-life and bioavailability of interferon-α-2a,[8] tumor necrosis factor,[9] brain-derived neurotropic factor,[10] growth hormone-releasing factor,[11] asparaginase,[12] lactoferrin,[13] interleukin-2,[14] and streptokinase[15] are improved significantly after PEGylation than the native proteins. The anticancer activity of interferon-α-2a and tumor necrosis factor increased profoundly after conjugation with PEG. Though extensive research have hovered towards the advancement in PEGylated proteins, only a few products has entered the market owing to expensive costs involved in the clinical development and regulatory approval process.[16] Of the marketed nanomedicines which got approval from the regulatory bodies, nearly 40% are based on protein-polymer conjugates and liposomal formulations.[17] The list of PEGylated proteins which are approved for clinical applications is presented in Table 1.

PEGylation-chemistry and disposition

Polyethylene glycol is considered as an ideal polymer for conjugation with proteins owing to its desirable properties such as, non-toxicity, non-immunogenicity, non-antigenicity, amphiphilic nature, FDA approval and low accumulation in the reticulo-endothelial system (RES) organs.[18] PEG is an inert polymer comprising of repetitive units of ethylene oxide, either as linear or branched chains as shown in figure 1. PEGs are commercially available in different molecular weights with functional groups present at one or more termini to facilitate conjugation. PEGs with free hydroxyl groups at both ends (-OH) or PEGs with methoxylated groups (-OCH_3) at one or two ends are frequently used in conjugation, of which the latter has important application in PEGylation. Reaction conditions and PEGylation chemistry are immensely responsible for the functional properties of the conjugated proteins.[19] The PEG chemistry for amine conjugation include PEG tresylate, PEG succinimidyl carbonate, PEG succinimidyl succinate, PEG dichlorotriazine, PEG trichlorophenyl carbonate,

Cite this article as: Nandhakumar S, Dhanaraju DM. Clinical Implications of Molecular PEGylation on Therapeutic Proteins. J Basic Clin Pharma 2017;8:87-91.

ORIGINAL ARTICLE

Clinical Implications of Molecular PEGylation on Therapeutic Proteins

Nandhakumar Sathyamoorthy, Dhanaraju Dasaratha Magharla

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

Molecular PEGylation has redefined the clinical importance of many biomolecules by improving their pharmacodynamic and pharmacokinetic properties. From its inception, PEGylation has grown substantively into a well-established technology to facilitate the clinical translation of macromolecules by overcoming their limitations. PEGylation renders a number of benefits to therapeutic proteins, such as, increase in hydrodynamic size, extension of circulation half-life, prevention of proteolytic degradation and reduction of immunogenicity and antigenicity. The successful entrance of the PEGylated protein pharmaceuticals to the market, can be ascribed to the unique properties of poly (ethylene glycol) (PEG) conjugated to these proteins. This article aims to review the precise role of PEG in improving the therapeutic efficacy of PEG-protein conjugates approved by regulatory bodies. The data presented herein were extracted from articles published in peer reviewed journals, official websites of manufacturers and safety labeling and drug approval summary of the FDA Centre for Drug evaluation and Research (CDER).

Key words: PEGylation, proteins, poly(ethylene glycol), circulation half-life, immunogenicity

Correspondence:
Dr. Dhanaraju Dasaratha Magharla
Department of Pharmaceutics, GIET School of Pharmacy, NH-16 Chaitanya Knowledge City, Rajahmundry, Andhra Pradesh, India.
E-mail: mddhanaraju@yahoo.com

Access this article online
Website: www.jbclinpharm.org
Quick Response Code:

INTRODUCTION

The advent of molecule-altering technologies and improved synthetic methods has led to the finding of newer proteins and peptides that resemble human proteins and peptides.[1] Although, capable of producing potential therapeutic benefits, protein molecules have serious biopharmaceutical concerns such as, poor shelf- life, rapid degradation in the physiological environment, poor solubility, immunogenicity and antigenicity.[2] These concerns can be overcome by utilizing the beneficial properties of polyethylene glycols and PEGylation. 'PEGylation' is the process of chemical attachment of PEG to bioactive proteins and peptides, to modify their pharmacokinetic and pharmacodynamic properties. Here, we present a brief summary of molecular PEGylation and PEGylated proteins currently approved for the clinical management of various conditions including oncology, infectious diseases and metabolic disorders.

