DR. RAJENDRA GODE COLLEGE OF PHARMACY

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Research Publication

2017 -2022

GATEWAY TO GLOBAL KNOWLEDGE

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1	RR Thenge, VB Patond, VS Adhao, PV Ajmire, LN Barde, NM Mahajan, NP Tekade	Preparation and Characterization of Co-crystals of Diacerin	Indonesian Journal of Pharmacy (2338-9427)	28(1), 2017, 34-41	Scopus/Web of Science/Pubmed	1
2	SA Chavan, SA Shinde, SB Sapkal, V Shrikhnade	Herbal Excepients in Novel Drug Delivery Systems	International Journal of Research and Development in Pharmcy and Life Science (P 2393-932X, E 2278-0238)	6(3), 2017, 2597-2605	Scopus/Web of Science/Pubmed	2
3	AU Thakur, RR Popat, SD Mhaske, MB Narkhede, PP Chinchole, VN Shrikhande	Zika Virus Disease - Review	Research Journal of Pharmacology and Pharmacodynamics (P 0975-4407, E 2321-5836)	9(2), 2017,	Scopus/Web of Science/Pubmed	3
4	PB Khodke, RR Popat, PB Burakale, PP Chinchole, VN Shrikhande	Silver Nanoparticles - A Review	Research Journal of Pharmacology and Pharmacodynamics (P 0975-4407, E 2321-5836)	10(6), 2017	Scopus/Web of Science/Pubmed	4
5	SA Shinde, SA Chavhan, SB Sapkal, MW Babhulkar, VN Shrikhande	Phytosomes : A Novel Drug Delivery System An Overview	Indian Journal of Research In Pharmacy and Biotechnology (P 2321-5671, E 2320-3471)	5(4), 2017, 272 - 277	Scopus/Web of Science/Pubmed	5
6	RA Darakhe, GD Mehetre, RR Thenge	Formulation and Evalauation of Gastroretentive Tablet Containing an Antibiotic Drug	European Journal of Biomedical and Pharmaceutical Sciences (2349-8870)	4(8), 2017	Scopus/Web of Science/Pubmed	6
7	M Narkhede, R Narkhede, M Mapari	Single Domain Antibiodies: A New Approach in Therapeutics	Journal of Medical Pharmaceutical and Allied Science (2320 - 7418)	6(8), 2017, 839-852	Scopus/Web of Science/Pubmed	7
8	VS Adhao, RR Thenge	Development and Validation of Stability Indicating High Performance Liquid Chromatography Method for Determination of Baclofen	American Journal of PharmaTech Research (2249-3387)	7(2), 2017, 17-21	Scopus/Web of Science/Pubmed	8
9	NM Mahajan, AD Malghade, NG Dumore, RR Thenge	Design and Development of Crystallo-co-Agglomerate of Ritonavir for the Improvement of Physicochemical Properties	Turkish Journal of Pharmaceutical Sciences (2148 - 6247)	15(3), 2018, 248-255	Scopus/Web of Science/Pubmed	9

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11	V Mhasal, SN Moharil, B Mali, MB Narkhede	Drug- Execipient Interaction Study of Lornoxicam with Polymers	Scholars Academic Journal of Pharmacy (P 2347-9531, E 2320-4206)	6(10), 2017, 423-428	Scopus/Web of Science/Pubmed	11
12	B Mali, SN Moharil, V Mhasal, MB Narkhede	Drug- Execipient Interaction Study of Tramadol with Polymers	World Journal of Pharmaceutical Research (2277-7105)	6(13), 2017, 848-861	Scopus/Web of Science/Pubmed	12
13	VS Adhao, J Sharma, M Thakare	Development and Validation of Stability Indicating RP-HPLC Method for Determination of Ceritinib	Indonesian Journal of Pharmacy (2338-9427)	28(4), 2017, 241-248	Scopus/Web of Science/Pubmed	13
14	SA Shinde, SA Chavhan, SB Sapkal, VN Shrikhande	Indian Medicinal Plants Used in Diabetes Mellitus: An Overview	Research & Reviews: A Journal of Pharmacognosy (2394-7276)	4(1), 2017, 1 - 10	Scopus/Web of Science/Pubmed	14
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15	SA Chavan, SA Shinde, NH Gupta	Natural Bioenhancer	International Journal of Pharmaceutical Science and Research (2455-4682)	3(1), 2018, 29-37	Scopus/Web of Science/Pubmed	15
16	SA Jadhav, GD Mehetre, SN Moharil, SV Ingole	Nasal Drug Delivery System - A Novel Appraoch	World Journal of Pharmaceutical Research (2277-7105)	7(8), 2018, 165-180	Scopus/Web of Science/Pubmed	16
17	SA Shinde, SS Patil, VP Deshmukh, SA Chavhan	A Survey on Ethanomedicinal Plants Used by Traditional Healers in Buldana District (MS)	World Journal of Pharmaceutical Research (2277-7105)	7(8), 2018, 450-461	Scopus/Web of Science/Pubmed	17
18	SB Sapkal, SA Shinde, RA Darakhe, VN Shrikhande	Solid Dispersion of Valsartan for Solubility Improvement	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	7(5), 2018, 1863-1883	Scopus/Web of Science/Pubmed	18
19	SB Sapkal, SA Shinde, RA Darakhe, S Chavan, VB Patond, J Krishna	Solubility and Dissolution Enhancement of Valsartan by Solid Dispersion Technique Using Natural Polymer	World Journal of Pharmaceutical Research (2277-7105)	7(15), 2018, 708-729	Scopus/Web of Science/Pubmed	19
20	SD Kadam, SA Chavhan, SA Shinde, PN Sapkal	Pharmacognostic Review On Datura	International Journal of Pharmacognosy and Chinese Medicine (2576-4772)	2(4), 2018, 11- 22	Scopus/Web of Science/Pubmed	20

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22	N Mahajan, K Wanaskar, Y Bhutada, R Thenge, V Adhao	Design and Invitro Evaluation of Extended Release Tablet of Nateglinide	Journal of Drug Delivery and Therapeutics (2250-1177)	8(5), 2018, 235-239	Scopus/Web of Science/Pubmed	22
23	HA Navthale, MB Bhaltadak, RR Thenge, SA Shinde, VS Adhao	Formulation and Comparative Standardization of Polyherbal Swadisht Virechan Churna	American Journal of Pharmacy and Health Research (2321 - 3647)	6(10), 2018	Scopus/Web of Science/Pubmed	23
24	SB Sapkal, SA Shinde, RA Darakhe, VN Shrikhande	Solid Dispersion of Valsartan for solubility Improvement using Beta Cyclodextrin	MOJ Bioequivalence and Bioavailability (	5(6), 2018, 313-319	Scopus/Web of Science/Pubmed	24
25	NM Mahajan, BB Lokhande, RR Thenge, PS Gangane, NG Dumore	Polyherbal formulation containing antioxidants may serve as a prophylactic measure to diabetic cataract: Preclinical Investigation in rat model	Pharmacognosy Magazine	14, 2018, 572-577	Scopus/Web of Science/Pubmed	25
26	SA Shinde, SA Chavhan, SB Sapkal, VN Shrikhande	Recombinant DNA Technology and Its Applications: A Review	Internaltional Journal of MediPharm Research (2394-423X)	4(2), 2018,79-88	Scopus/Web of Science/Pubmed	26
27	S Jaiswal, SA Chavhan, SA Shinde	New Tools for Herbal Drug Standardization	International journal of MediPharm Research (2394-423X)	4(2), 2018, 67-78	Scopus/Web of Science/Pubmed	27
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28	JS Bayas, R Cheke, P Lokhande, S Waghmare, S Gunjegaonkar, S Shinde	In-vitro studies and Evaluation of telmisartan marketed Tablet	Journal of Drug Delivery and Therapeutics (2250-1177)	9(1), 2019, 74-78	Scopus/Web of Science/Pubmed	28
29	SA Shinde, SA Chavhan, SB Sapkal, RA Darakhe	Potential of Piperine as Bioavailability Enhancer	International Journal of Biology Research (2455-6548)	491), 2019, 66-69	Scopus/Web of Science/Pubmed	29
30	H Dalke, A Wankhade, M Bhise, M Narkhede	Design and Characteriztion of Nutraceutical Lipstick of Beetroot Powder	Innovate International Journal of Medical and Pharmaceutical Sciences (2456-8694)	4(2), 2019,	Scopus/Web of Science/Pubmed	30

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32	RR Thenge, SS Mahajan, NM Mahajan, VS Adhao, PV Ajmire	Formulation and Evaluation of Buccoadhesive Drug Delivery System for Lovastatin	Journal of Drug Delivery and Therapeutics (2250-1177)	9(2), 2019, 6 - 12	Scopus/Web of Science/Pubmed	32
33	GD Mehetre, RR Popat, GK Lodha, RS Cheke	Formulation Evaluation of Metformin Hydrochloride Sustained Release Matrix Tablet and Studying the Effect of Sintering Technique Over The Drug Release In-vitro	Current Pharma Research (2230 - 7842)	9(4), 2019, 3427-3440	Scopus/Web of Science/Pubmed	33
34	VS Adhao, RR Thenge, J Sharma, M Thakare	Development and Validation of Stability Indicating RP-HPLC Method for Determination of Safinamide Mesylate	Jordan Journal of Pharmaceutical Sciences	13(2), 2020, 149 - 152	Scopus/Web of Science/Pubmed	34
35	RN Wathurkar, SA Chavhan, SA Shinde	Pharmacognostic Review on Bryonia Laciniosa (Shivling Beej)	International Journal of Pharmacognosy and Chinese Medicine (2576-4772)	3(3), 2019,	Scopus/Web of Science/Pubmed	35
36	SA Shinde, D Solanki, SA Chavhan	Pharmacognostic Study and Development of Quality Control Parameters for Certain Traditional Antidiabetic Herbs	International Journal of Pharmacy and Pharmaceutical Research (2349-7203)	15(4), 2019,	Scopus/Web of Science/Pubmed	36
37	GD Mehetre, A Dubey	Formulation Development and Invitro -Invivo Evaluation of Gastroretentive floating tablet incorporating Clarithromycin	Journal of Drug Delivery and Therapeutics (2250-1177)	9(5), 2019, 67-81	Scopus/Web of Science/Pubmed	37
38	GD Mehetre, MW Babhulkar, VN Shrikhande	Etodolac Extended Release Matrix Tablet Formulation and Evaluation in-vitro	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	8(10), 2019, 1005-1017	Scopus/Web of Science/Pubmed	38
39	SB Sapkal, VS Adhao, RR Thenge, RA Darakhe, SA Shinde, VN Shrikhande	Formulation and Characterization of Etoricoxib solid dispersion using Natural Polymers	Turkish Journal of Pharmaceutical Sciences (2148 - 6247)	17(1), 2020, 7-19	Scopus/Web of Science/Pubmed	39
40	SA Shinde, SA Chavhan, SD Bute, VD Rangari	Formulation and Phytopharmacological Activity studies of Fresh Juice of Acacia Arabica stem and Leaves for the treatment of Variety of Dentral problems	International Journal of Chemistry and Pharmaceutical Sciences (2321-3132)	7(11), 2019 187-195	Scopus/Web of Science/Pubmed	40

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42	SA Chavhan, SA Shinde, JP Ambhore	Phytopharmacognostic Review on Bryonia Lacinosa (Shivling Beej)	Current Pharma Research (2230 - 7842)	1093), 2020, 3724-3734	Scopus/Web of Science/Pubmed	42
43	AP Rathi, RR Popat, VS Adhao, VN Shrikhande	Nail Drug Delivery System A Review	International Journal of Pharmaceutical Chemistry and Analysis	7(1), 2020, 9 - 21	Scopus/Web of Science/Pubmed	43
44	AS Zanke, RR Popat, BV Mali, AB Ghonge, AV Patil	A Review on the Natural Resources use as Hair Color and Hair Dye	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	9(5), 2020, 270 - 277	Scopus/Web of Science/Pubmed	44
45	GD Mehetre, MW Babhulkar, RS Cheke	Formulation and Evaluation of Swellable and Floating Gastroretentive Ciprofloxacin Hydrochloride Tablets	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	9(5), 20220, 1006-1015	Scopus/Web of Science/Pubmed	45
46	AS Zanke, JP Ambhore, SA Chavhan	A Review on Tamarind Gum and Its Application	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	9(5), 2020, 534-547	Scopus/Web of Science/Pubmed	46
47	GD Mehetre, RS Cheke, VN Shrikhande	Formulation and In-vitro Evaluation of Enteric Coated Tablet Incorpoating Rabeprazole	Journal of Drug Delivery and Therapeutics (2250-1177)	10(2), 2020, 50-57	Scopus/Web of Science/Pubmed	47
48	AV Patil, GD Mehetre, AM Akotkar	A Review on Mucoadhesive Buccal Drug Delivery System	World Journal of Pharmacy and Pharmaceutical Sciences (2278-4357)	9(5), 2020, 237-260	Scopus/Web of Science/Pubmed	48
49	JP Ambhore, VS Adhao, RS Cheke	Molecularly Imprinted Polymer Based Fluoresent Sensors: A Promising Tool for Food and Environment Analysis	International Journal of Trend In Scientific Research and Development (2456-6470)	4(3), 2020, 539-542	Scopus/Web of Science/Pubmed	49
50	RS Cheke, S Shinde, J Ambhore, V Adhao, D Cheke	Coronavirus: Hotspot on Coronavirus disease 2019 in India	Indian Journal of Medicial Sciences	72(1), 2020, 29-35	Scopus/Web of Science/Pubmed	50
51	GD Mehetre, PG Mehetre, PP Chinchole	A Review of COVID 19 Diagnosis, Treatment and Prevention	European Journal of Biomedical and Pharmaceutical Sciences	7(6), 2020, 197-206	Scopus/Web of Science/Pubmed	51

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53	SA Shinde, K Shukla, S Jain, SA Chavhan	A Review on Indian Medicinal Plants and Marketed Formulations used in Diabetes Mellitus	Global Journal for Pharma and Allied Sciences (2582-5909)	1(3), 2020, 15-22	Scopus/Web of Science/Pubmed	53
54	GD Mehetre, SR Pande, SD Nayse, SU Gubare and TN Patil	Convalescent Plasma Therpay - A Promising Approach to Treat COVID - 19	European Journal of Pharmaceutical and Medical Research (2394-3211)	7(6), 2020, 417-426	Scopus/Web of Science/Pubmed	54
55	RR Narkhede, AV Pise, RS Cheke, SD Shinde	Recognition of Natural Products as Potential Inhibitors of COVID 19 Main Protease (Mpro): Insilico Evidences	Natural Products and Bioprospecting	10, 2020, 297-306	Scopus/Web of Science/Pubmed	55
56	SD Shinde, RS Cheke, PR Tathe, PG Jain, RR Narkhede	The Berberis Aristata Ameliorates Oxazolone induced contact dermatitis: Invivo and Insilico Evidences	Advances in Traditional Medicine	2020	Scopus/Web of Science/Pubmed	56
57	PV Burakle, MR Bhise, DM Sakarkar, SG Sudke	Synthesis and Assessment of Subacute Toxicity of Novel Rosin Esters of Polyethylene Glycol 200 in Swiss Albina Mice	Research Journal of Pharmaceutical Sciences and Technology (P 0974-3618, E 0974-360X)	14(4), 2021, 1859-1866	Scopus/Web of Science/Pubmed	57
58	SA Chavhan, JP Ambhore, SA Shinde, AA Zanke	A Brief Review on COVID 19 and Herbs Use for Management of COVID 19	International Journal of Pharmacy and Pharmaceutical Research (2349-7203)	18(3), 2022, 57-63	Scopus/Web of Science/Pubmed	58
59	AA Zanke, RR Thenge, VS Adhao	COVID 19: A Pandemic Declared by World Health Organization	IP International Journal of Comprehensive and Advance Pharmacology (2581-5555)	5(2), 2020, 49-57	Scopus/Web of Science/Pubmed	59
60	SP Mahajan, SA Chavan, SA Shinde, MB Narkhede	Miraculous Benefits of Cow Urine: A Review	Journal of Drug Delivery and Therapeutics (2250-1177)	14(4), 2020, 275-281	Scopus/Web of Science/Pubmed	60
61	MB Narkhede, VB Patond, NG Ratnaparkhi, SD Mhaske	Anacyclus Pyrenthrum: An unexplored Ethanomedicinal plant	International Journal of Trend In Scientific Research and Development (2456-6470)	4(5), 2020, 646-648	Scopus/Web of Science/Pubmed	61

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63	RS Cheke, RR Narkhede, SD Shinde, JP Ambhore, PG Jain	Repurposing of Anthelmintic Drugs Against SARS-CoV-2 (Mpro and RdRp): Novel Disease, Older Therapeutics	Letters in Applied Nanobioscience (2284-6808)	10(2), 2021, 2331-2338	Scopus/Web of Science/Pubmed	63
64	SA Chavhan, V Shrikhande	A Comprehensive Review on Bhasma and Herbomineral Formulation in Ayurveda	International Journal of Advance Research and Innovative Ideas in Education (2395-4396)	6(4), 2020, 12488	Scopus/Web of Science/Pubmed	64
65	VS Adhao, RR Thenge	Elemental Impurities : A Review	Research and Reviews: A Journal of Pharmaceutical Sciences (2229-7006)	11(1), 2020, 17-21	Scopus/Web of Science/Pubmed	65
66	AB Shreya, A Pandey, AN Nikam, PO Patil, R Sonawane, PK Deshmukh, S Mutalik	One Pot Development of Spray Dried Cationic Proliposome dry powder insufflation: Optimization, Characterization and Biointeractions	Journal of Drug Delivery Science and technology (E 2588-8943, P 1773-2247)	61, 2021, 102298	5.062	66
67	A Pandey, AN Nikam, G Fernandes, S Kulkarni, B Padya, R Prassl, S Das, A Joseph, PK Deshmukh, PO Patil, S Mutalik	Black Phosphorus as Multifaceted Advanced Material Nanoplateforms for Potential Biomedical Applications	Nanomaterials (2079-4991)	11, 2021, 13	5.719	67
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69	Sagar Pardeshi, Mahesh More, Pritam Patil, Chandrakantsing Pardeshi, Prashant Deshmukh, Arun Mujumdar, Jitendra Naik	A meticulous overview on drying-based (spray-, freeze-, and spray-freeze) particle engineering approaches for pharmaceutical technologies	Drying Technology (P 0737-3937, E 1532-2300)	39(11), 2021, 1447-1491	3.556	69

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71	MB Narkhede, HL Tare, DS Chumbhale, SR Chaudhari, KD Patil, GY Dama, SR Deore	Microscopy of Tamarind Seeds	International Journal of Biology, Pharmacy and Allied Sciences (2277-4998)	10(4), 2021, 1202 1207	Scopus/Web of Science/Pubmed	71
72	Narkhede, R., More, M., Patil, S., Patil, P., Patil, A. and Deshmukh	Eco-friendly synthesis of surface grafted Carbon nanotubes from sugarcane cubes for development of prolonged release drug delivery platform	International Journal of Nanodimensions (P 2008-8868, E 2228-5059)	12(3), 2021, 211 - 221	Scopus/Web of Science/Pubmed	72
73	Deshmukh, P.K., Mutha, R.E. and Surana, S.J.,	Electrostatic deposition assisted preparation, characterization and evaluation of chrysin liposomes for breast cancer treatmen	Drug Development and industrial pharmacy (P0363-9045, E 1520-5762)	47(5), 2021, 809-819	2.295	76
74	Pravin Onkar Patil, Sopan Namdev Nangare, Pratiksha Pramod Patil, Ashwini Ghanashyam Patil, Dilip Ramsing Patil, Rahul Shankar Tade, Arun Madhukar Patil, Prashant Krishnarao Deshmukh, Sanjay Baburao Bari	Fabrication of N-doped graphene@ TiO2 nanocomposites for its adsorption and absorbing performance with facile recycling	NanoBiomedicine and Engineering (2150-5578)	13(2), 2021, 179-190	Scopus/Web of Science/Pubmed	74
75	Sopan N.Nangare, Premnath M.Sangale, Ashwini G.Patil, Sai HS. Boddu, Prashant K.Deshmukh, Namdeo R.Jadhav, Rahul S.Tade , Dilip R.Patil, AbhijeetPandey, SrinivasMutali, Jayvadan K.Patel, Arun M.Patil, Sanjaykumar B.Bari, Pravin O.Patil	Surface architectured metal organic frameworks-based biosensor for ultrasensitive detection of uric acid: Recent advancement and future perspectives	Microchemical Journal (0026-265X)	169, 2021, 106567	4.821	75

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77	Mahesh P More, Prashant K Deshmukh	Quality by design approach for the synthesis of graphene oxide nanosheets using full factorial design with enhanced delivery of Gefitinib nanocrystals	Materials Research Express (2053-1591)	8, 2021, 075602	1.941	77
78	Prashant K. Deshmukh,Sameer H. Lakade,Umesh R. Jaiswal,Minal T. Harde	One step synthesis approach of mesoporous silica packed with graphene oxide nanosheet: Characterisation and drug release aspects	Materials Technology (P 1066-7857, E 1753-5557)	37(11), 2022, 1677-1690	3.846	78
79	Mahesh P. More, Shweta Patil, Sharwari Ghodke, Pravin O. Patil, Ratnesh Jain, Prajakta Dandekar & Prashant K. Deshmukh	Development of cross-linked collagen/pullulan ocular film for sustained delivery of Besifloxacin using novel spin-coating technique	Journal of Materials Research (P 0884-2914, E 2044-5326)	36, 2021, 3278 –3292	2.909	79
80	RS Cheke, SD Shinde, JP Ambhore, SR Chaudhari, SB Bari	Quinazoline: An update on current status against convulsios	Journal of Molecular Structure (0022-2860)	1248, 2022, 131384	3.841	80
81	S N Nangare, S Landge, A G Patil, R S Tade, P K Deshmukh and P O Patil	Green synthesis of Fe-doped Ag-loaded reduced graphene oxide ternary nanocomposite for efficient photocatalytic degradation of toxic dyes	Advances in Natural Sciences: Nanoscience and Nanotechnology (2043-6262)	12, 2021, 035004	Scopus/Web of Science/Pubmed	81
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83	SA Nikas, PG More, SB Wankhede, PP Chinchole, RR Popat, YB Zambare	Comparative Study of Scallion and Dry Bulb of Allium Cepa for Antioxidant Activity	International Journal of Botany Studies (2455-541X)	6(6), 2021, 18-21	Scopus/Web of Science/Pubmed	83
84	Rameshwar S Cheke, Rohan R Narkhede, Sachin D Shinde, Jaya P Ambhore, Pankaj G Jain	Natural product emerging as potential sars spike glycoproteins-ace2 inhibitors to combat COVID-19 attributed by in-silico investigations	Biointerface Res. Appl. Chem (2069-5837)	11(3), 2021, 10628-10639	Scopus/Web of Science/Pubmed	84

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86	NS Pachpor, VS Adhao	A Complete Review on Analytical Quality by Design	World Journal of Pharmaceutical Research (2277-7105)	11(1), 2022,	Scopus/Web of Science/Pubmed	86
87	Vaibhav S Adhao, Suraj R Chaudhari, Jaya P Ambhore, Sunil Sangolkar, Raju R Thenge, Rameshwar S Cheke, Amod S Patil	Reverse phase-liquid chromatography assisted protocol for simultaneous determination of lamivudine and tenofovir disoproxil fumarate in combined medication used to control HIV	Future Journal of Pharmaceutical Sciences (2314-7253)	7, 2021, 90	Scopus/Web of Science/Pubmed	87
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93	Rameshwar S. Cheke, Harun M. Patel,Vaishali M. Patil, Iqrar Ahmad Ansari, Jaya P. Ambhore, Sachin D. Shinde, Adel Kadri, Mejdi Snoussi, Mohd Adnan, Prashant S. Kharkar,Visweswara Rao Pasupuleti andPrashant K. Deshmukh	Molecular Insights into Coumarin Analogues as Antimicrobial Agents: Recent Developments in Drug Discovery	Antibiotics (2079-6382)	11, 2022, 566	5.222	93
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101	Sagar R Pardeshi, Eknath B Kole, Harshad S Kapare, Sachin M Chandankar, Prashant J Shinde, Ganesh S Boisa, Sanjana S Salgaonkar, Prabhanjan S Giram, Mahesh P More, Praveen Kolimi, Dinesh Nyavanandi, Sathish Dyawanapelly, Vijayabhaskarreddy Junnuthula	Progress on Thin Film Freezing Technology for Dry Powder Inhalation Formulations	Pharmaceutics (MDPI) (1999-4923)	14 (12), 2022, 2632	6.525	101
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Review Article

Herbal excipients in Novel Drug Delivery Systems

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Keywords: Natural excipients, gums, mucilage, polysaccharides, starch, volatile oil

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ABSTRACT: Due to advances in drug delivery technology, currently, excipients are included in novel dosage forms to fulfil specific functions and in some cases, they directly or indirectly influence the extent and/or rate of drug release and drug absorption. Recent trends towards use of plant based and natural products demand the replacement of synthetic additives with natural ones. Today, the whole world is increasingly interested in natural drugs and excipients. These natural materials have many advantages over synthetic ones as they are chemically inert, nontoxic, less expensive, biodegradable, improve the shelf life of product and widely available. This article gives an overview of natural excipients which are used in conventional dosage forms as well as novel drug delivery systems.

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INTRODUCTION

The term excipient was derived from Latin word, excipients, which means to receive, to gather, to take out. The quality of formulation depends on active pharmaceutical ingredient (API), production processes and the excipients used. These excipients contribute in a great way to the performance of the API and maintain the safety, efficacy of the product [1].

Excipients are primarily used as diluents, binders, disintegrants, adhesives, glidants and sweeteners in conventional dosage forms like tablets and capsules [2]. As the establishment of toxicity and approval from regulatory authorities poses a problem with synthetic excipients, of late more interest is being shown by researchers in herbal excipients. The drawback posed by heavy metal contamination often associated with herbal excipients is superseded by their lack of toxicity, easy availability, and economic considerations in pharmaceutical industry as compared to their synthetic counterparts.

Present day consumers look for natural ingredients in food, drugs, and cosmetics as they believe that anything natural will be more safe and devoid of side effects.

The traditional view that excipients are inert and do not exert any therapeutic or biological action or modify the biological action of the drug substance has changed and it is now recognized that excipients can potentially influence the rate and/or extent of absorption of a drug. As herbal excipients are non-toxic and compatible, they have a major role to play in pharmaceutical formulation. Hence, this article gives an overview of natural excipients which are used in conventional dosage forms as well as novel drug delivery systems [1-3].

Pharmaceutical excipients

Pharmaceutical excipients can be defined as nonactive ingredients that are mixed with therapeutically active compound(s) to form medicines.

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REVIEW ARTICLE

Zika Virus Disease- Review

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ABSTRACT:
Zika virus disease is an emerging viral disease transmitted through the bite of an infected Aedes mosquito. This is the same mosquito that is known to transmit infections like dengue and chikungunya. Zika virus was first identified in Uganda in 1947. However, the mosquito that transmits Zika virus, namely Aedes aegypti. Zika is transmitted to people through the bite of an infected Aedes mosquito. This is the same mosquito that transmits dengue and chikungunya. Zika is an infectious disease caused by the Zika virus, which is transmitted to people by *Aedes* red eyes mosquitoes. Symptoms of Zika typically include fever, rash, joint pain, There is no specific treatment for Zika virus infections, but most people do not become seriously ill and recover quickly. If any pregnant women and are bitten by mosquitoes while traveling in an area with Zika virus, you should contact your prenatal care provider. Specific testing for Zika virus is limited, and not always necessary. Zika virus disease is usually relatively mild and requires no specific treatment. People sick with Zika virus should get plenty of rest, drink enough fluids, and treat pain and fever with paracetamol. There is no specific medication for the treatment of Zika Fever (Zika Virus Infection). Medication can be taken to reduce the fever, pain and other symptoms. However, only Paracetamol (Acetaminophen) should be used for pain and fever. DO NOT TAKE pain killers such as aspirin, ibuprofen and other anti-inflammatory drugs e.g. diclofenac. Check with your Doctor or Pharmacist to be sure! No specific antiviral treatment is available for Zika virus disease. There is no vaccine or specific treatment for Zika virus infection.

KEYWORDS: Zika virus, Aedes aegypti, Chikungunya, Microcephaly

1. INTRODUCTION:

Zika virus disease is an emerging viral disease transmitted through the bite of an infected Aedes mosquito. This is the same mosquito that is known to transmit infections like dengue and chikungunya. Zika virus was first identified in Uganda in 1947. Outbreaks of Zika virus disease have been recorded in Africa, the Americas, Asia and the Pacific.

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During large outbreaks in French Polynesia and Brazil in 2013 and 2015 respectively, national health authorities reported potential neurological and auto-immune complications of Zika virus disease. Currently, World Health Organization has reported 22 countries and territories in Americas from where local transmission of Zika virus has been reported. Microcephaly in the new born and other neurological syndromes(Guillain Barre Syndrome) have been found temporally associated with Zika virus infection. However, there are a number of genetic and other causes for microcephaly and neurological syndromes like Guillain Barre Syndrome. Zika virus disease has the potential for further international spread given the wide geographical distribution of the mosquito vector, a lack of immunity

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REVIEW ARTICLE

Silver Nanoparticles - A Review

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ABSTRACT:
Silver is a soft, white, lustrous transition metal possessing high electrical and thermal conductivity. It is used in many forms as coins, vessels, solutions, foils, sutures, and colloids as lotions, ointments, and so forth. Silver nanoparticle has various advantages such as longer shelf-stability, high carrier capacity, longer clearance time, increase the bioavailability of drugs. Product life extension and one of the disadvantage is toxicity. Toxicity of silver nanoparticles is mostly determined *in vitro* with particles ranging from approximately 1-100 nm. Silver nanoparticles are synthesized by various methods like physical method, chemical method like chemical reduction, microemulsion technique and UV-initiated photoreduction, photoinduced reduction, electrochemical synthetic method, microwave-assisted synthesis, bio-based method like bacteria, fungi, algae, and plant. In mechanism of silver nanoparticle, the nitrate reductase is an enzyme in the nitrogen cycle responsible for the conversion of nitrate to nitrite. During the catalysis, nitrate is converted to nitrite, and an electron will be shuttled to the incoming silver ions. Silver ions are very reactive and are known to bind with various vital components of the cells inducing cell death. Silver nanoparticle has various applications such as clinical and pharmaceutical applications, diagnostic and therapeutic application, pharmacological applications, and miscellaneous applications. Some marketed products of silver nanoparticles are available named as Disinfectant spray, Facial soap, Shampoo and Conditioner, Nanosil Toothpaste and Professional Hairbrush.

KEYWORDS: Silver nanoparticles, Nano particles.

1. INTRODUCTION:

Silver is a soft, white, lustrous transition metal possessing high electrical and thermal conductivity. It has been known longer than the recorded history due to its medical and therapeutic benefits before the realization that microbes are agents for infections. It is used in many forms as coins, vessels, solutions, foils, sutures, and colloids as lotions, ointments, and so forth. It is the foremost therapeutic agent in medicine for infectious diseases and surgical infections. The benefits of silver are more than the risk factors.

Silver nanoparticles find use in many fields, and the major applications include their use as catalysts, as optical sensors of zeptomole concentration, in textile engineering, in electronics, in optics, and most importantly in the medical field as a bactericidal and as a therapeutic agent. Silver ions are used in the formulation of dental resin composites; in coatings of medical devices; as a bactericidal coating in water filters; as an antimicrobial agent in air sanitizer sprays, pillows, respirators, socks, wet wipes, detergents, soaps, shampoos, toothpastes, washing machines, and many other consumer products; as bone cement; and in many wound dressings to name a few. Though there are various benefits of silver nanoparticles, there is also the problem of nanotoxicity of silver. There are various literatures that suggest that the nanoparticles can cause

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Review article

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Phytosomes: a novel drug delivery system, an overview

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ABSTRACT

In the recent days, most of the prevailing diseases and nutritional disorders are treated with natural medicines. The effectiveness of any herbal medication is dependent on the delivery of effective level of the therapeutically active compound. But a severe limitation exists in their bioavailability when administered orally or by topical applications. Phytosomes are recently introduced herbal formulations that are better absorbed and as a result produced better bioavailability and actions than the conventional phyto molecules or botanical extracts. The term "phyto" means plant while "some" means cell-like. Phytosomes are little cell like structure. Phytosomes are produced by a process whereby the standardized plant extract or its constituents are bound to phospholipids, mainly phosphatidylcholine producing a lipid compatible molecular complex. Phytosome exhibit better pharmacokinetic and pharmacodynamic profile than conventional herbal extracts. The present review represents the recent advances and applications of phytosomes as a tool of drug delivery.

1. INTRODUCTION

Herbal Medicine: Herbal medicines are the synthesis of therapeutic experiences of generations of practicing physicians of indigenous systems of medicine for over hundreds of years[1]. The World Health Organisation (WHO) has recently defined traditional medicine including herbal drugs as therapeutic practices that have been in existence for hundreds of years before the development and spread of modern medicine and are still in use today. The traditional preparations comprise of medicinal plants, minerals and organic matter. Herbal drugs constitute only those traditional medicines which are primarily used as medicinal plant preparations for therapy[2]. Herbal medicines are also termed as phytotherapeutic agents or phytomedicines. These phytomedicines are also available as standardized herbal preparations consisting of complex mixtures of one or more plants, which are used in many countries[3].

There are three main reasons for the popularity of herbal medicines:

1) There is a growing concern over the reliance and safety of drugs and surgery.
2) Modern medicine is failing to effectively treat many of the most common health conditions.
3) Many natural measures are being shown to produce better results than drugs or surgery without the side effects[4].

Also there is increasing evidence that many current drug therapies simply suppress symptoms and ignore the underlying disease processes. In contrast, many natural products appear to address the cause of many diseases and yield superior clinical results. Unfortunately, most physicians and patients are not aware that these natural alternatives exist. But research in this field is a never ending process[5].

