DEPARTMENT OF BIOTECHNOLOGY (DBT), NEW DELHI

भारत सरकार
GOVERNMENT OF INDIA
विज्ञान और प्रौद्योगिकी मंत्रालय
MINISTRY OF SCIENCE AND TECHNOLOGY
जैवप्रौद्योगिकी विभाग
DEPARTMENT OF
BIOTECHNOLOGY
सत्यमेव जयते

Sponsored

National Conference

ROYAL COLLEGE OF PHARMACY
RAIPUR (C.G.)

On

"Recent advances and future prospects of Nanotechnology in Gene therapy : from Discovery to Delivery"

6th –7th February 2026

Organized by

ROYAL COLLEGE OF PHARMACY

Behind Pandit Ravishankar Shukla University,
Tatibandh, Raipur (C.G.)

Visit us at http://www.royalpharmacy.org
Email:rcpseminarroyal@gmail.com
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CORE ORGANIZING COMMITTEE

Chief Patron

Mr. Toshan Chandrakar
Chairman,
Combined Academy of Technical Education

Patron

Mr. Kamal Chandrakar
Secretary,
Combined Academy of Technical Education

Convener
Dr. Deepak Kumar Dash
Principal, Royal College of Pharmacy, Raipur (CG)

Organizing Secretary
Dr. Rajni Kant Panik
Associate Professor
Principal, Royal College of Pharmacy, Raipur (CG)

Joint Organizing Secretary
Dr. Anil Kumar Sahu
Associate Professor
Royal College of Pharmacy, Raipur (C.G.)

Joint Organizing Secretary
Dr. Rudra Pratap Singh Rajput
Associate Professor
Royal College of Pharmacy, Raipur (C.G.)

Organising Committee at a Glance

Sr. No.	Name of Committee	Coordinator	Co-Coordinator
1	REGISTRATION COMMITTEE	Mrs. Priyanka Dewangan	Mrs. Chandrika Ber Mrs. Gayatri Verma Ms. Seema Jaiswal
2	SCIENTIFIC COMMITTEE	Dr. Subhasri Mohapatra	Ms. Riya Vaiswade Mrs. Neha Giri Ms. Tripti Sahu
3	SCIENTIFIC PUBLICATION COMMITTEE	Dr. Anil Sahu Dr. Rudra Pratap Singh Rajput Dr. Rajni Kant Panik	
4	ACCOMMODATION &TRANSPORTATION COMMITTEE	Mr. Tapas Panigrahi Mr.Pankaj Kashyap	Mr. Vinayak
5	CATERING COMMITTEE	Mr. Tapas Panigrahi Mr. Pankaj Kashyap Dr. Rudra Pratap Singh	Mrs. Chandrika Ber All Class Teachers
6	DISCIPLINE COMMITTEE	Dr. Seema Verma Mr. Tapas Panigrahi Mr. Pankaj Kashyap	Ms. Sonali Maiti Ms. Kamini Potai Ms. Monika Keshri
7	HOSPITALITY COMMITTEE	Dr. Seema Verma	Ms. Ayushi Jain
8	STAGE & VENUE COMMITTEE Inaugural Function & Valedictory function Scientific/Plenary session Presentation	Mrs. Shilpa Kasture	Ms. Monika Keshri Mrs. Varsha Dhiwar Ms. Priyanka Sinha Mrs. Shubhasri Mohapatra Ms. Riya Vaiswade
9	MEDIA COMMITTEE	Mr. Tapas Panigrahi Dr. Rudra Pratap Singh Rajput	
10	PHOTO GRAPHY COMMITTEE	Ms. Tripti Sahu Mr. Varsha Dhiwar	
11	GUEST WELCOME	Mrs. Shilpa Kasture Dr. Seema Verma	Ms. Kamini Potai Ms. Ayushi Jain

Message from Chief Patron

I am happy to hear that Royal College of Pharmacy, Raipur, is organizing Department of Biotechnology, New Delhi Sponsored National Conference on ***"Recent advances and future prospects of Nanotechnology in Gene therapy: from Discovery to Delivery"*** on 6th-7th February 2026. This conference will surely benefit the scientific fraternity and researchers. I am sure that this occasion wouldbe an excellent opportunity for the participants to share their views and commit themselves to work towards Nanogene Therapy.

I extend my heartfelt greetings for the event and wish to the College for all the success inthis Conference and in future endeavours.

Mr. Toshan Chandrakar
Chairman
Combined Academy of Technical Education

Message from Patron

I feel very delighted to share that Royal College of Pharmacy, Raipur, is organizing Department of Biotechnology, New Delhi Sponsored National Conference on ***"Recent advances and future prospects of Nanotechnology in Gene therapy: from Discovery to Delivery"*** on 6th-7th February 2026.

I welcome all the guests, eminent resource persons, faculty of different colleges and students. This conference is a platform where participants would share and exchange their research and practical experiences and challenges in Regulatory framework of synthesizing the key for various scientific findings, contextualize their significance, and outline the future trajectory of nanogene therapy from discovery to delivery at target site.

Warm wishes for the grand success of this National Conference.

Mr. Kamal Chandrakar
Secretary
Combined Academy of Technical Education

Message from Convener

It is a proud privilege to share with you all thatRoyal College of Pharmacy, Raipur (CG), is organizing Department of Biotechnology, New Delhi Sponsored National Conference on ***"Recent advances and future prospects of Nanotechnology in Gene therapy: from Discovery to Delivery"*** on 6th-7th February 2026.

This conference aims to provide the platform to academicians, researchers of various fields like Pharmaceutical Science, Biotechnology, Clinical Practice and other disciplines. The Conferences also promote partnerships to "cross-pollinate" ideas and drive innovation for various discipline in the area of nano gene delivery. It is intended to provide proper direction and vision to future research for the benefit of mankind.

I wish a grand success for this conference.

Dr. Deepak Kumar Dash
Principal
Royal College of Pharmacy, Raipur (CG)

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DEPARTMENT OF
BIOTECHNOLOGY

DBT Sponsored National Conference
On
"Recent Advances and Future Prospects of Nanotechnology in Gene Therapy: From Discovery to Delivery"

ROYAL COLLEGE OF PHARMACY RAIPUR (C.G.)

6th -7th February 2026

Minute to Minute Program Schedule

S.No.	Particular	Time Duration (min)	Time
1	Registration and High Tea	60 Minutes	9:00 AM-10:00 AM
	Date-06/02/2026 (Inauguration)		
2	Arrival of Guests	-------	10:30 AM
3	Seating of Guest and Dignitaries on stage and Inaugural Function start	-------	11:00 AM
4	SaraswatiVandana and Lighting of the Lamp	5 Minutes	11:00 AM-11:05 AM
5	Welcome address by Chairman, Combined Academy of Technical Education **Mr. Toshan Chandrakar (Chief patron)**	10 Minutes	11:05 AM-11.15 AM
6	Address by **Chief guest**	15 Minutes	11:15 AM-11.30 AM
7	About the theme of Conference by Dr.Deepak Kumar Dash (Convener)	5 Minutes	11.30AM -11.35 AM
8	Introduction of our distinguished speaker by **Dr. Rajni Kant Panik (Organizing Secretary)**	5 Minutes	11.35AM -11.40 AM
(Day 1) Date- 06/02/2026 (Starts of Scientific Session)			
	No. of Session	**Time Slot**	**Name of Speaker**
9	**Scientific Session -I**	11:40 AM-12:40 PM	**Dr. Suman Jha** (Associate Professor) Department of Life Sciences, National Institute of Technology Rourkela, Odisha,

Scientific Session (E-Poster Presentation)			
11	**E-Poster Presentation Chairperson**	11.40 AM-4.00 PM	**Dr. Rakesh Tirkey** (Assistant Professor) University Institute of Pharmacy, Pt.RavishankarShukla University, Raipur
	Lunch Break		**1:30 PM-2:30 PM**
12	**Scientific Session -II**	2:30 PM-3:30 PM	**Dr. Sharda Bharti** (Assistant Professor) Department of Biotechnology National Institute of Technology, Raipur
	High Tea		3.30 PM-4.00 PM
(Day 2) Date- 07/02/2026 Scientific Session			
	No. of Session	**Time Slot**	**Name of Speaker**
13	**Scientific Session -III**	10:30 AM-11:30 AM	**Dr. Satyanarayan Pattnaik** (Professor) Calcutta Institute of Pharmaceutical Technology and Allied Health Science, Howrah, West Bangal
14	**Scientific Session -IV**	11:30 AM-01:00 PM	**Dr. Bibhu Prasad Panda** (Professor & HoD) Pharmacognosy & Phytochemistry, School of Pharmaceutical Education & Research, Jamia Hamdard, New Delhi
	Lunch Break		**1:00 PM-2:PM**
15	**Scientific Session –V**	03:00 PM-04:00 PM	**Dr. Ravi Shankar Pandey** (Professor) Department of Pharmacy Guru GhasidasVishwavidyalaya (A Central University) Bilaspur - Chhattisgarh
Time -4:00 PM Valedictory Function			
16	Arrival of guest	----------	3:45 PM
17	Seating of Dignitaries and Guests	----------	4:00 PM
18	Lighting of the Lamp	5 Minutes	4:00 PM-4:05 PM
19	Welcome Address & Floral Greetings	5 Minutes	4:05 PM-4:10 PM
20	Brief Report of the Event/Program By **Dr.Deepak Kumar Dash(Convenor)**	5 Minutes	4:10 PM-4:15 PM
21	Valedictory Address by **Chief Guest**	5 Minutes	4:15 PM-4:20 PM
22	Distribution of Certificates / Awards	5 Minutes	4:20 PM-4:25 PM
23	Vote of Thanks by **Dr. RudraPratap Singh (Joint Secretary)**	5 Minutes	4:25 PM-4:30 PM

List of E-poster Presentation

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
1	DBT/RCP/2026/001	Ms. Mousmi Sahu	Novel Therapeutic Approaches in Alzheimer's Disease Management	mousmisahu967@gmail.com
2	DBT/RCP/2026/002	Mr. Khemkaran Ahirwar	Pharmacognostic Evaluation and Pharmacological Potential of Cordia macleodii Hook. f.: An Ethnomedicinal Perspective	khempharma@yahoo.co.in
3	DBT/RCP/2026/003	Dr Subhasri Mohapatra	Virtual Screening for multi target activity of Curcuma Longa in treatment of Breast cancer	subhasrimohapatra961@gmail.com
4	DBT/RCP/2026/004	Ms. Nikita Gupta	Modified drug delivery system strategies to enhance the solubility and bioavailability of poorly soluble drug acitretin	guptanikita054@gmail.com
5	DBT/RCP/2026/005	Ms. Akanksha Chandra	Role of Nanotechnology in Personalized Medicine	akankshachandra2002@gmail.com
6	DBT/RCP/2026/006	Ms. Devika Sahu	New Developments and Difficulties a Gene Delivery Using Polyester-Based Nanoparticles	devikasahu2376@gmail.com
7	DBT/RCP/2026/007	Mr. Nikhil Yadu	Non-viral CRISPR / Cas9Delivery via Lipid Nanoparticles: A Robust Strategy for the In-Vivo Treatment of Genetic Diseases.	yadunikhil40@gmail.com
8	DBT/RCP/2026/008	Ms. Neelam Yadav	Advancing Gene Therapy: Nanotechnology-Enabled Translation from Discovery to Delivery	neelamyadavpharma3@gmail.com
9	DBT/RCP/2026/009	Mr. Tapas Kumar Panigrahi	Nanotechnology In Gene Therapy: Current Status and Future Perspectives	panigrahi.tapas@gmail.com
10	DBT/RCP/2026/010	Ms. Sarika Tiwari	Drug Delivery Systems for Natural Medicines in Filarial Worm Treatment	sariktiwari2@gmail.com
11	DBT/RCP/2026/011	Ms. Nisha Banjare	Reprogramming Diabetes Through Gene Therapy: Current Progress and Translational Outlook	nishabanjare1986@gmail.com
12	DBT/RCP/2026/012	Mr. Aditya Kumar Sahu	Biotechnology and Life Sciences: Regulatory Aspects of Gene Therapy Products	adityakumarsahu142@gmail.com
13	DBT/RCP/2026/013	Mr. Akshay Mandal	Nano-Gene Delivery System: Its Role in Current Drug Delivery Systems	mandalakshay859@gmail.com
14	DBT/RCP/2026/014	Mr. Alisa Hussain	Gene Diversity in Biotechnology and Life Sciences	sadafansari23044@gmail.com
15	DBT/RCP/2026/015	Ms. Archita Jaisinghani	Nano Gene Delivery System: Advancing Pharmaceutical Therapeutics and Precision Medicine	architajaisinghani49@gmail.com
16	DBT/RCP/2026/016	Mr. Ayush Jaiswal	Strategic Breakthroughs in Nano-Enabled Gene Delivery: A Path from Discovery to Clinical Application	
17	DBT/RCP/2026/017	Mr. Aayush Verma	An Overview on Nano - Gene Delivery System	aayush.shrutil6@gmail.com
18	DBT/RCP/2026/018	Ms. Muskan Chakradhari	Biotechnology and Life Science Gene Delivery	muskanchakradhari094@gmail.com
19	DBT/RCP/2026/019	Mr. Rishabh Jaiswal	Recent Advances and Future Prospects of Nanotechnology in Gene Therapy: From Discovery to Delivery	

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
20	DBT/RCP/2026/020	Mr. Sadaf Ansari	Solid Lipid Nanoparticles (SLN's)- Formulation Design and Physiochemical Characterization	sadafansari23044@gmail.com
21	DBT/RCP/2026/021	Ms. TanishaMandhan	Biotechnology and Life Sciences: Gene Delivery System	tanisha.mandhan54@gmail.com
22	DBT/RCP/2026/022	Ms. Sarita Sahu	Synthesis and Biological Evaluation of New Cinnamaldehyde-Based Compounds Targeting Aldose Reductase.	saritasahu196@gmail.com
23	DBT/RCP/2026/023	Ms. Anju Daharia	Molecular Docking Study, Green Synthesis, and In Vitro Antiglycation Evaluation of Polyhydroxy-Conjugated Piperidine Derivatives	anjudaharia055@gmail.com
24	DBT/RCP/2026/024	Mr. Harishchandra Naretia	Tuberculosis: An Updated Systematic Review of Pathogenesis, Diagnosis and Treatment Approaches	hachandranareti6@gmail.com
25	DBT/RCP/2026/025	Mr. Eshrat Ali	AI-Assisted Nanoparticle-Based Gene Delivery for Precision Therapy	ishratali1444@gmail.com
26	DBT/RCP/2026/026	Ms. Prachi Shukla	Biotechnology and Life Science in Gene Delivery	shuklaprachi4045@gmail.com
27	DBT/RCP/2026/027	Ms. Minee	Gene Delivery in Biotechnology and Life Sciences: Recent Advances and Future Perspectives	mineekaushal@gmail.com
28	DBT/RCP/2026/028	Mr. Gunjan Ghritlahare	Nanotechnology-Based Platforms for Gene Delivery	shreya16062006@gmail.com
29	DBT/RCP/2026/029	Mr. Vivek Sharma	Physiological Barriers and Pharmacokinetic Enhancement of Herbal Nanomedicines: A Systematic Review of Novel Drug Delivery Systems"	viveksharmapgimsrohtak@gmail.com
30	DBT/RCP/2026/030	Ms. Shalini Sharma	Role of AI in Early Cancer Diagnosis and its Physiological Aspects: A Game Changer in Cancer Treatment	shalinivivek2011pgims@gmail.com
31	DBT/RCP/2026/031	Mr. Swapnil Deshmukh	Nanoparticle-Mediated Kidney-Targeted Drug Delivery for Reducing Nephrotoxicity: Design and Synthesis Approach	swapnilpharma020@gmail.com
32	DBT/RCP/2026/032	Mr. Bhupendra Kumar Sahu	Rheumatoid Arthritis: An Overview of Immunopathology and Management	bobbysahu578@gmail.com
33	DBT/RCP/2026/033	Mr. Neeraj Kumar Sahu	Molecular Mechanisms and Innovative Therapeutic Approaches in Asthma Airway Inflammation	neerajkumarsahu2002@gmail.com
34	DBT/RCP/2026/034	Ms. Khushboo Verma	Liposomal Approach for Enhanced Topical Drug Delivery"	khushboo17verma@gmail.com
35	DBT/RCP/2026/035	Ms. Mansi Sahu	Formulation and Evaluation of Xanthan Gum Based Emulgel for Tretment of Onchomycosis	sahu.mansi@gmail.com
36	DBT/RCP/2026/036	Ms. Bhuneshwari	Peptide-Mediated Alpha-Glucosidase Inhibition: A Novel Antidiabetic Approach	bhuneshwarinirmalkar258@gmail.com
37	DBT/RCP/2026/037	Mr. Karan Kumar Rathore	Nanoparticle-Mediated Technics Organ-Specific Targeting Using Engineered Lipid Nanoparticles	karanrathore1805@gmail.com
38	DBT/RCP/2026/038	Ms. Manju Verma	Base-Editing Gene Therapy for Familial Hypercholesterolemia: A Precision Nanotechnological Approach	manjuverma9617@gmail.com

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
39	DBT/RCP/2026/039	Mr. Bhushan Lal	Targeting the Inflammatory Cascade: The Role of Nano-Gene Carriers in Arthritis Management"	imbhushan21@gmail.com
40	DBT/RCP/2026/040	Mr. Jayesh Verma	Role of Lipid Nanoparticles in mRNA And Gene Therapy	
41	DBT/RCP/2026/041	Mr. Vikas Kumar	Multiple Unit Particulate System of a Bronchodilator for the Treatment of Chronic Obstructive Pulmonary Disease	vikasdixena1995@gmail.com
42	DBT/RCP/2026/042	Mr. Ajit Kumar Pandey	Design and In Silico Screening of Multi-Substituted Coumarin Derivatives for Synergistic Multi-Target Anti-Rheumatoid Arthritis Therapy	
43	DBT/RCP/2026/043	Ms. Rajeswari J	Nanocarrier Strategies for Enhanced Resveratrol Delivery: Formulation Advances and Therapeutic Applications	jooraji@gmail.com
44	DBT/RCP/2026/044	Mr. Shubham Sahu	Nano-Based Gene Delivery Strategies in Cancer Gene Therapy	shubhambandhi@gmail.com
45	DBT/RCP/2026/045	Mr. Deleshwar Kumar	Nanoscale Delivery Platforms: A Mechanistic Approach to Managing Leishmanial Infections"	deleshwarkumar54@gmail.com
46	DBT/RCP/2026/046	Ms. Priyanka Rani Sahu	Nanocarrier-Based Delivery of Chromone-2-Carboxamido-Alkylbenzylamine Derivatives for Enhanced Blood–Brain Barrier	priyankarani7754@gmail.com
47	DBT/RCP/2026/047	Mr. Vasu Dev Sahu	Nanotechnology-Enabled Gene Therapy: Advances in Delivery Systems and Translational Challenges	officialvds333@gmail.com
48	DBT/RCP/2026/048	Mr. Harsh Kumar Tamrakar	Recent Advances In Nanotechnology for Gene Therapy: Challenges and Future Prospectives	harshtamrakar86@gmail.com
49	DBT/RCP/2026/049	Ms. Shweta Sinha	Non-Viral Gene Delivery Strategies for Amyotrophic Lateral Sclerosis: Challenges and Future Perspectives	shwetagajendra897@gmail.com
50	DBT/RCP/2026/050	Ms. Neeli Rose Beck	A Prospective on Nanocarriers for Gene Therapy in Neurodegenerative Diseases	neeli05011974@gmail.com
51	DBT/RCP/2026/051	Mr. Bhoj Pratap Bhuarya	Advances in Targeted Drug Delivery: Convergence of Molecular Biology, Nanomedicine, and Pharmaceutical Engineering"	bhojpratapbhuarya@gmail.com;
52	DBT/RCP/2026/052	Mr. Anurag Verma	The Potential Nano vectors in Plant Genome Engineering for Gene Delivery	anuragvermaji37@gmail.com
53	DBT/RCP/2026/053	Mr. Chintan Bhoi	The Green Revolution in Genetic Medicine Based on Nanotechnology in Gene Therapy	chintanbhoi01@gmail.com
54	DBT/RCP/2026/054	Mr. Harish Bhardwaj	Doxycycline and Ferulic Acid-Loaded Nanoparticles for Enhanced Healing of Infected Diabetic Wounds	harishbhardwaj808@gmail.com
55	DBT/RCP/2026/055	Ms. Hemlata Dhiwar	Nanotechnology: Gene Therapy for Effective Management of Cardiovascular Diseases	hemlatadhiwar29@gmail.com
56	DBT/RCP/2026/056	Mr. Gulshan Kumar Kashyap	Advances in Nanoparticle-Mediated Techniques for Enhanced Biomedical Applications	gulshankashyapgk888@gmail.com
57	DBT/RCP/2026/057	Mr. Ayush Verma	Advancements in Gene Delivery Systems: Enhancing Precision and Efficacy in Biotechnology and Medicine	21vermaayush@gmail.com

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
58	DBT/RCP/2026/058	Ms. Monika Sahu	Nanotechnology-Based Gene Delivery Systems: Recent Advances and Future Prospects in Precision Gene Therapy	monika12sahu12@gmail.com
59	DBT/RCP/2026/059	Mr. Vijay Kumar Bhoi	Advances in Gene Delivery Systems	ldcbhanpuri@gmail.com
60	DBT/RCP/2026/060	Mr. Bhavesh Yadav	Synthesis of Bis-benzylidene-o-phenylenediamine and its Solid Lipid Nanoparticle (SLN) Formulation via Double Emulsion Method for Enhanced Antimicrobial Activity	bhaveshyadav520@gmail.com
61	DBT/RCP/2026/061	Ms. Manisha	Nanogene Therapy for the Management of Chronic Neuropathic Pain	manishasahu4713@gmail.com
62	DBT/RCP/2026/062	Mr. Mithlesh diwan	Integrating Herbal Medicine and Nanotechnology in Gene Therapy for Depression	mithaleshdiwanmithalesh989@gmail.com
63	DBT/RCP/2026/063	Ms. Manju Patel	Recent Advances and Future Prospects of Nanotechnology-Enabled Gene Therapy in Depression: From Genetic Discovery to Targeted Brain Delivery	manjupatel9068@gmail.com
64	DBT/RCP/2026/064	Mr. Mayank Garhewal	Nano informatics-Based Metal–Quinazoline Nanoarchitectures for Gene Expression Modulation by Epigenetic Targeting and Radiotherapy-Synergized Anticancer Activity	mgarhewal13@gamil.com
65	DBT/RCP/2026/065	Ms. Ankita Sen	Nano-Gene Delivery Systems	ankitasen5571@gmail.com
66	DBT/RCP/2026/066	Mr. Pankaj Kumar	Nanotechnology In Gene Therapy: Recent Advances and Future Prospects Application in Neurological Disorder	spankajkumar572@gmail.com
67	DBT/RCP/2026/067	Ms. Jyoti Pujari	Recent Advances and Future Prospects of Nanotechnology in Gene Therapy for Gout from Discovery to Delivery	jyotipujari334@gmail.com
68	DBT/RCP/2026/068	Ms. Tripti Thakur	Nanotechnology-Based Strategies for The Treatment of Parkinson's Disease: Recent Advances and Therapeutic Insights	thakurtripti004@gmail.com
69	DBT/RCP/2026/069	Ms. Garima Sahu	Nano-Enabled Gene Therapy: Innovations, Challenges & Driven Strategies for Safe & Targeted Gene Delivery	sahugarima763@gmail.com
70	DBT/RCP/2026/070	Ms. Harsha Sahu	Nano-Gene Delivery Strategies in the Management of Type 1 and Type 2 Diabetes Mellitus: A New Era of Gene Therapy	sahuharsha1999@gmail.com
71	DBT/RCP/2026/071	Ms. Dageshwari Sahu	Nano Gene Delivery System	dageshwarisahu32@gmail.com
72	DBT/RCP/2026/072	Mr. Ashish Ekka	Nanotechnology-Based Gene Delivery Systems for Hypertension Management: Recent Advances and Future Perspectives	ashishekka1696@gmail.com
73	DBT/RCP/2026/073	Ms. Chandani Khare	Recent Advances of Nano Electroporation Technology in Gene Therapy	chandanikhare573@gmail.com
74	DBT/RCP/2026/074	Ms. Snigdha Rani Behera	Implementation of Quality by Design (QbD) Principles for the Development and Validation of a Bioanalytical RP-HPLC Method for Simultaneous Estimation of Empagliflozin and Metformin HCl in Human Plasma.	snigdhapharma0104@gmail.com
75	DBT/RCP/2026/075	Mr. Tomar Prasad Rajwade	Nano-Herbal Approach for Rheumatoid Arthritis: Anti-Arthritic Efficacy of Pueraria tuberosa Loaded Silver Nanoparticles	tomarrajwade91@gmail.com

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
76	DBT/RCP/2026/076	Ms. Mumuksha Yadav	Milk-derived bioactive peptide targeting biofilm determinants of Klebsiella pneumoniae: An in-silico study	awanik.bt@nitrr.ac.in
77	DBT/RCP/2026/077	Ms. Niharika Tiwari	Development and Characterization of Solid Lipid Nanoparticle of Diclofenac sodium in the Treatment of Ocular Pain After Photorefractive Keratectomy	niharikatiwari1999@gmail.com
78	DBT/RCP/2026/078	Ms. Kaminee Potai	Advancement of nanoparticle in nasal drug delivery system	potaikaminee222@gmail.com
79	DBT/RCP/2026/079	Ms. Bharti Shrivas	Formulation and evaluation of carbon dot ketamine nanoparticle	shrivasbharti268@gmail.com
80	DBT/RCP/2026/080	Mr. Gunjan Adwani	Development and Characterization of Polylactic acid/Polysuccinimide nanofibers: Future perspectives for Localized Gene Therapy	gunjanadwani.ga@gmail.com
81	DBT/RCP/2026/081	Ms. Vedika Jain	Exploring MIL-100 (Fe) Metal–Organic Framework as a Drug and Gene Delivery Vector: An in-Silico Study	sbharti.bt@nitrr.ac.in
82	DBT/RCP/2026/082	Mr. Jay Kumar Chandra	An Overview of Green Silver Nanoparticle Synthesis: Synthesis Techniques, Characteristics, and their application	jaychandrarcp@gmail.com
83	DBT/RCP/2026/083	Ms. Monali Chouhan	Nanotechnology-Driven Gene Therapy Approach for Cystic Fibrosis	monalichouhan2@gmail.com
84	DBT/RCP/2026/084	Ms. Neha Giri	Hepatoprotective Activity of Nanocarrier-Based Drug Delivery Systems: A Review	nehagoswami964@gmail.com
85	DBT/RCP/2026/085	Mr. Deepak Kumar Prajapati	Design and Synthesis of Novel Heterocyclic Compounds and Their Encapsulation into Nanoparticles for Controlled Release	deepakprajapati8458@gmail.com
86	DBT/RCP/2026/086	Ms. Manisha Khunte	Enhancing Oral Bioavailability and Therapeutic Efficacy of Risedronate using Mucoadhesive Thiolated Chitosan-Hydroxyapatite Core-Shell Nanoparticles for Osteoporosis Treatment	khuntemanisha412@gmail.com
87	DBT/RCP/2026/087	Ms. Himani Vaishanw	Chitosan-Based Mucoadhesive Nanoparticles for Oral Delivery of Peptide Drugs	himanivaishanw489@gmail.com
88	DBT/RCP/2026/088	Ms. Madhu Pradhan	Nanoparticles as Advanced Drug Delivery Systems: Design, Characterization, and Therapeutic Applications	meupra5@gmail.com
89	DBT/RCP/2026/089	Ms. Manisha Panda	Formulation and Characterization of Curcumin-Loaded Nanoparticles for Enhanced Anticancer Activity	pandamanisha75@gmail.com
90	DBT/RCP/2026/090	Ms. Prerana Patel	Formulation and Evaluation of pH-Sensitive Polymeric Nanoparticles for Enhanced Oral Bioavailability of Poorly Soluble Drugs	preranapatel82@gmail.com
91	DBT/RCP/2026/091	Ms. Suman Thakur	Green Synthesis of Bimetallic Nanoparticles and Evaluation of Their Antimicrobial Efficacy	sbharti.bt@nitrr.ac.in
92	DBT/RCP/2026/092	Mr. Tomeshwer Prasad	Comparative In-Vitro Evaluation of Conventional Drug and Nanoparticle-Based Delivery in Skin Cancer Cell Lines	tomeshwer198@gmail.com
93	DBT/RCP/2026/093	Ms. Khushi Verma	Application Of Biotechnology in Pharmaceutical Drug Design	kv7213008@gmail.com

Sr. No.	E-poster Code	Name of Presenting Author	Title of Abstract	Email ID
94	DBT/RCP/2026/094	Ms. KM Nandini	Gene Therapy Applications in Biotechnology and Lifesciences	kmnandini86@gmail.com
95	DBT/RCP/2026/095	Ms. Pushpanjali Patail	Formulation and Evaluation of Nanolipid Based Drug Delivery System for Antimalarial Drug	ppushpanjali70@gmail.com
96	DBT/RCP/2026/096	Mr. Ayush Patel	Integration of Nanotechnology with Herbal Actives in an Advanced Cosmeceutical Face Mask	hanupatel01@gmail.com
97	DBT/RCP/2026/097	Mr. Chirag Sahu	Exploitation of Moringa Oleifera Gum as a Novel Biopolymeric Matrix for Transdermal Therapeutic Systems	chiragsahu0312@gmail.com
98	DBT/RCP/2026/098	Mr. Pradeep Kewat	Nano-Encapsulation of Traditional Herbal Ingredients for Advanced Oral Care Toothpaste Formulation	kewatpradeepkumar71@gmail.com
99	DBT/RCP/2026/099	Ms. Aakansha Pandey	In Silico Exploration of Warfarin Analogues for Antihyperlipidemic Activity in Cardiovascular and Obesity Management	aakanshapandey100@gmail.com
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Novel Therapeutic Approaches in Alzheimer's Disease Management

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Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder and the most common cause of dementia, characterized by cognitive decline, memory impairment, and behavioral disturbances. The complex and multifactorial pathology of AD involves amyloid-β plaque accumulation, neurofibrillary tangles formed by hyperphosphorylated tau protein, oxidative stress, neuroinflammation, mitochondrial dysfunction, and synaptic loss. Currently available therapies provide only symptomatic relief and fail to halt or reverse disease progression, highlighting the urgent need for novel and effective therapeutic strategies. Recent research has focused on innovative approaches targeting multiple pathological pathways involved in Alzheimer's disease. These include amyloid-β and tau-directed therapies, cholinesterase and glutamate receptor modulators, antioxidants, anti-inflammatory agents, and neuroprotective compounds. Additionally, emerging therapeutic modalities, including peptide-based drugs, small-molecule inhibitors, immunotherapy, gene therapy, and stem cell-based interventions, have demonstrated promising outcomes in preclinical and clinical studies. Natural products and bioactive compounds have also gained attention due to their multitarget actions and improved safety profiles. This review offers a comprehensive overview of novel therapeutic approaches for managing Alzheimer's disease, highlighting recent advancements in drug discovery, molecular targets, and mechanistic insights. Challenges related to drug delivery across the blood–brain barrier, clinical efficacy, and long-term safety are discussed. Understanding these emerging strategies may facilitate the development of disease-modifying therapies and improve future clinical outcomes for patients with Alzheimer's disease.

