



AMITY
UNIVERSITY
— MADHYA PRADESH —

AMIPHARM

An Official Newsletter of Amity Institute of Pharmacy

Volume 2 Issue 2

Jan-June 2025



AMITY INSTITUTE
OF PHARMACY



VISION

To offer a value-based pharmacy programmes that facilitates to develop competent professionals and valuable citizens, who demonstrate excellence in the pharmacy disciplines, being locally and globally responsive in healthcare delivery and research.

MISSION

To provide innovative teaching and learning environment through technology-based delivery systems.

To promote a culture of value innovation and practices through education and practical training.

To promote education that enables the students to be successful individual with integrity, professionalism and a desire to contribute to society.



CONTENT

ABOUT AMITY INSTITUTE OF PHARMACY	3
FROM DIRECTORS DESK	5
EDITORIAL BOARD	7
FACULTY OF PHARMACEUTICS	8
FACULTY OF PHARMACEUTICAL CHEMISTRY	9
FACULTY OF PHARMACOLOGY	10
FACULTY OF PHARMACOGNOSY	11
STUDENTS ACHIEVEMENTS	12
STUDENTS PLACEMENTS	14
GLIMPSES OF EXTRA-CURRICULAR ACTIVITIES	16
PHARMA NEWS UPDATES	20
FACULTY AND STUDENTS ARTICLES	29
RESEARCH PUBLICATIONS	53
MEDIA COVERAGE	56



ABOUT AMITY INSTITUTE OF PHARMACY

Established in 2018, the Amity Institute of Pharmacy (AIP) approved by the Pharmacy Council of India (PCI), offers a range of pharmacy programs aimed at developing skilled, compassionate, and industry-ready professionals.

AIP offers the following academic programs:

- **Diploma in Pharmacy (D. Pharm)** – a two-year diploma program.
- **Bachelor of Pharmacy (B. Pharm)** – a four-year undergraduate program.
- **Master of Pharmacy (M. Pharm)** – a two year post graduate program with specializations in **Pharmaceutics and Pharmacology**.

AIP is accredited by the Committee for the Control and Supervision of Experiments on Animals (CCSEA) for conducting preclinical studies in both education and research. It is also recognized by the Indian Pharmacopoeia Commission under the Pharmacovigilance Program of India (PvPI) for monitoring and reporting adverse drug reactions.

Situated on a sprawling, eco-friendly campus, the institute provides a serene and intellectually stimulating learning environment. Its infrastructure includes spacious, air-conditioned lecture theatres and state-of-the-art laboratories, equipped with advanced instrumentation that supports high-quality academic and research pursuits.

The curriculum emphasizes industrial training, practice school modules, and research projects, effectively bridging the gap between academic learning and industry expectations. AIP is dedicated to nurturing not only competent pharmacy professionals but also ethical leaders with strong values and “Sanskaras”, ready to make meaningful contributions at the national and global levels.

To promote career readiness, the institute offers comprehensive placement training and facilitates a wide range of placement opportunities. AIP also conducts impactful community outreach programs and public health initiatives, instilling a sense of social responsibility among students.

Beyond academics, students are encouraged to actively participate in co-curricular and extracurricular activities, contributing to a vibrant and inclusive campus culture that supports holistic development and celebrates student excellence.

Year of Establishment
2018

Sanctioned Strength
400+30+60 (B. Pharm +
M. Pharm +D. Pharm)

Total Student Strength
(344)



Academic Program's
Diploma, UG & PG

Name of the Program
D. Pharm, B. Pharm and M. Pharm
(Pharmaceutics & Pharmacology)

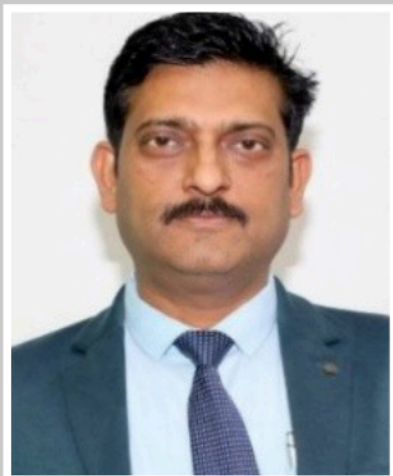
Faculty Ratio
1:13



Through the Kaleidoscope



FROM DIRECTORS DESK



Dear Readers

It is with great pleasure that we present the fourth edition of AMIPHARM, the official newsletter of the Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior. This issue encapsulates the institute's notable progress over the past six months—a phase distinguished by academic rigor, innovative endeavours, and a holistic approach to professional and personal development.

AMIPHARM continues to serve as a dynamic academic platform that fosters the dissemination of knowledge and promotes principles of sustainability, inclusivity, and educational excellence. It provides a forum for academicians, researchers, and aspiring professionals to engage in meaningful discourse and collaborative advancement within the ever-evolving domain of pharmaceutical sciences.

The current reporting period has witnessed a diverse array of academic and research-driven activities. Our dedicated faculty members have organized and participated in a series of impactful seminars, workshops, and community outreach programs focused on emerging challenges and innovations in the pharmaceutical sciences. Their scholarly contributions have been featured in high-impact journals and renowned academic publications from leading publishers such as Elsevier and Springer.

Furthermore, the enthusiastic involvement of our students across curricular, co-curricular, and extracurricular domains has been commendable. Their participation in academic symposia, technical exhibitions, cultural programs, and sporting events has significantly enriched the intellectual and cultural fabric of the institute, reinforcing our collective pursuit of excellence.

As we commemorate these accomplishments, we extend our sincere gratitude to all contributors, readers, and institutional stakeholders for their continued support and engagement. Your steadfast commitment to the mission of AMIPHARM and the advancement of pharmaceutical education and research is deeply valued.

Prof. Dr. Manoj Kumar Mishra

Director
Amity Institute of Pharmacy,
Amity University Madhya Pradesh,
Gwalior, Madhya Pradesh

FROM THE EDITOR-IN CHIEF



Dear Readers

It gives me the great pleasure to present you the 4th edition of our college newsletter AMIPHARM- a place for faculty and students to showcase their creativity, academic excellence and talent.

This edition captures the plethora of events connecting and harmonizing the various stakeholders of Amity Institute of Pharmacy, AUMP.

Event like conference, inter-college & inter-hostel competition, outreach activities, national seminars, scientific publications, GPAT & NIPER JEE achievement by students are some of the prominent reflections of last 6 months and each event illustrates the commitment of the Institute to the knowledge, ethics, and students welfare.

In the rapidly changing medical and healthcare world, the role of pharmacists is becoming more vital than ever. Amity Institute of Pharmacy, AUMP continues to nurture professionals who are not only academically sound but also socially responsible and ethically grounded. This newsletter is a testament to our endeavours, achievements, and the vision that propels us forward.

Readers, newsletter team has put sincere efforts in showcasing the different achievements of students and faculty members whose creativity, insights, and efforts have shaped this edition.

I extend my heartfelt gratitude to all the contributors. I also thank our readers for their continued encouragement and support.

As an Amitian let us learn, grow, and make a difference together.

Warm regards,

Dr. Mukesh Singh Sikarwar

Professor and Deputy Director

Amity Institute of Pharmacy

Amity University Madhya Pradesh

M: +916395867230 Ext: 6355

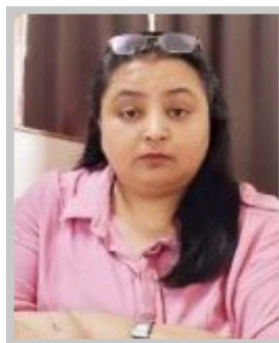
Email: mssikarwar@gwa.amity.edu



Prof. (Dr.) Mukesh Singh Sikarwar
Editor-in-Chief



Dr. Vikas Pandey
Editor



Dr. Zeba Siddiqui
Editor



Dr. Rajeev Sharma
Editor



Mr. Subham Agrawal
B. Pharm VIII Sem



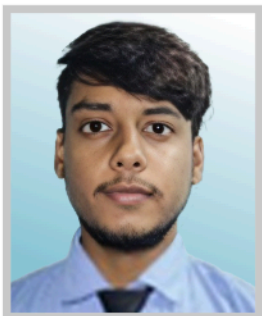
Ms. Palak Velankar
B. Pharm VIII Sem



Mr. Kushpal Rana
B. Pharm VI Sem



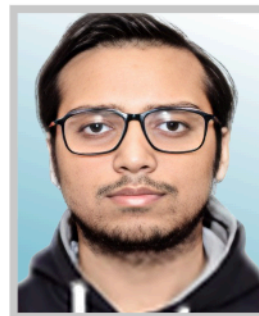
Ms. Roshni
B. Pharm VI Sem



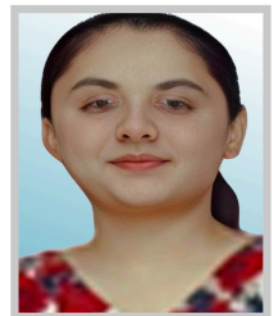
Mr. Arpit Bajpai
B. Pharm IV Sem



Ms. Mansi Chaubal
B. Pharm IV Sem



Mr. Harsh Gupta
B. Pharm II Sem



Ms. Simaran Kaur
B. Pharm II Sem



Dr. Neeraj Mishra
HOD, Professor



Dr. Vikas Pandey
Associate Professor



Dr. Jovita Kanoujia
Associate Professor



Dr. Ramakant Joshi
Associate Professor



Mr. Kapil Gupta
Associate Professor



Ms. Ankita Kishore
Associate Professor



Dr. Rajeev Sharma
Assistant Professor



Dr. Wasim Akram
Assistant Professor



Ms. Monika Vishwakarma
Assistant Professor



Dr. Sumit Sharma
Assistant Professor



Dr. Ram Babu Tripathi
HOD, Professor



Dr. Sathish K Mittapalli
Associate Professor



Dr. Pawan Kumar Gupta
Associate Professor



Dr. Pragyandip P. Dash
Associate Professor



Mr. Deepesh Parashar
Associate Professor



Mr. Hero Khan Pathan
Associate Professor



Dr. Ajay Mahor
Assistant Professor



Dr. Naveen Sharma
HOD, Professor



Mr. Talever Singh
Associate Professor



Dr. P. Sagar
Associate Professor



Dr. Monika Kaushik
Associate Professor



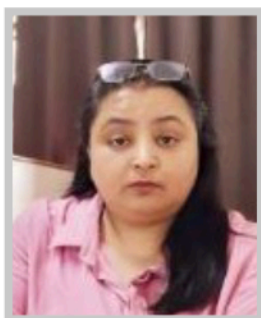
Mr. Arvind Singh Jadon
Assistant Professor



Mrs. MV Neethu
Assistant Professor



Prof. (Dr.) Mukesh Singh Sikarwar
Editor-in-Chief



Dr. Zeba Siddiqui
Associate Professor



Dr. Narendra Kumar
Assistant Professor



Dr. Devyani Rajput
Assistant Professor



Siddharth Dubey (B. Pharm VI Sem) proudly secured 2nd position in Inter Hostel & Inter Institution Yoga Competition 2024-25 — showcasing balance, strength, and dedication.



Congratulations Harshita Tomar and Tannu (3rd year) for securing second position in Scientific Model Competition organised by Divine International Group of Institutions



Congratulations Surya Pratap Singh Sikarwar for securing 2nd position in oral presentation in ITM National Conference on Pharmacy in Focus



AMITY
UNIVERSITY
— MADHYA PRADESH —

—♦Heartiest Congratulations♦—
**TO OUR GPAT & NIPER
JEE ACHIEVERS-2025**

Proud achievers from Amity Institute of Pharmacy shine
in national-level pharmacy entrance exams



PALAK VELANKAR
GPAT AIR- 290
NIPER-JEE AIR-109



PRABHAT KUMAR
GPAT AIR -716
NIPER-JEE AIR- 1275



ABHISHEK KUMAR
GPAT AIR- 1190
NIPER-JEE AIR- 2219



MADHAV KUMAR MISHRA
GPAT AIR -1289
NIPER-JEE AIR- 1259



AMAN SINGH CHAUHAN
GPAT AIR -1609
NIPER-JEE AIR- 840



AMAN SINGH RAJAWAT
GPAT AIR -2414
NIPER-JEE AIR-2282



HARSHIT SHARMA
GPAT AIR -3181



SHUBHAM SHARMA
GPAT AIR -3894
NIPER-JEE AIR- 1604



ROSHINI
GPAT AIR- 4297



DIPANSHU BHAGAT
GPAT AIR- 15238

Amity Institute of Pharmacy, Amity University Madhya Pradesh, proudly congratulates all the students for their successful campus placements in renowned organizations including Macleods Pharmaceuticals, H&H Health Care and Cosmetics Pvt. Ltd., Century Nova Drugs Pvt. Ltd, Charles Remedies Pvt. Ltd., and others. This milestone reflects AIP's commitment to academic excellence and career readiness through continuous guidance and industry engagement

S. No.	NAME OF STUDENT	PLACEMENT COMPANY
1	Raman Kumar Singh	H&H Health Care and Cosmetics Pvt. Ltd.
2	Akib Jawed	Charles Remedies Pvt. Ltd.
3	Gyan Prakash	H&H Health Care and Cosmetics Pvt. Ltd.
4	Shyam Babu	H&H Health Care and Cosmetics Pvt. Ltd.
5	Aniruddh Shaw	Century Nova Drugs Pvt. Ltd.
6	Priyanshu Singh Parihar	Century Nova Drugs Pvt. Ltd.
7	Harshit Sharma	Charles Remedies Pvt. Ltd.
8	Sumit Kumar	Cryoviva Lifesciences.
9	Nitish Kumar	Charles Remedies Pvt. Ltd.
10	Mohsin Reza	Charles Remedies Pvt. Ltd.
11	Priyanshu Kumar Choubey	H&H Health Care and Cosmetics Pvt. Ltd.
12	Narayan Sharma	Cryoviva Lifesciences.
13	Akash Dhakad	Macleods Pharmaceuticals Ltd
14	Aman Singh Rajawat	Macleods Pharmaceuticals Ltd
15	Anupam Singh	Macleods Pharmaceuticals Ltd
16	Komal Kumari	Macleods Pharmaceuticals Ltd
17	Madhav Kumar Mishra	Macleods Pharmaceuticals Ltd
18	Manish Kumar	Macleods Pharmaceuticals Ltd
19	Monu Kumar	Macleods Pharmaceuticals Ltd
20	Niraj Kumar Sharma	Macleods Pharmaceuticals Ltd
21	Prabhat Kumar	Macleods Pharmaceuticals Ltd
22	Rajdeep Mazumdar	Macleods Pharmaceuticals Ltd
23	Ananya Popli	Integrated Resources Inc.
24	Anushka Choudhary	Integrated Resources Inc.
25	Mansi Khatri	Integrated Resources Inc.
24	Monisha Sharma	Integrated Resources Inc.
25	Palak Velankar	Integrated Resources Inc.
24	Vanshika Jadon	Integrated Resources Inc.
25	Vartika Gupta	Integrated Resources Inc.

