ORIGINAL RESEARCH PAPER Volume-6 | Issue-12 | December-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 93.98

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

GLUTATHIONE -THE MASTER ANTIOXIDANT - AS VITAL FOR HUMAN LIFE AS OXYGEN.

Biological Science

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ABSTRACT

Glutathione also known as GSH is the body's essential health AID-Antioxidant, Immune booster and Detoxifier. This small protein, produced naturally in the body, maintain these three crucial protective functions. In fact your life depends on glutathione. Without it, your cells would disintegrate from unrestrained oxidation, your body would have little resistance to bacteria, viruses and cancer, and your liver would shrivel up from the eventual accumulation of toxins. Glutathione is not yet household word. Even doctors have only a vague idea of it. However, everyone will soon be talking about this critical supplement. There was a time when scientists had heard of cholesterol and vitamins, but today everyone knows about them. Now it's glutathione turn in the last five years over twenty-five thousand medical articles about this substance have been published, and this scientific understanding is gradually becoming common knowledge. Each and every cell in the body is responsible for its own supply of glutathione and must have the necessary raw material to make it. Glutathione is always in great demand and is rapidly consumed when we experience any sort of pressure – illness, stress, fatigue and even exercise. Glutathione level also diminish as we age and many disease normally associated with aging have been linked to glutathione deficiency.

KEYWORDS

Glutathione, Immune system enhancer, Detoxifier, Antioxidant, oxidative stress, cystic fibrosis, Parkinson disease

Introduction

Glutathione is a small protein produced naturally in body and plays three important functions i.e. Antioxidant, Immune booster and detoxifier thus also knows as the body's essential health AID [1]. Glutathione is produced naturally in each and every cell in the body [1]. Glutathione is the body's antioxidant present within cell and referred as "The Master Antioxidant". It protects our health naturally by reducing the negative impact of stress hormone, proper cell oxygenation, inhibits cellular mutagens and also warding off hazardous cellular invaders. Glutathione neutralize overactive and dangerous free radicals by roaming through our body [3]. Glutathione is also useful in cellular reactions like glyoxalase system, reduction of ribonucleotides to doxyribonucleotide, regulation of proteins and gene expression [4]. It is a water soluble substance that protects our body against infection by performing detoxification reactions [5]. It neutralizes toxic peroxides thus provide antioxidant defense mechanism in all mammalian cells. Ingestion of certain medications, environmental toxins, chronic liver infection and HIV infection results in rapid consumption and depletion of glutathione [6, 7, 8]. Glutathione is an endogenous antioxidant but also as essential factor in energy utilization as it protects the cell and mitochondria from oxidative and peroxidative damage [2]. Glutathione is a tripeptide, consists of three amino acids i.e. glycine, glutamic acid and cysteine. Cysteine is most important amino acid as it determines the production of glutathione in body [2]. Deficiency of cysteine leads to inadequate production of glutathione which further results in accelerated aging, toxins accumulation, less protection from disease, decline in health and greater degree of cellular oxidation [2]. Glutathione is poorly absorbed through GLT thus tissue level and serum concentration of glutathione can be increased by co-administration of N-acetyl cysteine, α-lipoic acid, silymarin flavonoid and l-glutamine [9].

"No other antioxidant is as important to overall health as glutathione. It is the regulator and regenerator of immune cells and the most valuable detoxifying agent in the human body"

-Patrick J. D. Bouic, Ph.D. in the immune system cure-

Antioxidant

Antioxidants are valuable in the treatment and prevention of that disease which involves oxidative attack by free radicals. Free radicals play causative role in all shots of illness like heart disease, cancer, diabetes and aging. Vitamin C, vitamin E and selenium are naturally occurring antioxidants acts by neutralizing free radicals.

Glutathione is an important antioxidant generated by body itself [1]. Effectiveness of other antioxidants like vitamin c, vitamin e, lipoic acid and selenium depends upon presence of glutathione and these antioxidants works synergistically with glutathione [2]. Glutathione is referred as the master antioxidant as its presence increases the effectiveness of other antioxidants [3]. There are two states of glutathione i.e. reduced glutathione and oxidized glutathione. Glutathione reductase is responsible for regeneration of reduced glutathione. In healthy cell and tissue the % of reduced glutathione and oxidized glutathione is 90% and 10% respectively. Oxidized stress can be indicated by activity of glutathione reductase. Glutathione is a cofactor for enzyme glutathione peroxide which maintains ascorbate and tocopherol level by acting as a reducing agent [5,6,7,8,10,11,12,13,16].