Keywords : Alzheimer's disease; Neurodegeneration; Novel therapeutics; Amyloid-β; Tau protein.

ABSTRACT CODE: DBT/RCP/2026/002

Pharmacogenetic Evaluation and Pharmacological Potential of Cordia macleodii Hook: An Ethnomedicinal Perspective

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Abstract

Cordia macleodii Hook. f. (family Boraginaceae) is a medium sized deciduous tree indigenous to central and western India, traditionally employed in Ayurveda and folk medicine for fever, skin diseases, gastrointestinal disorders, and inflammatory conditions. Despite its ethnomedicinal relevance, systematic pharmacognostic and phytochemical investigations remain limited. The present study consolidates pharmacognostic features, phytochemical constituents, and pharmacological activities of Cordia macleodii, highlighting its potential as a source of bioactive compounds for pharmacy and pharmacognosy students. Pharmacognostic evaluation includes macroscopic and microscopic characterization of leaves, bark, and fruit, supported by powder microscopy. Phytochemical screening was performed using standard qualitative assays. Pharmacological activities were assessed in experimental models reported in literature. Macroscopically, leaves are ovate, rough, and pubescent; flowers are small and white; fruits are drupaceous. Microscopy reveals unicellular trichomes, calcium oxalate crystals, lignified fibers, and starch grains. Phytochemical analysis confirms alkaloids, flavonoids, glycosides, tannins, steroids, and terpenoids. Bark extracts reduce oxidative stress and microbial growth. Cordia macleodii Hook. f. represents a promising medicinal plant with validated pharmacological properties and distinctive pharmacognostic markers. Its phytochemical diversity underscores potential for novel drug discovery. This plant exemplifies the integration of ethnomedicinal knowledge with modern pharmacological validation, warranting further research into its bioactive constituents and therapeutic applications.

Keywords : Cordia macleodii, Pharmacognosy, Phytochemistry, Ethnomedicine

ABSTRACT CODE: DBT/RCP/2026/003

Virtual Screening for multi target activity ofCurcuma Longa in treatment of Breast cancer

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Abstract

Curcumin, a bioactive compound derived from Curcuma longa, has shown promising potential in breast cancer therapy due to its multitarget pharmacological effects. This study aimed to explore the molecular mechanisms underlying curcumin's anticancer activity using an integrative computational approach, including predictive modeling, molecular docking, and pathway enrichment analysis. Curcumin demonstrated strong binding affinities to critical targets such as matrix metalloproteinase-9 (MMP9), protein kinase B (AKT1), epidermal growth factor receptor (EGFR), and signal transducer and activator of transcription 3 (STAT3), which are implicated in pathways regulating cancer cell survival, proliferation, invasion, and metastasis. Gene Ontology and Kyoto Encyclopedia of Genes and Genomes pathway analyses revealed curcumin's ability to modulate processes like apoptosis, inflammation, and cell signaling, emphasizing its therapeutic versatility. Molecular docking and dynamics simulations further validated its stable interactions with key targets. Complementing the computational findings, in vitro studies using MCF-7 breast cancer cells confirmed curcumin's dose-dependent cytotoxic effects. These results highlight curcumin's potential as a complementary therapeutic agent in breast cancer management, and in vivo studies are needed to substantiate its clinical utility in further studies.

Keywords : curcumin - breast cancer - molecular docking - pathway analysis, Indian saffron, Haldi

ABSTRACT CODE: DBT/RCP/2026/004

Modified drug delivery system strategies to enhance the solubility and bioavailability of poorly soluble drug acitretin

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Abstract

Acitretin a second-generation retinoid used in the treatment of severe psoriasis and other dermatological disorders, suffers from poor aqueous solubility and low bioavailability, limiting its therapeutic potential. To address these challenges, several modified drug delivery system strategies have been explored to enhance the solubility and bioavailability of acitretin.Nanoparticle-based approaches, including nanocrystals, polymeric nanoparticles,and solid lipid nanoparticles (SLNs), increase surface area and improve drug dissolution. Lipid-based systems like self-emulsifying drug delivery systems (SEDDS) and liposomes enhance drug solubilization and absorption. Solid dispersions, using techniques such as hot melt extrusion, improve drug dissolution rates by dispersing acitretin in polymeric matrices. Cyclodextrin complexation and micelle-based systems further enhance solubility by forming inclusion complexes or encapsulating the drug in micelles. Additionally, prodrug approaches,co-crystallization, pH modification, and supercritical fluid technologies offer promising ways to improve the drug's physical properties. These advanced drug delivery strategies hold significant potential to improve the therapeutic efficacy of acitretin by overcoming its solubility and bioavailability limitations.

Keywords : Acitretin, Solubility enhancement, Bioavailability, Nanoparticles,Drug delivery systems

ABSTRACT CODE: DBT/RCP/2026/005

Role of Nanotechnology in Personalized Medicine

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Abstract

The prescription of certain treatments that are most appropriate for a given patient is known as personalized medicine. A deeper comprehension of the disease at the cellular level provides the foundation for personalized cancer treatments. In this field, nanotechnology will be crucial. Nanobiotechnology is being used to improve drug delivery, molecular diagnostics, biomarker discovery, and other fundamental aspects of personalized medicine that are also relevant to cancer treatment. Examples of the use of molecular imaging, gold nanoparticles, and quantum dots in therapies and diagnostics another crucial aspect of customized medicine-are provided. Within the next ten years, personalized medicine is anticipated to be included into medical practice as it is starting to get recognition. Nanomedicine and personalized medicine are both relatively new to the medical field. The use of nanotechnology in medicine is known as "nanomedicine," and it is being incorporated into therapeutic and diagnostic instruments to treat a variety of illnesses. However, personalized medicine-also known as precision medicine-is a cutting-edge idea that seeks to tailor therapeutic management to each patient's unique characteristics in order to overcome general treatments that only work for a small percentage of patients, leaving others with either ineffective or highly toxic treatments. Many diseases have been treated with novel nanomedicines, which can be tailored to each patient's unique situation based on their genetic profiles. Many diseases have been treated with novel nanomedicines, which can be tailored to each patient's unique situation based on their genetic profiles. We address both fields as well as how the two new scientific fields overlap in this review. The review focuses on the state of personalized medicine today, the potential benefits of nanomedicine, and the use of nano constructs in genetic variability diagnosis to choose the appropriate medication for the patient.

Keywords : Nanobiotechnology, Nanotechnology, Nanomedicine, Personalized medicine

ABSTRACT CODE: DBT/RCP/2026/006

New Developments and Difficulties in Gene Delivery Using Polyester-Based Nanoparticles

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Abstract:

Gene therapy is a potentially effective method of treating a number of illnesses, including cancer, hereditary disorders, and viral or persistent infections. Exogenous nucleic acids (NA) have inherent pharmacokinetic disadvantages, such as electrostatic repulsions, enzymatic degradation, restricted cellular absorption, rapid clearance, etc., which must be overcome for cellular internalisation.The adaptability of polyester-based nanocarriers will be reviewed, along with their recent use in delivering the CRISPR/Cas (clustered, regularly-interspaced, short palindromic repeats/Cas) genome editing system to cure gene-related disorders. A range of foreign NA, including messenger RNA (mRNA), plasmid DNA (pDNA), and short interfering RNA (siRNA), are delivered using polylactic acid (PLA) nanoparticles. We'll talk about the remaining obstacles and potential future directions for the targeted distribution of this ground-breaking genome-editing technology. The crucial role of nanotechnology in combating newly developing illnesses like coronavirus disease 2019 (COVID-19) will receive particular emphasis; innovative mRNA vaccines administered by NPs are presently being deployed globally to combat the pandemic, pushing the limits of gene therapy.

Keywords : CLAN; COVID-19; CRISPR; PLA; PLGA; siRNA.

ABSTRACT CODE: DBT/RCP/2026/007

Non-viral CRISPR / Cas9Delivery via Lipid Nanoparticles: A Robust Strategy for the In-Vivo Treatment of Genetic Diseases.

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Abstract

Clustered regularly interspaced short palindromic repeats (CRISPR)/Cas (CRISPR-associated) genome editing technologies have emerged as one of the primaries means of both therapeutic and fundamental biomedical research in the years since they first appeared. The delivery of the CRISPR/Cas9 system to specific target cells in vivo remains an obstacle. Although viral vectors have been extensively used to deliver the CRISPR/Cas9 system in vitro and in vivo, their inherent limitations greatly restrict their potential applications.Conversely, a shorter timeframe for providing an individual with the components of gene editing reduces the chance of adverse, or unintended, effects from producing genes in the person who is receiving the CRISPR treatment. By December 2025, there were 136 CRISPR clinical trials under way, with 36 of these trials focusing specifically on delivery of CRISPR components using non-viral vectors. This work provides a broad overview of the current available CRISPR in-vivo investigations and clinical trials, as well as the various delivery methods and technologies available to provide these treatments today. This further discuss current opportunities and challenges associated with the use of CRISPR technology and delivery via non-viral vectors.

Keywords : CRISPR/Cas9; Non-viral delivery; In-vivo genome editing; Lipid nanoparticles (LNPs); mRNA; Ribonucleoprotein (RNP); Gene therapy; Clinical translation.

ABSTRACT CODE: DBT/RCP/2026/008

Advancing Gene Therapy: Nanotechnology-Enabled Translation from Discovery to Delivery

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Abstract

Nanotechnology has rapidly transformed gene therapy by addressing longstanding challenges in the discovery and delivery of genetic therapeutics. Traditional gene therapy vectors such as viral systems, while effective, are hindered by immunogenicity, insertional mutagenesis, and limited target specificity, prompting exploration of non-viral nanocarriers. Nanotechnology enables engineering of multifunctional nanoparticles - including lipid nanoparticles (LNPs),polymericnanoparticles, inorganic nanoparticles (e.g., gold, silica), and hybrid systems - that encapsulate and protect nucleic acids like DNA, mRNA, siRNA, and gene editing tools from degradation, enhance cellular uptake, and improve biodistribution in vivo. LNPs, validated through clinical success in mRNA vaccine platforms, now serve as leading non-viral delivery systems with tunable surface chemistry and reduced cytotoxicity.Recent advances includenanotheranostics, which integrate diagnostic imaging with therapeutic delivery to enable real-time tracking of gene delivery and controlled release mechanisms responsive to physiological stimuli, enhancing precision and minimizing off-target effects. Additionally, cutting-edge micro/nano-electroporation devices improve transfection efficiency and cell viability by facilitating gene transport across membranes without viral components. Nanotechnology also accelerates delivery of CRISPR/Cas gene editing systems, overcoming delivery barriers and reducing off-target genomic alterations.Despite these advances, significant hurdles remain, including immunogenic responses, scalable manufacturing, regulatory challenges, and long-term safety evaluations. Future prospects focus on stimuli-responsivenanocarriers, machine learning-guided design to optimize delivery vehicles, and expanded clinical translation across cancer, inherited disorders, and neurological diseases. Continued integration of nanotechnology with gene therapy is poised to usher in highly efficient, targeted, and safe gene-based interventions, moving toward personalized precision medicine.

Key words : nanotechnology, gene therapy, nanoparticle delivery, lipid nanoparticles, non-viral vectors, CRISPR/Cas, nanotheranostics, stimuli-responsive systems, precision medicine.

ABSTRACT CODE: DBT/RCP/2026/009

Nanotechnology in Gene Therapy: Current Status and Future Perspectives

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Abstract

Gene therapy holds immense promise for the treatment of genetic disorders, cancers, and infectious diseases by enabling the correction or regulation of defective genes. However, the clinical success of gene therapy has been limited by challenges such as poor gene stability, low transfection efficiency, immune reactions, and lack of targeted delivery. Nanotechnology has emerged as a transformative approach to overcome these barriers by providing safe, efficient, and targeted gene delivery systems.Nanocarriers such as liposomes, polymeric nanoparticles, dendrimers, inorganic nanoparticles, and lipid nanoparticles have demonstrated significant potential in protecting genetic material (DNA, RNA, siRNA, and mRNA) from degradation and enhancing cellular uptake. These nanostructured systems can be engineered for controlled release, tissue specificity, and reduced toxicity, thereby improving therapeutic efficacy. Recent advances, including CRISPR-Cas gene editing combined with nanocarrier-based delivery, have further expanded the scope of gene therapy applications.Despite encouraging preclinical and clinical outcomes, challenges such as large-scale production, long-term safety, regulatory approval, and ethical considerations remain. Future research is focused on developing multifunctional, biodegradable, and personalized nanocarriers to achieve precise gene delivery with minimal side effects. Overall, nanotechnology represents a critical enabling platform that is shaping the present and future landscape of gene therapy.

Keyword : Nanoparticle, CRISPR, Gene therapy, nanotechnology

ABSTRACT CODE: DBT/RCP/2026/010

Drug Delivery Systems for Natural Medicines in Filarial Worm Treatment

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Abstract

Filariasis is a neglected tropical disease caused by parasitic worms called filariae. Lymphatic filariasis is a vector-born infection with parasitic nematodes of family Filariodidea namely: *Wuchereria bancroftian, Brugiamalayi and B. timori.* About 90% of the infection is reported to be caused by *Wuchereriabancrofti*and the remainder is due to infection with either B. malayi or B. timori. The parasites are transmitted via mosquito bites. Lymphatic filariasis is transmitted by different types of mosquitoe genera, for example, in urban and semi-urban areas the disease is transmitted by *Culex* mosquito which is widespread across such habitat. The drug delivery systems can improve the precision of delivering these herbal compounds, enhancing efficacy while minimizing potential side effects. This comprehensive review focuses on the recent advancement in the delivery of plant-derived antifilarial compounds. Development as novel formulations owing to lack of scientific justification and processing difficulties. Such as standardization, Extraction and identification of mechanism of action, Different types of plants palash, Pippali, Neem some medicinal plants have an optimum concentration range within which maximum benefit is derived, can be toxic or produce no therapeutic benefit. Designing new medicine delivery mechanisms for natural components can help achieve this. The current review highlights the state of innovative herbal formulation development and provides an overview of the types of active ingredients, biological activities, and novel formulations uses.

Keyword- Lymphatic filariasis, Neem, infection, delivery

ABSTRACT CODE: DBT/RCP/2026/011

Reprogramming Diabetes Through Gene Therapy: Current Progress and Translational Outlook

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Abstract

Diabetes mellitus is a complex metabolic disorder characterized by chronic hyperglycemia resulting from impaired insulin secretion, insulin action, or both. Despite significant advances in pharmacological therapies, existing treatments primarily manage symptoms rather than addressing the underlying genetic and molecular defects responsible for disease progression. In this context, gene therapy has emerged as a promising and innovative strategy capable of targeting diabetes at its root cause. This review explores recent progress in gene therapy–based approaches for diabetes management, emphasizing molecular targets, delivery strategies, and translational potential. Various gene therapy techniques, including viral and non-viral vectors, genome editing tools, and RNA-based interventions, have demonstrated potential in restoring insulin production, enhancing β-cell survival, improving insulin sensitivity, and modulating immune responses in both type 1 and type 2 diabetes. Advances in vector engineering and tissue-specific gene delivery have significantly improved therapeutic precision while reducing off-target effects and safety concerns. Preclinical studies and early clinical trials highlight the feasibility of reprogramming metabolic pathways and pancreatic cell function through genetic intervention. However, challenges such as long-term gene expression, immune reactions, ethical considerations, and regulatory hurdles continue to limit widespread clinical application. This review critically evaluates current achievements and limitations in diabetes-oriented gene therapy and discusses emerging trends aimed at improving efficacy and safety. By integrating molecular medicine with translational research, gene therapy holds transformative potential to redefine future diabetes treatment paradigms and move toward durable, disease-modifying solutions.

Keywords: Gene therapy; Diabetes mellitus; Genetic reprogramming; Insulin signaling; Viral and non-viral vectors; Translational medicine

ABSTRACT CODE: DBT/RCP/2026/012

Biotechnology and Life Sciences: Regulatory Aspects of Gene Therapy Products

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Abstract

Gene therapy products represent a major advancement in the treatment of genetic and life-threatening diseases by introducing, removing, or modifying genetic material within a patient's cells. Due to their complex nature and long-term effects, gene therapy products are strictly regulated to ensure their safety, quality, and effectiveness. Regulatory authorities such as the US Food and Drug Administration (FDA), European Medicines Agency (EMA), and other national agencies have established specific guidelines for the development, testing, and approval of these products. The regulatory process begins with extensive preclinical studies to evaluate safety, toxicity, and biological activity. This is followed by carefully designed clinical trials conducted in multiple phases to assess efficacy and potential risks in humans. Manufacturing controls, including good manufacturing practices (GMP), play a vital role in maintaining product consistency and preventing contamination. In addition, post-marketing surveillance is required to monitor long-term safety and unexpected adverse effects after approval. Ethical considerations, patient consent, and risk–benefit evaluation are also key regulatory concerns in gene therapy. Overall, strong regulatory frameworks help balance innovation with patient safety, supporting the responsible development of gene therapy products for future medical use.

Keywords Gene therapy, Regulatory guidelines, FDA, EMA, Clinical trials, GMP, Biotechnology

ABSTRACT CODE: DBT/RCP/2026/013

Nano-Gene Delivery System: Its Role in Current Drug Delivery Systems

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Abstract

Gene therapy holds the potential for treating or curing several diseases such as genetic disorders, cancer, and infection-causing diseases. However, the efficiency of performing gene therapy is based on the creation of novel and safe systems of gene delivery. The nano-gene systems are thought to be the potential systems of the non-viral nature for the purpose of treating the diseases and avoiding all the hassle faced with the traditional systems. This abstract emphasizes the different aspects concerning the advancements observed with the different nanotechnology-based systems for the purpose of gene delivery.These nanoscale particles hold promise for protecting genetic molecules such as DNA, mRNA, and siRNA from enzymatic degradation, for enhancing their cellular uptake, and for delivering them specifically to targeted areas of the body while reducing their side effects. Breakthroughs, particularly in the field of lipid nanoparticles in relation to mRNA vaccines, have provided evidence of their application of nano gene delivery vehicles in clinical practice, owing to their potency in vaccine and drug delivery.Despite these advances, however, long-term safety, biodistribution, production, as well as approval, still pose major concerns as far as nano-gene delivery vectors are concerned. Future studies aim to develop intelligent, stimulus-sensitive nano-vectors as well as nano-gene delivery vectors with regard to gene therapy outcomes. In general, nano-gene delivery vectors present a revolutionary concept with respect to gene therapy, as modern gene therapies aim to address this gap to be effective clinically.

Keywords: Nano-gene delivery system; Gene therapy; Nanotechnology; Non-viral vectors; Targeted gene delivery; Lipid nanoparticles; RNA therapeutics; Biomedical nanotechnology

ABSTRACT CODE: DBT/RCP/2026/014

Gene Diversity in Biotechnology and Life Sciences

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Abstract

Gene diversity refers to variation in genetic information among individuals of the same species and is a key concept in biotechnology and life sciences. It provides the biological basis for evolution, adaptation, disease resistance, and survival. Modern tools such as DNA sequencing, polymerase chain reaction, and genomic analysis help identify and utilize genetic variation effectively.The human genome consists of approximately 3.2 billion base pairs and contains about 20,000 protein-coding genes.Although humans are highly similar genetically, around 0.1% genetic variation explains differences in traits, disease susceptibility, and drug response.In agriculture, gene diversity helps develop high-yielding, pest-resistant, and climate-tolerant crops. In medicine, understanding genetic variation enables personalized therapies, early disease detection, and safer drugs. Microbial gene diversity supports industrial biotechnology, including pharmaceutical production and environmental applications.Loss of genetic diversity due to habitat destruction, pollution, and climate change reduces adaptability and threatens sustainability. Preserving gene diversity is therefore essential for ecological balance and future biotechnological progress.In conclusion, gene diversity is a fundamental pillar of biotechnology and life sciences, linking genetics, health, agriculture, and environmental sustainability.

Keywords: Gene, DNA sequencing, polymerase chain reaction, and genomic analysis

ABSTRACT CODE: DBT/RCP/2026/015

Nano Gene Delivery System: Advancing Pharmaceutical Therapeutics and Precision Medicine

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Abstract

Nano gene delivery systems have emerged as a cutting-edge approach in pharmaceutical and biomedical sciences, offering unprecedented control over the delivery of genetic material for therapeutic purposes. These systems employ engineered nanocarriers such as lipid-based nanoparticles, polymeric nanoparticles, dendrimers, nanogels, and inorganic nanostructures to encapsulate and transport nucleic acids including plasmid DNA, messenger RNA (mRNA), small interfering RNA (siRNA), and antisense oligonucleotides. The nanoscale size and surface modifiability of these carriers enable enhanced cellular internalization, endosomal escape, prolonged circulation time, and protection of genetic payloads from enzymatic degradation.From a pharmaceutical perspective, nano gene delivery systems significantly enhance therapeutic efficacy while minimizing off-target effects and systemic toxicity, thereby addressing the key challenges associated with conventional viral and non-viral gene delivery vectors. Surface functionalization with ligands, antibodies, or peptides allows active targeting of specific tissues and diseased cells, supporting the development of personalized and precision medicine. Recent successes in mRNA-based vaccines and gene-editing technologies such as CRISPR-Cas systems further highlight the clinical potential of nanotechnology-driven gene delivery platforms. Overall, the integration of nano gene delivery systems into modern pharmacy not only revolutionizes drug design and dosage form development but also represents a crucial step toward curative, patient-centric, and future-ready healthcare.

Keywords: Nano gene delivery systems, CRISPR-Cas systems, DNA, messenger RNA (mRNA), small interfering RNA (siRNA).

ABSTRACT CODE: DBT/RCP/2026/016

Strategic Breakthroughs in Nano-Enabled Gene Delivery: A Path from Discovery to Clinical Application

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Abstract

Strategic breakthroughs in nano-enabled gene delivery have transformed the landscape of modern therapeutics, bridging the gap between molecular discovery and clinical application. Nanocarrier systems-including lipid nanoparticles (LNPs), polymeric nanoparticles, dendrimers, inorganic nanomaterials, and hybrid biomimetic platforms-have emerged as powerful tools to overcome the fundamental barriers of gene therapy such as nuclease degradation, poor cellular uptake, endosomal entrapment, and off-target effects. Advances in nanotechnology have enabled precise control over particle size, surface charge, morphology, and ligand functionalization, thereby enhancing stability, targeted delivery, and transfection efficiency while minimizing systemic toxicity.A key strategic milestone has been the development of ionizable lipids and stimuli-responsive polymers that facilitate endosomal escape and controlled intracellular release of nucleic acids, including plasmid DNA, siRNA, mRNA, and CRISPR–Cas components. Surface engineering with targeting ligands, antibodies, or peptides has improved tissue-specific delivery, particularly in oncology, genetic disorders, and infectious diseases. Furthermore, scalable manufacturing processes, improved formulation techniques, and regulatory standardization have accelerated translation from laboratory research to clinical trials.Clinically, nano-enabled gene delivery has gained significant validation through mRNA vaccine platforms and emerging gene-editing therapeutics, demonstrating safety, efficacy, and rapid adaptability. Integration with artificial intelligence, microfluidic synthesis, and personalized medicine approaches is further refining carrier design and therapeutic precision. Despite challenges such as long-term safety, immunogenicity, and large-scale reproducibility, current innovations signify a paradigm shift in gene therapy. Collectively, these strategic advances position nanotechnology as a central driver in the successful clinical realization of next-generation genetic medicines.

Keywords: Nanotechnology, Gene Therapy, Targeted

ABSTRACT CODE: DBT/RCP/2026/017

An Overview on Nano - Gene Delivery System

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Abstract

Nano - gene delivery system uses nano – particles (less than 100nm) to transport genetic material into cells. These nano gene delivery systems condense large genetic molecules into small and stable to avoid degradation. Nano - gene delivery systems work by encapsulation, targeting, cellular uptake and gene expression. It includes the relation between nano particles and gene delivery systems that act as carriers that bind, protect, and deliver genes to cells. Their relationship is based on their ability to safely and efficiently transport genetic material into host cells. This poster includes the core principle of nano gene delivery system to protect, package and transport. These systems overcome the limitations of traditional methods, targeting specific sites and reducing immune response. The poster includes the advantages of nano gene delivery systems like protection of genetic material, reduced toxicity, enhanced stability, enhanced solubility, ability to cross biological barriers, controlled release. It also has included disadvantages instability, poor solubility, low cellular uptake, manufacturing hurdles. It also includes the challenges entrapment, potential toxicity, poor cellular uptake, instability, and low targeting accuracy. The future of nano gene delivery systems is focused on multi-functional nanoparticles (liposomes, polymers, gold, magnetic), efficient delivery in treating genetic, cancer, and regenerative diseases, precision targeting (like for cancer), overcoming biological barriers.

Keywords: Nano gene delivery system, liposomes, reduced toxicity, enhanced stability.

ABSTRACT CODE: DBT/RCP/2026/018

Biotechnology And Life Science Gene Delivery

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Abstract

Biotechnology applies biology to develop lifesaving drugs, treatments to improve agriculture, industry, and environmental sustainability. Gene delivery is defined as the process in which foreign or therapeutic genes are delivered into a host cell to correct genetic defects. Gene delivery systems are essential for gene therapy (treating genetic disorders), cancer treatment, vaccine development, infectious disease treatment, biomedical research, agricultural biotechnology etc. Biotechnology applies gene delivery methods to introduce new genetic material (DNA &RNA) into target cells for the treatment of genetic disorders and genetic engineering using viral vectors (like retrovirus,AAV,Adenoviruses) or non-viral vectors (like liposomes, polymers, lipid nanoparticles) to overcome cellular barriers. Physical methods of gene delivery, including electroporation, suboperation, and hydrodynamic injection, used to temporarily open pores in the cell membrane. These techniques can provide high delivery efficiency in selected medical and research applications. Recent biotechnology innovations in gene delivery focus on CRISPR tools for genome editing, advanced nanoparticle delivery systems(Lipid Nanoparticles), in vivo gene therapy and effectiveness of gene delivery approaches. This poster includes biotechnology, gene delivery systems, different methods to deliver genetic material into target cells, and recent biotechnology innovations. The poster also includes the challenges of gene delivery systems overcoming biological barriers, cost and complexity, ensuring long-term safety (avoiding insertional mutagenesis), efficient delivery, minimizing immune responses, safety risks, addressing ethical and regulatory concerns.

Keywords: Biotechnology, Lipid Nanoparticles, biological barriers, efficient delivery.

ABSTRACT CODE: DBT/RCP/2026/019

Recent Advances and Future Prospects of Nanotechnology in Gene Therapy: From Discovery to Delivery

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Abstract

Nanotechnology has emerged as a revolutionary approach in gene therapy, providing innovative solutions to overcome the major challenges associated with conventional gene delivery systems. Recent advances in nanotechnology have led to the development of novel nanocarriers capable of efficiently delivering genetic materials such as DNA, RNA, siRNA, and CRISPR-Cas components with enhanced stability, targeted delivery, and reduced toxicity. Various nano systems including liposomes, polymeric nanoparticles, dendrimers, and inorganic nanoparticles have demonstrated promising results in improving cellular uptake, protecting genetic cargo from degradation, and achieving site-specific gene expression. The theme "from discovery to delivery" emphasizes the progression of nanotechnology-based gene therapy from fundamental research to translational and clinical applications. Advances in nano–bio interactions, surface modification, controlled release mechanisms, and targeting strategies have significantly improved therapeutic outcomes while minimizing off-target effects and immunogenic responses. These developments are paving the way for effective treatment of genetic disorders, cancer, and infectious diseases. Nanotechnology holds immense potential to transform the future of gene therapy by bridging the gap between laboratory discovery and clinical delivery. Continuous advancements in nanomaterial design, safety profiling, and regulatory frameworks are expected to accelerate clinical translation and commercialization. Integration of nanotechnology with personalized medicine and precision therapeutics will further enhance treatment efficacy and patient outcomes. Overall, nanotechnology-driven gene therapy represents a promising and sustainable approach for next-generation biomedical interventions.