#FacultyAchievement

AMITY UNIVERSITY
MADHYA PRADESH

—◆Congratulations◆—

Dr. Vikas Pandey and Dr. Rajeev Sharma,
for publishing a book titled
**LIGANDS FOR TARGETED DRUG DELIVERY:
BASIC FUNDAMENTALS AND APPLICATIONS**



DR. VIKAS PANDEY DR. RAJEEV SHARMA

Published by Elsevier, 2025
(Paperback ISBN: 9780443333668; eBook ISBN: 9780443333675)

AMITY INSTITUTE OF PHARMACY

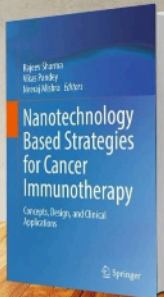
AMITY UNIVERSITY
MADHYA PRADESH

HEARTIEST Congratulations



Dr. Rajeev Sharma, Dr. Vikas Pandey, and Dr. Neeraj Mishra

For publishing a book titled
**"Nanotechnology-Based Strategies for Cancer Immunotherapy:
Concepts, Design, and Therapeutic Applications"**



published by
Springer Nature
ISBN **9819770211**

**Emerging Paradigms in
Delivery Systems for
Antitubercular Therapy**



Edited by
**Rajeev Sharma
Neeraj Mishra
Laxmikant Gautam
S.P. Vyas**

AP

HEARTIEST CONGRATULATIONS

to

Dr. Rajeev Sharma & Dr. Neeraj Mishra

on the successful

publication of their book titled

**Emerging Paradigms in Delivery Systems for
Antitubercular Therapy**

published by Elsevier,

2025 (ISBN: 978-0-443-24035-5).

The Amity Institute of Pharmacy, Amity University Gwalior, celebrated the Convocation Ceremony of the Class of 2024 on 15th February 2025. The event was a proud and joyous occasion, marking a significant academic milestone for the graduating students. Twenty-one students received their degrees during the event. The celebration was filled with emotion, reflection, and excitement as students, faculty, and parents came together to mark the beginning of a new chapter.

The convocation was graced with inspiring speeches and a dignified degree distribution ceremony. Dr. Manoj Kumar Mishra, Director, AIP, delivered the welcome address and, along with Dr. Mukesh Singh Sikarwar, Deputy Director, conferred degrees to the graduates. They were joined by senior faculty members, Dr. Neeraj Mishra, Dr. Naveen Sharma, and Dr. Ram Babu Tripathi, making the occasion even more memorable.

Special recognitions were awarded to outstanding performers.

Mr. Achlesh Tiwari and Mr. Navdeep Asthana were both honored with the Gold Medal for academic excellence. Mr. Achlesh Tiwari was also named the All-Rounder of the Batch for his exemplary overall performance. Ms. Anukrati Mishra received the Silver Medal and the prestigious Sri Baljeet Shastri Award, acknowledging her dedication and contributions throughout her academic journey.

The success of the ceremony was made possible by the dedicated efforts of Mrs. Neethu MV and Dr. Ramakant Joshi, who efficiently coordinated all aspects of the event. A heartfelt session allowed students to express their gratitude to faculty members, while a separate parent feedback session highlighted appreciation for the institute's quality education and holistic approach. The celebration concluded with a cheerful photo shoot in the C-Block foyer, capturing unforgettable moments of pride and joy. The event reflected the Institute's continued commitment to academic excellence and student success.





Degree distribution by Prof. Dr. Manoj Kumar Mishra (Director & Principal, AIP)



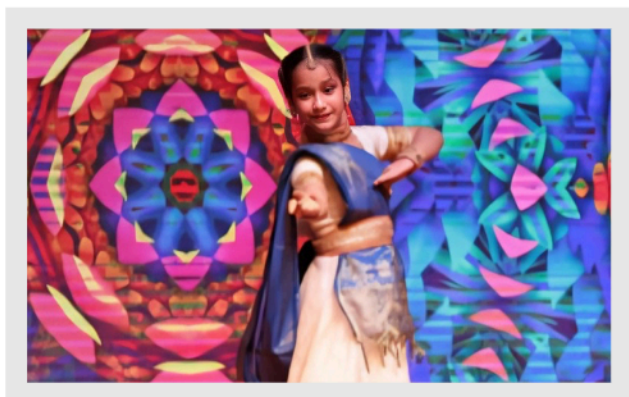
Interaction With Graduates and Their Parents

The Amity Institute of Pharmacy, AUMP, hosted a vibrant and energetic series of events as part of Amichroma 2025 on February 19th and 20th, 2025. The celebration featured five engaging events: Ami Puzzle, Gully Cricket, Table Tennis, Sizzle & Shake, and Battle of Melodies. The events were enthusiastically coordinated by faculty members—Mr. Arvind Singh Jadon and Dr. Devyani Rajput led Ami Puzzle, Table Tennis, Sizzle & Shake, and Battle of Melodies, while Dr. Narender Goel and Mr. Arvind Singh Jadon jointly coordinated Gully Cricket. Participation saw an overwhelming response, with several students registering for Ami Puzzle, 90 for Gully Cricket, 41 for Table Tennis, 60 for Sizzle & Shake, and 30 for Battle of Melodies. Among the many talented participants, Miss Palak Velankar earned the First Position in Battle of Melodies with her stellar performance. The events reflected the lively spirit and camaraderie of the student community, and all winners were felicitated with trophies and prizes, making Amichroma 2025 a memorable and spirited celebration of talent, teamwork, and creativity

BATTLE OF MELODIES



SIZZLE & SHAKE



AMI-PUZZLE

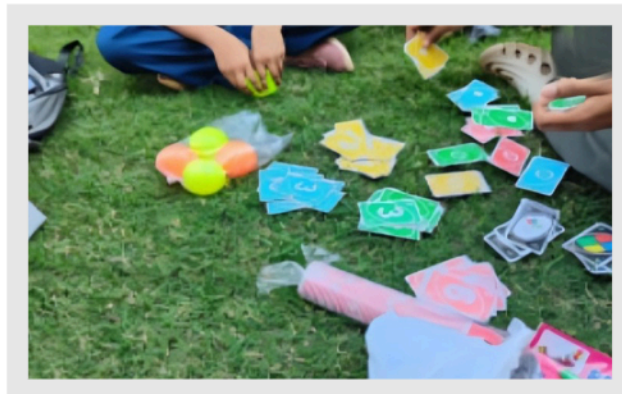
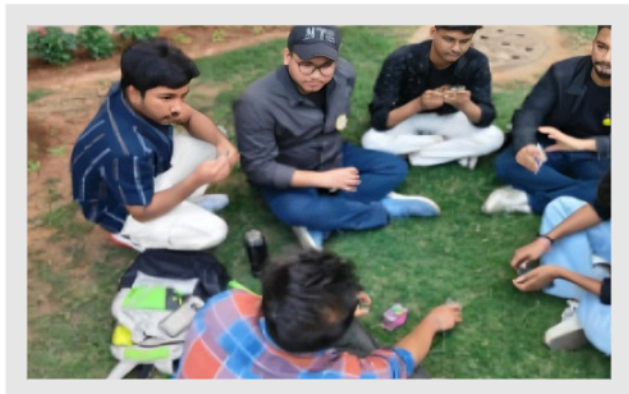
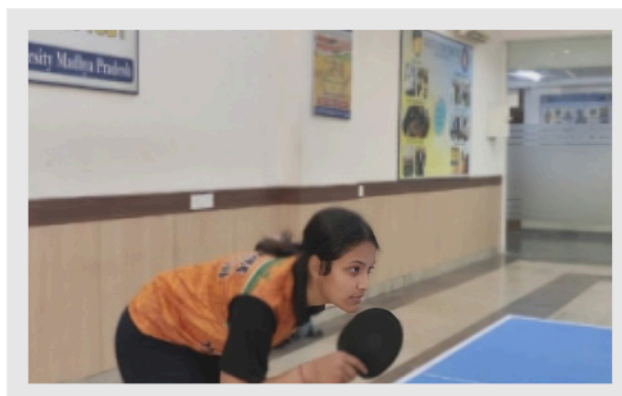


TABLE TENNIS



GULLY CRICKET



Seminar on Empowerment through Employment and Entrepreneurship Skills

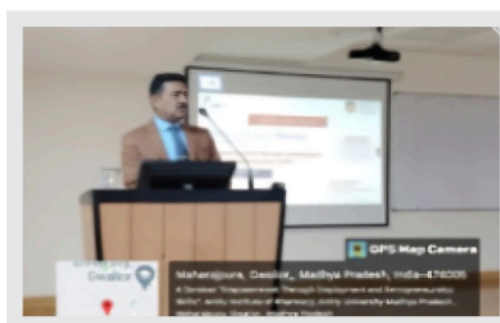
The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, in collaboration with the Institution's Innovation Council (IIC-AUMP), organized a seminar on "Empowerment through Employment and Entrepreneurship Skills" on 28th February 2025. The session witnessed enthusiastic participation from B. Pharm students, along with faculty members of AIP. The seminar was conducted under the guidance of Prof. (Dr.) Manoj Kumar Mishra, Director, AIP, and focused on skill development, career opportunities, pharmaceutical innovation, and awareness about startup schemes and incubation support.

The event began with a tribute to Goddess Saraswati, followed by a welcome address by Dr. Mishra, who emphasized the significance of bridging academics with industry readiness. Mr. Hari Om Sharma, Managing Director of Chemsynth Drugs & Pharmaceuticals Pvt. Ltd., and Executive Director of Alchemist Chemsynth Pharma Pvt. Ltd., New Delhi, was the invited expert speaker. His talk highlighted resume building, interview preparation, entrepreneurship, and business planning.

The session was interactive, with students engaging actively in discussions and Q&A. Mr. Sharma's approachable style and practical insights made the event highly impactful. The seminar successfully motivated students to explore career paths, develop essential skills, and embrace innovation and entrepreneurship in the pharmaceutical sector.



Lightening of lamp by guest speaker



Welcome Address by Dr. Prof. Manoj Kumar Mishra



Felicitation of Guest Speaker



Lecture Delivered by Guest Speaker



Student Interaction by Mr. Hari Om Sharma



Career Counselling Session on “Navigating Your Career Path with Alumni”

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, organized a Career Counselling Session titled “Navigating Your Career Path with Alumni” on 4th March 2025. The event witnessed the active participation of students and faculty members, coordinated by Dr. Jovita Kanoujia and Ms. Ankita Kishore, under the leadership of Prof. (Dr.) Manoj Kumar Mishra, Director, AIP.

The guest speaker, Mr. Adarsh Kumar Tiwari (Batch 2018–2022), currently Product Coordinator at Cavista Technology Pvt. Ltd., Maharashtra, shared his professional journey and offered practical insights into career development, industry readiness, and job opportunities. His interactive session provided valuable guidance on resume building, interview preparation, and networking.



Welcome of Guest Speaker



Students and Expert Interaction During Session

Community Outreach Program: AmiCare: Promoting Awareness About Water Borne Diseases



Felicitation of Contributors

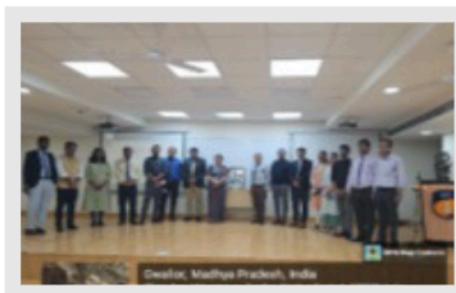
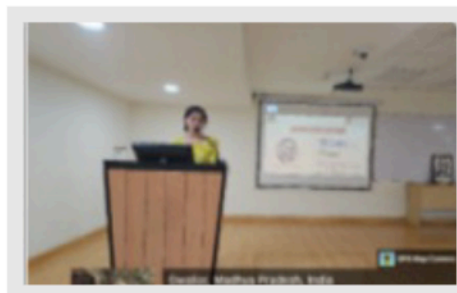


B. Pharm student volunteers

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, organized a community outreach program titled “AmiCare: Promoting Awareness About Water Borne Diseases” on 20th March 2025 at Gram-Birja, Gwalior, in alignment with the UN Sustainable Development Goal-3: Good Health and Well-being. The program was led by faculty coordinators Mr. Arvind Singh Jadon and Dr. Narender Kumar, with active participation of B. Pharm students.