Novel drug delivery system is a novel approach to drug delivery that addresses the limitations of the traditional drug delivery systems. Our country has a vast knowledge base of Ayurveda whose potential is only being realized in the recent years. However, the drug delivery system used for administering the herbal medicine to the patient is traditional and out-of-date, resulting in reduced efficacy of the drug. If the novel drug delivery technology is applied in herbal medicine, it may help in increasing the efficacy and reducing the side effects of various herbal compounds and herbs. This is the basic idea behind incorporating novel method of drug delivery in herbal medicines. Thus, it is important to integrate novel drug delivery system and Indian Ayurvedic medicines to combat more serious diseases. For a long time herbal medicines were not considered for development as novel formulations owing to lack of scientific justification and processing difficulties, such as standardization, extraction and identification of individual drug components in complex poly herbal systems.

Novel drug delivery system is a novel approach to drug delivery that addresses the limitations of the traditional drug delivery systems. Modern medicine cures a particular disease by targeting exactly the affected zone inside a patient's body and transporting the drug to that area. Drug delivery system is the method by which an optimum amount of the concerned drug is administered to the patient in such a way that it reaches exactly the 'site of action' and starts working then and there. Novel drug delivery system attempts to eliminate all the disadvantages associated with conventional drug delivery systems. There are various approaches by which novel drug delivery can

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FORMULATION AND EVALUATION OF GASTRORETENTIVE TABLET CONTAINING AN ANTIBIOTIC DRUG

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ABSTRACT
Ciprofloxacin is a broad spectrum fluoroquinoline antibiotic effective in a broad range of infections including some difficult to treat ones. Because of wide-spectrum bactericidal activity, oral efficacy and good tolerability, it is used in Urinary tract infection, Gonorrhoea, Bacterial gastroenteritis, Typhoid, Bone, soft tissue and gynaecological infection, Respiratory infection and tuberculosis. The main objective of formulating the floating system was to reduce the frequency of administration, to improve patient compliance and improve bioavailability of drug by preparing a gastroretentive drug delivery system. Floating tablets of Ciprofloxacin were prepared by employing two different grades of control releasing polymers HPMC K4M and HPMC K100M in different concentration. Sodium bicarbonate was incorporated as a gas-generating agent. The tablets were evaluated for uniformity of weight, hardness, friability, drug content, Floating behavior, Swelling studies and dissolution studies. Among tablet formulation, formulation F3 shows maximum drug release i.e. 92.25% at the end of 12 h compared with other formulations.

KEYWORDS: Ciprofloxacin HCl, Floating tablets, HPMC K4M, HPMC K 100M, FTIR.

INTRODUCTION
Dosage forms that can be retained in the stomach are called gastroretentive drug delivery system (GRDDS). Gastroretentive drug delivery is one of the promising approaches for enhancing the bioavailability and controlled delivery of drugs that exhibit narrow absorption window. Gastroretentive techniques increase the gastric retention time of the dosage form and control drug release. These are the systems which can remain in gastric region for several hours and significantly prolong the gastric residence time of drug. After oral administration, such a delivery system would be retained in stomach. It will release the drug there in a controlled & prolonged manner, so that the drug could be supplied continuously to absorption site in GIT.[1]

A major constraint in oral controlled drug delivery is that not all drug candidates are absorbed uniformly throughout the GIT. Some drugs are absorbed in a particular segment of GIT only or are absorbed to a different extent in various segments of GIT. Such drug candidates are said to have an 'absorption window'. But, in case of 'narrow absorption window' drugs, only the drug released in the region preceding and in close vicinity to the absorption window is available for absorption. Again after crossing the absorption window, the released drug drastically minimizes the time available for drug absorption after it, which is then accompanied by lesser bioavailability.[2] Thus, the success of oral controlled drug delivery has faced some difficulties related with physiological adversities, like short gastric residence time (GRT) and goes to waste with negligible or no absorption. This phenomenon is unpredictable gastric emptying time (GET). Prolonged GRT improves bioavailability, increases the duration of drug release, reduces drug waste and improves the drug solubility that are less soluble in a high pH environment.[2,3]

This has triggered the attention towards the development of various gastroretentive drug delivery technologies to deliver 'narrow absorption window' drugs with improved bioavailability. Gastroretentive dosage forms are designed to be retained in the gastric region for prolonged time and release and prolonged input of the drug to the upper part of the GIT beyond the level of existing controlled release dosage thus ensuring its optimal bioavailability. Thus, they not only prolong the dosing intervals, but also increase the patient incorporated drug candidates and thereby enable sustained compliance forms. This application is especially effective in delivery of sparingly soluble and insoluble drugs. Gastroretentive dosage forms greatly improved the pharmacotherapy of the GIT through local drug release.[4]

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REVIEW ARTICLE

Single Domain Antibodies: A New Approach in Therapeutics

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ABSTRACT

Single domain antibodies are rapidly comes into therapeutics in last two decades due to their therapeutic advantages. Most of drugs are derived from antibodies based proteins. Single domain antibodies having advantages over the monoclonal antibodies such as small size, heat resistant, stability, hydrophobicity, low immunogenicity, high solubility. These are small in size hence called nobodies. Their production is carried outing mammalian cells for therapeutic uses. These single domain antibodies are now employed in drug delivery system. They are also utilized in identification of toxin. Single domain antibodies are recently employed in treatment diseases like cancer, Alzheimer's disease, Parkinson's disease etc. They are also employed in virus detection.

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Development and Validation of Stability Indicating High Performance Liquid Chromatography Method for Determination of Baclofen

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ABSTRACT

A new, simple, specific, accurate and precise RP-HPLC method was developed for determination of Baclofen. In the present study, stress testing of Baclofen was carried out according to ICH guidelines Q1A (R2). Baclofen was subjected to stress conditions of hydrolysis, oxidation, photolysis and neutral decomposition. Extensive degradation was found to occur in acidic, condition. Mild degradation was observed in basic and at thermal conditions. Successful separation of drug from degradation products formed under stress conditions was achieved on a Hypersil BDS C18 column (250 mm × 4.6 mm, 5.0 µ particle size) using acetonitrile: acetate buffer (pH 3.7 ± 0.05) (50:50 v/v), at a flow rate of 1.0 mL/min and column was maintained at 40˚C. Quantification and linearity was achieved at 272 nm over the concentration range of 5 - 100 µg/mL for Baclofen. The method was validated for specificity, linearity, accuracy, precision, LOD, LOQ and robustness.

Keywords: Stability-indicating, HPLC, Baclofen, Validation, Stress Testing.

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ORIGINAL ARTICLE

Design and Development of Crystallo-co-agglomerates of Ritonavir for the Improvement of Physicochemical Properties

Fizikokimyasal Özelliklerin İyileştirilmesi için Ritonavirin Kristalo-Koaglomeratlarının Tasarımı ve Geliştirilmesi

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ABSTRACT

Objectives: The aim of the present study was to obtain CCA of ritonavir to improve the solubility, dissolution rate, and other physicochemical properties.

Materials and Methods: Ritonavir agglomerates were prepared using the CCA technique. Acetone-water containing HPMC K-15, PEG-6000, PVP K-30 was used as the crystallization medium. The agglomerates were evaluated for saturation solubility, micromeritic properties, yield, and drug content. The agglomerates were also characterized using FTIR, DSC, XRPD and SEM.

Results: The growth of particle size and the spherical form of the agglomerates resulted in the formation of products with good flow and packing properties. The improved compaction properties of the agglomerated crystals were due to the fragmentation that occurred during compression. DSC and XRD studies showed that ritonavir particles crystallized in the presence of HPMC, PEG-6000, PVP K-30 and diluents did not undergo structural modifications. The solubility and dissolution rate of ritonavir agglomerates were improve compare to pure ritonavir.

Conclusion: CCA was successfully applied to improve the physicochemical properties of ritonavir.

Key words: Crystallo-co-agglomeration, solubility, dissolution, ritonavir

ÖZ

Amaç: Bu çalışmanın amacı, çözünürlük, çözünme hızı ve diğer fizikokimyasal özelliklerini iyileştirmek için ritonavirin CCA'larını elde etmektir.

Gereç ve Yöntemler: Ritonavir aglomeraları, CCA tekniği kullanılarak hazırlandı. Kristalizasyon ortamı olarak HPMC K-15, PEG-6000, PVP K-30 içeren aseton-su kullanıldı. Aglomeratlar, doygunluk çözünürlüğü, mikromeritik özellikler, verim ve etkin madde içeriği açısından değerlendirildi. Aglomeratlar ayrıca FTİR, DSC, XRPD ve SEM kullanılarak karakterize edildi.

Bulgular: Aglomeratların partikül büyüklüğünün ve küresel formunun büyümesi, iyi akış ve paketleme özelliklerine sahip ürünlerin oluşumu ile sonuçlandı. Aglomere olmuş kristallerin iyileşmiş sıkıştırma özellikleri, sıkıştırma sırasında meydana gelen parçalanmadan kaynaklanmıştır. DSC ve XRD çalışmaları, HPMC, PEG-6000, PVP K-30 ve seyrelticilerin varlığında kristalleşen ritonavir partiküllerinin yapısal modifikasyonlara maruz kalmadığını gösterdi. Ritonavir aglomeratlarının çözünürlüğü ve çözünme hızı, saf ritonavir ile karşılaştırılır derecede gelişti.

Sonuç: Ritonavirin fizikokimyasal özelliklerini iyileştirmek için kristalo-koaglomerasyonu başarıyla uygulanmıştır.

Anahtar kelimeler: Kristalo-koaglomerasyon, çözünürlük, çözünme, ritonavir

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ASSESSMENT OF CONTROLLED RELEASE FORMULATION FOR DIFFERENT DRUG IN SPANSULES

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ABSTRACT

Spansules are a dosage form which was considered as one of the Advanced Drug Delivery System. Multidrug preparations can be delivered easily by spansules or granules in capsule technology. This type of delivery system designed to release a drug or a medicament at two or more different rates or in different span of time. A quick/slow release system provides an initial release of drug followed by a constant rate of drug release over a extended period or a defined period of time and in slow/quick release system provides release vice versa.[1] This will overall provide constant plasma drug concentration over a wide range of time. The drug release is followed by zero order kinetics so that constant release of drug is maintained. Biphasic release system is generally used when maximum relief is to achieved suddenly followed by sustained release phase over a prolong period of time to avoid repeated administration.[1]

KEYWORDS: Spansules are prolong period of time to avoid repeated administration.

INTRODUCTION

The oral route is considered as the most common and convenient route for controlled delivery of drugs due to following reasons.

1. Ease of administration.
2. Patient compliance.
3. Multidrug therapy in single dose.

Span sules have is a capsule which when swallowed releases one or more medicinal drugs over a Set period. Spansules are defined as capsules containing medicines (in form of

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Drug-Excipient Interaction Study of Lornoxicam with Polymers

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Abstract: Interaction study is the most important step in reformulation study for the preparation of all dosage forms. The interaction can affect physical, chemical, therapeutic and biological properties and stability of drug and create a new surprise problem, the successful formulation of stable and effective solid dosage form depends on the careful and suitable choice of excipient. Also the selection of excipient is vital in the design of a quality drug product. The quality of medicine depends not only on the active principals and productions process, but also on the performance of the excipients .The present work shows the interaction study of Lornoxicam and polymers for Nano products. In IR the interaction of infrared radiation with matter. It covers range of techniques, mostly based on absorption spectroscopy. DSC is a thermo-analytical technique in which the difference in the amount of heat required to increase the temperature of sample and reference is measured as a function of temperature.
Keywords: Interaction study, Differential scanning colorimetry (DSC), Infrared spectrophotometric study (IR).

INTRODUCTION

For the development in stage of dosage form, the study of drug-excipient compatibility is an important process. Incompatibility between drugs and excipient, alter the drugs stability and bioavailability and hence it affect their safety and efficacy. Excipient plays important role for preservation of product. The successful formulation of stable and effective solid dosage form depends on the careful and suitable choice of excipient. Also the selection of excipient is vital in the design of a quality drug product.

Also in dosage form, their may be a chances of unintended physicochemical interaction of an excipient with drug substance, thereby it can result in complexation or binding of drug, resulting slow or incomplete drug release in dissolution medium. The excipient and there concentration selected in formulation on the basis of their functionality as well as compatibility between drug and excipient [1].

Effect of drug-Excipient Interaction on Dosage form:

Dosage form is combination of drugs and non-drug components called as excipients. Drug is a chemical substance obtained from natural, synthetic or semi-synthetic source, which is used for the treatment, curing, prevention of disease or disorders in humans as well as animals. Excipients are nondrug components which are serve specific purposes like shape, stability, solubility, elegance, palatability, etc. of dosage form. The quality of medicine depends not only on the active principals and productions process, but also on the performance of the excipients [2].

Techniques to evaluate drugs- excipient compatibilities are-

- Thermal analysis
- Differential scanning colorimetry (DSC)
- Infrared spectrophotometric study (IR)
- Isothermal Stress testing (IST)
- High Performance Liquid Chromatography (HPLC)
- Thin Layer Chromatography (TLC) [3-7]

Thermal Analysis

Branch of materials science where the properties of materials are studied as they change with temperature.

Several methods of Thermal Analysis are

- Dielectric thermal analysis (DEA)
- Differential Thermal Analysis (DTA)
- Dilatometry
- Dynamic mechanical Analysis (DMA)
- Evolved Gas Analysis (EGA)
- Laser Flash Analysis (LFA)
- Thermogravimetric nalysis (TGA)
- Thermomechanical Analysis (TMA)
- Thermo-Optical Analysis (TOA) [7,8,14,15]

Differential scanning colorimetry (DSC)

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DRUG-EXCIPIENT INTERACTION STUDY OF TRAMADOL HCL WITH POLYMERS

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ABSTRACT

Drug-Excipient interaction study is important for the stability and good quality of product and to avoid the incompatibilities during production. various methods are available for that study like D,S.C, I.R. etc. Differential Scanning Calorimetry is widely used to observe or predict any physico-chemical interaction between drug and excipient Infrared absorption spectroscopy is related to the absorption of infrared radiation and get excited to excited state from the red end of visible spectrum to microwave region. That study totally depends on chemical and structural changes and thermal activity of compounds.

KEYWORDS: D.S.C., I.R., Interaction study.

INTRODUCTION

Drug: Active part of dosage form and it is mainly responsible for therapeutic value.

Excipient

Substance which are include along with drug being formulated in a dosage form so as to impart specific qualities to them.

Drug

Excipient compatibility study is important to check over its important as.

Stability of the dosage form can be maximized

Any physicochemical interaction between drugs and excipient affects bioavailability and stability of drug.

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Research Article

DEVELOPMENT AND VALIDATION OF STABILITY INDICATING RP-HPLC METHOD FOR DETERMINATION OF CERITINIB

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ABSTRACT

The purpose of the present work was to develop new, simple, specific, accurate and precise stability indicating RP-HPLC method for determination of ceritinib. In the present study, stress testing of ceritinib was carried out according to ICH guidelines Q1A (R2). ceritinib was subjected to stress conditions of hydrolysis, oxidation, photolysis and neutral decomposition. Extensive degradation was found to occur in acidic condition. Mild degradation was observed in basic and at thermal conditions. Successful separation of drug from degradation products formed under stress conditions was achieved on a Hypersil BDS C18 column (250×4.6mm, 5.0µ particle size) using acetonitrile: acetate buffer (pH 3.7±0.05) (50:50 v/v), at a flow rate of 1.0mL/min and column was maintained at 40°C. Quantification and linearity were achieved at 272nm over the concentration range of 5-100µg/mL for ceritinib. The Correlation Coefficient was found to be 0.9960. The method was validated for specificity, linearity, accuracy, precision, LOD, LOQ and robustness. The developed method will be useful for routine analysis for samples of stability studies in the formulation and development.

Keywords: Stability-indicating, HPLC, ceritinib, validation, stress testing.

INTRODUCTION

Ceritinib, 5-Chloro-N4-[2-[(1-methylethyl)sulfonyl]phenyl]-N2-[5-methyl-2-(1-methyl-ethoxy)-4-(4-piperidinyl)phenyl] 2,4-pyrimidine diamine, is an anaplastic lymphoma kinase (ALK) inhibitor which induces complete tumor regression in a xenograft model of EML4-ALK-positive lung cancer. The alternative names of ceritinib are LDK 378, NVP-LDK 378, ZykadiaTM. Ceritinib is a highly selective inhibitor of an important cancer target, ALK (Heudi, *et. al.,* 2014). Ceritinib, a recently approved drug by Food and Drug Administration, is used for the treatment of late-stage (metastatic) non-small cell lung cancer (Waters, 2014). The recommended dosage of ceritinib is 750 mg administered orally once daily on an empty stomach (Shaw, *et al.,* 2014). The chemical structure of ceritinib (Figure 1).

An ultrafast, sensitive, selective, and robust LDTD-APCI-MS/MS method was developed for the quantification of ceritinib in human plasma (Lanshoeft, 2015). A stability

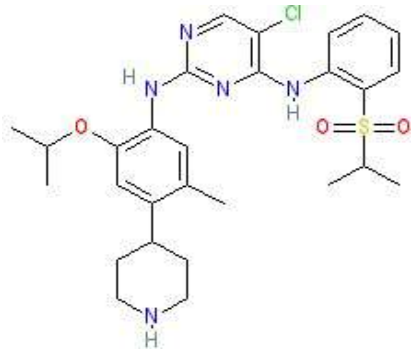

Figure 1. Structure of Ceritinib

indicating reversed-phase high-performance liquid chromatographic (RP-HPLC) method for estimation of ceritinib was reported (Kumar., 2014). Since, there are only two HPLC method reported in the literature for the estimation of ceritinib in pharmaceutical dosage forms

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Indian Medicinal Plants used in Diabetes Mellitus: An Overview

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Abstract

Diabetes mellitus (DM) is the commonest endocrine disorder that affects more than 100 million people worldwide (6% of the population). It is caused by the deficiency or ineffective production of insulin by pancreas which results in increase or decrease in concentrations of glucose in the blood. It is found to damage many of the body systems, particularly the blood vessels and nerves both insulin-dependent DM (IDDM) and non-insulin dependent DM (NIDDM) is a common and serious metabolic disorder throughout the world. In India, diabetes has been known for a long time, but its incidence is not of the same magnitude across the subcontinent. Medicinal herbs as potential source of therapeutic aids have attained a significant role in health system all over the world for both humans and animals. Traditional treatments have mostly disappeared in occidental societies, but some are prescribed by practitioner alternative medicine or taken by patients as supplements to conventional therapy. However, plant remedies are the mainstay of treatment in underdeveloped regions. A hypoglycaemic action from some treatments has been confirmed in animal models and dependent diabetic patients, and various hypoglycaemic compounds have been identified. Traditional medicines derived from medicinal plants are used by about 60% of the world's population. This review focuses on Indian herbal drugs and plants used in the treatment of diabetes, especially in India.

Keywords: *Diabetes mellitus, hypoglycaemic, antidiabetic plants*

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INTRODUCTION

Diabetes

As per ayurveda is a disease in which there is improper functioning of insulin and as a result sugar level in the blood increase. Diabetes may cause heart problem, kidney failure, blurred vision if not treated timely. Diabetes mellitus is increasing alarmingly worldwide and is defined as the abnormal glucose tolerance which affects pancreatic beta cells functions and sensitivity leading to progression of diabetes and its related complications. It is a chronic disorder of carbohydrate, fat and protein metabolism characterized by increased fasting and post prandial blood sugar level and an increased risk of vascular complications. It is the most common endocrine disorder in men and women, and the major public health problem of epidemic proportions, once believed to be a diseased of the west, is becoming an endemic to modernizing and urbanizing population in our country. Ayurvedic literature reveals that since the time of Charak and Sushrut many herbal medicines in different oral formulations have been recommended in Madhumeha (Diabetes mellitus) and confident claims of cure are on record [1].

Types of Diabetes

Diabetes mellitus Type 1 is a disease caused by the lack of insulin. Insulin must be used in Type I, which must be injected or inhaled.
Diabetes mellitus Type 2 is a disease of insulin resistance by cells. Treatments include:

1. Agents which increase the amount of insulin secreted by the pancreas,
2. Agents which increase the sensitivity of target organs to insulin and
3. Agents which decrease the rate at which glucose is absorbed from the gastrointestinal tract.

Type I diabetes (insulin dependent) is caused due to insulin insufficiency because of lack of functional beta cells. Patients suffering from this are therefore totally dependent on

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Natural bioenhancers

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Abstract
Bioenhancers are such agents, which by themselves are not therapeutic entities but when combined with an active drug lead to the potentiation of the pharmacologic effect of the drug. Many synthetic and herbal drugs suffer from the problem of low bioavailability; low membrane permeability is the major cause, lower lipophilicity, ionic characteristics, poor water solubility or P-glycoprotein. This paper highlights the various bioenhancers and their mechanism that enhance bioavailability when use combinely with API. The herbal bioenhancers are easily available, safe, free from side effects, minimizes drug toxicity, shortens the duration of treatment, and lowers the drug resistance problems and minimizes the cost of treatment. Herbal bioenhancer are use for various categories of drug like neutraceuticals, antibiotics, antitubercular and anticancer and cardiovascular for immediate effects. Bioenhancers are recently used in many novel drug delivery formulations such as liposomes, transferosomes, ethosomes etc.
Researchers must be solve these issues of drug toxicity to deliver a safe and effective dose of drugs to attain desired pharmacological response.

Keywords: P-glycoprotein, prodrug, piperine, curcumin, ginger

Introduction
Medicinal plants are major components of all indigenous or alternative systems of medicines like Ayurveda, Homeopathy, Naturopathy, Siddha, Unani, etc.
Demand of herbal drug and natural plant based products is increase throughout the world due to nontoxic, no side effect, low cost and affordable available to poor [1, 2].
Many synthetic and herbal drugs suffer from the problem of low bioavailability. Low membrane permeability is the major cause, lower lipophilicity, ionic characteristics, poor water solubility or P-glycoprotein. Bioavailability is the rate and extent to which a substance enters systemic circulation and becomes available at the required site of action [3]. Maximum bioavailability is attained by drugs administered via intravenous route, whereas drugs administered orally are poorly bioavailable as they readily undergo first pass metabolism and incomplete absorption. Such unutilized drug in the body may lead to adverse effects and also drug resistance. Thus, there is need of molecules which themselves have no same therapeutic activity but when combined with other drugs/molecules enhance their bioavailability. Many natural compounds from medicinal plants have capacity to augment the bioavailability when co-administered with another drug [4].
"The phenomenon of increasing the total availability of any chemical entity (nutrient or drug molecule) in biological fluid or systemic circulation is called biopotentiation or bioenhancement and the secondary agents which are responsible for this augmentation of plasma concentration of principle ingredient are termed as Biopotentiers or Bioavailability enhancers" [2].
Concept of biopotentiation was not so novel it has been so far used in old times by ayurvedic peoples so called as "*Yogvahi"* that meant to use herbs to increase or potentiates plasma concentration of drug. Piperine of black pepper was the first in this series as the major part of "*Yogvahi"*.
According to given in literature it is reveal that biopotentiator shows bioavailability enhancement if administered at lower dose with active ingredient and it do not introduce its own therapeutic action with the actual active principle at the therapeutic dose used. Piperine, naringin, quercetin, glycyrrhizin, genistein, sinomenine, nitrile glycoside and cow urine distillate have capability to augment and enhance the bioavailability. A augmentation of bioefficacy reduces dose, toxicity and adverse effects so in return shorten the time and cost of treatment. These concept covers drug categories like antibiotics, antitubercular and anticancer and cardiovascular which are so potent in nature and require quite immediate effects.
Bioenhancers are recently used in many novel drug delivery formulations such as liposomes, transferosomes, ethosomes etc [4].

Ideal properties of the bioenhancers
The contribution of bioenhancers have been reviewed which states that the ideal bioenhancers [5].
1. Should be nontoxic, non-allergenic and non-irritating.
2. Should not produce own pharmacological effects.
3. Should be rapid-acting with predictable and reproducible activity.
4. Should be unidirectional in action.
5. Should be compatible with other active pharmaceutical ingredients.
6. Should be stable with time and environment.

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NASAL DRUG DELIVERY SYSTEM-A NOVEL APPROACH

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ABSTRACT

Faster and higher level of absorption is done by nasel mucosa which is a potential administration route. Inrecent years many drugs have been shown to achieve better systemic bioavailability through nasal route than by oral administration. Nasal therapy, has been recognized form of treatment in the Ayurvedic systems of Indian medicine. It is a useful delivery method for drugs that are active in low doses and show no minimal oral bioavailability such as proteins and peptides it is logical to consider IN administration when developing new therapeutics, or when extending the life or improving the profile of an existing drug. In order to assess the desirability and viability of such an approach, a series of questions regarding the drug and its use should be addressed. IN delivery can be utilized for high molecular weight drugs such as peptides and proteins, however, systemic bioavailability is dramatically dependent upon the presence of permeation enhancers.

KEYWORD: Nasal drug Delivery System and Nasal Dosage Form.

1. INTRODUCTION[1-5]

1.1 Introduction: Faster and higher level of absorption is done by nasal mucosa which is a potential administration route. Level of drug absorption because it is permeable to more compounds than the gastrointestinal tract due to lack of pancreatic and gastric enzymatic activity, neutral pH of the nasal mucus and less dilution by gastrointestinal contents(Krishnamoorthy and Mitra, 1998). Inrecent years many drugs have been shown to achieve better systemic bioavailability through nasal route than by oral administration. Nasal therapy, has been recognized form of treatment in the Ayurvedic systems of Indian medicine, it is also called "Nasaya Karma" (Chien and Chang, 1987). Intranasal drug delivery – which has been studied and practices for several of years, has been given a new see of life. It is a useful delivery method for drugs that are active in low doses and show no minimal oral bioavailability such

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A SURVEY ON ETHNOMEDICINAL PLANTS USED BY TRADITIONAL HEALERS IN BULDANA DISTRICT (MS)

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ABSTRACT

District of Maharashtra state (India) has a rich biodiversity of medicinal plant species. An ethnobotanical survey was carried out in Buldana district, Maharashtra during June 2015 to December 2016 for documentation of various diseases knowledge acquired by the tribal communities. The tribal communities possess rich knowledge about medicinal plants and its uses as they are far away from modern facilities. Therefore, we have done an exhaustive ethnobotanical survey in this area. A list of 50 medicinal plants species are recorded, which are in practice by traditional healers of tribal communities. The traditional healers in this area use the wild as well as cultivated plants in the treatment of wounds. Documenting the indigenous knowledge through ethnobotanical studies is important the conservation and utilization of biological resources and for the wale fare of human being. The plants were identified with relevant information and are documented alphabetically with their botanical name, family, local name, parts used, mode of preparation and uses.

KEYWORDS: Traditional Medicinal Plants, Buldana District (M. S.), Korphad, Babhul.

INTRODUCTION

Forests are the sources of invaluable medicinal plant wealth since time immemorial. Tribal men's understand the prevention and curative characteristics of plants and started healthcare system. India's traditional systems of medicine are the part of cultures that attracted the attention of peoples today. Medicinal plants in meetings family's primary healthcare and nutritional needs are traditional which is found popular in all cultures.

From ancient time in human history the practice of using herbs to treat diseases dates back to the very earliest period. Due to constant intimacy with vegetation cover, primitive societies

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SOLID DISPERSION OF VALSARTAN FOR SOLUBILITY IMPROVEMENT

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ABSTRACT

The objective of work was to prepare and characterize solid dispersions of valsartan using natural polymers viz. xanthan gum, gaur gum and gum acacia to improve its aqueous solubility and rate of dissolution by solvent evaporation technique. Solid dispersions showed marked improvement in the solubility behavior and improved drug release. From all the formulations VS7 was found to be optimized formulation based on the characterization, solubility and dissolution studies. The results obtained showed that the aqueous solubility and rate of dissolution was significantly improved when formulated in solid dispersion as compare to pure drug. The enhancement of dissolution rate depends on the nature and amount of the carrier and increases with the increase in the concentration of the carrier. Increase in the dissolution rate may be attributed to; the reduced particle size of drug deposited on the surface of carrier and enhanced wettability of the drug particles by the carrier. The optimized formulations were evaluated by X-ray diffractometry (XRD), Differential scanning Calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM).

KEYWORDS: Valsartan, solid dispersions, Xanthan gum, gaur gum, gum acacia, solubility.

INTRODUCTION

The number of new drug candidates with poor aqueous solubility and dissolution rate has grown steadily over the past two decades due to the use of high throughput and combinatorial screening tools during the drug discovery and selection phase.[1] Improvement of oral bioavailability of poorly water-soluble drugs remains one of the most challenging aspects of drug development. Many approaches, such as salt formation, solubilization and particle size

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SOLUBILITY AND DISSOLUTION ENHANCEMENT OF VALSATAN BY SOLID DISPERSION TECHNIQUE USING NATURAL POLYMER

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ABSTRACT

The purpose of this study was to prepare and characterize solid dispersions of the poorly water soluble antihypertensive agent valsartan with natural carriers such as Xanthan gum, gaur gum and gum acacia to improve its aqueous solubility and rate of dissolution by solvent evaporation technique. All the formulations showed marked improvement in the solubility behavior and improved drug release. From all the formulations VS7 was found to be optimized formulation based on the characterization, solubility and dissolution studies. The results obtained showed that the aqueous solubility and rate of dissolution was significantly improved when formulated in solid dispersion as compare to pure drug. The enhancement of dissolution rate depends on the nature and amount of the carrier and increases with the increase in the concentration of the carrier. Increase in the dissolution rate may be attributed to; the reduced particle size of drug deposited on the surface of carrier and enhanced wettability of the drug particles by the carrier. The optimized formulations were evaluated by X-ray diffractometry (XRD), Differential scanning Calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM).

KEYWORDS: Valsartan, solid dispersions, Xanthan gum, gaur gum, gum acacia, solubility.

INTRODUCTION

Compounds with poorly aqueous solubility are increasingly posing challenge in the development of new drug coming directly from synthesis or from high throughput screening

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Pharmacognostic Review on Datura

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Review Article

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Abstract

Datura, a wildly growing plant from Solanaceae family, is attributed with both poisonous and medicinal values. *Datura* spp. in Ayurveda, different parts of Datura is used for various human ailments when applied both locally and through oral administration. Several functional groups have been reported to be present in different parts of the plant. The plant shows various types of activities such as analgesic, anti-inflammatory, anti-viral, and anti-diarrheal that may be due to the presence of the active chemical constituents. especially in Ayurvedic medicine, D. stramonium has been used for curing various human ailments, including ulcers, wounds, inflammation, rheumatism and gout, sciatica, bruises and swellings, fever, asthma and bronchitis, and toothache. This comprehensive review of *D. stramonium* includes information on botany, phytochemistry, pharmacology, toxicology and ethnomedicinal uses.

Keywords: Datura stramonium; Pharmacological actions; Medicine; Traditional; Phytotherapy; Drug toxicity

Abbreviations: LD50: Lethal dose 50%; IP: Intraperitoneal; OP: Organophosphate; D. Stramonium: Datura Stramonium.

Introduction

Herbal Plants

Plants have been used for health and medical purposes for several thousands of years. The use of herbal medicinal products and supplements has increased tremendously over the decades with not <80% of people worldwide relying on them for some part of primary health care. A majority of the world's population in developing countries still relies on herbal medicines to meet its health needs. Herbal medicines are often used to provide first-line and basic health service, both to people living in remote areas where it is the only available health service and to people living in poor areas where it offers the only affordable remedy. Even in areas where modern medicine is available, the interest on herbal medicines and their utilization have been increasing rapidly in recent years [1].

Datura

Ancient Verse about Datura

!!! धत्तुरोमदवर्नाग्निवताक्रुदज्वरकुष्टनुत !!!

!!! कषायोमधुरस्तिक्तोयूकालीक्षावीनाशक !!!

!!! उष्णोगुरुर्वश्लेष्मकन्डूक्रिमीविषापह !!!

Datura is an herbaceous perennial plant from Solanaceae family is grown in temperate and tropical region of the globe. It has been used in traditional medicine to relieve pain, breathlessness, fevers, etc. It is a

INDO AMERICAN JOURNAL OF PHARMACEUTICAL RESEARCH

"FORMULATION AND COMPARATIVE STANDARDIZATION OF AYURVEDIC SKIN CREAM"

M.B Bhaltadak*., H. A Navthale, R. R Thenge. S.A Shinde., V. S.Adhov
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Vicco Turmeric Skin Cream, Ayurvedic Formulation, Standardization.

ABSTRACT

The purpose of the present research work was to formulate and evaluated the Ayurvedic skin cream of crude drug comprising extracts of curcuma longa (Turmeric). One marketed formulation and one In house formulation were subjected to comparative standardization. There is a growing demand for herbal cosmetics in the world market and they are invaluable gifts of nature. Therefore, we tried to make an Ayurvedic skin cream containing the extract of curcuma longa in along with sandalwood oil. The extract of curcuma longa has antiseptic activity, anti-inflammatory activity, and also increases whitening of skin. The sandalwood oil increases the glow on skin and has emollient properties. Hence all these properties are beneficial to normal human keratinocytes and it is safe and stable too. Ayurvedic creams offer several advantages over other creams because of its side effects such as allergic reaction. Ayurvedic skin creams do not have any of these side effects, without any harm or unwanted effects it gives the fairness look to skin. The prepared Ayurvedic skin cream was evaluated with different parameters like appearance, Spreadability; pH, viscosity, rheological study and stability along with irritancy test. Stability parameters of the formulations showed that there was no significant variation between marketed and in house formulation during the study period. The cream was found to be more stable during stability study; thus the present study suggested that it is possible develop Ayurvedic skin cream containing herbal extract and can be used as antiseptic and for beautifying purpose.

