

SCIENTIFIC SOUVENIR



4th National Symposium

Frontiers in Drug Discovery and

Process Research

 9^{th} and 10^{th} March 2013



ACKNOWLEDGEMENT

We hereby take a great privilege in organizing the 4th National Symposium on Frontiers in Drug Discovery and Process Research (FDDPR) to be held on 9th and 10th March 2013. We are sure that their efforts will provide an intellectually stimulating forum for deliberations on many new frontiers. We certainly hope that the speakers and all the participants will find the symposium a thought provoking and enjoyable experience. We are confident that the symposium will be a starting for the numerous collaborative efforts amongst academic institution, research areas and the pharma industries. We must express our sincere gratitude to Shivaji University Kolhapur for their interest and participation throughout for organizing such an important event. We acknowledge with thanks to all members of the advisory board, scientific committee, chairpersons and members of various committees, numerous volunteers and the BVCPK staff for their tireless efforts. We also wish to thank all the invited speakers, scientific session chairpersons, coordinators, scientific poster and oral contributors, all the friends and colleagues without their contribution it would not have been possible to organize this symposium. Finally, financial contributors and other well wishers are thankful acknowledged.

> Dr. H. N. More Principal



Dr. Vishwajeet Kadam Secretary, Bharati Vidyapeeth Pune

Message

I am pleased to note that Bharati Vidyapeeth College of Pharmacy, Kolhapur is organizing the 4th National Symposium 'FRONTIERS IN DRUG DISCOVERY AND PROCESS RESEARCH-2013' on a theme of 'Pharma Research : Innovations and Strategies' to be held on 9th and 10th March, 2013 as part of golden jubilee celebration of Bharati Vidyapeeth. Pharmaceutical sciences encompass a group of interdisciplinary areas of study that cover the design, action, delivery, disposition and use of drugs. Results of research and developmental activities in pharmaceutical sciences are directly and relatively fast reflected in health care system. The objective, therefore of pharmacy education should be such that a graduate or postgraduate pharmacy student must be made well aware of recent developments and new technological advances in corporate as well as research sectors of healthcare system. Thus, the prime motive of this conference is to update contemporary knowledge of students and faculties by renowned experts in Pharmaceutical Sciences and to provide them a new insight and guidance in the field of pharmaceutical research.

My hearty greetings to the faculty members and students of Bharati Vidyapeeth College of Pharmacy, Kolhapur, for their dedicated efforts in organizing the National level symposium catering to the professional and research needs of the participants. My best wishes for the successful conduct of FDDPR 2013.

Dr. Vishwajeet Kadam



प्रा. (डॉ.) ना. ज. पवार एम.एस्सी., पीएच.डी. कुलगुरू

Prof. (Dr.) N. J. Pawar M.Sc.,Ph.D. Vice-Chancellor



शिवाजी विद्यापीठ, विद्यानगर, कोल्हापूर – ४१६ ००४. SHIVAJI UNIVERSITY, Vidyanagar, Kolhapur - 416 004.

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MESSAGE

I am indeed very happy to know that Bharati Vidyapeeth College of Pharmacy, Kolhapur, is organizing 4th National Symposium on "Frontiers in Drug Discovery and Process Research" (FDDPR) on 9th and 10th March, 2013.

I am confident that the presentations by resource persons, research scholars and students during the course of the conference will be most useful to the delegates in upgrading their knowledge. I send my warm greetings and good wishes to the Principal as well as the delegates attending the Seminar.

I wish the National Conference all success.

Kolhapur Date: 02/03/2013

(N.J. Pawar) Vice-Chancellor



Dr. M. S. Bhatia Vice – Principal Bharati Vidyapeeth, College of Pharmacy, Kolhapur



Dr. H. N. More Principal Bharati Vidyapeeth, College of Pharmacy, Kolhapur

Message

Dear FDDPR Participants, as a golden jubilee celebration of Bharati Vidvapeeth, Bharati Vidyapeeth College of Pharmacy, Kolhapur is Organising 4th National Symposium, Frontiers in Drug Discovery and Process Research (FDDPR 2013) and we take this opportunity to welcome one and all. Our college is the Lead College, amongst the pharmacy colleges affiliated to Shivaji University, Kolhapur. Presently, we conduct degree course in Pharmacy and post graduate courses in Pharmaceutical Chemistry, Pharmaceutics, Quality assurance, Pharmaceutical Technology and Pharmaceutical Analysis. The college is also a recognized Ph.D. research center of Shivaji University, Kolhapur and Bharati Vidyapeeth University, Pune. The college has always given emphasis on producing efficient pharmacists of highest professional standards and has also been dedicated to contributing to its humble share to the research needs of Pharmaceutical Sciences. Till date, we have organized distinguished curricular, co curricular and cultural mega events at university, state, and national level and organization of FDDPR in 2007, 2010 and 2011 were few amongst them. The idea behind organizing FDDPR symposium was to provide a common platform for interaction of scientists from academia and industry and also to provide an opportunity for the young Pharma students, teachers and professionals to bring their research contributions and achievements to the notice of their Pharma fraternity. On occasion of the fourth FDDPR, let us collectively interact and discuss on numerous areas of research and concern to the Pharmaceutical Sciences, on focus areas of the invited experts and the competitive oral and poster presentations with a common aim of enriching Pharma sciences with all our contributions. We heartily welcome you all and wish you enjoyable, safe and scientifically fulfilling experience at this symposium, FDDPR 2013.



Dr. A. A. Hajare Chief co-ordinatior FDDPR 2013



Dr. S. G. Killedar Convener FDDPR 2013

Message

We are pleased to introduce the fourth issue of the FDDPR. Today, research trends in the pharmaceutical sciences are entering an era of major change and at the same time educational systems are undergoing sweeping reforms. Pharmaceutical sciences is an interdisciplinary field that begins with basic sciences such as organic chemistry, biochemistry, pharmacology, genetics, physical chemistry, analytical chemistry, and pharmacokinetics but also extends beyond these aspects of drug discovery to encompass the proper use of the drug products that are generated by research and development. Amidst these tempestuous transformations, it is our duty to provide excellent supervision to help students in their quest for new knowledge that have impact in the Pharma world and beyond. The conference will provide a platform to students, academicians and industry personals to discuss on new innovation in the pharmaceutical industry and help them evaluate new and emerging opportunities. While great strides forward are being made in basic pharmaceutical research, there is simultaneously an urgent need to train high-quality pharmacists to shoulder the care of the Indian populace as medicine becomes ever more complex and specialized. Pharmacy graduates are expected to play active roles as pharmacists who occupy positions of leadership in Pharma sector for the welfare of the mankind. We are confident that the symposium will provide a concrete foundation for upliftment of pharmacy profession in India. We wish to take this opportunity to say a big, "Thank You" to all our delegates and resource persons for their continued support and endorsement. We look forward for years to come in the belief that education will continue to be of greater and greater importance both individually and collectively in facing the new challenges in pharmaceutical research.



Mr. Deepak V. Mahuli



Mr. Prafulla B. Choudhari

Message

With great pleasure we along with our scientific committee members present this scientific souvenir of the momentous event - '4th Frontiers in Drug Discovery and Process Research, targeted towards motivating the Pharma commune to associate with We are very much pleased to pen down the scientific literature covering various research areas of Pharma profession. To gain the knowledge whatsoever its kind is life process and never ending phenomenon. Man struggles endlessly to obtain the information of his/her interest. Through this souvenir you may find such rich and innovative scientific information for unfolding different vistas of research area. This significant landmark in bringing out this souvenir would not have been the success that it was without the whole-hearted participation and support of you all. We express our deep gratitude towards the secretary, Bharati Vidyapeeth Pune, vice chancellor Bharati University Pune, vice chancellor Shivaji University Kolhapur, for their blessings and well wishes. We thank our principal, convener and chief co-ordinator for their constant guidance and encouragement. We also thank and congratulate the participants and scientific contributors which becomes the heart of this souvenir. We feel the Souvenir is an integral part of this scientific symposium and sincerely you will enjoy reading the pages as much as we had enjoyed producing it.

LOCAL ORGANIZING COMMITTEE



From left to right Mr. R J. Jarag, Dr. N. R. Jadhav, Dr. A. A. Hajare, Dr. H. N. More, Dr. M. S. Bhatia, Dr. Mrs. N. M. Bhatia, Dr. S. G. Killedar, Mr. U. S. Patil, Mr. A. J. Shinde, Mr. F. T. Tamboli, Mr. D. V. Mahuli, Mrs. R. R. Jarag, Mr. R. P. Dhavale, Mr. S. A. Pishawikar, Mr. V. T. Pawar, Mr. P. B. Choudhari, Mr. S. D. Jadhav, Mr. D. P. Mali, Mr. D. T. Gaikwad.



BHARATI VIDYAPEETH COLLEGE OF PHARMACY KOLHAPUR National Symposium FRONTIERS IN DRUG DISCOVERY AND PROCESS RESEARCH (FDDPR 2013) 9th & 10th MARCH 2013 PROGRAMME – SATURDAY 9, MARCH 2013- (DAY 1)

PROGRAMME SCHEDULE

DAY 1 SATURDAY 9, MARCH 2013

TIME	EVENTS				
08.45 - 10.00 am	REGISTRATION AND TEA				
SESSION I					
10.00 - 11.30 am	INAUGURAL FUNCTION				
	Chief Guest: Shri. V. G. Khire				
	Managing Director, Okasa Pharma Pvt. Ltd, Satara				
Guest of honor: Dr. H. M. Kadam					
	Regional Director, Bharati Vidyapeeth, Pune				
	SESSION II				
11.30 – 11.50 am	Oral presentation 1				
11.50 - 12.10 pm	Oral presentation 2				
12.10 – 12.30 pm	Oral presentation 3				
12.30 – 12.50 pm	Oral presentation 4				
12.50 - 2.00 pm	LUNCH				
02.00 - 02.20 pm	Oral presentation 5				
02.20 - 02.40 pm	Oral presentation 6				
02.40 - 03.00 pm	Oral presentation 7				
L1: 03.10 – 04.10 pm	"Clinical Drug Development and Opportunities"				
	Dr. Sameer Sadekar				
	Managing Director, Pacific Clinical Research, Mumbai.				
04.10 - 04.25 pm	TEA BREAK				
04.25 - 06.25 pm	Poster session				
SSION III DAY 2	SUNDAY 10, MARCH 2013				
09.15 - 10.00 am	TEA & BREAKFAST				
10.00 - 10.20 am	Oral presentation 8				
10.20 - 10.40 am	Oral presentation 9				
10.40 - 11.00 am	Oral presentation 10				
L2: 11.00 - 12.00 pm	"Macromolecules for Biological Implications"				
L L	Dr. Jayant Khandare				
	Professor and Head, MIT College of Pharmacy, Pune				
12.00 - 12.20 am	Oral presentation 11				
11.20 – 12.40 pm	Oral presentation 12				
12.40 - 2.00 pm	LUNCH				
SESSION IV					
02.00 – 03.00 pm	CONCLUDING SESSION AND AWARD OF PRIZES				

Bharati Vidyapeeth College of Pharmacy, Kolhapur Organizes

Frontiers in Drug Discovery and Process Research (FDDPR 2012-13) 9th & 10th March 2013

WORKING COMMITTEE

Sr. No.	Committee	Members				
0.1						
01	Registration	Mr. S. D. Jadhav I/C				
		Mr. U. S. Patil				
		Mr. C. H. Suryavanshi				
		Mr. S. B. Pawar				
		Mr. Satish Mokale				
02	Accommodation	Mr. S. A. Pishawikar I/C				
		Mrs. S. S. Patil				
		Mr. S. S. Patil				
		Mr. Rahul Patil				
03	Conveyance	Mr. D. T. Gaikwad I/C				
		Mr. P. B. Choudhari				
		Mr. N. D. Khandagale				
04	Catering	Mr. R. J. Jarag I/C				
		Mr. D. P. Mali				
		Mrs. R. R. Kulkarni				
		Mr. R. T. Chavan				
		Mr. Tanaji Patil				
		Mr. D. S. Manjare				
05	Stage Committee	Mrs. R. R .Jarag I/C				
	_	Mr. R. P. Dhawale				
		Mr. S. S. Mali				
		Mr. Sachin Patil				
		Mr. Santosh Shinde				
		Mr. Shekhar Khond				
		Mr. S. N. Lad				
		Mr. Vishal Patil				
06	Poster	Dr. Mrs. N. M. Bhatia I/C				
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		Mr. N. D. Khandagale				
		Mr. Sunil Dhere				
		Mr. S. S. Salunkhe				
		Mr. Sambhaii Patil				
		Mr. M. I. Golandaj				
		Mr. Vinod Pawar				
07	Oral Presentation	Dr. N. R. Jadhay I/C				
~ '		Mr. U. S. Patil				
		Mr. P. D. Phadatare				
		Mr. Shekhar Khond				
		Mr. Santosh Shinde				

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH

		Mr. S. N. Lad
08	Scientific Committee	Dr. A. A. Hajare I/C
		Dr. M. S. Bhatia
		Dr. S. G. Killedar
		Dr. N. R. Jadhav
		Mr. R. J. Jarag
09	Finance	Dr. H. N. More I/C
		Dr. M. S. Bhatia
		Dr. A. A. Hajare
		Dr. S. G. Killedar
		Mr. S. P. Patil
	Souvenir, Website	Mr. P. B. Choudhari I/C
10	updation,Certificates, CD and Momento	Mr. D. V. Mahuli
11	Expert Invitees	Dr. M. S. Bhatia I/C
		Mr. A. J. Shinde
12	Publicity	Mr. D. V. Mahuli I/C
		Dr. S. G. Killedar
		Dr. A. A. Hajare
		Mr. A. J. Shinde
		Mr. S. S. Patil
		Mr. V. D. Jangam
13	Cultural Event	Mr. F. A. Tamboli I/C
		Mr. R. P. Dhawale
		Mrs. R. R. Jarag
14.	Discipline	Mr. V. T. Pawar I/C
		Mr. D. T. Gaikwad
		Mr. D. P. Mali
15	Sponsorship Committee	Dr. H. N. More I/C
		Dr. M. S. Bhatia
		Dr. A. A. Hajare
		Dr. S. G. Killedar
16.	Admin	Dr. S. G. Killedar

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH

ORAL PRESENTATIONS



Future management research directions in nanotechnology

Doijad R.C., Sankpal P.S., Londhe R.B., Wandre S.P.

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Abstract

Nanotechnology is novel emerging technology that allows the manipulation of materials at the scale comparable to the size of single molecule. There have been many new developments in nanotechnology, resulting in complex exposure and health risk implications. Advanced nanophase materials synthesized from nanopowders have improved properties. Carbon nanotube considered to be the building blocks of future nanoscale electronics and mechanical devices. Current risk assessments methods such as fullerenes nanotube are reviewed in the context of nanoparticle exposure routes and regulation for human and environmental health protection. The use of nanotechnology in medicine and more specifically drug delivery is set to spread rapidly. Currently many substances are under investigation for drug delivery and more specifically for cancer theraphy.

Key Words - Nanotechnology, carbon nanotube, health exposure, nanopartical. .