An informative session was conducted by Mr. Jadon, followed by the distribution of fruits, face masks, and basic medicines to children and women at the local Anganwadi centre. Under the guidance of Prof. (Dr.) Manoj Kumar Mishra, the initiative successfully connected health awareness with community care. Mrs. Saheli, Anganwadi in-charge, was honoured with a memento in appreciation of her support.

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, celebrated Pharma Anveshan 2025 on 6th March 2025, commemorating the 123rd Birth Anniversary of Prof. Mahadeva Lal Schroff, the Father of Pharmacy Education in India. Aligned with the theme "Entrepreneurship & Startups in Pharma and Pharmacy Practice", the event featured a guest lecture by Mrs. Sapna Avinash Kondalkar, Research Officer, RARI-CCRAS, Gwalior, who shared expert insights on Intellectual Property Rights and Patent Filing. Over 250 students and faculty members participated in the session, which was coordinated by Mr. Deepesh Parashar and Dr. Ramakant Joshi, under the guidance of Prof. (Dr.) Manoj Kumar Mishra, Director, AIP. Dr. Mukesh Singh Sikarwar, Deputy Director, AIP, welcomed the guest and later delivered a heartfelt vote of thanks. Mrs. Kondalkar was felicitated with a certificate and memento as a token of appreciation.



Welcome Speech by Palak, Guest Speaker Lecture and Group Photo with Faculty

Educational Tour to Government Autonomous Ayurveda College & Hospital

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, organized an educational tour to Government Autonomous Ayurveda College & Hospital, Amkho, Gwalior on 26th March 2025. Led by Dr. Naveen Sharma, Mr. Hero Khan Pathan, and Dr. Jovita Kanoujia, the visit included 16 B. Pharm students. The tour aimed to bridge theoretical learning with real-world applications of Ayurvedic medicine, supporting UN Sustainable Development Goal 4 on quality education.

Students explored key hospital departments like Panchkarma, Shalakya, Shalya Tantra, and Stri-Roga, and observed therapies such as Shirodhara, Basti, and Snehana. They also visited the medicinal garden. Dr. Pavan Sharma warmly welcomed the team and facilitated demonstrations. As a token of appreciation, he was presented with a memento and plant sapling, acknowledging his support and hospitality.



National Conference on Artificial Intelligence in Drug Delivery and Design: From Innovation to Implementation

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, successfully organized a National Conference titled "Artificial Intelligence in Drug Delivery and Design: From Innovation to Implementation" on 15th April 2025. The event aligned with Sustainable Development Goal 9 and the National Mission for Artificial Intelligence, emphasizing inclusive innovation, industry-academia collaboration, and ethical AI integration in healthcare. Dr. Manish K. Chourasia, Senior Principal Scientist, CDRI, Lucknow, graced the event as the Chief Guest. The conference featured oral and poster presentations in a hybrid format (online and offline), fostering broad

participation.

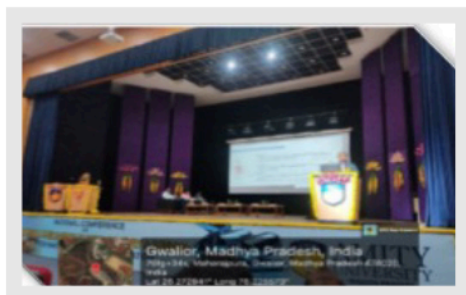
Discussions centred on AI-driven formulation design, personalized medicine, predictive modelling, bioinformatics, and regulatory challenges. The event was coordinated by Prof. (Dr.) Manoj Kumar Mishra (Convenor), Prof. (Dr.) Mukesh Singh Sikarwar (Co-Convenor), and Prof. (Dr.) Neeraj Mishra (Organizing Secretary), with active involvement from all AIP faculty. A heartfelt vote of thanks was delivered by Dr. Mukesh Singh Sikarwar, acknowledging the valuable contributions of the speakers, participants, and organizing team in making the conference a grand success.



Lamp Lighting: By Hon'ble Pro Chancellor and Chief Guest and Welcome Address by Hon'ble Vice - Chancellor, AUMP



Release of Conference Proceedings & Prize Distribution of Oral and Poster Presentation



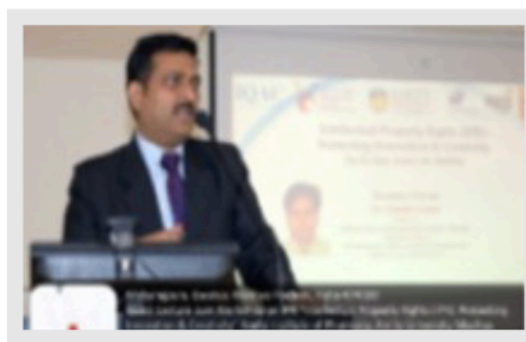
Address by Keynote Speaker Prof. Dr. Sanyog Jain and V. Ravichandran & Poster Presentation by Participants

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, organized a One Day Guest Lecture cum Workshop on "Intellectual Property Rights (IPR): Protecting Innovation & Creativity" on 15th April 2025. The session aimed to educate participants on the importance of IPR in safeguarding and monetizing innovations and research outputs. The expert speaker, Dr. T. Manish Kumar, Professor at Balaji Institute of Pharmaceutical Sciences, Warangal, and IP Trainer for NIPAM 2.0 (CGPDTM, Govt. of India), delivered insightful guidance on patent filing, legal frameworks, and commercialization strategies.

The event was successfully coordinated by Dr. P. Sagar and Dr. Monika Kaushik, and organized under the leadership of Dr. Manoj Kumar Mishra, Director, and Dr. Mukesh Singh Sikarwar, Deputy Director, serving as Convener and Co-convener respectively. Participants gained valuable knowledge on the strategic importance of IPR in research and entrepreneurship.



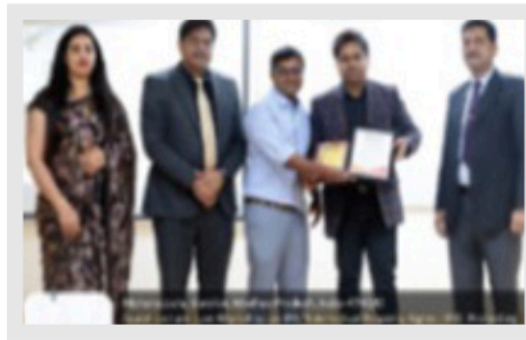
Welcome of Guest Speaker with Sapling



Welcome address by Director, AIP, AUMP



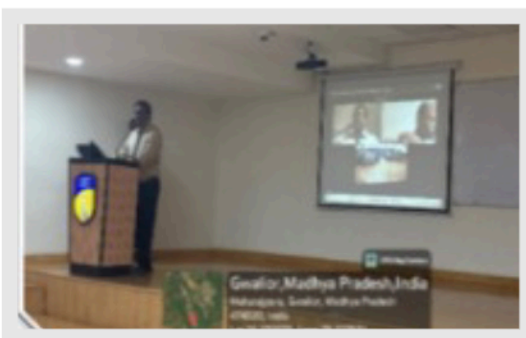
Guest Speaker Dr. T. Manish Kumar's Talk and Felicitation



Guest Lecture on Startup: From Idea to Execution

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, organized an Online Guest Lecture titled "Startup: From Idea to Execution", attended by B. Pharm 6th and 8th semester students and faculty. Under the guidance of Prof. (Dr.) Manoj Kumar Mishra, Director, AIP, the session focused on pharmaceutical entrepreneurship, innovation in drug development, startup schemes, incubation centers, and funding opportunities.

The event supported the Institution Innovation Council (IIC) and aligned with Sustainable Development Goal 9: Industry, Innovation, and Infrastructure. The keynote address was delivered by Dr. (Inv.) Shivakiran S. Makam, Chief Academics & Innovation Officer, HCG Enterprises Ltd., Bengaluru. Dr. Makam offered strategic insights into transforming ideas into successful ventures, equipping students with practical tools for entrepreneurship in the pharma and healthcare sectors



Community Outreach Program On: Promoting Awareness about Water Borne Diseases and Distribution of Health Supplements

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, in association with NGO Ek Kadam Vikas Ki Aur Welfare Society, Agra, organized a Community Outreach Program on 28th April 2025 focused on "Promoting Awareness about Water Borne Diseases" and distribution of health supplements. Dr. Naveen Sharma and Dr. Bansal addressed the villagers on causes, symptoms, and home-level treatments of common waterborne illnesses like cholera and diarrhea. ORS packets, fruits, and biscuits were distributed by faculty and students. The event supported SDG 3 – Good Health and Wellbeing, IQAC, Institution Innovation Council, and the Ayushman Bharat Mission.



Initiation of Outreach Program by Director, AIP



Distribution of Health Supplements by Students to Villagers



Interaction of Students and Villagers about Water Borne Diseases



Interaction of Students and Villagers about Water Borne Diseases

Guest Lecture on: The Next Step: Advancing Your Career Post-Graduation

The guest lecture highlighted the importance of continuous learning, skill development, and professional networking in shaping a successful career. It offered students practical insights on career planning, including setting achievable goals, identifying personal strengths and weaknesses, and building a clear career roadmap. Ms. Ananyaa Gupta's inspiring journey from campus to corporate life served as a strong motivational example, encouraging students to overcome challenges with confidence. Such alumni interactions not only boost student morale but also enhance the institution's reputation by showcasing success stories, attracting future talent, and reinforcing AIP's commitment to academic excellence and holistic student development.



Lecture by the Guest Alumni Speaker



Welcome & Felicitation of Guest Alumni Speaker

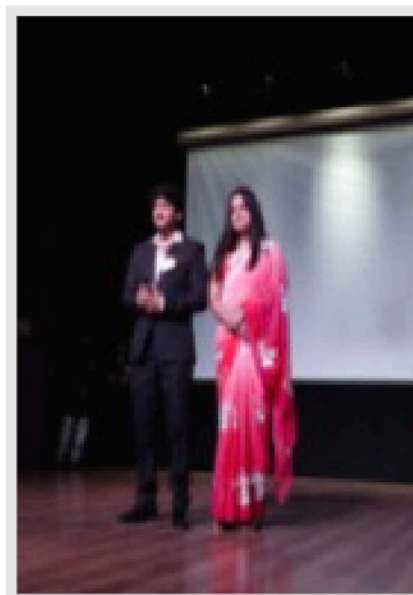
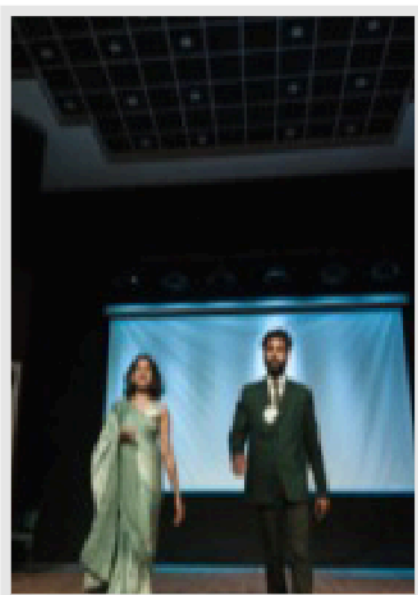


The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, successfully organized a One Day Industrial Visit Program on 17th May 2025 for the final-year B. Pharm students. The visit was conducted at Deft Organics Limited, Malanpur, Bhind, Madhya Pradesh. A total of 19 students actively participated in the program. They had the opportunity to observe various stages of production, quality control processes, and operational protocols followed in a pharmaceutical industry setup. The visit was planned and coordinated by Mr. Kapil Gupta and Ms. Ankita Kishore, Associate Professors at AIP, under the able guidance of Prof. (Dr.) Manoj Kumar Mishra, Director of AIP.



FAREWELL

The farewell celebration for the 2021–2025 batch of the Amity Institute of Pharmacy was held on 29th May 2025 in the B-Block Auditorium of Amity University Madhya Pradesh. The event, hosted by the 2022–2026 batch, was a heartfelt tribute to the graduating students, honoring their achievements and bidding them an emotional goodbye. by juniors and seniors, melodious singing acts, an energetic ramp walk, and fun games that brought laughter and joy to the gathering. Adding to the excitement, special titles were awarded to standout participants: Mr. Evening – Abhishek Kumar, Miss Evening – Anushka, Mr. Farewell – Kanha Sharma, and Miss Farewell – Vartika Gupta. The farewell served as a perfect blend of joy, nostalgia, and celebration, leaving everyone with cherished memories of their time at AIP.



Batch 2021-25

The Amity Institute of Pharmacy, Amity University Madhya Pradesh, Gwalior, celebrated the 11th International Yoga Day on Saturday, 11th June 2025. The event, themed “Yoga for One Earth, One Health”, aligned with the national campaign to promote well-being through yoga. Held on campus, the session included basic asanas, pranayama, and meditation practices, suitable for all participants. Faculty, non-teaching staff, and students actively engaged under the guidance of a certified yoga instructor. Emphasis was placed on integrating yoga into daily routines to enhance physical, mental, and emotional health. Educational insights on the benefits of postures and breathing techniques were also shared.

The event witnessed enthusiastic participation and effectively spread awareness on the importance of yoga. It reinforced the institute’s dedication to holistic health, motivating the community to adopt yoga as a sustainable lifestyle practice.



