SCINTILLA

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QUARTERLY E MAGAZINE

DEPARTMENT OF PHARMACEUTICS

FACULTY OF PHARMACY

www.msruas.ac.in/department/department-of-pharmaceutics

The Faculty of Pharmacy (FPH), formerly M. S. Ramaiah College of Pharmacy, was established in 1992. The Faculty of Pharmacy ranked 56 in the AIR–NIRF 2025, is a leading pharmacy institute with 33 years of legacy. It imparts outcome-based pharmaceutical education to meet our country's growing demands for well-trained healthcare professionals. The faculty offers 4-years undergraduate programme - Bachelor of Pharmacy (B. Pharm), 2-years Postgraduate programme – Master of Pharmacy (M. Pharm), in Pharmacognosy, Pharmaceutical Chemistry, Pharmaceutics, Pharmacology, Pharmacy Practice, a 6-years Doctor of Pharmacy (Pharm D) and a Doctoral research programme (Ph.D)

Vision

Aspires to create skilled and competent pharmacy professionals by imparting quality education in pharmaceutical sciences to meet the global health challenges for the betterment of mankind

Mission

- To impart quality education to develop pharmacy professionals to lead the progress in global healthcare
- To evolve into center of excellence in pharmaceutical research
- To create entrepreneurs and problem solvers in multi-disciplinary arena
- To inculcate professional ethics and passion for lifelong learning

EDITORIAL BOARD

Scintilla is the quarterly E-news letter of Department of Pharmaceutics, FPH, RUAS which seeks to provide to world outside, News, Views, and Creative expressions from the members of the Department. Scintilla comes directly from Latin, where it carries the meaning of "spark" - that is, a bright flash such as you might see from a burning ember or spark of specified quality or feeling, which is almost synonymous to department's intent, hence the name Scintilla

Editorial

The concluding quarter of 2025 has been marked by notable academic, research, and professional accomplishments, reflecting the Department's sustained commitment to excellence in pharmaceutical education and research.

A major highlight of this period was the distinguished academic contribution of **Dr. S. Bharath, Dean, Faculty of Pharmacy**, who served as the **Chairman of the Poster Scientific Committee** at the **74th Indian Pharmaceutical Congress (IPC)** held from **19th to 21st December 2025** at the **Bangalore International Exhibition Centre (BIEC)**. In addition, Dr. S. Bharath chaired an eminent scientific session titled *"Digital Drug Discovery: How AI/ML and In Silico Simulations Are Redefining Drug Discovery and Development"* at the **International Conference – R R Pharmacon 2025.**These contributions underscore the department's active involvement in advancing contemporary and technology-driven pharmaceutical research.

During this quarter, faculty members participated in several **workshops, seminars, and Faculty Development Programmes (FDPs)** conducted by reputed organizations, ensuring continuous professional development and academic upgradation in emerging and trending areas. Furthermore, faculty members published a significant number of research articles in **reputed, peer-reviewed international journals with high impact factors**, thereby strengthening the department's research visibility and academic standing.

The **postgraduate and Ph.D. scholars** of the department have also demonstrated commendable academic excellence by presenting **posters and oral papers** with awards at high-impact national and international conferences, reflecting the quality and relevance of research activities undertaken within the department. This issue of the magazine also documents the academic and scientific activities organized by the **Scientia Club** across diverse themes. While these initiatives are appreciable, greater emphasis on diversification and proactive organization of scientific events is encouraged in the forthcoming periods.

I extend my sincere appreciation to all the **students who contributed articles** for this issue and adhered to the prescribed timelines. Their enthusiastic participation is highly valued, and similar dedication is anticipated for future editions.

It is hereby informed that the **e-newsletter *Scintilla*** will henceforth be published on a **half-yearly basis**, replacing the earlier quarterly format. I hope that this issue offers readers an enriching academic experience and invite **constructive feedback, critical observations, and scholarly contributions** to further enhance the quality of the magazine.

I express my heartfelt gratitude to the **Editorial Team** for their systematic compilation, meticulous design, and timely release of the present issue, ensuring comprehensive coverage of departmental developments during the previous quarter.

I wish all readers a productive reading and learning experience.

Dr. S. Bharath
Chief-Editor

TEAM @ INFOCEUTICS

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Professor & Dean

Dr. B V Basavaraj
HOD & Professor

Dr. R Deveswaran
Professor

Dr. C S Lakshmeesha
Professor

Dr. Sindhu Abraham
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Asso. Professor

Dr. Shwetha K
Asst. Professor

Ms. Nikitha S
Asst. Professor

Ms. Sangavi C
Asst. Professor

Ms. Aneeta Raye
Asst. Professor

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Faculty in Focus

Dr. S Bharath, Dean, Faculty of Pharmacy, was the Chairman of the Poster Scientific Committee for the 74th Indian Pharmaceutical Congress (IPC), held on 19th –21st December 2025 at the Bangalore International Exhibition Centre (BIEC).

A key highlight of the event was the presentation of approximately 2,800 posters, reflecting the diverse and high-quality research output from institutions and organizations nationwide.

Dr. S. Bharath chaired a session titled *"Digital Drug Discovery: How AI/ML and In Silico Simulations Are Redefining Drug Discovery and Development"* at the **International Conference – R R Pharmacon 2025**, organized in association with **Rajiv Gandhi University of Health Sciences, Karnataka State Pharmacy Council**, and the **Indian Pharmaceutical Association**.

Faculty Dashboard

Dr. Sindhu Abraham
Certificate Course – Food Analysis and Quality Control
24–28 October 2025 | 5 Days

Dr. Pooja Mallya
Faculty Development Programme (FDP)
Holistic Insights into Pharma 4.0: Technology-Driven Innovation in Drug Discovery and Development
6–11 October 2025 | 6 Days

Dr. R. Deveswaran
Workshop
Grant Writing for Multidisciplinary Projects
28 October 2025 | 1 Day

Ms. Nikitha S.
Certificate Course
Introduction to Pharmaceutical Regulatory Affairs
1 December 2025 | 1 Day

Dr. B. V. Basavaraj
Workshop
Nanotechnology-Based Drug Delivery: Concepts to Clinical Transition
18–22 December 2025 | 5 Days

Dr. Sharon Furtado & Dr. R Deveswaran
Workshop
7th National Level Workshop on NIRF India Rankings 2026
11–12 December 2025 | 2 Days

Dr. Tanmoy Ghosh
Faculty Development Programme (FDP)
AI-Driven Transformation in Drug Discovery, Development and Clinical Trials
15–19 December 2025 | 5 Days

Dr. Shwetha K.
Professional Development Programme
Design and Development of MOOCs
6–10 October 2025 | 5 Days

Publications Spotlight

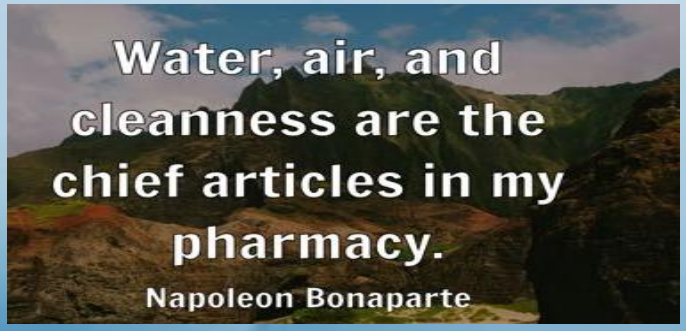
Thiolated Tamarind Seed Polymer–Chitosan Composite Scaffolds for Enhanced Skin Tissue Regeneration
Authors: Sri, R.; Ghosh, T.; Nayak, D.; Shashank, A. G.; Lakshmi Priya, P.; Basak, M.; Basavaraj, B. V.
Journal: *Journal of Biomaterials Science, Polymer Edition*