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Open Access Research Article

DESIGN AND IN VITRO EVALUATION OF EXTENDED RELEASE TABLET OF NATEGLINIDE

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ABSTRACT

The aim of present study is to formulate and evaluate extended release matrix tablet of Nateglinide by direct compression method using different polymer like HPMC K4 and HPMC K15. Matrix tablet of nateglidine were prepared in combination with the polymer HPMC K4, HPMC K15, along with the excipients and the formulations were evaluated for tablet properties and *in vitro* drug release studies. Nateglinide matrix tablet prepared by using polymer such as HPMC K4 and HPMC K15, it was found that HPMC K15 having higher viscosity as compare to HPMC K4 therefore different concentration of polymer were studied to extend the drug release up to 12 h. The tablets of Nateglinide prepared by direct compression had acceptable physical characteristics and satisfactory drug release. The study demonstrated that as far as the formulations were concerned, the selected polymers proved to have an acceptable flexibility in terms of in-vitro release profile. In present the study the percent drug release for optimize batch was found to 94.62%. Hence it can be conclude that Nateglinide extended release matrix tablet can prepared by using HPMC. The swollen tablet also maintains its physical integrity during the drug release study.

Keywords: Tablet, *in-vitro* drug release, Nateglinide, HPMC

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INTRODUCTION

Oral drug delivery systems is the most convenient mode of drug administration compared to other dosage forms due to its high patient compliance and flexibility.[1] In conventional oral dosage forms drug dosage must be administered several times which results in fluctuating drug levels in plasma. These limitations of conventional dosage form can be overcome by formulation of sustained release dosage forms which provides drug release in an amount sufficient to maintain the therapeutic drug level over extended period of time, with release profiles sustained by the special technological construction and design of the system[2-3]. An alternative to administration of another dose is to use a dosage form that will provide sustained drug release, and therefore, maintain plasma drug concentrations. Oral extended release drug delivery system becomes a very promising approach for those drugs that are given orally but having the shorter half-life and high dosing frequency. Controlled release formulations are much desirable and preferred for such therapy because they offer better patient compliance, maintain uniform drug levels, reduced dose and side effects and increased margin of safety for high potency drugs[4] . Nateglinide is an oral antihyperglycemic agent used for the treatment of non-insulin-dependent diabetes mellitus (NIDDM). belongs to the meglitinide class of short secretagogues, which act by binding to β cells of the pancreas to stimulate insulin release[5]. The short biological half-life (nearly 1.5hr) favours development of sustained release formulations[6]. Nateglinide is dosed three times daily before meals there is a rapid rise in plasma insulin, with peak levels approximately 1 hour after dosing and a fall to baseline by 4 hours after dosing. However, fluctuations of drug concentration in plasma may occur, resulting in side

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Formulation and Comparative Standardization of Polyherbal Swadisht Virechan Churna

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ABSTRACT

Standardization of herbal formulation is essential in order to check quality, purity, safety and efficacy of drug. "Swadisht Virechan" churna play an important role in constipation and detoxification due to safety and efficacy in it. Hence churna has been formulated by standard procedure and evaluated by organoleptic study, physical characteristics and physicochemical screening. One marketed formulation and one lab scale formulation were subjected to comparative standardization. The churna was standardized by determination of organoleptic characters, pH, loss on drying, ash value, extractive value, physical characteristics such as bulk density; tap density, angle of repose to determine flowability, determination of particle size, microbial content. The result of various parameters obtained from study showed that marketed formulation and lab scale formulation have comparable physical values. The flowability of formulation was found to be poor in both formulations. These studies showed that there is no uniformity in preparation of formulation which is may be due to varied geographical locations where there plants grow. The present paper reports the investigation and standardization of swadisht virechan churna an Ayurvedic formulation. The physical parameter evaluated confirms the standard of the formulated churna.

Keywords: "Swadisht Virechan" churna, Ayurvedic formulation, Standardization.

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Research Article
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Solid dispersion of valsartan for solubility improvement using β-cyclodextrin

Abstract

The objective of work was to prepare and characterize solid dispersions of valsartan using β-Cyclodextrin to improve its aqueous solubility and rate of dissolution by solvent evaporation technique. Solid dispersions showed marked improvement in the solubility behaviour and improved drug release. From all the formulations VSD4 was found to be optimized formulation based on the characterization, solubility and dissolution studies. The results obtained showed that the aqueous solubility and rate of dissolution was significantly improved when formulated in solid dispersion as compare to pure drug. The enhancement of dissolution rate depends on the nature and amount of the carrier and increases with the increase in the concentration of the carrier. Increase in the dissolution rate may be attributed to; the reduced particle size of drug deposited on the surface of carrier and enhanced wet ability of the drug particles by the carrier. The optimized formulations were evaluated by differential scanning Calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM).

Keywords: valsartan, solid dispersions, β-cyclodextrin, solubility, pure drug, dissolution studies

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Introduction

The number of new drug candidates with poor aqueous solubility and dissolution rate has grown steadily over the past two decades due to the use of high throughput and combinatorial screening tools during the drug discovery and selection phase.[1] Improvement of oral bioavailability of poorly water-soluble drugs remains one of the most challenging aspects of drug development. Many approaches, such as salt formation, solubilization and particle size reduction have commonly been used to increase dissolution rate and thereby oral absorption and bioavailability of such drugs.[2] However; all these techniques have potential limitations. All poorly soluble drugs are not suitable for improving their solubility by salt formation. Use of co-solvents or surfactants to improve dissolution rate pose problems and decreasing particle size increases solubility but there is poor wetting and flow.[3–6] Solid dispersions can overcome these problems. Many carriers used in solid dispersions also cause problems due to their hygroscopic nature. Hence, continuous search for new carriers and new techniques is going on which will be useful for large scale manufacturing. Research for alternative carriers has been increasing to suit for the industrial applications as well as to reduce the production cost and toxic effects. Many polymers have limitations in enhancing solubility of poorly water soluble drugs due to their high viscosity. Use of polymers with low viscosity and high swelling capacity offers better alternative for these types of polymers. Use of natural polymer is more beneficial because of their low cost, biocompatibility, and biodegradability.[7] Cost effective pharmaceutical excipients are always desirable. Pharmaceutical excipients developed from natural sources are economic. Present day consumers look for natural ingredients in food, drugs and cosmetics as they believe that anything natural will be safer and devoid of side effects.[8,9] Natural excipients show lack of toxicity, easy availability and economic considerations in pharmaceutical industry as compared to their synthetic counterparts. Naturally, derived excipients have shown promising results in the modification of drug release from the formulations.[10]

The aim of this work was to formulate Valsartan solid dispersions by a solid dispersion technique by solvent evaporation method using β-cyclodextrin in order to enhance its solubility, dissolution, in vitro release and hence its bioavailability.

Materials and method

Materials

Valsartan pure drug was gift sample from Abbott Health Care Pvt Ltd, Mumbai India. β-cyclodextrin was obtained from SD fine chemicals, Mumbai. All other chemicals used were of analytical grade.

Method

Saturation solubility and phase solubility study

The solubility of drug is a very important physicochemical property because it directly affects the rate of drug release from formulation into the dissolution medium, bioavailability of the drug and consequently the therapeutic efficacy of the pharmaceutical product. The solubility of Valsartan was determined by the equilibrium solubility method, in which a saturated solution of the material was obtained by stirring an excess of drug in the constant quantity of solvent until saturation or equilibrium was achieved in vortex mixer. Then it was filtered through whatmann filter paper (No. 1) and then concentration was analyzed by UV spectrophotometer. Solubility of Valsartan was determined in distilled water and pH across the GIT. i.e. in pH 1.2, 4.5 and pH 6.8. Phase solubility studies of Valsartan was carried out to evaluate the possible solubilising effect of the carrier by adding an excess of drug to 10ml of aqueous solutions containing increasing concentrations of β-cyclodextrin (0–2%w/v) and shaken at 25°C in

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Polyherbal formulation containing antioxidants may serve as a prophylactic measure to diabetic cataract: Preclinical investigations in rat model

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Abstract

Background: Cataract is a major cause of visual impairment in diabetic patients. Due to increasing numbers of type 1 and type 2 diabetics worldwide, the incidence of diabetic cataracts steadily rises. Cataract surgery is the best possible cure for patients suffering from this ailment. However, the elucidation of pathomechanisms to delay or prevent the development of cataract in diabetic patients remains a challenge. **Objective:** The aim of the present study was to develop a polyherbal eyedrops containing potent antioxidant herbal extract and study the effectiveness as prophylactic treatment against galactose-induced diabetic cataract. **Materials and Methods:** Formulations were prepared by using extracts of *Ginkgo biloba* leaves, beet root (*Beta vulgaris*), and amla (*Emblica officinalis*) fruits. The viscosity enhancers were used to increase the retention time. Formulations (F1–F5) were prepared by using carboxy methyl cellulose and poly ethylene glycol-400 as thickening agents and propylene glycol as a solubilizer. Preliminary evaluation showed that formulations have passed clarity, sterility, and eye irritancy tests. Viscosity and pH of formulation were within the normal range. Diabetic cataract was induced in Wistar rats by 10% galactose drink (for 30 days) and anticataract activity was evaluated. Formulation was installed in eye as a prophylactic treatment from day 1 of galactose drinking and continued for 30 days. **Results:** Slit-lamp photography of eyes of rats showed clear lens of rats without any trace of opacity. On the other hand, galactose-treated rats developed dense nuclear opacity in lens as an indication of diabetic cataract. Rats which received prophylactic treatment showed less percent opacity as compared to that of cataract control group and decreased vacuoles. **Conclusion:** We may conclude that polyherbal formulation containing extracts of *Ginkgo biloba* leaves, beet root (*Beta Vulgaris*), and amla (*Emblica officinalis*) fruits may prevent the development of cataract in diabetic patients. **Abbreviations used:** ARI: Aldose reductase inhibitors; GPx: Glutathione peroxidase; GR: Glutathione reductase; DTNB: Dithio-bis-nitrobenzoic acid; GSH: Thiol.

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Full Text

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SUMMARY

Polyherbal eye drops prepared from the extracts of Ginkgo biloba leaves, Beta vulgaris and Emblica officinalis fruits containing potent antioxidant actives were formulated and developed. All formulations were tested for the parameters like pH, viscosity, sterility and eye irritancy. All the parameters were found within the range of acceptance. Formulations were tested preclinically for the prophylaxis of diabetes induced cataract in Albino wistar rats. Diabetic cataract was developed by allowing the animals to drink galactose solution in tap water (4 gm of galactose every other day for the period of 30 days). Formulation was installed in eye as a prophylactic treatment from day one of galactose drinking and continued for 30 days. Level of different antioxidant enzymes were estimated in the lens of control, and cataract rats treated with either saline solution or formulation [Figure 3]. It was seen that level of catalase, GPx, GR, GSH and thiol level were significantly increased in the lens of rats following galactose administration as compared to control rats ($P < 0.01$). This indicated the role of these enzymes in development of cataract. Prophylactic treatment with formulation significantly restored level of these enzymes in cataract rats to normal level. Effect of significant as compared to vehicle treated cataract rats ($P < 0.01$). Biochemical findings were supported by slit lamp photography of eyes of rats that showed clear lens of rats without any trace of opacity. On the other hand galactose treated rats develops dense nuclear opacity in lens as an indication of diabetic cataract. Rats which received prophylactic treatment showed less percent opacity as compared to cataract control group and decreased vacuoles. This suggests that our polyherbal formulation may prevent development of cataract in diabetic patients.

Introduction

Cataract is a clouding that develops in the crystalline lens of the eye or in its envelope resulting in slight-to-complete opacity and obstruction in the passage of light.[1] This progresses slowly to cause vision loss and potentially blindness, if untreated. An estimated 200 million people worldwide are suffered with a cataract, which is the leading cause of approximately 42% of blindness.[2] Many factors such as age, nutrition, heredity, medications, toxins, healthy habits, and sunlight exposure influence the development of cataract.[3] Cataract is also widely diagnosed in individuals with lifestyle diseases such as hypertension, renal failure, and diabetes. Cataract is a major cause of visual impairment in diabetic patients. Due to increasing numbers of type 1 and type 2 diabetics worldwide, the incidence of diabetic cataracts steadily rises.[4] Cataract surgery is the best possible cure for patients suffering with this ailment. However, the elucidation of pathomechanisms to delay or prevent the development of cataract in diabetic patients remains a challenge. In addition, there is no drug treatment currently available in the market as a prophylactic measure for cataract.

Eye is exquisitely delicate and should be protected from foreign substances. The most important challenge to the formulation scientist is to circumvent the protective barriers of the eye without causing permanent tissue damage which otherwise may lead to blindness. Ocular drug delivery is one of the most fascinating and challenging tasks. Therapeutic efficacy of an ocular drug can be greatly improved by prolonging its contact with the corneal surface.[5] The viscosity-enhancing agents are used in the eyedrop preparations or the drug is formulated in water-insoluble ointment formulations to sustain the duration of intimate drug–eye contact. The present study aimed at the development of polyherbal eyedrops preparation containing extracts of Ginkgo biloba leaves, beet root (Beta vulgaris), and amla (Emblica officinalis) fruits. G. biloba is used as an antioxidant to treat diabetic-associated cataract. It contains glutathione (GSH) which is the important component of the innate antioxidant system in the lens and its deficiencies are observed in cataractous lenses.[6] It also contains important flavonoid, i.e., quercetin. It also contains important flavonoids, quercetin, which acts as aldose reductase inhibitor (ARI) responsible for the conversion of glucose to sorbitol. This also prevents oxidation induced sodium and calcium influx and loss of lens transparency in diabetic cataract.[7],[8] Carotenes such as lutein and zeaxanthin are antioxidants which are abundantly found in beet root.[9] Amla is a rich source of Vitamin C, the well-known antioxidant. It also prevents aggregation and insolubilization of lens proteins caused by hyperglycemia.

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Recombinant DNA Technology and its Applications: A Review

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Abstract: Biotechnology which is synonymous with genetic engineering or recombinant DNA (rDNA) is an industrial process that uses the scientific research on DNA for practical applications. rDNA is a form of artificial DNA that is made through the combination or insertion of one or more DNA strands,It offered new opportunities for innovations to produce a wide range of therapeutic products with immediate effect in the medical genetics and biomedicine by modifying microorganisms, animals, and plants to yield medically useful substances.Recombinant DNA technology is playing a vital role in improving health conditions by developing new vaccines and pharmaceuticals. This review gives brief introduction to rDNA and its applications in various fields.

Key words: Chimeric DNA, restriction enzymes, Transgenic Plants, Gene Therapy.

Introduction:

Human life is greatly affected by three factors: deficiency of food, health problems, and environmental issues. Food and health are basic human requirements beside a clean and safe environment. With increasing world's population at a greater rate, human requirements for food are rapidly increasing. Humans require safe-food at reasonable price. Several human related health issues across the globe cause large number of deaths. Approximately 36 million people die each year from noncommunicable and communicable diseases, such as cardiovascular diseases, cancer, diabetes, AIDS/HIV, tuberculosis, malaria. Despite extensive efforts being made, the current world food production is much lower than human requirements, and health facilities are even below standard in the third-world countries. Rapid increase in industrialization has soared up the environmental pollution and industrial wastes are directly allowed to mix with water, which has affected aquatic marines and, indirectly, human-beings. Therefore, these issues urge to be addressed through modern technologies.

Unlike tradition approaches to overcome agriculture, health, and environmental issues through breeding, traditional medicines, and pollutants degradation through conventional techniques respectively, the genetic engineering utilizes modern tools and approaches, such as molecular cloning and transformation, which are less time consuming and yield more reliable products. For example, compared to conventional breeding that transfers a large number of both specific and nonspecific genes to the recipient, genetic engineering only transfers a small block of desired genes to the target through various approaches, such as biolistic and Agrobacterium-mediated transformation [1]. The alteration into plant genomes is brought either by homologous

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New Tools for Herbal Drug Standardization

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Abstract: *The term "herbal drugs" denotes plants or plant parts that have been converted into phytopharmaceuticals.* The quality control standards of various medicinal plants used in indigenous system of medicine are becoming more relevant today in view of commercialization of formulations based on medicinal plants. For standardization and quality assurance purposes, following three attributes are desirable i) Authenticity ii) Purity and iii) Assay. Authenticity relates to proving that the material is true. Authentication in itself involves many parameters including gross morphology, microscopy, chemical, physical, biological and toxicological analysis. Assay part of standardization is chemical and biological profiling which could assess the chemical effects and curative values. The new era of herbal drug standardization includes chemometrics, Gel Electroporesis, Metabolomic technique, Differenital pluse polarography combination of this all techniques show clear picture and this will help to introduce new molecule or formulation in society which will safe and effective one.

Key words: Herbal drugs, Chemometrics, Gel Electroporesis, Metabolomic technique, Differenital pluse polarography.

Introduction:

The term "herbal drugs" denoted by means of plant or part of plants that have been converted into phytopharmaceuticals by simply means of processes involving collection or harvesting, drying and storage[1]. Herbal medicines have a long history of use for the prevention and treatment of diseases. The use of medicinal plants with therapeutical purposes represents a secular tradition in different cultures[2,3]. Their use was traced back to the first written testimonies of different book of Ayurveda. They have always been part of human culture. About 80% of world populations still rely on medicinal herbs for their primary health care, according to WHO. Not only in India but also in western nations the use of herbal medicine is increasing day by day[4]. Standardization of herbal plant is a critical issue to ensure the quality of the research process for safety and efficacy of the research products.

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In-vitro studies and evaluation of telmisartan marketed tablets

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ABSTRACT

Tablets or capsules taken orally remain one of the most effective means of treatment available. The effectiveness of such dosage forms relies on the drug dissolving in the fluids of the gastrointestinal tract prior to absorption into the systemic circulation. The present study reveals the evaluation of four marketed sample of Telmisartan tablets. The main aim of the study is to conduct dissolution test on the tablets to determine the compliance with a given official monograph. Four different marketed samples of Telmisartan were purchased from local market. The Telmisartan tablets were evaluated for the various in-vitro tablet properties such as thickness, hardness, friability, weight variation, drug content, disintegration time and dissolution rate. *In-vitro* dissolution test is conducted on four different brands of telmisartan tablets to assess their equivalency. All the four marketed samples of Telmisartan have shown good tablet properties and comply with the pharmacopoeial specification. The *in- vitro* dissolution showed the 80% drug release within one hour from all the four brands which complies with the specification of pharmacopoeia.

Key words: Telmisartan, *In-vitro* Dissolution Profile, hardness, disintegration.

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INTRODUCTION

Seventy-six percent of patients achieve a full response to treatment (Diastolic BP ≤ 90mm Hg or ≥ 10mm Hg reduction) and 22% had an inadequate response to telmisartan therapy (Diastolic BP > 90mm Hg or < 7mm Hg reduction). Overall, heart rate was reduced from 78.0 to73.8 beats/min after 6 months of treatment. The dosage was increased in 24% of patients because of the insufficient BP reduction with the lower dosage Global tolerability was rated as very good, good, moderate or poor in 75%, 22%, 1% and 1% of patients, respectively. There were no significant differences in global tolerability ratings between the patient groups. Telmisartan had only a minor or no effect on serum creatine levels across all patient groups. Serious adverse events were reported in 0.06% of patients and included death in 6 patients. None of the deaths were considered drug-related.[1-4]

The solubility/dissolution behavior of a drug is key determinant to its oral bioavailability, being the rate-limiting step to absorption of drugs from the gastrointestinal tract. Consequently poor solubility has low bioavailability increase in dosage, large inter and intra-subject variation in blood drug concentrations under fed versus fasted conditions.[5-7]

A drug may be a substance for diagnosis, cure, mitigation, prevention or treatment of disease in human beings or animals, which act by altering any structure or function of body of human being or animal. Every year number of drugs is introduced into the market. The total drug absorption into the body when administered i.e. *In-vivo* and dissolution tests is used to determine the absorption of drug *In-vitro* i.e. IVIVC absorption of the drug.[9-13]

Drug absorption from a solid dosage form after oral administration depends on the release of the drug substance from the drug product, the dissolution or solubilization of the drug under physiological conditions, and the permeability across the gastrointestinal tract. Because of the critical nature of the first two of these steps, *In-vitro* dissolution may be relevant to the prediction of *In-vivo* performance. Based on this general consideration, *In-vitro* dissolution tests for immediate release solid oral dosage forms, such as tablets and capsules, are used to

1) Assess the lot-to-lot quality of a drug product;

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Potential of Piperine as a bioavailability enhancer

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Abstract
Oral absorption of drug is very important issue especially when the drug is poorly bioavailable, given for long periods and expensive. Bio enhancers can be defined as chemical entities, which when mixed with drugs promote and augment their bioavailability without showing any synergistic effect with the drug. The factors like toxicity, cost, poor bioavailability and long-term administration of drugs give rise to the need of bio enhancers which help overcome most of these problems. Piper species produce a pungent alkaloid named Piperine or 1-peperoyl piperidine. Piperine increases permeability at the site of absorption by modulating lipid environment and membrane dynamics. Piperine has a molecular structure that is suitable for enzyme inhibition. It augments the bioavailability of several drugs like carbamazepine, curcumin, ciprofloxacin, ampicillin, metronidazole, oxytetracycline and many others by inhibiting various metabolizing enzymes. Thus piperine, being an efficacious inhibitor of drug metabolism is a powerful enhancer of absorption. The following review explores the mechanism, metabolism inhibition, influence of structural changes on activity, and drugs bio enhanced by piperine. It provides an insight on the application of piperine as an effective bio enhancer and the superiority of a bio enhanced drug formulation over the one without a bio enhancer Bio enhancers or bioavailability enhancers are mostly the plant-based molecules which promote the biological activity or bioavailability or the uptake of drugs in combination therapy. This review article concludes the bioavailability enhancing property of piperine.

Keywords: bioenhancers, piperine, oral absorption, alkaloid

Introduction

The concept of 'bioavailability enhancers' is derived from the traditional age-old system of Ayurveda (science of life). In Ayurveda, black pepper, long pepper and ginger are collectively known as "*Trikatu*". In sanskrit "*Trikatu*" means three acrids. The action of bio enhancers was first documented by Bose (1929) who described the action of long pepper to *Adhatoda vasika* leaves increased the antiasthamatic properties of *Adhatoda vasika* leaves.

Plant based medicines are used by a majority of the world's population. Our Ayurvedic texts have a mention of thousands of herbal drugs for various diseases including the rare ones. Almost 25% of modern pharmacopoeias too contain drugs of plant origin [1]. Many synthetic and herbal drugs suffer from the problem of low bioavailability. Bioavailability is the rate and extent to which a substance enters systemic circulation and becomes available at the required site of action [2]. Maximum bioavailability is attained by drugs administered via intravenous route, whereas drugs administered orally are poorly bioavailable as they readily undergo first pass metabolism and incomplete absorption. Such unutilized drug in the body may lead to adverse effects and also drug resistance. Thus, there is need of molecules which themselves have no same therapeutic activity but when combined with other drugs/molecules enhance their bioavailability. Many natural compounds from medicinal plants have capacity to augment the bioavailability when co-administered with another drug. Thus bioenhancers are chemical entities which promote and augment the bioavailability of the drugs which are mixed with them and do not exhibit synergistic effect with the drug [3.4].

Bioenhancers should have novel properties such as:

- Nontoxic to humans or animals,
- Should be effective at a very low concentration in a combination,
- Should be easy to formulate, and
- Most importantly, enhance uptake/absorption and activity of the drug molecules [5].

Following the use of bio enhancers, the dose of the drug is reduced and risk of drug resistance is minimized. It also reduces the dose-dependent toxicity of the drug, especially of anticancer drugs.

History as Bio enhancer

The term bioavailability enhancer or bio enhancer was first coined by Indian scientists C.K. Atal, the Director of the Regional Research laboratory, Jammu, who discovered and scientifically validated Piperine as the world's first bioavailability enhancer in 1979. Bio enhancers are molecules, which do not possess drug activity of their own at the dose used but promote and augment the biological activity or bioavailability or the uptake of drugs in combination therapy [6]. C.K. Atal, the Director of the institute scrutinized a list of ancient Indian Ayurvedic formulations used in the treatment of a wide range of diseases. He found that one of the groups of herbals which has been documented very frequently as essential part of about 70% of Ayurvedic prescriptions, is `Trikatu`, that comprises three acrids viz. long pepper, black pepper and dry ginger in equal proportions. He observed that a majority of Ayurvedic formulations contained either Trikatu or else one of the ingredients of Trikatu, namely Piper longum (210 formulations out of 370 reviewed) used in a large variety of diseases. In subsequent experiments using various drugs and extracts with trikatu and its ingredients they found that mainly piperine enhances the bioavailability of most of the

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Research Article

DESINE AND CHARACTARISATION OF NUTRACEUTICAL LIPSTIC OF BEETROOT POWDER

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ABSTRACT

Cosmetics are incredible in demand since historical time till day. Lipstick formulations are most widely used to enhance the beauty of lips and to add glamour's touch to the makeup. It is difficult to apply lipsticks to the dried, chafed, chapped, cracked lips with sores and lesions. In such cases, one can use nutraceutical lipsticks for the purpose of curing topical condition and beautification of lips. With this aim and objectives, an attempt was made to formulate and evaluate nutraceutical lipstick by using cow ghee and honey as natural excipients that substituted synthetic ingredients like lanolin, cetyl alcohol, and castor oil. Beet powder extract containing vitamin B- complex and silica element was selected for the local action on lips and beet root powder B cyanine selected as colouring agent. The lipsticks were evaluated for their organoleptic properties such as spreading, covering property, hardness, shine, and gloss and found to be satisfactory product to give attractive beauty with therapeutic effect on the diseased lips. Thus, the nutraceutical lipsticks with the natural ingredients like cow ghee and honey can serve as economical and effective cosmoceutical product.

Key word: Beet root powder, cosmoceutical, cow ghee, honey, lipstick

INTRODUCTION ,

According to D&C act 1940 and rules 1945, cosmetic means any article intended to be sprayed, poured, rubbed or sprinkled on, or introduced into, or applied to the human body or its any part for cleansing, beautifying, promoting attractiveness or altering the appearance. It also includes any articles intended for use as a component of cosmetic. Cosmetics are substances used to enhance the appearance of the human body. [1] Now a day's the demand of herbal cosmetics in the world market are growing and are inevitable gifts of nature.

Formulations of nutracuetical cosmetics can be used to cure skin problems by achieving esthetic sense. Lipsticks are cosmetic formulations for the modification or accentuation of lip colour and are prepared by molding a dispersion of colours in a waxy base, in the form of stick/crayon. The consumption of lipsticks in makeup preparation field exceeds that of any other product. Rather than decreasing in use, they posses increasing popularity. No substitute has been found to replace them. Lipsticks provide a convenient means of either freshening a makeup by coloring or protection of lips from the effects of cold, dry weather, UV light, and wind. Lip problems caused because of infection or pollution are dryness of lips, chafed, chapped, cracked lips,sores and Lesions on lips, Sunburn, and wind-burned lips.

Suitable drug candidates for nutracuetical lipsticks are locally acting on the lips, soothing, anti-irritant agent, skin protectant, and anti-inflammatory agents. Lipsticks were used for coloring the lips, but lipsticks could be used for coloring as well as to treat lip infections. Beet root powder was selected as a drug of choice because of their anti-irritating, moisturizing properties soothing and nontoxic agent naturally obtaining and used in the treatment of skin ulcers, wound, skin eruptions, fissures.

Aim and objective of the present study was to formulate nutracuetical lipsticks with cow ghee and honey as natural excipients that replaced conventional synthetic vehicles of lipsticks. The castor oil was replaced by cow ghee and formulations were subjected to the different evaluation. Honey helps to promote tissue regeneration and helps in healing. Antibacterial activity of honey is largely due to the presence of hydrogen peroxide. Cows' ghee have a great historical background for skin care and nourishment and is highly effective for all sorts of skin rashes. It also acts as a moisturizer. [1,2,3]

ADVANTAGES OF LIPSTICK

Beauty

No matter what style of lip color you prefer (sharp, bold and dramatic colors, or more natural and subdued shades that can be translucent), you will instantly feel more beautiful. If your goal is to stand out in the crowd, be more beautiful, or you simply need a boost in your confidence, lipstick is a perfect fashion tool for you.

Hydration

Even though some older brands of lipsticks use ingredients that can suck moisture from you lips, most of them are very conscientious about hydration and are made to preserve the natural state of your lips. New brands of lipstick can often contain some form of moisturizing additive, such as vitamin E or aloe-vera.

Sunscreen

Even in early 20th century, chemist and fashion designers came to conclusion that sunscreen protection is important and that most people leave their sensitive lips up to the mercy of the sun even if they are conscious about protecting the rest of the face. Lipstick manufacturers then added sun protection ingredients to their products, enabling you to protect your lips from sun, drying, wind, and other harmful and aging effects.

Posture

Several studies have shown that women who regularly use lipstick have a better posture in the later years of their life. With long and steady tradition of standing in front of the mirror and keeping your posture and body shape in healthy conditions, women in the ages of 65 to 85 have significantly less problems with their posture and balance.[4]

DISADVANTAGES

The following are a few harmful effects of lipsticks that can occur if you use low quality products constantly.

Heavy Metals

Studies have shown that lipsticks have concerning levels of chromium, cadmium and magnesium. This will result in increasing your risk to dangerous diseases and organ damage. High levels of cadmium can be stored in the kidney and finally result in renal failure.

Lead

It has been revealed that most of the lipsticks have a dangerously high

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RESEARCH ARTICLE

Development of Stability Indicating Assay Method for Antiemetic Drugs in Combined Dosage Formulation

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ABSTRACT

A new stability indicating reversed-phase high performance liquid chromatography method was developed for assay of Domperidone and Pantoprazolein tablet. The separation was achieved on column (4.6 × 250mm, 5µm) using methanol and water (60:40, v/v) as mobile phase for assay and flow rate 0.7ml/min. Detection was carried out in U.V detector at 285.0 nm. The retention time of 4.36min approximately for Domperidone and Pantoprazole. The system suitability test shows the response with retention time, theoretical plate, tailing factor and peak area for both the drugs. The force degradation study was carried out by acid, alkali, peroxide and neutral at RT and the % degradation was 5.45% by acid5.50% by base6.24% by peroxide. The validation of method carried out using ICH guidelines. The developed method was accurate, precise, economic, fast, and selective for simultaneous determination of Domperidone and Pantoprazolein combined tablet formulation. The method gave good resolution for drugs.

Keywords: Domperidone, Pantoprazole, reversed phase high performance liquid chromatography, Stability-indicating method.

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CONTENTS

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MODIFICATION AND CHARACTERIZATION OF LOVASTATIN CRYSTALS

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ABSTRACT

Lovastatinan anti-cholesteremic drug used in the treatment of hypertension. Being a BCS class II drug, it has poor solubility and dissolution rate. Thus the aim of present study was to modify the crystals of lovastatin in the presence of additives to improve solubility, dissolution rate and other physicochemical properties. The lovastatin crystals were prepared using solvent evaporation method in the presence of additives such as PVP-K30, PEG-4000 and Poloxamer 407.The modified crystals of lovastatin were characterized by Scanning electron microscopy, FT-IR spectroscopy, Differential scanning calorimetry and X-ray diffractometry.Also the modified crystals were evaluated for solubility, dissolution rate and other physicochemical properties and compared with commercial lovastatin. The modified crystals exhibit the difference in the size and shape when compare to commercial lovastatin indicate the habit modification. The FT-IR spectra of modified crystals in the presence of additives showed no difference in the characteristic peaks compared to commercial lovastatin. DSC data indicate the decrease in the melting endotherm of modified crystals indicate the polymorphic changes. The XRD spectra of modified crystals in the presence of additives showed decrease in number of peaks indicate the polymorphic changes. The Modified crystals showed improved solubility and dissolution rate.

KEYWORDS: Crystals, Lovastatin, Solubility, FT-IR, DSC, Dissolution rate.

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Research Article

Formulation-Evaluation of Metformin Hydrochloride Sustained Release Matrix Tablet and Studying the Effect of Sintering Technique over the Drug Release *In-Vitro.*

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ABSTRACT
Diabetes has become a vastly spreading disorder taking millions of people under its wings every year, so is the ever expanding need of curing it. Many drugs are the choices for treatment and effective management of diabetes; Metformin Hydrochloride is one of them. Because of the gastrointestinal concern which makes its journey into the body difficult, a lot has to be done to make it a perfect choice. To achieve spatial as well as temporal control over the drug release, sustained release formulations are useful. Sustained release systems include any drug delivery system that achieves slow release of drug keeping plasma drug concentration consistently at desired level. In the present study, work has been done to formulate and evaluate sustained release matrix tablet containing Metformin Hydrochloride, a blend of polymers including Eudragit RL100, Eudragit RS100, and HPMC K4M. Wet granulation method is used for tablet formulation. A newer concept of sintering has also been tried to affect a better drug release performance. Evaluation studies were performed on the prepared tablets in relevance to various parameters. Study and test results as FTIR, DSC analysis proved compatibility of polymers with the drug; the blend of polymers help control the drug release over an extended time period. The release analysis revealed erosion mediated drug release.

KEYWORDS
Metformin Hydrochloride, Eudragit, HPMC, matrix tablet, sintering technique.

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Development and Validation of Stability Indicating RP-HPLC Method for Determination of Safinamide Mesylate

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ABSTRACT

A new, simple, specific, accurate and precise RP-HPLC method was developed for determination of Safinamide Mesylate. In the present study, stress testing of Safinamide Mesylate was carried out according to ICH guidelines Q1A (R2). Safinamide Mesylate was subjected to stress conditions of hydrolysis, oxidation, photolysis and neutral decomposition. Successful separation of drug from degradation products formed under stress conditions was achieved on a Hypersil BDS C18 column (250 mm × 4.6 mm, 5.0 µ particle size) using Methanol: Phosphate Buffer pH 6.8 (80:20 % v/v), at a flow rate of 1.0 mL/min and column was maintained at 40˚C. Higher degradation was found to occur in acidic, alkaline, oxidative and photolytic condition. Lesser degradation was observed at thermal conditions. Quantification and linearity was achieved at 226 nm over the concentration range of 40 - 180 µg/mL for Safinamide Mesylate. The method was validated for specificity, linearity, accuracy, precision, LOD, LOQ and robustness.The developed method is suitable for the routine analysis as well as stability studies.

Keywords: Stability-indicating, HPLC, Safinamide Mesylate, Validation, Stress Testing.