Background

The origin of PEGnology dates back to the 1960's, when Davis and his colleagues were looking for a solution to overcome the immunological reactions produced injection of foreign proteins into humans. Eventually, they found that coupling monomethoxy PEGs to therapeutic proteins yielded PEG-proteins which possessed low immunogenicity and longer circulating half-lives in comparison to their unpegylated equals.[3] Then onwards PEGylation has grown profoundly into a well-accepted and well-established technology to produce biomolecules with improved stability and potency.[4]

Molecular PEGylation

The attachment of PEG to drug molecule to alter its bio-distribution, pharmacokinetics and toxicity is termed as molecular PEGylation.[5] Molecular PEGylation is principally used to configure therapeutic proteins and enzymes, although seldom used on small drug molecules.[6] PEGylating a protein or a peptide by chemical linkage is generally intended at improving its water solubility, bioavailability, decreasing elimination rate, formation of stable linkage and augmenting the therapeutic activity.[7] The most important application of PEG conjugation is increasing the circulating half-life of proteins and peptides. Research has shown that biological half-life and bioavailability of interferon-α-2a,[8] tumor necrosis factor,[9] brain-derived neurotropic factor,[10] growth hormone-releasing factor,[11] asparaginase,[12] lactoferrin,[13] interleukin-2,[14] and streptokinase[15] are improved significantly after PEGylation than the native proteins. The anticancer activity of interferon-α-2a and tumor necrosis factor increased profoundly after conjugation with PEG. Though extensive research have hovered towards the advancement in PEGylated proteins, only a few products has entered the market owing to expensive costs involved in the clinical development and regulatory approval process.[16] Of the marketed nanomedicines which got approval from the regulatory bodies, nearly 40% are based on protein-polymer conjugates and liposomal formulations.[17] The list of PEGylated proteins which are approved for clinical applications is presented in Table 1.

PEGylation-chemistry and disposition

Polyethylene glycol is considered as an ideal polymer for conjugation with proteins owing to its desirable properties such as, non-toxicity, non-immunogenicity, non-antigenicity, amphiphilic nature, FDA approval and low accumulation in the reticulo-endothelial system (RES) organs.[18] PEG is an inert polymer comprising of repetitive units of ethylene oxide, either as linear or branched chains as shown in figure 1. PEGs are commercially available in different molecular weights with functional groups present at one or more termini to facilitate conjugation. PEGs with free hydroxyl groups at both ends (-OH) or PEGs with methoxylated groups ($-OCH_3$) at one or two ends are frequently used in conjugation, of which the latter has important application in PEGylation. Reaction conditions and PEGylation chemistry are immensely responsible for the functional properties of the conjugated proteins.[19] The PEG chemistry for amine conjugation include PEG tresylate, PEG succinimidyl carbonate, PEG succinimidyl succinate, PEG dichlorotriazine, PEG trichlorophenyl carbonate,

Cite this article as: Nandhakumar S, Dhanaraju DM. Clinical Implications of Molecular PEGylation on Therapeutic Proteins. J Basic Clin Pharma 2017;8:87-91.