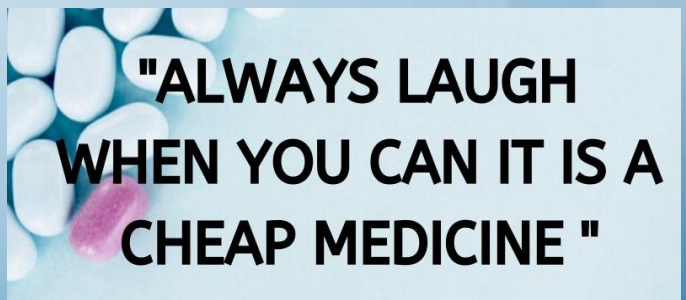
Pectin based three-dimensional printing in wound healing: Innovations, challenges, and future prospects: A review
Authors: Sindhu Abraham, Sharon Furtado, Shwetha Krishnamurthy
Journal: *Carbohydrate Polymer Technologies and Applications*

The New Regulatory Paradigm: Understanding the Revised Schedule M in the Indian Pharmaceutical Scenario
Authors: Chandrashekar, P.; Rajamanickam, D.
Journal: *Technische Sicherheit*

Evaluation of Wound Regeneration Potential of Nano-Phytoextracts Loaded Carboxymethyl Chitosan Scaffolds for Diabetic Foot Ulcer
Authors: Radhakrishnan, V.; Sabu, L.; Somayaji, P.; Prakash, M.; Krishnamurthy, S.; Shabi, M. M.; Basavaraj, B. V.; Anbu, J.
Journal: *Scientific Reports*

Dietary Influence on Gut Microbial Balance: Transitioning from Dysbiosis to Eubiosis
Authors: Nikitha, S.; Basavaraj, B. V.
Journal: *APTI Women's Forum Newsletter*





Students in Focus

Poster Presentations in conferences

Innovation in Translational Therapy & Targeted Drug Delivery (ITTD-2025)

BITS Pilani – Hyderabad Campus | Offline | 1–2 September 2025

- **Aditya Nemade**

Development of Multifunctional Electrospun Scaffolds for Potential Wound Healing

(Co-authors: Tanmoy Ghosh, Damodar Nayak A., Vineeth Kumar K., Shruthi N., Shwetha V., Pushplatha C.)

- **Shivam Bhaduria**

Bioengineered Tamarind Seed–Chitosan Biomaterial for Improved Wound Healing and Skin Regeneration

(Co-authors: Tanmoy Ghosh, Ramya Sri, Basavaraj B. V.)

- **Vinay D**

Electrospun Nanomats for Regenerative Healing in Diabetic Wounds

(Co-authors: Tanmoy Ghosh, Lakshmi Priya, Basavaraj B. V.)

International Conference on Translational & Technological Advances in Health Sciences

Dayanand Sagar University, Bengaluru | Offline | 14–15 November 2025

Gokulvasan S – *Therapeutic Evaluation of Piper Betel Mediated Silver Nanoparticles for Wound Healing*

Charishma – *Development and Characterization of a Topical Gel Containing Lignin and Tannins*

Indrakumar N – *Herbal-Based Mucoadhesive Buccal Films for Xerostomia*

Preethu G – *Hesperidin-Loaded Liposomes for Hepatocellular Carcinoma*

Ananya K. M. – *AI and 3D Printing in Medical Devices: Futuristic Trends*

Sanjay Kumar M. C. – *Process Validation in Pharmaceuticals: Regulatory Perspectives*

Yashaswini H. A. – *Critical Study of OOS-Related Warning Letters*

Akhila B – *Post-Market Surveillance of IVD Medical Devices*

G. Sai Varun – *Regulatory Requirements for Complex Generic Medicines*

Balaji Gowda H. R. – *Regulatory Science of mRNA Drug–Device Combinations*

Nandan C – *Comparative Study of Orphan Drug Regulations (US, EU & India)*

Dr. B V Basavaraj
Evaluator
Scientific Presentations

APA International Conference on Polymers for Advanced Technology
Udaipur, Rajasthan | Offline | 13–15 October 2025
Aditya Nemade
Formulation and Evaluation of Electrospun Antimicrobial Scaffolds for Biomedical Applications
(Co-authors: Tanmoy Ghosh, Damodar Nayak A., Vineeth Kumar K., Shruthi N., Shwetha V., Pushplatha C.)

Regulatory Science & Drug Delivery Symposium
IIT BHU | Offline | 2–3 December 2025
•Dharani R. K.
Regulatory Pathways and Post-Market Oversight of Combination Products in the USA

74th Indian Pharmaceutical Congress (IPC-2025)
BIEC, Bengaluru | Offline | 19–21 December 2025

- **Aditya Nemade** – *rhBMP-Functionalised Electrospun Scaffolds for Bone Tissue Engineering*
- **Nikitha S** – *Serum Containing Salicylic Acid, Marjoram Oil & Chitosan for Acne Management*
- **Sharavana B. N.** – *Cosmeceutical Peel-Off Mask with Trachyspermum ammi Seed Oil*
- **Arzu Sharma** – *Herbal Gel Using Custard Apple Leaf Extract for Oral Cancer*
- **Parnika C** – *Green Pharmacy: Reducing Environmental Footprint in Drug Manufacturing*
- **Poojitha M. G.** – *Nanosilver-Infused Phytogel for Wound Healing*
- **Sakthi Uma R. P.** – *Novel Topical Delivery Systems for Dermatological Treatment*
- **Varshitha R** – *pH-Indicating Smart Packaging Using Purple Heart Plant Extract*

From Volume to Value: The Strategic Transition Toward Complex Drug Delivery Systems in the Indian Pharmaceutical Sector

Mr. Aditya Nemade
Research Scientist

The Indian pharmaceutical industry is currently navigating a tectonic shift in its operational philosophy. While it has historically been celebrated as the global provider of affordable generic medicines, the landscape in 2026 will be defined by a rigorous transition toward value-driven innovation. This metamorphosis is evidenced by the sector's projected growth from USD 55 billion in 2025 to an estimated USD 130 billion by 2030. This trajectory is no longer sustained by mass-produced simple generics alone. Instead, the focus has moved toward Complex Drug Delivery Systems (CDDS), biosimilars, and the integration of digital manufacturing technologies to address unmet clinical needs.

The Rise of Complex Drug Delivery Systems (CDDS)

A significant trend within the domestic market is the rising investment in complex generics. These formulations involve intricate active ingredients or sophisticated delivery mechanisms such as liposomal injections, long-acting particulates, and inhalational products. The incentive for this shift is primarily driven by the "patent cliff" of 2025 and 2026, where blockbuster molecules worth over USD 300 billion are losing exclusivity globally.

Unlike traditional generics, CDDS require advanced pharmaceutical engineering and specialized regulatory pathways. For instance, the development of nanoparticle-based systems enables site-specific targeting, which is becoming essential in Indian oncology and infectious disease management. These systems improve therapeutic outcomes by optimizing pharmacokinetics and reducing the systemic toxicity associated with conventional dosage forms.

Digital Twins and Pharma 4.0

The integration of Digital Twins and Artificial Intelligence (AI) has emerged as a cornerstone of the 2026 manufacturing ecosystem. A digital twin is a virtual replica of a physical manufacturing process or a physiological system. By simulating formulation performance in a digital environment, researchers can predict molecular interactions and toxicity at an earlier stage, reducing R&D timelines by as much as 25% to 50%.

In India, this technology is being utilized to optimize continuous manufacturing lines. Traditional batch processing is gradually being replaced by integrated systems that allow for real-time quality monitoring and adaptive control. This shift ensures that the safety and efficacy of medications are maintained through every stage of production, aligning with the increasingly stringent global quality standards.

Patient-Centric Flexible Formulation Platforms

Another noteworthy development is the emergence of flexible formulation platforms designed for specific demographics.

The Indian market has historically lacked age-appropriate formulations for pediatric and geriatric populations, often leading to medication errors when tablets are manually split or crushed.

The industry is now pivoting toward "age-appropriate" platforms, such as orally disintegrating tablets (ODTs), mini-tablets, and multi-particulate systems like pellets or granules packed in sachets. These formulations provide better palatability and ease of administration, which are critical for patients with dysphagia or those requiring weight-based dose titration. This move toward personalized pharmacotherapy ensures that the therapeutic window is tailored to the individual's metabolic and physiological profile.