Wockhardt Develops India's First FDA-Approved Antimicrobial to Combat Antibiotic Resistance

Jan 2025

India's Wockhardt has developed nafithromycin, the country's first FDA-approved antimicrobial drug, to combat antibiotic resistance. Designed to treat community-acquired bacterial pneumonia (CABP), nafithromycin presents a potent alternative to azithromycin, which is increasingly ineffective due to resistance. In clinical trials, nafithromycin achieved a 96.7% cure rate, significantly outperforming traditional treatments. It offers eight times the lung exposure and ten times the potency of azithromycin, with fewer side effects and drug interactions. Developed over 14 years with a Rs 500 crore investment, nafithromycin received support from the Biotechnology Industry Research Assistance Council (BIRAC). Pending final approval from the Central Drugs Standard Control Organisation (CDSCO), the drug is set for a commercial launch by late 2025. The government plans to include it in the Ayushman Bharat scheme, ensuring its affordability and accessibility.

Source: Times of India.

GADD45A May Prevent Inflammation, Fibrosis, and Preserve Cardiac Function

May 2025

A recent study published in Cellular and Molecular Life Sciences has highlighted the crucial role of GADD45A in the heart, showing its potential to prevent inflammation, fibrosis, and apoptosis, which are key factors in heart failure progression. The study revealed that GADD45A deficiency in mice led to increased cardiac fibrosis, inflammation, and cell death, all contributing to adverse cardiac outcomes. The overexpression of GADD45A in human cardiomyocytes partially prevented these responses. Researchers suggest that GADD45A's ability to modulate stress signaling and cell damage could form the basis for new therapeutic approaches aimed at slowing heart failure. This discovery builds on prior research linking GADD45A to tumor suppression and metabolic regulation, offering hope for future treatments targeting cardiac dysfunction.

Source: McGovern, G. (2025). GADD45A May Prevent Inflammation, Fibrosis, and Preserve Cardiac Function. Cellular and Molecular Life Sciences.

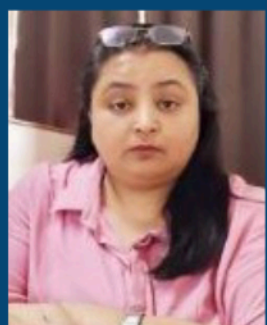
FDA Approves Ranibizumab Injection for Treatment of Diabetic Retinopathy

May 2025

Ranibizumab injection (Susvimo; Genentech) has received FDA approval as the first continuous delivery treatment for diabetic retinopathy (DR), a leading cause of vision loss. Susvimo delivers a customized ranibizumab formulation via a refillable eye implant, offering patients a treatment option with only one dose required every nine months, compared to the frequent monthly injections needed with other therapies. Diabetic retinopathy affects millions globally, causing blood vessel damage and fluid leakage into the retina. Positive Phase 3 results showed that Susvimo significantly improved DR severity, with no additional treatments required for one year. The drug provides a long-lasting alternative to traditional treatments, reducing the frequency of injections and potentially preserving vision in patients with DR. This innovative approach could significantly improve the management of diabetic retinopathy.

Source: Ferruggia, K. (2025). FDA Approves Ranibizumab Injection for Treatment of Diabetic Retinopathy. Roche.

ECOPHARMACOGNOSY: INTEGRATING SUSTAINABILITY IN CHEMICAL WASTE MANAGEMENT AND HERBAL DRUG RESEARCH



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1. INTRODUCTION

Pharmacognosy is the scientific study of crude drugs obtained from natural resources, while Ecopharmacognosy expands this scope by embedding the principles of sustainability into the discovery and utilization of biologically active natural products. This evolving discipline responds to the increasing environmental and ethical concerns associated with conventional drug discovery and herbal based pharmaceuticals by encouraging responsible sourcing, green extraction technologies, secondary metabolite production in culture and biodiversity conservation.

2. PLANT-BASED DRUG DISCOVERY AND THREATS TO MEDICINAL PLANT BIODIVERSITY

Plants have long served as a significant source of medicinal compounds. It is estimated that over 25% of modern pharmaceuticals are plant-derived, though only a limited number of plant species have been thoroughly investigated for their medicinal potential [1]. Ethnobotany yields key therapeutic agents such as morphine, aspirin, and ephedrine. As synthetic medicines encounter limitations, including antimicrobial resistance and long-term adverse effects, natural products continue to offer unparalleled structural diversity and potential for innovation.

Drug discovery through natural sources typically begins with the selection of plants having traditional efficacy and safety. These are authenticated and analyzed through phytochemical methods, often in consultation with traditional healers. The bioactive leads identified are then evaluated using *in vitro*, *in vivo*, and clinical models, in accordance with modern regulatory frameworks. During the 1980s, over 20 new drugs were

developed based on traditional medicinal knowledge [2]. Notable examples include parthenolide from *Tanacetum parthenium*, which acts as a selective inhibitor of the transcription factor NF- κ B, and prostratin from *Homalanthus nutans*, discovered through Samoan ethnobotanical research and explored for HIV treatment [3].

Despite such promise, medicinal plant biodiversity is under increasing threat. Overharvesting, habitat destruction, pollution, and the spread of invasive species are major drivers of species decline. According to estimates, around 15,000 medicinal plant species are at risk of extinction globally [4]. The unsustainable procurement practices of large pharmaceutical companies can render these resources inaccessible to the local populations who originally safeguarded their knowledge. Plants such as the Himalayan yew (*Taxus brevifolia*), the source of the anticancer drug paclitaxel, and *Podophyllum peltatum*, used to derive podophyllotoxin, face critical depletion.

Likewise, species such as Tongkat Ali and Kacip Fatimah are endangered in Southeast Asia, where conservation initiatives are still in early stages

2.1 Role of Ecopharmacognostical approach in preventing the overharvesting of plants in drug discovery and phytochemical production:

Post COVID-19 era, discovery of new drugs and re-purposing of drugs within short timeframe is accelerated by Computer-Aided Drug Design (CADD) and Artificial Intelligence (AI) driven tools. Docking studies in natural products aided by digital libraries for identifying potential drug candidates by virtually screening vast chemical spaces has become powerful tool in drug discovery. Techniques like cell and tissue cultures, 3D tissue culture (organs-

on-a-chip), computational and mathematical models and stem cell research are driving the current innovations.

Fourth Industrial Revolution (4IR) technologies can significantly complement ecopharmacognosy. 4IR, characterized by the convergence of physical, digital, and biological technologies, offers tools that can enhance the efficiency, precision, and scope of ecopharmacognosy research and practice. Artificial intelligence (AI) and machine learning (ML) streamline drug discovery by enabling rapid molecular docking, predictive modelling, and metabolite identification. These tools enhance reproducibility, ensure standardization, and support intellectual property rights through pattern recognition. AI also integrates data from clinical trials, improving efficiency and reducing human error. ML-driven taxonomic identification using PCR methods enhances botanical accuracy, which is essential for sustainable research and commercialization. The combination of AI, robotics, additive manufacturing, biotechnology, nanotechnology, and metabolomics forms the backbone of next-generation drug discovery programs, facilitating more ethical and eco-friendly pharmaceutical development.

Uprooting the plants and cutting down the forest for phytochemicals is now mitigated by biotechnology based secondary metabolite production. Biotechnological interventions further support conservation and sustainable production. Phytion Biotech's Plant Cell Fermentation

(PCF®) technology allows for the production of paclitaxel and docetaxel without trees. This process reduces solvent usage by over 80%, exemplifying a model of green pharmaceutical production. Similarly, Mitsui Petrochemicals developed shikonin from suspension cultures, while berberine has been synthesized using immobilized plant cell techniques. Advanced propagation methods such as shoot organogenesis and somatic embryogenesis have enabled the sustainable production of secondary metabolites from endangered species like *Euryodendron excelsum* [5].

3. Detrimental Impact of Pharmaceutical Practices on Environment

Pharmaceutical residues and chemical reagents used in drug production also contribute significantly to environmental pollution. Nearly 4,000 active pharmaceutical ingredients are in circulation globally, and improper disposal of these compounds results in contamination of water bodies, soil, and food chains. These residues include waste from human and veterinary pharmaceuticals, which can leach into ecosystems and cause biomagnification in crops and aquatic life. Techniques such as

Soxhlet extraction, liquid-liquid extraction, and accelerated solvent extraction often utilize volatile organic compounds (VOCs) like halogenated hydrocarbons and aromatic solvents, which are hazardous to both human health and the environment [6].

3.1 Role of Green Extraction Technologies to provide Sustainable Solution using Ecopharmacognosy approach

To mitigate the detrimental effects of organic and aromatic harmful chemicals on the environment, Ecopharmacognosy promotes the use of environmentally responsible extraction methods. Microwave-assisted extraction (MAE) significantly reduces solvent use and processing time. Supercritical fluid extraction (SFE), particularly with carbon dioxide, allows for efficient extraction without leaving toxic residues. Other green alternatives include ionic liquid-based extraction, ultrasound-assisted extraction, and enzyme-assisted extraction (EAE), all of which lower environmental impact while maintaining efficiency.

Pressurized liquid extraction (PLE) and water-based methods such as infusion and micellar extraction also support sustainability by minimizing chemical waste and enhancing compound yield [7].

Conclusion

Ecopharmacognosy represents a necessary and timely evolution in natural product research. It balances the urgent need for novel therapeutic agents with the imperative to protect biodiversity, uphold indigenous knowledge, and minimize environmental impact. The integration of green chemistry, biotechnology, and artificial intelligence positions this field as a cornerstone for sustainable drug discovery in the 21st century. By bridging traditional knowledge with contemporary science, ecopharmacognosy ensures that natural resources are used responsibly, equitably, and innovatively to benefit both global health and the environment.

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Regulatory Advancements by WHO, USFDA, and CDSCO: Fast-Tracking the Future

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Introduction

In the dynamic world of pharmaceuticals, timely regulatory approval of drugs is critical to public health. The COVID-19 pandemic dramatically reshaped the global regulatory landscape, compelling agencies such as the World Health Organization (WHO), United States Food and Drug Administration (USFDA), and Central Drugs Standard Control Organization (CDSCO) to implement innovative and accelerated pathways for drug and vaccine approvals. These adaptations were vital in facilitating the rapid development, review, and deployment of life-saving therapies and vaccines during a global health crisis. Mechanisms such as fast-track approvals, Emergency Use Authorizations (EUAs), rolling reviews, and real-time data assessments emerged as transformative regulatory tools. These allowed regulatory bodies to make timely decisions based on preliminary efficacy and safety data, significantly shortening approval timelines without compromising scientific rigor. As the world transitions into the post-pandemic era, these regulatory authorities continue to refine and institutionalize such expedited processes. Initiatives like the FDA's Project Orbis, WHO's Emergency Use Listing (EUL), and CDSCO's SUGAM portal signify a shift toward more agile and harmonized global regulatory systems. These changes not only enhance preparedness for future health emergencies but also hold the potential to accelerate the availability of innovative therapies for chronic and rare diseases, ultimately improving patient access

and public health outcomes worldwide.

1. Recent Developments and Trends

1.1 WHO: Strengthening Global Health Security

The World Health Organization (WHO) continues to play a pivotal role in global health governance by streamlining the evaluation and prequalification of medicines and vaccines, especially in low- and middle-income countries. One of its most impactful regulatory innovations, Emergency Use Listing (EUL), gained global attention during the COVID-19 pandemic. This framework remains crucial for rapid access to diagnostics, therapeutics, and vaccines during international health emergencies.

Recent Focus Areas: WHO has expanded the EUL framework beyond COVID-19 to include monoclonal antibodies, Ebola virus vaccines, and avian influenza interventions, indicating a preparedness strategy for potential zoonotic and pandemic threats [7]. Additionally, WHO has refined its Global Benchmarking Tool (GBT), which is used to assess and improve the maturity levels of national regulatory systems. The GBT promotes harmonization, quality assurance, and regulatory convergence among participating countries [1]. This benchmarking not only strengthens health systems but also fosters international collaboration in medicine regulation.

1.2 USFDA: Adopting Real-World Evidence and Accelerated Approvals

The United States Food and Drug Administration (USFDA) has taken significant strides in making drug development more

patient-centric and adaptive to emerging needs. The Accelerated Approval Program, initially launched to speed up the availability of treatments for serious conditions, has been expanded to integrate real-world evidence (RWE) and adaptive clinical trial designs. A notable example is the approval of lifileucel, the first tumor-infiltrating lymphocyte (TIL) therapy, which was granted under the Breakthrough Therapy Designation. This approval underscores the FDA's commitment to promoting innovative therapies for oncology and rare diseases [2]. In parallel, the FDA is increasingly incorporating digital biomarkers and patient-reported outcomes (PROs) to enrich clinical data and make assessments more reflective of real-world patient experiences. Moreover, the FDA's Project Orbis has emerged as a model of international collaboration, facilitating the concurrent review of oncology drugs among participating nations such as Canada, Australia, the UK, and Singapore. This initiative not only reduces duplication of work across regulators but also improves global access to life-saving treatments [3].



1.3 CDSCO: India Embraces Regulatory Reforms

The Central Drugs Standard Control Organization (CDSCO) of India has ushered in major regulatory reforms aimed at increasing transparency, digital efficiency, and timely access to essential medicines. The SUGAM portal is a cornerstone of this digital transformation, enabling online submission, tracking, and management of regulatory applications, thereby reducing administrative delays [4]. The New Drugs and Clinical Trials Rules, 2019 introduced accelerated pathways for drug approval, including waivers of local clinical trials, provisions for compassionate use, and priority review for therapies targeting unmet medical needs [5]. These steps align India's regulatory ecosystem more closely with global standards while promoting indigenous innovation. A landmark outcome of these efforts was the emergency approval of Gemcovac®-19, India's first mRNA-based COVID-19 vaccine, developed by Gennova Biopharmaceuticals. This approval in 2023 not only marked a milestone in Indian vaccine technology but also demonstrated CDSCO's agility in addressing urgent public health needs [6].