Detoxifier

Liver is the primary organ for the detoxification. Poor liver functions leads to increased toxin load. Glutathione in liver eliminate toxins like pollutants, heavy metals, carcinogens, and radiation damage and drug metabolites [2]. Primary mechanism of eliminating free radicals is glutathione conjugation [30]. Impaired liver's detoxification capacity leads to depletion of glutathione level in liver which in turn results in accumulation of toxins and potentially dangerous byproducts of metabolism [14, 15, 16, 17, 18]. Glutathione also helps in safe and efficient elimination of fat soluble toxins by converting them into water soluble forms [5,12].

Immune system enhancer

White blood cells are the front line of the immune system. High level of glutathione increases W.B.C. production. Glutathione level regulates the healthy growth and development of immune cells thus glutathione servers as food for the immune system. Glutathione is one of the most important components of overall health as it fights off illness. Sufficient or high level of glutathione produces better ability to prevent illness, disease as well as degenerative process of aging [2].

Food that best promote glutathione production and preservation

Whey protein of fresh, raw milk is natural food source that promotes glutathione production. It provides all key amino acids for glutathione production i.e. cysteine, glycine and glutamate. Glutamyl cysteine is a unique cysteine residue found in whey and has greater affinity to convert in glutathione. denaturation of whey proteins (via mechanical stress, high heat pasteurization and other processes that involves ion exchange, hydrolization and use of acidic bathes) decreases its ability of glutathione production [2]. Cheese, fish, eggs, germs, nuts, roots, vegetables and fruits are the other sources which act as cofactor for glutathione production.

Glutathione in health and disease

Glutathione plays important role in the treatment and prevention of hundreds of disease thus considered as important to health as a well-rounded diet, exercise and good lifestyle. Raised glutathione level decreases the risk of heart disease, stroke, diabetes, high cholesterol. Asthma, cigrate smoking, hepatitis, AIDS and enhance the ability to fight toxins, infectious disease, precancerous cells and aging process. Also responsible for greater energy, endurance, increased recovery time from injury, less muscles pain, fatigue and muscles promoting activity [1].

EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES

http://www.ejbps.com

ISSN 2349-8870
Volume: 3
Issue: 9
276-287
Year: 2016

SYNTHESIS AND SCREENING FOR ANTIMICROBIAL ACTIVITY OF NOVEL BENZIMIDAZOLE CHALCONE

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Article Received on 20/06/2016 **Article Revised on 11/07/2016** **Article Accepted on 01/08/2016**

ABSTRACT

Benzimidazole ring is an important pharmaco-phor in modern drug discovery. The synthesis of novel benzimidazole derivatives remains a main focus of medicinal research as there are wide clinical applications. The benzimidazole derivatives have different pharmacological activities like Antifungal, Neuroleptic, Anti-HIV, Antihistaminic, Antiulcer, Antimicrobial, Anthelmintic, Cardio tonic & Antihypertensives. This article was summarized to know about the chemistry of different derivatives of substituted benzimidazoles along with their pharmacological activities. Novel Benzimidazole Chalcone derivatives were synthesized by using different Aromatic aldehydes like 2-Nitro Benzaldehyde, 4-Nitro Benzaldehyde, and 4-Chloro Benzaldehyde. The reaction between o-phenylenediamine and lactic acid in presence of HCl as catalyst yields first intermediate which upon oxidation with $k_2cr_2o_7$ forms second intermediate and by the addition of different aromatic aldehydes, it yields 2-Nitro Benzimidazole chalcone, 4-Nitro Benzimidazole chalcone, and 4-Chloro Benzimidazole chalcone respectively. All these synthesized compounds were screened for *in vitro* antimicrobial activity and all of them had shown potency against both gram positive and gram negative bacteria.