Operational Attribute	Traditional Generic Model	2026 Innovation-Driven Model
Strategic Priority	Cost-based volume growth	Value-based innovation growth
Formulation Type	Solid oral dosage (Simple)	Complex Drug Delivery Systems (CDDS)
Production Style	Large-scale batch processing	Continuous and modular manufacturing
Digital Integration	Manual documentation	AI-driven digital twins and IoT
Quality Control	End-product testing	Real-time process analytical technology

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Regulatory Stimulus and Government Initiatives

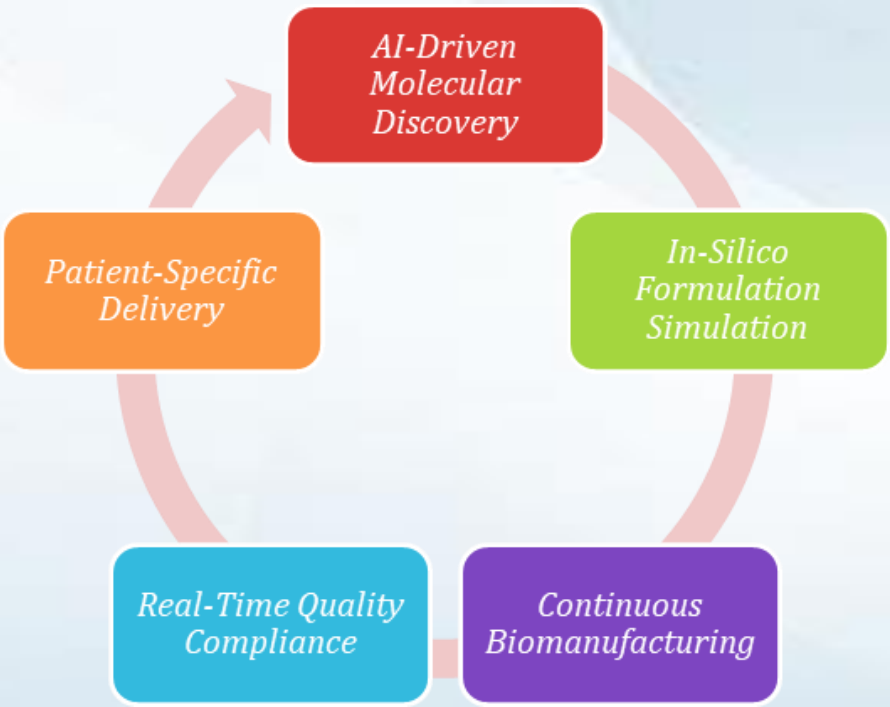
The transition from a cost-centric model to an innovation-led framework is supported by significant government stimulus. The Promotion of Research and Innovation in Pharma-MedTech (PRIP) scheme, with a total outlay of Rs. 5,000 crore, specifically encourages industry-academia collaboration. This initiative targets high-priority areas such as new biological entities, phytopharmaceuticals, and novel drug delivery systems.

Simultaneously, the Production-Linked Incentive (PLI) schemes have bolstered domestic manufacturing of critical active pharmaceutical ingredients (APIs) and medical devices.

These policies aim to reduce import dependency while elevating the Indian brand to a global leader in high-end medical technology.

Conclusion

The 2026 landscape of the Indian pharmaceutical sector represents a fundamental reimagining of what it means to be a global pharmacy. By embracing complex formulations, digital optimization, and demographic-specific delivery platforms, the industry is moving beyond the constraints of traditional generics. The synergy between government policy and technological adoption is establishing a new standard for healthcare delivery, where precision, quality, and innovation are the primary drivers of growth.



References

Deeksha, S., & Diksha, J. (2025). International Expansion of Indian Pharmaceutical Companies: Trends, Strategies, and Outlook. *Asian Journal of Pharmaceutical Research and Development*, *13*(6), 241-251.

Bordukova, M., Makarov, N., Rodriguez-Esteban, R., Schmich, F., & Menden, M. P. (2024). Generative artificial intelligence empowers digital twins in drug discovery and clinical trials. *Expert opinion on drug discovery*, *19*(1), 33-42.

Maharjan, R., Kim, N. A., Kim, K. H., & Jeong, S. H. (2025). Transformative roles of digital twins from drug discovery to continuous manufacturing: Pharmaceutical and biopharmaceutical perspectives. *International Journal of Pharmaceutics: X*, 100409.

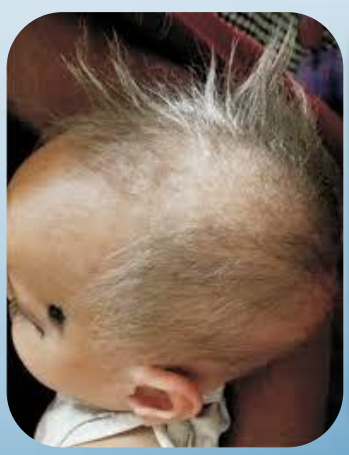
Breakthrough for Rare Disorder: First FDA-Approved Treatment for Children with Menkes Disease

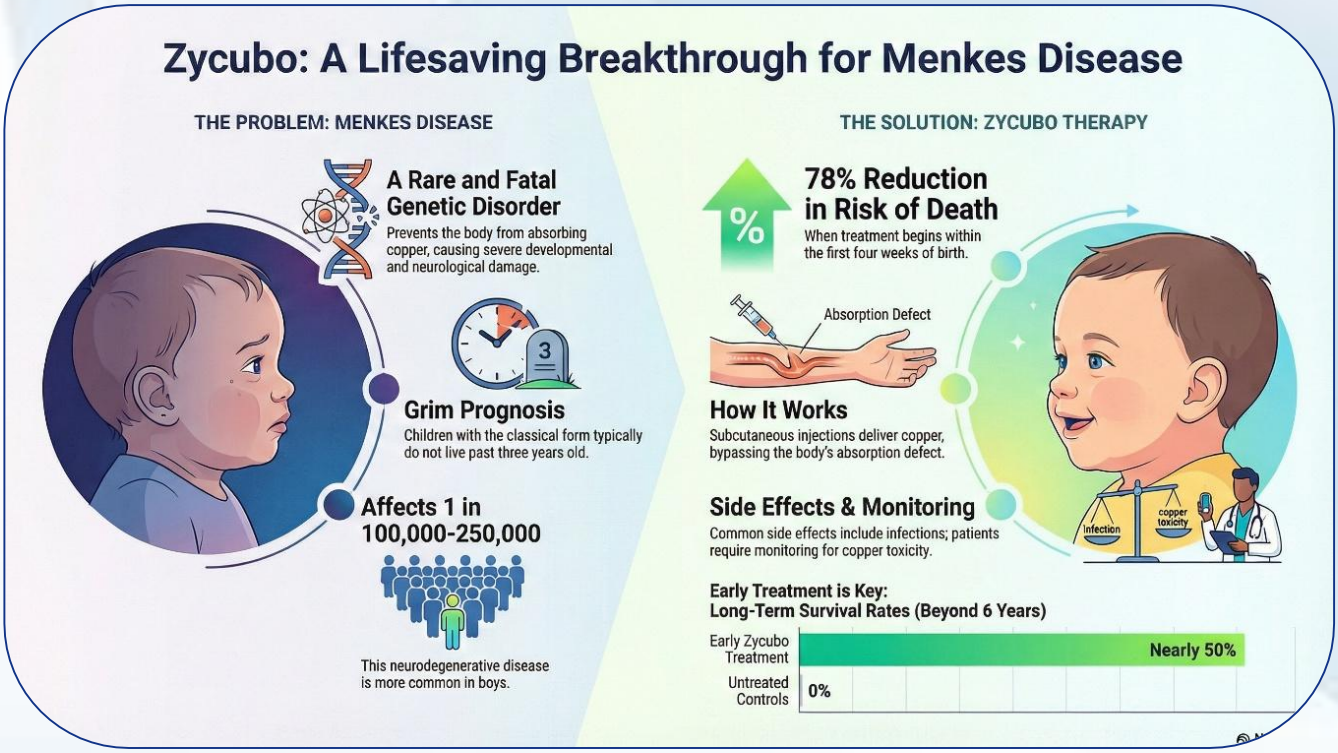
Ms.Suman
Project Assistant

Menkes disease is a rare, severe X-linked genetic disorder of copper metabolism, typically affecting male infants, characterized by progressive neurological deterioration, sparse/brittle "kinky" hair, and failure to thrive. Caused by *ATP7A* gene mutations, it disrupts copper transport, leading to deficiency in the brain and accumulation in other tissues. The disease is characterized by seizures, failure to gain weight and grow, developmental delays, and intellectual disability. It leads to abnormalities of the vascular system, bladder, bowel, bones, muscles, and nervous system. Children with classical Menkes (90% of those with the disease) begin to develop symptoms in infancy and typically do not live past three years. It affects approximately one in every 100,000-250,000 live births worldwide and is more common in boys.