Keywords: NanotechnologyContinuous advancements in nanomaterial design, safety profiling, and regulatory frameworks

ABSTRACT CODE: DBT/RCP/2026/020

Solid Lipid Nanoparticles (SLN's)- Formulation Design and Physiochemical Characterization

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Abstract

Solid lipid nanoparticles (SLN) are nanocarriers in the 10–1000 nm range of a solid core, containing both hydrophilic and hydrophobic active pharmaceutical ingredients. SLNs are composed of well-tolerated and biodegradable solid lipids such as mono-, di-, and triglycerides, fatty acids, waxes, and steroids, as well as lipophilic and hydrophilic emulsifying agents. This composition of biocompatible molecules makes SLNs one of the most successful options for the administration of drugs with different routes of administration. To determine its size, morphology, and surface charge, laser diffraction spectroscopy techniques, dynamic light scattering, coulter counter, scanning ion occlusion sensing, and advanced microscopy techniques are utilized. Specifically, surface morphology and length can be measured by electron microscopy-including scanning electron microscopy (SEM) and transmission electron microscopy (TEM)-as well as atomic force microscopy. Furthermore, dynamic light scattering and photon correlation spectroscopy determine particle size and size distribution. In addition, colloidal stability can be evaluated through the assessment of zeta potential, ensuring the formulation remains robust for clinical applications. By refining these characterization methods, SLNs provide a superior alternative for the targeted delivery of therapeutic agents.

Keywords: Solid lipid nanoparticles, routes of administration, surface morphology.

ABSTRACT CODE: DBT/RCP/2026/021

BiotechnologyandLifeSciences:GeneDeliverySystems

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Abstract

Gene delivery is a fundamental component of modern biotechnology and life sciences, playing a crucial role in gene therapy, vaccine development, and regenerative medicine. It refers to the process of introducing genetical material such as DNA or RNA into target cells to achieve therapeutic, diagnostic, or research related outcomes.Effective gene delivery systems are designed to protect genetic material from degradation, ensure targeted delivery, and promote efficient gene expression within host cells.Gene delivery methods are broadly classified into viral and non-viral systems. Viral vectors, including adenoviruses, retroviruses, and lentiviruses, offer high transfection efficiency and stable gene expression, making them suitable for clinical applications. However, concerns related to immunogenicity, toxicity, and limited cargo capacity restrict their wide spread use. Non-viral delivery systems such as liposomes, nanoparticles, polymers, and physical methods like electroporation and gene guns provides alternatives with improved scalability and lower immune response, although they often exhibit reduced efficiency. Recent advances in nanotechnology, CRISPR-Cas gene editing, and targeted delivery strategies have significantly enhanced the precision and effectiveness of gene delivery systems. These innovations hold great promise for treating genetic disorders,cancer,and infectious diseases.Overall,gene delivery remains a rapidly evolving field, driving progress in biotechnology and life sciences toward personalized and precision medicine.

Keywords: Gene delivery, genetherapy,viral vectors,nonviral deliverysystems,nanotechnology CRISPRCasgene editing, targeted delivery, biotechnology, precision medicine

ABSTRACT CODE: DBT/RCP/2026/022

Synthesis and Biological Evaluation of New Cinnamaldehyde-Based Compounds Targeting Aldose Reductase

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Abstract

Aldose reductase is a key enzyme involved in the polyol pathway and plays a crucial role in the onset and progression of diabetic complications. Therefore, inhibition of aldose reductase represents an important therapeutic strategy for the management of diabetes-associated disorders. Cinnamaldehyde, a naturally occurring α,β-unsaturated aldehyde, is known for its wide range of biological activities and serves as a promising lead molecule for drug development.In the present study, new cinnamaldehyde-based compounds were designed and synthesized with the objective of enhancing aldose reductase inhibitory activity. Structural modifications of the parent cinnamaldehyde scaffold were carried out to improve enzyme interaction and biological efficacy. The synthesized compounds were characterized using standard physicochemical and spectroscopic techniques. In vitro biological evaluation revealed that several derivatives exhibited significant aldose reductase inhibitory activity. These findings suggest that cinnamaldehyde-based compounds have potential as promising candidates for the development of novel aldose reductase inhibitors.

Keywords: Cinnamaldehyde derivatives, Aldose reductase, Diabetic complications, Enzyme inhibition, Structure–activity relationship.

ABSTRACT CODE: DBT/RCP/2026/023

Molecular DockingStudy, Green Synthesis, and *In Vitro* Antiglycation Evaluation of Polyhydroxy-Conjugated Piperidine Derivatives

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Abstract

A novel series of polyhydroxy-conjugated piperidine derivatives (4a-f) was designed, green synthesis, structurally characterized, and evaluated *in vitro* for their antiglycation potential. The compounds were efficiently prepared via a microwave-assisted green synthetic method, providing a sustainable and energy-efficient alternative to conventional synthesis. Structural elucidation was carried out using standard spectroscopic techniques. The *in vitro* antiglycation activity was evaluated using a human serum albumin-fructose (HAS-fructose) glycation model, by measuring the inhibition of fructosamine formation and protein carbonyl content. Several synthesized derivatives exhibited notable antiglycation activity. Among them, compounds 4a and 4b demonstrated superior potency, with IC_{50} values of 218.29 ± 7.22 µM and 240.03 ± 9.61 µM for fructosamine inhibition, IC_{50}= 157.81 ± 1.20 µM and IC_{50}= 192.23 ± 2.23 µM for protein carbonyl inhibition, respectively. These activities were significantly enhanced compared to the standard antiglycation agent pyridoxamine (IC_{50} = 302.05 ± 19.29 µM and 247.02 ± 2.10 µM). Structure-activity relationship analysis indicated that electron-donating substituents on the polyhydroxy-conjugated piperidine scaffold play a crucial role in enhancing antiglycation efficacy. Furthermore, molecular docking analysis against the human serum albumin-fructose complex (PDB ID: 4IW1) supported the biological findings, revealing favorable binding interactions for the most active compounds. Overall, the results identify polyhydroxy-conjugated piperidine derivatives, particularly 4a and 4b, as promising antiglycation leads.

Keywords: Piperidine derivatives; Antiglycation activity; Green synthesis; Human serum albumin; *In silico*.

ABSTRACT CODE: DBT/RCP/2026/024

Tuberculosis: AnUpdated Systematic Reviewof Pathogenesis, Diagnosis, and Treatment Approaches

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Abstract

Tuberculosis (TB) is a long-standing infectious disease caused by members of thecomplex and continues to be a major cause of illness anddeath across the globe. Although significant progress has been made in the developmentof diagnostic tools and effective treatment regimens, TB remains a serious public healthconcern, especially in low- and middle-income countries. The World Health Organization (WHO) identifies tuberculosis as one of the leading infectious causes of mortalityworldwide, second only to HIV/AIDS. Socioeconomic factors such as poverty, overcrowding, malnutrition, and inadequate access to healthcare contribute substantiallyto the persistence and spread of the disease. India accounts for a considerable proportion of the global TB burden and has adopted the National Strategic Plan (2017-2025), aimingfor the elimination of tuberculosis by 2025. Attaining this goal necessitates a thoroughunderstanding of the disease's biologicalmechanisms, clinical characteristics, diagnosticapproaches, and therapeutic management. This systematic review comprehensivelydiscusses the historical background, classification, epidemiology, histopathologicalfeatures, immunological responses, and pathogenesis of tuberculosis. Detailed emphasisis placed on both pulmonary tuberculosis (PTB) and extrapulmonary tuberculosis (EPTB), including their clinical presentation and immune-mediated responses. In addition, thisreview highlights contemporary diagnostic techniques ranging from conventionalmethodsto advanced molecular and immunological assays, along with established diagnosticalgorithms for PTB and EPTB. Current treatment strategies for drug-sensitive tuberculosis,multidrug-resistant TB (MDR-TB), and extensively drug-resistant TB (XDR-TB) aresummarized, with particular focus on newly approved antitubercular agents. Overall, thisreview aims to strengthen understanding and awareness of tuberculosis and supportongoing global efforts toward its effective control and eventual eradication.

Keywords: Tuberculosis; Pathogenesis; Immunology;Diagnosis; Antitubercular Therapy.

ABSTRACT CODE: DBT/RCP/2026/025

AI-Assisted Nanoparticle-Based Gene Delivery for Precision Therapy

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Abstract

Gene therapy is becoming an important method to treat genetic and other serious diseases. However, the success of this therapy depends a lot on how safely and effectively the genes can be delivered to the right cells. Nanoparticle-based gene delivery systems offer significant advantages, as they can protect the genetic material, help it enter cells better, and target specific tissues. Despite these advantages, challenges such as low delivery efficiency, adverse effects in other areas, and interpatient variability can limit their effectiveness. Recently, artificial intelligence (AI) has been used to improve these systems. AI tools can help design and optimize nanoparticles by studying their properties, predicting how genes interact with them, and improving stability. Machine learning can suggest the best nanoparticle size, surface characteristics, and modifications needed to reduce side effects and improve precision. AI can also use patient-specific data to make treatments more personalized and accurate. Combining AI with "nanoparticle-based gene delivery" provides a new way to make gene therapy more precise and effective. While this approach is still new, current research suggests that this integration enhances treatment outcomes for complex diseases like cancer and genetic disorders. Overall, AI-assisted "nanoparticle-based gene delivery" offers a promising and patient-friendly method for the future of gene therapy.

Keywords: Gene, Artificial intelligence, Nanoparticle, Cancer, Precision therapy

ABSTRACT CODE: DBT/RCP/2026/026

Biotechnology and Life Science in Gene Delivery

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Abstract

Life science encompasses the systematic study of living organisms and their biological processes, from cellular structure and function to complex molecular mechanisms that regulate life where as biotechnology represents the applied dimension of life science, combining biological principles with advanced technological tools to develop innovative solutions that improve human health, agriculture, and environmental sustainability. One of the most significant advancements in biotechnology is gene delivery, a process that involves the introduction of functional genetic material into living cells to modify, regulate, or restore normal cellular activity. Genes are specific segments of DNA that contain critical instructions for protein synthesis and cellular regulation. Defects or mutations in these genes can disrupt normal biological functions, leading to genetic disorders and disease conditions. Gene delivery offers a targeted approach to address such abnormalities by supplying therapeutic genes that compensate for or correct faulty genetic instructions. These systems include viral vectors, which are genetically engineered to safely transport genes into target cells, as well as non-viral carriers such as liposomes and nanoparticles that offer improved safety and reduced immunogenicity. Advances in gene delivery technologies have broadened their applications in gene therapy, vaccine development, regenerative medicine, and biomedical research. The integration of life science and biotechnology through gene delivery represents a transformative strategy in modern medicine. By enabling precise genetic intervention at the cellular level, gene delivery holds significant promise for the treatment of inherited diseases, the advancement of personalized medicine, and the deeper understanding of complex biological systems.

Keywords: Gene, liposomes, biotechnology, delivery, medicine.

ABSTRACT CODE: DBT/RCP/2026/027

Gene Delivery in Biotechnology and Life Sciences: Recent Advances and Future Perspectives

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Abstract

Gene delivery is a cornerstone of modern biotechnology and life sciences, enabling the therapeutic introduction, silencing, or editing of genetic material to treat a wide range of diseases. Efficient gene delivery remains a critical challenge due to biological barriers, immune responses, and safety concerns associated with conventional viral vectors. Recent advances in non-viral gene delivery systems, particularly nanotechnology-based carriers such as lipid nanoparticles, polymeric nanoparticles, dendrimers, and inorganic nanomaterials, have significantly improved transfection efficiency, biocompatibility, and targeted delivery. These systems facilitate the safe transport of DNA, RNA, siRNA, mRNA, and CRISPR-Cas components into specific cells and tissues. The success of lipid nanoparticle-mediated mRNA vaccines has further validated the clinical potential of nano-enabled gene delivery platforms. In the life sciences domain, gene delivery technologies are increasingly applied in cancer therapy, genetic disorders, regenerative medicine, and personalized medicine. Despite promising progress, challenges such as long-term toxicity, scalability, regulatory approval, and precise control over gene expression remain. Future prospects include smart and stimuli-responsive nanocarriers, AI-assisted vector design, and integration with traditional medicinal knowledge systems, especially relevant in countries like India where biotechnology and healthcare innovation are rapidly expanding. Continued interdisciplinary research is essential to translate advanced gene delivery systems from laboratory discovery to clinical application.

Keywords: Biotechnology, gene delivery, nanocarriers, gene therapy.

ABSTRACT CODE: DBT/RCP/2026/028

Nanotechnology-Based Platforms for Gene Delivery

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Abstract

Nano gene delivery systems represent an advanced and promising approach for the efficient and targeted delivery of genetic materials such as DNA and RNA into specific cells and tissues. These systems employ nanometer-sized carriers, including lipid-based nanoparticles, polymers, and dendrimers, to protect genetic material from enzymatic degradation, enhance cellular uptake, and improve gene expression. Compared to conventional viral and non-viral gene delivery methods, nanocarriers offer several advantages, including improved biocompatibility, reduced immunogenicity, controlled release, and site-specific targeting. Their small size and surface modification capability facilitate enhanced permeability and retention effects, resulting in improved therapeutic outcomes. Nano gene delivery systems have wide-ranging applications in cancer therapy, treatment of genetic disorders, vaccination, and regenerative medicine. Continuous advancements in nanotechnology and molecular biology are expected to further enhance the safety, efficiency, and clinical applicability of nano-based gene delivery strategies. Nanoscience, as a multidisciplinary platform, integrates applied health sciences, molecular chemistry, pharmaceutical sciences, engineering, and related fields to discover novel material properties at the nanoscale.

Keywords: Nano gene delivery; Nanotechnology; Gene therapy; Nanocarriers; DNA and RNA delivery; Targeted drug delivery; Nanomedicine; Lipid nanoparticles; Dendrimers; Controlled release

ABSTRACT CODE: DBT/RCP/2026/029

Physiological Barriers and Pharmacokinetic Enhancement of Herbal Nanomedicines: A Systematic Review of Novel Drug Delivery Systems

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Abstract

Herbal nanotechnology represents a novel convergence of nanotechnology and traditional herbal medicine. It merges the age-old practice of herbal medicine with modern nanotechnology, offering enhanced drug delivery systems that address limitations such as poor bioavailability, instability, and nonspecific targeting of herbal compounds. The aim of the present review was to find out innovative approaches to improve herbal drugs delivery, safety, controlled drug release, and improving therapeutic efficacy through nano formulations.A comprehensive literature review of peer-reviewed studies was conducted across major databases such as PubMed, EMBASE, and MEDLINE to identify the role of herbal nanotechnology in enhancing drug delivery systems. Non-peer-review studies were excluded. Nanotechnology offers several advantages in herbal drug delivery, such as enhanced bioavailability by improving solubility, stability and absorption. Targeted delivery of drugs to specific sites reduces systemic side effects, whereas controlled release maintains therapeutic levels over time and provides protection of active herbal compounds from environmental degradation. Advantages and applications of herbal nanotechnology also include cancer therapy, anti-inflammatory treatments, antioxidant delivery, wound healing, and antimicrobial delivery. Herbal nanotechnology represents a promising frontier in medicine, combining the benefits of nanotechnology with traditional herbal remedies. It opens avenues for more effective and safer therapies for a wide range of diseases by enhancing the pharmacological potential of herbal compounds. Thus, advancement in nano delivery system offers beneficial applications for enhancing the efficacy and pharmacological activity of herbal drug formulations.

Keywords: Bioavailability; Controlled drug release; Herbal drugs; Herbal nanotechnology; Nanocarriers; Nano formulations.

ABSTRACT CODE: DBT/RCP/2026/030

Role of AI in early cancer diagnosis and its Physiological aspects: A game changer in cancer treatment

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Abstract

Cancer is a major global health challenge, with high morbidity and mortality rates. Despite advancements in diagnosis and treatment, individualized and data-driven cancer care remains complex. Artificial Intelligence (AI) has emerged as a powerful tool to enhance cancer prognosis, prediction, and treatment selection by leveraging large datasets and advanced computational techniques. This review evaluates AI's role in oncology and its physiological aspects, focusing on cancer risk assessment, early detection, prognosis, and personalized treatment, while examining current limitations and future integration into clinical practice peer-review of recent studies and technological advancements covered AI and machine learning applications in various cancer types, including breast, lung, prostate, and liver cancers. Key methodologies include deep learning models (likes convolutional neural networks, Vision Transformers, radiomics, and genomic data analysis. Case studies highlighting AI's predictive accuracy, such as Google DeepMind's breast cancer detection system and CS-SVM (Support Vector Machine) for liver cancer recurrence, were analyzed. Challenges like data privacy, interoperability, and model interpretability were also explored.AI demonstrated significant potential to transform oncology by improving diagnostic accuracy, enabling early detection, and personalizing treatment plans for various cancers. However, addressing challenges such as data standardization, ethical concerns, and integration into clinical workflows is essential for widespread adoption. Future research should focus on leveraging emerging technologies like large language models-Chat GPT, for decision support.AI algorithms can detect subtle physiological shifts in blood chemistry or genetic expressions. It can evaluate physiological changes in tissue vascularization in advanced imaging. The continued evolution of AI in cancer care promises to enhance patient outcomes and advance precision medicine.

Keywords: AI models; Biomarker analysis; Imaging and blood flow; Early cancer detection; Physiological aspects

ABSTRACT CODE: DBT/RCP/2026/031

Nanoparticle-Mediated Kidney-Targeted Drug Delivery for Reducing Nephrotoxicity: Design and Synthesis Approach

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Abstract

Nephrotoxicity presents a major challenge with certain therapeutic agents, necessitating targeted drug delivery systems to the kidneys. This study to design a novel drug and develop nanoparticle-based carriers for effective renal delivery, thereby minimizing systemic toxicity. The nanoparticles were formulated with an emphasis on optimizing size, surface characteristics, and drug encapsulation efficiency to enhance kidney-specific accumulation. We characterized the drug and nanoparticle formulations using spectroscopic and physicochemical methods. This was done to confirm their structural integrity and stability. Evaluations in vitro and in vivo showed better renal targeting, sustained drug release, and a significant drop in nephrotoxic effects compared to traditional formulations. The results indicate that using nanoparticles for kidney-targeted drug delivery is a promising approach for reducing nephrotoxicity while keeping therapeutic effectiveness.
Keywords: Nanoparticles, targeted drug delivery, kidney.

ABSTRACT CODE: DBT/RCP/2026/032

Rheumatoid Arthritis: An Overview of Immunopathology and Management

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Abstract

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune inflammatory disorder primarily affecting synovial joints, leading to progressive pain, stiffness, swelling, and irreversible destruction of cartilage and bone. The disease arises from a complex interplay of genetic susceptibility, environmental factors such as smoking and obesity, and immune dysregulation. Pro-inflammatory cytokines, particularly tumor necrosis factor-α (TNF-α), interleukin-1β (IL-1β), and interleukin-6 (IL-6), play a pivotal role in the initiation and progression of synovial inflammation, pannus formation, and joint erosion. In addition to joint involvement, RA is associated with systemic manifestations, including skeletal muscle deformation and increased risk of cardiovascular and metabolic complications. This review comprehensively discusses the etiology, pathology, and pathogenesis of rheumatoid arthritis, along with its clinical features, complications, and diagnostic approaches. Current therapeutic strategies, including conventional disease-modifying antirheumatic drugs (DMARDs), biologics, and targeted synthetic agents, are summarized. Special emphasis is placed on emerging therapeutic targets such as cytokines, sialoprotein I, and novel biomarkers that aid in disease classification and prognosis. Furthermore, recent patents, marketed formulations, and advanced treatment approaches for RA management are highlighted. Overall, this review provides an updated overview of recent trends and innovations in the diagnosis and treatment of rheumatoid arthritis, aiming to support improved clinical outcomes and disease management strategies.

Keywords : Rheumatoid arthritis; Autoimmune disease; TNF-α; Interleukins; Synovial inflammation.

ABSTRACT CODE: DBT/RCP/2026/033

Molecular Mechanisms and Innovative Therapeutic Approaches in Asthma Airway Inflammation

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Abstract

Asthma is a chronic inflammatory disorder of the airways characterized by bronchial hyper-responsiveness, airflow limitation, and progressive structural remodeling of the lung tissue. Although airway obstruction in asthma is often reversible, sustained inflammation can result in irreversible pathological changes, including smooth muscle hypertrophy, subepithelial fibrosis, and mucus hypersecretion. The etiology of asthma is multifactorial, involving genetic susceptibility and environmental exposures such as allergens, pollutants, and early-life respiratory infections. These factors promote immune dysregulation, predominantly skewing the immune response toward a T-helper-2 (Th2) phenotype. At the molecular level, asthma pathogenesis is driven by the release of inflammatory mediators, including cytokines, chemokines, leukotrienes, prostaglandins, and reactive oxygen species, which collectively contribute to airway inflammation and remodeling. Key cytokines such as interleukins (IL-4, IL-5, and IL-13) regulate immunoglobulin E (IgE) synthesis, eosinophil activation, and mast cell degranulation, thereby amplifying the inflammatory cascade. Advances in chemical biology and medicinal chemistry have facilitated the identification of molecular targets involved in these signaling pathways, enabling the development of small-molecule inhibitors, biologics, and novel anti-inflammatory agents. This review summarizes the etiology and molecular mechanisms underlying airway inflammation in asthma, with emphasis on inflammatory mediators, signaling pathways, and chemically relevant therapeutic targets. Understanding these biochemical processes is essential for the rational design of next-generation pharmacological interventions for asthma management.

Keywords: Asthma; Airway inflammation; Cytokines; Inflammatory mediators; Molecular pathogenesis.

ABSTRACT CODE: DBT/RCP/2026/034

Liposomal Approach for Enhanced Topical Drug Delivery

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Abstract

Topical drug delivery systems are commonly used for the treatment of various skin disorders; however, their therapeutic effectiveness is often restricted due to poor skin penetration, low bioavailability, and limited drug retention at the site of application. Conventional topical formulations are unable to efficiently overcome the barrier properties of the stratum corneum, resulting in reduced clinical efficacy. In this context, liposomes have gained considerable attention as an advanced drug delivery system because of their biocompatibility, vesicular structure, and ability to enhance drug permeation through the skin.The present study focuses on the development and optimization of a liposomal approach for enhanced topical drug delivery. Liposomal formulations were prepared using suitable phospholipids and cholesterol and optimized using statistical experimental design techniques. The prepared liposomes were characterized for particle size, polydispersity index, zeta potential, and entrapment efficiency. The optimized formulation was further incorporated into a suitable topical base and evaluated for in-vitro drug release and ex-vivo skin permeation studies.The findings of the study revealed that the liposomal formulation exhibited improved drug entrapment efficiency and significantly enhanced skin permeation as compared to conventional topical formulations. The formulation also demonstrated acceptable stability, indicating its suitability for topical application. The study concludes that the liposomal approach offers a promising strategy for improving topical drug delivery and may enhance therapeutic outcomes in dermatological therapy.

Keywords: Liposomes, Topical drug delivery, Oral presentation, Skin permeation, Nanocarriers

ABSTRACT CODE: DBT/RCP/2026/035

FORMULATION AND EVALUATION OF XANTHAN GUM BASED EMULGEL FOR TRETMENT OF ONCHOMYCOSIS

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Abstract

Onychomycosis is a fungal infection of the nails that is difficult to treat with conventional topical or oral therapies. This study focuses on the formulation and evaluation of a xanthan gum-based emulgel containing Fluconazole for effective topical treatment of onychomycosis. Xanthan gum was used as a natural gelling agent to improve viscosity,spreadability, and drug release. The Fluconazole emulgel was prepared by incorporating the oil phase containing the drug and emulsifiers into an aqueous phase, followed by gelation using xanthan gum and addition of penetration enhancers such as propylene glycol and urea. The formulation was evaluated for pH, viscosity, spreadability, drug content, stability, in-vitro drug release, and antifungal activity.The optimized Fluconazole emulgel showed good physical stability, controlled drug release, and improved nail permeation compared to a plain gel. Xanthan gum-based Fluconazole emulgel is a promising and effective topical formulation for the treatment of onychomycosis, offering better drug delivery and patient compliance.

Keywords: Fluconazole, Xanthan gum, Emulgel, Onychomycosis, Antifungal, Topical delivery.

ABSTRACT CODE: DBT/RCP/2026/036

Peptide-Mediated Alpha-Glucosidase Inhibition: A Novel Antidiabetic Approach

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Abstract

Diabetes mellitus (DM) is a group of metabolic diseases characterized by high blood sugar levels due to insufficient insulin production or ineffective cellular response to insulin. The main symptoms include polyuria, polydipsia, and polyphagia. Diabetes is conventionally classified into three types, with Type 1 DM (insulin-dependent diabetes mellitus) resulting from the body's failure to produce insulin, necessitating insulin injections or pumps, often referred to as "juvenile diabetes. α-glucosidase inhibitors are effective oral medications for managing and preventing diabetes, a chronic disease, along with other critical conditions such as tumors and cardiovascular diseases. Recent studies have highlighted bioactive peptides as a promising source of α-glucosidase inhibitors, demonstrating appropriate hypoglycemic activity and regulating postprandial blood glucose levels through α-glucosidase activity inhibition. This paper systematically reviews various aspects of α-glucosidase inhibitory peptides, including their sources, methods of isolation and purification, bioavailability, and the potential mechanisms through which they exert their effects. Notably, it examines the sources of these peptides, focusing on those derived from animals, plants, and microorganisms. Additionally, the paper addresses existing challenges within the research methodologies pertaining to α-glucosidase inhibitory peptides, aiming to provide theoretical support that could enhance further research in this field. Diabetes mellitus affects 422 million people worldwide and leads to serious complications such as kidney issues, heart diseases, and retinopathy. Existing antidiabetic drugs have shown limited effectiveness, necessitating the development of new agents. α-Glucosidase inhibitors have emerged as promising targets, garnering significant interest from medicinal chemists. Recent studies highlight their enhanced therapeutic potential due to synergistic effects, improved safety profiles, and competitive inhibition mechanisms. The article reviews recent α-glucosidase inhibitors, focusing on their pharmacological effects, structure-activity relationships, and mechanistic insights, ultimately providing valuable information for researchers aiming to develop novel inhibitors with improved efficacy.

Keywords:α-glucosidase inhibitory peptide; source; mechanism; bioavailability

ABSTRACT CODE: DBT/RCP/2026/037

Nanoparticle-MediatedTechnics Organ Specific Targeting Using Engineered Lipid Nanoparticles

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Abstract

Organ-specific targeting using engineered lipid nanoparticles (LNPs) is an advanced nanoparticle-mediated technique that enhances the precision and safety of drug delivery. Lipid nanoparticles are nanosized carriers composed of biocompatible lipids capable of encapsulating both hydrophilic and lipophilic drugs.

Through surface engineering, such as ligand attachment, charge modification, and lipid composition optimization, LNPs can be directed toward specific organs like the liver, lungs, or spleen. This targeted approach improves drug accumulation at the desired site while reducing off-target effects and systemic toxicity.

Engineered LNPs protect drugs from degradation, enhance bioavailability, and allow controlled drug release. They are particularly significant in the delivery of nucleic acids, vaccines, anticancer agents, and gene therapies.

Due to their stability, scalability, and clinical success, lipid nanoparticle-mediated organ-specific targeting represents a promising strategy in modern pharmaceutics and personalized medicine, offering improved therapeutic outcomes and better patient compliance.

Keywords : Lipid nanoparticles, Organ-specific targeting, Surface engineering, Controlled drug delivery

ABSTRACT CODE: DBT/RCP/2026/038

Base-Editing Gene Therapy for Familial Hypercholesterolemia: A Precision Nanotechnological Approach

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Abstract

Familial hypercholesterolemia (FH) is an inherited metabolic disorder characterized by elevated low-density lipoprotein cholesterol (LDL-C) from birth. It affects approximately 1 in 250 individuals worldwide and markedly increases the risk of premature coronary artery disease. In India, FH remains largely underdiagnosed, and existing lipid-lowering therapies require lifelong use with variable clinical response. Recent advances in gene therapy have enabled nanotechnology-based delivery of defined gene-editing molecules for FH. Adenine base editor (ABE) mRNA and guide RNA targeting the *PCSK9* gene, delivered through lipid nanoparticles (LNPs), have demonstrated 60–70% sustained reduction in LDL-C levels after a single administration in preclinical and early clinical studies. Similarly, CRISPR–Cas9 mRNA and guide RNA targeting *ANGPTL3*, delivered using lipid nanoparticle-based carriers, resulted in 50–60% reduction in LDL-C and triglyceride levels in first-in-human trials. Beyond conventional LNPs, lipid-like nanoparticles (LLNs) have been used to deliver base editor mRNA and guide RNA targeting *PCSK9*, achieving efficient hepatocyte-specific editing and significant LDL-C reduction in animal models. Polymeric nanoparticles, such as PLGA-based systems, have been explored for the delivery of PCSK9-specific siRNA, leading to reduced PCSK9 expression and lowered LDL-C levels in preclinical studies. In addition, GalNAc-decorated nanocarriers have been employed to deliver PCSK9-targeting siRNA, enhancing liver-specific uptake and improving lipid-lowering efficacy. Exosome-based nanocarriers are emerging as biocompatible systems for the delivery of siRNA or CRISPR components targeting cholesterol-regulating genes, although these approaches remain at an early experimental stage. Overall, the delivery of well-defined gene-editing and gene-silencing molecules through advanced nanotechnological platforms highlights a rational and potentially one-time therapeutic strategy for the long-term management of familial hypercholesterolemia.