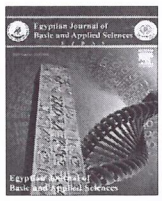
Egyptian Journal of Basic and Applied Sciences 4 (2017) 270–287

HOSTED BY

Contents lists available at ScienceDirect

Egyptian Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/ejbas



Full Length Article

Design, synthesis, spectroscopic characterization and anti-psychotic investigation of some novel Azo dye/Schiff base/Chalcone derivatives

Chandravadivelu Gopi [a,b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a,*]

[a] Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh 530017, India

ARTICLE INFO

Article history:
Received 26 December 2016
Received in revised form 7 October 2017
Accepted 10 October 2017
Available online 22 October 2017

Keywords:
Design
MVD
Catalepsy
Antipsychotic agent
X-ray crystallography

ABSTRACT

The purpose of the study is to design, synthesise and assess the antipsychotic activity of a set of the novel (5-(10-(3-*N*, *N*-Dimethylamino) propyl)-10*H*-phenothiazine-3-yl)-1,3,4-thiadiazo-2-yl) Azodye/Schiff base/Chalcone derivatives. The newly synthesised compound structure was characterised by FT-IR, ^{1}H NMR, Mass spectroscopy and elemental analysis. Each compound has been shown an excellent anti-psychotic activity in a haloperidol-induced catalepsy metallic bar test. The results found are firmly similar to docking study. Among the synthesised derivatives, compound 2-Amino-6-(3-hydroxy-4-methyl phenyl) pyrimidine-4-yl) (7-chloro-10-(3-(*N*, *N*-dimethylamino) propyl)-10*H*-phenothiazine-3-yl) methanone (**GC8**) exhibiting high potency of catalepsy induction. Therefore, the derivative of GC8 has been considered that a potent anti-psychotic agent among the synthesised compounds.

1. Introduction

Dopamine receptors are responsible for several functions such as fine motor control, emotion, learning, cognition, pleasure, sensation, motivation, memory and modulation of neuroendocrine behaviour, movements etc., [1]. Some changes in the role of dopaminergic receptor actions are generated many diseases like parkinsonism, psychomotor, schizophrenia, neurodegeneration, drug abuse, delusions and hallucinations etc., [2]. These receptors are mainly divided into D1-5. They belong to the class of G-protein-coupled-receptors [3,4]. Here, D1 and D5 receptors are known as D1 family associates, whereas D2, D3 and D4 receptors are known as D2 family associates [5]. Both families coupled with G-protein and retard the adenylyl cyclase [6,7]. With the knowledge of some evidence state that the possibility of the existence of D6 and D7 dopamine receptors, but such a type of receptor has not been sturdily documented. Generally, these receptors bind to the plasma membrane as a homodimer, heterodimers or higher-order oligomers etc., [8]. It has been targeted for different psychotic illnesses and also be considered in some non-psychotic disorders [9]. Drugs used to treat the psychotic problem are known as antipsychotic agents (or neuroleptic) is majorly classified into two types. Earlier antipsychotic drugs are called as typical or classical antipsychotic agents, whereas; currently available drugs are recognised as a second generation or atypical antipsychotic agents. Both the type of the antipsychotic agent is having a tendency to obstruct receptors in brain's dopamine pathways [10]. Most of the antipsychotic agents are having substantial side effects, such as dysphoria, parkinsonism, tardive dyskinesia, galactorrhea, sedation, irritability, hyperprolactinaemia, sexual functioning disorder and symptoms of ADHD, depression, narcolepsy, anxiety, improved appetite, obesity threat, paranoia, aggression, psychomotor agitation, diabetes mellitus (Type 2), akathisia, extrapyramidal symptoms and menstrual trouble [11]. Therefore, identification of a novel antagonist of dopamine receptor is needed to treat nervous diseases effectively. In recent years, there has been an immense awareness among the scientists toward the design of new drugs, which consumes less time, highly potent and lower cost to prepare an effective drug molecule against various health problems. Rapid and high throughput method of drug discovery is an only way to improve the therapeutic value of drugs in the animal model. Molecular docking is a one among the method to measure the biological activity of the proposed molecule with the targeted receptor rapidly using Molegro Virtual Docker (MVD). With the support of MVD, we found a bunch of novel compounds known as potent dopamine pathway inhibitors and bearing least side effect due to the presence of trusted thiadiazole and phenothiazine nucleus as part of the molecular structure. This study stated that easy way for the synthesis of novel Azo dye/Schiff bases/Chalcone