FORMULATION AND EVALUATION OF BILAYER TABLET OF URSODEOXYCHOLIC ACID AND SILYMARIN ON TREATMENT OF GALLSTONE

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OBJECTIVE

To develop the bilayer matrix tablet formulation which provides sustained release of Ursodeoxycholic acid (UDCA) and immediate release of Silymarin on treatment of Gallstone

METHODOLOGY

I. Formulation and Evaluation of monolayer SR tablets of UDCA

Ingredient	Quantity per tablet (mg)					
	F1	F2	F3	F4	F5	F6
UDCA	600	600	600	600	600	600
HPMC K15M CR	130	120	110	-	-	-
HPMC K4M CR	-	-	-	150	140	130
Lactose monohydrate	85	95	105	65	75	85
PVP-K30	20	20	20	20	20	20
IPA	qs.	qs.	qs.	qs.	qs.	qs.
Magnesium stearate	15	15	15	15	15	15
TOTAL	850	850	850	850	850	850

	B 1	B2	B3	
Sustained	(F6)	(F6)	(F6)	
		850 mg	850 mg	850 mg
	Silymarin (70%)	203	203	203
	Lactose monohydrate	140	138	136
	Sodium starch glycolate	12	12	12
	Sodium lauryl sulfate	4	6	8
Immediate	Starch (for paste)	15	15	15
release	Purified water	qs.	qs.	qs.
layer	Croscarmellose sodium	20	20	20
	Talc	4	4	4
	Magnesium stearate	2	2	2
	TOTAL	400	400	400
Average weight of tablet		1250	1250	1250
		mg	mg	mg

II. Formulation and Evaluation of Bilayer SR tablet of UDCA and Silymarin.



DRUG RELEASE KINETICS

Different kinetic models were studied from dissolution profile of the final optimized formulation of sustain release bilayer tablet

Batch	Zero-order	First-order	Higuchi	Hixon-Crowell	Korsmeyer- Peppas		
Sustained release layer							
B3	0.9882	0.9354	0.9911	0.974	0.9925(n=0.587)		
Immediate release layer							
B3	0.6589	0.993	0.9532	0.9839	0.979(n=0.268)		

CONCLUSION

The developed stable sustained release bilayer tablet of UDCA and Silymarin were found to have the desired drug release pattern.



Dimerisation of Nitrofurantoin and its Formulation Development for Enhancing Pharmacokinetics.

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Abstract

Nitrofurantoin is one of the drugs used in treatment of urinary tract infection. It is broad spectrum, weakly acidic antibacterial, generally bactericidal at therapeutic concentration. It is absorbed through GIT, and has low plasma half life and low plasma protein binding. The plasma half life appears to be major limitation for a drug like Nitrofurantoin which otherwise is an antimicrobial agent with very limited problems involving drug resistance.

In the presented work an attempt has been made to modify its chemical and physical properties by dimerisation of the drug with an objective to increase hydrophobicity that would favourably modulate its pharmacokinetic parameters. Dimerisation of the drug is carried out by using simple acylation reaction. Synthesis of dimer was confirmed from the results of quantitative analysis, spectral data and HPLC analysis. Tablet formulations of the dimer were evaluated for various parameters as per I.P. It was found that the dimer tablet of batch B shows better half - life than that of the marketed tablet formulation of Nitrofurantoin. The plasma protein binding studies revealed an increase in plasma protein binding which woula also lead to an increase in the duration of action of the drug. Futher confirmation of the dimer formation was done using HPLC data and the HPLC retention time is in agreement with the objective of dimer synthesis. Complete pharmacokinetic evaluation of the dimer would confirm the other benefits of dimer and its therapeutic applications.

Keywords: Nitrofurantoin, Dimerisation, Pharmacokinetic enhancement.



BODY RENEWABLE ATP RESOURCE PEDDLING FOR NANO-VIRICIDES AND OTHER AGENTS AGAINST BODY DISORDERS

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ABSTARCT:

Nanotechnology has an innovative approach for the development of Nanorobots/ Nano-particle with sensors for medicine. The nanoviricides operate in a virtual environment which catches virus; has architecture model nanobioelectronics, which facilitates its application for medical target identification and drug delivery. Methods to generate Nanoviricides is by non antigenic nucleotides or Aptamers make, along with sensitized by Epitope or Protein of Interferones or lethal diseased proteins in vitro. Human ATP or friction or wear tear generate the free radicals and energy. This forms energy source for the Nano-viricides that can kill any viruses. Functional disability of the WBC can be overcome by this Nano renewable energy based small Robo or modern medicine. Along with virus killing many diseases like atherosclerosis can be melted by body self energy or lethal free radicals of body with dual role like body aging control with its proper utilization as renewable free energy source.

Keywords:

WBC: white blood cells, ATP: adenosine tri phosphate, Nanoviricides, Epitope, Interferones etc

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Studies on Meningococcal Polysaccharide-Protein Conjugate for Vaccine Formulation

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Meningococcal disease also referred to as cerebrospinal meningitis is a contagious disease caused by the meningococcus (*Neisseria meningitidis*). A conjugate vaccine is composed of bacterial polysaccharide or size-reduced polysaccharide or oligosaccharides derived from covalently attached to T- cell epitope containing polypeptide. Covalently linking protein to polysaccharides converts the anti-polysaccharide immune response from a T-cell independent response to one which is T-cell dependent. We wished to establish polysaccharide: protein: activating agent ratio better conjugation efficiency and an efficient method for purification of conjugate. To conjugate the protein with polysaccharide we preferred cyanylation based on the structure of polysaccharide and chemical groups involved in that polysaccharide. Being native polysaccharides and carrier proteins less reactive with each other organic cyanylating agent was used to activate polysaccharides. Protein was derivatized with adipic acid dihydrazide. Degree of activation of carrier protein is estimated using 2, 4,,6,-trinitrobenzenesulfonic acid (TNBS) assay. The optimized conjugate was purified by diafiltration which was found to be efficient. After completion of conjugation reaction amount of unreacted polysaccharide was estimated from phosphorous assay. The optimized composition for polysaccharide: protein conjugate was 1:1.5 at 1.5 parts of model activating agent. Present work highlights preparation of polysaccharide protein conjugate by cyanylation which will be helpful in prevention of meningococcal disease.

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SYNTHESIS OF MANNICH BASES OF THIOSEMICARBAZIDE AS A MUTUAL PRODRUG FOR ANTICANCER ACTIVITY

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ABSTRACT:

Every year in India, there is number of new cancer cases detected. Though the lot of work has been done on prevention and treatment of cancer, still effective chemotherapy remains a challenge. Existing treatments are expensive and are associated with side effects like anemia, hair loss, nausea, vomiting, appetite loss, diarrhea, heart damage. In proposed work an attempt has been made, to design and synthesize mannich bases of thiosemicarbazide as mutual prodrug whereby amount of drug to be used may be reduced leading to lesser side effects. Conformation of activity is done carrying out docking study on EGFR-1M17.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



Fourth FDDPR-2013

Development and Evaluation of In Situ Thermoresponsive Nasal Gel System for Nardostachys jatamansi

Authors: Dipali Lohar*, Namdeo Jadhav Email id.: dipali.lohar@yahoo.com Department of Pharmaceutics, Bharati Vidyapeeth College of Pharmacy, Kolhapur-416013, Maharashtra State, India. Abstract

Nardostachys jatamansi is conventionally used indigenous plant as decoction for sedative effect. The purpose of present studies was to formulate and evaluate thermoresponsive nasal gel of *N. Jatamansi* extract. Cold method was used for formulation of gel containing pluronic PF 127 with dried ethanolic N. Jatamansi extract, PEG 400, PEG 4000 as gelling point modifiers and methyl paraben as preservatives. Most potent ethanolic extract used in the formulation was screened by assessing righting reflex using rat as animal model. 3² Factorial design was applied for factors of amount of Pluronic F 127 and PEG4000 and were evaluated for studying their effect on gelation temperature and p^H. Optimized batches showed gelation point at 34^oC and 37 ^oC. p^H between 4.1-5.3, Spreadability between 0.35-0.8cm, Mucoadhesive strength was 1524.44 and 1720.44 dyne/cm² across freshly excised sheep nasal mucosa. Rheological studies indicated viscous and Newtonian behavior signifies spreadability and increased residence time. The IR spectroscopic studies indicate possibility of jatamansone in the extract and formulation. HPTLC studies revealed the presence of jatamansone similar component. *N. Jatamansi* was successfully formulated into stable in situ thermoresponsive nasal gel system revealed by stability studies. It may enhance patient compliance by increasing bioavailability and reducing side effects.

Keywords: Nardostachys jatamansi, Pluronic F 127, nasal thermoresponsive gel.

Startegies and "Innovations harma Research:

RP- HPLC method for simultaneous estimation of Losartan Potassium, Hydrochlorothiazide and Amlodipine Besylate.

Kale A. S.*, Kulkarni P. A., Katkar K. E., Gurav S. B., Bhatia N. M. Quality Assurance dept. Bharati Vidyapeeth College of Pharmacy, Near Chitranagari, Kolhapur

O-8

An ion-pair RP-HPLC method was developed for estimation of Losartan Potassium (LOS) Hydrochlorothiazide (HTZ) and Amlodipine Besylate (AMLO) from tablet which can be conveniently employe for routine quality control in pharmaceutical dosage forms and bioanalytical study.

Literature reveals that various methods have been reported for analysis of LOS, HTZ and AMLO in single component formulations but no method is available for the simultaneous estimation of these three drugs in multicomponent dosage forms and hence an attempt has been made to develop RP-HPLC method for simultaneous estimation of these three components. Mixture of methanol: 0.02% n-hexane sulphonic acid in water (70:30v/ with pH maintained at 3.0 on stationary phase KYA TECH HiQ Sil C18HS column (250mm × 4.6mm i.d.,5µm) and flow rate of 1ml/min was used for analysis. The method has been validated by ICH Q2A R1 (Q2B) guidelines?

Application of proposed method to the analysis of LOS, HTZ and AMLO in laboratory prepared mixtures and pharmaceutical formulation shows that the excipients do not interfere with the analysis indicating that the proposed method can be applied for the determination of LOS, HTZ and AMLO in bulk drug and pharmaceutical formulation.

Key wards: Losartan Potassium, Hydrochlorothiazide, Amlodipine Besylate, RP-HPLC.

"Design and Development of Liposomal Spray Dried Powder for Inhalation"

Sandip Honmane*, Ashok Hajare

0-9

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ABSTRACT

The present was aimed to evaluate the feasibility of pulmonary delivery of liposomally encapsulated salbutamol sulfate (SBS) dry powder inhaler (DPI) for prolonged drug retention in lungsas rescue therapy to preventasthma. Liposomes were prepared by thin film hydration technique using 3²factorial design. The optimization of the formulation was performed on the basis of entrapment efficiency and particle size of SBS liposomes. Optimized composition wasdispersed in phosphate buffer saline(*p*H 6.4) containing lactose and maltodextrin. The dispersion was spray dried followed by characterization for in-vitro aerosol performance using Andersen Cascade Impactor. Liposome wasfound to have average size of 160 nm, 81% drug entrapment, and 20.07 mV zeta potential. Lactose based formulations showed above 90% in vitro prolonged (14h) drug release following Higuchi's controlled release model. The investigation provides a practical approach for direct delivery of SBS encapsulated in liposomes for controlled and prolonged retention at the site of action and therapeutic effect.

Keywords:Salbutamol sulfate, Liposome, pulmonary delivery, dry powder inhaler.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH

POSTER PRESENTATIONS



DEVELOPMENT OF FAST DISSOLVING TABLETS OF VALSARTAN

Mali Sachin^{*}, Gaikwad Suryakant, Salunkhe Sachin, Hajare Ashok

Department of Pharmaceutical Technology, Bharati Vidyapeeth College of Pharmacy, Kolhapur - 416013, Maharashtra, India Email: sachinmali143@gmail.com

ABSTRACT

Valsartan is apotent, specific competitive antagonist of the angiotensin-II AT1 receptor and lipophilic compound with very poor water solubility. An approach of solid dispersions followed by fast dissolving tablets can help to improve the solubility, bioavailability, and absorption of poorly water-soluble drugs.

The aim of the study was to develop the solid dispersions of valsartan using polyvinyl pyrrolidone K30 (PVP) and Methocel K4M by spray drying and solvent evaporation. Solid dispersion prepared by solvent evaporation with PVP K30, 1:5 showed 13.36±0.09 mg/ml, a 78 fold increase in saturation solubility of the drug in distilled water. FTIR spectra showed presence of all the characteristic peaks for valsartan in all the physical mixtures and solid dispersions indicating absence of drug: polymer interaction. PXRD and DSC studies showed complete amorphization of drug.In-vitro dissolution studies of solid dispersion with PVP K30 prepared by solvent evaporation method at 1:5 drug:carrier weight ratio showed 100% drug dissolution within 5 min and with Methocel K4M it was upto 60 minutes.

Preparation of valsartan solid dispersions by solvent evaporation using PVP K30 showed significant enhancement in saturation solubility and better in-vitro dissolution profiles. Thus, method and polymer used for solid dispersion of valsartan to enhance solubility and bioavailability are important parameters.



FORMULATION OF NON-AQUEOUS EMULSION FOR STABILITY OF MOISTURE SENSITIVE DRUGS

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ABSTRACT

Water is responsible for instability like degradation, discoloration, oxidation or hydrolysis of many active ingredients which leads to reduction in activity of drug. This can be avoided by formulating non aqueous emulsions where water is replaced by polar liquids like glycerin, polyethylene glycol, propylene glycol etc. Such emulsions were formulated by using glycerin and mineral oil and stabilized by using various non ionic surfactants like Span and Tween. It was observed that stable oil in glycerin emulsions were obtained by using glycerol mono stearate which has cream like consistency. No relation was found between the nature of surfactant and type of emulsion. Degradation of ascorbic acid was studied in non aqueous emulsion, water and glycerin which shows it has least degradation in non aqueous system while it was completely degraded in water.



POTENTIAL OF NOVEL OIL-IN-OIL EMULSION IN DOSAGE FORM DEVELOPMENT

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The delivery of poorly water-soluble drugs has been the subject of much research, also some drugs are unstable in the presence of water therefore cannot be incorporated into aqueous formulation. To overcome these problems emulsions can be formulated without an aqueous phase to produce non-aqueous or oil-in-oil emulsions. An stable oil-in-oil emulsion is disclosed containing a first oil phase dispersed as droplets in a continuous second oil phase, wherein the first oil phase is substantially immiscible in the second oil phase. The invention relates to emulsions comprising two non-aqueous, immiscible liquids, (L1) and (L2), whereby the liquid (L1), which is either the continuous or dispersed phase of the emulsion, is silicone oil. The emulsion is further stabilized by at least one non-ionic surfactant of which one fraction is soluble in the dispersed phase the other in the continuous phase, the fraction soluble in the continuous phase being greater than the fraction soluble in the dispersed phase. The invention generally relates to oil-in-oil compositions, for various uses, and in particular, to non-polar oils dispersed in non-polar oils which are capable of effectively solubilizing a variety of materials in the dispersed phase. Oil-in-Oil emulsion used as depot or reservoir vehicles for lipophilic drugs in controlled delivery systems.



EMERGENT POTENTIAL OF STEVIA REBAUDIANA AS A NATURAL EXCIPIENT IN PHARMACEUTICALS

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Natural sweetening agents are preferred over synthetic sweetening agents since they do not have any adverse impact on health. Non-saccharide natural sweetening agents are low calorific, nontoxic and super sweet in nature and can overcome the problems of sucrose and synthetic sweeteners. Natural sweeteners are useful sugar substitutes for diabetic patients. The most common endocrine disorder in is Diabetes mellitus, a heterogeneous syndrome rather than a single disease entity which have hyperglycemia. Diabetes mellitus is a major health problem not only in urban but in the rural areas. The natural sweeteners that can substitute for sucrose have caught great attention. The *stevia rebaudiana* Plant is approved by USFDA as food & also approved as GRAS can be used as natural excipient.