Keywords : Familial hypercholesterolemia, PCSK9, ANGPTL3, base editing, siRNA, nanotechnology.

ABSTRACT CODE: DBT/RCP/2026/039

Targeting the Inflammatory Cascade: The Role of Nano-Gene Carriers in Arthritis Management

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Abstract

Rheumatoid arthritis (RA) and osteoarthritis (OA) are characterized by a self-perpetuating inflammatory cascade involving pro-inflammatory cytokines (e.g., *TNF-α*, *IL-1β*), matrix-degrading enzymes, and activated immune cells. Conventional systemic therapies often fail due to poor joint bioavailability and significant off-target toxicity. This review examines the emergence of nano-gene carriers including lipid nanoparticles, polymeric micelles, and inorganic nanostructures as a precision strategy to modulate the arthritic microenvironment. By delivering therapeutic nucleic acids (siRNA, miRNA, or pDNA) directly to inflamed synovium, these platforms aim to silence overactive inflammatory pathways at the genetic level. Nano-gene delivery offers several advantages: enhanced permeability and retention (EPR) effects in inflamed joints, protection of genetic cargo from enzymatic degradation, and the ability for ligand-mediated targeting of activated macrophages and cnidocytes. Recent studies demonstrate that silencing key transcription factors, such as *NF-kappa B*, via nano-carriers significantly reduces bone erosion and cartilage degradation in vivo. Integrating nanotechnology with gene therapy represents a transformative shift from palliative care to disease-modifying intervention. While challenges in long-term stability and clinical scaling remain, nano-gene carriers provide a highly localized, potent approach to disrupting the inflammatory cascade in chronic arthritis management.

Keyword: Nano-gene delivery, Inflammatory cascade, Arthritis management, Gene silencing, Targeted therapy, Nucleic acid, *TNF-α,* Interleukins.

ABSTRACT CODE: DBT/RCP/2026/040

Role of Lipid Nanoparticles in MRNA and Gene Therapy

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Abstract

Lipid nanoparticles (LNPs) have emerged as a pivotal delivery platform for mRNA and gene-based therapeutics, overcoming key biological barriers associated with nucleic acid instability, enzymatic degradation, and poor cellular uptake. This poster highlights the role of LNPs in enabling efficient and safe delivery of genetic material for gene therapy and mRNA-based treatments. LNPs are typically composed of ionizable lipids, cholesterol, phospholipids, and polyethylene glycol (PEG) lipids, which together facilitate nucleic acid encapsulation, systemic administration, cellular internalization, endosomal escape, and cytoplasmic release. These properties have driven major clinical successes, including FDA-approved siRNA therapeutics and widely deployed mRNA vaccines for COVID-19. Beyond current applications, LNP technology shows strong potential for cancer gene therapy, personalized vaccines, rare disease treatment, and targeted delivery to specific organs such as the brain. Despite these advances, challenges remain, including immune responses, large-scale manufacturing, long-term safety, and regulatory complexity. Ongoing innovations in lipid design, formulation strategies, and targeting approaches are expected to further expand the therapeutic scope of LNPs, positioning them as a cornerstone of next-generation genetic medicine.

Keywords: Lipid nanoparticles; mRNA therapy; Gene therapy; Drug delivery systems.

ABSTRACT CODE: DBT/RCP/2026/041

Multiple Unit Particulate System of A Bronchodilator for the Treatment of Chronic Obstructive Pulmonary Disease

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder characterized by irreversible airflow limitation and chronic airway inflammation. Bronchodilators are the primary therapeutic agents used in the management of COPD; however, conventional dosage forms often lead to variable drug release, poor bioavailability, and increased systemic side effects. To address these limitations, the Multiple Unit Particulate System (MUPS) has gained significant attention as an advanced drug delivery system.MUPS comprises multiple discrete units such as pellets, beads, or microspheres, which are filled into capsules or compressed into tablets. In bronchodilator therapy, MUPS provides uniform drug distribution, reduced risk of dose dumping, improved gastrointestinal transit, and controlled or sustained drug release. This system enhances therapeutic efficacy while minimizing adverse effects and inter-patient variability. Furthermore, MUPS improves patient compliance due to flexible dosing and better safety profiles. Thus, bronchodilator-loaded MUPS represents a promising approach for effective and long-term management of COPD.

Keywords: Multiple Unit Particulate System (MUPS), COPD therapy, Pulmonary drug delivery, Controlled release pellets, Bronchodilator, Precision drug delivery.

ABSTRACT CODE: DBT/RCP/2026/042

Design and In Silico Screening of Multi-Substituted Coumarin Derivatives for Synergistic Multi-Target Anti-Rheumatoid Arthritis Therapy

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disorder characterized by persistent synovial inflammation, cartilage degradation, and joint destruction. Its complex pathogenesis involves multiple inflammatory mediators, including Tumor Necrosis Factor-α (TNF-α), Interleukin-6 (IL-6) receptor, and Cyclooxygenase-2 (COX-2). Conventional single-target therapies often exhibit limited efficacy and significant adverse effects, highlighting the need for safer multi-target approaches.Coumarin derivatives are versatile scaffolds with proven anti-inflammatory, antioxidant, and immunomodulatory activities. In this study, a library of multi-substituted coumarin derivatives was rationally designed by introducing electron-donating and electron-withdrawing groups at strategic positions to enhance binding affinity, selectivity, and synergistic potential. Molecular docking was performed against TNF-α, IL-6 receptor, and COX-2 to evaluate multi-target binding interactions. Binding energies, hydrogen bonding, and hydrophobic contacts were analyzed to identify lead compounds. ADMET predictions assessed pharmacokinetic properties, drug-likeness, and toxicity risk.Several derivatives demonstrated strong interactions with all three targets, indicating potential synergistic multi-target inhibition. Structure–activity relationship (SAR) analysis highlighted key substituents that enhanced binding affinity, stability, and selectivity. ADMET predictions indicated favorable oral bioavailability and low toxicity, supporting their drug-like properties.These findings provide a computational framework for the rational design of multi-substituted coumarin derivatives as synergistic multi-target anti-RA agents, offering promising leads for further in vitro and in vivo evaluation.

Keywords: Multi-substituted coumarin derivatives; Synergistic effect; multi-target inhibitors; Rheumatoid arthritis; Molecular docking; ADMET; Structure–activity relationship (SAR)

ABSTRACT CODE: DBT/RCP/2026/043

Nanocarrier Strategies for Enhanced Resveratrol Delivery: Formulation Advances and Therapeutic Applications

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Abstract

Resveratrol is a naturally occurring polyphenol widely recognized for its antioxidant, anti-inflammatory, cardioprotective, neuroprotective, and anticancer activities. Despite its broad therapeutic potential, clinical translation of resveratrol is severely limited by poor aqueous solubility, rapid metabolism, and low systemic bioavailability. In recent years, nanocarrier-based drug delivery systems have emerged as effective platforms to address these challenges by improving solubility, stability, targeted delivery, and controlled drug release. This presentation highlights recent advances in nanocarrier-based formulation strategies for resveratrol delivery, including liposomes, polymeric nanoparticles, solid lipid nanoparticles, nanostructured lipid carriers, dendrimers, and nano emulsions. Key design considerations, formulation advantages, and performance outcomes from preclinical and emerging clinical studies are discussed. Furthermore, the therapeutic potential of resveratrol nano formulations across major disease areas-such as cancer, cardiovascular disorders, neurodegenerative diseases, and metabolic syndromes-is critically summarized. Overall, nanocarrier-mediated delivery systems represent a promising approach to overcome the intrinsic pharmacokinetic limitations of resveratrol and enhance its therapeutic efficacy. Future research should focus on clinical translation, scalable manufacturing, regulatory alignment, and the development of multifunctional and stimuli-responsive nanocarriers to fully realize the clinical benefits of resveratrol-based therapies.

Keywords: Resveratrol, Nanocarriers, Liposomes, Solid lipid nanoparticles, Micelles, Microneedles, Anti-inflammatory, Anti-Diabetes.

ABSTRACT CODE: DBT/RCP/2026/044

Nano-Based Gene Delivery Strategies in Cancer Gene Therapy

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Abstract

Cancer presents a formidable challenge, necessitating innovative therapies that maximize effectiveness while minimizing harm to healthy tissues. Nanotechnology has emerged as a transformative force in cancer treatment. The proposal of gene therapy to tackle cancer development has been instrumental for the development of novel approaches and strategies to fight this disease, but the efficacy of the proposed strategies has still fallen short of delivering the full potential of gene therapy in the clinic. Despite the plethora of gene modulation approaches, e.g., gene silencing, antisense therapy, RNA interference, gene and genome editing, finding a way to efficiently deliver these effectors to the desired cell and tissue has been a challenge. Nanoparticle enhancements optimize this process, improving drug delivery, selectivity, and reactive oxygen species (ROS) production within tumors. The emerging nano-enabled approaches, that design multiscale artificial antigen-presenting cells for cell proliferation and stimulation in vitro, promote the transducing efficiency of tumor-targeting domains, engineer therapeutic cells for in vivo imaging, tumor infiltration, and in vivo functional sustainability, as well as generate tumoricidal T cells in vivo. Advances in mRNA technologies and lipid nanoparticle (LNP) delivery systems led to several clinical trials involving LNP-CRISPR-Cas9 mRNA-based therapeutics. Despite these advances, achieving cell-type-specific extrahepatic mRNA delivery is still challenging.

Keywords: gene therapy, cancer, nano, delivery

ABSTRACT CODE: DBT/RCP/2026/045

Nanoscale Delivery Platforms: A Mechanistic Approach to Managing Leishmanial Infections

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Abstract

Leishmaniasis remains a major global health challenge, characterized by high morbidity and limited therapeutic options. Current conventional treatments are often hampered by severe systemic toxicity, prolonged administration schedules, and the emergence of drug-resistant Leishmania strains. This paper explores the transition toward nanoscale delivery platforms as a transformative approach to managing leishmanial infections. By focusing on the mechanistic advantages of nanotechnology, we examine how engineered nanocarriers-including liposomes, polymeric nanoparticles, and metal-organic frameworks-facilitate the targeted delivery of bioactive agents directly to the host macrophages.We analyze the biochemical pathways through which these platforms bypass biological barriers, enhance drug bioavailability, and trigger site-specific release within the phagolysosomes where the parasites reside. Furthermore, this study highlights how surface modifications and functionalization allow for "active targeting," significantly reducing off-target effects and systemic concentrations. By integrating a mechanistic understanding of parasite-host interactions with advanced materials science, nanoscale platforms offer a more precise, potent, and patient-compliant strategy. We conclude that shifting from conventional chemotherapy to mechanism-driven nanomedicine is essential for overcoming the biological hurdles inherent in treating intracellular leishmanial infections and provides a roadmap for future clinical interventions.

Keywords: - Nanomedicine, Leishmaniasis, Targeted Drug Delivery, Macrophage Targeting, Intracellular Pathogens, Bioavailability Enhancement, Nanocarriers.

ABSTRACT CODE: DBT/RCP/2026/046

Nanocarrier-Based Delivery of Chromone-2-Carboxamido-Alkylbenzylamine Derivatives for Enhanced Blood–Brain Barrier

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Abstract

Alzheimer's disease (AD) remains a major neurodegenerative disorder with limited therapeutic options, largely due to poor drug permeability across the blood–brain barrier (BBB). Chromone-2-carboxamido-alkylbenzylamine derivatives have emerged as promising multifunctional agents for AD therapy; however, their clinical translation is constrained by suboptimal brain delivery. To address this limitation, the present study explores a nanocarrier-based drug delivery strategy to enhance the BBB penetration and neurotherapeutic potential of these chromone derivatives.The selected chromone-2-carboxamido-alkylbenzylamine compounds were encapsulated into biocompatible nanocarriers using optimized formulation techniques. The developed nano formulations were characterized for particle size, surface charge, encapsulation efficiency, and stability. In vitro release studies demonstrated sustained drug release profiles, while cellular uptake and BBB-mimicking permeability models indicated significantly improved transport compared to free drug. Preliminary neuroprotective assessments suggested enhanced biological activity of the nano-encapsulated compounds, potentially attributable to improved bioavailability and cellular internalization. The nanocarrier system effectively improved physicochemical properties and facilitated enhanced BBB penetration, highlighting its potential as a viable delivery platform for chromone-based anti-Alzheimer's agents. This study underscores the promise of nanotechnology-driven approaches in overcoming central nervous system delivery challenges and advancing chromone-2-carboxamido-alkylbenzylamine derivatives toward effective AD therapeutics.

Keywords: Alzheimer's disease; Chromone-2-carboxamido-alkylbenzylamine derivatives; Nanocarrier-based drug delivery; Blood–brain barrier; Neurotherapeutics

ABSTRACT CODE: DBT/RCP/2026/047

Nanotechnology-Enabled Gene Therapy: Advances in Delivery Systems and Translational Challenges

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Abstract

Gene therapy has the ability to target the way that genes operate, making it a very attractive treatment option for genetic disorders, cancer and infections. However, gene therapy is not currently being used in the clinic because of many challenges including: (1) the genetic material's stability in vivo, (2) the inability of cells to take up genes very well, (3) possibility of erroneous and off-target (non-specific) effects of the treatment, and (4) toxicity that the standard method of administering genes poses to the patient and/or their cells. Recently, nanotechnology has emerged as a promising method of helping to address these challenges and improve the efficiency of gene therapy. Research into new gene delivery methods using different kinds of nanotechnology (lipid, polymer, dendrimer, inorganic) has led to a large number of ways to deliver genes using these types of systems. These new types of systems all work together to protect nucleic acids from being degraded, increase the amount of available nucleic acids for absorption by cells, help to carry nucleic acids into cells, and provide a method for delivering and controlling nucleic acids specifically to particular cells or areas of the body. Additionally, advancements in nanocarrier surface functionalization and the creation of stimuli-responsive nanocarriers have improved both the efficiency of delivery of nucleic acids by these systems as well as the toxicity associated with their use. From a pharmaceutics standpoint, successful translational development of these systems from the research laboratory to clinical application is influenced by formulation design, stability, and scalability, all of which will affect the final outcome of the development process. This summary emphasizes the future of nanotechnology to be used in gene therapy including areas like personalized medicine, CRISPR-based gene-editing delivery, regulatory issues, etc., while also indicating that there are still many issues to resolve with long-term safety and large-scale production. There needs to be much more cross-disciplinary research to connect the gap between discoveries being made and their effective delivery as therapies.

Keywords: Gene delivery systems, Gene therapy, Nanocarriers, Nanotechnology, Targeted delivery, Translational challenges.

ABSTRACT CODE: DBT/RCP/2026/048

Recent Advances in Nanotechnology for Gene Therapy: Challenges and Future Perspectives

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Abstract

Micro/nanostructure-integrated electroporation (micro/nano-electroporation) uses short electric pulses to physically break the cell membrane barrier, allowing gene transfer into the cells. It avoids the off-target risks associated with viral vectors and stands out from other physical-based gene delivery methods with its high throughput and cargo-accelerating features. Recent advances in micro/nanotechnology have greatly improved cell viability, transfection efficiency, and dose controllability, especially in vivo. This technical innovation makes micro/nano-electroporation an effective and adaptable tool for gene therapy. In this study, we first outline the development of the electroporation technique and give a brief explanation of the perforation mechanism. After that, we give a summary of the latest developments and future possibilities of micro/nano electroporation technology in the gene therapy field. We concentrate on micro/nanoelectroporation devices and current applications at both in vitro and in vivo levels in order to thoroughly demonstrate the most recent advancements in micro/nano electroporation technology in gene therapy. We also describe the current clinical research on gene electro transfer (GET), which highlights the enormous potential of electroporation-based gene delivery in healthcare and illness therapy. Finally, the difficulties and potential paths for this field are explored.

Keywords: Nanotechnology, Gene therapy, Micro/nano-electroporation. micro/nano electroporation

ABSTRACT CODE: DBT/RCP/2026/049

Non-Viral Gene Delivery Strategies for Amyotrophic Lateral Sclerosis: Challenges and Future Perspectives

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Abstract

Amyotrophic lateral sclerosis (ALS) is a progressive and fatal neurodegenerative disorder for which no effective treatment is currently available to halt or significantly slow disease progression. Recent advances in gene therapy have generated renewed interest in developing targeted therapeutic strategies for ALS. Among these, non-viral gene delivery systems such as lipid-based and polymer-based nanoparticles, cationic polymers, and exosomes have emerged as promising tools for transferring therapeutic genes into neuronal cells. These non-viral vectors offer advantages including long-term and stable gene expression with reduced immunological risks, making them suitable for neurological applications.These abstract outlines the current status of experimental and clinical therapies for ALS and traces the development of non-viral vector-based gene delivery approaches. It further discusses key challenges that limit clinical translation, including biological barriers associated with systemic administration and the need to optimize the timing, targeting, and dosage of gene delivery. Additionally, emerging technologies such as CRISPR-Cas9 gene editing, stem cell-based therapies, and low-intensity focused ultrasound are briefly explored for enhancing central nervous system delivery and enabling personalized gene therapy. Despite existing challenges, continued research and technological advancements in non-viral gene therapy provide optimism for future ALS treatment strategies.

Keywords: Amyotrophic lateral sclerosis, neurodegenerative disease, Non-Viral Gene Delivery, Gene Therapy, Nanoparticles.

ABSTRACT CODE: DBT/RCP/2026/050

A prospective on nanocarriers for gene therapy in neurodegenerative diseases

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Abstract

This review explores the current state of nanocarriers for gene therapy as a potential treatment and management of neurodegenerative diseases. Generally, nanocarriers are understood to be transport and encapsulated systems of various origins and chemical compositions that primarily serve to protect and improve the dispersibility of predominantly hydrophobic active ingredients. It also enables their targeted delivery and controlled releases at the site of action. There are many types of nanocarriers such as polymer conjugates, polymeric nanoparticles, lipid-based carriers, dendrimers, carbon nanotubes, and gold nanoparticles. Lipid-based carriers include both liposomes and micelles. The synthesis of nanocarriers that provide small size, a wide surface area in relation to volume, better drug delivery, improved bioavailability, decreased systematic side effect and greater therapeutic efficiency. Additionally, it is also be surface modified with suitable ligands like peptides, antibodies etc., which show specific interactions with receptors or cellular targets associated with the disease process. These nanocarriers can be engineered to encapsulate drugs, facilitating their passage across the blood brain barrier (BBB), enabling treatment locally of the regions affected by neurodegeneration. This review covers the basic concepts and applications of nanomaterials in the therapy and emphasized the need for research in the future to validate the therapeutic applications of nanocarrier gene therapy. And also suggested continuing research efforts to bridge existing knowledge gaps, unlocking the full potential of innovative approach in the realm of neurological health.

Keywords : liposomes, dendrimers,synthesis, nanomaterials.

ABSTRACT CODE: DBT/RCP/2026/051

Advances in Targeted Drug Delivery: Convergence of Molecular Biology, Nanomedicine, and Pharmaceutical Engineering

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Abstract

Targeted Drug Delivery Systems (TDDS) have emerged as a crucial innovation in modern pharmaceutical research by enabling site-specific delivery of therapeutic agents to diseased tissues or cells, thereby improving therapeutic efficacy and reducing systemic side effects. The development of TDDS is inherently multidisciplinary, integrating nanotechnology,biotechnology, and pharmaceutical sciences to overcome the limitations of conventional drug delivery approaches. Nanotechnology offers a wide range of advanced carrier systems such as polymeric nanoparticles, liposomes, dendrimers, micelles, and solid lipid nanoparticles, which enhance drug solubility, stability, controlled release, and bioavailability. Biotechnology plays a vital role in molecular targeting by employing antibodies, ligands, peptides, aptamers, and gene-based components that facilitate receptor-mediated and intracellular drug delivery.Pharmaceutical sciences contribute significantly to formulation optimization, dosage form design, pharmacokinetic and pharmacodynamic evaluation, biocompatibility, and regulatory considerations. The integration of these disciplines has led to the development of smart and stimuli-responsive delivery systems capable of responding to internal and external triggers such as pH, enzymes, temperature, redox conditions, and magnetic fields. These advanced systems have demonstrated promising applications in the treatment of cancer, genetic disorders, infectious diseases, and chronic inflammatory conditions.Furthermore, recent advances in nano-gene delivery and personalized medicine have expanded the scope of TDDS toward precision therapeutics tailored to individual patient needs. Despite existing challenges related to scalability, toxicity, and regulatory approval, the multidisciplinary approach to targeted drug delivery holds immense potential for future therapeutic innovation and improved patient outcomes.

Keywords: Targeted Drug Delivery system, Nanoparticle, Targeting Methods,Biotechnology.

ABSTRACT CODE: DBT/RCP/2026/052

The Potential Nano vectors in Plant Genome Engineering for Gene Delivery

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Abstract

Highly efficient gene delivery systems are crucial for successful plant genetic engineering and genome editing. Conventional methods such as Agrobacterium-mediated transformation, PEG-mediated delivery, biolistic particle bombardment, electroporation, and viral transfection are widely used, but their application is often limited due to genotype/species dependence, tissue damage, low transformation efficiency, and high cost. Recently, nanomaterial-based vectors including mesoporous silica nanoparticles (MSNs), gold nanoparticles (AuNPs), carbon nanotubes (CNTs), and layered double hydroxides (LDHs) have emerged as promising alternatives for delivering DNA, RNA, proteins, and CRISPR–Cas RNPs into plants in a more species-independent and efficient manner these nano-delivery technologies have previously demonstrated effectiveness in producing stable transgenic crops like cotton and maize and provide benefits including improved biocompatibility, nucleic acid protection, increased transformation efficiency, and potential plant regeneration. explores the significant potential of nanomaterial-mediated plant transformation for furthering CRISPR-based genome editing, crop improvement, and future sustainable agriculture. It also emphasizes recent advancements, important advantages, and present constraints.

Keywords:efficient, transformation, nanoparticles, transgenic.

ABSTRACT CODE: DBT/RCP/2026/053

The Green Revolution in Genetic Medicine based on Nanotechnology in Gene Therapy

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Abstract

The integration of phyto-nanotechnology into gene therapy represents a transformative leap toward sustainable, low-toxicity clinical interventions by bridging the gap between the discovery of bioactive compounds and the precision delivery of these compounds. A strategic shift toward green-synthesized nanocarriers is highlighted by recent developments in 2026. These nanocarriers utilize intrinsic polyphenols and terpenoids to overcome key delivery bottlenecks, primarily by enhancing endosomal escape and facilitating stimuli-responsive release tailored to the acidic or oxidative stress of tumor microenvironments. This synergistic approach offers a scalable, environmentally friendly framework for managing complex oncological and neurodegenerative disorders by leveraging the powerful reducing and "cloaking" properties of particular medicinal plants, such as Phyllanthus emblica (Indian Gooseberry), Cymbopogon olivieri (Desert Lemongrass), Azadirachta indica (Neem), and Moringa oleifera (Drumstick Tree). Additionally, by utilizing the inherent fluorescent and magnetic characteristics of plant-mediated particles, the development of nanotheranostics in this field enables simultaneous real-time imaging and gene control. Ultimately, by successfully reducing the immunogenicity and exorbitant costs associated with traditional synthetic and viral delivery systems, these plant-based approaches provide a solid route to clinical translation.

Keywords: Gene therapy, Phyto-nanotechnology, drug delivery, Conventional vs. Controlled drug release.

ABSTRACT CODE: DBT/RCP/2026/054

Doxycycline and Ferulic Acid-Loaded Nanoparticles for Enhanced Healing of Infected DiabeticWounds

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Abstract

Chronic diabetic wounds, aggravated by oxidative stress and bacterial infections, pose considerable difficulties in clinical wound management, frequently resulting in extended healing durations, heightened risk of recurrent infections, and incapacity. Excessive accumulation of reactive oxygen species (ROS) in infected wounds hinders the proper action of macrophages, hence slowing the healing process. The creation of sophisticated wound dressings that include innovative medicine delivery technologies is crucial to resolve this issue. This work proposes a Doxycycline (DOX) and Ferulic acid (FA)-loaded Chitosan Nanoparticle to improve the healing of infected diabetic lesions. The DOX-FA-ChNP system integrates the antibacterial characteristics of DOX with the antioxidant properties of FA in a biodegradable matrix. The research employed ionic gelation methods to synthesise DOX-FA-ChNP, evaluating their biocompatibility, toxicity, skin irritation, and wound healing effectiveness in vivo with Wistar albino rats. Histopathological assessments, utilisingHaematoxylin and Eosin (H&E) and Masson's Trichrome staining, were conducted to assess tissue regeneration. The findings indicate that DOX-FA-ChNP markedly improves wound healing, presenting great therapeutic promise for the therapy of diabetic wounds.

Keywords: Diabetic wound healing, Nanoparticle, antibacterial, scratch assay in vivo evaluation.

ABSTRACT CODE: DBT/RCP/2026/055

Nanotechnology: Gene Therapy for Effective Management of Cardiovascular Diseases

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Abstract

Gene therapy for cardiovascular disease (CVD) focuses on angiogenesis, cardiomyocyte regeneration, and the treatment of hereditary cardiomyopathies. It offers prospective treatments for hereditary diseases, ischemic heart disease, and heart failure using vectors such as CRISPR-Cas9 or Adeno-associated viruses (AAVs). By focusing on vascular endothelial growth factor(VEGF), angiogenesis induction improves blood flow to injured ischemic tissue by encouraging the formation of new blood vessels. Repairing or Regenerating cardiac muscle cells following damage,such as myocardial infration,using CRISPR-Cas9 or gene editing.Using RNA-based treatments(siRNA,mRNA) to control gene expression, such as focusing on CaMKII delta to lessen the build-up of harmful proteins after a heart attack. Gene treatments,which are still in the research stage,have the potential to improve or replace genetic defective genes that cause protein deficits(haploinsufficiency).There are currently no FDA-approved gene treatment exclusively for the heart ,despite the fact that numerous (CVD) are being researched. Improving the effectiveness of treating complex disease by customizing gene-modifying techniques to each patient's own genetic code.

Keywords: CVD;CRISPR-Cas-9, AAVs;VEGF;siRNA, mRNA;CaMKII delta.

ABSTRACT CODE: DBT/RCP/2026/056

Advances in Nanoparticle-Mediated Techniques for Enhanced Biomedical Applications

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Abstract

Nanoparticle-mediated techniques have emerged as a transformative approach in various biomedical applications, leveraging the unique properties of nanoparticles to improve diagnostics, therapeutics, and imaging. These nanoscale materials, typically ranging from 1 to 100 nanometers, exhibit distinct physical and chemical characteristics that enable targeted drug delivery, enhanced imaging contrast, and effective biosensing. One of the most significant advancements is in targeted drug delivery systems, where nanoparticles can be engineered to encapsulate therapeutic agents and release them at specific sites within the body. This targeted approach minimizes side effects and maximizes therapeutic efficacy, particularly in cancer treatment. Moreover, surface modification of nanoparticles allows for the attachment of ligands that can selectively bind to cancer cells, facilitating precise drug delivery In diagnostics, nanoparticle-based biosensors have shown remarkable sensitivity and specificity for detecting biomarkers associated with various diseases. Gold nanoparticles, for instance, are widely used in colorimetric assays that enable rapid detection of pathogens and disease markers. Additionally, quantum dots and magnetic nanoparticles enhance imaging techniques such as MRI and fluorescence imaging, providing real-time visualization of biological processes. The integration of nanoparticle-mediated techniques into clinical practice holds immense potential for personalized medicine, allowing for tailored treatment strategies based on individual patient profiles. As research continues to evolve, the future of nanoparticle applications in biomedicine promises to revolutionize healthcare by improving patient outcomes through innovative diagnostic and therapeutic solutions.

Keywords: Nanoparticle , Biosensors, MRI , Quantum Dots

ABSTRACT CODE: DBT/RCP/2026/057

Advancements in Gene Delivery Systems: Enhancing Precision and Efficacy in Biotechnology and Medicine

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Abstract

Gene delivery systems play a crucial role in biotechnology and medicine by facilitating the introduction of genetic material into target cells for therapeutic and research purposes. This poster provides an overview of recent advancements in gene delivery technologies, focusing on both viral and non-viral methods. Viral vectors, including lentiviruses and adenoviruses, are known for their high efficiency in transducing cells, while non-viral approaches, such as liposomes, nanoparticles, and electroporation, offer advantages in terms of safety and ease of use. We discuss the mechanisms of action for these delivery systems, evaluating their efficiency, specificity, and potential applications in gene therapy, vaccine development, and genetic engineering. The poster also highlights the challenges faced in gene delivery, including immunogenicity, stability of the genetic material, and precision in targeting specific cell types. Recent innovations aimed at addressing these challenges are explored, such as the development of targeted nanoparticles and improved viral vectors with reduced immunogenic profiles. These advancements promise to enhance the safety and efficacy of gene delivery systems. Overall, this work emphasizes the critical importance of gene delivery technologies in advancing personalized medicine and biotechnological applications. By overcoming existing barriers, these innovations pave the way for future research and clinical developments, ultimately contributing to more effective therapeutic strategies for a variety of diseases.