* Corresponding author.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

https://doi.org/10.1016/j.ejbas.2017.10.003
2314-808X/

Egyptian Journal of Basic and Applied Sciences 4 (2017) 270–287

HOSTED BY

Contents lists available at ScienceDirect

Egyptian Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/ejbas

Full Length Article

Design, synthesis, spectroscopic characterization and anti-psychotic investigation of some novel Azo dye/Schiff base/Chalcone derivatives

Chandravadivelu Gopi [a,b], Vedula Girija Sastry [c], Magharla Dasaratha Dhanaraju [a,*]

[a] Research Lab, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh 533296, India
[b] School of Pharmaceutical Sciences and Technologies, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh 533003, India
[c] A.U. College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh 530017, India

ARTICLE INFO

Article history:
Received 26 December 2016
Received in revised form 7 October 2017
Accepted 10 October 2017
Available online 22 October 2017

Keywords:
Design
MVD
Catalepsy
Antipsychotic agent
X-ray crystallography

ABSTRACT

The purpose of the study is to design, synthesise and assess the antipsychotic activity of a set of the novel (5-(10-(3-*N*, *N*-Dimethylamino) propyl)-10*H*-phenothiazine-3-yl)-1,3,4-thiadiazo-2-yl) Azodye/Schiff base/Chalcone derivatives. The newly synthesised compound structure was characterised by FT-IR, ^{1}H NMR, Mass spectroscopy and elemental analysis. Each compound has been shown an excellent anti-psychotic activity in a haloperidol-induced catalepsy metallic bar test. The results found are firmly similar to docking study. Among the synthesised derivatives, compound 2-Amino-6-(3-hydroxy-4-methyl phenyl) pyrimidine-4-yl) (7-chloro-10-(3-(*N*, *N*-dimethylamino) propyl)-10*H*-phenothiazine-3-yl) methanone (**GC8**) exhibiting high potency of catalepsy induction. Therefore, the derivative of GC8 has been considered that a potent anti-psychotic agent among the synthesised compounds.

1. Introduction

Dopamine receptors are responsible for several functions such as fine motor control, emotion, learning, cognition, pleasure, sensation, motivation, memory and modulation of neuroendocrine behaviour, movements etc., [1]. Some changes in the role of dopaminergic receptor actions are generated many diseases like parkinsonism, psychomotor, schizophrenia, neurodegeneration, drug abuse, delusions and hallucinations etc., [2]. These receptors are mainly divided into D1-5. They belong to the class of G-protein-coupled-receptors [3,4]. Here, D1 and D5 receptors are known as D1 family associates, whereas D2, D3 and D4 receptors are known as D2 family associates [5]. Both families coupled with G-protein and retard the adenylyl cyclase [6,7]. With the knowledge of some evidence state that the possibility of the existence of D6 and D7 dopamine receptors, but such a type of receptor has not been sturdily documented. Generally, these receptors bind to the plasma membrane as a homodimer, heterodimers or higher-order oligomers etc., [8]. It has been targeted for different psychotic illnesses and also be considered in some non-psychotic disorders [9]. Drugs used to treat the psychotic problem are known as antipsychotic agents (or neuroleptic) is majorly classified into two types. Earlier antipsychotic drugs are called as typical or classical antipsychotic agents, whereas; currently available drugs are recognised as a second generation or atypical antipsychotic agents. Both the type of the antipsychotic agent is having a tendency to obstruct receptors in brain's dopamine pathways [10]. Most of the antipsychotic agents are having substantial side effects, such as dysphoria, parkinsonism, tardive dyskinesia, galactorrhea, sedation, irritability, hyperprolactinaemia, sexual functioning disorder and symptoms of ADHD, depression, narcolepsy, anxiety, improved appetite, obesity threat, paranoia, aggression, psychomotor agitation, diabetes mellitus (Type 2), akathisia, extrapyramidal symptoms and menstrual trouble [11]. Therefore, identification of a novel antagonist of dopamine receptor is needed to treat nervous diseases effectively. In recent years, there has been an immense awareness among the scientists toward the design of new drugs, which consumes less time, highly potent and lower cost to prepare an effective drug molecule against various health problems. Rapid and high throughput method of drug discovery is an only way to improve the therapeutic value of drugs in the animal model. Molecular docking is a one among the method to measure the biological activity of the proposed molecule with the targeted receptor rapidly using Molegro Virtual Docker (MVD). With the support of MVD, we found a bunch of novel compounds known as potent dopamine pathway inhibitors and bearing least side effect due to the presence of trusted thiadiazole and phenothiazine nucleus as part of the molecular structure. This study stated that easy way for the synthesis of novel Azo dye/Schiff bases/Chalcone