DEVELOPMENT OF FAST DISSOLIVNG BUCCAL PATCH OF ANTIHYPERTENSIVE DRUG

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ABSTRACT

The buccal mucosa has been investigated for local drug therapy and the systemic delivery of therapeutic peptides and other drugs .The tablet dosage forms are more popular but the problems associated with these dosage forms is hepatic first pass metabolism, GI toxicity and enzymatic degradation results in high incidence of non-compliance and ineffective therapy. The fast dissolving buccal patch overcomes the above problems. After the application of patch to the oromucosal tissue, it instantly wet by saliva, rapidly hydrates and adheres where it rapidly disintegrates and dissolves to release medicament for oromucosal absorption finally leads to quick onset of action particularly to manage pain, allergies, sleep difficulties, and central nervous system disorders. In present work fast dissolving buccal patch of Antihypertensive drug was formulated by solvent casting technique using polymers like PVP K 30, HPMC, PEG and evaluated for weight variation, film thickness, content uniformity, folding endurance, tensile strength, percent elongation, in-vitro dissolution study, in-vitro drug release study, surface pH. The fast dissolving buccal patch was successfully formulated to achieve a safe, rapid and effective dosage form with enhanced drug dissolution and rapid Antihypertensive therapy.



FLOATING DRUG DELIVERY SYSTEM: A TOOL TO INCREASE BIOAVAILABILITY Chavan D. S.^{*}, Ninganure S. S., Kadne S. A., Tikone N. M., Pishawikar S.A.

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ABSTRACT

Osteoporosis is a global problem, which is increasing in significantly as the population of the world is growing along with increased number of aged people. Strontium ranelate is a new antiosteoporotic treatment with a dual mode of action, both increasing bone formation and decreasing bone resorption, which rebalances bone turnover in favour of bone formation and increases bone strength. It has been shown to enhance osteoblastic cell replication and increase collagen synthesis while it decreases preosteoclast differentiation and bone-resorbing activity of mature osteoclasts in vitro.

The recommended daily dose of Strontium Ranelate is 2 gm in sachet form. Reported bioavailability is only 25% when given orally. The main site of its absorption is proximal small intestine. With intention to improve bioavailability, a successful formulation development of sustained release floating tablet of Strontium Ranelate has been done using Hydroxy propyl methyl cellulose K 100 M, sodium bicarbonate, citric acid, microcrystalline cellulose, polyvinyl pyrolidone K 30, magnesium stearate, and talc. Formulation development and evaluation part will be presented in detail in poster.

Keywords: Floating Drug Delivery System, Osteoporosis, Strontium Ranelate etc.



DESIGN, DEVELOPMENT AND IN VITRO EVALUATION OF BUCOADHESIVE TABLET OF PIROXICAM

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ABSTRACT

The buccal region of the oral cavity is an attractive target for administration of the drug of choice. Buccal drug delivery has several advantages as an intra-oral route of drug delivery. Being convenient, it provides accessibility to allow for the precise localization of the dosage form. It also offers the opportunity to directly modify tissue permeability, inhibit protease activity and avoid first pass metabolism. Buccoadhesive tablets of piroxicam were prepared by using HPMC K4M and carbopol 934 as mucoadhesive polymers. Ten formulations were developed with varying concentrations of polymers. H1 to H5 formulations were composed of HPMC K4M in ratios of 1:1 to 1:5 whereas in C1 to C5 formulations carbopol 934 was used in ratios of 1:0.25 to 1:1.5. The formulations were tested for *in vitro* drug release, in vitro bioadhesion, moisture absorption, *in vitro* retention time and in vitro drug permeation through porcine buccal mucosa. Formulation H3 showed maximum release of the drug (97.67 \pm 0.41) with the peppas model release profile and permeated 26.52 \pm 0.19 of the drug through porcine buccal membrane. H3 formulation showed 12.5gm of mucoadhesive strength. FTIR results showed no evidence of interaction between the drug and polymers. The results indicate that suitable bioadhesive buccal tablets with desired permeability could be prepared.

Keywords: Piroxicam, Buccal tablets, Formulation, Evaluation.



DEVELOPMENT, OPTIMIZATION AND EVALUATION OF SELF-NANOEMULSIFYING DRUG DELIVERY SYSTEM FOR POLYPHENOL RESVERATROL

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Objective:

The objective of current work is to develop, optimise and formulate Self-nanoemulsifying Drug Delivery System of poorly water soluble resveratrol for enhancing solubility and dissolution which further increases the bioavailability of drug.

EXPERIMENTAL METHODS:

Screening of excipients:

Solubility studies:

Solubility of drug in various oils such as fixed oils, surfactants and co-surfactants studied by adding excess amount of drug into 1 ml of each excipient and mixture was vortexed to facilitate solubilisation.

Screening of surfactants and co-surfactants:

Different surfactants and co-surfactants such as Capryol 90, Tween[®] 80, Span[®] 80, Cremophore[®] EL, Transcutol P were screened for emulsification ability of the selected oil phase. Selection was performed on the basis of % transparency and ease of emulsification using shake flask method.

Construction of ternary phase diagram:

On the basis of solubility and emulsification study, oil, surfactant and co-surfactants were selected. To determine concentration of component and pseudo ternary phase diagram constructed.

Optimisation and formulation of SNEDDS:

Formulations of resveratrol loaded-SNEDDS were optimized with D-optimal mixture experimental design. Drug added in accurately weighed amounts of oil into screw-capped glass vial followed by addition of surfactants and co-surfactants, mixed by using vortex mixer.

Evaluation of SNEDDS:

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Emulsification time:

Emulsification time was monitored by visually observing the disappearance of SNEDDS and final appearance of the nanoemulsion. Emulsification efficiency was measured by number flask inversions required for homogeneous emulsion formation.

Droplet size:

Measured by using particle size analyser.

RESULTS AND DISCUSSION:

Solubility studies:



Construction phase diagram:



Emulsification time: Emulsification time was found to be within 30 secs.

Droplet size: Droplet size was within 100 nm.

Conclusion:

In this study, SNEDDS of resveratrol were prepared and evaluated. The optimised formulation of resveratrol showed rapid rate of emulsification.

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IN VITRO ANTI-ARTHRITIC ACTIVITY OF CASSIA TORA LINN. LEAVES

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ABSTRACT

Rheumatoid arthritis is a major ailment among rheumatic disorders. It is a chronic condition with multiple causation and affects the people in their most active period of their life. Traditional ethno medical uses indicate the selected medicinal plant *cassia tora* is used to treat wound, ulcer and skin disease. Literature reveals that pharmacognostical evaluation has reported for the presence of glycosides, proteins, saponins, carbohydrate, tannins, flavonoids etc. since no further scientific study has been made in vitro anti- arthritic activity so an attempt has been made to carry out the present research work. The present study reveals with the in-vitro anti- arthritic activity using effect of membrane stabilization and protein denaturation using different concentration. The results are compared with standard drug. The aqueous extract of the selected medicinal plant showed significant activity.

KEY WORDS: Cassia tora, anti- arthritic, membrane stabilization, protein denaturation.



DEVELOPMENT AND EVALUATION OF FENOPROFEN MICROSPONGES AND ITS COLONIC **DELIVERY USING NATURAL POLYSACCHARIDES**

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ABSTRACT
The aim of the present study was to prepare microsponges containing fenoprofen by quasi emulsion- solvent diffusion method. In rheumatoid arthritis there is a need of a delivery system that will release the drug after some lag time, colonic delivery of drug serve this purpose. The colon specific formulations were prepared by compression coating using chitosan:HPMC mixture followed by tabletting of microsponges. Microsponges were spherical, uniform in shape, between 40.32 to197.32 µm in diameter and showed porosity values 15.85%. The production yield, actual drug content and encapsulation efficiency was found in the range of 24.54 ± 1.54 to $67.08 \pm 2.57\%$, $29.52 \pm 0.43\%$ to $64.48 \pm 0.71\%$, and $39.34 \pm 0.56\%$ to $73.66 \pm 0.82\%$ respectively. The results of compatibility tests FTIR, PXRD and showed that no chemical interaction or changes took place during preparation of the formulations. Cumulative percent drug release for the microsponges over 8h ranged from 54-70 %. In vitro release studies exhibited that compression coated colon specific tablet formulations started releasing the drug at 8 h corresponding to the arrival time at proximal colon. The study presents a new approach based on microsponges for colon specific and sustained drug delivery. **KEYWORDS:** Microsponge, Colonic delivery, Chitosan, Fenoprofen, Quasi emulsion- solvent diffusion method.

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Formulation development and Evaluation of Expandable Gastroretentive **Tablet of Diltiazem Hydrochloride**

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ABSTRACT

Oral sustained drug delivery system is complicated by limited gastric residence times. To overcome these limitations, various approaches have been proposed to increase gastric residence of drug delivery systems in the upper part of the gastrointestinal tract. The present study was to maintain the levels of diltiazem hydrochloride within a desired range, reduction in its dosing frequency and increase bioavailability. The tablets were formulated by using of 3² factorial design, the effect of independent variables X1 (concentration of HPMC K100M) and X2 (concentration of sodium CMC) on swelling index and drug release was studied. Tablets were prepared by direct compression method using 13 mm punch on rotary tablet machine. Physical properties of prepared by direct compression method using 13 mm punch on rotary tablet machine. Physical properties of compressed tablets such as hardness, friability, content uniformity, swelling index were determined. The swelling index of optimized batch varied between 114.21 and 220.41 %. The percentage drug release of optimized batch was 15.60% at 1 h and 71.97% at 12 h. From the drug release kinetic study, Peppas model was found to be best fit. Infrared spectrum showed that there was no interaction between drug and polymers in the formulation. Therefore, sustained drug release pattern was successfully achieved through the formulation of expandable gastro retentive tablets.

KEYWORDS:

Antihypertensive drug, Diltiazem hydrochloride, expandable tablet, factorial design, gastroretentive, swelling study.


"CASSIA FISTULA SEED POLYMER FOR FORMULATION DEVELOPMENT"

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ABSTRACT

The need for natural polymers is increasing due to toxicity and incompatibility of synthetic polymers, *Cassia fistula* is a common herbaceous belongs to the family Caesalpiniaceae and used as purgative. Seeds of the plant contain proteins hence attempt to evaluate the seeds polymer for suitability as sustained release polymer is considered and the present investigation reports the isolation of polymer of *Cassia fistula* seed. Defatted seeds were used for isolation of polymer by salt precipitation method and purification of polymer by dialysis. FTIR thermograms of drug and polymer indicated no chemical interaction. Phytochemical characteristics of polymer was studied which confirmed the protenious nature.

Wet granulation method was used for granulation and flow properties were analyzed. The seed polymer was evaluated for its sustained release properties in compressed tablet using Diclofenac sodium as model drug in (1:1, 1:2, 1:3, 1:4, 1:5 drug : polymer ratio). All the flow property results were within the standard limits for compression. The tablets prepared using seed polymer was compared with HPMC and marketed preparation of SR tablet of Diclofenac sodium. The drug release (73.20% at 10h) of tablet is sustained as compared to HPMC (102.12%) and very much close to marketed formulation (72.33%). Optimized batch (1:5) of tablet is subjected for stability studies for three months as per ICH guidelines and results are awaited.

Keywords: Cassia fistula, Wet granulation, Polymer, Sustained release.

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DEVELOPMENT OF SELF-MICROEMULSIFYING DRUG DELIVERY SYSTEM OF RITONAVIR FOR BIOAVAILABILITY ENHANCEMENT

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ABSTRACT

The main purpose of this study was to prepare lipid-based self-microemulsifying drug delivery system (SMEDDS) to improve bioavailability of Ritonavir. SMEDDS was a system consisting of Ritonavir, Tween 80, ethyl alcohol, and Propylene glycol monolaurate. Particle size change of the microemulsion was evaluated upon dilution with aqueous media and loading with incremental amount of Ritonavir. In vitro release was investigated by a dialysis method. Results showed that release of Ritonavir from SMEDDS was incomplete and typical of sustained characteristics. Pharmacokinetics and bioavailability of Ritonavir SMEDDS were evaluated and compared in rats. Plasma Ritonavir which was determined by high-performance liquid chromatography. It was concluded that bioavailability of Ritonavir was enhanced greatly by SMEDDS. Alternative mechanisms, such as improved lymphatic transport pathway, other than improved release may contribute to enhancement of bioavailability of Ritonavir.

Key words: Ritonavir, SMEDDS, Solubility enhacement



SYNTHESIS AND SCREENING OF ESTER PRODRUG OF FLURBIPROFEN

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ABSTRACT

Prodrug of Flurbiprofen was synthesized whereby its carboxylic group was condensed with a skeletal muscle relaxant Chlorxozaxone to give an ester prodrug, with the aim to avoid Flurbiprofen mediated GI damage and to eliminate the ulceration tendency of Flurbiprofen as well as to synergize the action. The synthesized prodrug was characterized and confirmed by physicochemical, IR, ¹H NMR. In vitro hydrolysis was studied at pH 3, 4, 5 and 7.4 byHPLC using a HIQ sil C18 column -10 (250 mm x 4.6 mm) column with mobile phase consisting of methanol: water (95:05) and quantitative evaluation was performed at 274 nm with a flow rate of 1.0 mL min⁻¹suggesting that the prodrug remains unhydrolysed in the stomach however rapidly cleaved by esterase in blood to give the parent drug after absorption. Mutual ester prodrug was evaluated for its anti-inflammatory, analgesic, skeletal muscle relaxation, ulcerogenic and total acid content activities andwas found to possess comparable activity with that of the parent drugs. Furthermore, T.S. specimen of the stomach also shows significant reduction in gastric ulcer formation to rat gastric mucosa as compared to parent carboxylic acid drug. These finding suggested that the prodrug is better in action as compared to that of parent drug and is advantageous in having less gastrointestinal side effects.

Key words: NSAIDs,Flurbiprofen,skeletal muscle relaxant,chlorxozaxone, ester prodrug, hydrolysis, RP-HPLC, ulcerogenicity



SCREENING POTENTIAL OF NATURAL GUMS IN SUSTAINING RELEASE OF VERAPAMIL HYDROCHLORIDE FROM MATRIX TABLET

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ABSTRACT

The development of sustained-release drug delivery systems is use of polymer of natural origin to fulfill the aim of sustaining the drug release. Natural polymers have advantages over synthetic materials because they are non toxic, less expensive and freely available. Aim of present study was to develop sustained release tablet of Verapamil hydrochloride using natural polymers such as seed flour of Vigna munga, Fenugreek seeds and HPMC. The physicochemical properties of seed flour of Vigna munga, and Fenugreek seeds such as swelling index, loss on drying, pH, and viscosity were studied. Different batches of SR tablet were prepared by using drug : polymer ratio such as 1:0.5, 1:1, 1:1.5 by wet granulation method. The granules for tableting were evaluated for angle of repose, loose bulk density, tapped bulk density, compressibility index and hausner ratio. Prepared tablets were evaluated for various parameters like hardness, friability, uniformity of weight, uniformity of drug content, swelling behavior, drug-polymer interaction, in-vitro drug release. In-vitro drug release studies were performed using USP XXIII apparatus-I at 100 rpm of dissolution medium pH 6.8 phosphate buffer for 12 hours. The results of physical characteristics of all formulations are in acceptable limits. The tablets prepared by Fenugreek seeds, and Vigna munga showed release of drug at 1:1 proportion also showed sustained action of the drug. There was concluded that increased concentration of polymer showed small retardation in drug release from tablet. Also it was found that HPMC based matrix tablet have decreased release rate of drug than Fenugreek seeds and seed flour of Vigna munga.