2. Emergency Use Authorizations (EUAs): Lessons and Legacy

Originally developed as a crisis response, EUA frameworks are now being repurposed for pandemic preparedness, biodefense,

and rare diseases. EUA pathways have demonstrated that science-based agility is possible without compromising safety. The focus is shifting towards preparedness toolkits, where EUA mechanisms are predesigned and embedded into public health protocols [7]. Globally, regulatory agencies are now emphasizing post-EUA pharmacovigilance to continuously monitor the long-term effects of fast-tracked products.

3. Global Harmonization and Collaborative Frameworks

As drug development becomes increasingly global, there is a growing emphasis on regulatory harmonization: The International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH) promotes uniformity in quality, safety, and efficacy standards [8]. WHO and other international bodies advocate for mutual recognition agreements (MRAs), allowing cross-border reliance on regulatory reviews. This collaborative approach reduces duplication of effort, increases efficiency, and ensures faster patient access to essential medications worldwide [9].

4. Implications for Pharmacy Professionals

Regulatory science is now at the forefront of pharmaceutical innovation. For pharmacy students, researchers, and practitioners, staying updated with regulatory developments is essential for success in domains such as: Regulatory Affairs,

keep us ahead in practice but also empower us to contribute more meaningfully to patient safety and global healthcare advancement

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Mental Health: A Challenge in Developing India

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Mental health has emerged as a major concern in India, a nation on the rise economically and technologically, yet burdened with deep-rooted stigma and inadequate mental healthcare systems. As societal pressures, urbanization, and digital exposure grow, so do the mental health crisis, affecting millions across the country. India is home to more than 1.4 billion people, making it the second-most populous country in the world. With such a vast and diverse population, mental health concerns vary significantly across regions, cultures, and age groups. According to the National Mental Health Survey of India (2015-16), nearly 14% of India's population requires active mental health interventions. Common disorders include depression, anxiety, bipolar disorder, schizophrenia, and substance abuse [1].

The World Health Organization (WHO) has estimated that India accounts for nearly 15% of the global mental, neurological, and substance use disorder burden. Suicide is the leading cause of death among those aged 15 to 29 in the country. These statistics highlight the urgent need for a robust mental health policy and infrastructure that can address this growing crisis. One of the most significant barriers to mental health care in India is the stigma attached to it. Mental illness is often misunderstood, perceived as a character flaw, weakness, or even a form of possession by evil spirits in rural areas. This results in discrimination, social ostracism, and denial of basic rights for those suffering from psychological conditions [2].

Families often hesitate to seek professional help due to fear of

social judgment or shame. In many cases, individuals are forced to suppress their symptoms or seek support from unqualified spiritual healers or quacks, which exacerbates their condition. This widespread stigma not only deters treatment but also isolates patients and deprives them of the support necessary for recovery [3].

Mental illness in India is often misinterpreted as a sign of weakness, madness, or supernatural influence. This results in social alienation, delayed diagnosis, and dependence on unqualified healers. India faces a critical shortage of mental health professionals. Only 0.3 psychiatrists and 0.07 psychologists per 100,000 people (WHO, 2017). Mental health services are urban-centric, leaving rural areas vastly underserved. Mental health receives less than 1% of the total health budget, indicating a severe lack of prioritization [4].

The Indian government has taken some steps to address mental health issues. The Mental Healthcare Act, 2017, was a landmark legislation that acknowledged the rights of people with mental illness and aimed to provide accessible and affordable mental health care. The act decriminalized suicide and emphasized patient dignity, consent, and autonomy in treatment decisions.

The National Mental Health Programme (NMHP), initiated in 1982 and revised over time, aims to integrate mental health with primary care and increase community participation. However, the implementation of these programs has been inconsistent, with limited budget allocations and a lack of proper monitoring mechanisms. Mental health continues to receive less than 1% of the total health budget, reflecting the low prioritization of the issue.

Despite growing online conversations and media campaigns, awareness remains limited, especially in rural and underprivileged communities. Mental health education is largely absent from school curricula, leading to misinformation and stigma from a young age. Increasing mental health advocacy by NGOs, influencers, and celebrities, and a Rise in youth-driven mental wellness movements India's digital transformation is creating new opportunities for mental health care delivery through teletherapy and mobile apps. These services are accessible, affordable, and private making them especially popular among youth and urban populations. There are certain limitations, such as rural areas lacking digital literacy, Concerns over data privacy, and regulatory issues. Digital innovation can help bridge the gap, but it must be implemented responsibly and inclusively [5].

Looking Ahead: A multi-pronged strategy is crucial for meaningful change. This includes increasing investment in

mental health services and workforce development, integrating mental health into primary care and public health policy, and introducing mental health education in schools and colleges. Additionally, it is essential to launch anti-stigma campaigns tailored to regional cultures and to expand digital mental health platforms while ensuring safety and quality.

Final thought

Mental health is not a luxury — it is a necessity for individual well-being and national growth. A developing India cannot afford to leave mental health behind. To build a stronger, more inclusive, and resilient society, mental wellness must be at the forefront of our development agenda.

Let's break the silence. Let's start the conversation. As India aspires to become a global superpower, it must ensure that the mental well-being of its people is at the core of its development agenda. Only then can we truly achieve the vision of a healthy and inclusive nation.

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Herbal Medicinal Plants Used in Pharmacological Management of Alzheimer's Disease

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1. Introduction:

Alzheimer's disease (AD) is a multifactorial, progressive, neurodegenerative disease that is characterized by memory loss, personality changes, and a decline in cognitive function. While the exact cause of AD is still unclear, recent studies point to lifestyle, diet, environmental, and genetic factors as contributors to disease progression [1]. Alzheimer's disease (AD) is one of the most significant global healthcare problems and is now the third leading cause of death in the United States. The pharmaceutical approaches developed to date do not alter disease progression. While etiology is incompletely understood, genetic factors account for the 5 to 10% of cases that are familial Alzheimer's, with the other 90 to 95% being sporadic [2]. Being heterozygous or homozygous for the Apo E4 allele significantly increases the risk of developing Alzheimer's. Efforts to find a cure for AD have so far been disappointing, and the drugs currently available to treat the disease have limited effectiveness, especially if the disease is in its moderate severe stage [3].

2. Pathogenesis:

Two characteristic features are seen in the brain of patients with AD.

1. Senile plaques contain extracellular deposits of amyloid-beta (A β), a peptide synthesized by breakage of abnormal deposits of A β are also found in blood vessels. A β precursors (genetic locus 21q21–22).
2. Neurofibrillary tangles, dense bundles of abnormal fibers in the cytoplasm of neurons which consist of an altered form of the microtubular-associated protein are found in patients with AD.

3. Stages of AD

- 3.1. Pre-symptomatic: mild memory loss with no functional impairment of routine activities.
- 3.2. Early: the appearance of several symptoms with loss of concentration and memory.
- 3.3. Moderate: increased memory loss and difficulty in reading, speaking, writing, and recognizing the family members, with the disease spreading in the cerebral cortex.
- 3.4. Severe: complete cognitive impairment due to accumulation of neuritic plaques proving fatal [4, 5].

Plant Name	Parts of Plant Used	Main Chemical Constituents	Role in Alzheimer's Disease
<i>Ficus carica</i> (Fig)	Mesocarp extract	β -Sitosterol, quercetin.	<i>Ficus carica</i> exhibits mild memory enhancing effect and evokes better learning ability and alter behavior.
<i>Zingiber officinale</i> (Ginger)	Rhizome and root Extract	Gingerols, shogaols, zingerone	It improves memory impairment induced by scopolamine via inhibition of acetylcholinesterase activity. antioxidant and a reducer of free radical, Zingiber officinale plays an important role in the treatment of AD
Ginkgo (<i>Ginkgo biloba</i>)	The leaves Extract	Flavonoids, steroids (stigmasterol and sitosterol), organic acids (ascorbic, shikimic acid, and vanillic acid).	Ginkgo biloba contributes to its neuroprotective properties by preventing various forms of oxidative and peroxidative brain damage in AD Alzheimer's disease.

Bacopa monnieri (Brahmi)	The leaves Extract	Bacopa saponins D, E, Antioxidant and neuroprotective effects and F, jujubogenin, and cognitive-enhancing effects. bisdesmosides, betulic acid, alkaloids, polyphenols, sterols.	
Ginseng (Panax ginseng)	The root Extract	Ginsenosides	Ginsenosides are believed to have anti-inflammatory and antioxidant effects and help improve cognitive function and slow the progression of Alzheimer's disease [7].
Turmeric (Curcuma longa)	Root Extract	Curcumin	Curcumin has potent antioxidant and anti-inflammatory properties and prevents the formation and accumulation of beta-amyloid plaques, a characteristic feature of Alzheimer's disease.
Ashwagandha (Withania somnifera)	The roots and leaves	Withanolides	Ashwagandha has potential in improving cognitive function and has neuroprotective effects against beta-amyloid-induced neurodegeneration in lab studies.
Convolvulus pluricaulis (Shankhpushpi)	leaves, stem, and flowers	Steroids, anthocyanins, flavonol glycosides, and triterpenoids.	Improvements in memory, anxiety relief, stress mitigation, neuroprotection, anti-inflammatory, antioxidant.
Green tea (Camellia sinensis)	Leaves	Epigallocatechin-3-gallate (EGCG).	It is thought to inhibit beta-amyloid aggregation and mitigate the neurotoxicity in Alzheimer's disease [8]

4. Herbal Treatment:

In recent years, interest in herbal medicine has grown, resulting in expanded research interest in the therapeutic use of plants to cure illness and improve health, often without causing major side effects. Herbs with anti-inflammatory and antioxidant properties can be useful in the treatment of AD. Acetylcholine deficiency is common in Alzheimer's patients. German chamomile, licorice, turmeric, and white willow bark are anti-inflammatory herbs that can help to reduce inflammation of the brain tissue in AD. Acetylcholine is a neurotransmitter that is essential for cognitive function and reasoning.

Due to the lack of a sufficient number of treatment options, the management of AD has remained a major concern for medical research over the years; only a few drugs have been developed and accepted by the US FDA as of today. Natural ingredients may be the ideal choice or producing an anti-AD drug due to their diversity of structures and functions [6].

5. Conclusion:

The potential of ethnomedicinal plants in the treatment of Alzheimer's disease (AD) is rooted in their ability to influence a

variety of mechanistic pathways implicated in the disease. These plants offer a range of bioactive compounds that may act on key pathological targets, such as amyloid-beta aggregation, tau protein hyperphosphorylation, oxidative stress, metal dysregulation, inflammation, and cholinergic deficit. Herbal therapy is now anticipated to control AD progression and help to relieve the symptoms related to AD. Herbal therapy can improve the life quality of patients with AD and memory deficits. Worldwide research is being done to find effective treatment of AD. Medicinal plants used in different systems of medicine particularly Unani system of medicine, exhibits their powerful role in management and cure memory disorders.

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Ancient Herbs Meet Modern Alzheimer's Research

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Introduction:

Alzheimer's disease is an age-related, progressive, irreversible neurological disorder that is caused by a deterioration in cognitive function, odd behavior, personality changes, and significant memory marked loss. The loss of identity, memories, and the capacity to identify even loved ones are all devastating consequences of Alzheimer's disease. Simple everyday chores become difficult as the illness worsens, leaving individuals reliant and disoriented.[1] 57 million individuals worldwide are estimated to be affected with Alzheimer's disease at the present time. By 2050, this number is predicted to increase significantly, possibly approaching 153 million. Alongside the rise in prevalence, the economic burden is also expected to rise; global costs related to ADODs are expected to reach INT\$14.5 trillion between 2020 and 2050.[2]

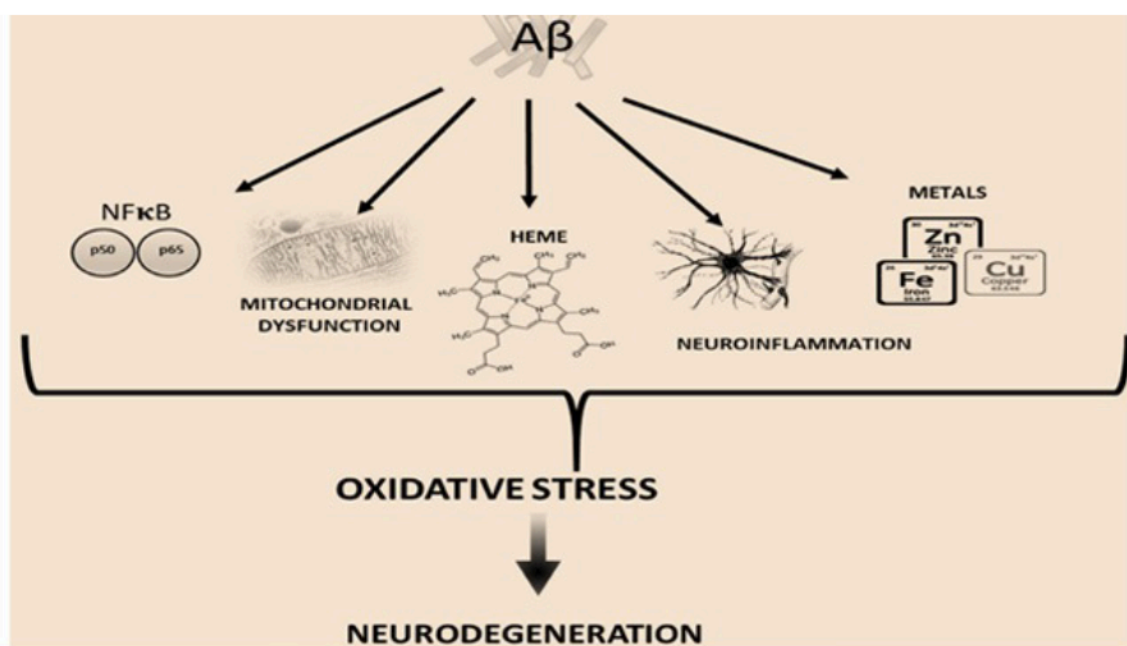


Figure: Aβ induces oxidative stress through multiple pathways, leading to neurodegeneration in Alzheimer's disease