* Corresponding author.
E-mail address: mddhanaraju@yahoo.com (M.D. Dhanaraju).

https://doi.org/10.1016/j.ejbas.2017.10.003
2314-808X/

Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Pelagia Research Library

Der Pharmacia Sinica, 2017, 8(2):16-22

Der Pharmacia

ISSN : 0976-

CODEN (USA):

Formulation and Optimization of Delayed Release MUPS (Multiple Unit Particulate System) Tablets of Omeprazole

Sundar VD*, Nandhakumar S, Alekya CH and Dhanaraju MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

The work was aimed to persuade the effect of size of sugar spheres and compression parameters on the prepa tablets, containing enteric coated pellets of omeprazole. Multiple unit dosage forms of Omeprazole were formul by wurster process. The sugar spheres (#18/20, #20/25, # 30/35, #40/60) were coated with the drug, HPMC 5 Eudragit L30D55 and then with PEG. The pellets were compressed into tablets using Prosolv granules as a pres absorbing matrix. The compressed tablets were characterized for DSC, SEM, and XRD. The Optimized formulat showed plastic deformation and the pellets embedded in the tablet maintain their integrity with no consider change in their surface properties. In vitro release profile of formulation F8 containing sugar spheres (#40/60) co with, Eudragit L30D55 70% w/w and PEG 4000 20% w/w as cushioning agent showed release up to 97% at end of 1 hr in buffer. The DSC, X-RD results proves that there is no potent incompatibility between the drug and polymer. The higher the size of sugar spheres higher will be the smash up to the coating and less resistance to gas environment than the small spheres. Small pellets were best suited for compression of multiple unit particulate syst of Omeprazole.

Keywords: Omeprazole, Sugar spheres, Eudragit L30D55, Prosolv

INTRODUCTION

Compression of pellets and microspheres into compact tablets is a smart approach to prepare a single unit dos forms that will readily crumble into its essential components when exposed to gastric fluids [1]. These dosage fo will maintain the advantages of pellets being a single unit dosage form [2,3] i.e., spread uniformly throughout gastro intestinal tract, improves bioavailability maximize the drug absorption; minimize local irritation of drug w indicates pellets can be used for immediate drug delivery [4-6]. The multiparticulates can be filled into capsule compressed into tablets. The fabrication of multiparticulates into tablets is proven to be familiar than the hard gel capsules where the later have been tampered, patient incompliance, difficulty in oesophageal transport, high production [7-9].

Pelletized tablets put forward various advantages like large dose drug administration, increased production rate, redu possibility of local irritation, toxicity, expected bioavailability, minimum fluctuations in plasma concentration of caused by food effects. Fabrication of compressed tablets using coated pellets is a tough task as; the pellets sh not fuse into non disintegrating matrix during compaction, and the drug release not to be altered by the compac process. With reservoir type pellet dosage forms, the layer of coating applied must withstand the compression forc can distort, but should not burst or must still provide controlled release even if ruptured [10].

Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Pelagia Research Library

Der Pharmacia Sinica, 2017, 8(2):16-22

Der Pharmacia

ISSN : 0976-

CODEN (USA):

Formulation and Optimization of Delayed Release MUPS (Multiple Unit Particulate System) Tablets of Omeprazole

Sundar VD*, Nandhakumar S, Alekya CH and Dhanaraju MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

The work was aimed to persuade the effect of size of sugar spheres and compression parameters on the prep tablets, containing enteric coated pellets of omeprazole. Multiple unit dosage forms of Omeprazole were formul by wurster process. The sugar spheres (#18/20, #20/25, # 30/35, #40/60) were coated with the drug, HPMC 5 Eudragit L30D55 and then with PEG. The pellets were compressed into tablets using Prosolv granules as a pres absorbing matrix. The compressed tablets were characterized for DSC, SEM, and XRD. The Optimized formulat showed plastic deformation and the pellets embedded in the tablet maintain their integrity with no consider change in their surface properties. In vitro release profile of formulation F8 containing sugar spheres (#40/60) co with, Eudragit L30D55 70% w/w and PEG 4000 20% w/w as cushioning agent showed release up to 97% at end of 1 hr in buffer. The DSC, X-RD results proves that there is no potent incompatibility between the drug and polymer. The higher the size of sugar spheres higher will be the smash up to the coating and less resistance to ga environment than the small spheres. Small pellets were best suited for compression of multiple unit particulate syst of Omeprazole.

Keywords: Omeprazole, Sugar spheres, Eudragit L30D55, Prosolv

INTRODUCTION

Compression of pellets and microspheres into compact tablets is a smart approach to prepare a single unit dos forms that will readily crumble into its essential components when exposed to gastric fluids [1]. These dosage fo will maintain the advantages of pellets being a single unit dosage form [2,3] i.e., spread uniformly throughout gastro intestinal tract, improves bioavailability maximize the drug absorption; minimize local irritation of drug w indicates pellets can be used for immediate drug delivery [4-6]. The multiparticulates can be filled into capsule compressed into tablets. The fabrication of multiparticulates into tablets is proven to be familiar than the hard gel capsules where the later have been tampered, patient incompliance, difficulty in oesophageal transport, high production [7-9].

Pelletized tablets put forward various advantages like large dose drug administration, increased production rate, redu possibility of local irritation, toxicity, expected bioavailability, minimum fluctuations in plasma concentration of caused by food effects. Fabrication of compressed tablets using coated pellets is a tough task as; the pellets sh not fuse into non disintegrating matrix during compaction, and the drug release not to be altered by the compac process. With reservoir type pellet dosage forms, the layer of coating applied must withstand the compression forc can distort, but should not burst or must still provide controlled release even if ruptured [10].

Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Pelagia Research Library

Der Pharmacia Sinica, 2017, 8(2):16-22

Der Pharmacia

ISSN : 0976-

CODEN (USA):

Formulation and Optimization of Delayed Release MUPS (Multiple Unit Particulate System) Tablets of Omeprazole

Sundar VD*, Nandhakumar S, Alekya CH and Dhanaraju MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

The work was aimed to persuade the effect of size of sugar spheres and compression parameters on the prepe tablets, containing enteric coated pellets of omeprazole. Multiple unit dosage forms of Omeprazole were formul by wurster process. The sugar spheres (#18/20, #20/25, # 30/35, #40/60) were coated with the drug, HPMC 5 Eudragit L30D55 and then with PEG. The pellets were compressed into tablets using Prosolv granules as a pres absorbing matrix. The compressed tablets were characterized for DSC, SEM, and XRD. The Optimized formulat showed plastic deformation and the pellets embedded in the tablet maintain their integrity with no consider change in their surface properties. In vitro release profile of formulation F8 containing sugar spheres (#40/60) co with, Eudragit L30D55 70% w/w and PEG 4000 20% w/w as cushioning agent showed release up to 97% at end of 1 hr in buffer. The DSC, X-RD results proves that there is no potent incompatibility between the drug and polymer. The higher the size of sugar spheres higher will be the smash up to the coating and less resistance to ga environment than the small spheres. Small pellets were best suited for compression of multiple unit particulate syst of Omeprazole.