KEYWORDS: Benzimidazole Chalcone, Benzaldehyde, o-phenylenediamine, lactic acid, Antimicrobial activity.

INTRODUCTION

Benzimidazole is a heterocyclic aromatic organic compound and is bicyclic in nature consisting of a fusion of benzene and imidazole, which has been used as a carbon skeleton for *N*-heterocyclic carbenes, usually used as ligand for transition metal complexes. [1]

Benzimidazole is commercially available. The usual synthesis involves condensation of o-phenylenediamine with formic acid, or the equivalent trimethyl orthoformate: $C_6H_4 (NH_2)_2 + HC (OCH_3)_3 \rightarrow C_6H_4N (NH) CH + 3 CH_3OH$

By altering the carboxylic acid used, this method is generally able to afford 2-substituted Benzimidazoles. [2]

In recent years, considerable attention has been given to the synthesis of Benzimidazole derivatives because of their various pharmacological activities. [3]

Various substitutions on this benzimidazole nucleus were found to have wide applications as Pesticides and herbicides. Compounds bearing Benzimidazole moiety are reported to possess a number of interesting biological activities like Anti-tubercular, Anti-cancer, Anti-helmintic, Anti-allergic, Anti-histaminic, Anti-microbial, Anti-oxidant.

Chalcone is an aromatic ketone and an enone that forms the central core for a variety of important biological compounds, which are known collectively as chalcones or chalconoids. [4]

Despite significant progress in Antimicrobial therapy, infectious diseases caused by bacteria and fungi remain a major worldwide health problem due to the rapid development of resistance to the existing Antimicrobial drugs (Antibacterial and Antifungal). In other words, the increasing use and misuse of existing Antimicrobial drugs has resulted in the development of resistant pathogens.

From this information an innovative thought was created in us to perform work on this Benzimidazole compounds. There by we framed work to synthesize Novel Benzimidazole Chalcone that produces Antimicrobial activity.

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INTERNATIONAL JOURNAL OF PHARMACY AND ANALYTICAL RESEARCH

ISSN:2320-2831

IJPAR |Vol.5 | Issue 3 | July - Sep -2016
Journal Home page: www.ijpar.com

Research article

Open Access

Formulation and evaluation of mucoadhesive microspheres of cimetidine

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ABSTRACT

The intention of the present study is to formulate mucoadhesive microspheres containing cimetidine by employing xanthan gum & gum kondagogu as mucoadhesive agent and by adapting ionotropic gelation technique. Response Surface Composite design was employed to study the effect of independent variables, polymer concentration (X1) and sodium alginate concentration (X2) on dependent variables mucoadhesion time. The best batch exhibited a high drug entrapment efficiency of 97.12% and a swelling index of 96.98%, percentage mucoadhesion after 10 h was 98%. The drug release was also sustained for 12 h. The prepared mucoadhesive microspheres were characterized for various properties like preformulation, flow properties, *in vitro* mucoadhesion, *in vitro* drug release, entrapment efficiency and surface properties. The external and internal surface morphological characteristics of mucoadhesive microspheres were investigated using Scanning Electron Microscope (SEM). The formulation which showed better flow properties, *in vitro* drug release and entrapment efficiency was selected as optimized formulation i.e., formulation MGK5. The *in vitro* release profiles from optimized formulations were applied on various release kinetic models of drug and suggested that the drug release from microspheres followed non-fickian diffusion. The optimized formulations MGK5 was subjected to stability studies for six months at $40^0 \pm 2^0$C & 75±5%RH as per ICH guidelines and result showed that there were no changes in physical parameters, formulation parameters and *in vitro* release studies.

Keywords: Mucoadhesive Microspheres, Cimetidine, Factorial Design, *In vitro* study.