On January 12, 2026, the U.S. Food and Drug Administration granted approval for Zycubo (copper histidinate) injection, marking it as the inaugural treatment for Menkes disease in children. With this approval, young patients suffering from this severe, degenerative condition now have an FDA-sanctioned treatment option, offering them the possibility of an extended lifespan.

Zycubo is administered through subcutaneous injection as a therapy to replace copper. It provides copper in a form that circumvents the genetic issue affecting intestinal absorption, thereby enhancing the body's ability to utilize the mineral. The FDA conducted an evaluation of Zycubo through two open-label, single-arm clinical trials involving pediatric patients who received treatment for up to three years. The overall survival rate was determined by comparing patients who received treatment with those who did not, using contemporaneous external control groups.





The study included 66 patients who were treated and 17 who were not, with the majority being from the United States. Children who began treatment within four weeks of birth experienced a 78% reduction in mortality risk compared to those who were untreated. Almost half of the patients who received early treatment lived beyond six years, with some surviving over 12 years. In contrast, none of the untreated control group survived past six years. Children who started treatment later than four weeks after birth also showed a significant survival advantage.

Commonly observed side effects of Zycubo include infections, breathing difficulties, seizures, nausea, elevated temperature, anemia, and reactions at the injection site. Due to the potential for copper to build up in the body, it is important for patients on Zycubo to be carefully monitored for signs of toxicity.

Cyclic Olefin Polymer- Innovative Packaging Material for Syringes

Ms. Manal Delvi
I M.Pharm, Pharmaceutics

COP (Cyclic Olefin Polymer) and COC (Cyclic Olefin Copolymer) syringes are advanced plastic syringes known for high transparency, chemical resistance, low extractables, and suitability for biologics, ensuring drug stability and safety. They have been available commercially since the 1990s, although their high cost has limited their use in packaging to specialist pharmaceutical and medical applications. The rising shift toward prefilled syringe formats in the pharmaceutical and biotech industries is expanding the market. Prefilled syringes offer numerous advantages, including reduced drug wastage, enhanced patient safety, and ease of administration, especially for biologics and vaccines.

COP and COC materials are highly suitable for these formats due to their excellent barrier properties, transparency, and resistance to breakage and chemical interactions. These materials offer exceptional chemical resistance to acids, alkalis and polar solvents.

High strength and clarity, combined with excellent moisture barrier and their better shatter resistance make them viable alternatives to glass for items such as pre-filled syringes, vials and ampoules for injectables. They can replace glass blood containers, petri dishes, test tubes, and bottles of various sizes, as well as other diagnostic and biomedical containers. There are grades suitable for film extrusion, bottle blowing and injection molding. For injection molding, COCs have good flowability, easily reproduce submicron-size surface features, and fill complex thin-walled parts. They also have low and substantially isotropic shrinkage during molding, resulting in little warpage.

They withstand all common sterilization procedures, including gamma radiation, steam, and ethylene oxide. They are exceptionally pure and have excellent biocompatibility. Tests show that no substances leach from them within the limits of detection during immersion in water or isopropanol after 24 hours at 70°C (160°F).

COP's have recently been used for pre-fillable syringes (PFS) for deep-cold drugs, which are stored and transported on dry ice at temperatures reaching -100°C. Example: SCHOTT TOPPAC freeze. COC cuvettes and multi-well microtiter plates resist common polar organic solvents as dimethyl sulfoxide, as well as high light transmission through the near UV. These COC devices provide low haze and low chromatic aberration for sensitive and accurate spectrophotometer readings.

In pharmaceutical containers, their high moisture barrier can extend drug shelf life longer than commodity plastics, either keeping moisture out or preventing moisture loss during storage. COC resins can also lengthen the life of moisture-sensitive medications in other drug-delivery systems such as injector pens and inhalers. COPs are commercially available from a range of manufacturers under various brand names (Apel™,Topas®, Zeonex® and Zeonor).

References

Hlobik T, "Polymer Syringe Considerations for Drug Applications and Administration". ON drug Delivery, Issue 113 (Oct 2020), pp 90–93

Waxman L, Erwin RL, Vilivalam VD. Characterization of a cyclic olefin polymer microcentrifuge tube. Biotechniques. 2017 May 1;62(5):223-228. doi: 10.2144/000114546. PMID: 28528575.

Angelov AK, Coulter JP (2008) The development and characterization of polymer microinjection molded gratings. Polym Eng Sci 48(11):2169–2177

Lamonte, R.R. and McNally, D., 2001. Cyclic olefin copolymers. Advanced Materials and Processes, 159(3), pp.33-36.

Needle Free And Shock Wave Syringe

Ms. Nisarga
I M.Pharm, Pharmaceutics

A shock-wave syringe is a needle-free drug delivery device that uses a shockwave to generate a high-speed micro jet capable of penetrating skin for precise drug or vaccine delivery.

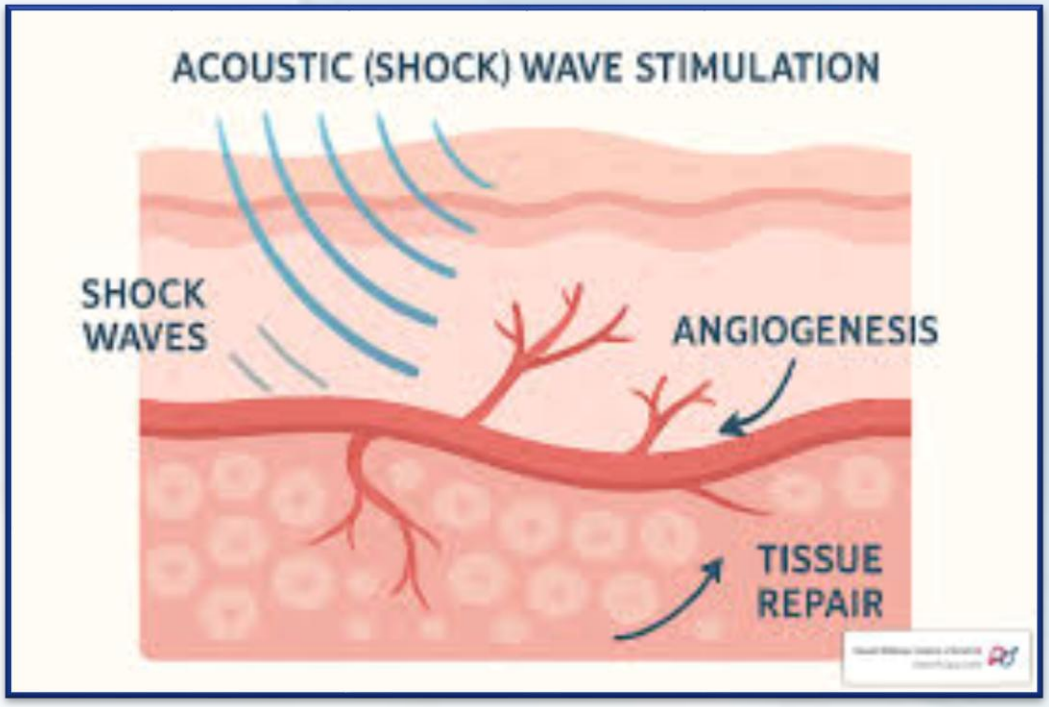
The shock wave powered needle-free syringe is used to deliver liquid drugs into living targets to assess the feasibility of drug injection and the efficacy of drug uptake by the host. These are non-linear waves traveling faster than the speed of sound, with high pressure and temperature spikes. The mode of delivery is by a high-speed liquid Microjet, to subcutaneous depths, targeting the microcirculation system of the skin, in a swift operation that renders the process minimally invasive. The method aids in minimizing discomfort and stress associated with conventional injection techniques.

