NEMPSule

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NEMPS
North Eastern Medical Pharmacological Society

OFFICIAL
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Volume 3 | Issue 2

* ANNOUNCEMENT *

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With effect from April 2026

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Cover page designed by Dr. Sukainnya Buragohain

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Message from the President

It is with utmost pride that I pen down this goodwill message for NEMPSule, the official e- bulletin of North Eastern Medical Pharmacological Society. I extend my heartiest congratulations to the entire editorial team for bringing out such a wonderful and informative publication which will add to the glory of our association as it has been doing in the last couple of years. Your dedication, creativity and commitment have transformed this bulletin into a valuable platform for academic exchange and professional achievement.

I extend my sincere appreciation to all the contributors whose efforts, insights and scholarly work have added depth and significance to this issue. Each contribution reflects the spirit of learning, collaboration and advancement in the field of Pharmacology.

I hope and aspire that NEMPSule continues to grow as a vibrant forum connecting Pharmacologists, clinicians, researchers and students across the region. May it inspire innovation, encourage scientific curiosity and strengthen the bonds within our Pharmacology community.

With warm Regards

Meghali Chaliha

Prof Dr. Meghali Chaliha

President, NEMPS

Message from the General Secretary

It gives me immense pleasure to extend my heartfelt congratulations and best wishes on the publication of NEMPSule, the official e-bulletin “Vol. 3 issue 2” of the North Eastern Medical Pharmacological Society (NEMPS). NEMPSule serves as an excellent platform for sharing academic achievements, innovative ideas, scientific developments, and the collective aspirations of the pharmacology fraternity across the North-East India. This initiative reflects the dedication, creativity and collaborative spirit of our members and contributors.

I sincerely appreciate the efforts of the Editorial Board and everyone involved in bringing out this publication. Their commitment and hard work have transformed their vision into meaningful and informative resources for students, researchers, academicians and healthcare professionals alike.

May NEMPSule continues to flourish as a source of knowledge, inspiration and academic excellence, fostering collaboration, promoting research and encouraging the exchange of ideas within the field of Pharmacology.

On this occasion, I convey my warmest greetings and best wishes to the Editorial Team and all members of NEMPS for the continued success and growth of NEMPSule. May each edition reach greater heights and contribute significantly to the advancement of pharmacological sciences.

With best regards,

Purnima Bordoloi

Dr. Purnima Bordoloi
General Secretary
NEMPS

From the Desk of the Editor

Dear Readers,

It is a matter of immense honour for me to step into the role of Editor for our society's prestigious e-bulletin NEMPSule. As we unveil Volume 3 Issue 2 (July 2026 – December 2026), I extend my warmest greetings to all the esteemed members of North Eastern Medical Pharmacological Society (NEMPS).

First and foremost, I extend my heartfelt gratitude to the President of our society, Dr. Meghali Chaliha, for her unwavering trust, vision, and guidance. I am also profoundly grateful to the brilliant members of the Editorial Board, whose collective expertise, dedication and timely feedback ensured the prompt and seamless completion of the entrusted work of the current issue.

Additionally, I would like to express my sincere thanks to Dr. Gayatri Sarma, the founding Editor of NEMPSule for her continuous mentorship. Her exceptional vision, dedication, and meticulous leadership have set a stellar benchmark for this publication—one that I am deeply committed to uphold.

For this issue, our society has truly outdone itself. I sincerely thank all our contributors for their enthusiasm, expertise, and effort, whose valuable contributions enrich this bulletin and promote the exchange of knowledge that strengthen our professional community. We have curated a fascinating line up of articles for this issue, spanning cutting-edge clinical advancements, pressing public health debates, and the future of our workforce.

While academic rigor remains our core focus, we also believe that scientific engagement can be dynamic and enjoyable. To that end, the Editorial Board is thrilled to debut a brand-new segment in this issue, the "*Fun Corner*." We hope it brings a light-hearted yet intellectually stimulating spark to your reading routine.

As we look forward to the latter half of 2026, I invite all of you to keep engaging, questioning, and contributing to our collective scientific discourse. I hope you find this issue both intellectually stimulating and enjoyable to read.

Happy reading!

Warm regards,

Lahon.

Dr. Joonmoni Lahon
Chief Editor
NEMPSule

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The future for Gen Z Pharmacologists: New Research Shows Why Gen-Z is Choosing to Work in Pharma Industry?

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The future for Gen Z pharmacologists is likely to be shaped by technology, personalized medicine, and interdisciplinary healthcare. Rather than focusing only on traditional drug development and dispensing, future pharmacologists will increasingly work at the intersection of biology, data science, and artificial intelligence.

Younger workers are increasingly choosing careers in pharmaceuticals over other leading industries like technology or finance due to perceptions of better work life balance and social purpose in the sector. Association of the British Pharmaceutical Industry (ABPI) found that a good salary continues to be the leading factor influencing career decisions of young people, with 50% saying good earnings were the most important factor when looking for roles.

Key Trends Shaping the Future:

1. AI-Driven Drug Discovery:

Companies and research organizations are using AI to identify drug candidates faster and at lower cost. Pharmacologists who understand both pharmacology and data analytics will be in high demand.

2. Personalized Medicine:

Advances in Pharmacogenomics allow treatments to be tailored to an individual's genetic profile. Future pharmacologists may help determine which medications work best for specific patients.

3. Biologics and Advanced Therapies:

Growth in monoclonal antibodies, gene therapies, cell therapies, mRNA-based medicines will create opportunities for pharmacologists with expertise beyond traditional small-molecule drugs.

4. Digital Health and Remote Monitoring:

Integration of wearable devices, mobile health apps, real-time patient monitoring will generate large amounts of medication-response data that pharmacologists can analyse to improve treatment outcomes.

5. Regulatory Science and Drug Safety:

As therapies become more complex, there will be increasing demand for experts in:

- Clinical research
- Pharmacovigilance
- Drug regulation
- Risk assessment
- Skills That Will Matter

A Gen Z pharmacologist can gain a competitive advantage by developing:

- Strong pharmacology fundamentals
- Clinical research skills
- Biostatistics knowledge
- AI and machine learning literacy
- Programming skills (Python, R)
- Scientific communication
- Understand regulatory requirements

Career Opportunities:

Potential career paths include:

- Pharmaceutical R&D scientist
- Clinical pharmacologist
- Medical writer
- Pharmacovigilance specialist
- Regulatory affairs professional
- Data scientist in healthcare
- Drug safety associate
- Academic researcher
- Precision medicine specialist

Outlook:

The future is promising, particularly for pharmacologists who combine life-science expertise with digital and analytical skills. As healthcare becomes more personalized and data-driven, pharmacologists will play a crucial role in developing safer, more effective treatments and translating scientific discoveries into clinical practice.