INTRODUCTION

Safinamide mesylate is the methanesulfonic acid form of its active component safinamide, a selective and reversible monoamine oxidase B (MAO-B) inhibitor. It is used for the treatment of Parkinson's disease (PD), safinamide potently modulates dopamine (DA), a substrate of MAO-B, suppressing DA uptake and reversibly binds to MAO-B blocking the function of MAO-B, which lead to the relief of PD symptoms.[1] Besides MAO-B inhibition, safinamide exhibits novel anticonvulsant activities, including sodium channel blockade, calcium channel blockade and glutamate release inhibition.[2]Safinamide mesylate is an orally available derivative from chemical class of · ñ amino amides, with multiple mechanisms of action involving inhibition of MAO-B and Dopamine reuptake used in the treatment of epilepsy and Parkinsonísdisease. Chemically, Safinamide mesylate is, (S)-(+)–2-[4-(3-fluoro-benzyl-oxy-benzyl-amino)propanamide]methane-sulfonate (1:1 salt).[1,2] The Structure is given in Figure 1.

Literature survey reveals that only one enantiomeric chiral chromatographic method[3], a bioassay in fluids human and various animals[4] and a HPLC method[5]has been reported for the estimation of Safinamide mesylate. The aim of the present study is to develop a simple, precise and accurate stability indicating reversed-phase HPLC method[6,7,10,11] for the estimation of Safinamide mesylate in pharmaceutical dosage form as per ICH guidelines.[8,9]

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Phytopharmacognostic Review on *Bryonia laciniosa (Shivlingi Beej)*

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Mini Review

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Abstract

Infertility varies across the regions of the world and it has been estimated to affect 8 to 12% couples worldwide. *Bryonia laciniosa* Linn commonly called as shivlingi is a medicinal plant belongs to the family Cucurbitaceae. It is a uterine tonic and improves the chances of conception in women suffering from infertility. Main chemical constituent is 'Bryonin' and it is folk medicine, its traditional uses are also reported like adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalospleny, paralysis, phthisis, snake bite. Its pharmacological proven as antidiabetic, anti-inflammatory, for obesity and specially for treatment of infertility. According to literature it is fertility enhancer herb used in ayurveda along with Putrajeevak Beej.

Keywords: Shivlingi; Oligozoospermia; *Staphylococcus Aureus*; Serotonin

Introduction

India is one of the richest countries as regards to the resources and availability of the medicinal plants. From time immemorial, we have been depending upon the forests for food, shelter, clothing, ornamentation, religious beliefs and most important is for health care. Tribals mostly reside in the forest areas and hilly terrains and they rely on these medicinal plants because of their effectiveness. More than 2500 species of plants have been recognized that have medicinal values. While more than 6000 plants have been recognized for having herbal usage. More than 50,000 plants have been identified and used for medicinal purposes throughout the world. Tribal communities have diverse knowledge of traditional medicines related to indigenous plants for basic healthcare needs [1-3].

During past few decades, modern synthetic medicines have come into prominence with miraculous and instantaneous results. However, these are not providing adequate relief to common people of the developing countries due to their soaring prices and complicated side effects. Due to this, it is a worldwide realization today that the use of natural products as medicines is advantageous over synthetic ones. Extracts of some plants even in crude form are known to exert remarkable effects over biological systems. Such effects are due to certain chemical constituents present in plants and are commonly known as "active principle." Systematic phytochemical investigations of some medicinal plants have led to the isolation and characterization of some of the active principles and are widely used as potent drugs [4].

Bryonia laciniosa Linn commonly called as shivlingi is a medicinal plant belongs to the family Cucurbitaceae Shivlingi Seeds are used for the treatment of female infertility. It is a uterine tonic and improves the chances of conception in women suffering from infertility. It is fertility enhancer herb used in ayurveda along with

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Pharmacognostic Study and Development of Quality Control Parameters for Certain Traditional Antidiabetic Herbs

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Keywords: Pharmacognostic, Phytochemical, Evaluation, Identification.

ABSTRACT

The objective of the present work is to study the pharmacognostic and phytochemical characteristics of some antidiabetic medicinal plants. Pharmacognostic and phytochemical investigation of *Momordica charantia, Azadirachta indica and Eugenia jambolana* describing its morphological, microscopical characterization, powder analysis, physicochemical evaluation, fluorescence analysis, preliminary phytochemical screening and TLC profiling has been studied in detail so as to develop a reference for academic and commercial purpose. Further, it can be used for the standardization and pharmacopoeial parameters development. The present findings are associated with standardization of parameters like macroscopic and microscopic characters, phytochemical screening, fluorescent analysis and physicochemical quantification of the plants. Ash values added more strength to crude drug standardization with prominent results indicating the involvement or non-involvement of irrelevant matter. Such study on the macro and microscopic anatomy, preliminary phytoconstituent screening and physicochemical parameters are important informations which may be useful in verification and contamination for quality control of this therapeutic plant afterwards. Thus, it is evident that the present study of the plant material provides various resourceful information in relation to pharmacognostical identification of this plant material. It would also help scientists to utilize such needful information regarding the plants identity and characteristics in building new polyherbal formulations.

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Open Access Research Article

Formulation-Development and *In-Vitro-In Vivo* Evaluation of Gastroretentive Floating Tablet Incorporating Clarithromycin

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ABSTRACT

The objective of the work is to summarize the applicability, manufacturing possibilities, excipients and the types of floating drug delivery systems and to optimize a floating, mucoadhesive system using Clarithromycin as the drug aiming at the eradication of Helicobacter pylori having desired floating and drug release properties based on preliminary excipient examination. Direct compressed (DC) tablet was chosen as dosage form being a cost-effective technology for pharmaceutical industry requiring fewer procedures. Before the implementation of the pharmaceutical technological aims, analysis of critical factors influencing the manufacture was carried out. Reproducible manufacturing processes are required to achieve suitability and tablets uniformity to achieve the uniform properties of tablets, which could influence experimental parameters. Ishikawa diagram evaluation was created, which is a commonly used graphical method to identify factors resulting in an overall effect on product design and quality imperfection. The aim was to reveal affecting factors on uniformity of DC tablets in order to standardize all possible conditions and adjustments. Critical factors are indicated separately in particular method sections.

Keywords: H. pylori, Clarithromycin, Floating Tablets, *In Vitro* Evaluation, *In Vivo* Evaluation.

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1. INTRODUCTION:

The most frequent application of medicines is the peroral way of administration, which provides easy to take option, relatively low therapeutic cost, various formulations and applicable technologies [1]. Its spread is shown by the fact that more than 50% of commercially available medicines are orally applied preparations [2]. Higher patient compliance may be experienced due to their easy application. Although among the per os administered preparations, few are designed with biopharmaceutical aspect meeting with the physiological environment of the dosage forms. While until the 90's not much, however nowadays more frequently modified drug delivery systems are designed containing special excipients and/or manufactured with special technological methods[1]. With novel preparations having controlled release, patient compliance can be increased more, namely multiple daily administrations can be reduced to once a day administration. Another advantage can be a local drug delivery, with which not only the administration of the medicine can be improved, but also the site-specific efficiency of a particular applied active pharmaceutical ingredient (API) may be optimized.

Based on the Dévay's proposal biopharmaceutical classification system of pharmaceutical preparations, the following classes of drug delivery systems can be distinguished [1]:

1.1 Time controlled systems based on the effect of time after their administration and the time interval of effect can be the following:

1.1.1 Rapid (e.g. solutions, effervescent preparations, fast dissolving or disintegrating tablets),

1.1.2 Sustained (e.g. extended tablets or tablet implants),

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ETODOLAC EXTENDED RELEASE MATRIX TABLET-FORMULATION AND EVALUATION *IN VITRO*

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ABSTRACT

Osteoarthritis and Rheumatoid Arthritis have become a vastly spreading disorder taking millions of people under its wings every year, so is the ever expanding need of curing it. Many drugs are the choices for treatment and effective management of diabetes; Etodolac is one of them. Because of the bioavailability and gastrointestinal concern which makes its journey into the body difficult, a lot has to be done to make it a perfect choice. To achieve temporal (time) control over the drug release, extended release formulations are useful. Extended release systems include any drug delivery system that achieves slow release of drug keeping plasma drug concentration consistently at desired level for an extended time. In the present study, work has been done to formulate and evaluate extended release matrix tablet containing Etodolac, a blend of polymers including HPMC K4M and K100M, Eudragit RS100, Carbopol 934, Polyvinyl Pyrrolidone K90. Wet granulation method is used for tablet formulation. Evaluation studies were performed on the prepared tablets in relevance to various parameters. Study and test results as FTIR analysis proved compatibility of polymers with the drug; the blend of polymers help control the drug release over an extended time period. The release analysis revealed erosion mediated drug release.

KEYWORDS: Etodolac, HPMC, Eudragit, Carbopol, PVP, matrix tablet.

INTRODUCTION

Oral route has been one of the most popular routes of drug delivery. The oral route of administration has wide acceptance and constitutes 50-60 % of total drug formulations. Extended release dosage forms release drug slowly, so plasma concentrations are maintained

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ORIGINAL ARTICLE

Formulation and Characterization of Solid Dispersions of Etoricoxib Using Natural Polymers

Doğal Polimerleri Kullanarak Etoricoxib Katı Dispersiyonunun Formülasyonu ve Karakterizasyonu

Sandip Babarao SAPKAL*, Vaibhav Suresh ADHAO, Raju Rambhau THENGE, Rahul Ashok DARAKHE, Sushilkumar Ananda SHINDE, Vinayak Natthuji SHRIKHANDE

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Objectives: The main objective of the present investigation to develop and evaluate solid dispersions of BCS Class II drugs etoricoxib employing various natural polymers, compatible with conventional manufacturing method to enhance solubility of poorly soluble drugs.

Materials and Methods: In this study, etoricoxib solid dispersion were prepared using xanthan gum, gaur gum and acacia and their combinations by solvent evaporation method. Solid dispersions and pure etoricoxib in the form of powder were characterized in comparison with pure drug and corresponding physical mixtures in the same ratios by Fourier transform infrared spectroscopy, differential scanning calorimetry (DSC), powder X-ray diffractogram, and *in vitro* drug release.

Results: Solid dispersion (ET11) prepared with 1: 2: 2: 2 drug carrier ratios were showed highest solubility in different solvents. Hence the solid dispersion (ET11) of 1: 2: 2: 2 ratios were selected for characterization. The DSC study indicated that the crystalline nature of etoricoxib was reduced to amorphous. The diffraction pattern of the solid dispersions in each figure indicates that diffraction peaks at 2ɵ values has less intensity than that of pure drugs. This indicated that the crystalline nature of drug sample was converted to amorphous with ET11. Scanning electron microscope photographs of solid dispersion seem to be more porous in nature. From the *in vitro* drug release profile, it can be seen that formulation ETM11 shows higher dissolution rate i.e. 98.2±1.3% compared with other formulations. It is predicted that, increasing concentration of carrier, increases the drug dissolution rate.

Conclusion: This study has shown that the solid dispersion of etoricoxib using natural carrier can be promising formulation for solubility and dissolution enhancement. Natural polymers used have shown promising results in the modification of drug release from the formulations.

Key words: Etoricoxib, solid dispersions, Xanthan gum, guar gum, gum acacia

ÖZ

Amaç: Bu araştırmanın temel amacı, zayıf çözünen ilaçların çözünürlüğünü arttırmak için geleneksel üretim yöntemiyle uyumlu, çeşitli doğal polimerler kullanarak BCS Sınıf II ilaçların katı dispersiyonlarını geliştirmek ve değerlendirmektir.

Gereç ve Yöntemler: Bu çalışmada, ksantan zamkı, gaur zamkı ve akasya ve bunların kombinasyonları kullanılarak çözücü buharlaştırma yöntemi ile etoricoxib katı dispersiyonu hazırlanmıştır. Katı dispersiyonlar ve toz halindeki saf etoricoxib, Fourier transform kızılötesi spektroskopisi, diferansiyel tarama kalorimetrisi (DSC), toz x-ışını difraktogramı ve *in vitro* etken madde salımı saf ilaç ve aynı oranlara karşılık gelen fiziksel karışımlarla karşılaştırmalı olarak karakterize edilmiştir.

Bulgular: 1: 2: 2: 2 ilaç taşıyıcı oranları ile hazırlanan katı dispersiyon (ET11), farklı çözücüler içinde en yüksek çözünürlüğü göstermiştir. Bu nedenle, karakterizasyon için 1: 2: 2: 2 oranlarındaki ET11 seçilmiştir. DSC çalışması, etoricoxib'in kristal yapısının amorf hale geçtiğini göstermiştir. Her bir şekildeki katı dispersiyonların kırınım modeli, 2ɵ değerlerindeki kırınım piklerinin saf etken maddeninkinden daha az gerilime sahip olduğunu göstermiştir. Bu, etken madde örneğinin kristal yapısının, ET11 ile amorf hale dönüştürüldüğünü göstermiştir. Katı dispersiyonun taramalı elektron mikroskobu fotoğrafları daha gözenekli yapıda görünmektedir. *İn vitro* etken madde salım profilinden, ETM11 formülasyonunun diğer formülasyonlara kıyasla %98,2±1,3 gibi daha yüksek çözünme oranı gösterdiği görülebilir. Artan taşıyıcı konsantrasyonunun etken maddenin çözünme hızını arttırdığı tahmin edilmektedir.

Sonuç: Bu çalışma, doğal taşıyıcı kullanılarak hazırlanan etoricoxibin katı dispersiyonunun çözünürlük ve çözünme artışı için umut verici bir formülasyon olabileceğini göstermiştir. Kullanılan doğal polimerler, formülasyonlardan etken madde salımının değiştirilmesinde ümit verici sonuçlar göstermiştir.

Anahtar kelimeler: Etorikoxib, katı dispersiyonlar, Xanthan zamkı, guar zamkı, acacia zamkı

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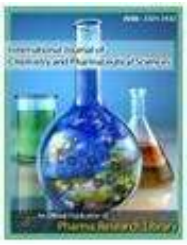

RESEARCH ARTICLE

Formulation and Phytopharmacological Activity Studies of Fresh Juice of *Acacia Arabica* Stem and Leaves for the Treatment of Variety of Dental Problems

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ABSTRACT

It is well known that use of plant material for oral healthcare and treatment of periodontal disorder is common in many cultures and many of such remedies are very effective with respect to long term health. From literature review, it comes to know that *Acaciaarabica* stem is used as chewing stick and claimed to be useful for health of gum. The objective of the proposed study is to perform the phytochemical studies on the fresh juice of babul stem and leaves. It is further envisaged to study anti-inflammatory, analgesic and antimicrobial properties of the dried fresh juice. Objective shall further be extended to convert the dried fresh juice to a suitable formulation for the treatment of variety of dental problems. Phytochemical tests suggest presence of carbohydrates, steroids, tannins and flavonoids in leaf and stem juice both. Leaf juice at the dose of 200mg/kg bodyweight was found to be very effective in imparting analgesic effect. In the anti-inflammatory studies leaf juice at the doses of 50, 100 and 200mg/kg body weight was effective to reduce inflammation. The activity of leaf juice was more than that of stem juice but both can be claimed to have analgesic and anti-inflammatory activity. The activity may be due to presence of tannins, steroids and flavonoids. The dry juice was incorporated into a mouthwash formulation at 1% leaf juice, 1% stem juice and 1%leaf and stem juice both of which formulation no. 3 with leaf and stem juice 1% both was better in taste, odour and colour.

Keywords: Anti-inflammatory, Analgesic, Mouthwash, *Acaciaarabica*

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CONTENTS

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Research Article

Valsartan Buccal Patches- A Promising Approach to Enhance Drug Delivery.

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ABSTRACT
Majority of the drugs are administered to the body with the basic aim to achieve a stable blood or tissue concentration which is therapeutically effective and nontoxic for an extended period of time. This can be achieved if proper dosage regimens are designed and attempt is made to attain a maximum rate and extent of drug absorption. By the use of new drug delivery systems, one can enhance the bioavailability and therapeutic index of medical agents as well as reduce side effects and can improve acceptance and compliance by the patients. The present work was aimed to formulate and evaluate buccoadhesive patches of Valsartan. Valsartan is an anti-hypertensive drug. Though seems an easier way, but proved very efficient to use buccal patches as drug delivery system. Suitable polymers HPMCK15, PVPK30, and PEG400 were selected as release retardants. Prepared formulations were appropriately evaluated and results analyzed. Among the various concentration of polymeric combinations, the combination ratio 2:1(HPMCK15:PVPK30) was found to be most suitable. The formulation R6 combination of polymers HPMCK15, PVPK30 fulfills the requirement of good buccal patches. It showed highest drug release up to 95.29% for 12hr. Preformulation and formulation results revealed that the buccal patches incorporated with valsartan proved to be a highly efficient drug delivery system showing improved release characteristics. The release analysis revealed diffusion mediated drug release following Higuchian model. Concluded the formulation as one desired and acceptable.

KEYWORD
Valsartan, HPMC, PVP, PEG, buccal patches.

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Phytopharmacognostic Review on *Bryonia laciniosa (Shivlingi Beej)*

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Mini Review

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Abstract

Infertility varies across the regions of the world and it has been estimated to affect 8 to 12% couples worldwide. *Bryonia laciniosa* Linn commonly called as shivlingi is a medicinal plant belongs to the family Cucurbitaceae. It is a uterine tonic and improves the chances of conception in women suffering from infertility. Main chemical constituent is 'Bryonin' and it is folk medicine, its traditional uses are also reported like adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalospleny, paralysis, phthisis, snake bite. Its pharmacological proven as antidiabetic, anti-inflammatory, for obesity and specially for treatment of infertility. According to literature it is fertility enhancer herb used in ayurveda along with Putrajeevak Beej.

Keywords: Shivlingi; Oligozoospermia; *Staphylococcus Aureus*; Serotonin

Introduction

India is one of the richest countries as regards to the resources and availability of the medicinal plants. From time immemorial, we have been depending upon the forests for food, shelter, clothing, ornamentation, religious beliefs and most important is for health care. Tribals mostly reside in the forest areas and hilly terrains and they rely on these medicinal plants because of their effectiveness. More than 2500 species of plants have been recognized that have medicinal values. While more than 6000 plants have been recognized for having herbal usage. More than 50,000 plants have been identified and used for medicinal purposes throughout the world. Tribal communities have diverse knowledge of traditional medicines related to indigenous plants for basic healthcare needs [1-3].

During past few decades, modern synthetic medicines have come into prominence with miraculous and instantaneous results. However, these are not providing adequate relief to common people of the developing countries due to their soaring prices and complicated side effects. Due to this, it is a worldwide realization today that the use of natural products as medicines is advantageous over synthetic ones. Extracts of some plants even in crude form are known to exert remarkable effects over biological systems. Such effects are due to certain chemical constituents present in plants and are commonly known as "active principle." Systematic phytochemical investigations of some medicinal plants have led to the isolation and characterization of some of the active principles and are widely used as potent drugs [4].

Bryonia laciniosa Linn commonly called as shivlingi is a medicinal plant belongs to the family Cucurbitaceae Shivlingi Seeds are used for the treatment of female infertility. It is a uterine tonic and improves the chances of conception in women suffering from infertility. It is fertility enhancer herb used in ayurveda along with

Nail drug delivery system a review

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Abstract
The nail is horny structure. Nail plate is responsible for penetration of drug across it. As it is hard enough the penetration becomes difficult, only a fraction of topical drug penetrates across it. Hence the effective therapeutic concentration is not achieved. The nail plate may appear abnormal as a result of decreased glow. It`s involvement of nail bed, reduction of blood supply, physical or chemical features of nail bed. As a result variety of diseases occurs.[1] Oral therapies are accompanied by systemic side effects and drug interactions, while topical therapies are limited by the low permeation rate through the nail plate. These diseases can be cured by achieving desired therapeutic concentration of drug by nail drug delivery system. Human nails do not have only protective and decorative role, but can also be considered as an alternative pathway for drug delivery, especially in nail diseases such as onychomycosis or psoriasis. The physical techniques (manual and electrical nail abrasion, acid etching, ablation by lasers, microporation, application of low-frequency ultrasound and electric currents) and chemicals (thiols, sulphites, hydrogen peroxide, urea, water, enzymes) that have shown ungual enhance reactivity. For effective topical therapy, fungal drug permeation must be enhanced.[3] This can be achieved by disrupting the nail plate using physical techniques or chemical agents. Alternatively, drug permeation into the intact nail plate may be encouraged, for example, by iontophoresis or by formulating the drug within a vehicle which enables high drug partition out of the vehicle and into the nail plate.

Keywords: Nail drug delivery, Onychomycosis, Iontophoresis, Psoriasis.

Introduction
The nail is horny structure. Nail plate is responsible for penetration of drug across it. As it is hard enough the penetration becomes difficult, only a fraction of topical drug penetrates across it. Hence the effective therapeutic concentration is not achieved. The nail plate may appear abnormal as a result of decreased glow. It`s involvement of nail bed, reduction of blood supply, physical or chemical features of nail bed. As a result variety of diseases occurs.[1]

These diseases can be cured by achieving desired therapeutic concentration of drug by nail drug delivery system. Human nails do not have only protective and decorative role, but can also be considered as an alternative pathway for drug delivery, especially in nail diseases such as onychomycosis or psoriasis. These nail diseases are widely spread in the population, particularly among elderly and immune compromised patients.[2]

Oral therapies are accompanied by systemic side effects and drug interactions, while topical therapies are limited by the low permeation rate through the nail plate. For the successful treatment of nail disease the applied active drug must permeate through the dense keratinized nail plate and reach deeper layers, the nail bed and the nail matrix.

Studies conducted on the human skin elucidated its structure, functions, and its permeability for some substances, but very little is known about skin derivate, the nail, and the properties of nail keratin.

The purpose of this work is to improve the understanding of physicochemical parameters that influence drug permeation through the nail plate in order to treat not only topical nail diseases but also to consider the possibility to reach systemic circulation and neighbouring target sites. The purpose of this review is to explore the difficulties in penetration of drug across nail plate & enhancement of bioavailability of antifungal drug. The existing clinical evidence suggests that a key to successful treatment of fungal diseases by topical antifungal product lies in ineffectively overcoming the nail barrier. Current topical treatments have limited therapeutic effectiveness possibly because they cannot sufficiently penetrate in the nail plate to transport a therapeutically sufficient quantity of antifungal drug to the target sites to eradicate the protection. Also the analysis of the drug's penetration is a difficult task. The topical therapy of nail diseases, especially of onychomycosis, and to a smaller extent, of nail psoriasis, is desirable to avoid the side effects associated with their systemic therapy, to increase patient compliance and reduce the cost of treatment. Systemic therapy is however the mainstay of treatment due to the poor permeability of the nail plate to topically applied drugs. For effective topical therapy, fungal drug permeation must be enhanced.[3] This can be achieved by disrupting the nail plate using physical techniques or chemical agents. Alternatively, drug permeation into the intact nail plate may be encouraged, for example, by iontophoresis or by formulating the drug within a vehicle which enables high drug partition out of the vehicle and into the nail plate. The physical techniques (manual and electrical nail abrasion, acid etching, ablation by lasers, microporation, application of low-frequency ultrasound and electric currents) and chemicals (thiols, sulphites, hydrogen peroxide, urea, water, enzymes) that have shown ungual enhance reactivity. The human nail can be afflicted by several disease states including paronychia, psoriasis and infections due to bacteria, viruses or fungi. Whilst rarely life threatening, these generate self-consciousness and psychological stress.[4] Approximately 50% of all problems result from fungal infections, onychomycoses, and the prevalence of these may be as high

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A REVIEW ON THE NATURAL RESOURCES USE AS HAIR COLOUR AND HAIR DYE

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ABSTRACT

Hair colour is one of the oldest and most well-known cosmetics that have been used by many ancient cultures in different parts of the world for not only women but also for men. Synthetic oxidative hair dyes available in the market contain combination of peroxide and ammonia which damage hair and causes allergic reactions. Also, Further the people using synthetic dyes are exposed the risk of breast cancer, urinary bladder cancer and non-Hodgkin's lymphoma. Hair dyes derived from plants to solve these problems and are safe to use. A few of these natural herbals are henna, clove, cinnamon, beets, fenugreek seeds, walnuts, etc. The developed oil hair colour may provide multifunctional effects such as softening, conditioning effect, promotion of growth and density of hair, etc. In this article, the types of used plants for hair colour and hair care products are discussed.[1]

KEYWORD: hair colour, henna, clove, cinnamon, beets, fenugreek seeds, walnuts.

INTRODUCTION

The use of hair colour is not new. The art of hair dyeing was used by Egyptians from vegetables dyes from the early 5000 years BC.[1] The first artificial dye was synthesized in 1856, and permanent hair colorants have been used commercially for over 100 years. Henna was the most Popular and is still one of the popular dye. But instead of getting black colour, red to copper red colour was obtained. Loss of natural hair colour is due to varied reason like genetic influence, effect of environmental factors. Though permanent synthetic hair dyes are available in varied Colour ranges, they have the disadvantage of producing hypersensitive reactions. Also studies have shown permanent hair colour have produced cancer. A need was felt to formulate a product which is safe for use and does not have any problem of

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FORMULATION AND EVALUATION OF SWELLABLE AND FLOATING GASTRORETENTIVE CIPROFLOXACIN HYDROCHLORIDE TABLETS

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ABSTRACT

Drugs that have narrow absorption window in the gastrointestinal tract (GIT) will have poor absorption. For these drugs, gastroretentive drug delivery systems offer the advantage in prolonging the gastric emptying time. The present investigation concerns the development of hydrodynamically balanced tablets of Ciprofloxacin Hydrochloride, are designed to prolong the gastric residence time after oral administration and thereby increasing drug bioavailability. Floating tablets of Ciprofloxacin HCl were prepared by direct compression using HPMC K4M and HPMC K15M as polymers along with Sodium bicarbonate as gas generating agent. The tablets were evaluated for in-vitro buoyancy, dissolution studies and physical characteristic viz. Density, Hardness, Friability, Thickness and Weight variation. Further, tablets were evaluated for in-vitro release characteristic for 12 hrs. It is found that the hardness of the tablets affects the Buoyancy characteristic of the dosage form. All formulations possessed good floating properties with total floating time more than 12 hrs. The in-vitro release studies indicated that the floating tablets of Ciprofloxacin HCl containing 200mg HPMC K15M (F4) showed sustained release when compared with the other formulation batches and provides a better option for controlled release action and improved bioavailability.

KEYWORDS Ciprofloxacin hydrochloride, gastroretentive, HPMC, in vitro studies.

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A REVIEW ON TAMRIND GUM AND IT'S APPLICTION

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ABSTRACT

Tamarind seeds or Kernel is a by-product of Tamarind pulp industry. Tamarind gum is obtained from endosperm of seeds of the tamarind tree, which is a seed gum with potential industrial applications. Tamarind gum is having applications in paper, food, textile industry etc. Recent years research has been initiated on the use of tamarind gum in pharmaceutical and cosmetic applications. Tamarind kernel powder disperses and hydrates quickly in cold water but does not reach maximum viscosity unless it is heated for 20-30 mins. Chemically tamarind kernel powder is highly branched carbohydrate polymer. The solution exhibits typical non newtonian flow properties common to most other hydrocolloids. Tamarind kernel powder is evaluated for its suitability as a carrier to improve the dissolution rate of poorly water-soluble drug celecoxcib. Tamarind gum along with xanthan gum and hydroxypropyl cellulose (water soluble neutral polymer) used for nasal mucoadhesion studies in powder formulation. Tamarind gum was also evaluated in bioadhesive tablets. Polysaccharide present in tamarind kernel powder is called as tamarind seed polysaccharide. Tamarind seed polysaccharide could be used for controlled release of both water-soluble and water insoluble drugs. In this review summarised application of tamarind gum.

INTRODUCTION

Natural polymers are biocompatible, nontoxic, cheap and biodegradable in nature compared to synthetic polymer.

- binding agents
- Gelling agents
- Thickening agent
- Stabilizers
- Coating agents

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Formulation and *In-Vitro* Evaluation of Enteric Coated Tablet Incorporating Rabeprazole

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ABSTRACT

The objective of the work is to try and assess the applicability and manufacturing possibilities to optimize an enteric coated tablet formulation containing Rabeprazole sodium as the drug aiming at the anti-acidity activity with desired drug release properties. Enteric coated tablet was chosen as dosage form being a cost-effective technology for pharmaceutical industry requiring fewer procedures. Before the implementation of the pharmaceutical technological aims, analysis of critical factors influencing the manufacture was carried out. Reproducible manufacturing processes are required to achieve suitability and tablets uniformity to achieve the uniform properties of tablets, which could influence experimental parameters. Rabeprazole in core content of tablet is blended with HPMC (different grades), xanthan gum, PVPK30, mannitol, crosspovidone, Sodium starch glycolate, Colloidal silicon dioxide to formulate the product. Prepared formulation was tested for weight and content uniformity, physical characteristics, in vitro dissolution behaviour, acid resistance and accelerated stability studies. All studies performed resulted and revealed for assurance of such enteric coated tablet formulation for drug Rabeprazole with optimum characteristics, concluding it as a promising approach to enhance drug release characteristics.

Keywords: Rabeprazole, HPMC, enteric coated tablets, *In Vitro* evaluation.

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1. INTRODUCTION

Oral site-specific drug delivery systems have attracted a great deal of interest recently for the local treatment of a variety of bowel diseases and also for improving systemic absorption of drugs, which are unstable in the stomach. However, the micro environment in the gastrointestinal tract and varying absorption mechanisms generally causes hindrance for the formulation scientist in the development and optimization of oral drug delivery.[1] Delivery of therapeutic agent into the intestinal region could be accomplished by the application of an enteric coating on a solid dosage form. Several approaches have been attempted and reported during the last decade to develop new methodologies for site-specific drug release, including pH-sensitive drug release and time-controlled drug release. Among these, the time-controlled release systems such as sustained or delayed-release dosage forms are very promising. Nevertheless, due to the potentially large variation of gastric emptying time of dosage forms in humans, these dosage form may show high inter patient variability in the site of drug delivery. On the other hand, pH-sensitive delivery systems such as enteric-coated dosage forms offer a simple and practical means for intestinal drug delivery. Rabeprazole sodium[2] is a classical example of proton pump inhibitors and is approved by FDA for the treatment of symptomatic gastro esophageal reflux disease, long-term treatment and maintenance of erosive esophagitis. The stability of Rabeprazole sodium decreases with a corresponding decrease in the pH of the media. Hence, the exposure of Rabeprazole sodium to the acidic contents of the stomach would lead to significant degradation of the drug and would result in reduced bioavailability. Few attempts have been made to deliver this drug by peroral route in the form of enteric coated granules, solid dispersion, and suspension and matrix tablets. A number of enteric coating polymers are available and capable of protecting the drug core from the aggressive environments of the stomach. Being soluble at higher pH values, these polymers dissolve in the intestine and release the core for ready action. These polymers include several synthetic polymers like cellulose acetate phthalate (CAP), hydroxy propyl methyl cellulose phthalate (HPMCP).

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Molecularly Imprinted Polymer-Based Fluorescent Sensors: A Promising Tool for Food and Environment Analysis

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ABSTRACT

Molecular imprinting technology (MIT), also called as molecular template technology, it is a novel and innovative technology use in material chemistry, polymer chemistry, biochemistry, and other different approaches. Molecularly imprinted fluorescence sensor (MIFs), a technique used to know the unique and selective capability of 3- dimensional cross-linked polymer called the molecularly imprinted polymers (MIPs). The MIPs has wide variety of applicability, correct plasticity, stability, excessive selectivity and their inner recognition sites can be selectively combined with template molecules to obtain selective detection. Molecularly imprinted fluorescence sensor (MIFs) carries fluorescent substance into molecularly imprinted polymer synthesis and transforms the binding sites between target molecules and molecularly imprinted materials into detected or readable fluorescence signals. This sensor shows the advantages of excessive sensitivity and selectively of fluorescence detection. Molecular imprinting materials shows research significance and broad application prospects. This review gives importance on progress in the construction and application of MIFs turned into reviewed with emphasis on the practice principle, detection methods, and molecular recognition mechanism widely used for food analysis.

KEYWORDS: *Molecularly imprinted polymer; fluorescence sensor; food quality and safety*

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INTRODUCTION

Molecular imprinting technology (MIT) is an emerging research tool based on interaction of antigen and antibody as well as enzyme and substrate, the importance of MIT is to synthesize three- dimensional (3-D) cross-linked polymers having unique molecular recognition potential [1]. Molecularly imprinted polymers (MIPs) display several advantages, such as selective adsorption, good affinity, easy preparation, good resistance as well as lower in cost. MIPs reveal huge utility application in several fields such as solid phase extraction, chemical biomimetic sensing technology, chromatographic separation methods and mimic enzymes [2]. Conventional MIPs have good specific recognition performance as a result, they lack signal output ability during analysis and recognition. Consequently, they need to be used in combination with instrumental authentication methods [3]. The fluorescence sensor usually made up of a recognition unit and a signal output unit. Molecularly imprinted fluorescence sensors (MIFs) can be comprises by addition of fluorescent material into the molecularly imprinted polymer synthesis system, which is helpful to understand specific identification and fluorescence detection of the target [4]. MIFs have an emerging novel tool in the field of medicine, environment and food safety analysis. [5]

In ancient times, several food and environment safety incidents have occurred, as a result food safety turning into the focus of global attention [6]. Food safety is relatively close human health, financial growth as well as social stability and is a major issue concern to national wealth and people's living [7]. Now, the food safety detection technology is much important and the validation strategies include gas chromatography, fluid chromatography, capillary electrophoresis, supercritical thin chromatography, fuel chromatography-mass spectrometry [9], and liquid chromatography-mass spectrometry [10]. But, the instrumental techniques having some drawbacks like complicated sample pretreatment procedure, higher in costs, difficult operation, time consuming and costly equipment. This technique is not able of achieve rapid detection, thus requiring proficient operators. In contrast, the fast detection technology this is easy, fast, low-cost, selective, and shows high specificity [11].