Keywords: Gene delivery, Viral vectors, Non- Viral Vector

ABSTRACT CODE: DBT/RCP/2026/058

Nanotechnology-Based Gene Delivery Systems: Recent Advances and Future Prospects in Precision Gene Therapy

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Abstract

Gene therapy has emerged as a transformative approach for the treatment of genetic disorders, cancer, and chronic diseases; however, its clinical translation is often limited by inefficient delivery, off-target effects, and safety concerns. Nanotechnology offers innovative solutions to overcome these challenges by enabling precise, stable, and targeted gene delivery. Recent advances in nano-gene delivery systems, including lipid nanoparticles, polymeric nanoparticles, dendrimers, and inorganic nanocarriers, have significantly improved the protection, cellular uptake, and controlled release of genetic materials such as DNA, mRNA, and siRNA. This abstract highlight the recent developments in nanoparticle-mediated gene delivery strategies, emphasizing their role in enhancing transfection efficiency while minimizing cytotoxicity and immunogenicity. Surface functionalization of nanocarriers with ligands, antibodies, or peptides has enabled targeted delivery to specific tissues and cells, thereby increasing therapeutic efficacy. Furthermore, stimuli-responsive and multifunctional nanocarriers have shown promising results in overcoming biological barriers and enabling controlled gene expression. Despite these advances, challenges related to large-scale production, long-term safety, and regulatory approval remain critical for clinical translation. Future prospects focus on the integration of artificial intelligence, personalized nanomedicine, and CRISPR-based gene editing systems to achieve precise and patient-specific gene therapy. Overall, nanotechnology-based gene delivery systems represent a powerful and evolving platform that bridges the gap Between gene discovery and effective therapeutic delivery, paving the way for next-generation precision medicine.

Keywords: Gene therapy, Nanotechnology, CRISPR

ABSTRACT CODE: DBT/RCP/2026/059

Advances in Gene Delivery Systems

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Abstract

Gene transfer into cells, both in vitro and in vivo, is essential for investigating gene function and for applications in gene therapy. A wide range of strategies has been developed, including viral vectors, nonviral vectors, and physical delivery methods. Viral vector–mediated gene transfer relies on replication-deficient viruses such as retrovirus, adenovirus, adeno-associated virus, and herpes simplex virus, and is distinguished by its high delivery efficiency. Nonviral vectors-such as cationic liposomes, cationic polymers, synthetic peptides, and naturally derived compounds-have shown strong gene delivery performance in cultured cells but remain comparatively inefficient in vivo. Physical approaches, including the use of mechanical force, electrical pulses, or hydrodynamic pressure, temporarily disrupt cell membranes to facilitate DNA uptake. These techniques are simpler than viral or nonviral systems and are particularly effective for localized gene delivery. Over the past decade, substantial progress has been made toward developing gene delivery methods that are safe, efficient, and target specific. This review aims to (i) explain the design principles underlying viral, nonviral, and physical gene delivery systems; (ii) summarize recent advances in gene transfer technologies; (iii) evaluate the advantages and limitations of commonly used delivery methods; and (iv) discuss future directions in the field.

Keywords: Gene transfer, Viral vector , DNA uptake

ABSTRACT CODE: DBT/RCP/2026/060

Synthesis of Bis-benzylidene-o-phenylenediamine and Its Solid Lipid Nanoparticle (SLN) Formulation via Double Emulsion Method for Enhanced Antimicrobial Activity

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Abstract

Schiff bases are well recognized for their broad spectrum of biological activities, particularly antimicrobial potential. In this study, Bis-benzylidene-o-phenylenediamine (BBOPD), a di-Schiff base, was synthesized by the condensation of benzaldehyde (BA) and o-phenylenediamine (OPD) in ethanolic medium under reflux. The synthesized compound was obtained with a yield of 82% and characterized by melting point determination and spectroscopic analysis, confirming successful imine formation. To improve the solubility and antimicrobial performance of the synthesized Schiff base, solid lipid nanoparticles (SLNs) were formulated using the double emulsion water–oil–water (W/O/W) solvent evaporation method. The optimized SLN formulation exhibited a mean particle size of 165 ± 8 nm and a zeta potential of –28.4 ± 2.1 mV, indicating good colloidal stability. In-vitro antimicrobial activity was evaluated against Staphylococcus aureus (S. aureus), Escherichia coli (E. coli), and Pseudomonas aeruginosa (P. aeruginosa) using the agar well diffusion method (AWDM). The SLN-loaded Schiff base showed significantly enhanced antimicrobial activity with zones of inhibition (ZOI) of 21 ± 1.2 mm, 19 ± 1.0 mm, and 17 ± 0.9 mm, respectively, compared to the free Schiff base (13–15 mm). The enhanced antimicrobial efficacy of the SLN formulation may be attributed to improved cellular uptake, sustained drug release, and increased interaction with microbial membranes. The findings of this study demonstrate that incorporation of BBOPD into SLNs is a promising strategy for improving its antimicrobial effectiveness and supports its further development as a nanoparticulate antimicrobial delivery system.

Keywords: Schiff base, Bis-benzylidene-o-phenylenediamine (BBOPD), Solid lipid nanoparticles (SLNs), Double emulsion method, antimicrobial activity

ABSTRACT CODE: DBT/RCP/2026/061

Nanogene Therapy for the Management of Chronic Neuropathic Pain

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Abstract

Chronic neuropathic pain arises from injury or dysfunction of the somatosensory nervous system and is often resistant to conventional pharmacological treatments. Existing therapies, including antidepressants, anticonvulsants, and opioids, provide limited relief and are frequently associated with adverse effects and long-term dependence. Nanogene therapy has emerged as a promising and innovative approach for the targeted management of chronic neuropathic pain by combining gene therapy with nanotechnology-based delivery systems. Nanocarriers such as lipid nanoparticles, polymeric nanoparticles, dendrimers, and viral-mimicking nanosystems enable safe and efficient delivery of therapeutic genes, siRNA, or CRISPR-based constructs to specific pain pathways. These systems can modulate the expression of key pain-related targets, including ion channels (Nav1.7, Nav1.8), inflammatory mediators, neurotrophic factors, and neurotransmitter receptors, thereby addressing the underlying molecular mechanisms of neuropathic pain rather than merely suppressing symptoms. Additionally, nanogene therapy offers advantages such as enhanced stability of genetic material, targeted tissue distribution, reduced systemic toxicity, and sustained therapeutic effects. Recent preclinical studies demonstrate significant analgesic outcomes using nanogene-based strategies, highlighting their potential to overcome limitations of conventional pain management. Although clinical translation faces challenges related to safety, scalability, and regulatory approval, nanogene therapy represents a novel, disease-modifying approach with substantial potential for long-term relief in patients suffering from chronic neuropathic pain.

Keywords: Nanogene therapy; Neuropathic pain; Targeted gene delivery; Nanoparticles; Pain modulation.

ABSTRACT CODE: DBT/RCP/2026/062

Integrating Herbal Medicine and Nanotechnology in Gene Therapy for Depression

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Abstract

Depression is a prevalent neuropsychiatric disorder with significant impact on global health. Although conventional antidepressant drugs are effective, their use is often limited by delayed onset of action and adverse side effects. Herbal medicines such as *Hypericum perforatum*, Withania*somnifera*, and *Camellia sinensis* have shown promising antidepressant effects through modulation of neurotransmitters, reduction of neuroinflammation, and enhancement of neuroprotection. However, poor bioavailability and limited brain targeting restrict their clinical effectiveness.Recent advances in nanotechnology have provided innovative strategies to improve drug and gene delivery to the central nervous system. Nanocarrier-based systems enhance the stability, bioavailability, and blood–brain barrier penetration of herbal bioactives. In addition, nanotechnology-based gene therapy offers efficient non-viral delivery of therapeutic genes, miRNAs, and neurotrophic factors, enabling targeted modulation of molecular pathways involved in depression. The integration of herbal therapeutics with nanotechnology and gene therapy represents a promising future approach for safer, targeted, and personalized treatment of depression.

Keywords: Depression, Medicinal herbs, Nanotechnology, Gene therapy, Antidepressant activity, Neuroprotection

ABSTRACT CODE: DBT/RCP/2026/063

Recent Advances and Future Prospects of Nanotechnology-Enabled Gene Therapy in Depression: From Genetic Discovery to Targeted Brain Delivery

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Abstract

Depression is a multifactorial neuropsychiatric disorder characterized by persistent low mood, anhedonia, cognitive impairment, sleep disturbances, and altered stress responsiveness, significantly affecting quality of life. Epidemiological studies indicate that depression is one of the leading causes of global disease burden, affecting more than 280 million people worldwide, with higher prevalence observed among women and individuals exposed to chronic stress and adverse life events. The etiology of depression involves a complex interplay of genetic susceptibility, neurobiological dysfunction, and environmental factors. At the molecular level, the discovery phase of depression research has identified several disease-causing and susceptibility genes, including the serotonin transporter gene (SLC6A4), brain-derived neurotrophic factor (BDNF), and monoamine oxidase-A (MAO-A), which are critically involved in neurotransmission, neuroplasticity, and stress response pathways. Gene therapy offers a promising strategy to correct these genetic abnormalities through gene replacement, gene silencing, or gene-editing approaches such as CRISPR/Cas9, with the aim of restoring normal gene expression and neuronal function. However, the clinical translation of gene therapy is limited by challenges related to gene instability, lack of targeting specificity, and restricted penetration of the blood–brain barrier (BBB). Nanotechnology has emerged as an effective solution to overcome these limitations by enabling safe, targeted, and efficient delivery of therapeutic genes to the central nervous system. Delivery strategies such as intranasal administration and ligand-targeted nanoparticle systems further improve brain-specific uptake while reducing systemic side effects. Recent advances include the development of non-viral nano-gene vectors, CRISPR-loaded nanoparticles, and brain-targeted nanotherapeutics. Future prospects of nanotechnology-based gene therapy in depression include personalized and precision-based treatments, smart and stimuli-responsive nanocarriers, and improved translation from preclinical models to clinical practice. Overall, nanotechnology bridges the gap between gene discovery and therapeutic delivery, offering a transformative and targeted approach for the effective treatment of depression.

Keywords:- Depression; Gene Therapy; Nanotechnology; Genetic Susceptibility; Blood–Brain Barrier; Nanocarriers; Targeted Brain Delivery; CRISPR/Cas9.

ABSTRACT CODE: DBT/RCP/2026/064

Nanoinformatics-Based Metal–Quinazoline Nanoarchitectures for Gene Expression Modulation by Epigenetic Targeting and Radiotherapy-Synergized Anticancer Activity

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Abstract

This study presents an integrated computational investigation of quinazoline derivatives as histone deacetylase (HDAC) inhibitors employing 2D and 3D QSAR modeling, Pharmacophore modeling, Toxicity study, virtual combinatorial library used for design metal conjugate quinazoline derivative from compound 02 which gives the best predicted biological activity 7.861 nM on the basis of 2D & 3D qsar model, density functional theory (DFT), and molecular docking. The robust 2D QSAR model demonstrated high predictive accuracy with r2=0.9543, q2=0.8314, and external predictivity predr2=0.7635 revealing descriptors such as T2C4, XlogP, and SsOHcount influencing HDAC inhibitory activity. Two 3D QSAR models developed by the k-nearest neighbor method yielded comparable internal predictivity (q2=0.7374) with Model 1 showing slightly better external predictivity (predr2=0.6031) and Model 2 providing greater reliability with lower prediction error (predr2=0.5985 predrse2=0.9284). DFT calculations revealed significantly reduced HOMO-LUMO gaps for metal-conjugated ligands compared to the reference SAHA, indicating enhanced electron delocalization and reactivity; the Cu-conjugate showed a gap of –0.0507eV versus –0.1432eV for SAHA. Molecular docking against HDAC (PDB ID 1C3S) confirmed superior binding affinities for metal-conjugated nanoparticles, with Au-conjugates exhibiting the highest docking score of –12.82 kcal/mol compared to –9.86kcal/mol for SAHA. By integrating multiple analytical approaches, this work reveals the structural and electronic factors essential for effective HDAC inhibition and identified metal–ligand conjugates as promising leads for anticancer therapy.

Keywords: Quinazoline Derivatives, HDAC Inhibitor,Radiosensitization, Pharmacophore, Molecular Docking.

ABSTRACT CODE: DBT/RCP/2026/065

Nano-Gene Delivery Systems

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Abstract

Nano-gene delivery systems have revolutionized the field of gene therapy by providing a platform for targeted and efficient delivery of genes. Nano-gene delivery systems can tackle several challenges plating traditional gene therapy. Nano-gene delivery systems can improve targeting using targeting ligands like antibodies or peptides that bind to specific cell receptors. Nanoparticles like liposomes or polymeric nanoparticles can facilitate uptake by fusing with cell membranes or being engulfed by cells. Nanoparticles can shield genes from these enzymes. Immune responses can also be reduced by modifying nanoparticles with stealth polymers like PEG, helping them evade immune detection.Nano-gene delivery systems faces challenges in safety, efficacy, scalability, regulatory issues, delivery barriers, toxicity as nanoparticles can accumulate in non-target tissues. Nano-gene delivery systems can overcome challenges associated with traditional gene therapy, highlighting benefits and methods to improve gene delivery efficiency and efficacy. Methods used in nano-gene delivery system include Electroporation, Microinjection, Sonoporation, Magnetofection, Immune-evasive nanoparticles. By surface modification, stimuli-responsive systems, and optimizing nanoparticle design (size, shape, composition). Nano-gene delivery system provide better targeted delivery, increased efficacy and therapeutic genes are shielded from degradation. Nano-gene delivery systems help deliver genes more effectively to target cells or tissues, increasing the therapeutic effect of the genes, provide better targeted delivery, reducing side effects, and provide shielding to therapeutic genes from degradation by nucleases (enzymes that break down nucleic acids), physical barriers, immune recognition and clearance. It is significant in gene therapy, treatment of genetic disorders and cancer treatment.

Keyword: Nano-gene delivery system, nanoparticles, cellular uptake, degradation by nucleases, gene therapy, genetic disorders, cancer.

ABSTRACT CODE: DBT/RCP/2026/066

Nanotechnology In Gene Therapy: Recent Advances and Future Prospects Application in Neurological Disorder

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Abstract

Nanotechnology has emerged as a promising strategy to enhance the effectiveness of gene therapy in the treatment of neurological disorders. Neurological diseases such as Alzheimer's disease, Parkinson's disease, Huntington's disease and brain tumors remain difficult to manage due to limited drug and gene transport across the blood–brain barrier. Gene therapy offers the potential to modify disease progression; however, its clinical application is restricted by instability of genetic material, poor cellular uptake and lack of targeted delivery.Nanotechnology-based delivery systems overcome these limitations by protecting therapeutic genes and facilitating their transport into the central nervous system. Engineered nanocarriers enable efficient blood–brain barrier penetration through receptor-mediated transport and endocytic mechanisms, while surface modification improves neuronal targeting and intracellular gene release. These systems enhance bioavailability, reduce systemic toxicity and improve therapeutic efficiency.Recent advances demonstrate that nano-enabled gene delivery systems hold significant potential for the treatment of neurodegenerative and genetic neurological disorders. Future developments focus on improving targeting precision, safety and clinical translation. Overall, nanotechnology-assisted gene therapy represents a promising approach for advancing neurological disorder management and achieving improved therapeutic outcomes.

Keywords:potential, genetic, modification, therapeutic

ABSTRACT CODE: DBT/RCP/2026/067

Recent Advances and Future Prospects of Nanotechnology in Gene Therapy for Gout from Discovery to Delivery

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Abstract

Among inflammatory arthritic conditions, Gout Arthritis (GA) ranks as a prevalent disorder, impacting between 0.02% and 6.80% of adults globally. Gout is a clinical manifestation of hyperuricemia, with Serum Uric Acid (SUA) greater than 6.8 mg/dL. This condition results when too much UA is produced, or its elimination is reduced; monosodium urate (MSU) deposits in joints and soft tissues to cause acute and chronic inflammation. The significant factors contributing to the development of gout include genetic predisposition, lifestyle choices, metabolic factors, and comorbid conditions. Genetic factors are essential, as specific genetic variants can affect the body's ability to metabolize. However recent genome-wide association studies (GWAS) in gout have revealed new pathogenic pathways, for example genes involved in NLRP3 inflammasome activation and activity. The patient's severe hyperuricemia and gout are likely to be due to genetic mutations. The current state-of-the-art advancements in gene therapy, focusing on the utilization of nanodelivery systems for precise and efficient gene transfer. Notably, polymersomes, synthetic vesicles with heightened stability and cargo retention, exhibit potential for delivering therapeutic agents to the cytosol with precision. Targeting strategies play a pivotal role in ensuring the precise delivery of therapeutic genes to desired sites within the body. In conclusion, nanodelivery systems represent a burgeoning frontier in gene therapy, offering unparalleled precision and efficacy in delivering therapeutic genes. Continued research endeavors aimed at refining nanocarrier design and targeting strategies hold immense promise for the future of precision medicine, paving the way for transformative advancements in the treatment of diverse diseases and conditions.

Keywords: Nano-Gene Revolution, non-viral systems, gout arthritis (GA), hyperuricemia, serum

ABSTRACT CODE: DBT/RCP/2026/068

Nanotechnology-Based Strategies for the Treatment of Parkinson's Disease: Recent Advances and Therapeutic Insights

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Abstract

Parkinson's disease (PD) is a chronic and progressive neurodegenerative condition primarily associated with the selective loss of dopaminergic neurons within the substantia nigra, leading to characteristic motor impairments along with diverse non-motor symptoms. Although existing pharmacological treatments remain central to disease management, their therapeutic effectiveness is often compromised by limited brain penetration, systemic adverse effects, and the inability to halt disease progression. In this context, nanotechnology-based therapeutic strategies have gained significant attention as innovative tools for improving treatment outcomes in Parkinson's disease. Recent advances in nanomedicine have enabled the development of diverse nanocarrier systems, including polymer-based nanoparticles, liposomes, solid lipid nanoparticles, dendrimers, and nanoemulsions, designed to facilitate targeted drug delivery to the central nervous system. These nanoscale delivery platforms have demonstrated enhanced transport across the blood–brain barrier, prolonged drug circulation, and controlled release profiles. Experimental and preclinical investigations indicate that nano-enabled delivery of neuroprotective compounds, antioxidants, and genetic materials can reduce oxidative stress, attenuate neuroinflammatory responses, inhibit pathological α-synuclein aggregation, and promote dopaminergic neuronal survival. Furthermore, nanotechnology-assisted gene and RNA-based therapies show promise in regulating disease-associated molecular pathways, offering potential disease-modifying effects. Overall, accumulating evidence from contemporary research underscores the potential of nanotechnology to transform therapeutic strategies for Parkinson's disease. Nevertheless, comprehensive clinical evaluation and long-term safety studies are required to support regulatory approval and clinical translation of these advanced nanotherapeutic approaches.

Keywords: Parkinson's disease, Nanomedicine, Neurodegeneration, Blood–brain barrier, Targeted drug delivery

ABSTRACT CODE: DBT/RCP/2026/069

Nano-Enabled Gene Therapy: Innovations, Challenges & Driven Strategies for Safe & Targeted Gene Delivery

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Abstract

Gene therapy offers a powerful approach for treating inherited disorders, cancer & infectious diseases by correcting or regulating faulty genes. Despite significant progress in gene discovery, clinical translation has been limited by challenges such as poor stability of genetic material, low cellular uptake, off-target effects & immune reactions. By addressing these obstacles through innovative material design, smart targeting strategies & regulatory advancements, nanotechnology is poised to transform gene therapy by enabling efficient, targeted & safe, precise & clinically viable therapeutic approach. The aim of this study is to review recent advances in nanotechnology-based gene delivery systems & to explore their future prospects in bridging the gap between gene discovery & clinical delivery. Gene therapy has emerged as a promising strategy for the treatment of genetic disorders, cancer & chronic diseases by enabling precise modification or regulation of gene expression. Nanotechnology has revolutionized gene therapy by providing innovative nanoscale carriers that enhance gene stability, targeting efficiency & cellular uptake while minimizing toxicity & immune responses. A comprehensive review of recent scientific literature was conducted, focusing on nano-enabled gene delivery platforms such as liposomes, polymeric nanoparticles, dendrimers, lipid nanoparticles & inorganic nanocarriers that facilitate controlled & targeted gene delivery. These nanocarriers have significantly improved the delivery of DNA, RNA, siRNA, rnRNA& CRISPR-based gene-editing systems. Furthermore, surface functionalization & stimulus-responsive nanomaterials have enabled site-specific & sustained gene release. Nanotechnology has significantly advanced gene therapy by overcoming major delivery barriers. Future prospects of nanotechnology in gene therapy focus on personalized medicine, multifunctional smart nanocarriers, improved biocompatibility & clinical translation, making gene therapy safer & more effective.

Keywords: Nanotechnology, Gene therapy, Nanocarriers, Targeted Delivery, CRISPR, mRNA Therapeutics.

ABSTRACT CODE: DBT/RCP/2026/070

Nano-Gene Delivery Strategies in the Management of Type 1 and Type 2 Diabetes Mellitus: A New Era of Gene Therapy

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Abstract

Gene therapy has emerged as a promising frontier in the management of diabetes, offering innovative approaches to address both type 1 and type 2 diabetes. This narrative review examines the advancements in gene therapy applications, focusing on both animal and human studies, and includes a total of 11 studies in adherence to PRISMA guidelines. These studies utilize various viral vectors, such as adeno-associated virus (AAV) and lentivirus, to deliver genes that regulate insulin production and enhance angiogenesis. synthesize recent advancements in gene therapy for both type 1 and type 2 diabetes and its complications, and to explore the evolving role of pharmacists in this emerging field. Type 1 and type 2 diabetes mellitus is a serious and lifelong condition commonly characterised by abnormally elevated blood glucose levels due to a failure in insulin production or a decrease in insulin sensitivity and function. Over the years, prevalence of diabetes has increased globally and it is classified as one of the leading causes of high mortality and morbidity rate. Furthermore, diabetes confers a huge economic burden due to its management costs as well as its complications are skyrocketing. The conventional medications in diabetes treatment focusing on insulin secretion and insulin sensitisation cause unwanted side effects to patients and lead to incompliance as well as treatment failure. Besides insulin and oral hypoglycaemic agents, other treatments such as gene therapy and induced β-cells regeneration have not been widely introduced to manage diabetes.

Keywords: type 1&2diabetes, gene therapy, conventional medications

ABSTRACT CODE: DBT/RCP/2026/071

Nano Gene Delivery System

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Abstract

Gene delivery is a technique used to introduce genetic material (DNA or RNA) into cells to treat or prevent diseases. Traditional gene delivery methods face challenges like low efficiency, toxicity, and immune reactions. Nano technology offers a promising solution through nano gene delivery systems.Nano gene delivery uses nanoparticles as carriers to transport genes safely into target cells. These nanoparticles are usually in the size range of 1–100 nm, which allows them to easily cross biological barriers and enter cells.Common nanocarriers include lipid nanoparticles, polymeric nanoparticles, dendrimers, gold nanoparticles, and carbon nanotubes. Among these, lipid. Nano particles protect genetic material from degradation in the bloodstream. They bind to the cell surface, enter the cell through endocytosis, and release the gene inside the cytoplasm or nucleus, where it can perform its function. Nano gene delivery systems offer high stability, targeted delivery, reduced toxicity, and improved gene expression. They can be modified to target specific tissues or cells, increasing treatment effectiveness. These systems are used in cancer therapy, genetic disorders, vaccines, and regenerative medicine. They also play an important role in gene therapy and personalized medicine.Development of highly target and smart nano particle that respond to pH temperature or enzyme for controlled gene release,scalability and reproducibility,crucial trial.Nano gene delivery systems represent a major advancement in biomedical science. With ongoing research, they hold great potential for safe and effective treatment of various diseases in the future.

Keywords : stability,nucleus,delivery, genetic material.

ABSTRACT CODE: DBT/RCP/2026/072

Nanotechnology-Based Gene Delivery Systems for Hypertension Management: Recent Advances and Future Perspectives

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Abstract

Hypertension is a major global public health challenge and a leading risk factor for cardiovascular diseases, stroke, and renal disorders. Although various antihypertensive drugs are available, effective long-term management remains challenging due to lifelong therapy requirements, adverse drug reactions, and poor patient compliance. In this context, gene therapy has emerged as a promising alternative approach by targeting the genetic and molecular pathways involved in blood pressure regulation. However, the successful clinical application of gene therapy is hindered by limitations such as instability of genetic material, inefficient delivery, immune responses, and off-target effects. Nanotechnology has revolutionized gene therapy by enabling the development of advanced and efficient gene delivery systems. Nanotechnology-based gene delivery platforms utilize a variety of nanocarriers, including lipid nanoparticles, polymeric nanoparticles, dendrimers, nanogels, and inorganic nanoparticles, for the delivery of therapeutic genes, siRNA, and mRNA. These nanocarriers protect nucleic acids from enzymatic degradation, enhance cellular uptake, allow controlled and sustained release, and facilitate targeted delivery to cardiovascular and vascular endothelial tissues. As a result, therapeutic efficacy is improved while minimizing systemic toxicity and side effects. Recent studies have demonstrated successful nanoparticle-mediated delivery of genes and siRNA targeting key components of the renin–angiotensin–aldosterone system, such as angiotensin-converting enzyme and angiotensin II type-1 receptor, leading to significant reductions in blood pressure in experimental models. Furthermore, nanocarrier-assisted enhancement of endothelial nitric oxide synthase gene expression has shown improvement in vascular function and endothelial homeostasis. Despite these promising advancements, challenges related to long-term biosafety, nanotoxicity, large-scale manufacturing, and regulatory approval remain major obstacles for clinical translation.These abstract highlights recent advances in nanotechnology-based gene delivery systems for hypertension management and discusses their future scope in precision medicine. The integration of nanotechnology with gene therapy represents a novel and promising strategy for the development of safer, more effective, and targeted antihypertensive therapies.

Keywords: Nanotechnology; Gene Delivery Systems; Hypertension; Nanocarriers; Gene Therapy; Precision Medicine.

ABSTRACT CODE: DBT/RCP/2026/073

Recent Advances of Nano Electroporation Technology in Gene Therapy

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Abstract

Gene therapy has emerged as a highly promising therapeutic strategy in precision medicine by enabling targeted modification of disease-associated genes. A critical determinant of its success is the efficient and cell-specific delivery of therapeutic genetic material. Electroporation is a physical gene delivery technique that employs brief electric pulses to transiently permeabilize the cell membrane, thereby facilitating the entry of nucleic acids into cells. Unlike viral vectors, electroporation avoids risks related to off-target effects and immunogenicity, and compared with other physical delivery methods, it offers advantages such as high throughput and enhanced cargo transport. Recent advances in micro- and nanotechnology have led to the development of micro/nanostructure-assisted electroporation platforms, which markedly improve cell viability, transfection efficiency, and dosage precision. These improvements have expanded the practical applicability of electroporation, particularly for in vivo gene delivery. Consequently, micro/nano-electroporation has become a powerful and adaptable tool for gene therapy. In this poster we first introduce the advancements and prospects of micro/nano-electroporation technology in the field of gene therapy. To comprehensively showcase the latest developments of micro/nano-electroporation technology in gene therapy, we focus on discussing micro/nano-electroporation devices and current applications at both in vitro and in vivo levels. Additionally, we outline the ongoing clinical studies of gene electro transfer (GET), electroporation-based gene delivery in disease evolution of electroporation technique with a brief explanation of the perforation mechanism, and then provide an overview of the recent revealing the tremendous potential of treatment and healthcare. Lastly, the challenges and future directions in this field are discussed.

Keywords: Nanotechnology, gene therapy, nano-electroporation.

ABSTRACT CODE: DBT/RCP/2026/074

Implementation of Quality by Design (QbD) Principles for the Development and Validation of a Bioanalytical RP-HPLC Method for Simultaneous Estimation of Empagliflozin and Metformin HCl in Human Plasma

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Abstract

A new formulation containing Empagliflozin (EPGZ) and Metformin HCL (METF) for the treatment of type 2 Diabetes was recently approved. The present work aims to explain the steps of the quality by design (QbD) concept to optimize a method for the validation of EPGZ. and METF in a combined dosage form by the RP-HPLC method in human plasma for identification of variables affecting the method performance. A Central Composite Design (CCD) was used to screen the variables and optimize the chromatographic conditions. ANOVA made for a 2k Factorial outline shows that arch is significant for all responses (K_1, Rs $_{(1, 2)}$, S $_{(1, 2)}$, and tR_2), and the p-value was under 0.05. The effect of chromatographic parameters was shown by RSM, FDS, and perturbation plots, and the final chromatographic condition was chosen from 100 solutions suggested by the desirability function. The Chromatographic separation was attained isocratically on a C-18 column by using Methanol, ACN, 0.01mM KH_2PO_4 at pH 3± 0.5 (41:10:59 % v/v) and a flow rate of 1.2 mL/min. The wavelength of the detector was set to 233 nm. Furthermore, for EPGZ and METF, RP-HPLC procedures demonstrated good linearity in the ranges of 5-25 EPGZ µg/mL and 20-60 µg /mL, respectively. The assay was found to be 98.8% and 101.01% for EMPG and METF, respectively. The proposed methods were simple, accurate, precise, and rapid. Therefore, the developed method can be used on a regular basis to analyze the fixed dose combination of Empagliflozin and Metformin HCl in pharmaceutical formulations in human plasma.