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2. Deloitte Global Survey 2025: Gen Z & Millennial Survey; growth and the pursuit of money, meaning, and wellbeing.

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Novel Nicotine Products (Vapes, Nicotine Pouches): Pharmacology and Public Health Challenges

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In the last decade, new nicotine products including e-cigarettes (as e-cigs or vapes) and nicotine pouches have emerged and spread globally. Presented as safer than regular tobacco products and as other smoking cessation methods, those products have created intense controversy among medical institutions, policymakers and health advocates alike. Although they may mitigate some of the toxic components present in combustible tobacco, nicotine dependence, long-term health effects, youth uptake and regulatory issues remain[1,2].

Nicotine is a highly addictive alkaloid whose main effect is to initiate nicotinic acetylcholine receptors (nAChRs) on central nervous system cells. Stimulation of these receptors then gives rise to dopamine, norepinephrine, serotonin, and acetylcholine—neurotransmitters that produce feelings of pleasure, alertness, and reward[3].

With repeated exposure, such changes happen over time in the brain pattern and nicotine accumulates as a form of drug addiction among the most used ones. E-cigarettes are powered by a battery, and they heat a liquid that contains nicotine, flavorings, and other chemicals to create an aerosol that is inhaled by the user. Unlike conventional cigarettes, which involve tobacco combustion, thereby reducing exposure to tar and many carcinogenic combustion products[4], this method requires no tobacco combustion process. Yet, vaping aerosols can possess some potentially hazardous materials including ultrafine particles, volatile organic compounds, heavy metals, and carbonyl compounds (e.g., formaldehyde, acrolein)[5].

Nicotine pouches are another new class of nicotine-related products. These tobacco-free pouches are placed between the gum and lip, allowing nicotine absorption through the oral mucosa. They are so discreet, smoke-free, and contain varying flavors that they have become more and more popular, especially with young adults[6]. There is tremendous variation in nicotine delivery from pouches depending on formulation, with some products delivering nicotine levels comparable to or even exceeding those of traditional cigarettes[7]. Nicotine is rapidly absorbed and dispersed throughout the body from a pharmacokinetic point of view. Inhaled nicotine from vaping can reach the brain in a matter of seconds, with a similar pharmacokinetic profile as cigarette smoking[3]. Nicotine pouches typically impart a gradual but prolonged increase in plasma nicotine concentrations via buccal absorption. Nicotine is mainly metabolized in the liver by CYP2A6 to cotinine, which is an influential biomarker for nicotine exposure[8].

Adolescents and young adults have become one of the major public health concerns. Flavor-suggested, social media advertising, and a belief that vaping is harmless led to increased experimentation among youth[2]. In adolescence, nicotine exposure can negatively impact brain development, cognitive function, attention, and impulse control, increasing the vulnerability to lifelong addiction[9]. The use of e-cigarettes in smoking cessation is disputed. There are some indications that e-cigarettes containing nicotine could be useful to adult smokers in cessation of conventional cigarettes when they use the e-cigarettes with behavioral support[10]. Yet, combining e-cigarettes and cigarettes is prevalent and many users remain hooked on nicotine rather than quitting completely. Moreover, non-smokers who began to use nicotine in the form of vaping may eventually switch to combustible tobacco products.

Around the globe, there are big challenges for regulatory authorities balancing benefits around harm reduction against the risk of breeding, and potentially increasing, an addiction to nicotine among future generations. India follows a preventive approach by banning electronic cigarettes under the Prohibition of Electronic Cigarettes Act, 2019, citing concerns regarding public health and youth initiation. Regulatory authorities still have the challenge of enforcing the laws due to the availability of illicit products and spread through online advertising.

As a whole, new nicotine product (e.g., vapes, and nicotine pouches) are an emerging development in nicotine delivery technology. While they may lower exposure to some harmful elements than traditional cigarettes, they are not risk-free. The associated addictive effects of nicotine, unknown long-term health effects, youth penetration rate increases and difficulties with regulation are the leading public health barriers to uptake. Further study and surveillance along with data-based regulations will be necessary to be available to protect the public's health while meeting the demands of people wanting substitutes for combustible tobacco.

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Strengthening Drug Safety through Pharmacovigilance: Activities and Contributions of the Regional Adverse Drug Reaction Monitoring Centre at Gauhati Medical College and Hospital, Guwahati

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Introduction

Drugs have transformed modern healthcare by lowering the burden of disease and improving treatment outcomes, drugs have transformed modern healthcare. However, despite their therapeutic advantages, drugs can occasionally have unpleasant side effects, known as adverse drug reactions (ADRs). ADRs are known to be significant contributor to morbidity, extended hospital stays, higher healthcare costs, and, in extreme situations, death. Therefore, it is crucial to continuously monitor drug safety to ensure that the advantages of drugs outweigh the risks.

Pharmacovigilance involves research and practices involved in detecting, assessing, understanding, and preventing adverse reactions or other drug-related issues. By detecting previously unidentified adverse reactions, monitoring variations in the frequency of known reactions, and encouraging the safe and rational use of medications, pharmacovigilance plays a crucial role in public health.

The Pharmacovigilance Programme of India (PvPI) was established to improve ADR monitoring and establish a national drug safety surveillance system. Adverse Drug Reaction

Monitoring Centers (AMCs) have been established in hospitals and medical colleges across the nation as part of this initiative. These facilities serve as primary centers for gathering, analyzing, and reporting ADR data to the National Coordination Center (NCC).

One of the best tertiary medical facilities in Northeast India, Gauhati Medical College and Hospital (GMCH), is a Regional ADR Monitoring Center under PvPI. The facility is a key contributor to encouraging pharmacovigilance efforts throughout the organization and receives ADR data from different clinical departments. The AMC at GMCH makes a substantial contribution to enhancing drug safety and safeguarding patient health through systematic reporting, causality assessment, raising awareness, and collaboration with medical professionals.