INTRODUCTION

Microsphere carrier systems made from the naturally occurring biodegradable polymers have attracted considerable attention for several years in sustained drug delivery. Recently, dosage forms that can precisely control the release rates and target drugs to a specific body site have made an enormous impact in the formulation and development of novel drug delivery systems. Microspheres form an important part of such novel

International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 4 | Issue 3 | July - Sep - 2016
www.ijamscr.com

Research article

Medical research

Formulation and evaluation of mucoadhesive microspheres of roxatidine acetate hydrochloride

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ABSTRACT

The intention of the present study is to formulate mucoadhesive microspheres containing roxatidine acetate hydrochloride by employing xanthan gum & gum olibanum as mucoadhesive agent and by adapting ionotropic gelation technique. Response Surface Composite design was employed to study the effect of independent variables, polymer concentration (X1), and sodium alginate concentration (X2) on dependent variables mucoadhesion time. The best batch exhibited a high drug entrapment efficiency of 95.01% and a swelling index of 96.23%, percentage mucoadhesion after 10 h was 97.01%. The drug release was also sustained for 12 h. The polymer-to-drug ratio had a more significant effect on the dependent variables. The prepared mucoadhesive microspheres were characterized for various properties like preformulation, flow properties, *in vitro* mucoadhesion, *in vitro* drug release, entrapment efficiency and surface properties. The external and internal surface morphological characteristics of mucoadhesive microspheres were investigated using Scanning Electron Microscope (SEM). The formulation which showed better flow properties, *in vitro* mucoadhesion, *in vitro* drug release and entrapment efficiency was selected as optimized formulation i.e., formulation MOG4. The *in vitro* release profiles from optimized formulations were applied on various release kinetic models of drug and suggested that the drug release from microspheres followed non-fickian diffusion. The optimized formulation MOG4 was subjected to stability studies for six months at $40^0 \pm 2^0$C & 75±5%RH as per ICH guidelines and result have not showed any changes in physical parameters, formulation parameters and *in vitro* release studies.

Keywords: Mucoadhesive microspheres, Roxatidine, Factorial design, *In vitro* study.

INTRODUCTION

Microspheres are discrete particles that make up a multiple unit system. Recently, much emphasis has been laid on the development of microspheres dosage forms in preference to single unit system because of their potential benefits such as increased bioavailability, reduced risk of systemic toxicity, reduced risk of local irritation and predictable gastric emptying. Microspheres systems show better reproducible pharmacokinetic behavior than conventional (monolithic) formulations. The

Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Der Pharmacia Lettre, 2016, 8 (4):331-340
(http://scholarsresearchlibrary.com/archive.html)

Scholars Research Library
ISSN 0975-5071
USA CODEN: DPLEB4

Design and evaluation of microspheres loaded with cimetidine

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ABSTRACT

Cimetidine loaded microspheres were prepared by Ionotropic gelation technique with different drug to carrier ratio. All the microspheres were characterized for particle size, scanning electron microscopy, FT-IR study, DSC, percentage yield, drug entrapment, stability studies and for in vitro *release kinetics and found to be within the limits. Among all the formulations C10, was selected as optimized formulation based on the physic chemical and release studies. In the* in vitro *release study of formulation C10 showed 95.35%, after 12h in a controlled manner, which is essential for anti ulcer therapy. The innovator Cimetidine conventional tablet shows the drug release of 96.15 within 1 h. The drug release of optimized formulation C10 followed zero order and Higuchi kinetics indicating diffusion controlled drug release.*

Key words: Cimetidine, chitosan, microspheres, scanning electron microscopy, release order kinetics.

INTRODUCTION

Oral drug administration is by far the most preferable route for taking medications. However, their short circulating half life and restricted absorption via a defined segment of intestine limits the therapeutic potential of many drugs. Such a pharmacokinetic limitation leads in many cases to frequent dosing of medication to achieve therapeutic effect. This results in pill burden and consequently, patient complains. Rational approach to enhance bioavailability and improve pharmacokinetic and pharmacodynamic profile is to release the drug in a controlled manner and site specific manner [1].

Microspheric drug delivery has advantage over various other dosage forms like we know for lungs disease now a days aerolised drugs are used for local delivery of drugs but it has disadvantage of shorter duration of action so for sustained release and reducing side effects and hence to achieve better patient compliance microspheres can be used. It also has advantage over liposomes as it is physicochemically more stable. Moreover the microspheres are of micron size so they can easily fit into various capillary beds which are also having micron size [2].