Keywords: QbD, RP-HPLC, p-value, CCD, Human plasma.

ABSTRACT CODE: DBT/RCP/2026/075

Nano-Herbal Approach for Rheumatoid Arthritis: Anti-Arthritic Efficacy of Pueraria tuberosa Loaded Silver Nanoparticles

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Abstract

Arthritis is a chronic inflammatory disease that causes joint pain, swelling, and stiffness. Conventional treatments such as NSAIDs, corticosteroids, and analgesics provide symptomatic relief but may lead to serious side effects with long-term use. Conventional therapies provide symptomatic relief but have long-term side effects. Herbal drugs such as turmeric, Boswellia, ginger, Ashwagandha, and Guggul show promising anti-inflammatory effects and may offer a safer, long-term approach for arthritis management. Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disease. This study evaluated the anti-arthritic efficacy ofPueraria tuberosa (PT) aqueous extractandPT-loaded silver nanoparticles (PTAgNPs)inFreund's Complete Adjuvant-induced arthritis in rats. Treatment shows significantly reduced paw swelling, arthritis score, inflammatory cytokines (TNF-α, IL-6) and oxidative stress, while improving biochemical, hematological, radiological and histopathological parameters. PTAgNPs showed superior anti-arthritic activity compared to PT extract and indomethacin, highlighting their potential as a novel nano-herbal therapy for rheumatoid arthritis. Herbal nanotechnology provides an advanced, safe and sustainable platform for effective delivery of herbal drugs in arthritis treatment, offering enhanced bioavailability, targeted action and reduced side effects, with strong potential for future clinical application.

Keywords:corticosteroids,biochemical,inflammatory, arthritis.

ABSTRACT CODE: DBT/RCP/2026/076

Milk-derived bioactive peptide targeting biofilm determinants of *Klebsiellapneumoniae*:An *in-silico* study

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Abstract

Klebsiella pneumoniae infections represent a major global health crisis, contributing to elevated morbidity, mortality, and healthcare costs, especially via biofilm related infections, as these structured microbial communities embedded in an extracellular polymeric matrix confer resistance to antibiotics and host immune defenses, leading to persistent chronic conditions. Biofilm formation involves quorum sensing pathways, such as LuxS-mediated autoinducer-2 (AI-2) signaling, and essential metabolic processes such as fatty acid biosynthesis via FabG (β-ketoacyl-ACP reductase), which promotes bacterial adhesion, matrix production, and survival. To address these, casein acid hydrolysate, a bioactive peptide derived from milk protein hydrolysis, was evaluated as a potential dual inhibitor through *in-silico* molecular docking study against LuxS and FabG targets. Using standard protein preparation and docking protocols, the binding affinities were found to be -6.143 kcal/mol for LuxS and -5.031 kcal/mol for FabG, indicating stable interactions driven by hydrogen bonds and salt bridges that could disrupt AI-2 synthesis and fatty acid biosynthesis critical for biofilm integrity. It can be delivered through engineered nanomaterial coatings or hydrogel matrices. By combining peptide biochemistry, molecular modelling, and targeted delivery strategies, this multidisciplinary framework positions casein acid hydrolysate as a promising candidate for next-generation antibiofilm systems.

Keywords: Molecular docking, infection, biomaterial, quorum sensing, biofilm inhibition, antibiofilm.

ABSTRACT CODE: DBT/RCP/2026/077

Development And Characterization of Solid Lipid Nanoparticle of Diclofenac sodium in the Treatment of Ocular Pain After Photorefractive Keratectomy

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Abstract

The aim of this study was to prepare and evaluate incorporating solid lipid nanoparticles (SLNs) of diclofenac sodium for systemic delivery of the active after ocular application. Diclofenac sodium loaded solid lipid nanoparticles (SLNs) have been successfully developed using a microemulsion technique. Three different formulations were prepared It was found that variation in the amount of ingredients had profound effects on the diclofenac sodium loading capacity, the mean particle size, and size distribution of charge, morphology, and drug- lipid compatibility. At optimized process conditions, diclofenac sodium loaded SLNs showed spherical particles with a mean particle size of 450 nm and 60% diclofenac sodium incorporation efficacy was achieved. The SLNs were evaluated for in vitro drug release, *ex-vivo* permeation studies. The SLN sustained the drug release for 6 h in vitro. The results suggest enhancement in ocular delivery of diclofenac sodium with incorporating SLNs.

Key words: - Solid lipid nanoparticles, diclofenac sodium, Ocular delivery, Analgesic activity.

ABSTRACT CODE: DBT/RCP/2026/078

Advancement of nanoparticle in nasal drug delivery system

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Abstract

The nasal drug delivery system has gained significant attention as an advanced route of administration due to its rapid drug absorption, non-invasive nature, and ability to bypass first-pass hepatic metabolism. Despite these advantages, conventional nasal formulations often suffer from limitations such as low bioavailability, mucociliary clearance, and enzymatic degradation. Recent advancements in nanoparticle-based drug delivery systems have successfully addressed these challenges. Nanoparticles such as polymeric nanoparticles, lipid nanoparticles, solid lipid nanoparticles, nano emulsions, and mucoadhesive systems enhance drug stability, prolong nasal residence time, and improve permeation across the nasal mucosa. Moreover, surface-modified nanoparticles enable targeted drug delivery to the brain through the olfactory and trigeminal pathways, offering promising therapeutic potential for central nervous system disorders. These advancements also support the nasal delivery of peptides, proteins, vaccines, and gene-based therapeutics. Overall, nanoparticle-mediated nasal drug delivery systems represent a significant advancement in pharmaceutical sciences, providing improved therapeutic efficacy, enhanced patient compliance, and expanded possibilities for targeted drug delivery.

Keyword : Nanoparticles; Nasal drug delivery system; Mucoadhesive delivery; Brain targeting; Olfactory pathway; Controlled drug release; Advanced drug delivery system

ABSTRACT CODE: DBT/RCP/2026/079

Formulation and Evaluation of Carbon Dot ketamine Nanoparticle

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Abstract

Ketamine loaded nanoparticles were synthesized by hydrothermal method with citric acid as the carbon source and urea as the nitrogen dopant here. Preformulation studies confirmed the purity, identity, and of ketamine, including solubility, λmax, and melting point, which supported its incorporation into nanoparticles. Four formulations (F1–F4) were prepared by varying the concentrations of citric acid and urea while keeping the drug content constant, allowing optimization of particle characteristics, fluorescence properties, and drug loading efficiency. Characterization studies demonstrated that nanoparticles were spherical, uniformly distributed, and within the nanoscale range (7–13 nm). Zeta potential indicated negative surface charges, providing moderate electrostatic stabilization and minimizing aggregation. Fluorescence studies revealed excitation-dependent blue emission, with F4 exhibiting the highest fluorescence intensity and optimal stability, making it suitable for bioimaging and sensing applications. Drug loading efficiency analysis confirmed with F4 achieving the maximum DLE of 91%, indicating superior drug entrapment and surface functionalization. Stability studies over 30 days showed that refrigerated storage (4 °C) preserved particle size, zeta potential, drug loading, and physical appearance, whereas room temperature storage led to partial aggregation and moderate drug loss. F4 was identified as the most, exhibiting optimal particle size, morphology, fluorescence, drug loading, and stability. This demonstrated that hydrothermal synthesis of ketamine-loaded carbon dots is an effective strategy to develop stable, fluorescent nanoparticles with high drug loading capacity. F4 holds significant potential for targeted drug delivery, bioimaging, and sensing, highlighting the importance of precursor ratio optimization and controlled synthesis conditions in achieving nanoparticles with desirable properties.

Keywords: Ketamine, Carbon dots, Hydrothermal synthesis, Nanoparticles, Drug loading efficiency, Fluorescence

ABSTRACT CODE: DBT/RCP/2026/080

Development and Characterization of Polylactic acid/Polysuccinimide nanofibers: Future perspectives for Localized Gene Therapy

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Abstract

Diabetic foot ulcers are characterized by delayed wound healing due to the lack of essential growth factors and high oxidative stress. Conventional dressings are ineffective, only protecting the wound; gene therapy provides an effective approach to healing by delivery of DNA/RNA and growth factors that promote angiogenesis. Research indicates that nanofibers (NFs), when combined with a therapeutic gene or growth factor, are an effective wound-healing material, since they mimic the extracellular matrix. This study presents the development of nanofibrous meshes utilizing biocompatible and biodegradable polylactic acid (PLA) and polysuccinimide (PSI). The meshes underwent thorough physicochemical and mechanical studies, such as FTIR, SEM, contact angle, and TGA. The characterization results showed that the scaffold has superior mechanical properties (tensile strength: 1.62 MPa) and wettability (WCA: 115.06°). TGA thermograms revealed high thermal stability with no significant degradation below 258°C, confirming that the NFs are stable at physiological conditions and are capable of protecting and carrying genetic cargo. Morphological study of the NFs using SEM exhibits a porous structure for cells to migrate into the wound and for the genes to be released at a controlled rate. The FESEM results indicated the successful fabrication of NFs with a 450 nm nano-scale fiber diameter. Thus, the significant properties of PLA/PSI NFs make them a suitable scaffold to be loaded with therapeutic genetic material, such as siRNA, and for upregulating growth factors like VEGF. These NFs can therefore provide a sustained-release environment for genetic cargo, overcoming the limitations of rapid degradation in the wound region.

Keywords: Biopolymer, nanofibrous materials, electrospinning, genetic material, therapeutics.

ABSTRACT CODE: DBT/RCP/2026/081

Exploring MIL-100 (Fe) Metal–Organic Framework as a Drug and Gene Delivery Vector: An in-Silico Study

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Abstract

MIL-100(Fe) is a biodegradable and non-toxic metal-organic framework (MOF) that features a highly porous crystalline nanostructure with an exceptionally large surface area and high porosity. These characteristic features make it an outstanding candidate for drug delivery carriers and gene delivery vectors. It is synthesized from iron (Fe^{3+}) ions, and benzene-1,3,5 tricarboxylic acid (BTC). Its well-defined pores facilitate high-capacity loading of therapeutic agents for diverse biomedical applications. A network pharmacology framework was employed to predict the biological targets of the MIL-100 monomeric structure using the Swiss Target Prediction database. At the same time, parallel ADME analysis was conducted to evaluate its pharmacokinetic properties. Subsequently, the identified targets were used to study the protein-protein interaction and gene enrichment pathways, including Kyoto Encyclopedia of Genes and Genomes (KEGG) and Gene Ontology (GO). This study identified 29 potential biological targets of MIL-100. Protein–protein interaction and gene enrichment analyses demonstrated that these targets are involved in several biologically relevant functions, supporting the potential utility of MIL-100 in drug delivery and gene-targeting applications. ADME analysis exhibited low gastrointestinal absorption of MIL-100 in its native form, suggesting that MOF-based formulation as a composite system may enhance its GI uptake. This could serve as a potential drug/gene delivery system as conventional gene and drug delivery vectors suffer from several limitations, including limited drug loading capacity, possibility of immune rejection, biosafety concerns, and limited targeting efficiency. These shortcomings can be effectively addressed through the development of advanced delivery platforms such as metal–organic frameworks (MOFs), including MIL-100. Keywords: MIL 100 (Fe), Metal Organic Framework, Gene Delivery System, Network Pharmacology, Protein-protein interaction.

Keywords: Biodegradable, KEGG, MIL-100, GI uptake.

ABSTRACT CODE: DBT/RCP/2026/082

An Overview of Green Silver Nanoparticle Synthesis: Synthesis Techniques, Characteristics, and Their Application

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Abstract

Green synthesis of silver nanoparticles (AgNPs) has emerged as an eco-friendly, cost-effective, and sustainable alternative to conventional physical and chemical methods. This approach utilizes biological resources such as plant extracts, microorganisms, enzymes, and biopolymers as reducing and stabilizing agents, eliminating the need for toxic chemicals and high energy input. Various green synthesis techniques influence the size, shape, surface charge, and stability of AgNPs, which are critical factors determining their physicochemical and biological properties. Characterization methods including UV–Vis spectroscopy, X-ray diffraction, electron microscopy, and Fourier transform infrared spectroscopy are commonly employed to analyze these features. Green-synthesized AgNPs exhibit remarkable antimicrobial, antioxidant, anticancer, and catalytic activities, enabling their application in medicine, agriculture, food packaging, water treatment, and environmental remediation. Despite their advantages, challenges related to scalability, reproducibility, and toxicity assessment remain. Overall, green synthesis offers a promising pathway for the safe and sustainable development of silver nanoparticles.

Keywords-Silver nanoparticles, Green Synthesis, Plant Extract, Microbial activity, medical application

ABSTRACT CODE: DBT/RCP/2026/083

Nanotechnology-Driven Gene Therapy Approach for Cystic Fibrosis

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Abstract

Cystic fibrosis is a genetic disease caused by mutations in the CFTR gene, leading to mucus accumulation in the lungs. For effective treatment, nanotechnology-based gene therapy represents an advanced and promising approach. In this strategy, lipid nanoparticles (LNPs) are used to deliver therapeutic genes or the CRISPR/Cas9 system directly to the lungs via inhalation (aerosol). These nanoparticles can cross the epithelial barrier and enable efficient gene delivery to airway cells. This approach offers a non-viral, targeted, and minimally invasive treatment strategy, making it highly promising for future cystic fibrosis therapy. Keywords- Cystic Fibrosis, CFTR Gene, Gene Therapy, Nanotechnology, Lipid Nanoparticles (LNPs), CRISPR/Cas9, Aerosol Drug Delivery.

Keywords : Cystic fibrosis, lipid nanoparticles, CRISPR/Cas9, CFTR Gene.

ABSTRACT CODE: DBT/RCP/2026/084

Hepatoprotective Activity of Nanocarrier-Based Drug Delivery Systems: A Review

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Abstract

Liver diseases represent a major global health burden, ranging from hepatitis and fatty liver disease to cirrhosis and hepatocellular carcinoma. Conventional pharmacotherapy for hepatic disorders is often limited by poor bioavailability, systemic toxicity, rapid metabolism, and lack of target specificity. Nanocarrier-based drug delivery systems have emerged as a promising strategy to overcome these limitations by enhancing drug stability, targeted delivery, and therapeutic efficacy while minimizing adverse effects. This review highlights the hepatoprotective and hepato-therapeutic potential of various nanocarriers, including polymeric nanoparticles, liposomes, solid lipid nanoparticles, nanoemulsions, dendrimers, and inorganic nanoparticles. Mechanisms of hepatic targeting, therapeutic applications, advantages, limitations, and future prospects of nanocarrier systems in liver disease management are discussed.

Keywords: Hepatoprotective activity, nanocarriers, liver targeting, nanoparticles, drug delivery, hepatic diseases.

ABSTRACT CODE: DBT/RCP/2026/085

Design and Synthesis of Novel Heterocyclic Compounds and Their Encapsulation into Nanoparticles for Controlled Release

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Abstract

The development of novel heterocyclic compounds with therapeutic potential is often limited by poor solubility and rapid clearance. This study focuses on the design and synthesis of new heterocyclic molecules and their encapsulation into polymeric nanoparticles to achieve controlled drug release. The synthesized compounds were structurally characterized using spectroscopic techniques, and nanoparticles were prepared using an optimized formulation method. Characterization of the nanoparticles included particle size, zeta potential, drug loading, entrapment efficiency, and surface morphology. In vitro release studies demonstrated sustained and controlled release of the heterocyclic compounds, indicating the effectiveness of the nanoparticulate system. Stability and cytotoxicity evaluations confirmed the safety and robustness of the formulations. Overall, encapsulating novel heterocyclic compounds into nanoparticles provides a promising strategy to enhance their therapeutic potential, improve bioavailability, and enable controlled delivery for future pharmacological applications.

Keywords: Heterocyclic compounds, nanoparticle encapsulation, controlled release, drug delivery, polymeric nanoparticles

ABSTRACT CODE: DBT/RCP/2026/086

Enhancing Oral Bioavailability and Therapeutic Efficacy of Risedronate using Mucoadhesive Thiolated Chitosan-Hydroxyapatite Core-Shell Nanoparticles for Osteoporosis Treatment

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Abstract

Oral risedronate (RIS) therapy for osteoporosis is compromised by poor bioavailability (<1%) and esophageal irritation. This study develops and comprehensively evaluates, through a tiered in vitro strategy, surface-engineered thiolated chitosan-hydroxyapatite nanoparticles (TC-HANPs) as an advanced oral delivery system. Optimized TC-HANPs demonstrated a particle size of 215 ± 18 nm, a positive zeta potential of +32.5 ± 2.1 mV, and an encapsulation efficiency of 88.4 ± 3.2%. Mucoadhesion studies using mucin particles showed a 4.2-fold increase in adhesion for TC-HANPs over unmodified particles. Intestinal permeability was assessed using a validated Caco-2/HT29-MTX co-culture monolayer, where TC-HANPs enhanced the apparent permeability (Papp) of RIS by 4.1-fold compared to free drug, without compromising monolayer integrity (TEER > 90% of control). Cellular uptake and bone-targeting were confirmed in MG-63 osteoblast-like cells, where TC-HANPs exhibited a 3.5-fold higher intracellular accumulation than free RIS, as quantified by HPLC. Finally, pharmacodynamic efficacy was evaluated in a direct in vitro osteoporosis model using a co-culture of HOB osteoblasts and differentiated RAW 264.7 osteoclasts. TC-HANPs treatment significantly increased osteoblast mineralization (Alizarin Red staining, 2.3-fold increase) and inhibited osteoclast resorption pit formation (by 68%) more effectively than free RIS. This integrated in vitro platform confirms that TC-HANPs enhance mucoadhesion, intestinal absorption, osteoblast-targeting, and the restorative efficacy of risedronate, presenting a compelling animal-free case for its advanced development.

Keywords: Risedronate, Oral Nanomedicine, Thiolated Chitosan, Hydroxyapatite Nanoparticles, Bone-Targeted Delivery

ABSTRACT CODE: DBT/RCP/2026/087

Chitosan-Based Mucoadhesive Nanoparticles for Oral Delivery of Peptide Drugs

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Abstract

Oral delivery of peptide drugs is limited by enzymatic degradation, poor permeability, and low bioavailability. This study aims to develop and evaluate chitosan-based mucoadhesive nanoparticles as an effective carrier system for oral delivery of peptide therapeutics. Nanoparticles were formulated using chitosan through an optimized ionic gelation technique and characterized for particle size, zeta potential, entrapment efficiency, and surface morphology. The mucoadhesive properties of chitosan were investigated to enhance intestinal residence time and improve peptide absorption. In vitro release studies demonstrated a sustained release profile, while enzymatic degradation studies confirmed the protective effect of the nanoparticulate system against gastrointestinal enzymes. Ex vivo permeation studies revealed enhanced transport of peptides across intestinal mucosa compared to free drug. Overall, chitosan-based mucoadhesive nanoparticles show significant potential as a promising oral delivery platform for peptide drugs with improved stability and bioavailability.

Keywords: Chitosan nanoparticles, mucoadhesive drug delivery, oral peptide delivery, nanoparticulate systems, enhanced bioavailability

ABSTRACT CODE: DBT/RCP/2026/088

Nanoparticles as Advanced Drug Delivery Systems: Design, Characterization, and Therapeutic Applications

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Abstract

Nanoparticles have gained significant attention in pharmaceutics as versatile carriers for drug delivery due to their unique size-dependent properties and surface modifiability. They offer solutions to challenges such as poor solubility, limited bioavailability, and non-specific drug distribution. This study focuses on the formulation, characterization, and evaluation of nanoparticles for targeted and controlled drug delivery. Various types of nanoparticles-including polymeric nanoparticles, solid lipid nanoparticles, liposomes, and metallic nanoparticles-were explored for their potential to enhance therapeutic efficacy and reduce adverse effects. Key preparation methods, such as solvent evaporation, nanoprecipitation, and high-pressure homogenization, were analyzed for their influence on particle size, drug loading, and release kinetics. Surface modification techniques were also reviewed for achieving site-specific delivery and prolonged circulation. The study highlights the critical role of nanoparticles in modern pharmaceutics while addressing challenges related to stability, scalability, and regulatory compliance.

Keywords: Nanoparticles, Drug delivery, Polymeric nanoparticles, Solid lipid nanoparticles, Targeted therapy, Controlled release, Bioavailability, Surface modification

ABSTRACT CODE: DBT/RCP/2026/089

Formulation and Characterization of Curcumin-Loaded Nanoparticles for Enhanced Anticancer Activity

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Abstract

Curcumin is a natural polyphenolic compound with well-documented anticancer activity; however, its clinical application is limited by poor aqueous solubility, low bioavailability, and rapid systemic elimination. In the present study, curcumin-loaded nanoparticles were formulated to overcome these limitations and enhance therapeutic efficacy. Nanoparticles were prepared using an appropriate nanoparticle fabrication method and characterized for particle size, polydispersity index, zeta potential, surface morphology, drug entrapment efficiency, and in vitro drug release. The optimized formulation exhibited nanoscale particle size with narrow size distribution and satisfactory drug loading. In vitro release studies demonstrated a sustained release pattern of curcumin from the nanoparticles compared to free drug. Furthermore, in vitro cytotoxicity studies revealed enhanced anticancer activity of the curcumin-loaded nanoparticles against cancer cell lines, indicating improved cellular uptake and therapeutic performance. These results suggest that nanoparticle-based delivery of curcumin is a promising approach for effective cancer therapy.

Keywords - Curcumin; Nanoparticles; Anticancer activity; Drug delivery system; Sustained release

ABSTRACT CODE: DBT/RCP/2026/090

Formulation and Evaluation of pH-Sensitive Polymeric Nanoparticles for Enhanced Oral Bioavailability of Poorly Soluble Drugs

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Abstract

Poor aqueous solubility and limited permeability are major challenges affecting the oral bioavailability of many therapeutic agents. The present study focuses on the formulation and evaluation of pH-sensitive polymeric nanoparticles designed to enhance the oral bioavailability of poorly soluble drugs. Nanoparticles were prepared using suitable biodegradable polymers through an optimized fabrication method and characterized for particle size, polydispersity index, surface charge, drug entrapment efficiency, and morphological properties. The pH-responsive behavior of the polymeric system was evaluated to ensure minimal drug release in gastric conditions and enhanced release in intestinal pH. In vitro drug release studies demonstrated a controlled and site-specific release profile, while stability studies confirmed the robustness of the formulation. Additionally, ex vivo and in vivo evaluations indicated improved dissolution and absorption compared to conventional formulations. Overall, the developed pH-sensitive polymeric nanoparticles represent a promising strategy for improving oral delivery and therapeutic efficacy of poorly soluble drugs.

Keywords: pH-sensitive nanoparticles, polymeric drug delivery, oral bioavailability, poorly soluble drugs, controlled release

ABSTRACT CODE: DBT/RCP/2026/091

Green Synthesis of Bimetallic Nanoparticles and Evaluation of Their Antimicrobial Efficacy

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Abstract

A novel green synthesis of bimetallic nanoparticles (BMNPs) show great potential in various applications such as in antimicrobial application, biosensing, energy conversion, environmental remediation, and biomedical uses. BMNPs especially as an antimicrobial agent, have attracted many researchers. Bimetallic nanoparticles are an extremely advantageous type of nanomaterials because of their enhanced and adjustable physicochemical properties, which result from the cooperative interaction of two different metallic components. In this study, we have synthesized AgNPs, and bimetallic AgCuNPs using Tamarindus indica leaf extract as a reducing capping and stabilizing agent. Optimal AgCuNPs synthesis condition was achieved using 10 mM precursor salts (pH 7) at 37° C. Comprehensive characterizations were performed using Ultraviolet Visible Spectroscopy (UV-Vis spectra), Fourier Transform Infrared Spectra (FTIR), X-ray diffractometer (XRD), FESEM (Field Emission and Scanning Electron Microscope), EDX (Energy Dispersive X-ray Spectroscopy. The antimicrobial activity was tested using AgNPs, and AgCuNPs through disc diffusion method against bacterial strains (Gram negative (E. coli), and gram positive (S. aureus). AgCuNPs showed higher ZOI (zone of inhibition) against both the strains as compared to AgNPs. Green-synthesized BMNPs generate reactive oxygen species, release metal ions, and rupture membranes to show potent antibacterial action against a wide range of pathogenic microorganisms, including bacteria and fungus. Due to their improved biocompatibility and multifunctionality, these nanoparticles can show great potential in drug delivery, wound healing, bioimaging, and gene delivery in biomedical applications. Future research is expected to emphasize biodegradable and stimuli-responsive BMNPs, targeted antimicrobial approaches, and next-generation nanomedicine systems. Keywords: Tamarindus indica, bimetallic nanoparticles (BMNPs), AgCuNPs, green synthesis, antimicrobial activity, disc diffusion method.

Keywords: bimetallic nanoparticles, AgCuNPs, Green-synthesized, BMNPs.

ABSTRACT CODE: DBT/RCP/2026/092

Comparative In-Vitro Evaluation of Conventional Drug and Nanoparticle-Based Delivery in Skin Cancer Cell Lines

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Abstract

Conventional chemotherapeutic agents often face challenges such as poor solubility, systemic toxicity, and limited cellular uptake, reducing their effectiveness in skin cancer treatment. This study presents a comparative in-vitro evaluation of conventional drug formulations and nanoparticle-based delivery systems in skin cancer cell lines. Nanoparticles were formulated using biodegradable polymers and characterized for particle size, surface charge, drug loading, and morphology. Cytotoxicity assays, cellular uptake studies, and apoptosis analysis were performed to assess the therapeutic efficacy of both formulations. Results demonstrated that nanoparticle-based delivery significantly enhanced drug internalization, increased cytotoxicity against cancer cells, and promoted apoptosis compared to conventional formulations. Additionally, the nanoparticles provided controlled release, reducing potential side effects. Overall, nanoparticle-based drug delivery represents a promising strategy for improving the therapeutic outcomes of skin cancer treatments by enhancing drug bioavailability, specificity, and cellular targeting.

Keywords: Skin cancer, nanoparticle drug delivery, in-vitro evaluation, cytotoxicity, controlled release

ABSTRACT CODE: DBT/RCP/2026/093

Application of Biotechnology in Pharmaceutical Drug Design

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Abstract

Biotechnology is a multidisciplinary scientific research field which uses living organisms or their parts to develop or modify products, or improve plants, animals and microorganisms. Biotechnology and the world of colors are always connected with each other through biotech applications. This has encouraged the requirement to construct a classification system based on colors. Advance technologies and products are developed within the areas include medicine (development of new medicines and therapies), agriculture (development of genetically modified plants, biofuels, biological treatment) or industrial biotechnology (production of chemicals, paper, textiles and food), environment (maintenance of biodiversity, bioremediation) etc. However, Biotechnology achieved considerable progress in the branch of healthcare sector. Pharmaceutical biotechnology is a relatively new and growing field in which the principles of biotechnology are applied to the development of drugs. Application of Biotechnology in Pharmaceutical Drug Design.A majority of therapeutic drugs in the current market are bioformulations, such as antibodies, nucleic acid products and vaccines. Biotechnology helps the pharmaceutical industry to develop new products, new processes, methods and services and to improve existing ones. There is a widespread list of biopharmaceutical products in healthcare management available for therapeutic use. In this review we are discussed about various classes of biotechnology-based products such as gene therapy, monoclonal antibody, DNA fingerprinting, vaccines, biopharmaceuticals, stem cell therapy, pharmacogenomics along with their therapeutic applications. Biotechnology plays a crucial role in drugs discovery. DNA fingerprinting, vaccines, biopharmaceuticals, stem cell therapy, pharmacogenomics along with their therapeutic applications. Drug targeting, target validation in HTS, biotechnology provides a sensitive and flexible method of detection. Biotech drug a large sector of pharmaceutical market.

Keywords: Gene therapy, Monoclonal antibody, Pharmacogenomics, DNA fingerprinting, Stem cell therapy.

ABSTRACT CODE: DBT/RCP/2026/094

Gene Therapy Applications in Biotechnology and Lifesciences

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Abstract

Gene therapy products represent a major advancement in the treatment of genetic and life-threatening diseases by introducing, removing, or modifying genetic material within a patient's cells. Due to their complex nature and long-term effects, gene therapy products are strictly regulated to ensure their safety, quality, and effectiveness. Regulatory authorities such as the US Food and Drug Administration (FDA), European Medicines Agency (EMA), and other national agencies have established specific guidelines for the development, testing, and approval of these products. The regulatory process begins with extensive preclinical studies to evaluate safety, toxicity, and biological activity. This is followed by carefully designed clinical trials conducted in multiple phases to assess efficacy and potential risks in humans. Manufacturing controls, including good manufacturing practices (GMP), play a vital role in maintaining product consistency and preventing contamination. In addition, post-marketing surveillance is required to monitor long-term safety and unexpected adverse effects after approval. Ethical considerations, patient consent, and risk–benefit evaluation are also key regulatory concerns in gene therapy. Overall, strong regulatory frameworks help balance innovation with patient safety, supporting the responsible development of gene therapy products for future medical use.