The primary goal of this technology is to reduce pain, trauma, and inflammation associated with conventional needle injections. Pain reduction is achieved by minimally breaching dermal blood vessels, preserving the microcirculation system, and promoting tissue regeneration at the site of administration.

The device generates micro-liquid jets approximately 125 µm in diameter, traveling at speeds of 72–80 m/s, which penetrate the skin to the level of the viable epidermis. The brief, millisecond-scale impulse generated by the shock wave is largely imperceptible to the human sensory system, further contributing to a painless injection experience

Components of Microjet Syringe

a) Power / Energy Unit (compressed gas, detonation chamber, or capacitor)
b) Shock-Wave Generation Section (Driver Section)
c) Shock-Wave Propagation Section (Driven Section / Shock Tube Body)
d) Drug Reservoir / Liquid Chamber
e) Membrane or Piston (pressure-transmitting interface)
f) Nozzle / Orifice (micron-scale)
g) Outer Housing / Structural Body
h) Trigger / Actuation Mechanism



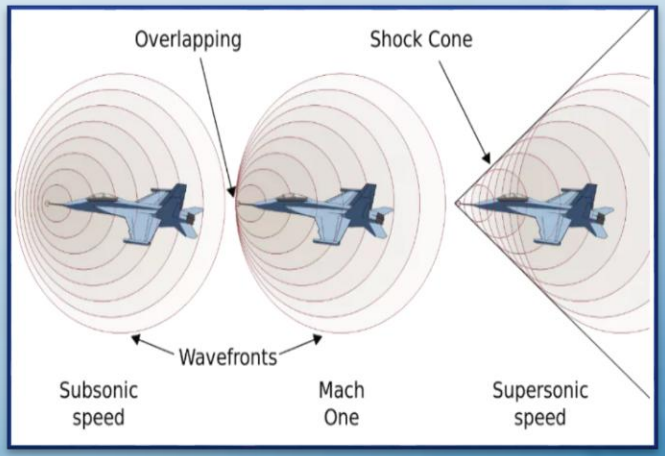
Conclusion

Needle free – Shock wave syringe has the following advantages: Enhanced Pharmacokinetics / Faster Absorption for Some Drugs, Flexibility in Route of Administration, Potential for Improved Bioavailability / Distribution, Patient Compliance, Safety, and Acceptability. The Challenges include the need for careful optimization of device + formulation + injection parameters, Formulation compatibility — viscosity, stability, rheology issues. Regulatory, quality control and manufacturing challenge and not all drugs or formulations may be Suitable.

Reference

Rane, Y.S. & Marston, J.O., 2021. Transient modelling of impact driven needle-free injectors. Computers in Biology and Medicine, 135, p.104586

Hankare, P., Menezes, V. and Thakare, V., 2026. A Needle-Free Shock Syringe for Drug Delivery into Skin. Biomedical Materials & Devices, 4(1), pp.505-512.



Ethical Implications of AI in Health Care

Ms. Anusha N
I M Pharm (PRA)

Artificial Intelligence (AI) refers to computational systems capable of replicating human intelligence by learning from data, recognizing patterns, solving problems, and making informed decisions. AI has emerged as a transformative technology across multiple sectors, including agriculture, manufacturing, transportation, and healthcare. In medicine, AI is reshaping clinical practice by enhancing diagnostic accuracy, optimizing treatment planning, accelerating drug discovery, and enabling precision and preventive healthcare. The rapid advancement of machine learning and deep learning has shifted AI applications from rule-based decision support systems to personalized, data-driven medical care.

AI is widely used in healthcare for medical imaging analysis, electronic health record (EHR) management, laboratory diagnostics, and clinical decision support. It supports physicians in making informed decisions, manages large biological and clinical datasets, and improves efficiency in healthcare delivery. The COVID-19 pandemic further highlighted the need for digital health solutions, as healthcare systems faced increased demand, rising costs, and limited resources, making AI integration both timely and necessary.

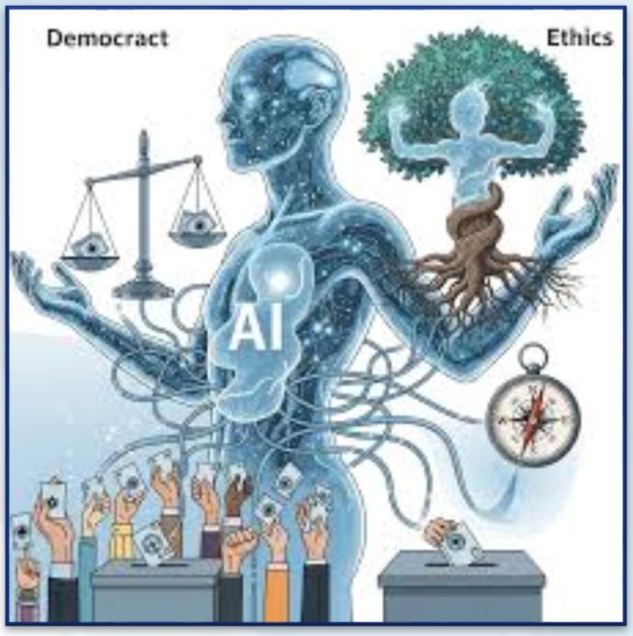
In plastic and reconstructive surgery, AI has demonstrated value in preoperative planning, surgical simulation, and outcome prediction. AI-assisted robotic systems improve precision, particularly in microsurgical procedures, while image-processing tools enable objective assessment of postoperative symmetry, volume, and aesthetic outcomes. Additionally, AI-based monitoring systems facilitate early detection of complications such as flap ischemia, often before clinical symptoms appear.

In cardiovascular medicine, AI has significantly improved diagnostic accuracy and risk prediction. AI-enabled electrocardiogram (ECG) systems, including wearable and mobile devices, enable early and accessible detection of arrhythmias such as atrial fibrillation. When combined with EHR data, AI models outperform traditional risk calculators in predicting cardiovascular events, including heart failure and acute coronary syndromes.

In oncology and oncologic surgery, AI integrates patient-specific and tumor-specific data including clinical history, imaging, and pathology. These models assist clinicians in identifying key variables influencing disease progression and therapeutic response, thereby supporting personalized cancer care.

Despite its benefits, the implementation of AI in healthcare presents ethical and legal challenges. Concerns related to data privacy, security, informed consent, equity, and algorithmic bias remain significant, particularly in low- and middle-income countries where access to AI technologies is limited. Furthermore, maintaining empathy, compassion, and human judgment in patient care is essential.

Looking ahead, AI is expected to play a central role in the transition toward digital and personalized medicine. A notable example is **Mitra**, a robotic assistant deployed during the COVID-19 pandemic to support healthcare professionals by monitoring vital signs and facilitating patient–clinician communication, demonstrating AI's potential in crisis response.



AI is no longer a future concept but a present reality. Academic institutions and healthcare organizations must actively prepare the next generation of healthcare professionals to adopt

REFERENCES

1. Farhud, D.D. & Zokaei, S. (2021) 'Ethical issues of artificial intelligence in medicine and healthcare', Iranian Journal of Public Health, 50(11).
2. Goranova, E., Bishara, R.A. & Lazarov, A. (2025) 'The new reality of artificial intelligence in healthcare', Journal of Vascular Surgery: Venous and Lymphatic Disorders.
3. https://www.theguardian.com/global-development/2020/dec/02/robodoc-how-india-robots-are-taking-on-covid-patient-care-mitra

Regulation of Wearables and Digital Health

Mr. Bharath G R
I M Pharm (PRA)

Wearables contribute significantly to digital health by enabling monitoring and predictive analytics in real world environments. However, successful adoption requires addressing data reliability, equity, and security concerns. Regulatory frameworks must evolve to ensure safe innovation while preserving privacy and trust.