MIFs not only exhibit the advantages of definite recognition and definite adsorption of molecular imprinting but also have high sensitivity and selectivity of fluorescent materials. This feature is key in integrating the detection unit and signal output unit proficiently in the quick recognition of food quality as well as safety [12]. This review broadly focuses on the preparation of MIFs, the recognition methods and molecular detection mechanisms. The application of MIFs in the rapid recognition of food quality and safety

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Review Article

Coronavirus: Hotspot on coronavirus disease 2019 in India

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ABSTRACT

The novel coronavirus disease (COVID-19) or also known as the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has been recognized as the cause of respiratory infection in Wuhan, Hubei Province, China, in late December 2019. As of April 5, 2020, this epidemic had spread to worldwide with 12,03,485 confirmed cases, including 62,000 deaths. The World Health Organization has declared it a Global Public Health Crisis. Coronavirus causes respiratory illness coughing, sneezing, breathlessness, and fever including pneumonia. The disease is transmitted person to person through infected droplets. At present, the research on novel coronavirus is still in the primary stage. Based on the published study, we thoroughly summarize the history and origin, microbiology and taxonomy, mode of transmissions, target receptor, clinical features, diagnosis, prevention, and treatment about COVID-19. This short report writes in hope for providing platform to community and researcher dealings against with the novel coronavirus and providing a reference for further studies.

Keywords: Coronavirus, COVID-19, Severe acute respiratory syndrome-CoV

INTRODUCTION

The novel coronavirus (2019-nCOV) as well, severe acute respiratory syndrome 2 (SARS-CoV-2) was first detected from patients with pneumonia of an unknown reason in Wuhan City of Hubei territory of China to the worldwide in December 2019.[1] Since it has been confirmed as the pathogen for the novel coronavirus, recently named as coronavirus disease 2019 (COVID-19) by the World Health Organization. Globally, until April 5, 2020, there have been reported 12,03,485 confirmed cases and 62,000 deaths.[2,3] India has reported 3577 cases till date. The coronavirus may cause various respiratory infection such as coughing, sneezing, pneumonia, fever, breathlessness, and lung infection. The disease is transmitted by direct contact with infected droplets and the incubation period ranges from 2 to 14 days. COVID 19 is mild in most peoples in some elderly peoples having underlying medical problem such as diabetes, chronic respiratory disorders, and cardiovascular disease are more possible to develop severe illness such as pneumonia, acute respiratory distress syndrome, and multiorgan dysfunction.[4,5]

HISTORY AND BEGINNING OF CORONAVIRUS

Coronavirus is first observed in the mid-1930[6] and first human coronavirus found in 1960 as a cold.[7] Around 500 patients were recognized as flu-like system according the study was done

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A REVIEW OF COVID-19 (CORONAVIRUS DISEASE-2019) DIAGNOSIS, TREATMENTS AND PREVENTION

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ABSTRACT
There is a new world health crisis threatening the public with spread of COVID-19 (Coronavirus Disease-2019). Since December 2019, when Covid-19 emerged in Hunan seafood market at Wuhan, South China and rapidly spread throughout the world, the virus outbreak has been declared a public health emergency of international concern by World Health Organization (WHO). We here summarized the current clinical characteristics data to guide potential COVID-19 about Prevention, Diagnosis, Treatments and Prevention of COVID-19. In this review, we extracted data from various Research Reports, WHO guidelines and other articles. It is important to caution the readers that new data updating nearly every hour regarding clinical characteristics, diagnosis, treatment strategies, and outcomes of COVID-19. Throughout the world the disease has caused varying degrees of illness. Patient shows various symptoms usually fever, cough, sore throat, breathlessness, fatigue, and malaise among others. The disease is being cured through general treatment, symptomatic treatment, by using antiviral drugs, oxygen therapy and by the immune system. It is necessary to identify the potential cases as soon as possible and isolate the suspected people from the confirmed cases of COVID-19, to prevent the potential transmission of infection to other patients and health care staff.

KEYWORDS: Coronavirus Disease-2019, COVID-19, respiratory syndrome, symptoms, SARS, treatment.

INTRODUCTION
Coronaviruses are a large family of viruses which may cause disease in animals or humans.[1] Seven Coronaviruses can produce infection in people around the world but commonly people get infected with these four human coronaviruses: 229E, NL63, OC43, and HKU1. They usually cause a respiratory infection ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) and the most recently discovered coronavirus (COVID-19) causes infectious disease.[1] This zoonotic disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The WHO originally called this infectious disease Novel Coronavirus-Infected Pneumonia (NCIP) and the virus had been named 2019 novel coronavirus (2019-nCoV). On 11th Feb 2020, the (WHO) officially renamed the clinical condition COVID-19 (a shortening of Corona Virus Disease-19), which was announced in a tweet. An outbreak of COVID-19 caused by the 2019 novel coronavirus (SARS-CoV-2) began in Wuhan, Hubei Province, China in December 2019, the current outbreak is officially a pandemic.[2] Since knowledge about this virus is rapidly evolving, readers are urged to update themselves regularly. "Fig.1".[3]

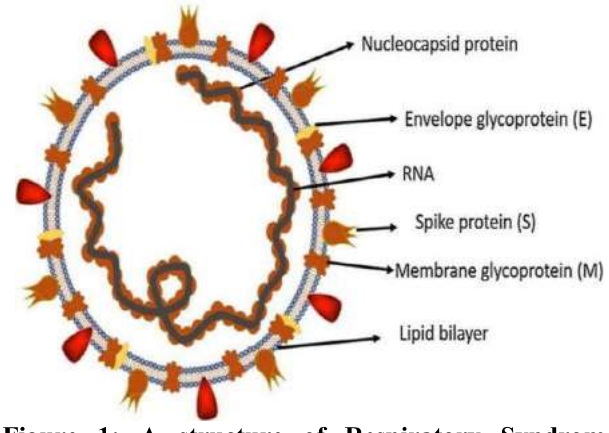

Figure 1: A structure of Respiratory Syndrome (SARS) coronavirus.

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Research Article

The Molecular Docking Study of Potential Drug Candidates Showing Anti-COVID-19 Activity by Exploring of Therapeutic Targets of SARS-CoV-2

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Abstract

Objectives: The novel human coronavirus designated severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first emerged in late 2019 in Wuhan, China. This virus spread rapidly around the globe, causing the respiratory illness called coronavirus disease 2019 (COVID-19). In view of the multiple threats and disorder posed by the pandemic, scientists around the world have been racing to understand SARS-CoV-2 and investigate the pathophysiology of this disease to find potential treatments and effective therapeutic drug candidates.

Methods: The virtual interaction of the COVID-19 main protease (Mpro) in complex with the inhibitor N3 (Research Collaboratory for Structural Bioinformatics Protein Data Bank [PDB] ID: 6LU7) with antiviral and antimalarial drugs was measured, as well as that of the SARS spike glycoprotein-human angiotensin-converting enzyme II (ACE2) complex (PDB ID: 6CS2) with antimalarial drugs currently on the market using the AutoDock Vina suite (O. Trott, The Scripps Research Institute, La Jolla, CA, USA).

Results: The binding energy result obtained from the docking of 6LU7 with ligands of oseltamivir, ritonavir, remdesivir, ribavirin, favipiravir, chloroquine, and hydroxychloroquine was found to be -4.7, -7.3, -6.5, -5.6, -5.4, -5.1, -5.3 kcal/mol, respectively. The binding energy from the docking of 6CS2 with ligands of chloroquine, and hydroxychloroquine was -7.1 and -6.8 kcal/mol, respectively. The docking results suggested drug molecules of oseltamivir, ritonavir, remdesivir, ribavirin, and favipiravir had a greater capability to inhibit SARS-CoV-2 since they demonstrated high affinity interactions with the COVID-19 Mpro in complex with the N3 inhibitor. Chloroquine and hydroxychloroquine also showed prominent binding interaction with the SARS spike glycoprotein-human ACE2 complex.

Conclusion: The results of this study suggest that these drugs are promising candidates for antiviral treatment with high potential to fight the SARS-CoV-2 strain.

Keywords: Antiviral drugs, hydroxychloroquine, SARS-CoV-2 protease

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Since December 2019, much of the world has suffered from the outbreak of coronavirus disease 2019 (COVID-19), the disease caused by a novel human coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] From its origin in Wuhan, China, it spread rapidly around the globe to affect all but Antarctica.[2] The World Health Organization declared it a pandemic in March 2020. As of April 14, 2020, 1,924,679 cases of COVID-19 infection had been reported worldwide, with 119,955 patient deaths and 445,405 patients who recovered.[3]

Novel approaches to drug design and discovery are being utilized to explore therapeutic drug candidates for COVID-19. Molecular docking is a promising tool for drug discovery and development through the study of the interaction of ligand (drug) molecules inside the binding pocket of a target protein (receptor).[4] It offers the opportunity to

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Review Article

QUICK RESPONSE CODE

A Review on Indian Medicinal Plants and Marketed Formulations used in Diabetes Mellitus

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ABSTRACT

Diabetes mellitus is a clinical syndrome characterized by a deficiency in insulin production or resistance to insulin action. Consequently, it leads to inappropriate hyperglycemia. The usage of herbal based medicine has been increasing tremendously in both developing and developed countries over the last three decades. The present study aims to provide a comprehensive review of antidiabetic activity of some medicinal plants. The efficiency of these medicinal plants may regulate the diabetic metabolic abnormalities. This work would help researchers to choose potential herbal for diabetic treatment. The study concludes that if explored and studies well these plants could act the unlimited source of bioactive compounds to be used in herbal medicine development. In the present review an attempt has been made to investigate the antidiabetic herbal plants and marketed formulations which may be useful to the health professionals and scholars for further scientific research in the field of pharmacology and therapeutics.

Keywords: Diabetes mellitus, antidiabetic activity, medicinal plants, formulations.

INTRODUCTION

Diabetes mellitus According to WHO, the term diabetes mellitus is defined as a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long-term damage, dysfunction and failure of various organs. Diabetes mellitus may have the characteristic symptoms such as thirst, polyuria, blurred vision and loss of weight [1].

Diabetes mellitus (DM) is a faction of metabolic disorder and commonly affects many people around the globe. Due to decrease in insulin, DM has been characterized by hyperglycemia, hyperlipedemia, hyperaminoacidemia and hypoinsulinaemia. DM generally known to be two types based on insulin dependent (i.e., type I and type II diabetes). Type I diabetes is also known as immature diabetes which depend on insulin and affects 5% of diabetic population. The Type II diabetes known to be non-insulin dependent and generally affects people who are above 40 age groups. It is well established that the hyperglycemia of diabetes which damages organs in the body [2].

Types of Diabetes Mellitus[3]

1. Insulin Dependent Diabetes Mellitus (IDDM, Type 1)

2. Non-Insulin Dependent Diabetes Mellitus (NIDDM Type 2)

3. Gestational diabetes (Type 3)

Diabetes Symptoms

- Loss of weight indicates that there is a problem in the blood sugar level and functioning of insulin
- Blurred vision
- Frequent urination is one of the major symptom of diabetes
- Severe hunger pain or emptiness stress and irritation also give sign of diabetes.
- Nausea and vomiting
- Extreme weakness and tiredness
- Unusual thirst
- Mood change, etc.

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Review Article

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CONVALESCENT PLASMA THERAPY- A PROMISING APPROACH TO TREAT COVID 19

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INTRODUCTION

In a rapidly evolving pandemic, therapeutic options must be available quickly as is applicable to the current pandemic threat to the human life named COVID 19.[1] Besides, many other options being tried to treat the disease, apart from use of medicinal agents which at the moment are being used as a blind trial and nothing more than that, use of convalescent plasma transfusions could be of great value in the current pandemic of coronavirus disease (COVID-19), given the lack of specific preventative and therapeutic options. This convalescent plasma therapy is of particular interest when a vaccine or specific therapy is not yet available for emerging viruses, such as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19. Response to emerging and re-emerging infectious diseases throughout history has included rapid scientific collaborations to develop specific vaccines or therapies. To that end, currently, there is a large global trial supported by the World Health Organization (WHO), SOLIDARITY, to investigate existing therapies for COVID-19, including remdesivir, chloroquine and hydroxychloroquine, lopinavir and ritonavir, and lopinavir + ritonavir + interferon-beta. In addition, there is broad interest to leverage convalescent plasma from recovered COVID-19 patients as treatment or for prophylaxis of health care workers and other caregivers. The United States Food and Drug Administration (US FDA) has released guidance for investigation of convalescent plasma in the United States for COVID- 19.[2] Additionally, historic data has reported safety and efficacy of convalescent plasma for use in other infectious diseases, and there is also new data on convalescent plasma use in the current global public health emergency specifically to treat COVID-19. Optimization of known potential benefits of convalescent plasma may improve efficacy to support the medical needs of the widespread impact of COVID-19.

Immune (i.e. “convalescent”) plasma refers to plasma that is collected from individuals, following resolution of infection and development of antibodies. Passive antibody therapy, through transfusion of convalescent plasma, may prevent clinical infection or blunt clinical severity in individuals with recent pathogen exposure. Antibody therapy can also be used to treat patients who are already manifesting symptoms of varying severity. However, passive antibody therapy is most effective when administered prophylactically or used early after the onset of symptoms.[3, 4]

COVID-19 disease

The coronavirus disease 2019 (COVID-19) viral pneumonia is now a worldwide pandemic caused by the severe acute respiratory virus coronavirus 2 (SARS-CoV-2).[5] The number of cases and associated mortality has increased dramatically since the first cases in Wuhan, China in December 2019. As of May 20th, this virus had affected at least 4900000 people worldwide and caused more than 330000 deaths. The global number of cases and related deaths are increasing steadily, with the notable exception of China that exhibits a flattening incidence curve since mid-February.

To date, no specific treatment has been proven to be effective for COVID-19. Treatment is currently mainly supportive, with in particular mechanical ventilation for the critically ill patients. Novel therapeutic approaches are in acute need. In this context, the therapeutic potential associated with convalescent plasma needs to be explored.[6, 7]

Clinical use of convalescent plasma

The transfusion of convalescent blood products is not a new clinical tool in emerging infectious disease outbreaks (“Fig.1”). Historically, passive immune therapy has involved convalescent whole blood, convalescent plasma, pooled human immunoglobulin for intravenous or intramuscular administration, high-titer human immunoglobulin, and polyclonal or monoclonal antibodies; however, plasma collected by apheresis is currently the preferred therapy.[8] Use of blood products from recovered patients dates back to the late 1800s.[9]

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ORIGINAL ARTICLE

Recognition of Natural Products as Potential Inhibitors of COVID-19 Main Protease (Mpro): In-Silico Evidences

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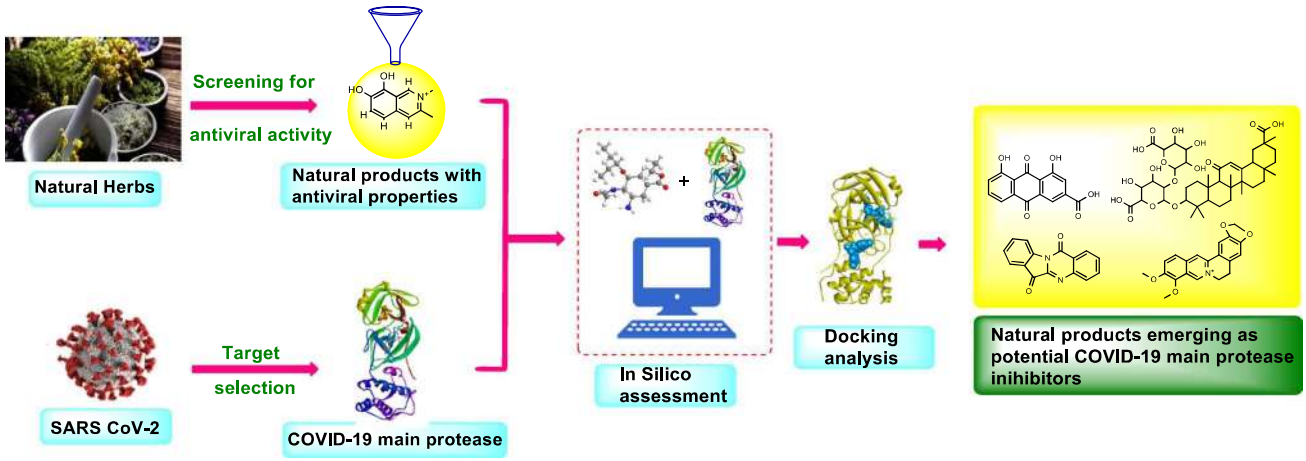
Abstract

SARS-CoV-2 (2019-nCoV) emerged in 2019 and proliferated rapidly across the globe. Scientists are attempting to investigate antivirals specific to COVID-19 treatment. The 2019-nCoV and SARS-CoV utilize the same receptor of the host which is COVID-19 of the main protease (Mpro).COVID-19 caused by SARS-CoV-2 is burdensome to overcome by presently acquired antiviral candidates. So the objective and purpose of this work was to investigate the plants with reported potential antiviral activity. With the aid of in silico techniques such as molecular docking and druggability studies, we have proposed several natural active compounds including glycyrrhizin, bicylogermecrene, tryptanthrine, β-sitosterol, indirubin, indican, indigo, hesperetin, crysophanic acid, rhein, berberine and β-caryophyllene which can be encountered as potential herbal candidate exhibiting anti-viral activity against SARS-CoV-2. Promising docking outcomes have been executed which evidenced the worthy of these selected herbal remedies for future drug development to combat coronavirus disease.

Graphic Abstract



Keywords nCoV-2019 · COVID-19 main protease · Herbal remedies · Docking study · Druggability

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1 Introduction

COVID-19 became a global risk to the healthcare system of almost every nation around the world. In the back of December 2019, a novel coronavirus strain was identified which was initially named as 2019 novel coronavirus (2019-nCoV) and it was evolved during an outbreak in Wuhan,

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RESEARCH ARTICLE

The *Berberis aristata* Ameliorates oxazolone induced contact dermatitis: in-vivo and in silico evidences

Sachin D. Shinde[1] · Rameshwar S. Cheke[2] · Prafulla R. Tathe[3] · Pankaj G. Jain[4] · Rohan R. Narkhede[5]

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Abstract

The objective of the present study was to evaluate the effect of *Berberis aristata* (BA) against oxazolone induced contact dermatitis in Balb/c mice and molecular docking with TLR-1 and TLR-2. Dermatitis was induced in Balb/c mice by sensitizing with topical application of 100 µl oxazolone (2%) and the effect of BA was screened in two doses (200 mg/kg and 400 mg/kg P.O.). The effect was evaluated by the change in ear thickness, anti-inflammatory cytokine (TNF-α, IL-6, and IL-1β) and oxidative stress on the sixth day in ear tissue homogenate. The ear skin of all group mice was subjected to histological analysis. This work was further evidenced by the docking of berberine with crystal structure of TLR1-TLR2 heterodimer caused by using the binding of tri-acylated lipopeptide (PDB ID: 2Z7X). In this study, we found that a significant reduction in ear thickness was found in BA (200 mg/kg and 400 mg/kg) as compared to 100 µl oxazolone(2%) treated mice. The reduction level of GSH and SOD found in 100 µl oxazolone (2%) sensitized mice. BA (200 mg/kg and 400 mg/kg) treated animals showed an increase in GSH and SOD levels. A significant reduction in inflammatory cytokines was observed in BA treated mice and indicates anti-inflammatory activity against oxazolone. Histopathological analysis showed minimal infiltration of lymphocytes and moderate harm to skin cells and layer in BA treated mice. Docking studies revealed promising binding interaction of berberine withTLR1-TLR2 heterodimer which can attribute to its anti dermatic effect. This present research shows that BA has a dose-dependent effect in contact dermatitis attenuated by oxazolone.

Keywords Oxazolone · Dermatitis · *Berberis aristata* · Cytokine · In silico study

Introduction

Dermatitis is a continual inflammatory disease associated with the immune system characterized through the infiltration of activated T cells, dermal angiogenesis, epidermal hyperplasia, and expanded cytokine levels (Guttman-Yassky et al. 2011; Zheng et al. 2009). The superiority of acute dermatitis is growing gradually and impacts about 25 million human beings in North America and Europe and is probably the most enormous immune-mediated pores and skin disease in adults(Furue and Kadono 2017; Menter 2016). Clinically of dermatitis are adjustments inside the skin as scales, thickening, redness(Charman et al. 2003). Histological symptoms of dermatitis lesions are the formation of Munro's microabscesses containing neutrophils, parakeratosis, ortohypokeratosis, and invasion of leukocytes such as CD4 + and CD8 + T cells, mast cells, dendritic cells, and macrophages into epidermis and dermis (Petersen 2006). Many published reports proved that Toll-like receptors (TLR) play a key role in inflammation-related to hapten-based innate immune activation, in dermatic condition activation of TLR-1 and TLR- 2 occurs (Schmidt et al. 2016). The underlying pathophysiological mechanism involved in dermatitis is provoked synthesis

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RESEARCH ARTICLE

Synthesis and Assessment of Sub-acute Toxicity of Novel Rosin Esters of Polyethylene Glycol 200 in Swiss Albino Mice

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ABSTRACT:
The objective of present investigation was to synthesize and assess sub-acute toxicity of novel rosin esters using Swiss Albino mice. Assessment of the safety and toxicity of rosin esters is very important step before its use in pharmaceuticals. The solutions of rosin esters were prepared in corn oil to perform acute (28d) oral toxicity study in Swiss Albino mice as animal model of both sexes. The oral administration of rosin esters at the dose of 25 mg/kg of body weight and constant volume was administered to the mice. One group of mice was kept as a control group. Toxicity of the rosin esters was assessed by using various tests like behavioral changes, clinical signs, mortality and morbidity, biochemical tests, haematological tests, relative organ weights and histopathology tests. The body weights and food-water consumption by mice were recorded on weekly basis. The study results revealed that, there were no signs and incidences of toxicity or mortality in mice during the study period. No significant difference between treated (rosin ester administered) and control group of mice were recorded in the observations of different tests, body weights and food-water consumption. The histopathological examination of organs from the mice treated with rosin esters for 28d does not show any signs of toxic effects when compared with the control group. Therefore, the present investigation confirmed the non-toxic nature of novel rosin ester at 25mg/kg daily dose of body weight after oral administration in both the sexes.

KEYWORDS: Rosin ester, Corn oil, Swiss Albino mice, Toxicity, Histopathology.

INTRODUCTION:

The advancement of the sustainable material is very important topic of concern for today and future. The production of energy and plastic from fossil fuel has several limitations. It will nearly exhaust soon. For the ecology concerns, as oil resources are depleting, the interest in the development of eco-friendly materials from renewable natural resources is increased.[1] Rosin is the one of most important renewable substance. Rosin or colophony is a natural and abundantly available polymeric material derived from pine tree. It was widely used in the paper, coating, printing ink, polymer, food industries etc. It acts as a precursor for flux in soldering.[2] The rosin contains about 90% of monocarboxylic acid (of alkylated hydrophenanthrene), rosin acid (molecular formula $C_{20}H_{30}O_2$).

The major rosin acids include abietic acid which contains tertiary carboxylic acid (-COOH) and conjugated double bonds and pimaric acid with non-conjugated double bonds. The rosin acid is containing two chemically reactive centers namely -COOH group and double bond. They are considered as safe, biodegradable and biocompatible.[3,4] These are soluble in alcohol, benzene, chloroform and ether. It is insoluble in water. Polyethylene glycol (PEG) or poly (ethylene oxide) is a petroleum base polymer represents water-soluble monohydroxy alcohols. These are used as a base in ointments and suppositories, as a plasticizer in film coating, as a auxiliary emulsifier, as flux vehicle in WSFs for electronic industrial etc.[4-6] But the natural polymers remains a choice of matter because of their low cost, quick availability, capacity of undergoing several chemical transformations and biological safety.

The rosin and its derivatives were employed for microencapsulating model drug.[7-9] They were used as an anhydrous binder and matrix former in conventional and sustained release formulations respectively.[10-12] They were exploited as a pharmaceutical aid in chewing gum

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Review Article

COVID-19: A pandemic declare by world health organization

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ABSTRACT

A novel coronavirus (SARS-CoV-2, currently known as 2019-nCoV) cause an acute respiratory disease which is termed as the coronavirus disease 2019 (COVID-19) recently has spread firstly in China and subsequently to other parts of world too and therefore, received worldwide attention. After the spread in China, World Health Organization (WHO) on 30 January 2020 officially declared the COVID-19 epidemic as a public health emergency of international concern. In the twenty-first century, firstly in 2002, the emergence of SARS-CoV-2 resulted in the severe acute respiratory syndrome followed by the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012, which was also remarked as the highly pathogenic and large-scale epidemic coronavirus affected the human population. As per data released by WHO on 1 March 2020, globally a total of 87,137 cases and 79,968 cases in China were confirmed with 2977 deaths (3.4%) worldwide. Subsequently, researchers have identified that SARS-CoV-2 belongs to β-coronavirus, which is quite similar to genome which belongs to bat coronavirus, declaring bat as the natural host for the particular virus. The novel coronavirus make use of the same receptor, angiotensin-converting enzyme 2 (ACE2) which was used by SARS-CoV, and chiefly spreads through the respiratory tract. Dominantly, this COVID-19 virus shows evidence of sustained human-to-human transmission, across the globe. The foremost clinical symptoms showing by most of the patients were fever, dry cough, fatigue, difficulty in breathing and less commonly gastrointestinal infections. The older and persons with underlying diseases like any cardiac problem, diabetes, cancer or kidney problems are more susceptible to COVID-19 infection and also vulnerable to serious outcomes, which may be associated with acute respiratory distress syndrome (ARDS) and cytokine storm. If we talk about the treatment part, currently, there are few specific antiviral strategies, but several drug regimen and other antibody type investigations are under trial. The present review summarizes the epidemiology, pathogenesis, and clinical characteristics of COVID-19 with the current treatment procedures and future scientific advancements to combat the epidemic novel coronavirus.

1. Introduction

1.1. What are coronaviruses?

Coronaviruses (CoVs) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERSCoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans. [1]

Coronaviruses are large, enveloped, positive-stranded RNA viruses. They have the largest genome among all RNA viruses. The genome is packed inside a helical capsid formed by the nucleocapsid protein and further surrounded by an envelope. Associated with the viral envelope are at least three structural proteins: the membrane protein and the envelope protein are involved in virus assembly, whereas the spike protein mediates virus entry into host cells. Among the structural proteins, the spike forms large protrusions from the virus surface, giving coronaviruses the appearance of having crowns (hence their name; corona in Latin means crown). In addition to mediating virus entry, the spike is a

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Open Access Review Article

Miraculous Benefits of Cow Urine: A Review

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ABSTRACT

Go-mutra therapy provides an especially rich and provocative research topic. The ancient scriptures of ayurveda consider cow urine to be the elixir of life. Cow urine is one of the five contents of *Panchagavya* which obtain from cow (urine, milk, ghee, curd and dung). Cow based treatment is called as *Panchagavya Chikitsa* (Cowpathy). Cow urine is a divine medicine and is used for treatment of diabetes, blood pressure, asthma, psoriasis, eczema, heart attack, blockage in arteries, fits, cancer, AIDS, piles, prostrate, arthritis, migraine, thyroid, ulcer, acidity, constipation, gynaecological problems, It also increase the nitrogen content of the soil, for better rearing of honey bees, hasten the pubertal age of the heifers exposed to bull's urine and as pesticide and larvicide for the fodder crops. Cow urine contains all substances, which are naturally present in the human body. Thus, consumption of cow urine maintains the balance of these substances and this helps cure incurable diseases like cancer, AIDS, autoimmune disorders better benefits in case of antibiotic resistance infectious diseases.

Cow urine is excellent bioenhancer and recently Cow urine distillate has been granted U.S. patents. Further researches is required to prove its qualities and benefits.Various actions and researches on cow urine are summarized in this article.It is the most effective natural remedy and the safest method of treatment on nature based.

Keywords: Gomutra, Panchgavya, CUC, Vermicompost, Immunostimulant.

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INTRODUCTION

'The cow' is an itinerant medicinal dispensary and cow urine is a panacea of all diseases[1]. Cow being considered as a holy animal from ancient time in eastern philosophy[2-3]. Indian cow breeds are exceptional and diverse species, popularly recognized as "Kamdhenu" (One who can comprehensive all wishes of mankind) and "Gaumata, (Cow is called as mother). Cow urine (Sanskrit: Gomutra) has a special significance in Indian custom. Cow urine is said to have a divine cleansing consequence as well. Cow urine has been narrated as water of life or "Amrita" (beverages of immortality), the nectar of the God. "Panchagavya" is a mixture of cow urine, milk, dung, ghee and curd[2]. The cow urine, one of the constituents of 'Panchagavya' is proficient of treating many curable as well as incurable diseases and has been used abundantly in ayurvedic preparations since time immemorial as quoted in prehistoric holy texts like Charaka Samhita, Sushruta Samhita, Vridhabhagabhatt, Atharva Veda, Bhavaprakash, Rajni Ghuntu, Amritasagar, etc[5]. In Charaka Samhita, Sushruta Samhita and Vangbhat, reported eight kinds of animal urines that can be used in medication and therapeutics. All these mutras (eight types of urine from diverse animals) are sharp, hot, pungent, bitter with salty as a secondary taste, light and promotive of evacuation[4].

Cow urine has many beneficial properties particularly in the areas of agriculture and therapeutics. It has also been observed during the scientific research that the urine of Indian cows is extremely effective. A lots of research has been conducted in Cow Urine Treatment and Research Center, Indore over the past few years and it has been stated that gomutra is capable of curing blood pressure, blockage in arteries, arthritis, diabetes, relieving Kaphaja and Vataja disorders, those caused by Krimi (worms), Meda (excessive adiposity), Visha(poisoning), Gulma (gaseous swelling of the abdomen), Arsha (piles), skin diseases including leprosy, psoriasis, eczema, Shopha (inflammation), Agnimandya (loss of appetite), pallor, heart disease, cancer, thyroid, asthma, prostrate, fits, AIDS, piles, migraine, ulcer, gynecological problems, ear and nose complications and several other diseases. Externally it has been used as lotion, ointments and bath, but, internally it has been used in preparation of oral medications and drinks[4,6]. The cow urine not only used in contradiction of ailments of diseases as therapeutic agents but also have several other uses as in domestic chores,

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Anacyclus Pyrenthrum: An Unexplored Ethanomedicinal Plant

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ABSTRACT

Anacyclus pyrenthrum most widely growing species of the family Asteraceae. The plant having several pharmacological actions such as antidiabetic, immunostimulant , inhibitory effects, antidepressant activity, anticonvulsant activity, memory-enhancing activity, aphrodisiacs, antimicrobial activity, antioxidant, local anesthetic effect, insecticidal effect, action on COX and LOX, interactions with testosterone, interaction with libido, and it interaction with testicles. mostly the root is having phytochemical components which shows above pharmacological activity.

KEYWORDS: *antidepressant activity, aphrodisiacs, antidiabetic, immunostimulant*

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INTRODUCTION

Akarkara bolongs to asteraceae family of plants and its botanical name is *Anacyclus pyrenthrum*. It is an herb with many medicinal uses. Apart from Ayurveda, it is used by other alternative systems of medicine like Unani and Homeopathy. The herb is mostly know and famous for its aphrodisiac effect on the body and helps in the detoxification of excess wastes and fluids from body. Most beneficial and useful part of plant is the root which is medicinally used in the form of dried powder.[1] *Anacyclus pyrentrum* is a perennial herb much like chamomile in habitat and appearance. It is in a different family Asteraceae from the plants know as pellitory of the wall and spreading pellitory. It is found in North Africa, in Mediterranean reagion, in North India, the Levant and in certain regions in the Arabian peninsula.

Anacyclus perenthrum or Pellitory or Spanish chamomile or Mount Atlas daisy or akarkara is a medicinal plant which traditionally used as sex stimulant, antidiabetic, antioxidant, asthmatic drug ,cardiac disease, and throat problems, remove laziness, nerves weakness, carminative, stomach ache, arthritis, diuretic, tooth and gum problems, aphrodiasiacs, epilepsy, headache, pains, muscle relaxant, etc.

Fig: *Anacyclus pyrenthrum*

Common Names of *anacyclus pyrenthrum*[1]

- English name: Pellitory
- Hindi name: Akarkara
- Sanskrit name: Akarkara
- Gujrati name: Akkorakaro
- Bengali names: Akkalkara
- Marathi name: Akkalkara
- Telugu name: Akarkaram
- Tamil name: Akkirakaram

Taxonomical Classification[1]

- Kingdom: Plantae
- Clade:Trachophytes

PHYTOCHEMICAL SCREENING AND EVALUATION OF INVITRO ANTIOXIDANT ACTIVITY OF POLYHERBAL FORMULATION

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ABSTRACT

The aim of the present research was to develop a polyherbal formulation (PHF) using five different herbal extracts and to evaluate phytochemicals by preliminary phytochemical screening, Physicochemical properties and determination of antioxidant activity by DPPH method. The plant materials were authenticated by studying its morphological and pharmacognostic characters. Phytochemical screening showed the presence of alkaloids, glycosides, carbohydrates, amino acid, tannin, steroids, and flavonoids in the combination extract. Physical parameters such as loss on drying (LOD), pH, ash values, LOD, and extractive value have been studied, and shows the better result within the limit prescribed by WHO. The antioxidant activity of the Polyherbal formulation was determined using DPPH free radical scavenging method. The results showed that the Polyherbal formulation has best antioxidant effect at a dose of 400 µg/ml when it was compared with ascorbic acid as the reference standard.