UNDERSTANDING ALZHEIMER'S DISEASE: Studies on postmortem and cerebrospinal fluid (CSF) in Alzheimer's disease (AD) have shown a significant drop in acetylcholine (ACh) levels because of cholinergic neuron loss and decreased choline acetyltransferase activity. Important symptoms including disorientation and memory loss are associated with this deficit. Cholinesterase inhibitors, such as donepezil and rivastigmine, are used to alleviate this by preventing the breakdown of ACh and raising its levels. These medications can improve everyday functioning and provide short-term cognitive enhancement. These medications only address the symptoms but don't stop the disease's [3]

The molecular mechanisms of Alzheimer's disease (AD) have been widely explored, BUT the exact pathology remains uncertain. The most widely accepted explanation, the amyloid hypothesis, holds that the accumulation of amyloid beta (A β) in neurones and brain

tissue is the primary cause of synaptic and neuronal damage that leads to cognitive decline. The trapping of metal ions including iron (Fe), copper (Cu), and zinc (Zn) within amyloid plaques, together with their interactions with A β and amyloid precursor protein (APP), further enhances plaque growth and neurotoxicity. Oxidative stress is a crucial aspect of AD that leads to neuronal damage. Through the activation of glial cells and the release of pro-inflammatory cytokines, clinical studies have shown that neuroinflammation plays a critical role in the progression of disease. [4,5,6]

HERBAL MEDICINE: Many cultures have long employed herbal and complementary therapies to treat neurological illnesses, including neurodegenerative diseases like Alzheimer's. In both historical usage and contemporary scientific research, a variety of plant-based treatments have shown encouraging cognitive advantages over decades.[7] Since the 16th century, *Salvia officinalis* and *Salvia lavandulaefolia*, sometimes known as Spanish sage, have been used in Europe to enhance mental clarity and memory. These herbs are recognized to have antioxidant qualities that are helpful in AD and to increase cholinergic function. Strong neuroprotective herbs have been introduced by India's long history of using herbal medicine. Indian ginseng, or *Withania somnifera* (Ashwagandha), is a potent adaptogen. It includes bioactive substances that are known to lower oxidative stress and promote brain health, including withanolides withaferins, sitoindosides, and alkaloids like isopelletierine and anferine.[8] *Centella asiatica* (Mandukparni or Jalbrahmi), a small herb from the Apiceae family, is recognized for its memory-boosting and neuroregenerative effects. Its anti-inflammatory and antioxidant qualities enhance brain function and synaptic plasticity.[9] For thousands of years, Ayurveda has relied on *Bacopa monnieri*, often known as Brahmi, to improve memory and learning. Bacosides, brahmine, nicotine, herpestine, and new saponins like bacopasides I–XII are among its active ingredients; these substances promote neuronal signaling and guard against amyloid toxicity.[10] The "elixir of the mind," *Celastrus paniculatus* (Jyotismati), is a plant that thrives in India's mountainous areas. Sesquiterpenoids (malkanguniol), celastrol, paniculatadiol, and derivatives of agarofuran are among the neuroactive phytochemicals found in it. These substances may have neuroprotective benefits in AD and improve cognition.[11]

SCIENTIFIC EVIDENCE & RESEARCH: A study by Lisna Anisa Fitriana et al. (2021) demonstrated that administration of *Centella asiatica* at a dose of 500 mg/day for 20 weeks significantly improved semantic fluency and visual memory in elderly women with dementia. Compared to the placebo group, the *Centella asiatica* group showed marked cognitive improvement, with p-values less than 0.001 for both parameters, indicating strong statistical significance.[12] A research study was conducted by Raghav, Sangeeta et al. (2006) to evaluate the efficacy of standardized *Bacopa monnieri* extract (SBME) in individuals with age-associated memory impairment. Using a double-blind, placebo- controlled randomized design, participants received either 125 mg of SBME or a placebo twice daily for 12 weeks, followed by a 4-week placebo phase. The study demonstrated significant improvement in mental control, logical memory, and paired associate learning [13] A study was conducted by Choudhary et al. (2017), to evaluate the cognitive-enhancing effects of

Plant Name	Main Chemical Constituents	Role in Alzheimer’s Disease
Bacopa monnieri	Bacosides (I–XII), Brahmine, Nicotine, Herpestine	Enhances memory, protects neurons from β -amyloid toxicity, antioxidant, modulates neurotransmitters
Withania somnifera	Withanolides,Withaferin A, Sitoindosides, Isopelletierine,	Reduces oxidative stress, promotes neuronal growth, improves memory and cognition, anti-inflammatory
Centella asiatica	Asiaticoside, Madecassoside, Asiatic acid, Flavonoids	Antioxidant, neuroprotective, promotes dendritic growth, improve synaptic plasticity
Celastrus paniculatus	Celastrol, Malkanguniol, Paniculatine, Agarofuran derivatives, Polyalcohols	Enhances cognition, reduces neuroinflammation, protects synapses, inhibits acetylcholinesterase

Withania somnifera (Ashwagandha) root extract over an eight-week period. Participants receiving Ashwagandha showed significant improvements in immediate and general memory, as assessed by the Wechsler Memory Scale subtests. The treatment group also exhibited enhanced executive function, sustained attention, and processing speed, as indicated by improvements in the Eriksen Flanker task, Trail-Making Test, Wisconsin Card Sorting Test, and Mackworth Clock test. These results highlight Ashwagandha's potential as a natural cognitive enhancer in healthy adults.[14] A study was conducted by Faldu KG, Patel SS, and Shah JS to evaluate the neuroprotective effects of *Celastrus paniculatus* (CP) oil in a scopolamine-induced cognitive impairment rat model. Rats received scopolamine (2 mg/kg, i.p.) for 15 days. CP oil was tested as both a preventive and curative agent. Behavioral tests (MWM, NOR, CA) showed improved memory and learning. Biochemical analysis revealed increased dopamine, serotonin, antioxidants, and reduced AChE, MDA, IL-6, TNF α , and NF- κ B. Synaptophysin expression indicated improved synaptic plasticity, suggesting CP oil's strong neuroprotective potential.[15]

LIMITATIONS AND IMPLICATIONS: Further studies are necessary to directly compare current standard therapies for Alzheimer's disease (AD) with herbal remedies in terms of symptom control and overall effectiveness. One major limitation is the lack of clear understanding of the exact mechanisms of action of most herbal formulations. Additionally, existing studies often involve small sample sizes and short durations, which limit the reliability and generalizability of the results.

CONCLUSION: Herbal medicines show promise in managing Alzheimer's disease due to their neuroprotective, antioxidant, and anti-inflammatory effects. Herbs like *Bacopa monnieri*, *Withania somnifera*, *Centella asiatica*, and *Celastrus paniculatus* have demonstrated cognitive benefits in experimental and some clinical studies. However, their clinical use is limited by unclear mechanisms of action, small sample sizes, short study durations, and lack of standardized formulations. Additionally, few studies compare these herbs directly with standard Alzheimer's treatments. While the results are encouraging, more rigorous, large-scale, and long-term clinical trials are essential to confirm their effectiveness and safety, and to establish their role as complementary therapies in Alzheimer's care.

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Artificial Intelligence in Pharmaceutical Drug Discovery: Innovations, Regulatory Challenges, and Future Directions

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Abstract

Artificial intelligence (AI) has emerged as a transformative force in the pharmaceutical industry, particularly in the domain of drug discovery. From target identification to clinical trial design, AI-driven technologies are accelerating timelines, improving accuracy, and reducing costs. However, the integration of AI introduces a new set of regulatory, ethical, and operational challenges that must be carefully addressed. This review critically examines the recent innovations in AI-powered drug discovery, analyzes current regulatory frameworks, and explores the future trajectory of AI applications in the pharmaceutical landscape.

1. Introduction

Drug discovery has traditionally been a long, costly, and complex process, often taking over a decade and billions of dollars to bring a new molecule to market [1]. The integration of Artificial Intelligence (AI) — including machine learning (ML), deep learning (DL), and natural language processing (NLP) — is revolutionizing this paradigm by offering faster, data-driven insights into molecular behavior, disease pathways, and therapeutic outcomes [2]. The surge in biomedical data, coupled with advancements in computational power, has positioned AI as an essential tool in pharmaceutical research and development (R&D) [3]. Major companies like Pfizer, Roche, and AstraZeneca, along with tech-biotech collaborations (e.g., Google DeepMind and Isomorphic Labs), are actively investing in AI platforms to optimize the drug discovery pipeline [4].

2. AI Applications in Drug Discovery

2.1 Target Identification and Validation

AI algorithms can analyze vast datasets — such as genomic, proteomic, and transcriptomic data — to identify novel drug targets [5]. Deep learning models trained on protein interaction networks and biological databases like ChEMBL or UniProt can predict protein-ligand interactions with high precision [6].

Example: BenevolentAI uses machine learning to map complex disease mechanisms and propose viable therapeutic targets [7].

2.2 De Novo Drug Design

AI facilitates the de novo generation of molecular structures that exhibit desired pharmacological properties. Generative adversarial networks (GANs) and variational autoencoders (VAEs) can create novel chemical entities optimized for potency, solubility, and safety [8].

Example: Insilico Medicine developed the first AI-generated preclinical drug candidate (for fibrosis) in under 18 months [9].

2.3 Virtual Screening and Lead Optimization

AI streamlines virtual screening by predicting binding affinities, ADMET profiles (Absorption, Distribution, Metabolism, Excretion, and Toxicity), and drug-likeness scores, reducing the dependency on time-consuming wet-lab experiments [10].

Example: Atomwise's AI platform, AtomNet, has screened billions of compounds for diseases including Ebola and COVID-19 [11].

2.4 Clinical Trial Design and Patient Stratification

AI enhances clinical trial success by identifying suitable patient populations, predicting adverse events, and optimizing dosage regimens. ML models can forecast trial outcomes based on real-world data and previous study results [12].

Example: IBM Watson assists in protocol design and site selection based on historical trial data [13].

3. Regulatory Challenges in AI-Based Drug Discovery

3.1 Data Quality and Standardization

AI algorithms are only as good as the data they are trained on. Inconsistent, biased, or unstructured data can lead to erroneous outcomes. Regulatory agencies require data traceability, integrity, and standardization across platforms [14].

3.2 Algorithm Transparency and Explainability

Regulators demand transparency in AI decision-making. However, many AI models, especially deep neural networks, operate as "black boxes" with limited explainability. The FDA's Good Machine Learning Practice (GMLP) emphasizes algorithm interpretability as a cornerstone for approval [15].

3.3 Validation and Lifecycle Management

AI systems must undergo rigorous validation akin to any

analytical method. As models evolve with new data (dynamic learning), regulators are challenged with ensuring continued compliance and safety [16].

3.4 Intellectual Property and Ethical Concerns

Determining IP ownership for AI-generated molecules and addressing ethical issues (such as algorithmic bias) are still under debate in global regulatory circles [17].

4. Global Regulatory Landscape

- FDA (USA): Issued discussion papers on AI/ML-based Software as a Medical Device (SaMD). Emphasizes real-world performance monitoring and algorithm change control (FDA, 2021) [15].

- EMA (Europe): Initiated workshops and guidance on AI in medicine development, focusing on data reliability and model validation [14].

- ICH: Future guidelines may incorporate AI principles into Quality, Safety, and Efficacy frameworks (e.g., Q12, E6-R3) (ICH, 2023) [16].

- India's CDSCO and Japan's PMDA: Developing draft frameworks for AI-based tools in pharma and healthcare, promoting innovation while ensuring compliance [18][19].

5. Future Perspectives

The future of AI in drug discovery lies in hybrid intelligence — the collaboration between human expertise and AI reasoning. Key developments to watch include:

- AI-powered cloud platforms for real-time R&D collaboration
 - Quantum computing to enhance molecular simulations
 - Synthetic biology and AI convergence for next-gen biologics
 - Global regulatory harmonization for AI evaluation and approval
- Investment in AI-literate pharmaceutical workforces and ethical AI governance will be crucial for sustainable progress [4].

6. Conclusion

AI is undeniably reshaping pharmaceutical drug discovery by accelerating timelines, improving accuracy, and enabling innovative therapeutic strategies. However, realizing its full potential requires overcoming regulatory, technical, and ethical barriers. A collaborative approach involving industry leaders, regulatory bodies, academic institutions, and AI developers is vital

to create a robust, transparent, and safe AI ecosystem for drug discovery.

By harnessing the power of AI responsibly, the pharmaceutical industry can usher in a new era of precision medicine, global health impact, and patient-centric care.

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Cancer Immunotherapy: Transforming the Landscape of Cancer Therapy

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Introduction:

Today, cancer is a major health concern and one of the most leading causes of death across the world after heart disease. According to the World Health Organization (WHO), in 2025, an estimated 20 million new cancer cases and over 10 million cancer-related deaths are expected globally. This dramatic rise from previous decades highlights the growing burden and urgency for effective, safe, and targeted treatment approaches [1]. Despite advancements, conventional cancer therapies chemotherapy, radiotherapy, and surgery continue to suffer from significant limitations. Chemotherapy, while a widely used treatment, lacks specificity and indiscriminately targets both cancerous and healthy proliferating cells, leading to severe side effects. Radiotherapy and surgical interventions are often ineffective against metastases and are highly dependent on the stage and type of cancer. Moreover, the heterogeneity of cancer, its ability to evade immune surveillance, and the emergence of drug resistance further hinder successful treatment outcomes. Cancer is a complex, multistep disease marked by uncontrolled proliferation, invasion, and metastasis. It is characterized not only by genetic mutations—accounting for 5–10% of cases—but also by external factors such as viral infections (HBV, HPV, EBV), tobacco use, UV radiation, pollution, and sedentary lifestyles, which can trigger carcinogenic mutations [2].