Wearable devices are increasingly used in healthcare as tools for biomedical research and clinical care. These devices support a shift toward digital, personalized, preventive medicine. Their growth raises ethical, technical, and regulatory concerns including privacy, data quality, and cybersecurity. Countries are still developing regulatory responses to ensure safety and compliance in the use of wearable health technologies.
Wearables perform essential functions such as monitoring, screening, detection, and prediction. They collect health-related data such as heart rate, physical activity, and oxygen saturation. Clinical adoption is rising, especially in outpatient cardiac monitoring.

Wearables enable continuous and remote data collection, improving tele-monitoring in healthcare. They support earlier identification of disease through screening and detection functions. Digital health technologies can increase healthcare accessibility, including in resource-limited regions. Grouped digital health systems like "Hospital-at-Home" improve care efficiency and sustainability.

Advantages:

- Wearables enhance personalized health management through real-time monitoring.
- They can predict health deterioration and improve preventive decision-making.
- Smart wearables help empower patient engagement in self-care.
- Regulated medical devices with clinical validation can support safer, home-based healthcare.

Disadvantages:

- Variable data quality and sensor accuracy remain major limitations.
- There are cybersecurity and privacy risks including unauthorized third-party access.
- Unequal access may worsen health inequities and digital divides.
- Interoperability challenges make integration into clinical workflows difficult.

Sl. No	Functions	Examples
1	Monitoring	• Advanced tele-monitoring • Pulse monitoring • COVID-19 symptoms and long-term effects monitoring
2	Screening	• Atrial fibrillation screening • Sleep apnea screening • Cardiovascular disease screening
3	Detection	• Physical activity levels detection • Pre-symptomatic detection of COVID-19 infections • Seasonal influenza detection
4	Prediction	• Prediction of mortality and clinical risk • Prediction of COVID-19 infections • Prediction of exacerbations of chronic obstructive pulmonary disease

Market access pathways include U.S. FDA clearance and EU CE-marking processes. Regulators must assess risk, safety, and effectiveness, especially when devices are network-connected. EU GDPR enforces strict data protection obligations for handling personal health data. Regulatory frameworks are being adapted for evolving digital health ecosystems

Wearable devices are transforming digital health through continuous monitoring, preventive analytics, and remote patient management. However, several challenges remain including data quality, cybersecurity threats, and privacy concerns due to sensitive health data being shared through connected systems. Inequitable access to digital tools may also deepen existing healthcare disparities. Regulatory frameworks such as FDA approval, CE-marking, and data-protection requirements like GDPR must evolve to ensure safe, effective, and secure adoption of wearable technologies in clinical settings. Strong governance and privacy-by-design approaches are essential to build public trust and enable the future integration of wearables into sustainable healthcare systems.

References.

1. Canali S, Schiaffonati V, Aliverti A. Challenges and recommendations for wearable devices in digital health: Data quality, interoperability, health equity, fairness. PLOS Digit Health. 2022;1(10):e0000104.
2. Bouderhem R. Privacy and regulatory issues in wearable health technology. Eng Proc. 2023;58(87):1-6.
3. Mathias R, McCulloch P, Chalkidou A, Gilbert S. Digital health technologies need regulation and reimbursement that enable flexible interactions and groupings. npj Digit Med. 2024;7:148.

Microbial Biosurfactants - Applications and Significance

Ms. Sanjana N & Ms. Ramya K M
II Pharm D

Microbial biosurfactants are surface-active compounds produced by living organisms such as bacteria and fungi that lowers the surface tension between liquids, oil and air. They are revolutionizing industrial applications due to their exceptional chemical properties and remarkable stability across varied environmental conditions. What makes these biological molecules particularly compelling is their versatility: they are increasingly being harnessed for medical device coatings, advanced drug delivery systems, synergistic antimicrobial formulations, and even vaccine adjuvants.

Microbial Biosurfactants: Unlocking Solutions Across Industries

Microbial biosurfactants are emerging as powerful, environmentally sustainable tools addressing critical challenges across multiple sectors. From environmental remediation to pharmaceutical innovation, these biological molecules offer versatile applications that conventional synthetic alternatives cannot match.

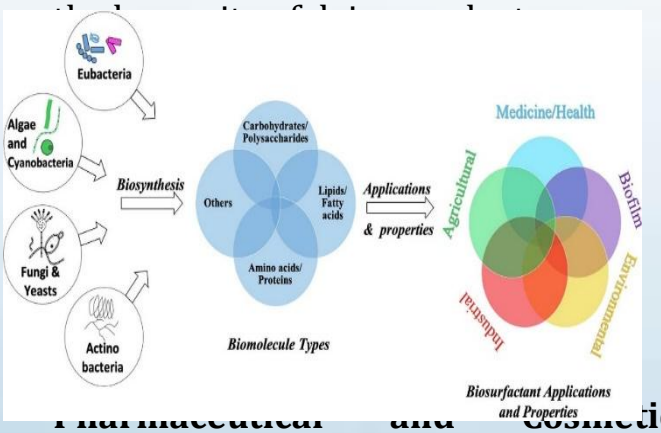
Environmental Protection and Bioremediation

In environmental applications, biosurfactants excel at tackling one of modern industry's most persistent problems: contaminated soil and water. Hydrophobic organic pollutants—particularly polycyclic aromatic hydrocarbons (PAHs) generated from fossil fuel combustion, wood preservatives like creosote, and industrial activities—resist natural degradation due to poor solubility. Biosurfactants solve this challenge through two key mechanisms: they increase substrate bioavailability and enhance bacterial cell surface interactions with hydrophobic compounds, thereby accelerating biodegradation processes in soil bioremediation and wastewater treatment systems. Similarly, in phytoremediation applications, biosurfactants support plant growth and improve soil quality, enhancing metal-contaminated plant development during germination and cell division phases. Studies on wheat and pepper crops treated with biosurfactants showed increased leaf weight and reduced proline concentration (an oxidative stress marker), demonstrating measurable benefits. At higher concentrations, biosurfactants also function as biocidal agents, reducing microbial biodiversity through mechanisms including free hydroxyl radical generation, cell membrane disruption, and bacterial death.

Food Industry Innovation

The food sector increasingly recognizes the potential of biosurfactants in addressing critical sanitation and product quality challenges. Biofilms are notoriously resistant to conventional sanitizing agents and antimicrobials and offer promising solutions while maintaining food safety and quality.

A study by Campos et al. showed that combining biosurfactants with guar gum created superior mayonnaise with enhanced creaminess, uniformity, stability, and microbiological quality compared to traditional emulsifiers. Similarly, rhamnolipids—a specific biosurfactant class—enhance dough stability and bakery product volume, texture, and shelf life, while improving



Applications

In pharmaceutical development, biosurfactants are revolutionizing drug formulation by improving solubility of poorly water-soluble compounds, a critical limitation for newer therapeutics including peptides, proteins, vitamins, vaccines, and oligonucleotides. Beyond solubility enhancement, biosurfactants stabilize encapsulated drugs, improve thermodynamic activity, increase diffusion rates, and serve as effective wetting agents and dispersants for powders, granules, and nanoparticles.

The cosmetic industry similarly leverages biosurfactants' interfacial tension-reducing properties and biodegradability, incorporating them into anti-aging skincare products, conditioning hair masks, shower gels, and toothpastes as green alternatives to synthetic surfactants.

Conclusion

What sets biosurfactants apart in various applications is their unique combination of outstanding technical performance and environmental consciousness. Their natural composition, ability to biodegrade, and efficient production not only make them effective solutions but also sustainable ones, revolutionizing how industries tackle everything from pollution remediation to the development of consumer products.

References

Jui, A. H., Hossain, M. N., Afrin, S., Bhowmik, B., Ranadheera, C. S., & Bhuiyan, Md. H. R. (2026). Microbial Biosurfactants: Prospect and Challenges for Application in Food Industry. Food Reviews International, 42(1), 181–214.