Keywords: Polyherbal formulation, Phytochemical, Antioxidant activity, Ascorbic acid

INTRODUCTION

The human body has a complex system of natural enzymatic and non-enzymatic antioxidant defenses which counteract the harmful effects of free radicals and other oxidants. Free radicals are responsible for causing a large number of diseases including cancer, cardiovascular disease, neural disorders, Alzheimer's disease, mild cognitive impairment, Parkinson's disease, alcohol induced liver disease, ulcerative colitis, aging and atherosclerosis. Protection against free radicals can be enhanced by various herbal antioxidants. Substantial evidence indicates that polyherbal formulations containing antioxidants are of major importance in disease prevention. There is, however, a growing consensus among scientists that a combination of antioxidants in form polyherbal formulations, rather than single entities, may be more effective over the long term. Antioxidants may be of great benefit in improving the quality of life by preventing or postponing the onset of degenerative diseases. In addition, they have a potential for

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Repurposing of Anthelmintic Drugs against SARS-CoV-2 (Mpro and RdRp): Novel Disease, Older Therapeutics

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Abstract: Since late December 2019, the entire nations are facing the novel enemy of COVID-19, which has imposed a tremendous burden on the researchers across the globe to develop a treatment for it. Recognition of main protease and RNA dependent RNA polymerases as a promising target of SARS-CoV-2 encouraged us to repurpose some older antihelmintic drugs against COVID-19. In this constructive research, we have investigated anthelmintic drugs' antiviral activity, including ivermectin, doramectin, and selamectin, for their antiviral potential against SARS-CoV-2 by employing *in silico* tools. The selected drugs, including ivermectin, doramectin, and selamectin, were encountered as potential inhibitors of SARS-CoV-2 RNA-dependent RNA polymerases with an affinity of -9.2, -10.0, and -10.2 kcal/mol. They were found to exhibit main protease inhibitor activity with an affinity of -8.3, -8.7, and -9.0, respectively. Thus, using the repurposing approach in conjugation within *silico* tools, we have proposed ivermectin, doramectin, and selamectin as potential antivirals against SARS-CoV-2.

Keywords: COVID-19; anthelmintic drugs; RNA dependent RNA polymerases; main protease; *in silico* tools.

1. Introduction

The entire era faces the outbreak of pandemic COVID 19, which was previously recognized under the term of pneumonia invading in China's areas, especially in Wuhan, in late December 2019 [1–3]. SARS-CoV strain is recognized as frightful among the coronavirus producing massive deaths after spreading across nearly all the nations [4]. Similar to SARS-CoV, MERS-CoV emerged in Saudi Arabia and has about 2,500 cases, with 800 deaths [5]. The common clinical manifestations of COVID-19 include respiratory complications, fever, dry cough, muscle ache, and malaise [6]. World Health Organization declares COVID-19 as pandemic on 11 March 2020, which is ruinous for across the entire nations [7]. As of 26 August 2020, there has been 2,12,94,845 cases of COVID-19 are reported worldwide, along with more than 7,61,779 deaths all over the nations (Coronavirus Outbreak. Available at https://www.worldometers. info/coronavirus/). The developed countries, including the USA, Spain, and Italy, are suffering from the extreme death rate, which is rapidly increasing (Coronavirus Outbreak. Available at https://www.worldometers. info/coronavirus/). The

A COMPREHENSIVE REVIEW ON BHASMA AND HERBOMINERAL FORMULATION IN AYURVEDA

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ABSTRACT

Ayurveda is *one of the oldest system of medicine, The Ayurvedic literature Sarangdhar Samhita tinted the idea of polyherbalism to attain greater therapeutic efficacy. Polyherbal and herbo-mineral formulations combining the multiple herbs in a meticulous ratio, it will give an enhanced therapeutic effect and decrease the toxicity. Herbomineral formulation is known as Rasaaushadhies. Ayurvedic herbal and herbo-mineral preparations are used for the treatment of chronic and degenerative diseases without any side-effect. Herbo mineral formulation uses the metals and minerals for chronic disorders in different combinations, dosage forms and at various levels of purities. Hence it is very essential to prepare it in a proper way. As per the reported data, there are so many herbo-mineral formulations available in market which is useful in anaemia, diabetes, cancer, liver diseases, skin diseases etc. This review is an attempt to emphasis on the benefits and problems associated with it.*

Keywords: *Ayurveda, Bhasma, Heavy metals, Herbo-mineral*

INTRODUCTION

In the few decades, there has been exponentially growth in the field of herbal medicines. Nature always stands as a golden mark to exemplify the outstanding phenomena of symbiosis. Today about 80% of people in developing countries still relay on traditional medicine based largely on the different species of plants for their primary health care. About 500 of plants with medicinal uses are mentioned in ancient literature and 800 plants have been used in indigenous system of medicine. The various indigenous systems such as Ayurveda, siddha, unani use several plant species to treat different ailments[1-3.]

The "Ayurvedic Materia Medica" comprises of resources of plant, animal, metal, and mineral origin. Herbal extracts are being used as ingredients of poly-herbal, herbomineral, and metallic compound formulations this given in classical texts of Ayurveda including *Charakasamhita*, *Sushruta Samhita*, and *Ashtanga hridaya*[4]. Ayurvedic drugs in two group i.e. Kasthoushadhies (herbal preparation) and Rasaoushadhies (Herbo-bio-mineral metallic preparation).

Concept of Herbomineral Formulation

A specialized branch in Ayurveda, which is "Rasa Shastra" having literal meaning as "Science of Mercury" deals with materials known as 'Rasa dravyas''. Rasa denotes mainly *Parada* (Mercury). Formulations made by mercury and incinerated metals and minerals are known as Rasa-aushadhis (Herbo-mineral-metallic preparations).

The rasa-aushadhis are having qualities such as instant effectiveness, requirement in very small dosage and ample therapeutic utility. There are four methods of preparation of these formulations i.e. *Khalviya Rasayana, Parpati Rasayana, Kupipakawa Rasyana, Pottali Rasayana. Mahalaxmivilas Rasa* is a herbo-mineral-metallic preparation comes under the *Khalviya Rasayana*[5].

The herbomineral preparations essentially contain minerals and metals as integral part of the formulations but these metals are not present in elemental form. They are in the compound form and their fate in the body will not be the same as it is for the elemental form of heavy metals. The sophisticated manufacturing process of *Shodhana* and *Marana* ensure that deep changes are taking place in these minerals. The finished form after reaction with several organic and inorganic material of herbal origin is finally responsible for action, changing the properties of the toxic metal, making it therapeutically effective and provide safety of very high grade[6].

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Elemental Impurities: A Review

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Abstract

The ICH Q3D is an important guideline to harmonize control of elemental impurities. The guideline sets strict limits for final drug products, limits for excipients, active pharmaceutical ingredients and other pharmaceutical drug products. The analysis of elemental impurities in the pharmaceutical products is most important in pharmaceutical industries. In the last decade noteworthy progress has been made in the analysis of elemental impurities. The changes from using special reagents which form precipitate with the metallic impurities and are detected by colorimetric methods to using highly sophisticated instruments for analysis. This review article will cover in brief about the classes of elemental impurities, their permitted daily exposures, concentrations, risk assessment, control strategies and instruments used for analytical testing. With the risk assessment approach, the contribution of elemental impurities of each component is assessed. The option 1 limit (based on 10 g daily dose) may be used as default concentration limit. This approach allows manufacturers to provide crucial information about the contribution of impurities in final drug products from excipients or active pharmaceutical ingredients.

Keywords: *Analytical, control limits, elemental impurities, ICH, risk assessment, strategy*

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INTRODUCTION

In the pharmaceutical products, different types of elemental impurities may present like some metals, catalysts, contaminants and excipients. These impurities may be from natural sources or equipment which are used in the synthesis of drug. It may also come from containers or may be added intentionally by the manufacturer of the product. When elemental impurities are known to be present or added, it required the assurance of compliance to the specified levels. The levels of elemental impurities in the drug product should be controlled within acceptable limits, because elemental impurities do not provide any therapeutic benefit to the patient. The International Conference on Harmonization (ICH) has published the ICH Q3D Guideline for Elemental Impurities in December 2014 and the guideline was revised in March 2019. There are three parts of this guideline: A) the evaluation of the toxicity data for potential elemental impurities; B) the establishment of a Permitted Daily Exposure (PDE) for each element of toxicological concern; and C) application of a risk-based approach to control elemental impurities in drug products. The PDEs mentioned in this guideline are considered to be protective for public health for all patient populations. In some cases, lower levels of elemental impurities may be warranted. Levels below toxicity thresholds have been shown to have an impact on other quality attributes of the drug product (e.g., element catalyzed degradation of drug substances). In addition, for elements with higher PDEs, other limits may have to be considered from a pharmaceutical quality perspective and other guidelines [1].

The guideline applies to new finished drug products and new drug products containing existing drug substances. The drug products containing purified proteins and polypeptides, and their derivatives, are within the scope of this guideline [1].

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Research paper

One- pot development of spray dried cationic proliposomal dry powder insufflation: Optimization, characterization and bio-interactions

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Carboxymethyl chitosan
Proliposomes

ABSTRACT

In the present investigation, one-pot synthesis method has been reported for the preparation of tramadol loaded proliposomes (PLs) coated with chitosan (CCPLs) and carboxymethyl chitosan (CM-ChPLs) for intranasal administration. Spray drying method used for formulation of PLs was optimized using Design of Experiment (DoE). The formulated PLs were extensively characterized and evaluated. The formulation was assessed for biocompatibility using cell viability assay, along with estimation of inflammatory potential of PLs, *in vitro* drug permeation across nasal mucosa, *in vitro* mucoadhesion study, nasal mucosa penetration study and analysis of powder spray pattern. The prepared PLs were also assessed for their interactions and stability under various physiological conditions. The interaction of different PLs with serum protein and mucin was assessed using DLS and zeta potential measurement. The stability study demonstrated superiority of coated PLs over uncoated PLs. The cell viability study confirmed the biocompatibility of developed PLs while confocal microscopy confirmed enhanced permeation of coated PLs across nasal mucosa. All PLs were stable in simulated nasal fluid. The *in vitro* drug release studies demonstrated sustained release which was also supported by results obtained after *ex vivo* permeation study. The overall results confirmed that type of surface modification and surface charge along with particle size plays an important role in type and extent of interaction of PLs with proteins and mucin. This could directly or indirectly affect the diffusion or penetration of nanoliposomes across mucosa and ultimately affects *in vivo* results.

1. Introduction

The concept of drugs getting absorbed systemically is quite old and potential of this route for drug delivery has been reported previously by many researchers from early 1980s [1–5].The pioneer work for exploring nasal route for delivery of therapeutic agents was done by Hussain et al., in 1979. Delivery of drugs through nasal route presents distinct benefits such as vast surface of the nasal cavity from where drugs pass directly into the systemic circulation after being absorbed and richly vascularised epithelial cells facilitates in avoiding the first-pass liver metabolism which makes it an attractive route for drug delivery [6]. Apart from convenience of administration and safety of being non-invasive, nasal route results in rapid onset of action in comparison with sublingual, transdermal and oral route [7]. However, low permeation across nasal mucosa along with rapid muco-ciliary clearance (which decreases the retention time of dosage form on nasal epithelium) are some of the major disadvantages associated with nasal route of drug delivery [8]. To enhance the time of residence of drug on nasal epithelium and to reduce mucociliary clearance, several modifications were performed in past such as use of viscosity enhancer [9] and bio-adhesive microsphere [10] to name a few.

Powder formulations for nasal administration have been reported

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nanomaterials

MDPI

Review

Black Phosphorus as Multifaceted Advanced Material Nanoplatforms for Potential Biomedical Applications

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Abstract: Black phosphorus is one of the emerging members of two-dimensional (2D) materials which has recently entered the biomedical field. Its anisotropic properties and infrared bandgap have enabled researchers to discover its applicability in several fields including optoelectronics, 3D printing, bioimaging, and others. Characterization techniques such as Raman spectroscopy have revealed the structural information of Black phosphorus (BP) along with its fundamental properties, such as the behavior of its photons and electrons. The present review provides an overview of synthetic approaches and properties of BP, in addition to a detailed discussion about various types of surface modifications available for overcoming the stability-related drawbacks and for imparting targeting ability to synthesized nanoplatforms. The review further gives an overview of multiple characterization techniques such as spectroscopic, thermal, optical, and electron microscopic techniques for providing an insight into its fundamental properties. These characterization techniques are not only important for the analysis of the synthesized BP but also play a vital role in assessing the doping as well as the structural integrity of BP-based nanocomposites. The potential role of BP and BP-based nanocomposites for biomedical applications specifically, in the fields of drug delivery, 3D printing, and wound dressing, have been discussed in detail to provide an insight into the multifunctional role of BP-based nanoplatforms for the management of various diseases, including cancer therapy. The review further sheds light on the role of BP-based 2D platforms such as BP nanosheets along with BP-based 0D platforms—i.e., BP quantum dots in the field of therapy and bioimaging of cancer using techniques such as photoacoustic imaging and fluorescence imaging. Although the review inculcates the multimodal therapeutic as well as imaging role of BP, there is still research going on in this field which will help in the development of BP-based theranostic platforms not only for cancer therapy, but various other diseases.

Keywords: bioimaging; wound healing; 3D printing; surface modification; characterization

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1. Introduction

The discovery of Black Phosphorus (BP) dates back to a hundred years ago. It all began with Bridgman [1], who brought about the conversion of white phosphorus to black phosphorus under a high temperature and pressure. Later, Hultgren et al. [2] demonstrated

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Research Paper

Recent advances in phytochemical-based Nano-formulation for drug-resistant Cancer

Mahesh P. More [a], Sagar R. Pardeshi [b], Chandrakantsing V. Pardeshi [c], Gaurav A. Sonawane [a], Mahesh N. Shinde [d], Prashant K. Deshmukh [e], Jitendra B. Naik [b], Abhijeet D. Kulkarni [a,*]

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Phytonanoformulations
Inhibition of expressed proteins

ABSTRACT

The graph of drug resistance in cancer is reportedly increasing in terms of therapeutic efficiency. As per the WHO reports, around 70% of death reported in low- and middle-income countries. The increase in death toll was imparted from improper diagnosis and inadequate therapy. The 25% increase in disease burden may be laden due to resistance mutations in cancer during treatment. Exposure of high concentrations of chemotherapeutic agents leads to toxicity in the normal cells. Long-term conventional chemotherapy develops acquired resistance. The conventional therapeutics was not able to target the cancer cell specifically and need to promulgate the use of nanocarrier or bioengineering for the polychemotherapy. Phytochemicals are natural constituents providing alternative therapeutic approach to minimize the resistance. The present review highlights the nano-therapeutic approaches pondering over the conventional chemotherapy. The phytochemicals are extracted, isolated, and purified from daily dietary fibers or natural plants. Natural extractives act via multiple pathways and provide optimum effectiveness against resistance cancer. The poor solubility and bioavailability are major constraints in combination therapy. The nanotechnological approach improves the functional properties transportation across cell barriers, and improves bioavailability. The present review highlights the phytochemical based nanoformulations in improving the therapeutic response and several alternative ways to target resistance cancer. The major implications of phytochemical and chemotherapeutic combination therapy could lead in the future.

1. Introduction

Cancer is an important health issue that comprises a large group of disease in all populations. Low- and middle-income countries have major challenges in eradicating cancer due to limited resources available. The estimated global burden of cancer will nearly double (29–37 million) by 2040 with a major impact in lower middle-income countries. The statistical explicit of mortality rate in cancer development was highlighted in Figure 1.

The conventional therapeutic approaches rely on chemotherapeutic delivery, surgery, or radiation therapy. Cancer cells rapidly divide, expand, and coinfect adjacent cells. The radiation therapy rapidly destroys the

Abbreviations: MDR, multidrug resistance; CDk2, cyclin-dependent kinase2; mTOR, mammalian target of rapamycin; TNK, tenecteplase; PI3K, phosphoinositide 3-kinase; Bcl 1, B-cell lymphoma 1; Bcl 2, B-cell lymphoma 2; DNA, deoxyribonucleic acid; GSH, glutathione SH; GST, glutathione S-transferases; GPxn, glutathione peroxidases; ROS, reactive oxygen species; STAT3, signal transducer and activator of transcription 3; NFKB, nuclear factor kappa light chain enhancer of activated B cells; VEGF, vascular endothelial growth factor; PI3K, the phosphoinositide 3-kinase; CIP2A, cancerous inhibitor of PP2A; PP2A, protein phosphatase 2A; COX, cyclooxygenase; MAPK, a mitogen-activated protein kinase; ERK, extracellular-signal-regulated kinase; P-gp, P-glycoprotein; G2M, Gaussian-2 Method; PAPR, poly (ADP-ribose) polymerase; JAK, Janus kinase; MMP, matrix metalloproteinase; MAPK, mitogen-activated protein kinase; PBA, pyridine-3-Boronic Acid; PLGA, poly (D,L-lactic-*co*-glycolic acid; PLA, polylactic acid; QUE, quercetin; MMP9, matrix metallopeptidase 9; MEL-A, mannosylerythritol lipid-A; OVCAR-3, ovarian cancer; MLKL, mixed-lineage kinase domain-like protein; HK, honokiol; DHA, dihydroartemisinin; EpCam, epithelial cell adhesion molecule; PAMAM, polyamidoamine; CNTs, carbon nanotubes; SWCNTs, single-walled CNTs; Cur, curcumin; PTX, pertussis toxin.

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A meticulous overview on drying-based (spray-, freeze-, and spray-freeze) particle engineering approaches for pharmaceutical technologies

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ABSTRACT

Drying is an indispensable operation in the preparation of pharmaceutical powders and always remained one of the energetic tasks in the pharmaceutical industry. Improving the stability, solubility, and dissolution of pharmaceutical products are being prime objectives of the drying process, intending to produce the products loving the dry state. Although there are voluminous literatures available concerning drying operations, there is scant information available regarding the applicability of drying in drug delivery and process scale-up. The current communication embodies the different particle engineering technologies of drying viz. spray-, freeze-, and spray-freeze drying. In addition, potential uses of drying in the taste masking, and the development of inhalable powders presented briefly. Recent advancements in the drying of novel drug delivery systems is the major focus of the present review. In our opinion, the commercial aspects, regulatory guidelines, and scale-up strategies presented herein provide an opportunity to readers, researchers, and industrialists to ruin the critical issues during drying operations and aid in developing quality pharmaceutical technologies.

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KEYWORDS
Particle engineering; shell formation; spray drying; freeze drying; solubility; crystallinity

1. Introduction

Drying was extensively studied from ancient times. Since then peoples were utilizing the capability of drying techniques in storing material, food, grains, and so forth for a longer period. The drying techniques are now transferred into various adaptive processes. The transformation of the solution, suspension, and emulsion into a dried powder has primarily been used in the drying process at a commercial scale. Many chemicals, pharmaceutical, biological, food industries are principally using the drying technique in the process. Almost maximum numbers of active drug substances, pharmaceutical excipient, food ingredient, intermediates, and so forth are available in powder form and utilizing any one of the methods of drying.[1,2] The modification or improvement of the powder characteristics is possible with the help of drying technologies to improve the solubility and dissolution characteristics of the pharmaceutical powders. In biological process enzymes, proteins extracted from animals or plants are converted into dried powder. The suitability of using the drying technique not only improves the solubility but also increases flow characteristics.[3] The flow characteristics of powdered materials are immensely important in transportation and long-term storage. The powdered materials improve the processing capability of the pharmaceutical manufacturing process and control. Due to uniform size, low moisture level makes the pharmaceutical powder easy to mix, blend, and flow from the hopper to the filling cavity.[4,5] The optimum moisture contained in powder helpful for increasing the compression and compaction characteristics of solid dosage forms. While designing dosage form particle properties of active pharmaceutical ingredients and excipients play an important role. Properties of pharmaceutical powder can be modified by surface engineering or surface chemistry which explores the applicability of powdered dosage forms like the enteric coating of

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REVIEW ARTICLE

A Concise Analytical Profile of Efavirenz: Analytical Methodologies

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ABSTRACT

Non-nucleoside reverse transcriptase inhibitors are the prime members of antiretroviral therapy that are presently employed for the management of the human immunodeficiency virus. It uses an enzyme i.e., reverse transcriptase to convert its ribonucleic acid into reverse transcription; these agents impede the function of reverse transcriptase and reverse transcription counter human immunodeficiency virus from replicating. Efavirenz is the first-generation non-nucleoside reverse transcriptase inhibitor agent. Similar to the other non-nucleoside reverse transcriptase inhibitor agents; it is prescribed with other inhibitors in combination for regimens antiretroviral therapy. To enhance survival and avoid aggressive infections in patients affected with human immunodeficiency virus infection, adequate antiretroviral therapy is the most significant treatment. Accordingly, the development and validation of such therapeutic agents are challenging work for the analysts. Therefore, the proposed review integrally addresses the analytical reports of efavirenz recorded in the literature databases like Scopus, Web of Science, Google Scholar, Pub-Med, and through many other sources. It has been remarked that for the development of efavirenz many analytical techniques were used for addressing the qualitative and quantitative estimation of efavirenz from various pharmaceutical and biological matrices. This review plan to review the stereochemistry, mechanism of action, resistance, pharmacokinetics, pharmacodynamics, safety and adverse reaction, and various analytical approaches assessed for the same. The hyphenated and chromatographic techniques are frequently used for analysis of cited drug.

KEYWORDS

Analytical methods; antiretroviral therapy; efavirenz; HIV; pharmaceutical; matrices

Introduction

Mortality and morbidity related to the Human Immunodeficiency Virus (HIV) have significantly controlled with the highly active combination antiretroviral therapy (ART).[1] Because of the very slow rate of success as those who are administering just one HIV inhibitor at a period, healthcare specialists started ART in 1996. The beginning of antiretroviral therapy (three-drug candidates) marked a pivotal movement in the history of HIV treatment. The modern treatment design has turned what used to be a disease with a very poor perspective into a manageable disease.[2] However, nowadays management course of therapy is restricted by the intolerance, near and far-term toxicities, and the resistance emergence of medicinal agents. There are seven classes of medication for HIV, consisting of around thirty different drugs; non-nucleoside reverse transcriptase inhibitor (NNRTI), nucleoside reverse transcriptase inhibitors (NRTIs), post-attachment inhibitors, protease inhibitors (PI), CCR5 antagonists, integrase strand transfer inhibitors (INSTIs).

Primary procedures of therapy typically consist of twice NTRIs paired with a third vital antiretroviral inhibitor, which may also be the group of NNRTI, INSTI, or PI, may have a booster that might be ritonavir or cobicistat.[3]

Efavirenz (EVZ) is an NNRTI agent, permitted for HIV treatment by the United States of Food and Drug Administration (USFDA) from 1998. It expanded quickly to be commonly used for the same in developed nations. Current recommendations suggest EVZ is with two NNRTIs, either abacavir/lamivudine or emtricitabine/tenofovir as preferred first-line regimens for the management of HIV-affected patients.[4]

Chemistry

EVZ is designated as a derivative of benzoxazinone, which is a white or slightly yellowish crystalline in nature with a melting point ranging from 136 to 141 °C. EVZ structurally ((S)-6-chloro-4-(cyclopropylethynyl)-1,4-dihydro-4-(trifluoromethyl)-2*H*-3,1-benzoxazin-2-one).

It having molecular formula $C_{14}H_9ClF_3NO_2$ and a molecular mass is 315.68 gm/moL, respectively.[5,6] The chiral carbon atom was observed on EVZ at position 4. In published studies, the 4S stereoisomer is mainly exploited for marketed pharmaceutical matrices. It demonstrated a

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MICROSCOPY OF TAMARIND SEEDS

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ABSTRACT

In this study, we are reporting anatomical features of seeds of *Tamarindus indica Linn*. The transverse sections of these seeds are differentiated into two layers outermost is sclerotesta and inner one is sarcotesta. There are two cotyledons which comprise outer layer of smaller square shaped epidermal cells. The ground tissue consists of homogenous, circular, highly thick walled parenchyma cells. Hope, these will surely be useful to global researchers in preparation of pharmacopoeial standards.

Keywords: Microscopical Characteristics, *Tamarindus indica* Linn, Anatomical features

INTRODUCTION

Tamarindus indica Linn. belonging to Caesalpiniaceae subfamily is commonly identified and known as Chincha in Ayurveda system of medicine **[1]**. Its fruit, tender leaves and flowers are used extensively in culinary and medicinal preparations. It's a large wide spreading tree 12 to 18 meters high. The trunk with dark

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ORIGINAL ARTICLE

Eco-friendly synthesis of surface grafted Carbon nanotubes from sugarcane cubes for the development of prolonged release drug delivery platform

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Abstract

Surface grafting of nanocarriers could modulate their properties and characteristics. As carbon nanotubes synthesis is a very tricky process and requires high-end methods, hence the present investigation was aimed to develop an eco-friendly method for synthesis carbon nanotubes (CNTs) and subsequent surface grafting for enhanced drug delivery application. The present study elaborates two-step chemical modifications; wherein the first step is catalytic cleavage of natural precursor in the presence of ferrocene and the second step involve chemical grafting of Acyclovir (ACV) as a model drug to understand the drug release behaviour. The catalytic cleavage of sugarcane cubes (natural precursor) was carried out in a closed copper tube, which prevents oxidation and results in a conversion of tubular nanostructures to amorphous carbon. The covalent attachment of ACV on purified CNTs (fCNTs) was done using carbodiimide chemistry. The preliminary Uv-Vis absorbance spectra defined at 260 nm was arised due to π-π* stacking of aromatic C-C bonds. The Fourier Transforms Infrared Spectroscopy (FTIR) indicates the hydroxyl stretch at 3300 cm-1 while amide I bond formation was observed at 1672 cm^{-1}. The XRD spectra confirmed successful synthesis of CNTs. The calculated average crystallite size (Scherer equation) of synthesized CNTs was found to be 42.84 and 44.45 nm; it was also in accordance with the morphological observation as confirmed simultaneously using SEM analysis. The covalently attached ACV was released up to 80% during 8h of *in vitro* drug release study. The surface grafting potential of CNTs was found to be promising compared to other nanomaterials.

Keywords: *Acyclovir; Amorphous Carbon; Carbodiimide Chemistry; Natural Precursor; Purification.*

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INTRODUCTION

Even though the investigation on allotropic forms of carbon was begun before 1990, but the most intuitive form of carbon allotrope i.e. carbon nanotubes (CNTs) were reported in 1991[1]. Numerous classical approaches for the synthesis of CNTs are reported by academic researchers and industry experts for their promising physicochemical properties. In case of CNTs, the

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RESEARCH ARTICLE

Electrostatic deposition assisted preparation, characterization and evaluation of chrysin liposomes for breast cancer treatment

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ABSTRACT

Chrysin (CHR), a flavone found in multiple vegetables, fruits and mushrooms has been explored so far as a neurotropic, anti-inflammatory and anti-cancer biomolecule. Despite the stated therapeutic potential, low solubility and bioavailability limit its therapeutic benefit. To circumvent these drawbacks, development of chrysin liposomes (CLPs) is reported in the present investigation. The CLPs were developed by electrostatic deposition assisted film hydration method using chitosan/lecithin to protect chrysin in the nano-lipoidal shell. Developed CLPs were extensively characterized by DSC, XPRD, FE-SEM, TEM, particle size, polydispersity index, zeta potential, percent drug loading and encapsulation efficiency. These CLPs were further characterized by *in vitro* dissolution, *in vivo* bioavailability, *in vitro* anticancer and stability study. Suitable particle size, PDI and ZP implying stabilization of developed CLPs. The % DL and % EE was found to be 3.56 ± 0.13 and 90.5 ± 1.49 respectively. DSC and PXRD study revealed amorphous transition of CHR, which may help to increase its solubility and dissolution profile. *In vivo* pharmacokinetic study demonstrated more than 5-fold increase in relative bioavailability of CLPs. The in silico molecular docking study results demonstrated the electrostatic interaction between two polymers. The present study suggests that chitosan could protect and encapsulate chrysin which eventually enhances its cytotoxicity as well as bioavailability.

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KEYWORDS
Electrostatic deposition; film hydration; chrysin; liposomes; in silico molecular docking

Introduction

Encapsulation of bioactive drug using polymeric coating is beneficial due to its nontoxic, nonimmunogenic and biodegradable properties, along with protection of drug with improved biocompatibility [1–3]. In addition to this, issue of poor aqueous solubility and bioavailability of many bioactive compounds could be resolved using techniques like nanoencapsulation [4].

The electrostatic deposition method is based on the deposition of one polymer material on another in liquid form followed by evaporation of the solvent to form encapsulation of the subsequent polymer. This technique of encapsulation attracted researchers in recent years; herein it coats the active ingredient with the assistance of polymeric matrix [1]. The electrostatic deposition based microencapsulation approach has also been used for the preparation of hydrogels [5], microemulsion [6], liposomes [7] to name a few.

Out of the many approaches used for drug encapsulation, liposomes are widely used for both hydrophilic and hydrophobic drugs such as antioxidants, antimicrobials and other pharmacologically important compounds [8]. However, organic residual effect, leakages of active compounds and instability during storage of traditional liposomes may restrict their applications [9,10]. So as to conquer these limitations, polycationic polymer like chitosan could be used as a coating material which forms polyelectrolyte complex with oppositely charged polymeric material by intermolecular electrostatic deposition [11,12].

Chrysin (CHR), a flavone found in multiple vegetables, fruits, and mushrooms, has been suggested as neurotrophic for nerve cells, anti-inflammatory, and anti-amyloidogenic [13]. The CHR has been known as an anti-cancer and wellbeing-promoting compound [14]. In several biological tests, it has demonstrated that it may be effective against many disorders. The CHR may block most cancer-related pathways and inhibits cancer by fostering apoptosis and moderating cell death due to autophagy. Hence, extensive research in this direction should be focused on in the coming years to validate its possible clinical use in cancer.

The main objective of the present study was to encapsulate CHR in liposomal form using the electrostatic deposition technique for protection and further enhancement in bioavailability. For the same, biocompatible and biodegradable biological macromolecules viz. chitosan (CHN) and soya lecithin (SOL) were used which form a polymeric nanoshell with the aim to shield CHR against degradation and to enhance its biocompatibility [15,16]. Being a polycationic macromolecule, chitosan, through intermolecular electrostatic deposition, form polyelectrolyte complexes with oppositely charged macromolecules [17]. Developed chrysin liposomes (CLPs) were further characterized using different physicochemical parameters like particle size (PS), polydispersity index (PDI), zeta potential (ZP), entrapment efficiency (% EE), drug loading (% DL), differential scanning calorimetry (DSC), transmission

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Supplemental data for this article can be accessed here.

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Research Article

Fabrication of N-Doped Graphene@TiO_2 Nanocomposites for Its Adsorption and Absorbing Performance with Facile Recycling

Pravin Onkar Patil[1], Sopan Namdev Nangare[1], Pratiksha Pramod Patil[1], Ashwini Ghanashyam Patil[2], Dilip Ramsing Patil[2], Rahul Shankar Tade[1], Arun Madhukar Patil[2], Prashant Krishnarao Deshmukh[3], Sanjay Baburao Bari[1]

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Abstract

The present work aims to synthesize nitrogen-doped reduced graphene oxide-titanium dioxide nanocomposite (N-rGO@TiO_2) using a simple, eco-friendly method and its applications in spectroscopic detection of heavy metal ions such as lead (Pb^{2+}), mercury (Hg^{2+}), and chromium-VI [Cr(VI)] in potable water. Initially, TiO_2 nanoparticles loaded N doped rGO sheets were fabricated by an ecological method using *Gossypium hirsutum* (cotton) seeds extract as a green reducing agent. Then, the N-rGO@TiO_2 nanocomposites were subjected for characterizations such as spectroscopic techniques, particle size analysis, zeta potential analysis, and spectroscopic sensing. Notably, the results of this study confirmed that N-rGO@TiO_2 exhibited countless stupendous features in terms of sensing of an analyte. Briefly, the UV-visible spectroscopy and Fourier transform infrared (FTIR) spectroscopy confirmed the successful synthesis of N-rGO@TiO_2. The SEM images showed the wrinkled, folded, and cross-linked network structures that confirmed the surface modification and nitrogen doping in the rGO sheet and synthesis of N-rGO@TiO_2. The EDAX study confirmed the elemental composition of the N-rGO@TiO_2 nanocomposite. Finally, due to the larger surface area, porous nature, high electron mobility, etc. the N-rGO@TiO_2 probe provides the lower detection limit for Pb^{2+}, Hg^{2+}, and Cr (VI) as low as 50 nM, 15 µM, and 25 nM, respectively. Concisely, our study affirms the admirable sensitivity of N-rGO@TiO_2 nanocomposite to the Pb^{2+}, Hg^{2+}, and Cr (VI) in potable water can provide better environmental remediation.

Keywords: Graphene oxide, N-rGO@TiO_2, Nanocomposite, Cotton-seed, Heavy metals, Biodegradable, Sensing

Introduction

Over the past two decades, graphene-based materials are gaining tremendous attention from a scientific fraternity in various fields [1-3]. It may because of its astonishing properties and potential to revolutionize the scientific sector [3-5]. Graphene can be used to fabricate several dimension materials such as 1D nanostructure [6], 2D layer stacked films [7], 3D graphene hydrogel [7-9], and aerogel [10-13], etc. Out

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Review Article

Surface architectured metal organic frameworks-based biosensor for ultrasensitive detection of uric acid: Recent advancement and future perspectives

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ABSTRACT

Gout is the world's most popular inflammatory arthritis and the prevalence of gout is rapidly rising worldwide. Typically, gout develops in a single joint as excessive swelling and intense pain wherein excessive deposition of uric acid (UA) crystals results in inflammation of the joint. Accordingly, UA is considered an effective biomarker to diagnose gout. Recently, the use of innovative sensors has attracted great attention, as it is effortless, responsive, quick, and powerful. While the traditional sensors for UA assessment are widely used, they pose many limitations and hurdles in terms of sensitivity, selectivity, and simplicity. In this vein, metal ions and organic ligand-based metal–organic framework (MOF) have gained much attention for the recognition of UA due to its larger surface area, porosity, high sensitivity, and defined selectivity. In this review, we provide details on the latest developments of MOF-centered biosensors for sensitive detection of UA. The status of gout, fundamentals of MOF, and MOF availed for detection of UA have been elaborated. Besides, we highlighted the nanoparticles and conjugates that rely on advanced strategies along with MOF that boost the sensitivity and selectivity towards the UA. Interestingly, different surface architectured MOFs biosensors showed a lower detection limit for UA from μM to nM. Finally, the threats and potential opportunities for MOF-based UA biosensors have been summarized. Therefore, based on ongoing research, the commercialization of this advanced platform for the biosensing of diverse biomarkers will open a new door for the *in vitro* diagnosis of assorted diseases.