For the treatment of chronic diseases it is important to take medication several times, this may lead to fluctuating drug level in body. In order to avoid frequent drug administration and maintenance of therapeutic drug level in body it is essential to administer drug by a sustained release system. Drugs with short elimination half life are most suitable for sustained release formulations. Sustained delivery of drugs can be achieved by microspheres formulation [3].

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 12, pp.42907-42915, December, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

PHARMACEUTICAL WASTE– EFFECT ON ENVIRONMENT AND ITS MANAGEMENT

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ARTICLE INFO

Article History:
Received 03rd September, 2016
Received in revised form
19th October, 2016
Accepted 26th November, 2016
Published online 30th December, 2016

Key words:

Pharmaceutical waste, Harmful effects, Treatment, Regulatory bodies.

ABSTRACT

Pharmaceutical waste is type of medical waste, the improper disposal of which is causing the harmful effects on the environment in turn affecting health of all forms of living creatures. If appropriate action is no taken the adverse effects may lead to serious consequences. This paper discusses about generation of pharmaceutical waste from different sources, types of pharmaceutical waste, various regulating bodies, waste treatment and disposal methods and solutions for pharmaceutical waste management. So there is a need for providing better facilities to ensure proper waste management and to reduce the amount of waste generation by bringing awareness and education.

Citation: Vani Mamillapalli, Koleti Sindhu, Padma Latha Khantamneni and Petla Lakshmi Prasanna, 2016. "Pharmaceutical waste– Effect on environment and its management", *International Journal of Current Research*, 8, (12), 42907-42915.

INTRODUCTION

Pharmaceutical waste is not one single waste stream, but many distinctive waste streams that can affect the integrity and uniformity of the chemicals that involve pharmaceuticals. Pharmaceutical waste is possibly generated through a wide variety of deeds in a healthcare facility, including but not limited to I.V. preparation, general compounding, breakages, partially used ampoules, needles, and I.V., out-dated, unused preparations, fallow unit doses, personal medications and outdated pharmaceuticals (Shafir, 2013). Recent investigations showed that low concentrations of pharmaceuticals are detectable in municipal waste water, surface water, groundwater and even drinking water. Occurrence of pharmaceuticals in surface waste, drinking water and sediments are not well known except for two preliminary studies that measured levels of pharmaceuticals in the environment (Hignite *et al.*, 1977; Richardson *et al.*, 1985). The worldwide ranges of pharmaceuticals are 12,000 human and 2,500 veterinary pharmaceuticals. Each pharmaceutical consists of an active substance, mixed with a number of auxiliary substances to make it possible to handle and use the pharmaceutical. The pharmaceuticals and their metabolites are excreted *via* faeces and urine and end up in the aquatic environment, either by discharge after passage of a sewage water treatment plant, or by run-off from the surface, leaching *via* the soil or drainage to the surface water after spreading of manure on the land. To counter the above shortcoming and to preserve the high quality of the environment new concept so called "*Cleaner Production*" for waste minimization is being introduced, technology designed to prevent waste emission at the source of generation itself (Freitos dos santos *et al.*, 1995). There are a number of different options available for the treatment and management of waste containing dodging, minimization, re-use, reutilizing, energy recovery and disposal (Shafir, 2013). Differently, direct release of veterinary pharmaceuticals in environment may occur *via* application in aquaculture (*i.e.* fish farming), but also indirect release by way of animals topically treated, and mostly *via* run-off and leaching through fields from manure spreading to agricultural fields and livestock wastes (Boxall, 2008; Khan *et al.*, 2007; Kemper 2008). Many other studies identified many products, including analgesics, anti-inflammatories, antibiotics, antiepileptics, beta-blockers, blood lipid regulators, antidepressants, contrast media, oral contraceptives, and cytostatic and bronchodilator drugs in sewage, surface water, groundwater, and drinking waste (Constanzo *et al.*, 2005).