Adverse Drug Monitoring Center at GMCH

The Pharmacovigilance Programme of India (PvPI) monitors the Adverse Drug Reaction Monitoring Centre (AMC) at the Gauhati Medical College and Hospital (GMCH), Guwahati. As a regional center for pharmacovigilance initiatives in Northeast India, the AMC plays a crucial role in facilitating the exchange of drug safety data between medical professionals and the National Coordination Center (NCC-PvPI).

Patients from Assam and nearby northeastern states are treated at GMCH, a high-volume tertiary care teaching hospital. The institution offers an ideal environment for identifying and tracking adverse drug reactions because of its large patient population and the widespread use of drugs across multiple departments. In required to ensure that suspected ADRs are identified, recorded, evaluated, and reported in a timely and systematic manner.

Objectives of the AMC

The following are the primary objectives of GMCH's ADR Monitoring Centre:

- To encourage the identification and reporting of possible adverse drug reactions.
- To enhance patient safety by keeping a close eye on adverse drug reactions.
- To provide the national pharmacovigilance database with high-quality ADR data.
- To identify potential warning signs related to drug use.
- To raise awareness of the significance of pharmacovigilance among medical professionals.

- To promote the responsible and secure use of medications in clinical environments.

Core Functions of the AMC

As part of its regular operations, the AMC performs several crucial pharmacovigilance activities. Among them are:

i. Identifying and Documenting ADRs

ADR cases from outpatient departments (OPDs), inpatient wards (IPDs), emergency rooms, and specialized facilities are actively identified by healthcare professionals, including doctors, residents, nurses, pharmacists, and pharmacovigilance associate. Standardized ADR reporting forms are used to gather and record important clinical data.

ii. Verification and Assessment of Reports

Every reported ADR was thoroughly examined to guarantee accuracy, consistency, and completeness. Prior to submission, patient demographics, drug history, temporal relationships, clinical symptoms, test results, therapy interventions, and results are evaluated.

iii. Assessment of Causality Practices

The WHO-Uppsala Monitoring Center (WHO-UMC) causality assessment methodology is an established technique used to evaluate reported adverse drug reactions.

iv. National Reporting and Data Entry

The worldwide web-based pharmacovigilance database used by the PvPI, VigiFlow, receives validated ADR reports. The reports that are submitted enhance signal detection operations domestically and globally and add to the national database.

v. Monitoring of Serious ADRs

Further clinical data and monitoring are necessary to identify serious adverse drug reactions. To ensure thorough reporting, the AMC contacts with treating physicians and healthcare teams to gather missing information, laboratory reports, therapy adjustments, and patient outcomes.

vi. Developing Capacity and Raising Awareness

The centre regularly holds awareness and sensitization programmes for physicians, nurses, interns, postgraduate trainees, and other healthcare workers. These initiatives promote voluntary ADR reporting within the organization and enhance knowledge of pharmacovigilance principles. By increasing drug safety surveillance and supporting the larger goals of public health protection, the AMC at GMCH plays a crucial role in the healthcare systems.

Department wise Pharmacovigilance Activities and ADR Surveillance at GMCH

Active surveillance across several clinical fields, where patients receive various treatment approaches, is necessary for effective pharmacovigilance. The ADR Monitoring Center at Gauhati Medical College and Hospital regularly conducts pharmacovigilance activities in several departments to ensure early identification and reporting of adverse drug reactions.

The interdisciplinary nature of the hospital makes it possible to study a broad range of adverse drug reactions (ADRs) linked to antibiotics, antineoplastic agents, psychiatry drugs, cardiovascular drugs, gastrointestinal drugs and other therapeutic drugs. Frequent communication with medical professionals facilitates the identification of possible adverse drug reactions (ADRs) and improves reporting processes.

Medicine Department

The Department of Medicine represents a significant percentage of ADR reports because of the large number of patients and the widespread use of certain drugs. Examples of pharmacovigilance activities regular ward visits, patient record assessments, and conversations with treating physicians about possible adverse drug reactions.

In this department, gastrointestinal problems, lightheadedness, drug-induced liver damage, allergic reactions, electrolyte imbalances, and adverse effects from cardiovascular and antimicrobial treatments are often reported. The department is important for identifying serious and clinically significant adverse drug reactions (ADRs) that require close monitoring.

Dermatology Department

Because cutaneous adverse drug reactions are frequently obvious and simple to identify, the Department of Dermatology is one of the primary sources for ADR reporting. Drug relations are examined in patients who arrive with rashes, urticaria, pruritus, fixed drug eruptions, Stevens-Johnson syndrome, toxic epidermal necrolysis, and other dermatological symptoms.

Working together with dermatologists makes it possible to accurately record adverse drug reactions (ADRs) related to the skin and provide important information on drug safety profiles.

Pediatrics Department

Because children may react differently to drugs than adults, pharmacovigilance is

especially essential for pediatric patients. The AMC closely monitors on adverse reactions that occur in outpatient clinics and pediatric units.

Antibiotic-associated diarrhea, vomiting, skin rashes, fever, hypersensitivity reactions, and gastrointestinal intolerance are frequently reported adverse drug reactions (ADRs). Understanding the safety of drugs in this vulnerable group is greatly aided by the reporting of pediatric adverse drug reactions.

Pulmonary Medicine Department

Long-term courses of antibiotics, antitubercular drugs, bronchodilators, corticosteroids, and supportive therapy are frequently administered to patients hospitalized in the Department of Pulmonary Medicine. Therefore, it is crucial to monitor for any adverse events related to these drugs.

Allergic reactions, gastrointestinal problems, hepatotoxicity, neurological symptoms, and reactions related to long-term antimicrobial therapy are among the reported adverse drug reactions. Monitoring these cases reduces drug-related harm and maximizes treatment.

Psychiatry Department

antidepressants, anxiolytics, and mood stabilizers are filed by the psychiatry department. The main goal of pharmacovigilance efforts is to find neurological, metabolic, cardiovascular, and psychiatric side effects associated with psychotropic drugs.

Sedation, light-headedness, extrapyramidal symptoms, weight fluctuations, gastrointestinal issues, and other drug-related side effects are frequently reported. Documenting these reactions improved patient care and safer psychiatric practices.

Oncology Department

Patients with cancer frequently undergo complex treatment plans that include immunomodulatory drugs, targeted therapies, chemotherapy, and supportive drugs. Consequently, the Department of Oncology is essential for ADR monitoring.

Chemotherapy-induced nausea and vomiting, neurotoxicity, hematologic abnormalities, mucositis, gastrointestinal toxicity, and hypersensitivity reactions are among the reactions have been reported. Active monitoring of patients with cancer provides important information on the safety of anticancer treatments and assists in the early detection of treatment-related problems.