FORMULATION AND CHARACTERIZATION OF MOMETASONE FUROATE AND AZITHROMYCIN TOPICAL CREAM FOR ANTI-INFECTIVEACTIVITY

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ABSTRACT

Mometasone furoate is a synthetic corticosteroid, exhibiting anti-inflammatory, anti-pruritic and vasoconstrictive properties. The highly lipophilic nature of mometasone furoate may provide high absopstion rate by topical route. Azithromycin is an azalide, a subclass of macrolide antibiotics. In recent years, it has been used primarily to prevent bacterial infections. Azithromycinis topically used in the treatment of blepharitis. Blepharitis is a common inflammatory disease of the eyelid that may be infectious in nature.

A successful attempt has been made in developing a cream based topical formulation using experimental design containing, Mometasone furoate&Azithromycin. Any kind of wound is a open access to microorganisms and is one of the major cause of infection. Use of compounds with anti-infective, anti-inflammatory, anti-pruritic and vasoconstrictive properties the developed formulation should turn out to be good topical formulation, which will be helpful in better management of topical infections.

Formulation and evaluation aspects will be explained with diagrams in poster.

Keywords: Anti-infective activity, Bacterial infection, Topical formulation.



HOW TO STUDY PROTEINS BY CIRCULAR DICHROISM

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ABSTRACT

Circular dichroism (CD) is being increasingly recognised as a valuable technique for examining the structure of proteins in solution. However, the value of many studies using CD is compromised either by inappropriate experimental design or by lack of attention to key aspects of instrument calibration or sample characterisation. In this article, we summarise the basis of the CD approach and its application to the study of proteins, and then present clear guidelines on how reliable data can be obtained and analysed.

Keywords: Circular dichroism; Protein structure; Secondary structure; Protein folding; Ligand binding



OPTIMIZATION OF GRANULATION TECHNIQUES FOR DEVELOPMENT OF TABLET DOSAGE FORM

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Abstract:

The purpose of this study was to investigate the influence of various powder agglomeration processes on tabletting mixture flow and compaction properties. The distribution in particle size is a factor for the processing behavior of a powder during pharmaceutical manufacturing. Still there is a need for a correlation between the particle size distribution and the manufacturability of powders. For a powder exhibiting marginal flow 6 properties during powder handling, granule formulation is an effective means to improve flow properties and manufacturability. To obtain uniform powder flow of a given formulation or granule particle size should be carefully controlled. Hence to study particle size distribution and flow properties of granules prepared by different granulation techniques which affect final tablet performance. In this study Diclofenac sodium is used as model drug for preparation of granule. Granules were prepared by different granulation techniques such as Fluidized bed granulation (Fluid bed granulator), Low shear granulation (Planetary mixer granulator) and Rapid mixer granulation (Rapid mixer granulator) characterized for its physical properties. Three different wet granulation methods of the same model placebo formulation were tested at a semi-industrial scale and their properties were compared to those of the directly compressed mixture. The wet granulated mixtures had excellent flow properties compared to other mixtures and showed better compressibility, measured by the kawakita plot. It was shown that the kawakita had slightly better discriminative power to differentiate tableting mixtures according to compressibility. In conclusion, it is important to emphasize that general assumption like higher porosity better compressibility and better compatibility cannot be established for complex tableting mixtures.



DEVELOPMENT OF SOLID SELF MICRO EMULSIFYING DRUG DELIVERY SYSTEM FOR POORLY WATER SOLUBLE DRUG

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ABSTRACT

Most of the new drug candidates exhibit low solubility in water, which leads to poor dissolution, poor oral bioavailability, high intra and inter-subject variability and lack of dose proportionality. Various novel approaches have been used to improve dissolution rate of the drug. Among them, one is the solid-self micro emulsifying drug delivery systems (S-SMEDDS). Conventional SMEDDS are normally prepared in liquid dosage forms which have some disadvantages especially in the process of manufacturing. With the help of Solidification technique S-SMEDDS was prepared from liquid self emulsifying ingredients into powders in order to create solid dosage forms. The main objective of the study was to develop and evaluate an optimal S-SMEDDS formulation containing poorly water soluble drug Pioglitazone by solidification technique. Pioglitazone is oral anti diabetic drug having high permeability and low solubility having half life 3-7 hr. The solubility of Pioglitazone which is poorly aqueous drug was determined in various oil, surfactant and cosurfactant. Pseudo ternary phase diagrams were used to evaluate the micro emulsification existence area. Three component of SMEDDS formulation were established. Selected combinations were exposed to solidification technique using solid carrier. S-SMEDDS formulations were tested for micro emulsifying properties and for solid state characterization. The in-vitro dissolution studies of S-SMEDDS and marketed formulation was carried out. Results showed that drug releases from S-SMEDDS formulations were found to be significantly higher as compared with that of marketed formulation. Thus study concluded with S-SMEDDS provides useful solid dosage form to improve solubility and dissolution rate of poorly water soluble drug.



ADSORPTION STUDIES OF BROMHEXINE HYDROCHLORIDE ON TALC

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Abstract

The objective of this study was to find out the effect drug-excipient interaction through adsorption studies of talc and Bromhexine hydrochloride in different proportion of binary solvent system of methanol and water. Literature survey show that talc is very versatile excipient used as diluents. But in some cases talc containing formulations such as pellets, agglomerates gone through drug release problems and sustained release action was found in dissolution studies. This study reveals the adsorption capacity of talc in various concentrations of methanol and water binary system. There is adsorption interaction was found in which BXH was adsorbed on the talc particles in the solvent system because of poor solubility of BXH in water. But in case of solvent system composed of methanol and was, increased adsorption has been seen. The adsorption study was done by taking various concentrations of methanol: water system (15%:85% vol/vol; 20%:80 vol/vol; 25%:75 vol/vol). This was confirmed by reggration analysis and absorbance at λ_{max} 317nm. It was found that adsorption was higher in concentration methanol: water (15:85) but as concentration of methanol increases in solvent system adsorption decreases due to desorption of drug from talc to methanol. The adsorption study was done with the Langmuir and Freundlich adsorption isotherms. From this study we come on conclusion that talc acts as adsorbent for many drugs so there is always problem with drug release from talc containing formulation. This property of talc can be used in the formulation of sustained release formulations or in MUPS.

Key words: Adsorption isotherms, BXH and talc interaction, Solvent system, Sustained release.



STUDIES ON EXTENDED RELEASE APPLICATIONS OF POLYMER EXTRACTED FROM MORINGA OLEIFERA

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ABSTRACT

The aim of our work is to explore extended release applications of moringa coagulant (MC). Separation of MC was carried out by salt precipitation method using 3% NaCl solution. Different categories of drugs (charge basis) like Diclofenac sodium, Diltiazem HCL, Ibuprofen were compacted with the coagulant and systematically studied by 3^3 factorial designs wherein, amount of MC (X₁), amount of chitosan (X₂) & amount of HPMC (X₃) were selected as three independent variables. Further matrix were evaluated for different studies like, thickness, hardness, Heckel study, FTIR, DSC, PXRD, In Vitro dissolution Studies. In Heckle study, mean yield pressure was increased with increase in concentration of HPMC & chitosan, while tensile strength was increased with increase in concentration of HPMC & coagulant. Similarly, with increase in concentration of coagulant & HPMC, compressibility goes on increasing. While all the three polymers have shown varied effects on compression susceptibility of matrices. In vitro dissolution studies showed that drug release was extended up to 12 hours & showed drug release in the range of 24-50% for diclofenac sodium, 33- 52% for diltiazem HCL & 25-60% for ibuprofen. Drug release followed, first order, zero order & matrix model respectively. It has been observed that, drug release retardation was to a greater extent in the matrices of the diclofenac sodium; Here the effect was due to opposite charged coagulant. However, the extended release was seen in cases of both diltiazem HCL & ibuprofen, stating importance of coagulant in controlling the release of cationic and neutral drugs also.

Keywords: Diclofenac sodium, Diltiazem HCL, Ibuprofen, MC, 3³ factorial design & extended release tablets.



DISSOLUTION ENHANCEMENT OF MELOXICAM USING MORINGA COAGULANT-PVP MIXTURES

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ABSTRACT

The aim of the work is to develop method for solubility enhancement and amorphous state stabilization of meloxicam (Melo) using moringa coagulant (MC). Work in our laboratory has already proved potential of MC for the same, hence, its combination with PVP has been proposed. MC was extracted; purified, and ternary (Melo-MC-PVP) as well as binary solid dispersions (Melo-MC/PVP) were prepared by physical kneading, and ball milling at various proportions. Physical kneading involved uniformly triturating the Melo with a MC and or PVP for 20 minutes, while ball milling involved milling of aforesaid components up to 20 hrs. Finally the solid dispersions were evaluated for dissolution and stability studies using Invitro dissolution, DSC and X-ray diffraction.

The ternary solid dispersions displayed excellent dissolution enhancement over pure Melo and binary solid dispersions. Ternary solid dispersion of Melo-MC-PVP in proportion of [1 :(3:1)] prepared by ball milling showed highest drug dissolution (86.556 %) compared to physical kneading (58.710 %) respectively. Whereas, plain Melo showed only 13.579 % drug dissolution. DSC and PXRD spectra revealed complete amorphous state stabilization even after 3 months. MC and PVP blend holds potential to enhance drug dissolution and stabilize amorphous state of solids by synergism.

Key Words: Moringa Coagulant, Meloxicam, PVP, Solid dispersion, solubility enhancement.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



DEVELOPMENT AND IN VIRO EVALUATION OF DICLOFENAC POTASSIUM TABLET FOR COLON TARGETING

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ABSTRACT

The present study was to formulate tablet of Diclofenac potassium using the hydrophilic polymer hydroxyl propyl methyl cellulose (HPMC), Hydroxypropyl Cellulose (HPC), Ethyl Cellulose (N22), Cross Povidone and Sodium Starch Glycolate as a superdisintegrants and Instacoat EN super II as a enteric coat to the colon specific tablet. A 3^3 randomized full factorial design, 3 level and 3 factors were used. The concentration of Hydroxy propyl cellulose (X₁), concentration of HPMC K4M (X₂) and concentration of Ethyl cellulose (X3) were selected as independent variables. The percentage drug release at 12 hours (Q₁₂), percentage friability and hardness of tablet were selected as dependent variables for optimization study. The core, press coat tablets were compressed by rotatory tablet machine evaluated with different parameters like diameter, thickness, average weight, hardness, friability, kinetic release data. Hardness of tablets was found to be in the range of 7–8 kg/cm². The enteric coated tablets containing diclofenac potassium released 38.12 % at the end of 12 hrs by in vitro release study. It is concluded that the formulation is prepared of enteric coating of tablet can be used successfully in the systems designed for colon specific drug delivery.



ANTIMICROBIAL ACTIVITY OF CALOTROPES PROCERA TO HEAL DISEASES

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ABSTRACT

Generation of multi-drug resistance in pathogenic microbes and parasites is major area of concern. Nonavailability of safe antimicrobial drugs for systemic infections necessitates a search for new antimicrobial substances from other sources, including plants. Traditionally used medicinal plants produce a variety of compounds of known therapeutic properties The substances that can inhibit pathogens and have little toxicity to host cells are considered candidates for developing new antimicrobial drugs. In this era, antimicrobial properties of Indian medicinal plants have been increasingly reported. Leaves extracts of <u>Calotropes procera</u> were studied for their antimicrobial activity against bacterial strains. The extracts showed strong activity against all the tested bacterial strains. Hence, this plant can be used to discover bioactive natural products that may serve as leads in the progression of new pharmaceuticals that address unmet curative needs.



FORMULATION AND EVALUATION OF LIQUISOLID COMPACTS OF LORNOXICAM

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ABSTRACT

Liquisolid compact is a novel technique to formulate water insoluble drugs in non-volatile solvents and converting into acceptably flowing and compressible powders along with enhancement of solubility. The aim of the work was to improve the dissolution of the practically insoluble lornoxicam (NSAID) by adopting the liquisolid compaction technique. Reported liquid load factors and excipient ratios were used to calculate the required amounts of excipients necessary to prepare the eight batches of liquisolid compacts according to a mathematical model. Avicel PH 200, and Florite R were used as the carrier and the coating materials, respectively and crosspovidone was used as disintegrant to prepare formulation. The drug release rates of liquisolid compacts were distinctly higher as compared to directly compressed tablets and marketed tablet, which show significant benefit of liquisolid in increasing wetting properties and surface area of drug available for dissolution. The batch LS-6 showed acceptable flowability, Carr's compressibility index, Hausner's ratio and dissolution release. So we conclude that the Liquisolid technique is a promising technique for improvement of solubility and dissolution of lornoxicam. Thus liquisolid technique can be applied to enhance the solubility and dissolution of water insoluble drugs.

Keywords: Liquisolid compact, lornoxicam, solubility and dissolution.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



COMPARATIVE STUDIES ON POLYVINYL PYRROLIDONE K30 AND POLOXOMER 188 FOR IMPROVEMENT OF SOLUBILITY AND DISSOLUTION RATE OF INDOMETHACIN USING SOLIDDISPERSION

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ABSTRACT

The aim of this study was to investigate the suitability of carriers polyvinyl pyrrolidone K30 (PVP) and poloxamer 118 (POLO) for enhancing solubility, dissolution rate and bioavailability of indomethacin (INDO) using solid dispersion (SD). The SDs of INDO was prepared by solvent evaporation method. The SDs were evaluated for practical yield, drug content, saturation solubility and in vitro dissolution study, Scanning electron microscopy (SEM), X-ray powder diffractometry (XRPD) and differential scanning calorimetry (DSC). The dissolution rates in PVP and POLO SDs were much faster than the pure INDO and physical mixtures (PM). XRPD analyses crystallinity of INDO in all PMs. DSC studies on SDs showed significant change in melting peak indicating amorphization. SDs showed marked increase in the solubility of drug with carrier concentration. At the highest ratio of carriers the drug solubility was enhanced about 6-folds and 3-folds for SD in POLO and in PVP, respectively. The dissolution rate was increased with carrier concentration at pH 7.4. XRPD data revealed a remarkable interaction between the INDO and the carrier that enhanced drug dissolution. The 1:10 ratio of POLO was sufficient for conversion of INDO to amorphous form indicating its superiority over PVP.



RECENT STRATEGIES IN NANOTECHNOLOGY

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Abstract

Nanotechnology is the science of the small; the very small. It is the use and manipulation of matter at a tiny scale. At this size, atoms and molecules work differently, and provide variety of surprising and interesting uses. Nanotechnology should not be viewed as a single technique that only affects specific areas.

Nanotechnology offers major benefits to humankind. Nanotechnology in the form of nanoparticles has great potential in the drug delivery field. The main advantage of using nanoparticles for drug delivery is the specific delivery of drug in the targeted organ without affecting the non-targeted organs. In this way side-effect of the drugs can be minimized.

Nanotechnology may also be useful for developing ways to eradicate cancer cells without harming healthy, neighbouring cells. There are many interesting nanodevices being developed that have a potential to improve cancer detection, diagnosis, and treatment.

Key Words – Nanotechnology, nanopartical, nanodevice, site specific targeting.