1. Introduction

From its inception, arthritis is a severe health issue of a joint in almost all developed and developing nations. Arthritis is a term that derives from the Greek word "disease of the joint." Commonly, it can be stated as acute inflammation or chronic inflammation of the joint that is sometimes with the effect of pain and sometimes co-exists with structural damage [1]. As many as 100 classes of arthritis have been characterized according to the research. Generally, it can be classified into two type's namely non-inflammatory arthritis and inflammatory arthritis. In the first category, non-inflammatory arthritis is commonly known as osteoarthritis, while inflammatory arthritis is categorized

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(REVIEW ARTICLE)

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Futuristic review on progress in force degradation studies and stability indicating assay method for some antiviral drugs

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Abstract

Force degradation studies of drug substance give perceptive knowledge about the intrinsic stability of the molecule as well as possible degradants which formed during the shelf life of drug and thus, aid within the successive development of its stable formulation. A number of analytical methods with hyphenated techniques are required for the identification, determination and characterization of degraded product and impurities produce during different conditions of stress studies; Chromatographic methodology play a vital role in the field of impurity and degradation profiling .This review summarizes the current regulatory requirements guidelines for the laboratory performance of forced degradation and its application for the development of stability indicating method. There are number of strategies have been implemented for the quantitative assessment of antiviral drugs. This study will provide detailed literature on stability-indicating HPLC/ RP-HPLC approaches for the development and validation of various antiviral drugs.

Keywords: Intrinsic stability; Degradants; Forced degradation; Stability indicating methods

1. Introduction

The stability of pharmaceutical product requires more attention because the stability get directly affects the safety, purity and efficacy of drug products. Stability parameter of active pharmaceutical drugs and their formulations are determined during the early stage of drug development process [1]. The International Council for Harmonization (ICH) and Food and Drug Administration (FDA) provided the different guidelines and requirements for stability testing data [2]. According to different guidelines generally two types of stability testing studies, like, long-term stability studies and accelerated stability studies. In case of long-term studies, the require time for completion of study is about 12 months. Generally long-term stability studies useful for identification and separation of degraded products. In case of accelerated stability testing required around 6 months, Intermediate stability testing is also proceeding for 6 months at conditions milder than accelerated studies [3].

2. Search area

This review summarizes the current regulatory requirements for the practical performance of forced degradation and its application for the development of stability indicating method. There are numerous strategies have been implemented for the quantitative assessment of antiviral drugs.This study will provide detailed literature on stability-indicating HPLC/ RP-HPLC approaches for the development and validation of various antiviral drugs as well as gives a basic idea to the researchers who are working in the area of product development and finish product testing.

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PAPER

Quality by design approach for the synthesis of graphene oxide nanosheets using full factorial design with enhanced delivery of Gefitinib nanocrystals

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Keywords: Gefitinib nanocrystals, quality by design, graphene oxide nanosheets, enhanced dissolution, full factorial

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Abstract

Designing drug delivery carriers is the most focused work for a material scientist. The formulator can screen the material starting from its properties to the performance of the material. The quality by design approach has simplified the path of selection of the right parameter for analyzing the process. The present investigation elaborates the use of a full factorial design model for understanding the interaction of oxidizing agents on the conversion of graphite to graphene oxide (GO). The most frequently assessable laboratory method is chemical oxidation, which is used for understanding optimum oxidation potential and nanosheet formation. The method utilizes 2 level assessments for screening reactant concentration of sulphuric acid and potassium permanganate on preprocessed graphite. In present investigation, one categorical factor is used to understand the effect of precursor size on the final product. The statistical model provides optimum oxidation conditions, using particle size, polydispersity index (PDI), and I_D/I_G ratio with a 95% confidence interval (p-value less than 0.05). The optimized synthesis procedure provides the least particle size of GO nanosheet of about 220.7 nm with PDI 0.289 and I_D/I_G ratio of 0.98. Furthermore, pulse mode ultrasonication converts Gefitinib (GF) into nanocrystals and is deposited within intricates of GO nanosheets (nGOGF). The GO and nGOGF were preliminarily characterized using optical and vibrational spectroscopy. The hydrodynamic diameter was found to be slightly increased to 237.5 nm with decreasing surface charge (−33.64 mV) after fabrication. The x-ray Photoelectron Spectroscopy (XPS) study reveals successful grafting of oxygen-containing functional groups on GO nanosheets with peak positions observed at 284–288 eV. The Transmission electron microscopic (TEM) observation supports the wrinkled structure of GO nanosheets synthesis, along with encapsulation of GF nanocrystals. The nGOGF retard the release of GF for a prolonged period of time and the rate of dissolution was increased by fold compared to pure GF.

1. Introduction

Designing a drug delivery carrier is a very critical step and requires technological assessment along with appropriate facilitation. Many scientists uses laboratory based approaches to selectively synthesize the nano-based carrier for the delivery of the therapeutic agent. Synthesis of carbon backbone-based material has been explored tremendously for delivery and diagnosis during the last decade [1]. Compared to polymeric or metal nanoparticle synthesis, carbon backbone-based synthesis approaches are elucidative and require a few steps. The path of synthesis and verification is very expository and need to screen every step crucially for designing the final

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One step synthesis approach of mesoporous silica packed with graphene oxide nanosheet: Characterisation and drug release aspects

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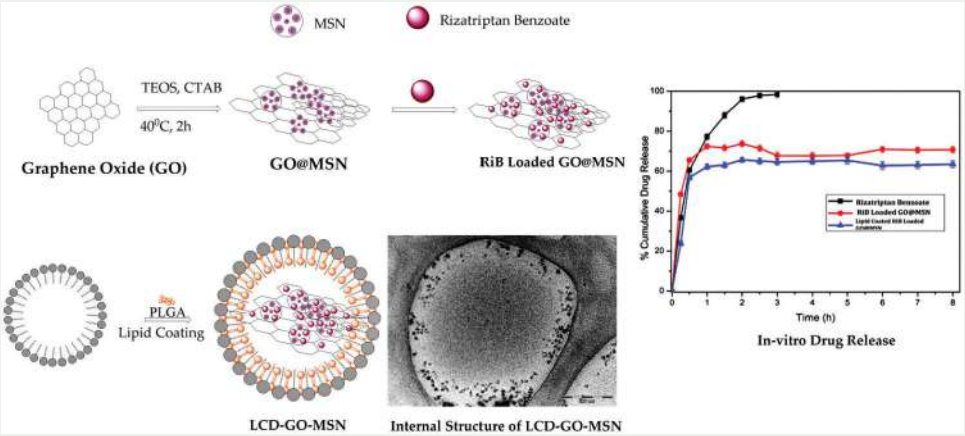
ABSTRACT

The motive of the present investigation was to establish a novel, hybrid multifunctional lipid-coated graphene oxide mesoporous silica nanocomposite (GO-MSN) for controlled delivery of Rizatriptan Benzoate (RiB). The lipid coating helps to achieve a longer circulation time of the fabricated carrier for targeted delivery of RiB. The modified Hummers method with slight modification gives a uniform sheet of GO, subsequently sol-gel approach use to synthesized mesoporous silica for the preparation of nanocomposite. The in-vitro RiB release from RiB-GO-MSN and lipid decorated GO-MSN was found to be 70.74% and 63.45% respectively. The lipid coating retards the release of RiB around 8 h. The entrapment efficiency of RiB-MSN and GO-MSN were found to be 48.17% and 62.29% respectively. In the presence of GO, RiB entrapment increases as RiB may entrap within inter and intra spacing of GO. The present investigation oversee, simple methodology adopted for synthesis of GO-MSN can effectively deliver RiB towards brain for the management of migraine.



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Graphene oxide; Mesoporous silica; Bilayer lipid coating; Migrain; Brain Targeting

Introduction

Over the past few decades, revolutionary development in the field of nanotechnology has demonstrated remarkable advances and novel applications in drug delivery and biomedical applications. The nanoscale drug delivery carrier includes functionalised nanomaterial such as polymeric gold nanoparticle, liposomes, dendrimers, metallic nanoparticles, fullerenes, protein nanoparticles, self-assembly nanoparticles, ferric oxide nanoparticles, polymer, lipid and ceramic based nanoparticles, etc for biomedical and drug delivery applications [1,2]. The nanocomposite interaction with biological systems has gain crucial importance to investigate the efficacy and safety of drug carriers. Comparing conventional formulations, nanomedicine enables lowering dose requirement, increases therapeutic efficacy, increase in safety with minimum systemic cytotoxicity. Among variety of nanomaterials, graphene oxide-mesoporous silica (GO-MSN) nanoparticles emerged as one of the smart, novel, hottest, hybrid, functionalised nanocomposite designed by incorporation of two different nanomaterials that possesses several attractive features as effective drug carrier [3,4]. The successful conjugation of graphene oxide (GO) with MSN broadens the ultimate applications of alone or individual MSN and GO. GO-MSN a very popular

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Development of cross-linked collagen/pullulan ocular film for sustained delivery of Besifloxacin using novel spin-coating technique

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Spin coaters are ideal tools for the preparation of thin and ultrathin films. In the present investigation, an attempt has been made to develop a novel and simplified method for the preparation of cross-linked collagen (CCG)/pullulan film. Marine collagen (MCG) has been modified, and crosslinking efficiency was preliminarily confirmed by observing an increase in CH_2–CH_2 stretching using vibrational spectroscopy, dynamic light scattering, X-ray diffraction, etc. The spray drying of CCG and Besifloxacin (BFN)–CCG produced spherical-shaped particles as confirmed from surface morphological observations. The molecular weight of MCG was slightly decreased after crosslinking (CCG) and shifted from 4205 to 4112 Da indicating the copolymerization. The emergence of high intensity peak in Nuclear Magnetic Resonance at 63 ppm was assigned for covalent bond formation in CCG. The BFN–CCG pullulan film (67.38%) showed an increase in dissolution time at the end of 12 h. Developed BFN–CCG pullulan film demonstrated enhanced antibacterial effect against *Staphylococcus Aureus* and *Escherichia Coli.*

Introduction

Structural and functional complexities are more in the eyes as compared to other organs of the human body and even to other mammals. The common infection to the anterior as well as a posterior section of the eye may possibly be due to a variety of bacteria, viruses, fungi, and other parasites. The superior position of the eye might be responsible for co-infection. The presence of the lachrymal gland and several protective enzymatic systems can be potentially protected from serious infections. The bacterial infection could occur easily in children and geriatric patients. Globally, around 32–74% of cases of ocular infection contribute to infection caused by bacteria. Both gram-positive and gram-negative bacteria can infect the ocular cavity, mainly *Staphylococci* and *Pseudomonas Aeruginosa, Klebsiella Pneumonia, Escherichia Coli* to name a few [1, 2].

The conventional eye drop formulations are not able to destroy the bacteria instantly, due to less residence time in the ocular cavity. Hence, the conventional drug delivery system may not provide optimum results in terms of therapeutic output. Residence time on the ocular surface for a prolonged period of time and corneal permeability across barriers are the two major challenges in designing ophthalmic formulation [3]. Most bacterial infections can be cured by fluoroquinolone derivatives and are mostly prescribed for eye infections. The fluoroquinolones inhibit the bacterial cell cycle and block DNA replication, which directly binds to DNA gyrase, topoisomerase IV, or both. Besifloxacin (BFN), a model drug selected in the present approach is a fourth-generation fluoroquinolone derivative, which acts on gram-positive bacteria. The BFN contributes to an enhanced spectrum of activity because of a high affinity towards DNA gyrase and Topoisomerase IV [4, 5].

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Review

Quinazoline: An update on current status against convulsions

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ABSTRACT

Epilepsy is one of the most frequent chronic neurological disorder extremely threatening the life and good health. More than 70 million individuals suffering from epilepsy worldwide and it required long-term therapy. Many epileptic patients not fully satisfied with currently available treatment likewise, frequent drugs have shown a lack of efficacy, side effects, and drug interaction. Therefore, the search for antiepileptics with greater selectivity and lesser toxicity continues to be the focus and task in medicinal chemistry. Quinazoline represents a distinct class of biologically active nitrogen heterocyclic nucleus with great anticonvulsants potential. In the past few years, persistent medicinal chemistry efforts have developed diverse structurally functionalized potential quinazoline derivatives for anticonvulsant potential. This work report covers most current efforts taken in the design, development, and anticonvulsant efficacy of quinazoline analogs from 2015 to 2020.

1. Introduction

Heterocycles is a leading group of organic compounds. The most common and naturally occurring heterocycles include those having five- or six-membered rings containing nitrogen (N) oxygen (O) and sulfur (S) [1,2]. Therapeutic entities or drugs having nitrogen and sulfur containing heterocyclic ring have tremendous pharmacological applications [3]. In medicinal chemistry incredible courtesy has been paid for preparation of pharmaceuticals, different agrochemicals and vaternary products [4]. Nitrogen-containing heterocycles engage a lager territory in the field of heterocyclic analogs [5]. Several N-containing heterocycles such as indole, triazole, oxindole, quinilone, quinazoline, and quinoxaline have been synthesized or found in natural products [6,7]. Among all the heterocyclic hybrids we picked quinazoline ring for this collection as it has wide spectrum of pharmacological actions with minimal toxicity profile.

Quinazoline (1,3-diazanaphthalene) (Fig. 1) is a heterocyclic hybrid [8] having molecular formula $C_8H_6N_2$ [9]. It is composed two fused six-member aromatic ring i.e., benzene and pyrimidine ring having solubility in water. Researchers got fascinated since 1888 with the finding of peganine (vasicine). Quinazoline synthetically prepared in the laboratory by Gabriel in 1903 [10] while firstly isolated form Chinese plant aseru [11]. Synthesis of quinazoline has been done by various research groups (Fig. 2) were they employed the different strategies like application of catalyst, reaction conditions, and different naming reactions. No wonder quinazoline frameworks serve as the broad spectrum of pharmacological actions such as anticancer [12,13], antimicrobial [14–16], antibacterial [17–19], anti-inflammatory [20–22], antihistaminic [23–25], antidiuretic [26,27], antioxidant [28–30], antiviral [31–33], antidiabetic [34–36], antitubercular [37–39] and so on.

Epilepsy is a neurological disorder characterized by recurrent seizures, mostly affecting over 1–2% of the world population [40,41]. Approximately 70 million individuals suffer from epilepsy worldwide with majority of the them residing in the developing nations. Most of these patients are deprived of suitable medication [42,43]. Epilepsy, if not prevent, is accompanying with progressively weakened thought and function, brain damage, and other neurologic deficits [44,45]. The exact reason of seizures in most cases is unknown [46]. In few patients, epilepsy occurs as a conse-

Abbreviations: AEDs, Anti-epileptic drugs; CNS, Central nervous system; MES, Maximal electroshock; scPTZ, Subcutaneous pentylenetetrazole; GABAA, Gamma-aminobutyric acid type A; p-TsOH, p-Toluenesulfonic acid; ED_{50}, Median effective dose; SAR, Structure activity relationship; NMDA, N-methyl-D-aspartic acid; AMPA, (R,S)-2-amino-3- (3-hydroxy-5-methylisoxazol-4-yl) propionic acid; TD_{50}, Median toxic dose; Et3N, Triethylamine; BBB, Blood brain barrier; GAA, Glacial acetic acid; EWG, Electron withdrawing group; EDG, Electron donating group; $SOCl_2$, Thionyl chloride; RMSD, Root mean square density; DMF, Dimethylformamide.

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Green synthesis of Fe-doped Ag-loaded reduced graphene oxide ternary nanocomposite for efficient photocatalytic degradation of toxic dyes

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Abstract

The green synthesis of iron nanoparticles (FeNPs) doped and silver nanoparticles (AgNPs) loaded reduced graphene oxide (rGO) (Fe-Ag@rGO) nanocomposite and its applications in methylene blue (MB), malachite green (MG), rhodamine B (RB) degradation were reported. Initially, AgNPs loaded rGO (Ag@rGO) nanocomposites were synthesised simultaneously by an ecological method using *Tamarindus indica* shell extract as a green reducing agent. Then, the doping of FeNPs into rGO@Ag nanocomposites afforded Fe-Ag@rGO nanocomposite. Interestingly, the finding of this study confirmed that the Fe-Ag@rGO nanocomposites exhibited countless stupendous features in terms of dye degradation. Briefly, the UV-visible spectroscopy and Fourier-transform infrared spectroscopy (FTIR) study confirmed the synthesis of Fe-Ag@rGO nanocomposite. The scanning electron microscopy (SEM) images showed the spherical shape with cross-linked network structures that confirmed the surface modification and synthesis of Fe-Ag@rGO nanocomposite. Finally, the dye degradation potential of the photocatalyst was found to be 97.20%, 98.43%, and 97.33%, for MB, MG, RB, respectively. Herein, the improved photocatalytic performance of the Fe-Ag@rGO was found due to the larger surface area, porous nature, high electron mobility, and synergistic effect of the Fe-Ag@rGO nanocomposite. Additionally, the effective interfacial hybridisation of 'Ag', and doping of 'Fe' on the rGO sheet extended the duration of the photogenerated electron (e^-) hole pairs that can also be contributing to dye degradation. Conclusively, the present experiment provides the new Fe-Ag@rGO nanocomposite to the dye degradation, which could be improved environmental remediation.

Keywords: dye degradation, nanocomposite, Fe-Ag@rGO, Tamarindus indica shells, graphene oxide, Green synthesisClassification numbers, 2.00, 5.00, 5.11

1. Introduction

Today is the era of accelerated industrialisation, which has seen rapid developments and has played an essential role in

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REVIEW ARTICLE

Graphene quantum dots (GQDs) nanoarchitectonics for theranostic application in lung cancer

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ABSTRACT

Lung cancer (LC) is heading up as a substantial cause of mortality worldwide. Despite enormous progress in cancer management, LC remains a crucial problem for oncologists due to the lack of early diagnosis and precise treatment. In this context, numerous early diagnosis and treatment approaches for LC at the cellular level have been developed using advanced nanomaterials in the last decades. Amongst this, graphene quantum dots (GQDs) as a novel fluorescent material overwhelmed the horizons of materials science and biomedical fields due to their multifunctional attributes. Considering the complex nature of LC, emerging diagnostic and therapeutic (Theranostics) strategies using GQDs proved to be an effective way for the current practice in LC. In this line, we have abridged various approaches used in the LC theranostics using GQDs and its surface-engineered motif. The admirable photophysical attributes of GQDs realised in photolytic therapy (PLT), hyperthermia therapy (HTT), and drug delivery have been discussed. Furthermore, we have engrossed the impasse and its effects on the use of GQDs in cancer treatments from cellular level (*in vivo-in vitro*) to clinical. Inclusively, this review will be an embodiment for the scientific fraternity to design and magnify their view for the theranostic application of GQDs in LC treatment.

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Introduction

Global cancer risk is elevating gradually and results in a greater mortality rate per year. As per the fresh report of GLOBOCAN 2020, about 19.3 million cases and nearly 10.0 million deaths by cancer were recorded in 2020. Epidemiologists suggested that there would be probable 28.4 million new cases of cancer to befall nearly in 2040. Amongst all cancers, lung cancer (LC) has positioned on second diagnostic occurrence followed by breast cancer (11.7%) and crossed about 11.4% mortality rate, led by 1.8 million deaths (18%) in 2018 [1]. Besides, LC mortality is probable to reach 2.45 million globally by 2030. Principally, LC is a complex form of (adenocarcinoma) which increasing worldwide as an utmost cause of mortality. Generally, adenocarcinoma is known as the cancer of glandular mucus-producing cells (especially lungs). As per literature, LC is classified into four types: invasive adenocarcinoma (IA), adenocarcinoma in-situ (AIS), and minimally invasive adenocarcinoma (MIA) and other variants (e.g. lipidic) (Figure 1(A)). Besides this, the World Health Organisation (WHO) gives a sub-classification of lung adenocarcinomas as per their cellular origin. It includes acinar cells, papillary cells, bronchoalveolar, and mucus-secreting [2]. Literature survey advocated that there is a scarcity in our current knowledge of cancer statistics due to changing epidemiological trends of LC amongst developing countries [3]. In this context, it is observed that there is a vital role of the Human Development Index (HDI) in cancer mortality and morbidity in several countries. Both developed and developing countries experiencing an evident rise in the augmented effects of cancer risk factors. Moreover, there is an alarming rise in LC incidents in non-smokers as well. Notably, some major risk factors associated with the LC are smoking, exposure to second-hand smoke, previous radiation therapy, exposure to radon gas, exposure to asbestos and other carcinogens, and hereditary history of LC. Besides, the world is evidenced by the residual burden of different respiratory infections associated with LC. For example, Coronavirus disease 2019 (COVID-19), its emergence in 2020, and recurrence in 2021 have been overwhelmed the global healthcare systems. At this juncture, COVID-19 is becoming a major risk factor for LC patient's treatment. However, an extensive survey regarding the precise impact of COVID-19 associated with a patient suffering from LC is not available to date [4,5].

Current diagnostics and management strategies for LC

Despite the significant development in cancer therapeutics, several risk factors escalating in front of the developed and developing nations. Recently, Sung et al. reviewed the global cancer prevalence, which suggested the frequent diagnostic appearance as well as morbidity of LC up to 2020 which raised significantly after 2018 (Figure 1(B)) [1,6].

The traditional methods including X-ray, magnetic resonance imaging (MRI), Computed tomography (CT), or positron-electron microscopy (PET) scanning are commonly used for the diagnosis of cancer. Primary screening of LC by traditional methods is dependent on the severity and phases of LC. Unfortunately, the lack of site-specific localisation or inability to detect micrometer-sized tumours becomes inconclusive in the early detection of LC. Apart from this, sputum cytology, biopsy, and bronchoscopy methods are commonly used for the diagnosis of LC.

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Comparative study of scallion and dry bulb of *Allium cepa* for antioxidant activity

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Abstract
A Chemicals or organic compound that inhibitsthe oxidation of other molecules in biological system generally termed as Antioxidants. Upon oxidation of chemical compound produce free radicals, after chain of reactions that may damage cells. Either of natural or synthetic antioxidants such as ascorbic acid (vitamin C) or thiolsterminates terminates the chain reactions and prevents the oxidation of the molecules. Mainly two different groups of substances classified as "antioxidant" are:
1. Industrial chemicals that added to products for prevention of oxidation,
2. Natural chemicals added to food sand found in body tissue for beneficial health effects.

Early day's research was going on the role of antioxidants which focused on the use in preventing the oxidation of natural unsaturated fats, to prevent rancidity. Simply by placing the fat in a closed container filled with oxygen, the rate of oxygen consumption is measured for calculating the Antioxidant activity. After the discovery of vitamins A, C, and E as antioxidants revolutionized the field of biochemistry that led to the realization of the importance of antioxidants in the living organisms. After identifying the process of lipid peroxidation and prevention of the peroxidation led to the recognition of vitamin Eas antioxidants. So Antioxidants are the reducing agents that prevent oxidative reactions, generally by scavenging reactive oxygen species so they cannot damage cells.
In the present research comparatively studied the antioxidant activity of scallion and dry bulb of *Allium cepa*.

Keywords: antioxidant activity, *Allium cepa,* DPPH method, ABTS method

Introduction
Most of the biological systems on Earth require oxygen to process major pathway in metabolism for its existence. At the stage of metabolism of complex life highly reactive oxygen species is formed that may damages living organisms by producing reactive oxygen species. Contrary, organisms prevent oxidative damage to cellular components such as DNA, lipids and proteins by maintaining complex network of antioxidant such as enzymes and metabolites that work together.
In the late 1980s and early 1990s, the relationship between the protective role of antioxidants against age and disease-induced damage to cells and biological molecules, DNAs, lipids and proteins exploited. Numerous researchers studied the mechanism (s) of action of antioxidants and identified the factors which influence their effectiveness.
The mechanism of oxidation takes place via free radical-mediated chain reaction which included initiation, propagation, branching and termination steps. The reaction may be initiated by the catalytic action of some external agents such as light, heat or ionizing radiation or by chemical activation involving metalions or metalloproteinase as catalyst.

The Mechanism of oxidation[1]
Initiation
$LH + R\cdot \rightarrow L\cdot + RH$

Where LH is the substrate molecule, and with $R^{\cdot}$ is the initiating oxidizing radical. The oxidation of the substrate generates a highly reactiveallyl radical ($L\cdot$) that can rapidly react with oxygen to form a substrate peroxyl radical ($LOO\cdot$)

Propagation
$L\cdot + O2 \rightarrow LOO\cdot$
$LOO\cdot + LH \rightarrow L\cdot + LOOH$

The peroxyl radicals formed may act as chain carriers of the reaction which further oxidize the substrate to produce hydroperoxides (LOOH). This hydroperoxides in turn break down to a wide range of compounds such asalkyl formates, alcohols, aldehydes, ketones and hydrocarbons, and radicals.

Branching
$LOOH \rightarrow LO\cdot + HO\cdot$
$2\ LOOH \rightarrow LOO\cdot + LO\cdot + H2O$

The breakdown of substrate hydroperoxides often involves transition metal ion catalysis, in reactions similar to those involving hydrogen peroxide, yielding substrate peroxyl and subtratealkoxyl radicals.

Termination
End of the reactions involve the interaction of radicals to form non-radical products:

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Natural Product Emerging as Potential SARS Spike Glycoproteins-ACE2 Inhibitors to Combat COVID-19 Attributed by *In-Silico* Investigations

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Abstract: COVID-19 is a pandemic infectious disorder that emerged as a major outbreak for the community and health care system across the globe. Since the currently available drug therapeutics available for COVID-19 are prone to provide symptomatic and supportive relief, which has invited the entire scientist of all over the nations to investigate therapeutic drug candidates accompanied by anti-COVID-19 activity. The recognition of ACE2 mediated entry of SARS-CoV-2 encouraged us to investigate natural products as a potential inhibitor of the SARS spike glycoprotein-Human ACE2 complex. Using the strategy of molecular docking, we have assessed berberine, indigo blue, β-sitosterol, glycyrrhizin, indirubin, hesperetin, bicylogermacrene, β-caryophyllene, chrysophanic acid, rhein, curcumin, and eugenol for their inhibitory activity towards SARS spike glycoprotein-Human ACE2 complex. We have investigated including indigo blue, glycyrrhizin, β-sitosterol, indirubin, bicylogermacrene, curcumin, hesperetin, rhein, berberine with an affinity of -11.2, -10.9. -10.1, -9.8, -9.5, -9.3, -9.2, -9.1 and -9.0 kcal/mol respectively as *in silico* inhibitors of SARS spike glycoprotein-Human ACE2 complex which can vitalize the researchers for *in-vivo* assessment of these natural products.

Keywords: nCoV-2019; phytoconstituents; docking study.

1. Introduction

A modern coronavirus strain was investigated in December 2019 in Wuhan, China, which was formerly referred to as the 2019 novel coronavirus (2019-nCoV) [1]. The Emergency Committee of the World Health Organization (WHO) promulgates an unanticipated outbreak on January 30th, 2020, emerging as Public Health Emergencies of International Concern[2]. A disease of global health concern has transpired and designated as COVID-19 by World Health Organization (WHO) [3]. Till October 10th 2020, about 36,361,054 confirmed cases of COVID-19 have been reported worldwide, accompanying about 1,056,186 death have been reported [4]. Since COVID-19 is proliferating expeditiously around all over the world, it is inviting investigators and scientists worldwide to investigate potential drug candidates to confront the emergency of COVID-19.

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Research Article

Preparation and Evaluation of Silymarin-Loaded Solid Eutectic for Enhanced Anti-Inflammatory, Hepatoprotective Effect: *In Vitro–In Vivo* Prospect

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Solubility of phytochemicals is a major concern for drug delivery, permeability, and their biological response. However, advancements in the novel formulation technologies have been helping to overcome these challenges. The applications of these newer technologies are easy for commercialization and high therapeutic outcomes compared to conventional formulations. Considering these facts, the present study is aimed to prepare a silymarin-loaded eutectic mixture with three different ratios of Polyvinylpyrrolidone K30 (PVP K30) and evaluating their anti-inflammatory, and hepatoprotective effects. The preliminary phytochemical and characterization of silymarin, physical mixture, and solid dispersions suggested and successfully confirmed the formation of solid dispersion of silymarin with PVP K30. It was found that the solubility of silymarin was increased by 5-fold compared to pure silymarin. Moreover, the *in vitro* dissolution displayed that 83% of silymarin released within 2 h with 2.8-fold increase in dissolution rate compared to pure silymarin. Also, the *in vivo* study suggested that the formulation significantly reduced the carbon tetrachloride- ($0.8620\pm0.05034^{**}$ for 1 : 3 ratio), paracetamol- ($0.7300\pm0.01517^{**}$ for 1 : 3 ratio), and ethanol- ($0.8100\pm0.04037^{**}$ for 1 : 3 ratio) induced hepatotoxicity in rats. Silymarin solid dispersion was prepared using homogenization methods that have prominent anti-inflammatory effect ($0.6520\pm0.008602^{**}$ with 8.33%) in carrageenan-induced rat paw model.

1. Introduction

Solid solution is an interchangeable solution state while solute interacting strongly in the form of eutectics. Solid dispersion method maximizes interaction with water and profoundly incorporates hydrogen bonds. Furthermore, it allows the intercalation of the lipophilic substance centrally giving the odor of hydrophilic monolayer polymer. Solid dispersion is widely used and a well-explored technique for the enhancement of solubility at both laboratory and commercial scale [1]. But macerates of plants or animal displayed the limited solubility in aqueous environment, and recent

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A COMPLETE REVIEW ON ANALYTICAL QUALITY BY DESIGN (QBD)

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ABSTRACT

Quality by design is that the modern approach for quality of prescription drugs. This paper offers plan concerning the Pharmaceutical Quality by Design (QbD) and describes use of Quality by choice to make sure quality of prescription drugs. The standard by choice is represented and some of its components known. Method parameters and quality attributes square measure known for every unit operation. Benefits, opportunities and steps concerned in Quality by choice of Pharmaceutical merchandise square measure represented. The aim of the pharmaceutical development is to style a top quality product and its producing method to systematically deliver the supposed performance of the product. Quality cannot be tested into merchandise however quality ought to be in-built by choice. It includes the standard target product profile, crucial quality attributes and key aspects of Quality by choice. It conjointly offers comparison between product quality by finish product testing and merchandise quality by Quality by choice. The muse of Quality by choice is ICH tips. It's supported the ICH tips Q8 for pharmaceutical development, Q9 for quality risk management, Q10 for pharmaceutical quality systems. It also gives application of Quality by choice in pharmaceutical development and producing of prescription drugs.

KEYWORDS: Quality by Design (QbD), Process Analytical Technology (PAT), Quality target product profile, Critical quality attributes.

INTRODUCTION

Quality by design (QbD) is A Quality System for managing a product's lifecycle, a restrictive expectation, supposed to extend method and product understanding and thereby

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RESEARCH Open Access

Reverse phase-liquid chromatography assisted protocol for simultaneous determination of lamivudine and tenofovir disoproxil fumarate in combined medication used to control HIV infection: an investigative approach

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Abstract

Background: Human immunodeficiency virus (HIV) causes severe life-threatening condition, i.e., AIDS. HIV destabilises an individual's ability to prevent infection. Therefore, the combine medication lamivudine (LVD) and tenofovir disoproxil fumarate (TDF) are prescribed to suppress the amount of HIV infection in individual's body; thus, the individual's immune system could function properly. Consequently, the objective of present research work was to investigate robust and sensitive liquid chromatography avenue for simultaneous determination of lamivudine and tenofovir disoproxil fumarate in pure material and combined dosage form.

Results: The reversed-phase chromatographic separation has been performed through Hypersil BDS C_{18} column using solvent system composed of 10 mM potassium dihydrogen phosphate (pH 4.0): acetonitrile (60:40% *v/v*). The determination was executed at 30 °C at 1 mL/min rate for flow of solvent system through column. The eluents of column were monitored at 265 nm using Photodiode Array detector has revealed admirable retention times, i.e., 4.67 and 8.78 min for both drugs, respectively. The calibration curve demonstrated excellent linearity in the range of 10–50 μg/mL for lamivudine and tenofovir disoproxil fumarate with better determination coefficients was more than (r^2 0.999).

Conclusion: The estimable method was effectively validated with respect to accuracy, precision, sensitive (limit of detection and limit of quantitation), robustness, ruggedness, and for selectivity and specificity. The value less than 2 for percentage relative standard deviation for accuracy, precision, robustness, and ruggedness satisfying the acceptance criteria as per procedure of International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use.

Keywords: HIV medication, Lamivudine, Tenofovir disoproxil fumarate, Liquid chromatography, Robustness

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Review

Therapeutic Outcomes of Isatin and Its Derivatives against Multiple Diseases: Recent Developments in Drug Discovery

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Abstract: Isatin (1*H* indole 2, 3-dione) is a heterocyclic, endogenous lead molecule recognized in humans and different plants. The isatin nucleus and its derivatives are owed the attention of researchers due to their diverse pharmacological activities such as anticancer, anti-TB, antifungal, antimicrobial, antioxidant, anti-inflammatory, anticonvulsant, anti-HIV, and so on. Many research chemists take advantage of the gentle structure of isatins, such as NH at position 1 and carbonyl functions at positions 2 and 3, for designing biologically active analogues via different approaches. Literature surveys based on reported preclinical, clinical, and patented details confirm the multitarget profile of isatin analogues and thus their importance in the field of medicinal chemistry as a potent chemotherapeutic agent. This review represents the recent development of isatin analogues possessing potential pharmacological action in the years 2016–2020. The structure–activity relationship is also discussed to provide a pharmacophoric pattern that may contribute in the future to the design and synthesis of potent and less toxic therapeutics.