Daily Pharmacovigilance Activities

The AMC regularly engages in the following tasks to improve ADR surveillance across

departments:

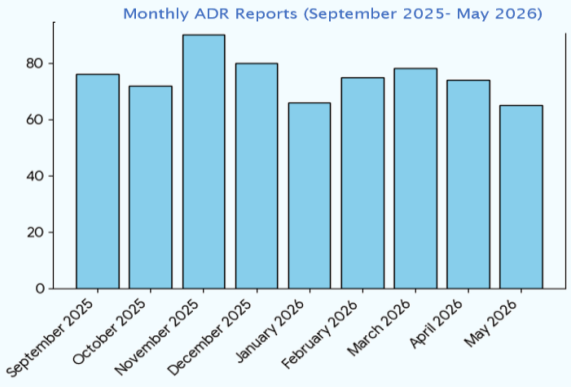
- Identifying suspected ADR cases during daily ward rounds.
- Examination of lab data, prescription charts, and patient case papers.
- Communication about possible reactions with physicians, residents, nurses, and pharmacists.
- ADR reporting forms are collected and verified.
- Recording of treatment adjustments and patient outcomes.
- Serious ADR cases should be followed up on more clinical data.
- Encouraging healthcare workers to voluntarily report adverse drug reactions.

These coordinated efforts strengthened GMCH's pharmacovigilance culture and significantly increased the quantity and quality of ADR reporting within the institution.

ADR Reporting Trends and Analysis at GMCH

Gauhati Medical College and Hospital's (GMCH) Regional Adverse Drug Reaction Monitoring Centre (AMC) continuously monitors adverse drug reactions and makes frequent contributions to the Pharmacovigilance Programme of India (PvPI). The center's ongoing dedication to patient safety and drug safety monitoring is demonstrated by an analysis of the ADR database until June 2026.

During the reporting period from September 2025 to June 2026, 703 reports of adverse medication reactions were recorded and added to the pharmacovigilance database as shown in the figure. 27 cases were recorded as of June 11, 2026. ADR surveillance actions were consistent throughout the investigation, according to the monthly reporting trend.



Pharmacovigilance guidelines have been successfully incorporated into routine healthcare activities, as evidenced by the reporting patterns that showed ongoing contributions from different clinical departments.

Active case detection, routine departmental monitoring, and increased healthcare worker understanding of the significance of reporting

adverse drug reactions are all factors contributing to the continuously high reporting rate during the reporting period. The institution's reporting culture has been strengthened by increased involvement of clinicians, resident physicians, nurses, and pharmacists.

The information also shows the success of the AMC's ongoing awareness programs. The improvement of spontaneous reporting processes has been significantly aided by frequent training sessions, departmental visits, and face-to-face interactions with healthcare personnel. Underreporting continues to be one of the biggest issues facing pharmacovigilance systems globally, making these initiatives important.

According to trend analysis, ADR reporting at GMCH has changed from a passive reporting method to a more active surveillance-based approach. The discovery of drug safety issues, tracking of new trends, and participation in national signal detection initiatives are made possible by the ongoing flow of reports produced in different fields.

GMCH's regular reporting performance reflects its commitment to bolstering drug safety surveillance in Northeast India and underscores its significant role as a regional pharmacovigilance center.

Demographic Characteristics and Clinical Outcomes of Reported ADRs

Between September 2025 and June 2026, the Regional Adverse Drug Reaction Monitoring Center at Gauhati Medical College and Hospital recorded 703 reports of adverse drug reactions. The reports showed a wide range of medications used in a tertiary care teaching hospital and represented a diverse patient group receiving care across several clinical areas.

Demographic Profile

Male patients were dominant, according to an analysis of the recorded cases. Males represented 516 cases (73.4%), and females represented 185 cases (26.3%) of the 703 ADR reports. The demographic data in the remaining reports were incomplete. Males may be more likely to report adverse drug reactions (ADRs) due to differences in disease load, prescribing habits, reporting standards and increased healthcare consumption in some clinical areas.

Across a broad age range, including pediatric, adult, and geriatric populations, previously described ADRs were noted. This study

highlights the importance of pharmacovigilance throughout life because age-related physiological parameters, comorbidities, and medications habits can all affect a person's susceptibility to hazardous drug reactions.

Clinical Outcomes

Positive results were obtained when patient outcomes were measured. Most patients underwent full recovery or significant clinical improvement after receiving proper medical care and therapy adjustments. Most reported cases were classified as either "Recovered/Resolved" or "Recovering/Resolving," demonstrating that the treating doctors were successful in identifying and managing adverse drug reactions.

At the time of reporting, only a small percentage of cases were still pending. Long-term follow-up, further studies, or ongoing observation are typically necessary in such cases. The overall pattern of the results highlights the importance of quick treatment management and early ADR diagnosis in reducing patient harm.

Serious and Non- Serious Adverse Drug Reactions

Serious and non-serious adverse drug reactions were reported in the pharmacovigilance database. Most of reported cases were non-serious reactions, frequently including weakness, dizziness, skin reactions, gastrointestinal difficulties, and mild hypersensitivity symptoms.

A significant proportion of reports had serious adverse drug reactions (ADRs), which called for thorough clinical assessment and monitoring. Severe hypersensitivity reactions, hospitalization-related cases, serious organ toxicities, and other medically significant disorders requiring close observation and therapy modifications were among these reactions. Serious ADR documentation is especially crucial because it plays a significant role in signal detection and regulatory safety evaluations.

Frequency Implicated Medicines

Many different treatment drugs were involved in the ADR reports. A significant percentage of cases included antimicrobial drugs, with ceftriaxone and other antibiotics being implicated. Rifampicin, isoniazid, pyrazinamide, and ethambutol combinations were among the antitubercular drugs that significantly increased the number of reported side effects.

Corticosteroids, diuretics (including furosemide), analgesics, antipyretics, and drugs used in specific clinical situations were among the other drugs linked to ADR. The high frequency of antimicrobial-related adverse drug reactions (ADRs) reflects the widespread use of these drugs in tertiary healthcare facilities and is consistent with the results of other hospital-based pharmacovigilance studies.

Significance of the findings

The data on clinical outcomes and demographics show how well GMCH's pharmacovigilance system works. Healthcare workers are actively involved in drug safety surveillance, as evidenced by the high number of documented cases, improved patient outcomes, and consistent reports across departments.