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International Journal of Drug Delivery 8 (2016) 60-65
http://www.arjournals.org/index.php/ijdd/index

Original Research Article

ISSN: 0975-0215

In Vitro and *In Vivo* Evaluation of Cimetidine loaded mucoadhesive microspheres

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Abstract

In the present research work mucoadhesive microspheres of cimetidine was prepared using ionotropic gelation technique. All the microspheres were characterized for particle size, scanning electron microscopy, FT-IR study, DSC, percentage yield, drug entrapment, stability studies and for in vitro release kinetics and found to be within the limits. Among all the formulations M12 was selected as optimized formulation based on the physicochemical and release studies. In vitro drug release study of optimized formulation M12 showed 99.12% after 12 h in a controlled manner, which is essential for anti ulcer therapy. The innovator cimetine conventional tablet showed the drug release of 96.15% within 1 h. The drug release of cimetidine optimized formulation M12 followed zero order and Higuchi kinetics indicating diffusion controlled drug release. *in vivo* studies revealed that the optimized formulation M12 gave the highest AUC and T_{max}. The results are indicative of cimetidine as mucoadhesive microspheres for improving the oral bioavailability with controlled drug release.

Keywords: Cimetidine, mucoadhesion, chitosan, ionotropic gelation, bioavailability.

Introduction

Oral route is most sought-after for administration of drug molecules to the systemic circulation due to low cost therapy, ease of administration, patient compliance [1]. New drug delivery technologies are revolutionizing the drug discovery, development and creating R&D focused pharmaceutical industries to increase the momentum of global advancements. In this regard novel drug delivery systems (NDDS) have many benefits, which includes improved therapy by increasing the efficacy and duration of drug activity, increased patient compliance through decreased dosing frequency and convenient routes of administration and improved site specific delivery to reduce unwanted adverse effects [2].

Despite the problem frequently encountered with controlled release dosage forms is the inability to increase the residence time of the dosage form in the stomach and proximal portion of the small intestine, due to the rapid gastrointestinal transit phenomenon of the stomach which may consequently reduce the extent of absorption of many drugs since almost most of the drug entities are mostly absorbed from the upper part of the intestine, therefore it would be beneficial to develop a sustained release formulation which remain at the absorption site for an extended period of time so that maximum of dose is absorbed in systemic circulation. Several approaches have been immersed to prolong the residence time of the dosage forms at the absorption site and one of these is the development of oral controlled release mucoadhesive system. Various gastrointestinal mucoadhesive dosage forms, such as microspheres and tablets, have been thoroughly prepared and reported by several research groups [3,4].

Mucoadhesion is the relatively new and emerging concept in drug delivery. Mucoadhesion keeps the delivery system adhering to the mucous membrane [5].

Peptic ulcer disease is a break in the lining of the stomach, first part of the small intestine or occasionally the lower esophagus [6].

Cimetidine is histamine H_2-receptor antagonists, which is used to reduce the risk of stomach ulcers in patients treated with nonsteroidal anti-inflammatory drugs, which has less bioavailability (60%) and lesser half life of 2 h [7]. The aim of present work is to design and evaluate mucoadhesive microspheres of cimetidine *in vitro and in vivo* to enhance its bioavailability and prolong residence time in stomach.

Materials and Methods

Materials

Cimetidine pure drug was generous gift from Aurobindo Pharma Limited, Hyderabad, India. Sodium alginate was obtained from Pruthvi Chemicals, Mumbai. Sodium alginate, chitosan, xanthan gum, kondagogu gum and sodium CMC were gifted from MSN Labs Ltd., Hyderabad. All other chemicals used were of analytical grade.

ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Formulation and Evaluation of Controlled Release Roxatidine Acetate HCl Mucoadhesive Microspheres: *In-vivo* Study.

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ABSTRACT

Present study aims to prepare and evaluate Roxatidine acetate HCl mucoadhesive microspheres by ionotropic gelation method. Among all the formulations, M13 was selected as optimized formulation for mucoadhesive microspheres based on the evaluation parameters and drug release studies. In vitro release study of formulation M13 showed 99.4% in 12 h in a controlled manner, which is essential for disease like peptic ulcer. The release order kinetics for M13 was best fit with the highest correlation coefficient was observed in Higuchi model, indicating diffusion controlled principle. The innovator Rotane 150 mg conventional tablet showed the drug release of 96.45% within 1 h. In vivo studies revealed that the optimized formulation M13 gave the highest AUC and Tmax. The controlled release of drug from M13 also provides for higher plasma drug content and improved bioavailability.