Cancer and immune system

The immune system is complex network of cells, tissues, organs, and the bio-substances they help recognize “foreign invaders” and fight against infections or diseases. However, the immune system can recognize, eliminate, and subsequently protects the body from viral, bacterial infections, and the transformed cells (pre-cancer cell) extension [3]. The immune system can respond against cancer cells by reacting against tumor-specific antigens (molecules that are unique to cancer cells). Cancer immunologists investigated that cancer cells have the ability to suppress the immunity systemically as well as in and around the tumor

microenvironment. In addition to immunosuppressive molecules, the vesicular endothelial growth factor (VEGF), inhibitory cytokines- interleukin (IL-10), and transforming growth factor (TGF- β) [4], various human cancer cells also synthesize and release the immunosuppressive enzyme indoleamine-2,3-dioxygenase (IDO) [5]. This enzyme was reported as a regulator of autoimmunity which mediates and regulates the inhibition of T-cell activation. Murine tumors which produce TGF- β that convert antitumor effector T cells into regulatory T cells, could escape their own destruction by the immune cells. An increase in regulatory T cells population is observed in the peripheral blood of patients with head and neck cancer or melanoma [6].

Limitations of existing cancer therapies

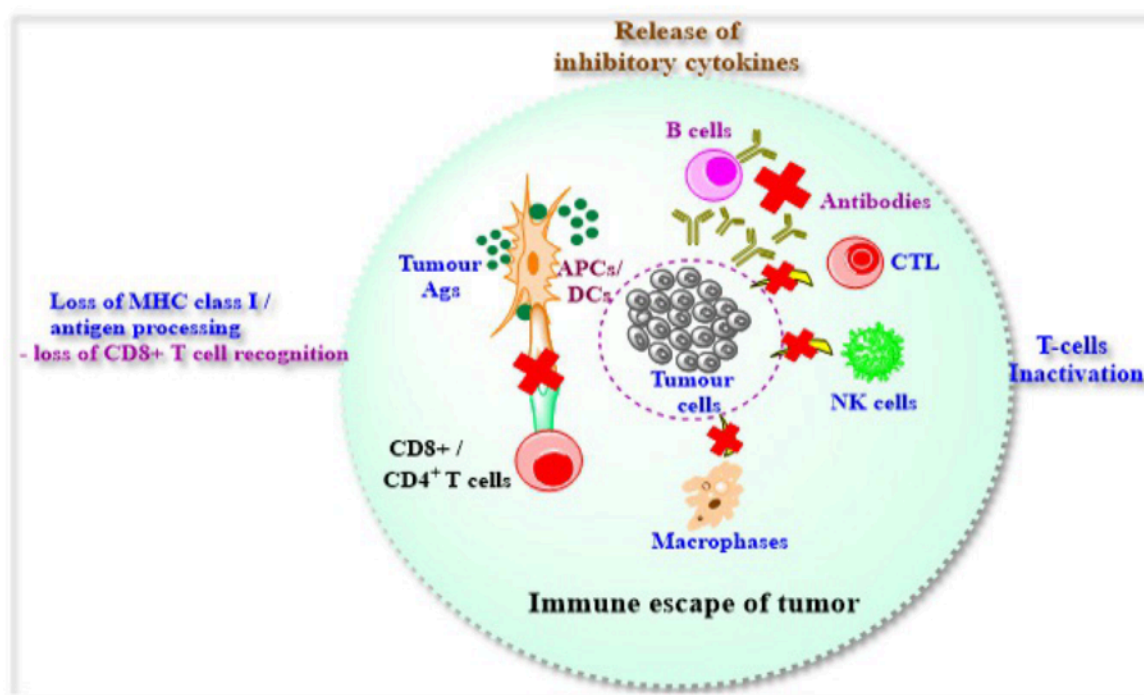
The existing curative treatments for cancer, i.e. chemotherapy, surgery and radiotherapy are generally successful if the cancer is detected at an early stage. The current treatments of cancer still have many major limitations as shown in the figure. Once the tissue has metastasized, these therapies are less successful. Sometimes logical combinations of existing therapies are effective but only for limited periods. Infact, it has been observed that single treatment regimens have limited ability to eliminate cancer cells owing to its heterogeneous nature. Although these approaches have improved the therapeutic efficacy of bioactive(s) with minimum systemic toxicity, much attention on development of effective approaches is still needed to reduce chemotherapy related side effects, prevent tumor evasion, drug resistance and increase patients’ compliance [7]

Basics and Strategies of Cancer Immunotherapy

Cancer cells often mimic normal cells at the molecular level, making it challenging for the immune system to distinguish them as foreign. In the early stages of tumor development, The body’s immune system—through a network of immune cells and signaling molecules—attempts to eliminate the such as macrophages, natural killer (NK) cells, cytotoxic T lymphocytes (CTLs),

and dendritic cells (DCs) often referred to as the "soldiers" of the immune system (Dhake, 2013). Among these, macrophages and dendritic cells serve as professional antigen-presenting cells (APCs). They process tumor-associated antigens and present them to T-helper (TH) cells via major histocompatibility complexes (MHC I and MHC II), initiating a cascade of immune activation [8].

These activated T-helper cells then stimulate cytotoxic T cells and other phagocytes (e.g., inactive macrophages and NK



abnormal cells, a process known as the elimination phase. However, some cancer cells develop resistance to immune attack and enter an equilibrium phase, where they persist in a dormant or minimally active state. Eventually, these resistant tumor cells may escape immune control altogether, leading to unchecked growth and disease progression. At this stage, the immune system fails to recognize tumor cells as "non-self." The goal of cancer immunotherapy is empowering the immune system—either by reprogramming it in vivo or manipulating it ex vivo—to recognize and destroy cancer cells more effectively. Alterations in the tumor microenvironment, including changes in the extracellular matrix, also play a role in tumor cell survival and immune evasion. Immunotherapy activates key immune components, cells, which in turn attack tumor cells through direct cytotoxicity or phagocytosis. In addition to T cells, B lymphocytes contribute to the antitumor response by producing tumor-specific antibodies, which help tag cancer cells for destruction and assist in recruiting other immune cells. One of the most promising aspects of immunotherapy is its ability to generate immunological memory, which can prevent tumor recurrence by enabling long-term immune surveillance. For lasting immunity, it is essential to prime both

cytotoxic effector T cells and memory T cells against tumor-specific antigens. Thus, cancer immunotherapy offers a dynamic and adaptive strategy for treating cancer, moving beyond direct cytotoxicity to engage the body's natural defenses for targeted and sustained tumor control [9]. Immunotherapy/vaccination helps to recognize the non-self-biomolecules associated with the cancer cells and helps body to fight against variant cancer cells.

Nanotechnology based immunotherapeutic approaches are aimed to induce tumor-specific T cells for its destruction.

Immunotherapy is thus expected to protect and improve the quality of life of cancer patients because of its low toxicity and also by preventing the remission of cancer.

For the development of effective cancer immunotherapy, certain limitations are to be addressed which include (a) identification of target antigen or antibody, (b) selection of appropriate adjuvant for immunity modulators. © Provision to overcome immune suppression that operates and used by the tumor, or by previous therapy (d) revoke immune suppression that operates in the case of cancer cells (d) Design and develop specific immune response vis a vis ensure for no possibility of an auto immunity as may be

caused by immunotherapy. In addition, enhancement of adjuvant activity through the use of nano delivery system(s) is particularly exciting, as synergistic effects are seen resulting in stronger immune responses. Targeting these immune suppressive populations as well as stimulating immune effector cells against tumors is a major goal of cancer immunotherapy. In a study, Kwong and their coworker observed that lipid based nanocarriers(s) could

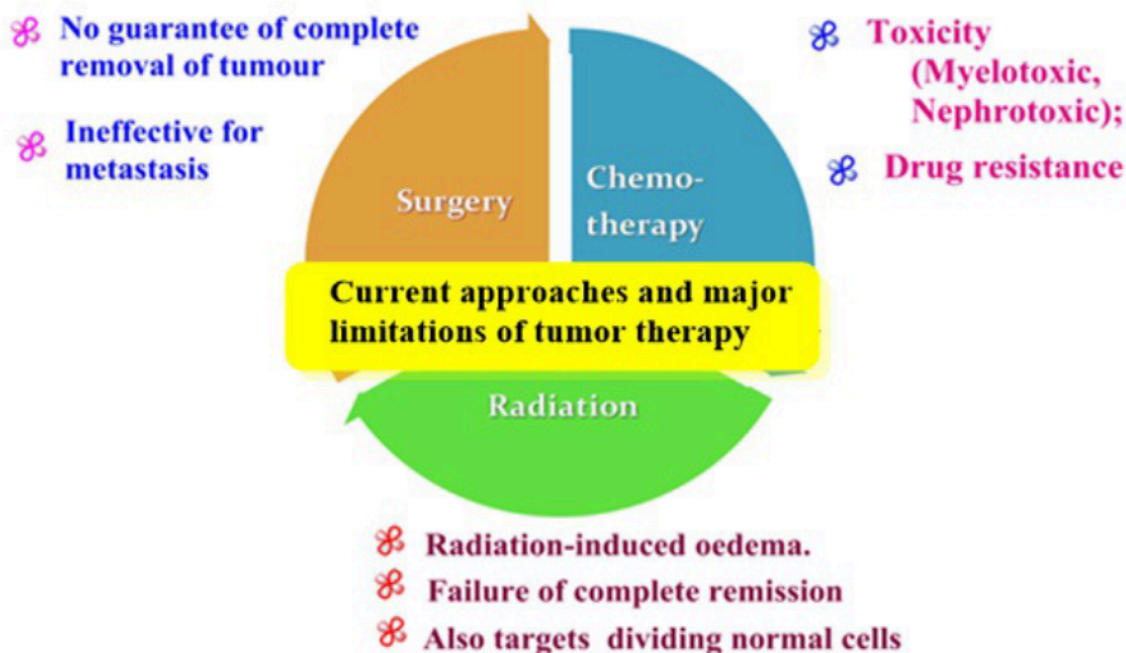
deliver the immune stimulatory CpG oligonucleotide and anti-CD40 antibody, inducing an enhanced antitumor response without release of inflammatory cytokines typically associated with cancer treatment [10].

Conclusion:

Today, Oncologists and researchers are continuously advancing new treatment paradigms for effective cancer management. Among these, the convergence of nanomedicine, nanobiotechnology, and collaborative efforts between immunologists and nanomaterial scientists has opened promising avenues for immune cell-mediated

therapies—collectively referred to as cancer immunotherapy. This approach harnesses the patient's own immune system to recognize and eliminate cancer cells. Nanocarriers, such as nanoparticles, liposomes, micelles, and dendrimers, have emerged as powerful platforms for the targeted delivery of antigens, antibodies, cytokines, or ligands. These can be administered either individually or in combination, in a programmed manner, to key immune components to induce a robust and long-

lasting effector and memory immune response. Importantly, certain nanocarriers possess intrinsic immunomodulatory properties, enabling them to function dually—as both immune stimulants and delivery vehicles. Although particle-based tumour immunotherapy is still in its early stages, it demonstrates significant potential. Recent studies have utilized both micro- and nanoparticles to co-deliver tumour antigens and immune-stimulatory agents directly to dendritic cells (DCs) and other professional antigen-presenting cells (APCs). Compared to conventional, non-particulate vaccine strategies, these nano-based systems have shown improved induction of



CD4+ helper and CD8+ cytotoxic T-cell responses, essential for tumour eradication. Nanoparticle-based strategies have also shown early promise in overcoming tumour-induced immunosuppressive mechanisms, further supporting their clinical potential. The primary objective of these systems is to elicit a strong systemic adaptive cytotoxic immune response, typically achieved by selectively targeting DCs with nanocarriers loaded with tumour antigens and adjuvants. These adjuvants

either possess intrinsic stimulatory properties or are co-encapsulated to provide secondary signals necessary for the activation and maturation of DCs. Several nanocarrier-based immunotherapies have yielded promising preclinical results, both in prophylactic and therapeutic contexts. Several have advanced to clinical trials (Phase I–III), demonstrating their safety profiles and potential therapeutic efficacy. However, predicting which specific nanopatforms will emerge as clinically

dominant remains premature due to the diversity and complexity of these systems. In summary, nanotechnology-enhanced immunotherapy represents a highly promising, next-generation approach to cancer treatment. By merging targeted delivery with immune activation, it offers the potential to overcome current therapeutic limitations and improve long-term outcomes in cancer patients.

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AMIPHARM





In-situ Gel: A Success Story in Drug Delivery

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Introduction

In-situ gel forming drug delivery systems offer a smart way to release medication. They start as a liquid that's easily applied to a target area. Once there, the body's natural environment triggers a change, causing the liquid to transform into a gel. This unique "sol-to-gel" transition allows for the sustained and controlled release of the drug, maintaining consistent levels in the bloodstream.

Application of in-situ Drug Delivery System

Oral administration: Oral in-situ gels are proving effective for treating gastric disorders. For instance, combining H₂-antagonists like ranitidine or famotidine with antacids in a gel form allows for local drug delivery, significantly boosting their effectiveness at

stomach wall receptor sites and reducing acid secretion. Beyond gastric applications, in-situ gelling pectin formulations have been developed for the sustained oral delivery of drugs like paracetamol and ambroxol. Another example is a thermosensitive chitosan-based hydrogel, reported for local paclitaxel delivery in cancer treatment, which improves drug bioavailability directly at the tumor site.