Sarita Sharma., et al. "Microbial Biosurfactants: An Overview of their Uses, Classification, Types, Properties, and Biosynthesis". Acta Scientific Microbiology 6.6 (2023): 61-71.

Bridging Industry and Academia

Quintessentials of QbD & Regulatory Compliance in Pharmaceutical Product Lifecycle

A DAY OF LEARNING AND NETWORKING

NOV 22 2025

SPEAKERS

Dr. Santanu Roy
Senior Director, RA
Althera Laboratories, Bengaluru.

Dr Mahesh B K
Co-Founder and Director
Cryovita Private Limited,
Shivamogga Dist.

Mr. Santosh Kashyap
Vice President - RA
Relicare Tech Services Pvt. Ltd.,
Bengaluru

Ms. Kalpana N
Assistant General Manager
Quality Assurance
Bioplus Life sciences, Hosur.

MORE THAN 100 REGISTRATIONS,
29 BRAIN STORMING E-POSTERS,
2 OUTSTANDING WINNERS !!

MS. SHREEJA NGSM INSTITUTE OF PHARMACEUTICAL SCIENCES, NITTE UNIVERSITY

MS. AKHILA BALAJI , M S RAMAIAH UNIVERSITY APPLIED SCIENCES, BENGALURU

Extra Scholastic Efforts

PharmaPack 3

(Walkthrough exhibition by Practice School Students)

PharmaPack 3.0, organized by the Department of Pharmaceutics, Faculty of Pharmacy, RUAS, on 26–27 November 2025, served as a comprehensive academic platform focusing on parenteral preparation technologies. The two-day event showcased the creativity and technical competence of IV B. Pharm students, who developed detailed scientific models, handmade labels, and smart labels reflecting formulation principles, sterilization processes, packaging techniques, and regulatory requirements. The walkthrough exhibition enabled visitors to explore each exhibit in detail, encouraging meaningful academic interaction between students and faculty. The event received an enthusiastic response from B. Pharm, Pharm D, and M. Pharm students, whose participation enriched interdisciplinary learning and peer engagement.

Enrichment Programs

Labella

(Label Artistry Competition)

A Pharmaceutical Label Making Competition was successfully conducted on **25th November 2025**, with the objective of enhancing students' understanding of regulatory requirements, accuracy in drug information, and creativity in pharmaceutical communication.

The competition witnessed **enthusiastic participation** from students, who showcased a high level of interest and engagement. Participants demonstrated remarkable **creativity, clarity, and innovation** in designing pharmaceutical labels while adhering to essential components such as drug name, dosage form, composition, directions for use, warnings, and regulatory symbols.

On the Horizon

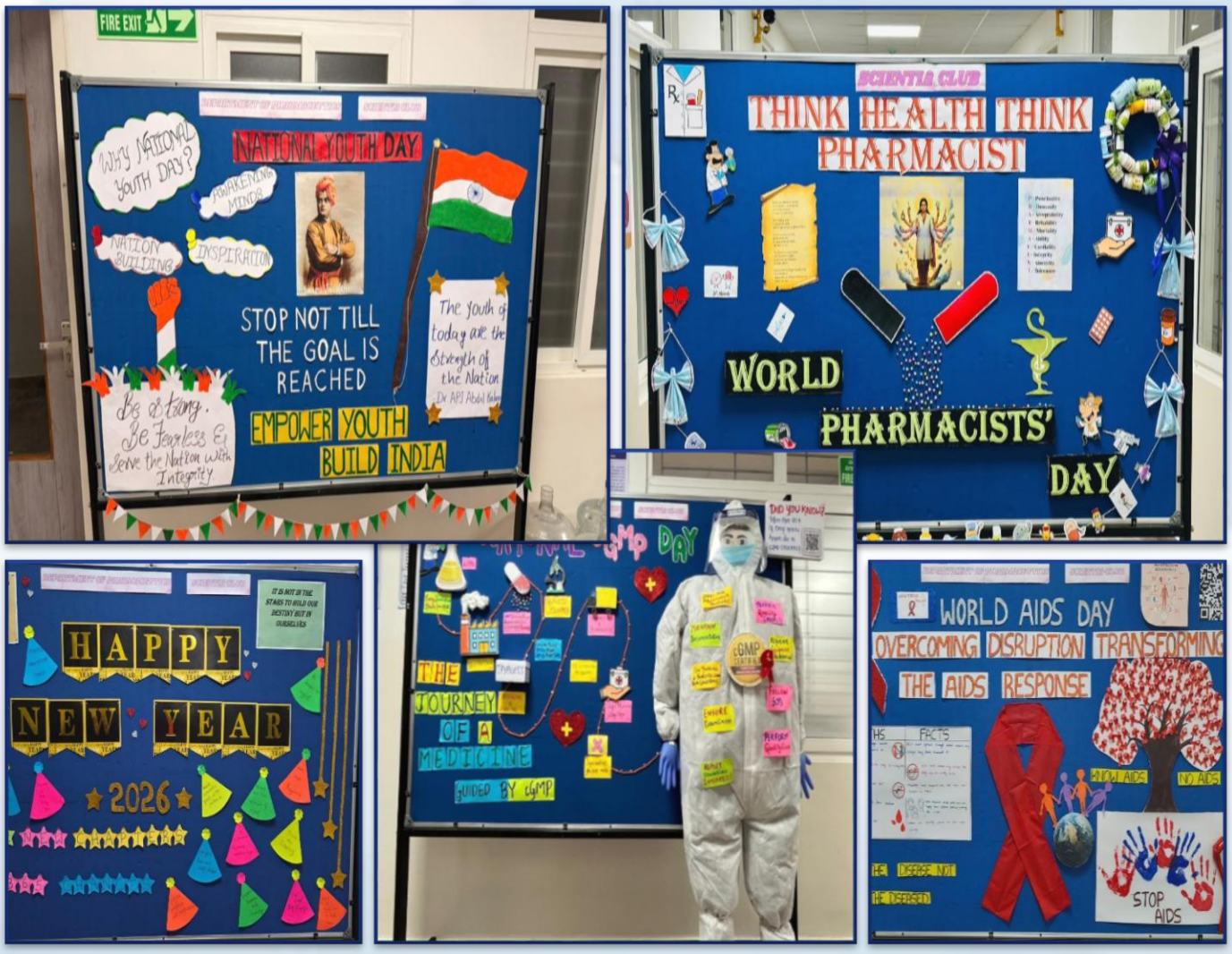
Showcasing 40 Posters from Department of Pharmaceutics presented by M Pharm Students from Pharmaceutics and Pharmaceutical Regulatory Affairs Program.

The 9th Annual Conference of the Society for the study of Xenobiotics, organized with the theme 'New Approaches to navigate Complexities in Drug Discovery and Development' will feature:

- 2 Keynote Sessions and
- 8 Focused Symposia
- Networking
- Panel discussion
- Mentorship talks

led by global experts in ADMET (Absorption, Distribution. Metabolism. Excretion. and Toxicity) and CMC (Chemistry. Manufacturing, and Controls).

SCIENTIA Club Activities

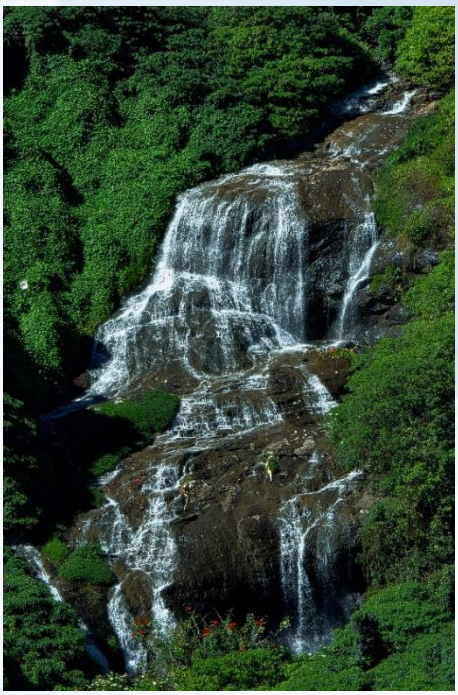


As part of student club initiatives, **creative notice boards** were prepared to mark various significant occasions including **National Youth Day**, **World Pharmacist Day**, **New Year celebrations**, and **National cGMP Day**. The notice boards were thoughtfully designed with informative content, visuals, and creative elements highlighting the importance and relevance of each occasion.