Keywords: Roxatidine, mucoadhesiveness, in vivo bioavailability studies, microspheres.

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ISSN: 0976-3081

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

International Journal of Recent Scientific Research
Vol. 7, Issue, 11, pp. 14405-14412, November, 2016

International Journal of Recent Scientific Research

Review Article

3D BIOPRINTING - CHANGING THE SHAPE OF MEDICAL PRACTICE

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ARTICLE INFO

Article History:

Received 20th August, 2016
Received in revised form 29th September, 2016
Accepted 30th October, 2016
Published online 28th November, 2016

Key Words:

3D bio printing, 3D bio printers, sectors of sources, cell sources, revolutionary, industrial.

ABSTRACT

3D Bioprinting is regeneration of tissues and organs suitable for transplantation. The innovative idea needs knowledge from various sectors of sciences like Biotechnology, Bio material sciences, physics, engineering, medicine and pharmacy. This paper discusses methods of 3D bioprinting, 3D bioprinters, approaches, Materials and scaffolds, Printability, degradation kinetics, cell sources, challenges. Researchers continue to improve 3D printing technology as commercial and industrial inters growing in this revolutionary area where regeneration of human tissues possible which are unable to self regenerate like bone, cartilage and nervous system.

INTRODUCTION

Three-dimensional (3D) printing is driving major innovations in many years, such as engineering, manufacturing, art, education and medicine. Recent advances have enabled 3D printing of biocompatible materials, cells and supporting components into complex 3D functional living tissue. 3D Bioprinting is being applied to regenerative medicine to address the need for tissues and organs suitable for transplantation. Compared with non-biological printing, 3D Bioprinting involves additional complexities, such as the choice of materials, cell types, growth and differentiation factors, and technical challenges related to the sensitivities of living cells and the construction of tissues. Addressing these complexities requires the integration of technologies from the fields of engineering, biomaterials science, cell biology, physics and medicine.

3D Bioprinting has already been used for the generation and transplantation of several tissues, including multilayered skin, bone, vascular grafts, tracheal splints, heart tissue and cartilaginous structures. Other applications include developing high-throughput 3D-Bioprinted tissue models for research discovery and toxicology. Printing has a revolutionary effect on society, affecting education, politics, religion and language across the globe. This technology, indeed, will be able to build *ex-novo* organs using biocompatible materials and human cells; replace the allograph transplants, eliminating waiting lists that often make the difference between life and death; and provide more predictive, less expensive experimental models, replacing animal tests. Production of 3D complex structures has been applied by the industry to produce customized objects, such as pieces of bicycles and jewels.

Definition

3D bioprinting is the process of creating cell patterns in a confined space using 3D printing technologies, where cell function and viability are preserved within the printed construct (Chua C.K. *et al.*, 2015). Generally, 3D bioprinting utilizes the layer-by-layer method to create tissue-like structures that are later used in medical and engineering fields. Bioprinting covers a broad range of materials. Currently, bioprinting can be used to print tissues and organs to help research drugs and pills (www.explainingthefuture.com 2016). In addition, 3D bioprinting has begun to printing of scaffolds. These scaffolds can be used to regenerate joints and ligaments.

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ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Pharmacognostical, Quantitative Phytochemical and *In-Vitro* Antioxidant Studies of the Root Extracts of *Typha Angustata Bory & Chaub.*

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ABSTRACT

The aim of the study was to carry out the pharmacognostical, quantitative phytochemical determination of flavonoids, phenolics, tannins, saponins and *in vitro* antioxidant studies by reducing power assay, scavenging of hydrogen peroxide radical assay and nitric oxide radical scavenging assay on the root extracts of *Typha angustata*. Quantitative microscopy, fluorescence analysis, physico chemical analysis has been carried out to produce quality control parameters for the *Typha angustata* roots and extracts. Quantitative determinations indicated the high amount of phenolics 107.94 ±0.70 mg/g and saponins 108.5 mg/g ±0.7 mg/g in the aqueous extract of roots of *Typha angustata*. The *in vitro* anti oxidant activity was studied at 30-180µg/ml by using quercetin as standard. The studies showed that significant activity was present in both aqueous and alcoholic extracts when compared with standard drug.Therefore the investigation on the root extracts of *Typha angustata* can be further explored inorder to study out more therapeutic benefits.