Additionally, the identification of commonly implicated drug classes offers useful information to policymakers, pharmacists, and physicians. This evidence supports targeted treatments, rational prescription practices, and concentrated monitoring of high-risk drugs. These results support the important role of the Regional ADR Monitoring Center in Northeast India in pharmacovigilance and patient safety initiatives.

Electronic Reporting of through VigiFlow and Causalty Assessment

Causalty Assessment Practices of Reported ADRs

A crucial part of pharmacovigilance is causality assessment, which evaluates the possibility that a suspected drug and an adverse event are causally related to each other. Internationally recognized methods were regularly used at GMCH to assess causality for reported adverse drug reactions.

The main tool for determining causality was the WHO-UMC system. This method divides adverse drug reactions (ADRs) into several groups according to the reaction after drug withdrawal, clinical plausibility, temporal correlation, and alternative explanations.

The categories of causality are as follows:

Certain

Certain cases show a distinct temporal association between the administration of the drug and the adverse reaction, with improvement occurring when the suspected drug is stopped and no plausible alternative explanation is provided.

Probable/Likely

These cases show a clinically feasible correlation with the suspected drug and a reasonable temporal association. Although

rechallenge information may not always be available, improvement after stopping the medication further supports this causality.

Possible

The temporal association may be compatible with a drug-related episode in certain situations, but other explanations, such as underlying medical issues or concurrent drugs, cannot be ruled out.

Unlikely

Cases classified as unlikely are either more likely to be explained by causes other than the suspected treatment or have weak temporal connections.

Electronic Reporting through VigiFlow

The Pharmacovigilance Program of India uses VigiFlow, a web-based Individual Case Safety Report (ICSR) management system, to enter validated ADR reports. ADR data are recorded, stored, and transmitted from ADR Monitoring Centers to the National Coordination Center via VigiFlow, a standardized platform.

Using VigiFlow ensures consistency in reporting procedures and promotes effective communication among pharmacovigilance stakeholders. Additionally, electronic reporting facilitates large-scale data analysis, increases the effectiveness of pharmacovigilance efforts and allows quick access to safety information.

The GMCH promotes evidence-based regulatory decision-making and makes a significant contribution to the national pharmacovigilance database through regular submission of validated reports.

Clinical Interpretation of Findings

The significance of active pharmacovigilance in a tertiary care teaching hospital is demonstrated by an investigation of ADR reports from GMCH. Regardless of a drug's apparent safety profile, ongoing drug safety monitoring is crucial because of the prevalence of both major and non-serious adverse events across several therapeutic categories.

Given that patients frequently receive many drugs and present with complex clinical problems, the majority of likely and possible causality assessments reflect the practical characteristics of pharmacovigilance. Despite these difficulties, rigorous causality assessment promotes well-informed clinical decision-making and offers important evidence regarding drug safety.

Additionally, the identification of important adverse events, frequently implicated drug classes, and repeated reaction patterns improves the pharmacovigilance system and

promotes better prescribing practices. These results confirm the vital role of GMCH's ADR Monitoring Center in advancing patient safety and the goals of the Pharmacovigilance Programme of India.

Sensitization and Awareness activities

Promoting pharmacovigilance awareness among medical personnel is one of the primary responsibilities of the ADR Monitoring Center at the Gauhati Medical College and Hospital. In addition to identifying adverse drug reactions, effective pharmacovigilance depends on healthcare professionals' willingness and capacity to accurately identify and report them.

The AMC periodically ran sensitization campaigns in several clinical departments to improve the culture of ADR reporting. Physicians, postgraduate trainees, interns, nurses, pharmacists, and other healthcare workers who provide patient care were the target audience for these activities.

The main objectives of the awareness programs were as follows:

- Pharmacovigilance is crucial for ensuring patient safety.
- Identifying possible adverse drug reactions.
- The Pharmacovigilance Programme of India's (PvPI) ADR reporting procedures.
- Filling out ADR reporting forms correctly.
- Reporting both major and non-serious adverse drug reactions is crucial.
- Role of healthcare professionals in strengthening national drug safety surveillance.
- Frequent communication with healthcare professionals promoted voluntary involvement in pharmacovigilance initiatives and enhanced knowledge of ADR reporting requirements.

Departmental Engagement

Through regular visits, conversations, and follow-up meetings, the pharmacovigilance team kept in constant communication with different clinical departments. Such interactions made it easier for:

- Early detection of possible adverse drug reactions.
- ADR reports will be more detailed.
- Improved monitoring of severe cases.
- Enhanced collaboration between the AMC and physicians.

The growth of ADR reporting within the organization was greatly facilitated by this kind of interdisciplinary collaboration.

Challenges encountered during ADR reporting

Pharmacovigilance initiatives presented a number of difficulties despite consistent efforts.

Underreporting of ADRs

One of the biggest issues in pharmacovigilance is still underreporting. Healthcare workers were less likely to report adverse drug reactions (ADRs) due to a heavy clinical workload, limited time, and conflicting healthcare goals.

Incomplete Documentation

Initially, many ADR reports were missing crucial details like:

- Full history of drug use.
- Results of a laboratory investigation.
- Information about rechallenge and de challenge.
- Details about the results.

Repeated follow-up with treating physicians and healthcare teams was frequently required due to incomplete documentation.

Difficulty in Follow Up

It was especially difficult to get follow-up data for patients who had been sent to other medical facilities or were released. Sometimes the completeness of the causality assessment was reduced by missing follow-up data.

High patient load

GMCH manages a large number of patients, being one of the biggest tertiary care facilities in Northeast India. Systematic ADR detection may be difficult due to the high volume of hospitalizations and outpatient visits.

Limited Awareness among newly joined staff

Pharmacovigilance processes may initially be unfamiliar to new interns, residents, and nursing staff. Therefore, maintaining reporting quality requires ongoing training and sensitization.

Measures Implemented to improve ADR reporting

The AMC implemented a number of preventative and corrective actions to deal with these issues.

Regular Departmental visits

Frequent trips to wards and outpatient clinics promoted early detection of probable adverse drug reactions (ADRs) and allowed for close communication with medical staff.

Continuous Follow Up

In order to gather missing clinical data, test findings, therapy adjustments, and patient outcomes, the pharmacovigilance team vigorously investigated reported cases.