MEDICATED CHEWING GUM-A NOVEL APPROCH TO IMPROVE PATIENT COMPLIANCE

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Abstract In recent years scientific and technological advancements have been made in the research and development of oral drug delivery systems. The reasons that the oral route achieved such popularity may be in part attributed to its ease of administration. Chewing gum is one of the very popular oral confectionery products. It is a potentially useful means of administering drugs either locally or systemically via, the oral cavity. The medicated chewing gum has through the years gained increasing acceptance as a drug delivery system. Chewing gum known as gum base (insoluble gum base resin) contains elastomers, emulsifiers, fillers, waxes antioxidants, softeners, sweeteners, food colourings, flavoring agents, and in case of medical chewing gum, active substances. It offers various advantages over conventional drug delivery systems. Unlike chewable tablets medicated gums are not supposed to be swallowed and may be removed from the site of application without resorting to invasive means. Moreover, medicated gums require the active and continuous masticatory activities for activation and continuation of drug release. Medicated chewing gums are dosage forms given orally for both local and therapeutic effect, and no performance test has been indicated for medicated chewing gums in USP. An *In-vitro* apparatus was specially designed and constructed for release testing of medicated chewing gums. It was concluded that Chewing gum is an excellent drug delivery system for self-medication as it is convenient and can be administered discretely without water.

Key Words: oral drug delivery, chewing gum, patient compliance

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SYNTHESIS OF 3-[4-(TRIFLUOROMETHYL) PHENOXY], 3-PHENYL PROPANAMINE AND ANALYTICAL METHOD DEVELOPMENT FOR FLUOXETINE AND ITS METABOLITE.

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Abstract

Synthesis and characterization of clinically significant metabolites of new drugs utilizing optimum time and material resources is one of the areas of current pharmacoeconomic and clinical interest. In this project we have attempted to address some such synthetic and analytical issues pertaining to Fluoxetine and its metabolite. Fluoxetine, exhibits selective inhibition of serotonin uptake in presynaptic neurons. FLX is extensively metabolized by cytochrome P450 (CYP) isoenzymes in the liver to form an active N-demethylated metabolite Norfluoxetine which has similar potency and selectivity with regard to the serotonin reuptake inhibiting effect of parent drug. After extensive review of literature and preliminary experimentation with respect to hetero-atom dealkylation reactions we selected hydroxylamine hydrochloride and triethylamine for synthesis of 3-[4-(Trifluoromethyl) phenoxy], 3-phenyl propanamine (Norfluoxetine) from Fluoxetine. Confirmation of the product was done by GC/MS, IR and NMR. For the analytical component of the project we have developed HPTLC and HPLC methods for the quantitation of Fluoxetine and its N-demethylated metabolite (Norfluoxetine) from different body fluids. As the metabolite had poor sensitivity for UV-detection a precolumn derivatization of the metabolite was done for the HPLC method and we have got very promising results. In the process we have also developed a HPTLC method for the estimation of Fluoxetine in its capsule formulation. All the developed methods have been validated as per the ICH Q2 (R1) guidelines. The HPLC and HPTLC methods described are selective, sensitive and reproducible for quantitation of FLX and N-FLX from biological fluids. Our studies show that the HPLC method owing to its specificity could also allow for the detection and determination of some impurities, such as N-FLX and others which can be toxic, often present in the pharmaceutical formulations. All the methods described here are suitable for estimation of Norfluoxetine from various formulation and biological matrices and could be useful in a clinical laboratory for therapeutic drug monitoring, metabolic and bioequivalence studies.



DEVELOPMENT AND EVALUATION OF LIQUISOLID TABLET FORMULATIONS OF NATURAL PROGESTERONE

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ABSTRACT

Progesterone is naturally occurring female sex hormone used to treat secondary amenorrhea, dysfunctional uterine bleeding, hypogonadism, and abortion. It belongs to BCS class II and is highly water insoluble. Liquisolid technique is one of the techniques to improve solubility of drugs. Liquisolid compact implies oily liquid drugs and solutions or suspensions of water insoluble solid drugs carried in suitable non volatile solvent systems. The Natural Progesterone (NP) was dispersed in PEG 400, while Neusilin US2 and Syloid 244FP were used as carrier and coating material respectively. Sodium starch glycolate was used as disintegrant to prepare liquisolid tablets. Compressibility, compactibility and drug dissolution studies of the liquisolid tablet and conventional formulations were carried out. FTIR, DSC, XRPD studies were carried out to investigate physicochemical interaction between NP and excipients. The liquisolid tablets formulated with PEG 400 at drug concentration of 10% w/w demonstrated high dissolution profile with acceptable tablet properties. Furthermore, Neusilin US2 and Syloid 244FP were found to be more effective for liquid adsorption than Avicel and Aerosil which are often used for liquisolid systems. FTIR, DSC, XRPD and SEM suggested reduction in NP crystallinity and polymorphic transformation from the stable α form to meta-stable β form upon liquisolid formulation. The findings suggest that, the drug in liquisolid tablet form is held within the powder substrate in a solubilized, almost molecularly dispersed state, contributes enhanced drug dissolution properties. Liquisolid technique changes the properties of progesterone by its solubilization and dispersion in PEG 400 and shows enhanced in vitro dissolution profiles.

Key words: NP, Liquisolid technique, PEG 400, Neusilin US2, Syloid 244FP, Avicel, Aerosil.



LIQUISOLID TECHNIQUE AS NEW APPROACH FOR BIOAVAILABILITY ENHANCEMENT OF ANTIHYPERTENSIVE DRUG

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Abstract

Liquisolid system is acceptably flowing and compressible powdered form of liquid medication. The present work showed that liquisolid technique can be optimized for the dissolution enhancement of poorly water soluble drugs. The Lovastatin Liquisolid compacts were prepared by using Avicel PH 102 as absorbing carrier and Aerosil 200 as adsorbing coating material. PEG 400 was used as the liquid vehicle or non-volatile solvent.IR studies showed there was no interaction between functional group of drug and excipients. X-ray diffractograms indicate that drug has almost entirely converted from crystalline to amorphous or solubilized form. DSC study shows complete disappearance of characteristic peaks of drug indicates the formation of drug solution in the liquisolid powdered system, i.e., the drug is molecularly dispersed within the liquisolid matrix. SEM photomicrographs of the final liquisolid system signify the complete disappearance of Lovastatin crystals, a fact that indicates that the drug was totally solubilized in the liquisolid system. Hardness and dissolution profile of drug were not affected by aging. The Hardness, friability and Carr's compressibility index test falls within acceptable limits. The in vitro dissolution study confirmed enhancement of drug release from Liquisolid compacts (>90%) compared to conventional matrix tablet counterparts (< 60%) at the end of 60 min. Finally we conclude that the proposed new technique is used for dissolution enhancement of poorly water-soluble drugs such as lovastatin.

Keywords

Liquisolid • Lovastatin • Dissolution • Solubility • Mathematical model



NANOROBOTS: AN ENGINEERING SOLUTION TO DRUG DELIVERY Shah.R.R., Kulkarni.P.V*,Shinde.P.S., Appasaheb Birnale College of Pharmacy,Sangli,Maharashtra.

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Abstract:

Nanorobotics is emerging as a demanding field dealing with miniscule things at molecular level. Nanorobots are quintessential nanoelectromechanical system designed to perform a specific task with precision at nanoscale dimensions. Its advantage over conventional medicine lies on its size. Carbon will likely to be the principal element comprising the bulk of medical nanorobot in the form of Diamond/Fullerene nanocomposites. The various components in the nanorobots design may include on board sensers, motors, maniculators, power supplies & molecular computers. There are two main approaches to building at nanometer scale: positional assembly and self assembly. The use of microdevices in surgery and patient monitoring is a reality that has brought many improvements for clinical procedures in recent years. It is a valuable tool for Diabetis control, nanorobotes are used for automatically monitoring glucose levels. The hSGLT3 molecule can serve to define the glucose levels for diabetis patients. The important data may help doctors and specialist to supervise and imporve the patient medication and daily diet. This process using nanorobots may be more convenient and safe for making feasible an automatic system for data collection and patient monitoring. Thus nanorobotics will serve as efficient tool for diabetic patients and will prove as best alternative for conventional systems of diabetic treatment.

Keywords: Nanorobotics, Nanorobots, Diabetis.



FORMULATION AND EVALUATION OF FAST DISSOLVING HERBAL ANALGESIC TABLET

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Abstract:

Sonchus asper is the plant from the asteraceae family which is used traditionally to treat variety of ailments and diseases which includes treatment of wounds, boils, asthma, bronchitis, GIT Infections, malaria and venereal disease. In Miraj Mr. Milind Babar of Kirti Phenolics uses this plant for dental pains and this is his third generation practicing the plant juice. The traditional method of using fresh juice and the availability of plants in all season is difficult hence tablet dosage form from whole extract was made and found effective. Clinical trials of this herbal formulation were done; it shows analgesic activity but for complete cure it takes 3 days. To improve the effectiveness and duration of treatment it was necessary to modify the formulation. Hence in the present work fast dissolving tablets are prepared to overcome these problems.

In the present work, fast dissolving tablets of *Sonchus asper (dried extract-whole plant)* were prepared by direct compression method with a view to enhance patient compliance. Fresh juice of *sonscus asper* was collected and concentrated by vacuum evaporation. Preparation of tablet was done by direct compression method. Two superdisintegrants i.e., cross povidone and cross carmellose sodium with binder, microcrystalline cellulose and diluents talc and lactose were used. The prepared batches of tablets were evaluated for hardness, friability, weight variation, disintegration, wetting time, and in vitro dissolution studies. Based on evaluating parameters, formulation prepared by using 5% cross carmellose sodium and cross povidone was selected as optimized formulation, which show 94 % drug release in 12 min. Finally, the optimized formulation was compared with plane conventional formulation. The results concluded that FDT of *Sonchus asper* has showed improved bioavailability and drug release.

Keywords: Fast-dissolving tablets, Sonchus asper, Superdisintegrants



TABLETTABILITY AND MOLECULAR PROPERTIES OF TALC PELLETS PREPARED BY EXTRUSION/SPHERONISATION TECHNIQUE

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Abstract

The objective of present work was to pelletize talc by extrusion- spheronization technique using minimal amount of microcrystalline cellulose (MCC) as a pelletization aid and study pellet tablettability and molecular properties. A 3² factorial design was used to study the effect of independent variables (amount of talc and MCC) on pellet properties. Total nine batches of pellets obtained (TM1-TM9) were evaluated for percentage yield, topology, sphericity, micromeritics and mechanical properties. An optimized talc pellet batch (TM9) and MCC pellets (MP0), were layered with felodipine coated using aqueous ethyl cellulose dispersion (Surelease NG). Then pellets were compressed and evaluations of compacts were carried out. From the Heckel plot study, MyP (2.0591±0.0827) values of optimized batch were found to be more showing better consolidation ability. Pressure- tensile strength relationship suggested that MCC was responsible for improved tensile strength and observed in the range of 2 -2.80 N/mm². Compactibility was found to be maximum (0.01490 to 0.03045) at intermediate levels of MCC and talc. Instrumental analysis like FTIR, DSC and PXRD revealed no chemical interaction between drug and excipients or no any polymorphic change. SEM image showed spherical shape, smooth surface of TM-9 which indicated uniform layering of drug and polymer over talc pellets. The drug release studies showed that from functionalized TM9 and MP0 followed first order kinetics. However, during crushing/compression they get deformed instead of fracturing of interparticular slippage of talc which may open new area for research.

Keywords: Talc, Extrusion-Spheronization, compacts etc.



COMPARATIVE ACCOUNT ON TANNINS PRESENT IN FRUIT PULP AND FRUIT SHELL OF COUROUPITA GUIANENSIS

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Abstract:

Tannins are complex moieties produced by various plants. They are stored as a protecting material in various parts of the plant and exhibiting wide range of therapeutic effects. The objective of the research work to estimate the tannin content of plant *Couroupita guianensis* by use of Folin-denis reagent. The free tannin estimated by taking 2g each of dried powder sample and refluxed with 75 ml of double distilled water for 30 min. Mixture cooled, filtered and centrifuged at 2000 rpm for 20 min. Supernatant was collected and used for experiment. The hydrolysable tannin also estimated by taking 2g each of dried powder sample dust for 30 min. Mixture cooled, filtered and 75 ml of double distilled water for 30 min. Mixture cooled, filtered and 75 ml of double distilled water for 30 min. Mixture cooled, filtered and centrifuged at 2000 rpm for 20 min. Mixture cooled, filtered and centrifuged at 2000 rpm for 20 min. Supernatant was collected and used for experiment. The hydrolysable tannin also estimated by taking 2g each of dried powder sample was refluxed with 0.1ml hydrochloric acid and 75 ml of double distilled water for 30 min. Mixture cooled, filtered and centrifuged at 2000 rpm for 20 min. Supernatant was collected and used for experiment by spectrophotometry method. Standard curve was prepared by Gallic acid with the (beer limit 10-22 µg) were analysed at 700nm. Calibration curve shows coefficient of variance (r²=0.9916). Hydrolysable tannin content was found to be highest (21.42±0.22%) in fruit shell as compared to fruit pulp (3.77±0.13%) and the free tannin was found to be higher in fruit shell (14.26±0.25%) than in fruit pulp (5.16±0.42%). From the experimental data it confirms that more amount of tannin in fruit shell than fruit pulp. Seasonal variation of tannin content is in process and will be completed shortly.

Key words:- Total tannins estimation, Folin-denis reagent, Couroupita guianensis

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



QUALITY BY DESIGN: AN APPROACH TOWARDS QUALITY BUILDING IN PHARMACEUTICALS

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Abstract:

Quality by Design (QbD) refers to a holistic approach towards drug development. QbD has become the answer to assist both industry and FDA to move towards a more scientific, risk based, holistic and proactive approach to pharmaceutical development. The concept promotes industry's understanding of the product and manufacturing process starting with product development, basically building quality in, not testing it. Under this concept of QbD during designing and development of a product, a company needs to define desire product performance profile like Target product Profile (TPP), Target Product Quality Profile (TPQP) and identify critical quality attributes (CQA). On the basis of the information, company design the product formulation and process in such a way that it will meet the product attributes and there is no necessity to check the quality of the final product. This leads to understand the impact of raw materials such as critical material attributes (CMA), critical process parameters (CPP) on the CQAs and identification and control sources of variability. This systematic approach to product development and manufacturing has received a great deal from traditional approach, which was extremely empirical. Implementation of QbD is enabling transformation of the chemistry, manufacturing, and controls (CMC) review of Abbreviated New Drug Applications (ANDAs) into a modern, science and risk based pharmaceutical quality assessment.

Key words: TPP, TPQP, CQA, CMA, CPP, Design Space



EFFECT OF METHANOL LEAF EXTRACT AND ITS FRACTIONS OF MEMECYLON UMBELLATUM BURM ON FROGS HEART

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ABSTRACT

Cardiovascular disease incurs a greater economical constraint than any other illness especially in the developing countries. It is the most common cause of death by the year 2020. *Memecylon umbellatum* Burm. (Family: Melastomataceae) is small evergreen shrub or tree and bears numerous umbellate cymes. Plants are distributed mostly in coastal regions of the Deccan peninsula. Leaf extracts have shown in-vitro antioxidant activity. To correlate the free radical scavenging activity with cardio protection is the objective of our work. Since no activity on heart is reported the present work was undertaken to study the effect of methanol leaf extract and its fraction for their effects by "Isolated Frog Heart Perfusion Technique".

Electronic Sherrington's recording drum previously affixed with recording paper was fixed to the machine and adjusted for speed (1.2mm/sec) and baseline time was adjusted for 60 sec. Frog heart was isolated and adjusted to the writing lever. Normal cardiogram was operated with plain ringer solution and heart rate per minute and force of contractions were recorded. Different concentrations of leaf extracts in DMSO and DW were tested for response. Similarly the effects of extracts with hypo dynamic ringer solution were recorded on failing heart along with standard digoxin.

Methanol leaf extract has shown increase in force of contraction and decrease in heart rate up to $60\mu g$. Above this concentrations it has shown both + inotropic and chronotropic effects. The effect was found dose dependant. Also 100% positive response was observed with hypo dynamic heart at 180µg as compare to standard digoxin. The fractions of extract showed weak activity as compare to original extract.