Keywords: chemotherapeutic agent; anticancer drugs; isatin derivatives; drug design and development; heterocyclic compounds; therapeutic targeting

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FORMULATION AND EVALUATION OF A HYDRODYNAMICALLY BALANCED GASTRORETENTIVE DRUG DELIVERY SYSTEM INCORPORATING CIPROFLOXACIN HYDROCHLORIDE

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ABSTRACT
Drugs that have narrow absorption window in the gastrointestinal tract (GIT) will have poor absorption. For these drugs, gastroretentive drug delivery systems offer the advantage in prolonging the gastric emptying time. The present investigation concerns the development of hydrodynamically balanced tablets of Ciprofloxacin Hydrochloride,are designed to prolong the gastric residence time after oral administration and thereby increasing drug bioavailability. Floating tablets of Ciprofloxacin HCl were prepared by direct compression using HPMC K4M and HPMC K15M as polymers along with Sodium bicarbonate as gas generating agent. The tablets were evaluated for in- vitro buoyancy, dissolution studies and physical characteristic viz.Density, Hardness, Friability, Thickness and Weight variation. Further, tablets were evaluated for in-vitro release characteristic for 12 hrs. It is found that the hardness of the tablets affects the Buoyancy characteristic of the dosage form. All formulations possessed good floating properties with total floating time more than 12 hrs. The in-vitro release studiesindicated that the floating tablets of Ciprofloxacin HCl containing 200mg HPMC K15M (F4) showed sustained release when compared with the other formulation batches and provides a better option for controlled release action and improved bioavailability.

KEYWORDS: Ciprofloxacin hydrochloride, gastroretentive, HPMC, in vitro studies.

1. INTRODUCTION
Oral sustained release dosage forms deliver the drug for longer period and helps in producing the therapeutic effect for 24 h for those drugs which are having low plasma half life. Drugs that have narrow absorption window in the gastro intestinal tract (GIT) will have poor absorption.[1,2] For these drugs, gastroretentive drug delivery systems (GRDDSs) have been developed. Oral sustained release dosage form with prolonged residence time in the stomach helps in absorption of the drugs which are less soluble or unstable in the alkaline pH and those which are absorbed from the upper gastrointestinal tract.[3] GRDDSs help in maintenance of constant therapeutic levels for prolonged periods and produce therapeutic efficacy and thereby reduce the total dose of administration. Recently several gastroretentive approaches like swelling devices,[4,5] floating systems,[6] bioadhesive systems,[7] low density systems,[8] high density systems,[9] expandable systems,[10] super porous, biodegradable hydrogels,[11,12] and magnetic systems,[13] have been developed. To increase the gastric retention time (GRT), one should have a thorough knowledge about the physiology of GIT, and all the limitations should be well understood. To justify the in vitro studies, in vivo studies must be conducted.

The excellent floating system is effective only in the presence of sufficient fluid in the stomach; otherwise, buoyancy of the tablet may be hindered. This limitation can be overcomeby using a combination of a floating system with other gastroretentive approaches.[14] GRDDSs are formulated as floating microparticles, tablets, pellets, capsules, etc. among which the multiparticulate systems are more effective than the single unit dosage forms.[15,16] Ciprofloxacin hydrochloride, a broad-spectrum fluroquinolones antibacterial agent is moreabsorbed from the stomach and the proximal part of the small intestine.[17] Oral bioavailability is about 70% and reaches the peak plasma concentration to 2.5 μg/ml in 1 to 2h after administration of 500 mg. As the tablet passes down the GIT, the decrease absorption is the draw back with sustained release dosage form of ciprofloxacin hydrochloride. The extended release formulation of ciprofloxacin HCl (Cipro XR and Proquin XR) is used for complicated and uncomplicated urinary tract infections (UTIs).[18,19] Ciprofloxacin HClextended release (500 mg once daily) shows higher plasma concentration than the immediate

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REVIEW ARTICLE

A key role by polymers in microneedle technology: a new era

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ABSTRACT

The skin serves as the major organ in the targeted transdermal drug delivery system for many compounds. The microneedle acts as a novel technique to deliver drugs across the different layers of the skin, including the major barrier stratum corneum, in an effective manner. A microneedle array patch comprises dozens to hundreds of micron-sized needles with numerous structures and advantages resulting from their special and smart designs. The microneedle approach is much more advanced than conventional transdermal delivery pathways due to several benefits like minimally invasive, painless, self-administrable, and enhanced patient compliance. The microneedles are classified into hollow, solid, coated, dissolving, and hydrogel. Several polymers are used to fabricate microneedle, such as natural, semi-synthetic, synthetic, biodegradable, and swellable polymers. Researchers in the preparation of microneedles also explored the combinations of polymers. The safety of the polymer used in microneedle is a crucial aspect to prevent toxicity *in vivo*. Thus, this review aims to provide a detailed review of microneedles and mainly focus on the various polymers used in the fabrication of microneedles.

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Microneedle; transdermal drug delivery; biocompatible; biodegradable; polymer

Introduction

Microneedles

The use of combined methods in pharmaceutical science and health care allows us to attain higher success in research activities. The transdermal drug delivery system (TDDS) is considered the emerging system in drug delivery due to its distinctive advantages compared to other routes of administration, such as peroral and injectable [1]. Hence, TDDS is widely preferred for delivering drugs, macromolecules, and immune biologicals locally and systemically. However, the poor penetration of the substances across the stratum corneum (SC) is acting as the main hurdle in the TDDS. One of the novel and innovative approaches is microneedles (MNs) to overcome this limitation. Hence, various researchers have started working in microneedle technology to overcome the pitfalls of other drug delivery systems and transport drugs across SC [2].

Considering the development in needles in 1844, drugs were administered to the patients using hypodermic needles *via* the intravenous route. Approximately 16 billion injections are administered worldwide, and it is sought to be the widely preferred medical device [3]. The hypodermic needles are provided several advantages as devices for the systemic administration of the drug and bioactive. It is also suitable for most pharmaceuticals, which suffer from low gastrointestinal tract absorption and undergo enzymatic breakdown [4]. In the case of administration of medications through the intravenous route *via* hypodermic needle is accompanied by a sensation of pain and psychological disturbances in patients having a fear of a needle.

Many efforts were made to overcome this limitation of the hypodermic needles, especially in designing the hypodermic needle to make them painless and patient-friendly drug delivery systems. Hence, hybrid structures MNs were innovated between transdermal patches and hypodermic needles [5], consisting of several needles of different dimensions based on use. One of the eminent pioneers and well-known researchers in the field, Mark Prasuintz, classified the MNs as the third-generation system in transdermal drug delivery [6]. This type of medical unit results in the micron-sized opening onto the skin post-application and can be explored for the administration of several drugs. In the case of the dimensions, the length of the MNs ranged from 250 and 1000 μm, and sharp tip portion than hypodermic needles [7]. The first patent in the field of microneedles was filed by scientists of Alza corporation (Gerstel and Martin) in 1976 and projected that these small (micron size) microneedles could be helpful for delivery in a painless manner *via* transdermally [8]. During this phase, three organizations, Alza Corporation, Becton Dickinson, and Georgia Tech Institute, are the first to start research on the microneedle drug delivery system [9].

MNs consist of a single or an array of needles of micron-scale (length of 0.2–1.5 mm in length), which offer a minimally invasive way to overcome the significant hurdle (i.e. SC) of the skin. The needles are efficient enough to puncture the SC and generate transport channels of tiny size for easy application [10,11].

Several fabrication techniques are used, such as pressure molding, injection molding casting, computer numerical control (CNC), etc., which can be used at an industrial scale. Many of these

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In Silico study of 3-D structural interactions and quantitative structural drug likeness of marketed Cox-2 inhibitors

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Abstract

In the field of molecular modeling, docking may be a method which predicts the well-liked orientation of any molecule to a receptor to make a stable complex. Knowledge of the well-liked orientation successively could also be able to predict the strength of association or binding affinity between two molecules using, for instance, scoring functions.

Cyclooxygenase-2 (COX-2) inhibitors block cyclooxygenase-2 (COX-2), an enzyme that promotes inflammation. COX-2 enzyme converts to prostaglandin via arachidonic acid, causing pain and inflammatory responses. They are mainly present in places of inflammation and are responsible for formation of prostanoids (prostacyclins, prostaglandins and thromboxane) as part of the inflammatory response. COX-2 inhibitors are used to relieve pain raised from the inflammation.

In the present study, the marketed COX-II inhibitors are subjected for the docking study and the drug likeness study which validate that the drugs show the optimum binding energy and drug likeness score with optimum bioactive score.

Keywords: Cyclooxygenase-2 (COX-2) Inhibitors; Prostaglandin Synthase Kinase-2; Docking Study; Drug Likeness Study

1. Introduction

Recent review reveals that pain and inflammation are the most common sign and symptom for almost all diseases so NSAIDs (Table 1) are found to be most commonly prescribed class of drug. Thus compare with all medications, NSAIDs approximately up to 5-10% part of prescription every year. In the general practice, patients over 65 years old treated with prevalence use as high as 96% of NSAID. Similarly 7.3% of elderly patients are prescribed by at least one NSAID in one year period. NSAIDs as like to their anti-inflammatory effect, also shows antipyretic and analgesic properties. Mostly all NSAIDs act by inhibiting Cyclooxygenase (COXs) enzymes, which are responsible for prostaglandins and other prostanoids synthesis, such as thromboxane, so termed as rate determining enzymes [1].

Selective cyclooxygenase (COX)-2 inhibitors are just as effective as NSAIDs in relieving arthritic pain and yet less gastrotoxic, they are being used in place of "conventional" nonsteroidal anti-inflammatory drugs (NSAIDs) [2].

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ORIGINAL ARTICLE

Statistical optimization of voriconazole nanoparticles loaded carboxymethyl chitosan-poloxamer based in situ gel for ocular delivery: In vitro, ex vivo, and toxicity assessment

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Abstract

The research study reflects the development of novel voriconazole (VCZ) loaded nanoparticles (NPs) for prolonged delivery for the management of ocular diseases. The in situ ophthalmic gel was prepared by incorporating NPs into carboxymethyl chitosan (CMCh) and poloxamer. The central composite design was used to optimize the process for the preparation of nanoparticles by the o/w solvent evaporation method. The developed nanoparticles were evaluated for the encapsulation efficiency (89.6 ± 1.2%), particle size (219.3 ± 1.8 nm), polydispersity index (PDI, 0.1), zeta potential (−21.1 ± 1.12 mV), saturation solubility, DSC study, and drug release. The etherification process grafts carboxyl surface functional groups, on chitosan, and was confirmed by FTIR and NMR studies. The developed CMCh-poloxamer based gelling system was found to be clear and transparent with gelation temperature varying from 33 to 40 °C. The nanoparticle-loaded gel containing CMCh demonstrated enhanced antifungal activity against *Candida albicans*. The optimized batch containing CMCh showed improved mucoadhesion by 2.86-fold compared to VCZ nanosuspension. The drug release was prolonged up to 8 h with an ex vivo study suggesting the enhanced permeation across goat cornea estimated via fluorescent microscope. The hen's egg chorioallantoic membrane study revealed that the formulation was non-irritant and tolerated by the chorioallantoic membrane. The present study concludes that the VCZ loaded nanoparticulate in situ ophthalmic gel using CMCh may act as a potential alternative for traditional eye drops.

Keywords Voriconazole · Nanoparticles · In situ gel · Chitosan · Carboxymethyl chitosan · Poloxamer

Introduction

Fungal keratitis and conjunctivitis can result from a fungal infection in the eyes. It is a serious infection of the corneal tissue triggered by various fungi including *Aspergillus*, *Fusarium*, or *Candida* [1]. Severe corneal ulcers and visual loss may occur if treatment is delayed [2]. One of the most challenging issues in the area of ophthalmology is treating ocular fungal infections. Furthermore, the eye is a tiny, complicated organ with a limited amount of tear fluid for medication retention and absorption [3]. The effective proportion of the applied dosage accessible for absorption is reduced by tear film turnover and blinking. The remaining portion of the dosage must then get past the corneal epithelium's tight connections to be absorbed and offer treatment [4]. The most common approach for ocular medication administration is topical eye drops, as it is easy to use, non-invasiveness, and therefore highly acceptable by patients [5]. Eye drops, on the other hand, have certain disadvantages, such as loss of drug in the precorneal part of the eye, limited corneal penetration, require multiple administration, and reduced bioavailability to less than 5% [6]. Also, traditional ocular dose forms, including solutions and suspensions, have several disadvantages, including the drug's fast precorneal clearance owing to nasolacrimal drainage [7]. The requirement for recurrent application and, in particular, pulse release from solutions

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Review

Molecular Insights into Coumarin Analogues as Antimicrobial Agents: Recent Developments in Drug Discovery

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Simple Summary: Coumarins are a large family of benzopyrones, and more than 1300 coumarins have been reported to date. Natural, as well as synthetic, coumarins have demonstrated a diverse activity spectrum. On the other hand, the demands of the current health scenario witnessing morbidity and mortality due to microbial infections and multidrug-resistant bacterial strains, the well-reported phytochemical coumarin can be of interest. Some of the well-reported coumarin analogues as antimicrobial agents include β-lactum derivatives, coumarin-based 1,2,3-triazole compounds, the miconazole analogue, coumarin-substituted pyrazole hybrids, pyranocoumarin, coumarin−sulphonamide hybrids, pyranocoumarins, coumarin−sulphonamide derivatives, chromenylpyrazoles candidates, 3-amidocoumarins analogues, uracil−coumarin hybrids, indolinedione−coumarin hybrids, coumarin−imidazole hybrids, coumarin-fused pyrazolones and methyl thiazole derivatives, coumarin−theophylline hybrids, etc. In the present review, several methods for the synthesis of coumarin derivatives as antimicrobial agents are reported, along with structure−activity relationship (SAR) studies focusing on the developments reported since 2016.

Abstract: A major global health risk has been witnessed with the development of drug-resistant bacteria and multidrug-resistant pathogens linked to significant mortality. Coumarins are heterocyclic compounds belonging to the benzophenone class enriched in different plants. Coumarins and their derivatives have a wide range of biological activity, including antibacterial, anticoagulant,

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A REVIEW ON QUALITY BASED DESIGN (QBD)

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Abstract : In this paper, Associate in Nursing application of Quality intentionally (QbD) ideas to the event of a stability indicating HPLC methodology for a fancy pain management drug product containing drug substance, 2 preservatives, and their degradants is represented. The QbD approach consisted of (i) developing a full understanding of the meant purpose, (ii) developing prognosticative solutions, (iii) coming up with a substantive system suitableness answer that helps to spot failure modes, and (iv) following style of experiments (DOE) approach. The beginning methodology lacked any resolution among drug degradant and preservative aerophilousdegradant peaks, and peaks for preservative and another drug degradant. the strategy improvement was accomplished victimisation Fusion AE™ software system (SMatrix Corporation, Eureka, CA) that follows a DOE approach. Column temperature (50 ± 5°C), mobile part buffer hydrogen ion concentration (2.9 ± 0.2), commercialism acetonitrile (ACN, 2 ± 1%), and initial hold time (2.5, 5, or ten min) of the HPLC methodology were at the same time studied to optimize separation of the unresolved peaks. The optimized HPLC conditions (column temperature of 50°C, buffer hydrogen ion concentration of three.1, three-d initial ACN with a pair of.5 min initial hold) resulted in absolutely resolved peaks within the 2 important pairs. The QbD based mostly methodology development helped in generating a style house and operative house with information of all methodology performance characteristics and limitations and victorious methodology strength inside the operative house. Quality intentionally (QbD), a current trend utilized to develop and optimise varied important pharmaceutical processes, could be a systematic approach supported the attribute that quality ought to be designed into the merchandise itself, not simply finish tested once manufacture. the current work details a step-wise application of QbD principles to optimise method parameters for production of particles with changed functionalities, victimisation dry particle coating technology. Initial risk assessment known speed, atmospheric pressure, time interval and batch size (independent factors) as having high-to-medium impact on the dry coating method. A style of experiments (DOE) victimisation MODDE software system utilized a D-optimal style to see the result of variations in these factors on known responses (content uniformity, dissolution rate, particle size and intensity of Fourier remodel infrared (FTIR) C = O spectrum). Results showed that batch size had the foremost important result on dissolution rate, particle size and FTIR; with a rise in batch size enhancing dissolution rate, decreasing particle size (depicting absence of coated particles) and increasing the FTIR intensity. whereas content uniformity was suffering from varied interaction terms, with speed and batch size having the very best negative result. best style house for manufacturing functionalised particles with best properties needed most atmospheric pressure (40psi), low batch size (6g), speed between 850 to fifteen00 rev and process times between 15 to hr.

INTRODUCTION-

Quality by Design (QbD) be a concept first outlined by quality expert Joseph M. Juran in publications, most notably Juran on Quality intentionally. Designing for quality and innovation is one among the three universal processes of the Juran Trilogy, during which Juran describes what's required to realize breakthroughs in new products, services, and processes. Juran believed that quality might be planned, which most quality crises and problems relate to the way during which quality was planned. While Quality intentionally principles are wont to advance product and process quality in industry, and particularly the automotive industry, they need also been adopted by the U.S. Food and Drug Administration (FDA) for the invention,

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Central Nervous System: A Review

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Abstract

The current review gives detail insight about central nervous system various barriers like Blood Cerebrospinal fluid barrier, Blood tumor barrier and efflux mechanisms in drug transportation to brain chemical factors affecting inputs to brain and distribution strategy like Invasive strategies, Physiological strategies, Pharmacological strategies which gives a detail idea abour brain transport and central nervous system.

Key Words: CNS, CNS Transport, CNS Drug Delivery, Barriers for drug transport, Distribution of drug in Brain

1. INTRODUCTION

Despite dramatic improvements in brain research, disorders of the brain and central nervous system continue to be the leading cause of disability worldwide, accounting for hospitalizations and long-term care. term more than most other comorbidities. The presence of BBB is a major obstacle to drug delivery to the brain. BBB must be overcome by drugs effective against central nervous system diseases and reach the brain via the hematoma. Understanding the mechanisms involved in uptake and efflux from the brain is essential for the development of drugs that successfully cross the BBB and display the expected therapeutic effects on the CNS. The function of the BBB is dynamically regulated by many cells present at the level of the BBB.

This discovery requires a deeper understanding of the relationship between the drug's structure and the physico-chemical and transport properties of BBB. Although there are good examples of central nervous system delivery of drugs, only a few have developed to the extent that they can be used safely and effectively in humans. Invasive techniques for the treatment of CNS diseases will become less necessary as

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ANTI-SNORING DEVICE: A REVIEW

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ABSTRACT

Snoring is often caused by variety of things, like the anatomy of your mouth and sinuses, alcohol consumption, allergies, a cold, and your weight. If a snorer is having un-refreshing sleep, feeling of choking, recurrent awakening from sleep, daytime fatigue, and change in personality, he/she has crossed the line of demarcation between snoring and potentially life-threatening disease. Anti-snoring Devices are the devices which use to stop snoring and clear the pathway for air. Anti-snoring Devices may useful to treat Obstructive sleep apnea. This review article focuses on anti-Snoring Device used worldwide with their significance.

Keywords: Snoring, Anti-snoring Devices, Obstructive sleep apnea

INTRODUCTION

Obstructive sleep apnea or Snoring occurs when vibrations of the pharyngeal airway create a respiratory sound during sleep. Snoring is a common sleep disorder of breathing, commonly encountered in middle-aged individuals. If a snorer is having un-refreshing sleep, feeling of choking, recurrent awakening from sleep, daytime fatigue, and change in personality, he/she has crossed the line of demarcation between snoring and potentially life-threatening disease. There are many predisposing factors such as obesity, sedentary life style, heredity, alcohol, and certain drugs that lead to this condition. OSA is affecting the population worldwide. Various studies have been done till date to evaluate its actual prevalence **[1]**. The Wisconsin Sleep Cohort Study showed that 25% of middle-age men and 10% of middle-age women had sleep-disordered breathing (AHI > 5/h), with 4% of men and 2% of women also having hypersomnolence, fulfilling the current

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(REVIEW ARTICLE)

Check for updates

Review on *in vivo* and *in vitro* experimental model of anti-hypertensive agent

Shubham Purushottam Jaybhaye *, Samiksha Dnyaneshwar Ajmire, Sachin Ramesh Baringe, Mahesh Bhanudas Narkhede, Pavan Prabhakar Chinchole and Pratik Sunil Kapse

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Abstract

We aimed to evaluate the use of specific antihypertensive drugs and drug classes, as well as combinations in patients treated with 3 or more drugs classified as having or not resistant hypertension (RH), controlled or uncontrolled RH and true versus white-coat RH. From the Spanish ABPM Registry, we identified 21238 patients treated with 3 (14264) or more (6974) antihypertensive drugs of different classes. Among patients treated with 3 drugs we compared those with controlled (<140/90 mmHg; No RH) or uncontrolled (RH) office BP. In patients treated with 4 or more drugs we compared controlled versus uncontrolled RH. Hypertension continues to be an important public health concern because of its associated morbidity, mortality and economic impact on the society. It is a significant risk factor for cardiovascular, cerebrovascular and renal complications. It has been estimated that by 2025, 1.56 billion individuals will have hypertension. The increasing prevalence of hypertension and the continually increasing expense of its treatment influence the prescribing patterns among physicians and compliance to the treatment by the patients. A careful selection of drug therapy along with close follow-up offers the best prospect to reduce the burden of morbidity and mortality in hypertension. This article provides an overview of drugs in the management of patients with hypertension.

Keywords: Antihypertensive; Cerebrovascular; Renal Complications; ABPM Registry

1. Introduction

Hypertension is a major contributing factor for cardiovascular disease (CVD) and renal diseases that can increase the risks of comorbidities such as myocardial infarction, stroke and heart failure (HF) [1]. Studies have revealed that risk factors such as obesity and genetic factors can influence the occurrence and development of hypertension [2,3]. In addition, complicated regulatory networks, including the renin-angiotensin-aldosterone system (RAAS), the nervous system and arterial remodelling [4-6] also affect the progression of hypertension. Because blood pressure (BP) is difficult to control, the priority is finding drug targets to effectively control and manage BP in the hypertensive population. In this review, we primarily describe the classical and new drug targets used in hypertension therapy. Hypertension is the most common chronic disease in the world and produces substantial morbidity and mortality. However, in the majority of individuals, the precise cause of elevated blood pressure (BP) cannot be determined. Risk factors for primary (formerly called essential) hypertension include advancing age, obesity, high dietary NaCl consumption, and low dietary potassium intake, although these appear to contribute to, but not cause, hypertension. Renin-sodium profiling has been used to classify primary hypertension, suggesting that the phenotype is highly variable, but treatment remains largely empirical and influenced by race and comorbid disease. A number of hypertensive subtypes also exist, and although they may make up only a small fraction of the cases of hypertension, they can nonetheless be relatively common, given the broad prevalence of hypertension itself. Malignant hypertension is related to, but pathophysiological distinct from, primary hypertension, as is the syndrome of preeclampsia. Secondary causes may involve the renal vasculature, endocrine organs, and kidney and may be involved in up to 20% of cases of resistant

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Superdisintegrants in Orally Administered Products of Pharmaceuticals: A Review

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ABSTRACT

Superdisintegrants are developed to improve the palatability in orally administered products and to advancing the development of various formulations with increase performance and acceptability. Superdisintegrants are used to revise the potency of solid dosage form .This is accomplish by decreasing the disintegration time which in turn improvement the drug dissolution rate. Diverse categories of Superdisintegrants such as synthetic, semi synthetic, natural and cross-processed blend etc. The present study comprises the various kinds of Superdisintegrants which are being used in formulations to provide the safer effective drug delivery with patient's compliance.

KEYWORDS: *Orally administered products; Superdisintegrants; potency; palatability*

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INTRODUCTION

On analyzing the behavior of disintegration time in the oral cavity as well as wetting time by surface free energy we came to know, that for a faster wetting a molecule should have high polar component of surface free energy and the agents which meet these special requirements are called as Superdisintegrants [1].

Superdisintegrants are those substances, which facilitate the faster disintegration with smaller quantity in contrast to disintegrants. The disintegration of dosage forms are depends upon various physical factors of disintegrants/Superdisintegrants which are as follow:

1. Percentage of disintegrants present in the formulation
2. Proportion of disintegrants used
3. Compatibility with other excipients.
4. Presence of surfactant.
5. Hardness of the tablets.
6. Nature of Drug substances
7. Mixing and types of addition.[2,3]

Superdisintegrants are added version of super-absorbing materials with tailor-made swelling properties. These materials are not planned to absorb significant amounts of water or aqueous fluids, but planned to swell very fast. Superdisintegrants are used as a structural weakener for the disintegrable solid dosage forms. They are physically dispersed within the matrix of the dosage form and will expand when the dosage form is exposed to the wet environment. [4]. These newer substances are more effective at lower concentrations with greater disintegrating efficiency and mechanical strength.[5] Superdisintegrants are generally used at a low level in the solid dosage form, typically 1 - 10 % by weight relative to the total weight of the dosage unit. [6] Their particles are generally small and porous, which allow for rapid tablet disintegration in the mouth without an objectionable mouth-feel from either large particles or gelling. The particles are also compressible which improves tablet hardness and its friability.[4] Effective Superdisintegrants provide improved compressibility, compatibility and have no negative impact on the

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ORIGINAL ARTICLE

Gossypol-Embedded Casein Nanoparticles for Potential Targeting of Ovarian Cancer: Formulation, Characterization, and Anticancer Activity

Ganesh B. Patil[1] · Darshana M. Borse[1] · Mahesh P. More[2] · Dilip A. Patil[1]

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Abstract

Background The present study intends to investigate the ability of gossypol-loaded casein nanoparticles (gossypol-loaded CAS NPs) for the treatment of ovarian cancer. The key emphasis of this study was to synthesize and characterize gossypol-embedded casein NPs by the desolvation technique.

Method Casein is used as a polymer to fabricate the NPs; the fabricated nanoparticles are then characterized using UV–visible spectroscopy, FTIR spectroscopy, SEM, EDX, zeta potential and size analysis, and DSC to explore the efficiency and strength. The role of cross-linked casein nanoparticles was observed to improve the blood bioavailability of gossypol.

Results The particle size of the optimized batch was found to be 278 ± 5 nm, and the PDI is 0.399; the zeta potential was found to be − 14.88 mV, and the % CDR of the optimized batch was found to be 55.66%. The cytotoxicity of gossypol-loaded CAS NPs was tested in vitro against a human breast cancer cell line (MCF-7) and found to be considerable.

Conclusions The gossypol-loaded casein NPs were successfully synthesized with important advantages such as being easy to prepare, stable, and cost-effective with their applicability in ovarian cancer.

Keywords Ovarian cancer · Gossypol · Nanoparticles · Nanotechnology

Abbreviations

IARC	International Agency for Research on Cancer
CAS	Casein
CAS NPs	Casein nanoparticles
NPs	Nanoparticles
SEM	Scanning electron microscopy
EDX	Energy-dispersive X-ray analysis
DSC	Differential scanning calorimetry
PDI	Polydispersity index
CDR	Cumulative drug release
XRD	X-ray diffraction
MCF-7	Michigan Cancer Foundation-7
SRB	Sulforhodamine B
RPMI	Roswell Park Memorial Institute Medium
ACTREC	Advanced Centre for Treatment, Research & Education in Centre
ZP	Zeta potential

Background

According to the International Agency for Research on Cancer (IARC), in 2020 there were 19.29 million new cancer cases and 9.95 million cancer deaths worldwide. By 2040, the global burden is expected to grow to 28.8 million new cancer cases and 16.2 million cancer deaths in the population. The future burden of cancer patients is likely to be even greater due to the increasing prevalence of risk factors such as smoking, poor diet, physical inactivity, and others [1, 2].

Gossypol is a non-volatile yellow pigment that was discovered in 1889 in the seeds and roots of *Gossypium* plants, notably cotton plants. The knowledge of gossypol's biological activity increased after it was identified in cottonseed-based supplements for livestock [3]. There were some reports on the toxicological effects of the components of the cotton plant [4]. Along with this, some researchers have tried to focus on the beneficial effects

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Research Article

A study on Formulation and Evaluation of Gastroretentive tablet incorporating Ciprofloxacin Hydrochloride

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Abstract

Ciprofloxacin is a broad spectrum fluoroquinolone antibiotic effective in a broad range of infections including some difficult to treat ones. Because of wide-spectrum bactericidal activity, oral efficacy and good tolerability, it is used in Urinary tract infection, Gonorrhea, Bacterial gastroenteritis, Typhoid, Bone, soft tissue and gynecological infection, Respiratory infection and tuberculosis. The main objective of formulating the floating system was to reduce the frequency of administration, to improve patient compliance and improve bioavailability of drug by preparing a gastroretentive drug delivery system. Floating tablets of Ciprofloxacin hydrochloride were prepared by employing two different grades of control releasing polymers HPMC K4M and HPMC K100M in different concentration. Sodium bicarbonate was incorporated as a gas-generating agent. The tablets were evaluated for uniformity of weight, hardness, friability, drug content, floating behavior, swelling studies and dissolution studies. Among tablet formulations, formulation F3 showed maximum drug release i.e. 92.25% at the end of 12 h compared with other formulations and was concluded as optimized one.

Keywords: Ciprofloxacin HCl, floating tablets, HPMC K4M, HPMC K 100M, FTIR.

INTRODUCTION

Dosage forms that can be retained in the stomach are called gastroretentive drug delivery system (GRDDS). Gastroretentive drug delivery is one of the promising approaches for enhancing the bioavailability and controlled delivery of drugs that exhibit narrow absorption window. Gastroretentive techniques increase the gastric retention time of the dosage form and control drug release. These are the systems which can remain in gastric region for several hours and significantly prolong the gastric residence time of drug. After oral administration, such a delivery system would be retained in stomach. It will release the drug there in a controlled & prolonged manner, so that the drug could be supplied continuously to absorption site in GIT.[1]

A major constraint in oral controlled drug delivery is that not all drug candidates are absorbed uniformly throughout the GIT. Some drugs are absorbed in a particular segment of GIT only or are absorbed to a different extent in various segments of GIT. Such drug candidates are said to have an „absorption window". But, in case of „narrow absorption window" drugs, only the drug released in the region preceding and in close vicinity to the absorption window is available for absorption. Again after crossing the absorption window, the released drug drastically minimizes the time available for drug absorption after it, which is then accompanied by lesser bioavailability.[2] Thus, the success of oral controlled drug delivery has faced some difficulties related with physiological adversities, like short gastric residence time (GRT) and goes to waste with negligible or no absorption. This phenomenon is unpredictable gastric emptying time (GET). Prolonged GRT improves bioavailability, increases the duration of drug release, reduces drug waste and improves the drug solubility that are less soluble in a high pH environment.[2,3]

This has triggered the attention towards the development of various gastroretentive drug delivery technologies to deliver „narrow absorption window" drugs with improved bioavailability. Gastroretentive dosage forms are designed to be retained in the gastric region for prolonged time and release and prolonged input of the drug to the upper part of the GIT beyond the level of existing controlled release dosage thus ensuring its optimal bioavailability. Thus, they not only prolong the dosing intervals, but also increase the patient incorporated drug candidates and thereby enable sustained compliance forms. This application is especially effective in delivery of sparingly soluble and insoluble drugs. Gastroretentive dosage forms greatly improved the pharmacotherapy of the GIT through local drug release.[4]

Various drugs have their greatest therapeutic effect when released in the stomach, particularly when the release is prolonged in a continuous, controlled manner. Drugs delivered in this manner have a lower level of side effects and provide their therapeutic effects without the need of repeated

pharmaceutics

MDPI

Review

Progress on Thin Film Freezing Technology for Dry Powder Inhalation Formulations

Sagar R. Pardeshi [1], Eknath B. Kole [2], Harshad S. Kapare [3], Sachin M. Chandankar [4], Prashant J. Shinde [1], Ganesh S. Boisa [1], Sanjana S. Salgaonkar [1], Prabhanjan S. Giram [3,5], Mahesh P. More [6,*], Praveen Kolimi [7], Dinesh Nyavanandi [8], Sathish Dyawanapelly [9,*] and Vijayabhaskarreddy Junnuthula [10,*]

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Abstract: The surface drying process is an important technology in the pharmaceutical, biomedical, and food industries. The final stage of formulation development (i.e., the drying process) faces several challenges, and overall mastering depends on the end step. The advent of new emerging technologies paved the way for commercialization. Thin film freezing (TFF) is a new emerging freeze-drying technique available for various treatment modalities in drug delivery. TFF has now been used for the commercialization of pharmaceuticals, food, and biopharmaceutical products. The present review highlights the fundamentals of TFF along with modulated techniques used for drying pharmaceuticals and biopharmaceuticals. Furthermore, we have covered various therapeutic applications of TFF technology in the development of nanoformulations, dry powder for inhalations and vaccines. TFF holds promise in delivering therapeutics for lung diseases such as fungal infection, bacterial infection, lung dysfunction, and pneumonia.

Keywords: thin film freezing; dry fine powder; novel drug delivery; poorly soluble drug; pulmonary; inhalation

1. Introduction

Recently, the dissolution profile of water-insoluble medications has been significantly improved by using the particle engineering technique known as thin film freezing (TFF) [1]. TFF is the evolution of a fast-freezing technique to form films and produce powdered drug particles. The API and stabilizer solution are immediately iced onto a cryogenically frozen surface in the TFF process, after which the frozen particles are collected, and the solvent is sublimated. The supercooling of the API and stabilizer solution minimizes the phase separation and nucleation, which possibly converts the crystalline drug to an amorphized form [2]. Additionally, the high freezing rate increases the number of liquid crystals and lowers the particle size. The amorphous composition with enhanced surface area contributes to an increased rate of drug dissolution. Zhang et al. formulated a fenofibrate

VISION

To excel the field of pharmaceutical education by inculcating moral values and developing high-quality pharma professionals

MISSION

To adopt high-quality technical education and training methodologies to foster the spirit of research, innovation, entrepreneurship and contribute to the profession and society

Program Educational Objectives (PEOs)

PEO 1: To provide comprehensive knowledge of fundamental principles and their applications in the area of Pharmaceutical Sciences and Technology

PEO 2: To produce pharmacy students with strong fundamental concepts and high technical competence.

PEO 3: To introduce discipline, professionalism, team spirit, communication skills, social and ethical commitment to the students.

PEO 4: To train the students to contribute towards the health care system and creating awareness about healthcare issues.

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