Keywords : Gene therapy, Regulatory guidelines, FDA, EMA, Clinical trials, GMP, Biotechnology

ABSTRACT CODE: DBT/RCP/2026/095

Formulation and Evaluation of Nanolipid Based Drug Delivery System for Antimalarial Drug

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Abstract

Lipid-based drug delivery systems have gained considerable attention as efficient carriers for enhancing the therapeutic performance of poorly water-soluble drugs due to their biocompatibility, ability to improve solubilization, and potential to increase oral bioavailability. The present study focuses on the formulation and evaluation of nanolipid-based drug delivery systems for antimalarial therapy with the objective of overcoming limitations associated with conventional dosage forms. Self-emulsifying drug delivery systems and solid lipid nanoparticles were initially developed using a model drug to optimize formulation variables and evaluate critical quality attributes. Optimized self-emulsifying formulations prepared with suitable lipid and surfactant combinations produced nanosized globules with uniform distribution and rapid in-vitro drug release, whereas solid lipid nanoparticles prepared by hot homogenization and probe sonication exhibited acceptable particle size, polydispersity index, and zeta potential indicating good physical stability. Further, nanostructured lipid carriers were explored for antimalarial agents to address problems such as poor solubility, low bioavailability, frequent dosing, and development of resistance. Artemisinin-based combination drugs were successfully co-encapsulated into lipid nanoparticles, resulting in controlled drug release, high entrapment efficiency, and improved in-vivo antimalarial efficacy compared to conventional formulations. Primaquine-loaded nanostructured lipid carriers optimized through experimental design showed sustained release behavior, enhanced parasite suppression, reduced toxicity, and satisfactory storage stability. Overall, the investigation demonstrates that nanolipid carriers significantly enhance dissolution characteristics, systemic availability, and therapeutic effectiveness of antimalarial drugs while minimizing dose-related adverse effects. The study establishes nanolipid-based systems as a promising and patient-compliant platform for the development of advanced antimalarial drug delivery strategies.

Keywords: Nanolipid drug delivery system; Solid lipid nanoparticles; Nanostructured lipid carriers; Antimalarial drugs; Bioavailability enhancement; Controlled release; Artemisinin combination therapy; Primaquine.

ABSTRACT CODE: DBT/RCP/2026/096

Integration of Nanotechnology with Herbal Actives in an Advanced Cosmeceutical Face Mask

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Abstract

Nanotechnology has emerged as a powerful tool in the development of advanced cosmeceutical formulations by enhancing skin penetration, stability, and efficacy of herbal bioactives. The present study aims to formulate and evaluate a nanotechnology-based herbal face mask incorporating selected herbal extracts with antioxidant, antimicrobial, and anti-inflammatory properties. Herbal actives were nano-encapsulated using a suitable nanocarrier system and incorporated into a face mask base. The formulation was evaluated for physicochemical properties, particle size, zeta potential, pH, spreadability, antimicrobial activity, and stability. The developed nano-herbal face mask showed nanoscale particle size, good stability, skin-friendly pH, and enhanced antimicrobial efficacy compared to conventional formulations. The improved performance was attributed to increased surface area, controlled release, and better interaction of nano-sized herbal actives with skin layers. The study demonstrates that nanotechnology-based herbal face masks represent a promising approach for advanced skincare and cosmeceutical applications.

Keywords: Nanotechnology, Herbal face mask, Nano-encapsulation, Cosmeceuticals, Skin delivery

ABSTRACT CODE: DBT/RCP/2026/097

Exploitation of *Moringa oleifera* Gum as a Novel Biopolymeric Matrix for Transdermal Therapeutic Systems

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Abstract

Transdermal drug delivery systems (TDDS) offer a promising alternative to conventional dosage forms by providing controlled drug release, improved patient compliance, and avoidance of first-pass metabolism. The present study explores the potential of *Moringa oleifera* gum as a novel natural biopolymeric matrix for the development of transdermal therapeutic systems. *Moringa oleifera* gum, a plant-derived polysaccharide, was isolated, purified, and characterized for its suitability as a film-forming polymer. Transdermal patches were formulated using the solvent casting method, incorporating a model drug, plasticizers, and permeation enhancers. The prepared patches were evaluated for physicochemical properties, including thickness, weight variation, folding endurance, moisture content, tensile strength, and drug content uniformity. The results demonstrated that *Moringa oleifera* gum exhibits excellent film-forming ability, mechanical strength, and compatibility with the drug. Formulations showed sustained drug release over 24 hours and satisfactory skin permeation characteristics. The study concludes that *Moringa oleifera* gum is a promising, biodegradable, and cost-effective natural polymer for transdermal drug delivery applications, with potential for further development in advanced therapeutic systems.

Keywords: *Moringa oleifera* gum, Natural biopolymer, Transdermal drug delivery, Sustained release, Film-forming polymer

ABSTRACT CODE: DBT/RCP/2026/098

Nano-Encapsulation of Traditional Herbal Ingredients for Advanced Oral Care Toothpaste Formulation

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Abstract

Oral health care products incorporating herbal ingredients have gained increasing attention due to their antimicrobial, anti-inflammatory, and antioxidant properties. However, the therapeutic efficacy of conventional herbal toothpaste formulations is often limited by poor solubility, instability, and reduced bioavailability of active phytoconstituents. The present study focuses on the development of an advanced oral care toothpaste formulation employing nano-encapsulation technology to enhance the delivery of traditional herbal ingredients, including miswak, babool, fennel, clove, salt, and cardamom. Nano-encapsulated herbal actives were prepared using a suitable nano-carrier system and incorporated into a toothpaste base. The formulation was evaluated for physicochemical properties, antimicrobial activity, spreadability, pH, foaming ability, and stability. The nano-toothpaste exhibited improved homogeneity, acceptable pH suitable for oral use, and enhanced antimicrobial efficacy against common oral pathogens compared to conventional herbal toothpaste. The improved performance was attributed to increased surface area, improved penetration, and sustained release of herbal actives achieved through nano-encapsulation. The study concludes that nano-encapsulation of traditional herbal ingredients represents a promising approach for developing effective and stable herbal oral care formulations.

Keywords: Nano-encapsulation, Herbal toothpaste, Oral care, Antimicrobialactivity, Nanotechnology

ABSTRACT CODE: DBT/RCP/2026/099

In Silico Exploration of Warfarin Analogues for Antihyperlipidemic Activity in Cardiovascular and Obesity Management

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Abstract

The growing burden of cardiovascular diseases and obesity necessitates the development of novel therapeutic strategies. Warfarin, despite its primary use as an anticoagulant, exhibits promising antihyperlipidemic properties. This study delves into the identification of potent warfarin analogues with antihyperlipidemic activity for potential application in these prevalent conditions.A comprehensive library of warfarin analogues has been constructed and subjected to in silico screening using Molegro Virtual Docker, a robust molecular docking platform. Docking simulations will target key lipid-related proteins implicated in cardiovascular and obesity pathogenesis. Subsequently, promising candidates have been rigorously evaluated for potential toxicity risks using ADMET 2.0, a computational tool for ADMET (absorption, distribution, metabolism, excretion, and toxicity) prediction to confirm their antihyperlipidemic efficacy and elucidate their mechanisms of action.This research aims to discover warfarin analogues exhibiting superior antihyperlipidemic activity coupled with favorable toxicity profiles. The findings hold the potential to pave the way for the development of innovative therapeutic agents for effectively managing cardiovascular and obesity-related complications.

Keywords : Antihyperlipidemic activity, In-silico screening, ADMET Lab 2.0, Cardiovascular disease,Warfarin.

ABSTRACT CODE: DBT/RCP/2026/100

Solid Oral Dosage Forms Reimagined: The Impact of 3d Printing and Continuous Manufacturing on Personalization and Supply

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Abstract

The paradigm of solid oral dosage form (SODF) manufacturing is undergoing a fundamental transformation, moving away from traditional batch processing toward agile, digitalized systems. This review examines how two disruptive technologies-3D printing (additive manufacturing) and continuous manufacturing (CM)-are collectively reimagining the production, personalization, and supply of tablets and capsules. 3D printing enables the precise fabrication of complex geometries with tailored drug release profiles, such as multi-layered polypills, porous structures for rapid dissolution, or implants with zero-order kinetics, paving the way for patient-specific dosing and combination therapies. Concurrently, CM offers a streamlined, end-to-end production line that enhances quality control through real-time monitoring (via Process Analytical Technology), reduces waste, and dramatically shortens production cycles. The synergy of these technologies holds profound implications: CM ensures robust, scalable, and consistent production, while 3D printing injects unprecedented flexibility for on-demand personalization. This convergence promises to address critical challenges in pharmacotherapy, including polypharmacy in aging populations and the need for precise pediatric dosing. Furthermore, it can strengthen supply chain resilience by enabling distributed, smaller-scale manufacturing. We argue that the integration of digital design with flexible production is not merely an incremental improvement but a necessary evolution to meet the growing demands for precision medicine and robust pharmaceutical supply.

Keywords: 3D Printing, Continuous Manufacturing, Personalized Medicine, Process Analytical Technology (PAT), Digital Pharmaceutics

ABSTRACT CODE: DBT/RCP/2026/101

Mouth Dissolving Tablets - A Review

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Abstract

The demand for Mouth Dissolving Tablet has been increasing for the last decade particularly in geriatric, pediatric and patient with some sort of disabilities in swallowing. Mouth dissolving tablets are those tablets which when placed in mouth get dissolved rapidly in saliva without the need of liquid and can be swallowed. European pharmacopeia adopted the term Oro-dispersible tablet for MDTs. Mouth dissolving tablets are also known as Fast melting tablets. Oro-dispersible tablets, fast dissolving tablets or melt in mouth tablets. This article reviews the potential benefits offered by MDTs as an oral drug delivery system for various kinds of patients suffering from different diseases and disabilities. Desired characteristics and challenges for developing fast disintegrating drug delivery systems, quality control tests, various techniques used in the preparation of fast disintegrating drug delivery systems like lyophilization technologies tablet molding method, sublimation techniques, spray drying techniques, direct compression method, it also reviews the patented technologies for fast dissolving tablets, advantages and disadvantages of different technologies for preparing fast disintegrating dosage form, future prospective for MDTs. The growing importance for MDTs is due to the potential advantages offered by this technology; MDT is a New Drug Delivery System with least disintegration tone

Keywords:MDT,lyophilization, disabilities, Delivery

ABSTRACT CODE: DBT/RCP/2026/102

Biotechnology of gene delivery system in plant tissue culture

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Abstract

Gene delivery systems play a pivotal role in modern plant biotechnology by enabling the introduction of desirable traits that enhance crop productivity, stress tolerance, and nutritional quality. Efficient transfer of foreign DNA into plant cells is fundamental for genetic transformation, functional genomics, and the development of transgenic plants. Both biological and physical methods are widely employed for gene delivery in plant cultivation. Agrobacterium-mediated transformation remains the most commonly used biological approach due to its high efficiency, stable gene integration, and low copy number insertion. Alternatively, direct gene transfer techniques such as biolistics (gene gun), electroporation, microinjection, polyethylene glycol (PEG)-mediated transformation, and nanoparticle-assisted delivery provide versatile options for species that are recalcitrant to Agrobacterium infection. Recent advances in nanobiotechnology, viral vectors, and CRISPR/Cas-based genome editing systems have further improved transformation precision and reduced off-target effects. These technologies facilitate targeted gene insertion, gene silencing, and trait improvement for disease resistance, abiotic stress tolerance, enhanced secondary metabolite production, and yield optimization. Integration of gene delivery systems with tissue culture techniques such as callus induction, organogenesis, and somatic embryogenesis ensures efficient plant regeneration and stable expression of introduced genes. Despite challenges including genotype dependency, low transformation efficiency, and regulatory concerns, continuous innovations are making gene delivery more reliable and cost-effective. Overall, advanced gene delivery strategies are accelerating the development of improved plant varieties, contributing significantly to sustainable agriculture, food security, and environmental resilience.

Keywords: Gene delivery, Plant transformation, Agrobacterium tumefaciens, Biolistics, Tissue culture, Genetic engineering,

ABSTRACT CODE: DBT/RCP/2026/103

CRISPR Technology in Disease Management

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Abstract

CRISPR-Cas9 technology has rapidly advanced as a transformative genome-editing platform, facilitating precise genetic modifications and expanding therapeutic opportunities across various diseases. This review explores recent developments and clinical translations of CRISPR applications in oncology, genetic and neurological disorders, infectious diseases, immunotherapy, diagnostics, and epigenome editing. CRISPR has notably progressed in oncology, where it enables the identification of novel cancer drivers, elucidation of resistance mechanisms, and improvement of immunotherapies through engineered T cells, including PD-1 knockout CAR-T cells. Clinical trials employing CRISPR-edited cells are demonstrating promising results in hematologic malignancies and solid tumours. In genetic disorders, such as hemoglobinopathies and muscular dystrophies, CRISPR-Cas9 alongside advanced editors like base and prime editors show significant potential for correcting pathogenic mutations. This potential was affirmed with the FDA's first approval of a CRISPR-based therapy, Casgevy, for sickle cell disease in 2023. Neurological disorders, including Alzheimer's, ALS, and Huntington's disease, are increasingly targeted by CRISPR approaches for disease modelling and potential therapeutic intervention. In infectious diseases, CRISPR-based diagnostics such as SHERLOCK and DETECTR provide rapid, sensitive nucleic acid detection, particularly valuable in pathogen outbreaks like SARS-CoV-2.

Keywords: tumours, hematologic, genetic, immunotherapy,intervention.

ABSTRACT CODE: DBT/RCP/2026/104

Development and Characterization of a Self- Emulsifying Drug Delivery System to Enhance Oral Bioavailability of an Antineoplastic Drug

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Abstract

Self-emulsifying Drug Delivery Systems (SEDDS) are isotropic mixtures of oil, surfactant and/or cosurfactants, and a drug that spontaneously forms an oil-in-water microemulsion upon gentle agitation with water. When dispersed in the (GI) tract, the motility of stomach provides necessary agitation for emulsification. SEDDS incorporated with a poorly water-soluble drug demonstrates improved drug absorption since it maintains the drug in a solubilized state in the GIT tract. The purpose of this research was to screen lipid excipient for their self- emulsification efficiency and to develop SEDDS based formulation in liquid and solid forms using Methotrexate as a model drug. Excipients evaluated for SEDDS were Tween 80 as surfactants, PPG as cosurfactants and castor oil as the oil. Self emulsifynig mixtures containing various proportions of these components were tested for their self-emulsification ability and were characterized by ternary phase diagrams. Based on these results, a particular mixture containing Tween 80 - PPG - castor oil (M15, M36, M38, M39) formulation was selected and optimized for drug delivery purpose. Solid SEDDS was formulated by adsorbing Liquid SEDDS onto an inert carrier Potassium dihydrogen phosphate by physical mixing. SEDDS were analyzed for their droplet size, PDI, zeta potential and viscosity. Solid state characterization of Solid SEDDS was performed using FTIR and Powder x-ray diffractometry. Finally, in vitro drug release studies were performed on Solid SEDDS and the results compared to plain MTX dissolution. MTX was found to be physically and chemically stable in the SEDDS and did not precipitate upon aqueous dilution. Solid and Liquid SEDDS showed a droplet size of less than 50 nm and possessed a neutral zeta potential. Solid state characterization of Solid SEDDS confirmed the presence of MTX in a molecularly dissolved state in the formulation. In vitro drug release studies showed that 65-75 % of drug was released from Solid SMEDDS within first one minutes of the dissolution time. A SEDDS based dosage form was successfully developed and shows potential for application in the delivery of poorly water-soluble drugs.

Keywords: SEDDS, Tween 80, ternary phase diagrams, droplet size, PDI, zeta potential.

ABSTRACT CODE: DBT/RCP/2026/105

Site-Specific Drug Delivery to HER2-Positive Breast Cancer: Trastuzumab-Grafted Dendrimer Nanosystem for Docetaxel

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Abstract

Human epidermal growth factor receptor 2 (HER2)-positive breast cancer accounts for approximately 20% of all breast cancer cases and exhibits increased aggressiveness and higher recurrence rates compared to HER2-negative subtypes.To develop and evaluate trastuzumab (TZ)-conjugated dendrimers as a targeted drug delivery system for docetaxel (DTX) to enhance therapeutic efficacy against HER2-positive breast cancer cells.TZ-grafted dendrimers were synthesized via bioconjugation using a MAL-PEG-NHS heterocrosslinker. Fluorescein isothiocyanate (FITC) was conjugated to the dendrimers for cellular imaging. In vitro studies compared the selectivity, antiproliferative activity, cellular internalization, and apoptosis induction of TZ-conjugated dendrimers versus unconjugated dendrimers in HER2-positive MDA-MB-453 and HER2-negative MDA-MB-231 human breast cancer cell lines. In vivo pharmacokinetic studies were also conducted.TZ-conjugated dendrimers demonstrated significantly higher selectivity and antiproliferative activity toward HER2-positive MDA-MB-453 cells compared to HER2-negative MDA-MB-231 cells. Compared to unconjugated dendrimers, the TZ-conjugated formulation exhibited enhanced cellular internalization and increased apoptosis induction in MDA-MB-453 cells. In vivo studies revealed that the conjugated nanosystem significantly improved the pharmacokinetic profile of DTX.Trastuzumab-conjugated dendrimers represent a promising targeted drug delivery platform for site-specific delivery of docetaxel to HER2-positive breast cancer cells, potentially reducing systemic toxicity and improving therapeutic outcomes.

Keywords: HER2-positive breast cancer, trastuzumab, dendrimers, docetaxel, targeted drug delivery, nanosystem, pharmacokinetics

ABSTRACT CODE: DBT/RCP/2026/106

Inorganic Nanoparticles in the Treatment of Osteoporosis

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Abstract

Osteoporosis (OP), characterized by decreased bone mineral density and heightened fracture risk, remains a significant global health burden. Conventional pharmacological treatments, such as bisphosphonates and hormone therapies, often suffer from poor bone-targeting efficiency and severe systemic side effects. Inorganic nanoparticles (NPs) have emerged as a transformative solution, offering a multifunctional platform for targeted delivery and intrinsic bone regeneration. This review explores the primary classes of inorganic NPs, including hydroxyapatite (HA), mesoporous silica (MSN), gold (AuNPs), and magnetic iron oxide NPs, highlighting their unique ability to mimic the natural bone mineral environment. Specifically, inorganic NPs serve as high-capacity vehicles for delivering growth factors, siRNA, and anti-resorptive drugs directly to bone. These NPs can be functionalized with bone-seeking ligands (e.g., alendronate or aspartic acid) to ensure site-specific delivery. For instance, MSNs release osteogenic ions such Si^{4+}, which stimulate the Wnt/β-catenin signaling pathway to promote bone formation. Furthermore, inorganic NPs help restore the balance between osteoblastic activity and osteoclastic resorption by neutralizing oxidative stress and modulating the bone microenvironment. Despite challenges regarding long-term biosafety and metabolic clearance, inorganic nanoparticles represent a sophisticated, dual-action strategy for treating osteoporosis, offering a path toward more precise, effective, and safer orthopedic interventions.

Keywords: Osteoporosis, Osteogenic, Mesoporous silica, Resorption, Inorganic.

ABSTRACT CODE: DBT/RCP/2026/107

Development and Evaluation of Ethosomal Drug Delivery System for Acne Therapy

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Abstract

Acne vulgaris is a common chronic inflammatory disorder of the pilosebaceous units that affects adolescents and adults worldwide. Conventional topical therapies used for acne management often show limited effectiveness due to poor skin penetration, inadequate drug retention at the target site, and potential systemic side effects. To overcome these limitations, ethosomes-lipid-based vesicular carriers containing a high concentration of ethanol-have emerged as a promising transdermal drug delivery system capable of enhancing dermal drug permeation. In the present study, clindamycin, a widely used antibiotic for acne treatment, was formulated into an ethosomal delivery system to improve its topical therapeutic efficacy.Clindamycin-loaded ethosomes were prepared using the cold method with varying concentrations of ethanol and Span 60, and the optimized formulation was incorporated into Carbopol 934 gel for topical application. The prepared ethosomal gels were evaluated for physicochemical properties such as pH, viscosity, spreadability, drug content, entrapment efficiency, and zeta potential. In-vitro drug diffusion studies were performed to assess the release profile, and antibacterial activity was evaluated against *Staphylococcus aureus* using standard microbiological methods.Among the formulations developed, formulation F2 exhibited optimal characteristics, including acceptable pH (6.90), high spreadability (14.3 gm·cm/sec), suitable viscosity, and favorable zeta potential, indicating stable vesicle formation. The formulation demonstrated high entrapment efficiency, sustained drug release over 8 hours, and superior antibacterial activity compared to the plain gel base and marketed clindamycin gel. These findings suggest that ethosomal gel formulations offer a promising, non-invasive approach for effective topical treatment of acne vulgaris.

Keywords: Acne vulgaris, Ethosomes, Clindamycin, Transdermal delivery, Antibacterial activity, Drug entrapment efficiency.

ABSTRACT CODE: DBT/RCP/2026/108

Nanotechnology in Gene Therapy: From Gene Discovery to Targeted Delivery Systems

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Abstract

Gene therapy has gained significant attention as an advanced therapeutic approach for the treatment of genetic disorders, cancer, and infectious diseases. Despite its potential, the clinical application of gene therapy is limited due to challenges such as poor stability of genetic material, low cellular uptake, and unwanted immune responses. Nanotechnology has emerged as a powerful tool to address these challenges by improving the delivery and effectiveness of gene-based therapies. Nanocarriers such as lipid nanoparticles, polymeric nanoparticles, dendrimers, and inorganic nanoparticles are widely studied for their ability to protect genetic material and enhance targeted delivery to specific cells or tissues. These nanosystems improve transfection efficiency, reduce toxicity, and enable controlled release of genes at the target site. In addition, nanotechnology plays an important role in gene discovery, diagnosis, and imaging by allowing sensitive detection of genetic components. This review highlights the role of nanotechnology in bridging the gap between gene discovery and successful gene delivery. The integration of nanotechnology with gene therapy holds great promise for developing safer, more efficient, and personalized treatment strategies in modern pharmaceutical and biomedical research.

Keywords: Nanotechnology, Gene Therapy, Nanocarriers, Targeted Delivery, Nanomedicine

ABSTRACT CODE: DBT/RCP/2026/109

Nanoparticle-Enhanced Radiotherapy for Targeted TumourRadio sensitization

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Abstract

Radiotherapy has been a key treatment for cancer patients, thanks to advances in various scientific fields. It's important to continuously integrate new innovations into radiation oncology. Nanomedicine is a new field that could significantly impact radiation therapy because nanoscale materials have beneficial features like better absorption and magnetism. However, radiation therapy often has limitations, such as damaging healthy tissues and not effectively targeting resistant tumors. Some nanoparticles can enhance the effectiveness of radiation therapy by increasing the sensitivity of cancer cells to radiation. Various types of nanoparticles, including metal, quantum dots, and silica, have been explored as potential tools to improve treatment outcomes. Despite progress, there are still major challenges to using nanoparticles in large-scale applications, including issues related to their production and specific biological challenges. Solving these problems could lead to better radiation treatments for different types of cancer in the future.

Keywords- Nanoparticle, Radiotherapy, Radiation Therapy, Drug Delivery, Tumours.

ABSTRACT CODE: DBT/RCP/2026/110

Role of Phytoconstituents in Type 1 and Type 2 Diabetes mellitus

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Abstract

Diabetes mellitus is a chronic metabolic disorder that includes type 1 and type 2 diabetes, characterized by persistent hyperglycemia and metabolic imbalance. Despite the availability of conventional therapies, long-term complications and adverse effects remain significant concerns, encouraging exploration of alternative treatment approaches. Phytoconstituents, bioactive compounds derived from medicinal plants, have gained attention for their potential antidiabetic properties. Major phytoconstituents such as flavonoids, alkaloids, phenolics, terpenoids, and saponins exhibit antioxidant, anti-inflammatory, and immunomodulatory effects. In type 1 diabetes, these compounds may protect pancreatic β-cells from autoimmune damage, while in type 2 diabetes they improve insulin sensitivity, enhance glucose uptake, inhibit carbohydrate-digesting enzymes, and regulate lipid metabolism. Evidence from experimental and emerging clinical studies suggests that phytoconstituents act through multiple molecular pathways to improve glycemic control. However, further clinical validation is required. Phytoconstituents hold promise as complementary agents in diabetes management.

Keywords-β-cell protection, Oxidative stress, Type 1 diabetes, Type 2 diabetes, Phytoconstituents

ABSTRACT CODE: DBT/RCP/2026/111

A Transethosome-Based Combined Drug Delivery System Approach Targeting JAK–STAT Pathway for Vitiligo Management

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Abstract

Vitiligo is an autoimmune disorder characterized by the destruction of active melanocyte cells, resulting in white patches on the skin's surface. The condition is characterized by multifactorial pathophysiology, including genetic predisposition, oxidative stress, environmental influences, and autoimmune activation. In the auto -immune mediated mechanism, aberrant activation of cytotoxic CD 8^+ T c ells lymphocytes play a central role in melanocyte destruction. The current treatment frequently encounters limited absorption into the skin; alternative targeted delivery of drug s demonstrates poor therapeutic outcomes. The objective of this study is to develop transethosome based combined drug delivery system targeting the JAK-STAT signaling pathway for better and synergistic effect for the management of vitiligo. Transethosomes, a vesicular drug delivery system composed of phospholipid, ethanol, and an edge activator, offer an effective approach to topical skin delivery of drug s. It offers numerous advantages over conventional drug delivery system s, including the deform ability of vesicles, enhanced penetration and retention of the d rug at the targeted regio n. C o-encapsulation of multiple therapeutic agents enables synergistic interactions, allowing drugs ac ting through complementary mechanisms to improve therapeutic efficacy.The transethosomal system is offers to demonstrate enhanced drug loading for both hydrophilic and lipophilic drug molecules, improved skin penetration, and increase drug retention at the target site. Combined drug delivery offers synergistic modulation of the JA K– STA T pathway is expected to reduce C D 8^+ T-cell– mediated immune activation, thereby limiting melanocyte destruction and improving therapeutic efficacycompared to conventional formulations.Transethosome-mediated synergistic drug delivery approach targeting the JAK– STAT path way offers a pro mising strategy for effective, localized, and patient-co m pliant management of vitiligo. Vitiligo; JAK-STAT path w ay; C D 8^+T c ells; Transethosomes; synergistic modulation.

Keywords:transethosomal, melanocyte, immune, synergistic

ABSTRACT CODE: DBT/RCP/2026/112

Copper ferrite Nano carrier used as biomedical applications

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Abstract

Copper ferrite Nano carriers are unique advanced magnetic, spinel structured materials used in biomedicine for drug delivery, MRI contrast enhancement, and magnetic hyperthermia for cancer therapy and used as antimicrobial agents. They have been used as therapeutic and diagnostic purpose. Copper ferrite Nano carrier having antibacterial and antifungal activity against several types of bacteria and fungi, such as E. coli and Candida albicans. biological molecules, so they can penetrate easily and interact with these biomolecules. Copperferrites possessing chemical and thermal properties, magnetic and electrical properties. The developed spinal ferrite nanomaterial improves the drug availability to the specific disease sites. It will also improve enhance the bioavailability of the existing drug used in various disease. Advantages of using Copper ferrite nano carriers is high surface volume ratio, unique structure,porous in nature, stable in water, magnetically active, good homogeneity, low process cost, high purity of the product.$CuFe_2O_4$matellic nanocarrier were characterized by field emission scanning electron, Differential Scanning Caloimetry DSC microscopy (FE-SEM), energy dispersive X-ray spectroscopy (EDX), Brunauer-Emmett-Teller (BET) analysis of porosimetric data.

Keywords: Biomedicine, Magnetic hyperthermia, enhancement,penetrate

ABSTRACT CODE: DBT/RCP/2026/113

Synthesis and Characterization of new Indole chalcone hybrid for anti-inflammatory activity

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Abstract

The present study involves the synthesis and characterization of novel indole-chalcone hybrid molecules with potential anti-inflammatory activity. A series of indole-based chalcone derivatives were synthesized, wherein the indole aldehyde was reacted with various substituted acetyl pyridine under basic conditions. The synthesized compounds were purified and characterized using spectroscopic techniques such as FTIR, ^{1}H NMR, ^{13}C NMR, and mass spectrometry to confirm their chemical structures. Molecular docking of compound was performed using Argus lab software, in which all the compound showed good docking score range -10.82 to -11.80 Kcal/mol. Compound 2 showed least docking energy -11.88 Kcal /mol. The anti-inflammatory potential of the synthesized hybrids was evaluated in vitro using the egg albumin denaturation assay. Among the series, compound 2 exhibited the most promising activity, showing significant inhibition of protein denaturation compared to the reference standard. The presence of electron-donating or withdrawing groups on the phenyl ring was found to influence the biological activity, suggesting structure–activity relationship (SAR) trends. The results indicate that indole-chalcone hybrids can serve as a promising scaffold for the development of new anti-inflammatory agents.