Key words: Memecylon umbellatum, Frog heart, Hypo dynamic ringer solution.



MODELLING AND COMPARISON OF DISSOLUTION PROFILES OF MATRIX TABLET

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Abstract:

Over recent years, drug release from solid pharmaceutical dosage forms has been the subject of intense and profitable scientific developments. Whenever a new solid dosage form is developed or produced, it is necessary to ensure that drug dissolution occurs in an appropriate manner. The pharmaceutical industry and the registration authorities do focus, nowadays, on drug dissolution studies. The quantitative analysis of the values obtained in dissolution / release tests is easier when mathematical formulas that express the dissolution results as a function of some of the dosage forms characteristics are used. In some cases, these mathematic models are derived from the theoretical analysis of the occurring process. In most of the cases the theoretical concept does not exist and some empirical equations have proved to be more appropriate. Drug dissolution from solid dosage forms has been described by kinetic models in which the dissolved amount of drug (Q) is a function of the test time, t or Q5 f(t). Some analytical definitions of the Q(t) function are commonly used, such as zero order, first order, Hixson–Crowell, Weibull, Higuchi, Korsmeyer–Peppas and Hopfenberg models. Other release parameters, such as dissolution time (t), dissolution efficacy (ED), difference factor (f_1), similarity factor (f_2) can be used to characterize drug dissolution / release profiles.



PREPARATION AND EVALUATION OF AZITHROMYCIN AND AMBROXOL HYDROCHLORIDE BILAYER TABLET.

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Abstract:

Azithromycin is widely used antibiotic; to treat or prevent certain bacterial infections whereas the ambroxol is mucolytics agent which restores the physiological clearance mechanisms of the respiratory tract. As the action of these drugs is related with the respiratory tract infection, combination of these can give better relief from respiratory tract infection. We designed and evaluated bilayer tablet of azithromycin and ambroxol for respiratory tract infection by using polymers like HPMC 100 M and ethyl cellulose for sustained release of the ambroxol whereas the azithromycin is for immediate release. In present study, the high viscosity grade HPMC K100 MCR as specified by USP was used as hydrophilic matrix forming agent whereas ethyl cellulose is release retarding polymer also viscosity enhancing agent. Bilayer tablet is the best choice for formulation, as ambroxol which is having short biological half life (3hrs) can be given by sustained release and azithromycin by immediate release as the biological half life is more. So the ambroxol release up to 16 hrs will be able to show the pharmacological action up to 24hrs. Bilayer tablet allows us for designing and modulating the dissolution and release characteristics along with both drugs in single dose administration, which is of patient convenience. Bilayer tablets can be prepared with one layer of drug for immediate release while second layer designed to release drug later, either as second dose or in an extended release manner. As per the suitability of Drug: Excipient interaction, formulation trails with varying concentration of polymer will give the optimized formula on trial and error basis.

Key words: Azithromycin, Ambroxol, HPMC 100 M, Ethyl cellulose, Bilayer tablet.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



MICROSPHERES: Novel Drug Delivery System Sawant S. S*, Mali S.S, Suryawanshi A. R, Shinde A.J Bharati Vidyapeeth College of Pharmacy, Kolhapur

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Abstract:

Microspheres are free flowing powders having size 50nm to 2mm consists of proteins or synthetic polymers. Microspheres have many more advantages over conventional powders and granules. Microspheres are useful in various pharmaceutical applications such as GIT stability, improve patient compliances well as pharmacoeconomic. This process is found to be least expensive than any other pharmaceutical encapsulation technique. Different types of carriers are used in preparation of microspheres according to release pattern required as per dosage form such as duration of action, control release, biocompatibility, target ability, etc. There are various techniques by which microspheres are prepared in that emulsion techniques, polymerization, Co-acervation Phase separation, solvent extraction, spray drying, etc. In this poster we cover all the techniques of microsphere preparation with their characterization and advantages. Along with this we focus on the innovative applications of microspheres in upcoming era in the novel drug delivery system.

Key words: Microsphere techniques, Characterization of microspheres, Innovative applications.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



GENERIC DRUG VERSUS BRANDED DRUGS DISCRIMINATION AND REGULATORY CONSIDERATION IN GENERIC DRUG DEVELOPMENT: A REVIEW Nikhil Bhutkar^{*}, Rupali Bhilare, Ashok Ghadage, Kishor Burade Government College of Pharmacy, Karad, Satara, M. S., India.

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ABSTRACT

A generic drug is identical with a brand name drug with respect to dosage form, safety, and strength, route of administration, quality, performance characteristics and intended use. But it differs by excipients, price. A brand name drug is a medicine that's discovered, developed and marketed by any of company called as a innovator. Once a new drug is discovered, company files for a patent to protect against other companies making copies and selling the drug. The generic drugs are marketed only after the expiration of branded /innovator drugs patents. The Hatch-Waxman Act was passed in 1984 to accomplish this laudable goal, establishing a delicate balance between the competing interests of brand name drug companies and generic drug companies. Before Hatch-Waxman Act only 10-20% prescriptions are of generic drug, but today about 50-60 % prescriptions are generic drug because of their low cost and effectiveness similar to branded drugs. An example is the pain reliever Tylenol[®] and its generic is acetaminophen both contains same active ingredient acetaminophen in same strength, dosage forms but differs in cost and look. As such there is no such discrimination between the branded drugs and generic drugs but always questions are asked about generic drugs like, what is the difference between a generic drug and a brand-name drug? How are both types of drugs approved? Are generic drugs as effective as brand-name drugs? Why generic drugs are cheaper? Are generic drugs safe? Does every brand name drug have a generic form? Are generic drugs monitored as carefully as brand-name drugs? Where can I get more information about generic drugs? Current review discriminates between branded and generic drugs along with its development & regulatory consideration.

Keywords: Bioequivalent, Hatch-Waxman Act, Tylenol®, Low Cost, Generic

6 harma Research



RECENT STRATEGIES IN NANOTECHNOLOGY

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Abstract

Nanotechnology, created up by rapid advances in life science and technology, gained new opportunities for modern medical science and disease treatment in human health care . size reduction is most fundamental unit operation which has prime operation importance in pharmacy profession.size reduction process helps in improving stability and bioavailibility, reducing toxicity, enhancing release and providing better formulation opportunities for drug. In recent trends, drugs in nanometer size range have found to increase the performance in variety of dosage forms.

Nanotechnology is the science that deals with processes that occurs at molecular level and of nanoline scale size. Application of nanotechnology significantly benefits clinical practices in cancer diagnosis, treatment and mangement, brain tumor, ocular drug delivery, maleria therapy, cardiac therapy. especially, nanotechnology offers a promice for targeted drug delivery and therefor alliviating the toxicity of anticancer drug agents in healthy tissues.

In this article current advancement in nanotechnology and also the disease treatment are reviewed.

FRONTIERS AND DRUG DISCOVERY AND PROCESS RESEARCH



Comparative Antibacterial studies aqueous of extracts of Sapindus mukorossi and Acacia concinna.

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Dr.Patil S.S.⁴, Ghotane R.B.⁵, Gandhi J.M.⁶, Patil S.H.⁷

Abstract

The antimicrobial activity of aqueous extract of the pericarps of *Sapindus mukorossi* and capsules of *Acacia cocinna* was evaluated by the agar diffusion method. The aqueous extracts of the drugs were tested separately as well as in combination to facilitate comparative evaluation of the antimicrobial activity. The aqueous extract was tested at a final concentration of 25 mg/ml, produced antibacterial activity in assays against Staphylococcus haemolyticus, Staphylococcus epidermidis & Micrococcus luteus which are isolated from scalp & other three bacteria were isolated from a person suffered from unknown skin infection. The results showed that the extract has a broad spectrum of antibacterial activity against all the strains of microbes that it was tested for. The minimum inhibitory concentration values of the extract for tested seven bacteria were between 8 and 10 mg/ml. It was evident that the extract was very stable after heat treatments. It was observed that the combination of the two drugs had more effective antimicrobial activity as compared to individual extracts.

Keyword : *Sapindus mukorossi; Acacia cocinna*; antibacterial activity; aqueous extract; agar diffussion method; minimum inhibitory concentration.



MPLE EVALUATION OF WOUND HEALING ACTIVITY OF FORMULATION OF ALLOPHYLUS COBBE L. ON ALBINO RATS.

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Abstract

Wounds are physical injuries that result in an opening or breaking of the skin. Proper healing of wounds is essential for the restoration of disrupted anatomical continuity and disturbed functional status of the skin. It is a product of the integrated response of several cell types to injury. Wound healing is a complex multifactorial process that results in the contraction and closure of the wound and restoration of a functional barrier. Traditionally, a large number of plants are used for treatment of wounds. In India *Allophylus cobbe L*. (Theepani) is traditionally used for treatment of open wounds, to treat fever and stomach ache, bone fracture etc. Hence, the present study was conducted to investigate the wound healing activity of alcoholic extract of *Allophylus cobbe L*. formulated ointment on excision wound model. The effect was compared with the wound healing by povidone-iodine (Betadine®) drug. The wound healing effect was investigated by application of 0.5 g/wound of the *Allophylus cobbe L*. ointment and Betadine® once daily for 19days to the excision wound of albino rats and was observed at 4 days intervals. It was observed that ointment formulation accelerate the wound closer time. This study suggests that *Allophylus cobbe L*. Plant extract ointment herbal formulation could be developed as a therapeutic agent for wound healing effects.

Key words: Allophylus cobbe L. wound healing, herbal formulation.



COMBINATION OF HIGH-FAT DIET-FED AND LOW-DOSE ALLOXAN-TREATED RAT: A model for type 2 diabetes and pharmacological screening Author- T. N. Tamboli, Y. B. Anuse V. H. Potdar N. S. Naikwade, J. I. Disouza Department of Pharmacology, Tatyasaheb Kore College of Pharmacy, Warananagar Tal: Panhala, Dist: Kolhapur 416113, MS. India. E-mail: tntamboli.tkcp@gmail.com

Abstract

The objective of the present study was to develop a rat model that replicates the natural history and metabolic characteristics of human type 2 diabetes and is also suitable for pharmacological screening. Male Sprague–Dawley rats (160–180 g) were divided into two groups and fed with commercially available normal pellet diet (NPD) (12% calories as fat) or in-house prepared high-fat diet (HFD) (58% calories as fat), respectively, for a period of 2 weeks. The HFD-fed rats exhibited significant increase in body weight, basal plasma glucose (PGL), triglycerides (PTG) and total cholesterol (PTC) levels as compared to NPD-fed control rats.

Thus, these fat-fed/Alloxan-treated rats simulate natural disease progression and metabolic characteristics typical of individuals at increased risk of developing type 2 diabetes because of insulin resistance and obesity. Further, the fat-fed/Alloxan-treated rats were found to be sensitive for glucose lowering effects of insulin sensitizing as well as insulinotropic agents. Besides, the effect of antidiabetics on the plasma lipid parameters (PTG and PTC) was shown in these diabetic rats. The present study represents that the combination of HFD-fed and low-dose Alloxan-treated rat serves as an alternative animal model for type 2 diabetes simulating the human syndrome that is also suitable for testing anti-diabetic agents for the treatment of type 2 diabetes.

Key words- Alloxan, High fat diet, Antidiabetic drugs

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An introduction to induced pluripotent stem cells

Abstract:

Recent landmark studies show that it is now possible to convert somatic cells, such as skin fibroblasts and B lymphocytes, into pluripotent stem cells that closely resemble embryonic

Stem cells. These induced pluripotent stem (iPS) cells can be generated without using human embryos or oocytes, thus bypassing some of the ethical issues that have limited the use of human embryonic stems (hES) cells. Additionally, they can be derived from the patient to be treated, thereby overcoming problems of immunological rejection associated with the use of allogeneic hES cell derived progenitors. Whilst these patient specific iPS cells have great clinical potential, their immediate utility is likely to be in drug screening and for understanding the disease process.

Keywords:Embryonic stem cells, induced pluripotent stem cell.



ANTIMICROBIAL ACTIVITIES AND BIOMEDICAL APPLICATIONS OF CHITOSANS

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ABSTRACT

Hydrophilic polymer chitosan and modified chitosans have prominent role in drug delivery system. Chitosans, polysaccharides obtained from the exoskeleton of crustaceans, have been shown to exert antibacterial activity in vitro and their use as a food preservative. However, it has been reported that chitosan appears to disrupt the bacterial cell membrane where effect of molecular weight and susceptibility varies among different bacterial species. The morphological changes of microorganisms appear to be changed after exposure to the chitosan which can be studied by atomic force microscopy. The growing need of antibacterial activity and preservation of food will be looked after by studying effect chitosans over susceptible microorganisms. The modified polymer will be beneficial to be used in various drug delivaries and biomedical applications

Keywords: Atomic Force Microscopy, Chitosan, Polysaccharides


TOBACOO AND CANCER: A REVIEW

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The present review aims to give a short overview on tobacco and its products effects human body and human body organ, such as head, neck, colon , etc. Many tobacco products exist, and their use varies both geographically and over time [13]. Most tobacco products are made from the species *Nicotiana tabacum* [13]. The tobacco and its product contains acetylpyrazin, dimethylhydrazin, *N*-nitroso compounds, 4- (methylnitrosamino) - 1-(3-pyridyl)-1-butanone (NNK), etc. this products are harmful to human body and causes cancer or death.

Key words: Tabacco, Cancer, Nicotin

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ине ANTIDIABETIC AND HYPOLIPIDEMIC EFFECTS OF CARALLUMA FIMBRIATA

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Abstract:

Diabetes mellitus (DM) is a serious health problem with high rates of incidence and mortality. DM is characterized by elevated plasma glucoseconcentrations resulting from insufficient insulin, insulin resistance, or both, leading to metabolic abnormalities in carbohydrates, lipids and proteinsThe antidiabetic and antilipidemic effects of Caralluma fimbriata was investigated in this study using five male wistar rats. The rats were dividedinto 5 groups comprising of five animals each. These groups include a normal control (administered saline), an extract control (administered 100mg/kg of extract) and a diabetic control (untreated group).The remaining two groups were administered 100mg/kg and 400 mg/kg of the extract respectively. The study lasted for three weeks although blood samples were obtained from the rat tails after every week. The results show that theextract significantly reduced the hyperglycemia from (Diabetic Control). Likewise, the extract significantly reduced the hyperglyceride (TG) and Low-Density Lipoprotein Cholesterol (LDLCholesterol), while increasing the High -Density Lipoprotein Cholesterol (HDL-C). Inconclusion, the observations from this study show that Caralluma fimbriata has antidiabetic effect and beneficial effects on blood lipid profile, thusjustifying the use of the plant by traditional medicine practitioners for the treatment of diabetes mellitus

Keywords: Anti-diabetic, Anti-lipidimic, Total Cholesterol, Triglycerides



RECENT DEVELOPMENT OF NANOTECHNOLOGY APPLICATIONS IN PHYTOFORMULATIONS

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Abstract:

In past considerable attention has been focused on the development of novel drug delivery systems for herbal drugs. In phytoformulation research, developing nano dosage forms have a number of advantages in terms of formulation and biopharmaceutical aspects. Nanonization adds reward in terms of reducing medicinal doses and improving the absorbency of herbal medicines compared with the respective crude drugs preparations. In present study attempts have been made to focus on review of nano sized novel drug delivery systems for herbal drugs and different possible future strategies which might have a potential for overcoming obstacles in drug delivery. Herbal drugs have enormous therapeutic potential which should be explored through some value added drug delivery systems. Standardized plant extracts when administered asnano drug delivery system show enhanced bioavailability. Hence more amount of active constituents present at site of action at similar or less dose as compared to the conventional plant extract or phytomolecule. Hence there is a great budding aptitude in the development of nanomedicine formulations as drug delivery in the era of herbal drugs.