Availability of Reporting Forms

Healthcare personnel were encouraged to report potential reactions as soon as possible by making ADR reporting forms easily available inside clinical departments.

Repeated Awareness Programmes

Frequent education programs raised healthcare workers' awareness of the significance of reporting adverse drug reactions.

Quality Review of Reports

Before being submitted, every report was thoroughly checked to make sure the data was accurate, comprehensive, and consistent.

The number and quality of ADR reports that the organization submitted were both significantly increased by these initiatives.

Impact of the ADR Monitoring Centre at GMCH

The AMC's activities have improved the institution's pharmacovigilance practices.

Key achievements consist of:

- Gathering and submitting a substantial number of ADR cases to the national database.
- Increased knowledge about drug safety among medical personnel.
- Strengthening the culture of volunteer ADR reporting.
- Improved departmental awareness of adverse drug reaction patterns.
- Improved cooperation between pharmacovigilance staff and clinicians.

The analysis of 703 ADR reports shows how GMCH actively promotes patient safety through methodical pharmacovigilance initiatives. The center continues to provide important safety data that promotes safer use of drugs and evidence-based regulatory choices.

Conclusion

In order to protect patients from drug-related harm, pharmacovigilance is an essential part of modern healthcare. The Adverse Drug Reaction Monitoring Center at Gauhati Medical College and Hospital actively participates in national drug safety surveillance and functions as a significant regional hub under the Pharmacovigilance Program of India.

The center has effectively improved drug safety monitoring inside the organization by methodically identifying, recording, evaluating, and reporting adverse drug reactions. The examination of 703 ADR reports demonstrates the variety of adverse reactions that occur in standard clinical practice and highlights the significance of ongoing monitoring in all treatment areas.

ADR reporting procedures at GMCH have greatly improved due to departmental cooperation, regular sensitization initiatives, and a dedication to high-quality reporting. The application of focused corrective actions has improved the efficacy of pharmacovigilance efforts despite difficulties including underreporting and inadequate documentation. In addition to enhancing patient safety at the institutional level, the AMC's ongoing activities provide important data to national and international pharmacovigilance databases. In the future, encouraging sensible drug usage and enhancing healthcare outcomes will continue to depend on strengthening ADR reporting and cultivating a culture of medication safety.

Acknowledgement

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The Curse of Compelling Evidence: The Cockroach Conundrum

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The Most Enlightened and Sovereign Cockroach Republic had, like all great democracies, two kinds of citizens: those who were afraid, and those who were certain the afraid ones we're being irrational. The first group had noticed that cockroaches who ventured out in daylight tended to return in significantly reduced condition, or not at all. The second group had a WhatsApp group, three economists, and a deep suspicion of feelings.

Into this vibrant democratic discourse came the Fanatics. They were, admittedly, excessive. They spoke of *the Overlords of Light* — malevolent luminescent deities, led by their dark shepherd, the Satan of the LED Bulb, who sought the extermination of all cockroach kind. They demanded that every cockroach who so much as glimpsed a photon must immediately retreat, perform ablutions of darkness, and pray to the God of Shadows for safe passage. Anyone who defended the light was a collaborator. A traitor. Possibly a plant sent by Big Bulb.

The Rationalist Opposition found this embarrassing. They wrote op-eds. They held rallies. They commissioned tote bags that said *I TRUST THE PROCESS* and *EVIDENCE NOT EMOTION*.

They were very popular at dinner parties in the drainage system.

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The Ruler — a cautious centrist who had survived four elections by never being clearly wrong about anything — decided the matter required a committee. And so, the High-Powered Scientific Committee to Investigate the Alleged Malevolence of Illumination was convened, with great ceremony, a press conference, and a logo that had clearly cost more than the research budget.

The Committee deliberated. It was composed of highly acclaimed cockroach scientists who had published extensively, cited tremendously and peer-reviewed magnificently. But spent very little time in actual kitchens. They approached the question with the only instrument worthy of it: the gold standard of evidence-based cockroach medicine. The *Randomised Controlled Trial*.

Volunteers were solicited. The volunteers were praised, publicly and at length, for their bravery and their service to science and democracy. A press release was issued about the volunteers. The volunteers were given certificates. Then one group was placed in the light, and the other group was placed in the dark, in a carefully controlled laboratory. This was considered a feature.

The experiment was elaborate, meticulous, and very well-photographed. The hypothesis — that light kills cockroaches — was, the Committee declared, *adequately disproven*. A white paper was released. Guidelines were issued. The finding was paraded as a triumph of cockroach rationalism over cockroach superstition.

"Bright light cannot kill," the Committee Chair announced, to sustained applause. "This is science. This is the scientific method. This is the standard the evidence demands, and the evidence has spoken." Evidence was published in highest impact factor journal. The Ruler declared a national Science Appreciation Week. The Committee was given an award. The award ceremony was catered.

That night, the newly emboldened citizenry went out to forage. They moved, as democracies do, in two distinct camps: those

who had retained their ancestral suspicion of open light, and those who had read the executive summary of the white paper and found it reassuring. Then light came on. The first group — irrational, superstitious, embarrassing at dinner parties — fled behind the refrigerator with the undignified haste of citizens who prioritise survival over ideological consistency.

The second group remained. They had the evidence. They had the guidelines. They had the results of the RCT. They stayed put. And were immediately flattened to death.

The sandal that killed them did not distinguish between the experimenter or the subject, nor bothered about the strength of p value.

What the Republic got wrong about its gold standard

The Cockroach Republic's error was not scientific negligence. It was a category error that recurs in research-driven governance with the reliable frequency of a badly-designed study: mistaking the quality of the evidence for the relevance of the evidence. The RCT was good. The question it answered was real. The answer it produced was correct. But the answer was produced in conditions so controlled that they bore no meaningful relationship to the conditions in which it would be applied — and no one in the policy pipeline asked whether this mattered.

Controlling for the mechanism, finding nothing

The deeper failure in the Republic's inquiry was structural. By designing a trial that excluded sufficient factor, the experiment had not merely simplified the question, it had eliminated the answer. Light kills cockroaches *through* a specific mechanism by making them visible to human beings, who then exercise their sandal-based intervention. A sandal falling on a cockroach is sufficient enough factor, but light is a necessary factor to be able to do so, but not sufficient enough to kill on its own. Controlling for the human factor or the sandal factor in the experimental setting had removed the mechanism. The trial then, correctly but uselessly, reports that light has no lethal effect. RCTs can confirm a sufficient factor but will not be able to find evidence of necessary factors in all situations. As this situation shows that results may be scientifically accurate but also fail hopelessly to achieve the objective for which the science is being conducted.