Nasal administration: In-situ gels are an innovative approach for nasal drug delivery, offering significant advantages over traditional nasal formulations like solutions or sprays. These systems are designed to be administered as a low-viscosity liquid that then transforms into a gel upon contact with the nasal mucosa, triggered by physiological changes like temperature, pH, or the presence of specific ions. In-situ gelling systems based on temperature-dependent phase transition are used for treatment of sinusitis. Bhalerao et al. studied nasal mucoadhesive in-situ gel of ondansetron, a serotonin receptor antagonist used in the treatment of nausea and vomiting that is associated with cancer chemotherapy.

Ocular administration: Conventional ophthalmic drug delivery faces significant challenges, primarily poor bioavailability and suboptimal therapeutic responses due to the rapid elimination of drugs by high tear fluid turnover. To address these limitations,

ophthalmic in-situ gels have emerged as a superior solution. These innovative systems are designed to transition from a liquid to a gel upon contact with the ocular surface, triggered by physiological stimuli such as pH, temperature, or specific ions. This sol-to-gel transformation significantly increases ocular residence time, thereby enhancing drug absorption and overall bioavailability. Numerous studies highlight the efficacy of various in-situ gel formulations. For instance, Chunjie et al. developed a pH-triggered in-situ gelling vehicle for puerarin, demonstrating improved corneal permeation. Similarly, Abraham et al. successfully formulated ion-activated and pH-triggered in-situ gels, respectively, for the antibacterial agents ofloxacin and ciprofloxacin, enhancing their efficacy in treating ocular infections like dacryocystitis, bacterial conjunctivitis, and corneal ulceration (1, 2).

Injectables administration: The field of injectable drug delivery has seen significant advancements, with a particular focus on in-situ gel-forming systems. These innovative formulations, administered as a liquid, transform into a gel within the body, offering sustained and controlled drug release. Researchers have explored various applications for these gels. For instance, Amsden et al. pioneered biodegradable injectable in-situ gel systems for drug delivery. Paavola et al. developed an injectable liposomal gel of ibuprofen for managing epidural pain, showcasing its controlled-release capabilities. Furthermore, chitosan hydrogels have been engineered as injectables for targeted cancer therapy. More recently, Kim et al. investigated biodegradable injectable gel systems based on MPEG-b-(PCL-ran-PLLA) diblock copolymers, which allow for an adjustable therapeutic window. Researchers also explored injectable in-situ forming systems for cancer chemotherapy utilizing novel tissue adhesives. These developments highlight the versatility and promise of injectable in-situ gels in modern medicine (3, 4, 5).

Periodontal administration: In-situ gels present a significant advancement for periodontal drug delivery, offering a more effective approach than traditional methods. Periodontal diseases, like gingivitis and periodontitis, are chronic

Brand Name	Gelling Agent	Active ingredient	Manufacturer
Timoptic-XE®	Gellan gum	Timolol maleate	Merk and Co.Inc
Regel depot technology	Poly(lactide-co-glycolide)-poly(ethylene glycol)-poly(lactide-co-glycolide)	Paclitaxel	Macromed
Cytoryn	Poly(lactide-co-glycolide)-poly(ethylene glycol)-poly(lactide-co-glycolide)	Interleukin	Macromed
Acid Jelly®^a	tragacanth gum and accacia gum	Oxyquinolone sulphate	Hope Pharmaceuticals
Conceptrol®	Sodium carboxymethylcellulose	Nonoxynol-9	Advance Care products
Gynol II®	Sodium carboxymethylcellulose	Nonoxynol-9	Janssen-cilag
Metrogel vaginal®^c	Carbopol 974 P	Metronidazole	3M Pharmaceuticals
Prostin E2®^c	Colloidal silicon dioxide	Dinoprostone	
Soft gel (Scherersol)	Poloxamer	Ibuprofen	R.P Scherer
Piroxicam gel	Poloxamer	Piroxicam	KRK, Hyal Pharmaceuticals

inflammatory conditions affecting the gums and supporting bone, often requiring sustained local drug release in the complex and dynamic environment of the periodontal pocket. Conventional treatments struggle with rapid drug clearance from the pocket due to gingival crevicular fluid flow and patient activities like eating and brushing. In-situ gels overcome this by being administered as a low-viscosity liquid that then transforms into a semi-solid gel directly within the periodontal pocket. This gelation is typically triggered by physiological factors such as temperature changes (thermosensitive), pH shifts, or the presence of specific ions (6).

Topical and Dermal applications: Gels as potential topical drug delivery systems possess advantages over traditional bases in terms of ease of application, and drug release characteristics. In-situ gels represent a promising advancement for transdermal drug administration, offering a superior approach for delivering therapeutic agents through the skin compared to traditional topical formulations. This method bypasses the gastrointestinal tract and first-pass metabolism, providing sustained systemic drug levels and enhanced patient compliance. Traditional transdermal patches or creams can suffer from limited drug permeation, inconsistent release profiles, or issues with adhesion

and patient comfort. In-situ gels overcome these challenges by being applied as a low-viscosity liquid that then transforms into a gel directly on the skin's surface. This gelation is typically triggered by external stimuli like temperature changes (thermo-sensitive gels), pH variations, or solvent evaporation (7). Overcoming Challenges in Pharmaceutical Delivery with In-situ Gels The pharmaceutical industry consistently strives to provide effective and patient-friendly treatment options. In-situ gel formulations represent a promising, albeit challenging, drug delivery system in this pursuit. While many in-situ gel products are still under development, a few have successfully reached the market, demonstrating their potential. (For specific examples and qualitative compositions, refer to Table 1.)

Conclusion

Over the past two decades, significant research has focused on controlled drug release from polymeric systems, leading to numerous clinical and commercial successes. This review highlights the immense potential of novel in-situ gelling systems to enhance the efficacy, bioavailability, and pharmacokinetic properties of therapeutic agents across various diseases. In-situ gels are particularly promising for both systemic and local vaginal drug delivery. Ongoing research continues to refine

development in this area positions in-situ gelling systems as a true success story within the field of drug delivery.

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Heart Attack Demystified: What You Need to Know About Myocardial Infarction

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Introduction:

Myocardial infarction is described as a type of acute coronary syndrome caused by pathological event in the setting of myocardial ischemia with the marked cardiac insult and injury. Myocardial infarction (MI), commonly known as a heart attack, results from a significant reduction or complete cessation of blood flow to a portion of the myocardium. MI can occur 'silently' and remain undetected, or it may present as a sudden and catastrophic event, leading to hemodynamic instability and even sudden cardiac death. It is a clinical manifestation of coronary artery disease (CAD), one of the most widespread cardiovascular conditions globally [1].

Over the past four decades, there has been a substantial evolution in our understanding of MI pathogenesis, which has catalyzed the development of innovative treatment approaches and significantly improved patient survival. This expanding knowledge has ushered in a paradigm shift in clinical management—from the traditional method of extended bed rest and passive recovery to modern practices that emphasize early discharge, often within 2 to 3 days. This transformation is largely credited to the introduction of immediate reperfusion strategies and the consistent application of guideline-directed medical therapies [2].

Epidemiology

Globally, cardiovascular diseases are the foremost cause of mortality and myocardial infarction being the key component of CVD. Worldwide, CVD led to 17.9 million deaths in 2016 signifying 31% of total global deaths. It is expected that by 2030 due to CVD 2,36,00,000 individuals will expire [3]. More than 75% of CVD deaths occurred in developing countries. Of this, 82% of CVD deaths occurred in low- and middle-income countries. The South Asian countries of India, Pakistan, Nepal, Bangladesh, and Sri Lanka accord to the utmost incidence of CVDs [4]. In developed countries, the prevalence of age-specific myocardial infarction is seen more in older above 75 years compared to younger below 45 years whereas the contrast

of this i.e., the highest prevalence of myocardial infarction seen in younger than 45 years of age compared to those elder than 60 years in South Asian counties. Sex-wise prevalence of myocardial infarction in men was about three times greater than for women. The Global Burden of Disease survey estimated that the age standardized CVD death rate of 272 per 100000 people in India, which is higher than the global average of 235 per 100000 people [5].

Types of Myocardial Infarction:

ST-Elevation Myocardial Infarction (STEMI)

- Complete occlusion of a coronary artery
- Full-thickness (transmural) myocardial necrosis
- Characterized by ST-segment elevation on ECG

Non-ST-Elevation Myocardial Infarction (NSTEMI):

- Partial or temporary occlusion
- Subendocardial (partial thickness) necrosis
- No ST-segment elevation, but elevated cardiac biomarkers [1]

Etiology of Myocardial Infarction:

Myocardial infarction may occur due to cardiac and non-cardiac ailments which may lead to a mismatch of oxygen demand and supply.

The major etiological factor responsible for the development of myocardial infarction is atherosclerosis. In 90% of cases of myocardial infarction obstruction of a coronary artery due to rupture and erosion of atherosclerotic plaque leads to development of coronary thrombosis [6]. This coronary thrombosis by the different cascade of mechanisms causes the activation of platelets and its aggregation which in turn activates the coagulation cascade thereby leading to vasoconstriction of endothelium leading to coronary occlusion which decreases the supply of oxygen to myocardial tissue thereby leading to myocardial infarction.

Other Causes of myocardial infarction or ischemia stratified by etiology include the following:

Atherosclerosis – The buildup of cholesterol-rich plaques in

coronary arteries.

Plaque Rupture or Erosion – Causes exposure of thrombogenic material, triggering clot formation.

Thrombus Formation – A blood clot occludes the artery.

Coronary Artery Spasm – Temporary constriction of the artery (e.g., in Prinzmetal's angina).

Embolism – A clot from elsewhere (e.g., heart valves) lodging in a coronary artery [7].

Pathophysiology of Myocardial Infarction:

Myocardial infarction is a consequence of a series of events initiated by plaque rupture and thrombosis, leading to ischemia, cell death, and ultimately, scar formation in the heart muscle [8].

Atherosclerosis leads to the buildup of plaques in coronary arteries. When a plaque ruptures, platelets aggregate at the site, forming a thrombus (clot).

This clot occludes the coronary artery, leading to ischemia (inadequate oxygen supply).

Prolonged ischemia (>20–30 minutes) causes irreversible myocardial cell injury and necrosis.

Diagnosis of Myocardial Infarction:

A diagnosis of myocardial infarction is done by assimilating the history of the presenting illness through a physical examination with electrocardiogram (ECG) tracings, cardiac biomarkers and through angiography. According to the fourth universal definition of myocardial infarction, the elevation of cardiac troponin (cTnT) values by a minimum incentive over the ninety-ninth percent higher locus limit is the main diagnostic criteria [1].

Myocardial infarction in a scientific scenery is utmost frequently recognized through individual's past besides electrocardiogram.

Following diagnosis tools are used:

Electrocardiogram (ECG)

- Primary tool for detecting ST-segment changes, Q waves, and T wave abnormalities.
- Helps differentiate STEMI from NSTEMI.

Cardiac Biomarkers

- Troponins (I and T): Most specific and sensitive; elevated within 3–6 hours, peak at 12–24 hours.
- Creatine Kinase-MB (CK-MB): Useful in reinfarction detection.

Imaging

Echocardiography: Detects wall motion abnormalities and ejection fraction. Coronary angiography: Visualizes blockage and is often done during intervention [9].

Risk Factors Associated with Myocardial Infarction:

A substantial proportion of patients with coronary artery disease do not have traditional risk factors of the disease. The common risk factors of atherosclerosis explain disease occurrence in only half of the diagnosed cases. The INTERHEART study recognized

abnormal lipids (ApoB/ApoA ratio), smoking (Current smokers and former smokers), hypertension, diabetes, abdominal obesity, psychosocial influences (financial pressure, global tension, locus of control, depression, as well as life occasions counting conjugal division, work misfortune, family struggle), dietary risk (ingesting of salty snacks, fried foods, meats), and alcohol, and regular physical activity (moderate or strenuous exercise) account for most of the risk of myocardial infarction globally [10].

Management of Myocardial Infarction:

Rapid diagnosis and management are the key components to decrease mortality in patients with myocardial infarction along with understanding the pathology and disease progression.

Immediate Goals:

- Restore blood flow to minimize infarct size
- Stabilize the patient
- Prevent complications

Acute Treatment:

- Morphine: Pain relief, anxiety reduction
- Oxygen: If oxygen saturation <90%
- Nitrates: Vasodilation to improve perfusion
- Aspirin: Antiplatelet therapy to prevent clot growth
- Beta-blockers: Decrease oxygen demand

Reperfusion Therapy:

- Percutaneous Coronary Intervention (PCI): Preferred method if done within 90 minutes.
- Coronary Artery Bypass Grafting (CABG): Considered for multivessel disease or failed PCI

Conclusion:

We have come a long way over the last several decades in our understanding and treatment of coronary atherosclerosis and its complications. Although we have not considered stroke, many of the same drugs and techniques used for MI are applicable in its prevention and acute treatment. What are the next steps? Billions of dollars are spent yearly on new drug and other treatment strategies in CAD which are generally applied either in secondary prevention or in high-risk primary prevention. But isn't that a little late? To significantly reduce the incidence and improve outcomes above those seen with our later therapies as described above, we think the best option is rapid diagnosis and intervention. The integration of emergency care, advanced diagnostics, reperfusion strategies, and preventive measures significantly improves survival rates and quality of life post-MI. Public awareness, lifestyle changes, and early detection of risk factors are essential components in reducing the global burden of heart attacks [6].

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