Transdermal Patches a new rapid topical Drug Delivery system. <u>Vijaya Rawool*</u>,Swati M. Aute, Santosh A.Payghan Dept of Pharmaceutics. vvrawool.tkcp@gmail.com Tatyasaheb Kore College of Pharmacy, Warananagar Tal- Panhala Dist- Kolhapur 416113

Abstract

The conventional oral dosage form has significant drawbacks of low bioavailability due to hepatic first pass metabolism and tendency to produce rapid blood level spikes (both, high and low) leading to a need for frequent dosing, which can be both cost ineffective. To improve such character Transdermal drug delivery system was emerged which will improve the therapeutic efficacy and safety of drug. The human skin is a radialiy accessible surface for drug delivery skin of average adult body covers a surface approximately 2 msq and receive one third of the blood circulating through the body .Over the past three decades developing controlled drug delivery as becoming increasingly important in the pharmaceutical industry .The human skin surface is known to contain, on an average the potential of using the intact skin as the part of drug administration to the human body has been recognized for a several decade but skin is very difficult barrier to the ingress of material allowing only small quantities of a drug to penetrate over a period of time. The TDDS has a numerous advantages over the more traditional drug delivery system this include high bioavailability and absence of first pass hepatic metabolism, maintenance of steady plasma level of drug increase therapeutic efficacy.



ANALGESIC AND ANTI-INFLAMATORY STUDIES OF MEMECYLON UMBELLATUM BURM

LEAF EXTRACTS IN EXPERIMENTAL ANIMALS

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ABSTRACT

The different extracts of the leaf of *Memecylon umbellatum* Burm (Melastomataceae) were screened for analgesic and anti-inflammatory activities in mice and rats. Pain responses were studied in mice using the hot plate test while carrageenan induced paw oedema was used to access anti-inflammatory activity. The acetone and alcoholic extracts exhibited significant analgesic activity as compared with the control (saline, 10ml/kg) as evidenced by increase in significant (p<0.01) reaction time. The analgesic activity was higher in AcLMU compared with other extracts. The extracts progressively reduced rat paw oedema induced by subplantar injection of carrageenan, the acetone extract showing more pronounced effect than the aqueous extract. Thus, the results showed that *Memecylon umbellatum* had significant analgesic and anti-inflammatory activity as reflected by the parameters investigated. Further investigations are, however, necessary to explore mechanism(s) of action involved in these pharmacological activities.

Keywords: Memecylon umbellatum, inflammation, analgesic activity, anti-inflammatory, carrageenan.



Reading old people's mind

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Abstract

The paper summarizes old people's were using specific fruits in pooja of god ,with a specific reason, possible reason may energy of fruits with this attitude fruit's used in pooja of god checked scientifically by using specific tool that is Lecher antenna and found those fruits were used in pooja shown positive energy.



SUSTAINED RELEASE DOSAGE FORMS: A REVIEW

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Abstract-

Sustained release dosage forms are drug delivery system that are designed to achieve a prolonged therapeutic effect by continuously releasing medication over an extended period of time after administration of a single dose. Sustained release formulation are helpful in increasing the efficiency of the dose as wall as they are also improving the patient's compatibility. Sustained release is also providing promising way to decrease the side effect of drug by preventing the fluctuation of the therapeutic concentration of the drug in the body. In the sustained release dosage form physiochemical and biological factors are considered in the formulation. Drug complexes, Encapsulated slow release granules, Tabletted slow release granulation and Matrix tablets are the practical formulation of the sustained release dosage forms. In vitro and In vivo methods are used for the evaluation and testing of the sustained release dosage forms



REVIEW ON RESEALED ERYTHROCYTES AS A DRUG CARRIER

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Abstract:-

The current reviews the detail study on Resealed Erythrocytes as a Drug Carrier. Erythrocytes are potential biocompatible vectors for different bioactive substances, including drugs. These can be used successfully as biological carriers of drugs, enzymes and peptides.

This review includes introduction, advantages, disadvantages, factor which shall be considering released erythrocyte as a carrier. It's source, isolation, mechanism of drug release, pharmacokinetic parameter, method of preparation, characterization, specification of drug used in this delivery system, marketed preparation, application, current research goes on this topic & future of this novel drug deliver y system.

There are currently diverse methods that permit drug encapsulation in erythrocytes with an appropriate yield. The methods most commonly employed are based on a high haematocrit dialysis procedure, mainly hypo-osmotic dialysis. Erythrocytes loaded with drugs and other substances allow for different release rates to be obtained. It is concluded that erythrocyte carriers are tremendous potential in "**Novel Drug Delivery Systems**."

Keywords:- Haematocrit, hypo-osmotic.



Phenolic Antioxidants Property of Areca (Areca catechu L) Seeds

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Abstract:

The chemical composition, phenolic constituents and contents, antioxidant activities of areca seeds are examined. High contents of phenolics and flavonoids contributed to strong antioxidant activity. Areca seeds contain considerably high amounts of phenolics, in which a large proportion is flavonoids. Two phenolic compounds, syringic acid and epicatechin were identified from the extract by HPLC and their structures are confirmed by electrospray ionization-mass spectroscopy. Antioxidant properties of areca seeds extracts appear to be dependent upon the contents of phenols. In addition, as rich for the contents of phenolic and flavonoids and high antioxidant activity, areca seeds may be a good resource to the antioxidant status and disease chemoprevention of people in future.



NANOSUSPENSION A NOVEL DRUG DELIVERY SYSTEM

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ABSTRACT:-

Solubility is an essential factor for drug effectiveness, independent of the route of administration. Poorly soluble drugs are often a challenging task for formulators in the industry. Conventional approaches for enhancement of solubility have limited applicability, especially when the drugs are poorly soluble simultaneously in aqueous and in non-aqueous media. One of the critical problems associated with poorly soluble drugs is too low bioavailability. Nanosuspension technology can be used to improve the stability as well as the bioavailability of poorly soluble drugs. Nanosuspensions are biphasic systems consisting of pure drug particles dispersed in an aqueous vehicle, stabilized by surfactants. Nanotechnology can be used to resolve the problems associated with these conventional approaches for solubility and bioavailability enhancement. Many conventional dosage forms are available to treat disease ailments. The larger surface area of disperse drug may help ensure a high degree of avaibility for absorption. Suspension offer some advantages over other conventional dosage form, as it gives ease of absorption, bioavailability and fast onset of action. In the present project report attempt has been made to review the literature available for the "NANOSUSPENSION".



Frontiers in Drug Discovery and Process Research Effect of Ethyl Cellulose on Release of Felodipine Crystallo-co-Agglomerate

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ABSTRACT

Crystallo-co-agglomeration (CCA) technique was developed by Kadam et al 1997, to conquer the confines of spherical crystallization. CCA is novel particle size enlargement technique used for size enlargement of low dose & high dose, single/two or more drugs in combination with or without diluents/excipients. The process involves simultaneous crystallization and agglomeration of drug/s with diluents/excipients, in a single step generating spherical agglomerates.

Literature has revealed that release of drug from agglomerates prepared by CCA couldn't be extended, but, it was extended from compacts only. Hence, it was thought to explore CCA technique for extended release application as well as preparing agglomerates with better handling properties by incorporating EC, HPMC (release retardant) and talc to agglomerates using 3^2 factorial design. Considering the poor solubility and poor compressibility of felodipine, need was felt to improve the micromeritic, mechanical, dissolution properties of felodipine by preparing beads.

The agglomerates obtained by CCA were spherical and had excellent micromeritic, mechanical, & compressional properties. The release of felodipine was extended up to 12 hours (Higuchi- Matrix model) signifying role of CCA in design of extended release beads as a multiple unit particulate system (MUPS). This extended drug release is due to ethyl cellulose. In future, these extended release agglomerates can be used as directly compressible tablet intermediates or multiple unit particulates to be encapsulated.

Key words: ethyl cellulose, Crystallo-co- agglomerates, felodipine.



STABILITY STUDIES OF THE PHARMACEUTICAL PRODUCTS

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<u>Aim:</u>

To study the stability studies of the pharmaceutical products.

Objectives:

Stability testing is an integral part of the formulation development. It is also a important part of dossier submission to regulatory agencies for licensing approval. So the objectives of the present investigation is to review the literature available for the stability studies

With special emphasis on acclerated stability testing and ICH guidelines available for the stability studies .

Abstract:

Stability means the capacity of a drug substance or product to remain within established specifications of identity, strength, quality and purity in a specified period of time. Stability studies ensuring the maintenance of product quality, safety and efficacy throughout the shelf life are considered as pre-requisite for the acceptance and approval of any pharmaceutical product. The studies are required to be conducted in a planned way following the guidelines issued by ICH, WHO and/ or regulatory agencies. Importance of various methods followed for stability testing of pharmaceutical product guidelines issued for stability testing of pharmaceutical pharmaceutic



NEW PHARMACEUTICAL EXCIPIENTS.

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Abstract:-

Modern pharmaceutical products contain excipients that fulfill important technological function that ensure their manufacturability and to assist in effective delivery of the drug. One of the most important prerequisites for further progress in the design novel drug delivery system is the development of excipients that are capable of fulfilling the multifunctional role such as enhancing drug bioavailability and stability as well as controlling the drug release according to the therapeutic needs.Newer excipients provide the means for simplifying formulation development and improving overall operation cost while preserving the quality that is expected by industry.The main focus of this discussion is on excipients that perform specific function in pharmaceutical formulation.



Development and Evaluation of Olmesartan Medoxomil Fast Dissolving Tablets with Improved Dissolution Using Solid Dispersion Technique"

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ABSTRACT

The aim of present work was to enhance the solubility of poorly aqueous soluble drug Olmesartan Medoxomil (OLM). A phase solubility study was performed to determine effect of various polymers on aqueous solubility of drug. The binary solid dispersions (SD) of OLM were prepared by using Poloxamer 407. The solid dispersions were prepared by kneading, melting and solvent evaporation (SE) method by varying drug to carrier ratio. From results it was observed that solid dispersion prepared by solvent evaporation method showed rapid dissolution rate as compared to other methods. In all SDs drug to carrier ratio 1:1 showed better dissolution profile whereas, higher proportion of poloxamer 407 retards the drug release due to formation of viscous boundary layer around the drug particle. The optimized SD formulations were characterized by Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), scanning electron microscopy (SEM), X-ray diffraction (XRD). The results of SEM, DSC, and FTIR study showed the conversion of crystalline form of OLM to amorphous form. The dissolution rate was found to be increased in case SD prepared by SE method as compared to pure OLM. Fast dissolving tablets of OLM were formulated using optimized SD formulation along with superdisintegrants. The FDTs containing croscarmellose sodium (5%) showed faster in vitro drug release (100% within 20 min). The results conclusively demonstrated successful increase in solubility and dissolution rate of poorly water soluble drug.

Formulation and Evaluation of Oral Fast Dissolving Strips of Rizatriptan Benzoate"

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ABSTRACT

In the present investigation, oral fast dissolving strips of rizatriptan benzoate were formulated using polyox N-10 as a film former and studied the effect of plasticizer and polymer concentration on physicomechanical properties, in vitro disintegration and in vitro dissolution of strip. Polyox N-10 is highly water soluble polymer obtained chemically from oxyethylene groups. Rizatriptan benzoate, an antimigraine drug was selected for study and PEG 400 was used as plasticizer. The solvent casting method was used for preparation of oral fast dissolving strips. The fast dissolving strips were evaluated for the bitter taste of drug was masked by using sucralose and strawberry flavor. The in vitro disintegration time of optimized batch A2 was found to be 10 seconds. The moisture absorption of strips depends upon concentration of polymer and plasticizer. The strips containing high proportion of polymer and plasticizer showed higher moisture absorption. The strips exhibited satisfactory thickness, mechanical properties like tensile strength, folding endurance. In vitro dissolution and disintegration studies were also performed. The optimized batch was found to be stable for three months under specified stability conditions. These findings suggest that the Rizatriptan benzoate containing oral strip is potentially useful for controlling migraine who limit the oral intake.

SYNTHESIS OF SILVER NANOPARTICLES AND ITS EFFECT ON SOLUBILITY OF IBUPROFEN"



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(9975130476)

ABSTRACT

Green approach for synthesizing metal nanoparticles are becoming more popular owing to their advantages like high yield, low cost, non-toxicity, biocompatibility and most important environment friendly. Moreover green methods are considered more effective than physical and chemical methods available for synthesizing metal nanoparticles. Metal nanoparticles (MNs) are new generation materials being widely studied for biomedical and therapeutic applications. MNs owing to their unique properties such as comparable size with biomolecules, binding ability to various molecules and optical properties in the visible and IR regions make them potential candidates for said applications. The green approach was used in present investigation to synthesize metal nanoparticles and to study its effect on solubility of model drug Ibuprofen.

Silver nitrate was used as source of metal, microcrystalline cellulose (MCC) was used as template for nanoparticles growth and lactose was used as reducing sugar. A typical one step method was used for preparation of nanosilvers (NS). Formation of clear reddish brown colour to liquid indicates the formation of silver nanoparticles. Resolution in results of formation of silver nanoparticles was further brought by applying factorial design using MCC and lactose as variables. UV spectrophotometric analysis was used to confirm formation of silver nanoparticles as it showed typical, symmetrical UV absorption peak at 420 nm corresponds to the characteristic Surface Plasmon Resonance of MNs. Phase solubility study depicts altered solubility of Ibuprofen in presence of NS, and shown increase in solubility in the concentration range i.e. 0.5 to 10 %.



FORMULATION AND EVALUATION OF EFFERVESCENT TABLET OF FAMOTIDINE FOR PEPTIC ULCER THERAPY

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Abstract:

Recently, fast-dissolving drug delivery system have started gaining popularity and acceptance as new drug delivery system, because they are easy to administer and lead to better compliance. Usually, elderly people experience difficulty in swallowing the tablet. Effervescent tablets are uncoated tablets that generally contain acid substances and carbonates or bicarbonates and which react rapidly in the presence of water by releasing carbon dioxide. The aim of this study was to formulate effervescent tablet with sufficient mechanical integrity and to achieve faster disintegration in the water by direct compression. They are intended to be dissolved or dispersed in water before use. Effervescent compositions in the form of tablets are comprising a therapeutic agent, and an effervescent system which dissolve rapidly in water to yield an effervescent solution containing a completely dissolved therapeutic agent and a process for their preparation. In this different ratio of Citric acid and Effersoda used, and Ludipress LCE in combination of diluents, superdisintegrants with lubricants used for preparation of effervescent tablet.

Keyword: Effervescent tablet, Direct compression, Citric acid, Effersoda, ludipress LCE



"GREEN SYNTHESIS OF SILVER NANOPARTICLES: A NOVEL ECO FRIENDLY APPROACH." Bhosale R. R.*, Kulkarni A. S., Aloorkar N. H., Gilda S. S.,

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Abstract-

Nanotechnology is an escalating field that has made its contribution to all spheres of human life. The green synthesis of nanoparticles has paved for better methodologies and approaches in the medicinal field. Nowadays silver, gold and other metallic nanoparticles are used as an efficient carrier for drug molecules for developing novel drug delivery systems. In course of synthesizing these nanoparticles various chemicals, solvents and reagents are used which harms our eco system directly or indirectly. Silver nanoparticles (Ag NPs) have been widely used as a novel therapeutic agent extending its use as antibacterial, anti-fungal, anti-viral and antiinflammatory agent. Silver nanoparticles (Ag NPs) prepared by green synthesis have many advantages over conventional methods involving chemical agents associated with environmental toxicity. Green synthetic methods include polysaccharide method, irradiation method, biological method, polyoxometallates method and tollens method. Green synthesis of nanoparticles is found to be an emerging branch of nanotechnology. The use of environmentally benign materials like plant leaf extract for the synthesis of nanoparticles offers numerous benefits of eco-friendliness and compatibility for pharmaceutical and biomedical applications as they do not use toxic chemicals in the synthesis protocols. Rapid and green synthetic methods using various plant extracts have shown a great potential in silver nanoparticles (Ag NPs) synthesis. In short it is described that how bio-inspired synthesis of nanoparticles provides advancement over chemical and physical methods as it is cost effective and eco friendly.