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Confidence in Certainty, Certainty in CINeMA

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There are two words that sound like they should mean the same thing. Confidence. Certainty. In everyday speech, we use them interchangeably. In medicine, that habit can be dangerous.

Confidence, in statistical terms, is a property of an estimate — the width of the interval around a number, the reliability of the measurement itself. Certainty is something deeper: it asks whether the estimate is even answering the right question, whether the evidence behind it was gathered honestly, whether the comparison it represents is coherent at all. Network meta-analysis is the technique that allows researchers to simultaneously compare dozens of treatments that have never been directly tested against each other and produces numbers that look like confidence. What it has historically struggled to produce is certainty about whether those numbers should be believed.

Enter CINeMA: Confidence In Network Meta-Analysis. An acronym that wears its purpose on its sleeve, and borrows the name of the darkened room where we suspend our disbelief and trust what we are shown – The Multiplex. The parallel is not accidental.

The Multiplex Problem: Too Many Films, No Common Screen

To understand what CINeMA does, you must appreciate the peculiar challenge it was built to solve.

Imagine you are a physician choosing between six drugs for the same condition. Clinical trials exist — dozens of them — but they were conducted independently, in different countries, across different decades, with different patient populations. Drug A was tested against Drug B. Drug B was measured against Drug C. Drug D competed against placebo. Nobody, at any point, put all six in the same trial.

Network meta-analysis solves this by constructing a web of indirect comparisons —

inferring how Drug A might perform against Drug D by stitching together intermediate evidence. It is mathematically elegant. It is clinically seductive. And it has a fundamental credibility problem: when you synthesize evidence that was never designed to be synthesized, you need a rigorous way to ask how certain you can be that the synthesis holds.

That is the question CINeMA was built to answer. Not by improving the evidence — it cannot do that. But by being honest, structured, and transparent about its quality.

The Framework: Six Tests of Certainty

Developed at the University of Bern and published in 2020, CINeMA applies the principles of the GRADE system — the established gold standard for rating evidence quality — to the specific demands of network meta-analysis. It evaluates every pairwise comparison across six domains, each probing a different dimension of certainty, before issuing a final verdict: high, moderate, low, or very low confidence.

Think of it as a screenplay being stress-tested before production. Each domain is a different script editor, asking a different question. The film only gets made when all six are satisfied. These six domains are not arbitrary additions; they represent a fundamental rethinking of what certainty means in the context of networked evidence.

Domain 1: Within-Study Bias — Was the Camera Steady?

The first test of certainty is the most fundamental: was the raw footage any good? In clinical research, this means interrogating the trials themselves. Were patients genuinely randomized? Were outcomes assessed by someone who did not know which treatment each patient received? Were dropout rates suspiciously unequal between arms? A network built on trials at high risk of bias is a film assembled from shaky, poorly-lit home footage. CINeMA assigns each trial a risk of bias rating and crucially, weights it by how much that trial contributes to each network estimate. A biased trial contributing 40% of a comparison's evidence is far more serious than one contributing 3%. This weighted approach is unique to network meta-analysis.

Domain 2: Reporting Bias — What Never Made It to the Screen?

Here is a thought experiment. Suppose a film studio only releases movies that test well with audiences. Every failure is quietly shelved. Over years, cinema-goers would develop an inflated sense of how good modern

filmmaking is — because they only ever see the hits.

Medical research has been running this experiment for decades. Trials with positive results are substantially more likely to be published than trials that find nothing — or worse, find harm. What reaches the literature is a curated highlight reel. When you pool that reel, your certainty about the true effect is compromised — not because any individual trial was dishonest, but because the selection process was. CINeMA assesses reporting bias using techniques like funnel plot asymmetry.

Domain 3: Indirectness — Is This the Right Film for This Audience?

Most comparisons in a network are indirect. We did not test A versus D. We inferred it: we took trials of A versus B conducted in elderly Scandinavian patients in 2003, and spliced them with trials of B versus D conducted in young adults in India in 2019. Certainty about indirectness requires asking whether the populations, interventions, comparators, and outcome definitions across contributing trials are similar enough for their combination to be meaningful. Splicing a Bergman drama with a Bollywood musical does not create a coherent film. It creates a genre collision. CINeMA downgrades confidence when indirectness becomes an assumption too large to swallow.

Domain 4: Imprecision — Is the Picture Sharp Enough to Act On?

A perfectly constructed film, shot on flawless equipment, can still be unwatchable if it is screened out of focus. Imprecision is the statistical focus problem. When a comparison rests on a handful of small trials, the resulting estimate arrives with enormous confidence intervals — so wide they are compatible with almost any interpretation.

CINeMA's certainty framework requires that estimates be precise enough to guide action. An estimate that could mean almost anything means almost nothing. What makes this particularly challenging in network meta-analysis is that indirect evidence sometimes produces unexpectedly narrow confidence intervals, creating a false sense of certainty that CINeMA must actively interrogate.

Domain 5: Heterogeneity — Did All the Cameras Film the Same Scene?

Even when every trial was conducted impeccably, results can still scatter — one finding a large benefit, another finding nothing, a third suggesting possible harm. This is statistical heterogeneity.

CINeMA asks: are we certain that these trials were measuring the same underlying effect? Or have we pooled trials that differ in patient subgroup, drug formulation, dose, or duration? High heterogeneity does not always invalidate a comparison, but it does demand explanation. CINeMA refuses to paper over this with a pooled average.

Domain 6: Incoherence — Does the Network Tell a Consistent Story?

This domain belongs exclusively to network meta-analysis. Incoherence occurs when the direct evidence for a comparison contradicts the indirect evidence inferred through the network. We calculated, from the network, that A should substantially outperform C. The trials that directly tested them found almost no difference. The story does not hold together. This is not a rounding error. It is a red flag that something in the network's assumptions has broken down. You cannot be certain of an estimate that contradicts itself. CINeMA quantifies this incoherence and flags it prominently.

When all six domains have been examined, CINeMA delivers its rating. High confidence means the true effect is likely close to the estimated effect. The evidence is certain enough to act on. Moderate confidence means the true effect is probably close. Low confidence means the estimate may be substantially different from reality. Very low confidence means we genuinely do not know. To have confidence in a network estimate, you must first achieve certainty about its underlying quality. This is the chiasmus the title describes.