These displays served as an effective medium for **awareness creation**, encouraging students to engage with national, professional, and academic themes while showcasing their creativity and teamwork.

Vantage Point

Ms.Vandana G, I Sem ,PRA

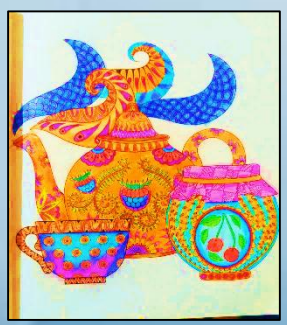




Meditative Crafting

II M Pharm (Ms.Yashaswini / Ms.Charisma)






MIND MATTERS

By

Ms.Dristi Bhattacharya
(II B Pharm)

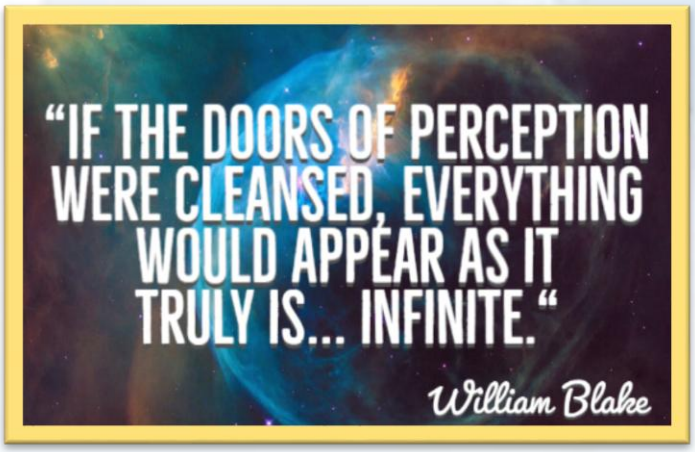
Across

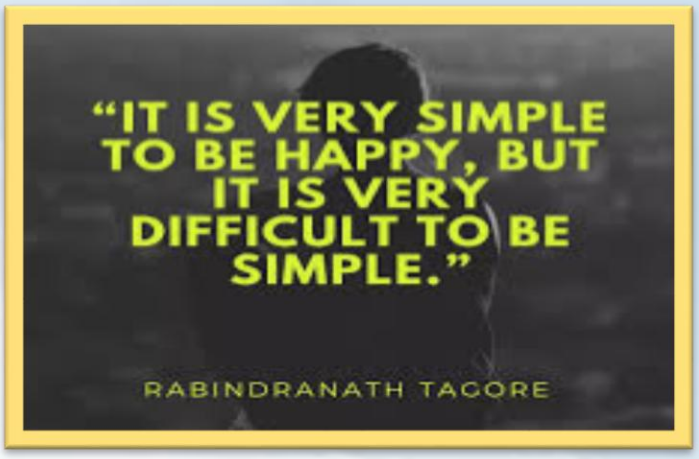
3. Corrective and Preventive Action
5. Written operational instructions
7. Departure from approved procedure
8. Drug enclosed in a shell
12. Adjustment of equipment accuracy
13. Removal of moisture from materials
14. Separation based on particle size

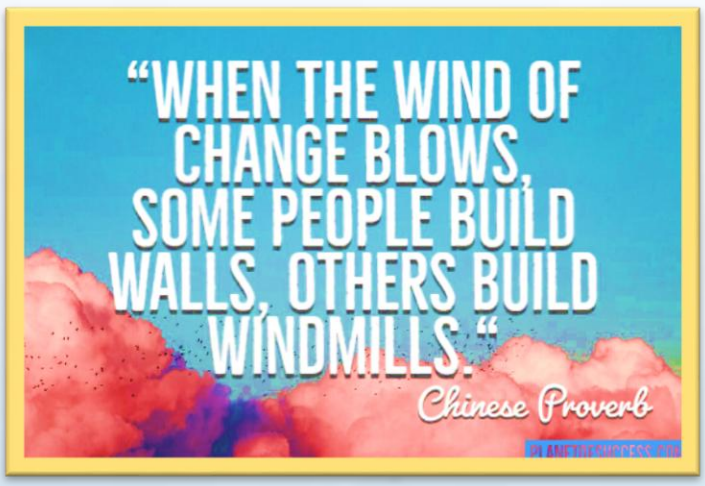
Down

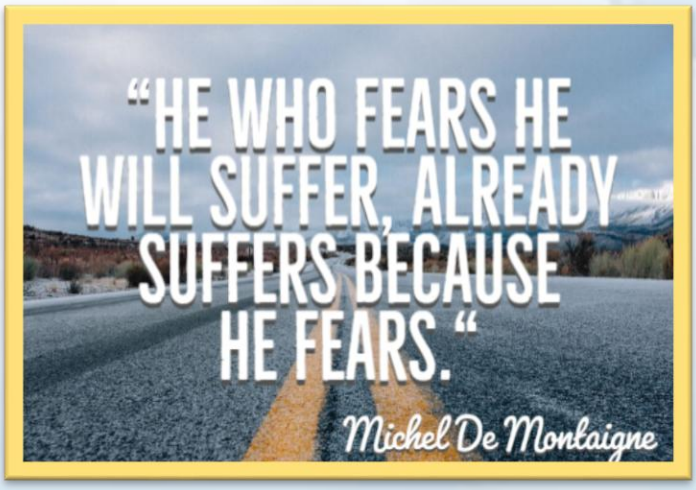
1.Documented evidence of process consistency
2. Inactive formulation ingredient 4. Solid dispersed in liquid
6. Actual output of a process
9. Equipment used for sterilization by steam
10. Final containment of the dosage form
11. Equipment for blending powders
15. Good Manufacturing Practice

MINDUITION

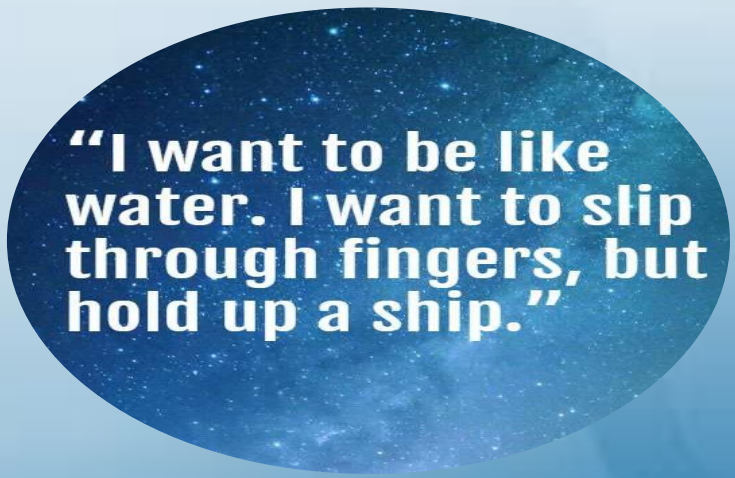

"IF THE DOORS OF PERCEPTION WERE CLEANSED, EVERYTHING WOULD APPEAR AS IT TRULY IS... INFINITE."
William Blake


"IT IS VERY SIMPLE TO BE HAPPY, BUT IT IS VERY DIFFICULT TO BE SIMPLE."
RABINDRANATH TAGORE


"WHEN THE WIND OF CHANGE BLOWS, SOME PEOPLE BUILD WALLS, OTHERS BUILD WINDMILLS."
Chinese Proverb


"HE WHO FEARS HE WILL SUFFER, ALREADY SUFFERS BECAUSE HE FEARS."
Michel De Montaigne


Honesty is a rare, expensive gift. Don't expect it from cheap people.


"I want to be like water. I want to slip through fingers, but hold up a ship."

SCINTILLA

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