NANOCOCHLEATE: A NOVEL DRUG DELIVERY SYSTEM" <u>Harkare B. R.</u>^{*}, Kulkarni A. S., Aloorkar N. H., Gilda S. S.,

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Abstract-

Oral route is most popular and preferred route for drug administration. Nanocochleates are cigar like spiral rolls formed of negatively charged phospholipid bilayer which are rolled up through the interaction with multivalent counter ions as bridging agents between the bilayer. Nanocochleates acts as a new technology for oral and systemic delivery of drugs with improved mechanical stability and drug loading capacity. It is a novel lipid-based system which shows a unique pathway suitable for the oral and systemic administration of a wide variety of molecules with important therapeutic, biological activities; including drugs, genes and vaccine antigens. Nanocochleate formulation technique is generally applicable to macromolecules and also to small molecule drugs that are hydrophobic, positively charged, negatively charged, and that possess poor oral bioavailability. Pre-clinical studies for cochleate-mediated oral delivery of macromolecules and small molecule drugs is being carried out in appropriate animal models with well established, clinically important drugs; which currently can only be effectively delivered by parenteral route.



"FORMULATION AND EVALUATION OF GEL USING DICLOFENAC DIETHYLAMINE MICROSPONGES."

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Abstract-

Most of the drugs are poorly water soluble and hence pose many problems in formulation of a dosage forms. One of the critical problems associated with poorly soluble drugs is too low bioavailability and erratic absorption. There are number of formulation approaches to resolve these, such as liposomes, emulsions, microemulsions, solid-dispersions and inclusion complexes etc.; which shows reasonable success but they lack in universal applicability. Furthermore, conventional dermatological and personal care products typically provide active ingredients in relatively high concentrations but with a short duration of action, leading to a cycle of short-term overmedication followed by long-term undermedication. Microsponges offer an advantage of programmable release and are biologically safe. This technology offers entrapment of active pharmaceutical ingredients which contribute towards reduced side effects, improved stability, increased elegance and enhanced formulation flexibility. A controlled release formulation of diclofenac diethylamine was prepared using microsponge drug delivery system. The quasi-emulsion solvent diffusion method used for the preparation was simple, rapid and reproducible. Obtained microsponges exhibited spherical shape, high porosity, good flowability and self sterilizing. The drug: polymer ratio showed significant effect on drug content, encapsulation efficiency and particle size. These microsponges were then incorporated in gel; which showed the viscous modulus along with pseudoplastic behavior. The in-vitro drug release showed that microsponge with Eudragit RS-100 co-polymer in the ratio of 5:1 was more efficient to give extended drug release of 84.18% at the end of 8 h.; while conventional formulation released 81.09% drug at the end of 4 h. As compared to conventional formulation, these microsponges are expected to remain on the skin surface, gradually releasing their contents over the time.



FORMULATION AND EVALUATION OF IBUPROFEN CHEWABLE TABLET USING CO-PROCESSED EXCIPIENTS."

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Abstract-

In the present study, novel co-processed excipient were developed by solvent evaporation method using dicalcium phosphate (70%) and magnesium stearate (0.5%,1%,1.5% and 2%) for use in chewable tablet formulations. Ibuprofen is NSAIDS which is having analgesic, antipyretic and anti-inflammatory action and used in treatment of rheumatoid arthritis also treatment of mild to moderate pain. Effects of co-processed excipient on different parameters have been studied. Drug compatibility with excipient was checked by FTIR and DSC studies. No chemical interaction between drug and excipient was confirmed by DSC and FTIR studies. Stability studies were carried out as per ICH guidelines for three months. In all the formulations, the post compressional parameters evaluated were within prescribed limits. Co-processed formulation showed improved performance compared to respective physical mixture formulation. The drug release of ibuprofen chewable tablet was found to be dependent of concentration of magnesium stearate. The in-vitro disintegration time were found to be in the range of 26-34 min. In case of crushed ibuprofen chewable tablet formulation B1 showed maximum drug release 96% in 60 min. Among all the designed formulations, formulation A1 to A4 showed less drug release compared to formulation B1 to B4.The formulation B1 contaning 352.5% w/w of co-processed excipient. Stability studies on promosing formulation indicated that there were no significant changes in drug content ,physical and chemical parameters of optimised formulation and indicated a stable formulation.



"BHASMA: A DRUG OF METALLO-MINERAL ORIGIN"

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Bharati Vidyapeeth College of Pharmacy, Kolhapur-416013, Maharashtra State, India. Bhasmas are the calcinated products of minerals. In practice of ayurveda, herbo-minaral/metallic formulation (Bhasma of metals and minerals) are used since 7th centuries. Charaka and Sushruta, two of the founding fathers of Ayurveda, describe the tonic value of a number of minerals. It was supposed that these medicines have superior level of efficacy In comparison to other Ayurvedic dosage forms. Several studies claimed that Bhasmas are biologically produced nanoparticles. Ayurveda lays much emphasis on the purifactory aspects of its drugs which are mainly of herbo-metallo-mineral and animal origin, some of which are highly toxic when taken in their crude or natural form. After specific purifactory processes, metals are subjected to treatments such as impregnation and trituration with other herbal drugs and are eventually subjected to different types of heat treatment, using conventional methods. The heavy metals are brought into colloidal form after incineration. Literature reveals that size reduction found to be beneficial. So the bhasma preparation prepared by the well controlled and charactrized procedure found to be beneficial in number of diseases like jwara, pandu, apsmar, prameha, anidra, kshaya etc. Bhasmas are claimed to be nanoparticles prescribed with several other medicines of Ayurveda. Results indicate that after Marana, Bhasma becomes easily absorbable and assimilable in the body, and spreads quickly in the body. These are biodegradable, biocompatible and non-antigenic in nature. These can be used to extend time window of bioavailability and to protect drug from chemical and enzymatic decomposition.



FORMULATION AND EVALUATION OF MELT SONOCRYSTALLIZED FENOFIBRATE AGGLOMERATES AS A NOVEL PARTICLE ENGINEERING TECHNIQUE

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ABSTRACT :

The purpose of the research was to employ a novel particle engineering technique-melt sonocrystallization (MSC) for anti- hyperlipidemic drugs for development of more soluble forms of the drugs without the use of excipients. The original forms Fenofibrate (FNO) subjected to MSC to improve physicochemical properties. In this study,FNO was subjected to melt sonocrystallization as 3^2 factorial design where,variables are sonication time(1,2 and 3 minute) and amplitude(60,70 and 80%) and characterized for various pharmacotechnical parameters, performance characteristics and pharmacokinetic evaluation. In which the best optimized batch found to be an intermediate sonication time batch that is 70 %,2 Minute. Micromeritic properties were found to be superior to the original form (OFFNO). On melt sonocrystallization, solubility and in-vitro dissolution rate were enhanced. The MSCFNO was formulated as conventional release tablets (F1 – F2) and evaluated with reference tablets of OFFNO (F0). F2 was identified as best formulation with suitable tablet characteristics and in-vitro drug release profile. X-ray powder diffraction shows decreased relative intensities of peaks of MSC forms due to reduction in the crystallinity that was confirmed by visualization of MSC particles by scanning electron microscopy. SEM analysis revealed uniformly shaped smaller drug particles of MSCFNO as compared to FNO. Conclusively, MSC is a promising cost-effective technique that may afford powder with improved flow and formulative properties as well as improved solubility and dissolution.



CARDIOTONIC ACTIVITY OF AQUEOUS AND ALCOHOLIC EXTRACTS OF LEEA MACROPHYLLA.

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ABSTRACT

The present study was undertaken to evaluate Cardiotonic activity of aqueous and alcoholic extract of *Leea macrophylla* (Roxb.ex.Hornem.). The plant species are rich in alkaloids, sterols, terpenes, glycosides, tannins, resin, lactones, etc. Cardiotonic activity of aqueous and alcoholic extract of *Leea macrophylla* was studied by using isolated frog heart perfusion technique (IFHP). Calcium free ringer solution was used as vehicle for administration of aqueous and alcoholic extract of *Leea macrophylla* as a test extract and digoxin was used as a standard. A significant increase in height of force of contraction (positive ionotropic effect) and increases in heart rate (positive chronotropic effect) was observed with test extract as compared to the similar dose of standard digoxin, but in alcoholic fruit extract which showed negative ionotropic & negative chronotropic effect. The test extract produced cardiac arrest at 5 mg/ml, a higher concentration as compared to standard, digoxin 0.5 mg/ml. Compared to digoxin a drug with narrow therapeutic window *Leea macrophylla* showed wide therapeutic window.

Keywords: IFHP, Digoxin, Leea macrophylla, Therapeutic window.



DRUG NANOCRYSTALS

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ABSTRACT During the last two decades, many modern technologies have been established in the pharmaceutical research and development area. The automation of the drug discovery process by technologies such as high throughput screening, combinatorial chemistry, and computer- aided drug design is leading to a vast number of drug candidates possessing a very good efficacy. Unfortunately, many of these drug candidates are exhibiting poor aqueous solubility. The use of drug nanocrystals is an universal formulation approach to increase the therapeutic performance of these drugs in any route of administration. Drug Nanocrystals are prepared by high pressure homogenization method, precipitation method, media milling or combination of homogenization and precipitation method i.e. Nanoedge method. Drugs Nanocrystals are novel drug delivery system to enhance bioavailability of poorly water soluble drugs.



DEVELOPMENT AND EVALUTION OF MICROSPONGE OF ANTIACNE DRUG BY **QUASI EMULSION SOLVENT DIFFUSION METHOD**

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Kolhapur ABSTRACT Microsponge are novel drug delivery system which are formulated for topically, orally etc administration. Microsponges are porous microsphere biologically inert particles that are made up of polymer and these particles serves to protect entrapped drug compound from physical and environmental degradation. Microsponges consists of microporous beads of 10-25 micron in diameter. Size of microsponge varies from 5-300 micron in diameter. Benzyol peroxide is topically used drug for treatment of acne. Skin irritation, peeling are common side effects of benzyol peroxide. It has been shown that controlled release of benzyol peroxide from delivery system to the skin could reduce side effects while reducing percutaneous absorption. The aim of present work is to study to produce ethyl cellulose and eudragit RS 100 microparticles containing benzyol peroxide. Here microsponge are prepared by qusi emulsion solvent diffusion method. The effect of different polymer and its different drug to polymer ratio on physical properties of microsponge were investigated. Microsponge were prepared by using internal phase consisting of polymer (ethyl cellulose and eudragit RS 100), BPO and dichloromethane and ethanol in same proportion which is poured into external phase consisting aqueous polyvinyl alcohol solution. It was shown that, generally an increase in drug to polymer ratio resulted in reduction in the release rate of BPO from microsponge which was attributed to a decreased porosity of the microsponge. From in-vitro diffusion study it was showed that microsponge prepared by using polymer ethyl cellulose shows greater drug release as compared to eudragit RS 100.

Keywords: Benzyol Peroxide, Microsponge, Emulsification, Eudragit RS 100



DEVELOPMENT AND EVALUATION OF PULSATILE PRESS COATED TABLET TO CONTROL EARLY MORNING BP SURGE

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Abstract :

In majority of individuals blood pressure rises in the early morning hours, which lead to serious cardiovascular complications. Formulation of pulsatile system makes it possible to deliver drug at definite period of time when symptoms of the disease condition are most critical. The purpose of the present work was to develop and evaluate pulsatile press coated tablet which release total amount of drug at early morning. Here core tablet (150mg) containing valsartan 80 mg and super disintegrant (sodium starch glycolate) was prepared by direct compression. The core tablet was then coated by coating material composed of different concentrations of ethyl cellulose press coating technique. Prepared Press Coated Tablet was evaluated for all tests. *In-vitro* dissolution test was carried out in 0.1 N HCl for first two hrs and 6.8 pH phosphate buffer for remaining period. From that formulation was selected as optimized formulation as it retarded drug release in stomach and gave burst release after the predetermined lag time of 8 hrs. Initially compatibility study was carried out by FTIR study showing that all the excipients and polymers were compatible with drug. This approach can thus provide a useful means for timed release of valsartan and is helpful for patients with morning surge..

Keywords: Pulsatile tablets, press coated tablet, valsartan, ethyl cellulose, lag time



NATURAL GUMS AS A BINDER

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Abstract

The aim of this study was to investigate the possibility of using basil seed gum as a tablet binder in comparison with standard binders such as hydroxypropyl methyl cellulose and polyvinyl pyrrolidone (PVP k-30). Paracetamol was used as model drug while magnesium stearate, talc, sodium starch glycolate and dicalcium phosphate were used as excipients. Paracetamol granules were prepared with different concentration of the gum as binder by wet granulation method. Tablets were prepared by using rotary tablet machine and evaluated for content uniformity, weight variation, hardness, friability, disintegration time, in vitro dissolution studies. Formulations containing the minimum concentration of 0.5 % basil seed gum as binding agent and used as an alternative binder to produce tablet of better mechanical strength and dissolution profile of particular drug substance.



FORMULATION AND EVALUATION OF MICROSPHERES FOR INTRANASAL **DELIVERY OF LISINOPRIL**

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ABSTRACT :

Lisinopril is an angiotensin converting enzyme inhibitor used in the treatment of hypertension and heart failure in prophylactic treatment after myocardial infarction and in diabetic nephropathy(However, it is very poorly absorbed from gastro-intestinal tract. Intranasal administration is an ideal alternative to the parenteral route for systemic drug delivery. Formulating multiparticulate system with mucoadhesive polymers may provide a 6 significant increase in the nasal residence time. The aim of the present approach was to overcome the drawbacks of the conventional dosage forms of lisinopril by formulating intranasal microspheres with Carbopol 974P NF and HPMC K4 M along with film forming polymer ethyl cellulose and polyethylene glycol to increase drug release along with absorption enhancer sodium taurocholate as lisinopril is BCS III class drug i.e. hydrophilic. Microspheres were prepared by using factorial design 3^3 (total 27) batches prepared and evaluated.Method: The microspheres were prepared by emulsion solvent evaporation method. The prepared microspheres were characterized for encapsulation efficiency, drug loading, particle size, and surface morphology, degree of swelling, ex vivo mucoadhesion, drug release, ex-vivo diffusion studies. Results: Formulations CEC4 and HCEC4 displayed the best results for Carbopol and combination of carbopol and HPMC K4M based microspheres respectively. Entrapment efficiency was 84.95±0.50% and 97.44±0.61%; mucoadhesion was 83.76 % and 94.41%; and drug release up to 8 h was 88.05% and 89% for CEC4 and HCEC4 respectively. Ex-vivo studies revealed that the formulations CEC4and HCEC4 showed good bioavailability compared to oral drug administration.Conclusion: Both in-vitro and ex-vivo studies conclude that combination of Carbopol and HPMC based microspheres are better than carbopol based microspheres for the delivery of lisinopril.

Keywords: microspheres, lisinopril, solvent evapouration.