Key words- Indole, chalcone, molecular docking, anti-inflammatory

ABSTRACT CODE: DBT/RCP/2026/114

Bioinspired and biomimetic Nanocarriers

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Abstract

Bioinspired and biomimetic nanocarriers have emerged as a promising class of delivery systems that leverage principles derived from natural biological structures and processes to enhance therapeutic efficacy and safety. Unlike conventional synthetic nanocarriers, these systems are designed to mimic cellular membranes, viruses, proteins, or endogenous transport mechanisms, enabling improved biocompatibility, prolonged circulation time, and targeted delivery. Common strategies include the use of cell membrane–coated nanoparticles, virus-like particles, protein- and lipid-based nanostructures, and stimuli-responsive systems inspired by physiological microenvironments. By emulating natural interactions with biological barriers, biomimetic nanocarriers can evade immune recognition, enhance cellular uptake, and achieve precise spatiotemporal release of therapeutic agents. This approach has shown significant potential in drug delivery, gene therapy, immunotherapy, and diagnostics. Despite their advantages, challenges such as large-scale manufacturing, reproducibility, and regulatory translation remain. These abstract highlights recent advances, design strategies, and biomedical applications of bioinspired and biomimetic nanocarriers, emphasizing their role in advancing next-generation nanomedicine.

Keywords: Bioinspired, biomimetic, nanocarriers, emphasizing

ABSTRACT CODE: DBT/RCP/2026/115

Gene Based Targets for Mammary Cancer

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Abstract

Gene-based targeting has become a cornerstone in the diagnosis and treatment of mammary cancer, driven by advances in molecular biology and genomic profiling. Key genetic alterations involved in breast cancer initiation, progression, and therapeutic resistance include mutations or dysregulation of *BRCA1/2*, *TP53*, *PIK3CA*, and hormone receptor–related genes such as *ESR1* and *PGR*. These genes regulate critical cellular pathways associated with DNA repair, cell cycle control, apoptosis, and signal transduction. Targeting such genetic abnormalities through approaches including gene silencing, gene editing, antisense oligonucleotides, and RNA-based therapeutics has shown significant promise in improving treatment specificity and reducing systemic toxicity. Additionally, emerging targets such as microRNAs, long non-coding RNAs, and epigenetic regulators are expanding the landscape of gene-directed therapies. Integration of gene-based targets with personalized medicine and nanotechnology-assisted delivery systems offers new opportunities for effective and precise management of mammary cancer. These abstract highlights current gene-based targets, therapeutic strategies, and future perspectives in breast cancer research and treatment.

Keywords: Mammary cancer, *BRCA1/2*, *TP53*, *PIK3CA*, *ESR1*, *PGR*

ABSTRACT CODE: DBT/RCP/2026/116

Physicochemical and Targeting Strategies in Nanoparticle-Mediated Drug Design

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Abstract

Nanoparticle-mediated drug design represents a promising strategy to enhance the efficacy, safety, and specificity of therapeutic agents. By exploiting the unique physicochemical properties of nanoparticles, such as high surface area, tunable size, and surface functionality, drug molecules can be engineered for improved solubility, stability, and controlled release. Nanoparticles including polymeric systems, lipid-based carriers, metallic nanoparticles, and hybrid nanostructures enable targeted delivery through passive and active targeting mechanisms, thereby minimizing off-target effects and systemic toxicity. Surface modification with ligands, polymers, and stimuli-responsive components further enhances cellular uptake and site-specific drug release. This approach is particularly effective for the delivery of poorly soluble drugs and biomacromolecules such as proteins and nucleic acids. Despite significant advances, challenges related to large-scale production, long-term biocompatibility, and regulatory translation remain. Overall, nanoparticle-mediated drug design offers a versatile and innovative platform with significant potential for advancing precision medicine and improving clinical outcomes.

Keyword : Physicochemical properties, Targeted drug delivery,Nanocarriers, functionalization

ABSTRACT CODE: DBT/RCP/2026/117

Nano-Enabled Herbal Gene Therapy for Targeted Management of Rheumatoid Arthritis

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by persistent synovial inflammation and progressive joint destruction. Conventional therapies provide symptomatic relief but are often associated with adverse effects, high costs, and limited long-term efficacy. Gene therapy offers a promising alternative by targeting inflammatory cytokines and immune pathways; however, challenges such as poor gene stability, low delivery efficiency, and off-target effects limit its clinical translation. Nanotechnology-based gene therapy has emerged as an advanced approach to overcome these limitations by protecting therapeutic genes, enhancing cellular uptake, and enabling targeted delivery to inflamed synovial tissues. Herbal medicines rich in anti-inflammatory and immunomodulatory phytochemicals provide a safer and sustainable therapeutic option. Medicinal plants such as *Curcuma longa*, *Withaniasomnifera*, *Boswellia serrata*, *Tinospora cordifolia*, and *Zingiber officinale* have demonstrated significant potential in modulating RA-associated inflammation. The integration of herbal bioactives with nanocarrier-based gene delivery systems such as liposomes, polymeric nanoparticles, solid lipid nanoparticles, and phytosomes enhances gene protection, bioavailability, targeted action, and controlled release. This synergistic approach holds promise for improving therapeutic efficacy, reducing systemic toxicity, and developing safer, cost-effective, and disease-modifying strategies for rheumatoid arthritis management.

Keywords: Rheumatoid arthritis, medicinal, herb, Gene therapy, Nanotechnology.

ABSTRACT CODE: DBT/RCP/2026/118

Recent advancements in nanotechnology in diagnostics and therapeutics for gastrointestinal disorders

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Abstract

Gastrointestinal (GI) disorders encompass a diverse range of pathological conditions affecting the oesophagus, stomach, intestines, and hepatobiliary system, often presenting with inflammation, infection, and malignancy. Conventional diagnostic and therapeutic approaches are frequently constrained by limited sensitivity, systemic toxicity, and poor target specificity. The advent of nanotechnology has revolutionised the landscape of GI research, offering innovative solutions through precisely engineered nanomaterials for enhanced diagnostics and therapeutics.Various nanocarriers, such as liposomes, polymeric nanoparticles, dendrimers, solid lipid nanoparticles, and metallic nanostructures, enable improved solubility, bioavailability, and controlled release of therapeutic agents for disorders including inflammatory bowel disease (IBD), colorectal cancer (CRC), and hepatic dysfunctions. In diagnostics, advanced nano systems, such as nanowires, iron oxide nanoparticles (IONPs), quantum dots (QDs), nano shells, carbon nanotubes (CNTs), and gold nanoparticles (AuNPs), have enabled multimodal imaging techniques, including MRI, CT, PET, and fluorescence imaging, significantly improving disease localisation and monitoring.Moreover, nano biosensors leveraging surface-enhanced Raman scattering (SERS) and near-infrared fluorescence (NIRF) technologies have demonstrated exceptional sensitivity in detecting GI biomarkers, facilitating early diagnosis and real-time disease tracking. Collectively, these advancements underscore the potential of nanotechnology as a cornerstone of precision medicine, promising safer, targeted, and more effective management strategies for GI disorders. Continued translational research and clinical validation remain essential to bridge the gap between experimental innovation and therapeutic application.

Keywords: Nanotechnology, Gastrointestinal Disorders, Nanoparticles, Nanocarriers.

ABSTRACT CODE: DBT/RCP/2026/119

Nanotechnology in Diagnostics and Therapeutics for Ocular Diseases

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Abstract

Ocular diseases constitute a major global public health concern due to their direct impact on vision and quality of life. According to global estimates, hundreds of millions of individuals suffer from visual impairment, with a substantial proportion affecting the elderly population. The effective management of ocular disorders remains challenging because of the unique anatomical and physiological barriers of the eye, including the corneal epithelium, blood–aqueous barrier, and blood–retinal barrier, which significantly restrict drug penetration and bioavailability. Conventional ocular drug delivery systems often fail to achieve optimal therapeutic concentrations at target sites, particularly in posterior segment diseases.By manipulating materials at the nanoscale (1–100 nm), nanotechnology enables improved physicochemical and biological properties that enhance drug solubility, stability, corneal permeability, and ocular residence time. Nanocarriers such as nanoparticles, liposomes, nanoemulsions, dendrimers, and polymeric micelles have demonstrated significant potential in targeted drug delivery, sustained release, and reduced systemic side effects.Nanotechnology-based strategies have shown effectiveness in addressing the underlying pathophysiological mechanisms of ocular diseases, including inflammation, oxidative stress, vascular dysfunction, neurodegeneration, and microbial infections. These approaches are particularly beneficial in managing conditions such as uveitis, cataract, age-related macular degeneration, diabetic retinopathy, glaucoma, and infectious keratitis. Furthermore, nanodiagnostic tools enhance early disease detection and monitoring, contributing to improved clinical outcomes.Overall, nanotechnology represents a transformative advancement in ocular diagnostics and therapeutics, offering opportunities to overcome conventional limitations and significantly improve patient care. Continued research and clinical translation are expected to further expand its role in ophthalmology.

Keywords: Nanotechnology; Ocular diseases; Ophthalmic drug delivery; Nanocarriers.

ABSTRACT CODE: DBT/RCP/2026/120

Herbs with immunosuppressive potential for the management of asthma

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Abstract

Asthma is a common disease that is rising in prevalence worldwide with the highest prevalence in industrialized countries. Asthma affects about 300 million people worldwide and it has been estimated that a further 100 million will be affected by 2025. Since the ancient times, plants have been exemplary sources of medicine. Current asthma therapy lacks satisfactory success due to adverse effect; hence patients are seeking complementary and alternative medicine to treat their asthma. Ayurveda and other Indian literature mention the use of plants in various human ailments. India has about 45 000 plant species and among them several thousand are claimed to possess medicinal properties. Numerous herbs were screened for their antiasthmatic activity such as *Asystasiagangetica, Glycyrrhiza glabra, Calotropis gigantea, Arisarum vulgare, Mentha longifolia, genus Inula. findings* indicates that these herbs can be useful for development of new antiasthmatic agents with least side effects.

Keywords: Asthma, Alternative medicine, Asystasiagangetica, Glycyrrhiza glabra.

ABSTRACT CODE: DBT/RCP/2026/121

Recent Advancements in Nanotechnology in Diagnostics and Therapeutics for Cardiovascular Disease

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Abstract

Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality worldwide, necessitating the development of advanced diagnostic and therapeutic approaches. In recent years, nanotechnology has emerged as a promising interdisciplinary field with significant potential to improve cardiovascular disease management. Advances in nanodiagnostics have enabled highly sensitive and specific detection of cardiovascular biomarkers using nanoparticles, nanosensors, and nano-enabled imaging agents, facilitating early diagnosis and precise disease monitoring. Nanotechnology has also enhanced cardiovascular imaging techniques, including magnetic resonance imaging and molecular imaging, by improving contrast resolution and target specificity.In therapeutics, nano-based drug delivery systems have demonstrated improved pharmacokinetics, targeted delivery, and controlled release of cardiovascular drugs, thereby minimizing off-target effects and systemic toxicity. Lipid-based, polymeric, and biomimetic nanoparticles are increasingly explored for the delivery of anti-atherosclerotic agents, thrombolytics, and gene therapies. Furthermore, nanotechnology has contributed to cardiovascular regenerative medicine through nanoparticle-assisted stem cell therapies and nanostructured scaffolds that support myocardial repair and angiogenesis. Despite encouraging preclinical outcomes, challenges related to biosafety, large-scale production, and regulatory approval hinder clinical translation. Continued interdisciplinary research and clinical validation are essential to fully realize the potential of nanotechnology in advancing cardiovascular diagnostics and therapeutics.

Keywords: Nanotechnology; Cardiovascular disease; Nanodiagnostics; Targeted drug delivery; Regenerative cardiology; Theranostics

ABSTRACT CODE: DBT/RCP/2026/122

GREEN NANOTECHNOLOGY IN DIABETES MANAGEMENT: ROLE OF PLANT-BASED SILVER NANOPARTICLES

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Abstract

Diabetes mellitus (DM) is a chronic, non-communicable metabolic disorder associated with persistent hyperglycemia and severe systemic complications. Conventional Antidiabetic therapies often suffer from limitations such as side effects, high cost, and lack of longterm efficacy. In recent years, green-synthesized silver nanoparticles have emerged as a sustainable and eco-friendly alternative with significant therapeutic potential.Several studies have reported the biosynthesis of AgNPs using medicinal plant extracts such as Azadirachta indica, Gamochaeta parviflora, and Allium sativum through green synthesis approaches. These plant-mediated AgNPs were characterized using standard physicochemical techniques including UV–Visible spectroscopy, FT-IR, DLS, and XRD. Literature findings demonstrate that green-synthesized AgNPs exhibit strong, dose-dependent anti-diabetic activity by inhibiting key carbohydrate-digesting enzymes (α-amylase and α-glucosidase), enhancing glucose uptake, reducing hepatic glucose production, and improving glycemic control in streptozotocin-induced diabetic models. Importantly, green synthesis offers distinct advantages over conventional chemical methods by eliminating toxic reagents, improving biocompatibility, and utilizing phytochemicals as natural stabilizing and reducing agents. Future prospects include the standardization of green synthesis protocols, detailed toxicity evaluation, and the integration of nanotechnology with targeted delivery and gene-based approaches. Overall, green-synthesized AgNPs represent a promising, safer, and sustainable Nano-medicine for future diabetes management.

Keywords: Green synthesis, Silver nanoparticles, Antidiabetic activity, Nanomedicine.

ABSTRACT CODE: DBT/RCP/2026/123

Recent advances and future prospects of nanotechnology in gene therapy: from Discovery to Delivery

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Abstract

Nanotechnology has revolutionized gene therapy by enabling precise, efficient, and safe delivery of genetic materials to targeted cells and tissues.Recent advances have introduced diverse nanocarriers such as liposomes, lipid nanoparticles, polymeric nanoparticles, dendrimers, and inorganic nanostructures for gene delivery.These nanocarriers effectively protect DNA, RNA, siRNA, mRNA, and CRISPR-Cas components from enzymatic degradation and premature clearance.Nanotechnology-based systems significantly enhance cellular uptake, endosomal escape, and transfection efficiency compared to conventional delivery approaches.Surface functionalization with ligands, antibodies, or peptides enables targeted gene delivery while reducing off-target effects and systemic toxicity.Stimuli-responsive nanocarriers allow controlled gene release in response to pH, temperature, redox conditions, or enzymatic activity.Integration of nanotechnology with gene therapy has shown promising outcomes in cancer treatment, inherited genetic disorders, cardiovascular diseases, and neurological conditions.From discovery to delivery, nanotechnology addresses key challenges including poor bioavailability, limited targeting capability, and immune responses.Recent preclinical and clinical studies highlight the improved therapeutic efficacy and safety of nano-enabled gene therapy platforms.Despite progress, challenges remain in large-scale manufacturing, reproducibility, long-term biocompatibility, and regulatory approval processes.Future prospects focus on developing multifunctional, biodegradable, and personalized nanocarriers for precision and patient-specific gene therapy.Overall, interdisciplinary research bridging nanotechnology, biotechnology, and medicine is crucial for translating laboratory discoveries into successful clinical gene delivery applications.

Keywords:discoveries, nanotechnology, transfection, efficiency.

ABSTRACT CODE: DBT/RCP/2026/124

Biotechnology and Life Science Gene Delivery

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Abstract

Gene delivery is a fundamental technique in biotechnology and life sciences that involves the introduction of foreign genetic material into host cells to study gene function or to treat genetic disorders. It plays a crucial role in genetic engineering, gene therapy, vaccine development, and molecular biology research. Various gene delivery methods have been developed, broadly classified into viral and non-viral systems. Viral vectors such as adenoviruses and lentiviruses offer high efficiency, while non-viral methods including liposomes, nanoparticles, electroporation, and microinjection provide safer alternatives with lower immunogenicity. Recent advancements in gene delivery technologies have improved targeting efficiency, reduced toxicity, and enhanced therapeutic potential. Despite significant progress, challenges such as immune responses, stability of genetic material, and controlled gene expression remain. Continuous research in gene delivery systems is essential.

Keywords:genetic, toxicity,therapeutic, efficiency.

ABSTRACT CODE: DBT/RCP/2026/125

Nano Gene Delivery System

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Abstract

Nano gene delivery is an advanced technique in biotechnology that uses nanotechnology to deliver genetic material such as DNA or RNA into target cells. In this method, nanoparticles like liposomes, polymeric nanoparticles, gold nanoparticles, or silica nanoparticles act as carriers that protect genes from degradation and help them enter cells efficiently. Nano gene delivery improves the stability, targeting ability, and controlled release of therapeutic genes, making gene therapy safer and more effective. It is widely used in the treatment of genetic disorders, cancer, and infectious diseases. Compared to traditional viral vectors, nano-based systems reduce immune reactions and toxicity. Due to their small size and customizable properties, nanoparticles offer great potential for future gene therapy and personalized medicine.

Keywords:genetic, therapy, nanoparticles,biotechnology.

ABSTRACT CODE: DBT/RCP/2026/126

Nano Gene Delivery System

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Abstract

Add a little bit of body gene therapy holds great promise for the treatment of genetic disorders, cancer and neuro degenerative diseases., however the safe and efficient delivery of nucleic acids remains a major challenge. Nano gene delivery systems have emerged as a powerful solution to overcome the limitations of conventional viral and non- viral vectors. These systems utilize nanoscale carriers such as liposomes, polymeric nanoparticles, dendrimers and inorganic nanoparticles to protect DNA and RNA from degradation, enhance cellular uptake and enable targeted delivery to specific tissues. Their small size and biocompatibility allow controlled release and improved therapeutic efficacy with reduced toxicity. Recent advancements in nanotechnology have enabled the development of multifunctional nanocarriers capable of crossing biological barriers, including the blood brain barrier, making them suitable for treatingneurological disorders such as Parkinson's and Alzhimer's disease. This review summarizes the types of nano gene delivery vectors, their mechanism of action, current biomedical applications, and the challenges associated with their clinical translation.

Keywords:translation, neurological, barriers, disorders.

ABSTRACT CODE: DBT/RCP/2026/127

Nanotechnology-Driven Innovations in Gene Therapy: Recent Advances and Future Perspectives

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Abstract

Nanotechnology has emerged as a transformative platform in gene therapy, addressing long-standing challenges related to gene stability, targeted delivery, cellular uptake, and controlled release. Recent advances in nanotechnology-based gene delivery systems have significantly expanded the therapeutic potential of gene therapy, moving it from experimental discovery toward clinical translation. Nanoparticles such as lipid-based carriers, polymeric nanoparticles, dendrimers, inorganic nanoparticles, and hybrid nanostructures have demonstrated improved protection of nucleic acids, enhanced transfection efficiency, and reduced off-target effects compared to conventional viral and non-viral vectors. Surface functionalization strategies, stimuli-responsive designs, and multifunctional nanocarriers have further enabled precise targeting, endosomal escape, and sustained gene expression. Emerging applications include RNA-based therapies, CRISPR-Cas gene editing, cancer gene therapy, and treatment of chronic and genetic diseases. Despite promising outcomes, challenges such as long-term safety, immunogenicity, scalability, and regulatory approval continue to limit widespread clinical adoption. Future prospects focus on improving nanoparticle biocompatibility, payload stability, and personalized delivery strategies, alongside advances in manufacturing and regulatory frameworks. This review highlights recent progress in nanotechnology-enabled gene therapy, emphasizing the transition from discovery to delivery and underscoring the potential of nanomedicine to redefine the future of precision genetic therapeutics.

Keywords: Nanotechnology, Nanoparticles, Nanostructures, CRISPR

ABSTRACT CODE: DBT/RCP/2026/128

In-vitro Anti-inflammatory Effect of Ginger Peel*(Zingiber officinale)*

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Abstract

Ginger (*Zingiber officinale*) is a well-known medicinal plant extensively used in traditional and modern medicine for its anti-inflammatory properties. While the rhizome has been widely studied, recent research has focused on ginger peel, an often-discarded by-product, as a valuable source of bioactive phytoconstituents. The present abstract summarizes recent in-vitro investigations (last five years) evaluating the anti-inflammatory potential of ginger peel extracts. Various in-vitro models, including inhibition of protein denaturation, membrane stabilization assays, nitric oxide scavenging, and suppression of pro-inflammatory enzymes and cytokines, have demonstrated significant anti-inflammatory activity. These effects are primarily attributed to phenolic compounds such as gingerols, shogaols, flavonoids, and other antioxidant constituents present in the peel. Comparative studies indicate that ginger peel exhibits comparable or, in some cases, superior activity to the rhizome, highlighting its pharmacological relevance. The findings support the potential utilization of ginger peel as a sustainable, natural anti-inflammatory agent and encourage further studies for isolation of active principles and mechanistic validation. This review underscores the importance of ginger peel in pharmacognosy and its possible application in the development of herbal anti-inflammatory formulations.

Keywords:cytokines,rhizome,phytoconstituents, extracts.

ABSTRACT CODE: DBT/RCP/2026/129

Invasomes: A Versatile Nanocarrier for Targeted Therapy

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Abstract

Invasomes are novel elastic lipid vesicular systems developed to enhance transdermal drug delivery. They are composed of phospholipids, ethanol, and terpenes, which collectively improve vesicle deformability and skin penetration ability. The presence of ethanol fluidizes the stratum corneum lipids, while terpenes act as penetration enhancers by disrupting the highly ordered lipid structure of the skin barrier. This synergistic mechanism enables invasomes to transport both hydrophilic and lipophilic drugs into deeper skin layers and systemic circulation.Compared to conventional liposomes, invasomes exhibit superior flexibility, higher drug loading efficiency, and enhanced permeation capacity. They have been successfully investigated for the delivery of corticosteroids, antifungals, antihypertensives, and anticancer agents. Invasomes offer advantages such as non-invasive administration, improved bioavailability, reduced first-pass metabolism, and better patient compliance.Due to their promising characteristics, invasomes represent an advanced and effective vesicular carrier system in the field of transdermal and topical drug delivery, with significant potential in pharmaceutical and cosmetic applications.

Keywords: Invasomes, Elastic lipid vesicles, Transdermal drug delivery, Terpenes, Penetration enhancers, Vesicle deformability, Enhanced skin permeation, Bioavailability improvement, Non-invasive drug delivery.

ABSTRACT CODE: DBT/RCP/2026/130

Polymeric Nanogels: A Promising Platform for Topical Therapeutics

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Abstract

Polymeric nanogels are nanosized, three-dimensional cross-linked polymer networks capable of absorbing large amounts of water while maintaining structural integrity. Their small particle size, high surface area, and tunable physicochemical properties enable efficient drug loading and enhanced penetration across the stratum corneum. These systems can be prepared using natural polymers such as chitosan, alginate, hyaluronic acid, and gelatin, as well as synthetic polymers including polyvinyl alcohol, Carbopol, polyethylene glycol, and poly(N-isopropylacrylamide). . Polymeric nanogels have shown considerable potential in the topical delivery of a wide range of drugs, including anti-inflammatory, antimicrobial, antifungal, antioxidant, and anticancer agents.The incorporation of therapeutic agents into polymeric nanogels improves drug stability, prolongs residence time at the site of application, and allows controlled and sustained drug release.

Keyword: Polymers, Nanogels, Surface, Skin.

ABSTRACT CODE: DBT/RCP/2026/131

Formulation and Evaluation of Miltefosine–Curcumin Transdermal Gel for Topical Treatment of Cutaneous Leishmaniasis

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Abstract

Cutaneous leishmaniasis (CL) is a neglected tropical disease affecting millions globally, characterized by disfiguring skin lesions. Oral miltefosine, though effective, causes systemic toxicity and teratogenicity, while curcumin, a natural polyphenol, offers anti-inflammatory and wound-healing properties with poor dermal bioavailability. In this study, we report the formulation and evaluation of a Carbopol-based hydrogel co-loaded with miltefosine (MTF) and curcumin (CUR) for topical delivery. The gels were optimized using varying polymer concentrations and permeation enhancers (propylene glycol and oleic acid). Physicochemical properties (pH,viscosity, spreadability, drug content), in vitro release, ex vivo permeation (porcine ear skin), skin retention, and biological activity (promastigote inhibition, amastigote reduction, keratinocyte cytotoxicity, skin irritation) were systematically investigated. The optimized gel (1% MTF + 1% CUR in Carbopol 940, with 10% PG and 5% OA) showed a pH of 5.8, pseudoplastic rheology, uniform drug content, sustained release over 24 h, and enhanced dermal retention while minimizing systemic permeation. Biological assays revealed synergistic anti-leishmanial efficacy, with significant intracellular amastigote clearance compared to single-drug formulations. Cytotoxicity studies confirmed biocompatibility, and no irritation was observed ex vivo. These findings suggest that MTF–CUR transdermal gel is a promising candidate for localized CL therapy.

Keywords: Cutaneous leishmaniasis, Miltefosine, Curcumin, Transdermal gel, Carbopol hydrogel, Franz diffusion, Topical therapy

ABSTRACT CODE: DBT/RCP/2026/132

Nanotechnology-Enabled Gene Therapy: Innovations in Precision Delivery and Therapeutic Translation

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Abstract

Gene therapy has emerged as a transformative approach for the treatment of genetic and acquired disorders by enabling precise modification, replacement, or silencing of disease-causing genes. However, efficient and safe delivery of genetic material remains a major challenge limiting its clinical translation. Recent advances in nanotechnology have revolutionized gene therapy by offering innovative platforms for targeted, controlled, and minimally invasive delivery systems. Nanocarriers such as lipid nanoparticles, polymeric nanoparticles, dendrimers, gold nanoparticles, and inorganic nanomaterials have demonstrated enhanced stability, reduced immunogenicity, and improved cellular uptake of nucleic acids including plasmid DNA, siRNA, mRNA, and CRISPR/Cas systems.The success of lipid nanoparticle-based delivery in mRNA therapeutics, exemplified by COVID-19 vaccines, highlights the clinical potential of nanotechnology-driven gene delivery systems. Functionalization strategies such as ligand conjugation, surface modification, and stimuli-responsive designs have further improved tissue specificity and reduced off-target effects. Additionally, advances in nanomaterial engineering have enabled co-delivery of gene-editing tools and therapeutic agents, enhancing therapeutic efficacy in cancer, inherited disorders, and neurodegenerative diseases.Despite these advancements, challenges including long-term safety, large-scale manufacturing, regulatory considerations, and potential toxicity remain critical concerns. Future prospects lie in the development of personalized nanomedicine, smart nanocarriers with real-time tracking capability, and integration with artificial intelligence for optimized design and delivery. Overall, nanotechnology continues to bridge the gap between gene discovery and clinical application, offering promising avenues for next-generation precision medicine and durable therapeutic outcomes.

Keywords: Gene Therapy, Nanocarriers, COVID-19, CRISPR, Neurodegenerative Diseases

About Institute at a Glance

Royal College of Pharmacy was established in the year 2004, by the society of Combined Academy of Technical Education, Raipur (C.G.). The institution has been approved by PCI, New Delhi and affiliated from Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.).

The institute is located at the heart of Raipur city at its own land with suitable infrastructure. It is well connected at 5 km distance from Raipur Railway Station. Other Institutions such as AIIMS, NIT, Pt. Ravishankar Shukla University are in close proximity to our institution.

We are committed to provide quality pharmaceutical education for Degree, Diploma and PG Courses and PhD Research works. Well-equipped laboratory, library and an excellent team of experienced teaching faculty have made it one of the premier institutes in Chhattisgarh State.

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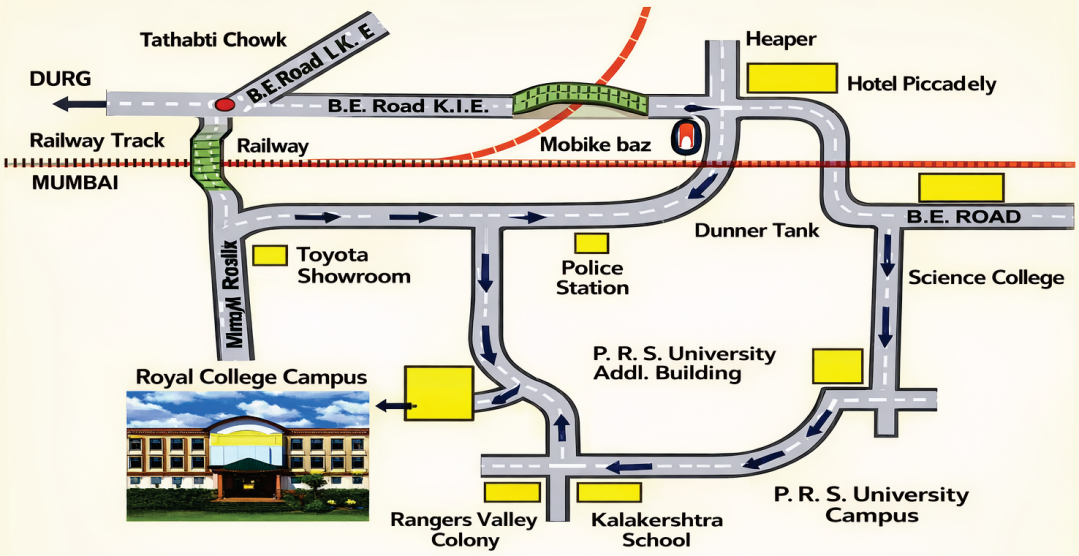

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