Keywords: Omeprazole, Sugar spheres, Eudragit L30D55, Prosolv

INTRODUCTION

Compression of pellets and microspheres into compact tablets is a smart approach to prepare a single unit dos forms that will readily crumble into its essential components when exposed to gastric fluids [1]. These dosage fo will maintain the advantages of pellets being a single unit dosage form [2,3] i.e., spread uniformly throughout gastro intestinal tract, improves bioavailability maximize the drug absorption; minimize local irritation of drug w indicates pellets can be used for immediate drug delivery [4-6]. The multiparticulates can be filled into capsule compressed into tablets. The fabrication of multiparticulates into tablets is proven to be familiar than the hard gel capsules where the later have been tampered, patient incompliance, difficulty in oesophageal transport, high production [7-9].

Pelletized tablets put forward various advantages like large dose drug administration, increased production rate, redu possibility of local irritation, toxicity, expected bioavailability, minimum fluctuations in plasma concentration of caused by food effects. Fabrication of compressed tablets using coated pellets is a tough task as; the pellets sh not fuse into non disintegrating matrix during compaction, and the drug release not to be altered by the compac process. With reservoir type pellet dosage forms, the layer of coating applied must withstand the compression forc can distort, but should not burst or must still provide controlled release even if ruptured [10].

Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Pelagia Research Library

Der Pharmacia Sinica, 2017, 8(2):16-22

Der Pharmacia

ISSN : 0976-

CODEN (USA):

Formulation and Optimization of Delayed Release MUPS (Multiple Unit Particulate System) Tablets of Omeprazole

Sundar VD*, Nandhakumar S, Alekya CH and Dhanaraju MD

Department of Pharmaceutics, GIET School of Pharmacy, Rajahmundry, Andhra Pradesh, India

ABSTRACT

The work was aimed to persuade the effect of size of sugar spheres and compression parameters on the prepa tablets, containing enteric coated pellets of omeprazole. Multiple unit dosage forms of Omeprazole were formul by wurster process. The sugar spheres (#18/20, #20/25, # 30/35, #40/60) were coated with the drug, HPMC 5 Eudragit L30D55 and then with PEG. The pellets were compressed into tablets using Prosolv granules as a pres absorbing matrix. The compressed tablets were characterized for DSC, SEM, and XRD. The Optimized formulat showed plastic deformation and the pellets embedded in the tablet maintain their integrity with no consider change in their surface properties. In vitro release profile of formulation F8 containing sugar spheres (#40/60) co with, Eudragit L30D55 70% w/w and PEG 4000 20% w/w as cushioning agent showed release up to 97% at end of 1 hr in buffer. The DSC, X-RD results proves that there is no potent incompatibility between the drug and polymer. The higher the size of sugar spheres higher will be the smash up to the coating and less resistance to gas environment than the small spheres. Small pellets were best suited for compression of multiple unit particulate syst of Omeprazole.

Keywords: Omeprazole, Sugar spheres, Eudragit L30D55, Prosolv

INTRODUCTION

Compression of pellets and microspheres into compact tablets is a smart approach to prepare a single unit dos forms that will readily crumble into its essential components when exposed to gastric fluids [1]. These dosage fo will maintain the advantages of pellets being a single unit dosage form [2,3] i.e., spread uniformly throughout gastro intestinal tract, improves bioavailability maximize the drug absorption; minimize local irritation of drug w indicates pellets can be used for immediate drug delivery [4-6]. The multiparticulates can be filled into capsule compressed into tablets. The fabrication of multiparticulates into tablets is proven to be familiar than the hard gel capsules where the later have been tampered, patient incompliance, difficulty in oesophageal transport, high production [7-9].

Pelletized tablets put forward various advantages like large dose drug administration, increased production rate, redu possibility of local irritation, toxicity, expected bioavailability, minimum fluctuations in plasma concentration of caused by food effects. Fabrication of compressed tablets using coated pellets is a tough task as; the pellets sh not fuse into non disintegrating matrix during compaction, and the drug release not to be altered by the compac process. With reservoir type pellet dosage forms, the layer of coating applied must withstand the compression forc can distort, but should not burst or must still provide controlled release even if ruptured [10].