Keywords: Quality control; *Typha angustata root*; phenols; saponins; *in vitro* anti oxidant

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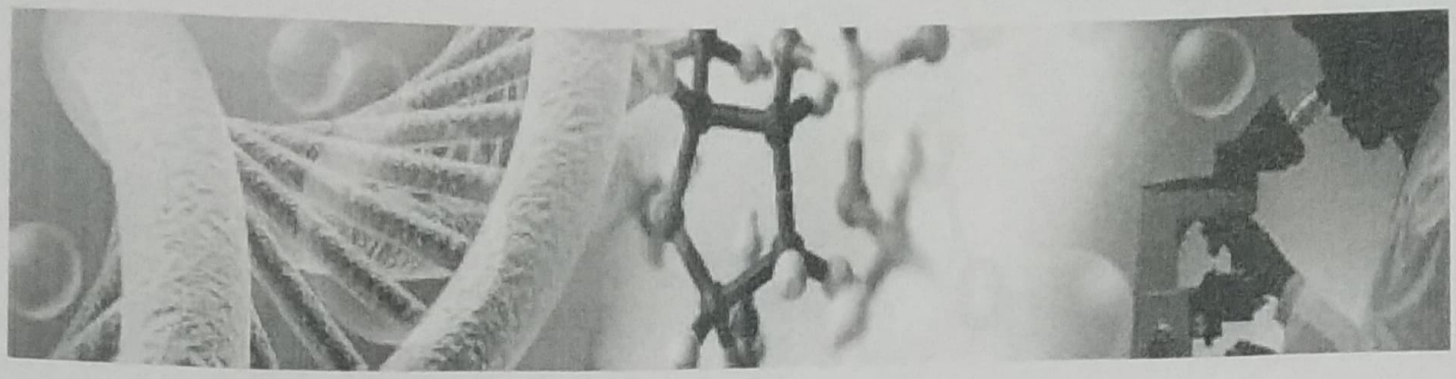

Review Article

ISSN CODE: 2456-1045 (Online)
(ICV-MDS/Impact Value): 2.31
(GIF) Impact Factor: 1.272

Journal Code: ARJMD/MDS/V-7.0/I-1/C-11/NOV-2016
Website: www.journalresearchijf.com
Received: 28.11.2016
Accepted: 04.12.2016
Date of Publication: 08.12.2016
Page: 67-78

ABSTRACT

Medical implants are products that have to satisfy functionality demands defined by the human body as working environment. The choice of material used for designing a medical implant is governed by biocompatibility. The development of this area attracts commercial utility. Focus of this contribution is on metallic, ceramic and polymeric biomaterials and laws regulating their use in modern medical applications. Further studies relating to long-term effects of materials on biological tissues are necessary, and are likely to lead to an increased understanding of the biocompatibility of materials in the future.

KEY WORDS:

Medical implants,

biocompatible,

biomaterials

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Citation of the Article

Mamillapalli V; Khantamneni P.L; Madhuri Y.H, Sravya AHLB. (2016, December 8). Bio compatible materials used in medical practice. Advance Research Journal of Multidisciplinary. 7(1). C11, PP.67-78, Nov 2016. ISSN-2456-1045. from http://www.Journalresearchijf.com/

I. INTRODUCTION

The development of medical implants utilizing new materials continues to attract considerable academic and commercial interest. The development of new biomaterials involves a complicated mix of materials science and cell biology. Collaboration of various experienced specialists such as material scientists, metallurgists, traumatologists, orthopedists, chemists, mechanical engineers, pharmacists and others in order to achieve better results in research, development and implementation of the extracted knowledge into the practice is of essential importance. Biomaterials are nonviable materials used in a medical devices intended to interact with biological systems (Ratner et al., 2004) and cover several classes of materials, such as metallic, ceramic, and polymeric materials. Medical implants are products that have to satisfy functionality demands defined by the human body as working environment. Ideally, they should have biomechanical properties