Before CINeMA and similar frameworks existed, fewer than one per cent of published network meta-analyses formally assessed the confidence that should be placed in their own findings. Researchers generated estimates and reported them with precision, letting guideline committees assume that a precise estimate is a trustworthy one.

Network meta-analyses now sit at the heart of treatment guidelines across cardiology, oncology, psychiatry, and infectious disease. They determine which drugs are recommended first-line. When those recommendations rest on low or very low confidence evidence that was never labelled as such, patients receive treatments whose comparative benefits are essentially unknown.

CINeMA is often described as an extension of GRADE — but that description undersells how much it had to reinvent. GRADE was built for pairwise comparisons: one treatment

against one comparator, evidence pooled from directly matched trials. Network meta-analysis violates every one of those conditions.

Domain	GRADE (Pairwise)	CINeMA (Network)
Within-study bias	Assessed per comparison using risk of bias tools.	Weighted by each study's proportional contribution to the network estimate.
Reporting bias	Funnel plot asymmetry; suspected when small positive trials dominate.	Applied per pairwise comparison within the network.
Indirectness	Are PICO elements applicable to the target question?	Evaluates whether indirect comparisons introduce additional PICO mismatches.
Imprecision	Width of CI around direct pooled estimate.	Applied to network estimates, which may vary in precision.
Heterogeneity	Statistical and clinical heterogeneity across trials.	Heterogeneity evaluated per comparison node within network.
Incoherence	Not applicable to pairwise meta-analysis.	Unique to NMA: tests whether direct and indirect estimates agree.

Table 1. Key differences between GRADE and CINeMA. PICO = Population, Intervention, Comparator, Outcome; CI = Confidence Interval; NMA = Network Meta-Analysis.

The CINeMA framework is freely available at cinema.ispm.unibe.ch, developed by the Institute of Social and Preventive Medicine, University of Bern. Foundational paper: Nikolakopoulou A et al. CINeMA: An approach for assessing confidence in the results of a network meta-analysis. PLOS Medicine, 2020.

NEMPSule

The Rise of GLP-1 Agonists: Beyond Diabetes and Obesity

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Glucagon-like peptide-1 (GLP-1) receptor agonists have become one of the most revolutionary segments of modern medicine. Originally formulated for the management of type 2 diabetes mellitus (T2DM), these agents are proving to be quite effective for glycemic and weight control. Increasingly so in the past decade, robust evidence supporting that GLP-1 receptor agonists are not limited to diabetes and obesity has provided novel therapeutic targets of their discovery in cardiovascular disease, chronic kidney disease, metabolic dysfunction-associated steatotic liver disease (MASLD), and neurodegenerative disorders. GLP-1 is an incretin hormone secreted by intestinal L-cells in response to food intake. It stimulates glucose-dependent insulin secretion, suppresses glucagon release, delays gastric emptying, and promotes satiety. Native GLP-1 has a very short half-life due to rapid degradation by dipeptidyl peptidase-4 (DPP-4) GLP-1 receptor agonists such as exenatide, and tirzepatide (a dual GIP/GLP-1 receptor agonist) were developed to overcome this limitation and provide sustained therapeutic effects.

The role of GLP-1 receptor agonists in diabetes management is well established. They effectively lower glycated hemoglobin (HbA1c) while carrying a low risk of hypoglycemia because their insulinotropic action is glucose-dependent. In addition, these agents contribute to substantial weight loss, making them particularly useful in patients with obesity-associated T2DM.

Perhaps the most significant advancement has been the recognition of their cardiovascular benefits. Large cardiovascular outcome trials such as LEADER, SUSTAIN-6, and REWIND demonstrated reductions in major adverse cardiovascular events, including cardiovascular death, non-fatal myocardial

infarction, and stroke among high-risk patients with T2DM. These findings have led international guidelines to recommend certain GLP-1 receptor agonists for patients with diabetes who have established cardiovascular disease or are at high cardiovascular risk.

Beyond cardiovascular protection, GLP-1 receptor agonists have shown promising renoprotective effects. Clinical studies suggest that these drugs reduce albuminuria and slow the progression of diabetic kidney disease, potentially through improvements in glycemic control, blood pressure, body weight, and direct anti-inflammatory mechanisms. Emerging evidence indicates that GLP-1 receptor agonists may become an important component of comprehensive chronic kidney disease management in the future.

Another rapidly evolving area is their role in metabolic dysfunction-associated steatotic liver disease (MASLD), previously known as non-alcoholic fatty liver disease (NAFLD). Obesity and insulin resistance are major drivers of MASLD, and GLP-1 receptor agonists address both conditions effectively. Clinical trials have demonstrated reductions in liver fat content and improvements in hepatic inflammation, with Semaglutide showing encouraging results in non-alcoholic steatohepatitis (NASH).

The possible neuroprotective effects of GLP-1 receptor agonists have also been investigated in recent studies. GLP-1 receptors are found across several brain areas and experimental data indicate beneficial effects on neuroinflammation, oxidative stress, and neuronal survival. These agents are under investigation for conditions such as Alzheimer's and Parkinson's disease. Although clinical evidence remains preliminary, early findings are promising and warrant further investigation. Newer agents have shown unprecedented weight loss and have transformed the management of obesity. Semaglutide and Tirzepatide have been shown to achieve reductions in body weight approaching those seen with some types of bariatric procedures. This has changed the way obesity is viewed from a simple lifestyle problem to a chronic, treatable disease that needs long term medical care.

Although all of these factors enhance the effectiveness of GLP-1 receptor agonists, they should be considered by any clinician. Common side effects are nausea, vomiting, diarrhea, and gastrointestinal discomfort, especially at the beginning of therapy. Other

issues can also concern it such as pancreatitis, gallbladder disease, and the relatively high cost of therapy. Their public health potential will be maximized with long-term safety data and wider availability. From antidiabetic drugs, GLP-1 receptor agonists are multifunctional therapy agents with numerous organ system benefits. With demonstrable outcomes in cardiovascular health, kidney disease, obesity, and liver disease, and emerging evidence of neurological disorders, they are listed among the most effective pharmacological interventions of the 21st century. Indeed, as studies progress GLP-1-based therapies may redefine management of a number of chronic diseases and extend accuracy and precision medicine's limits.

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NEMPSule

The Fish Gene That Could One Day Fix Your Heart: The Zebrafish

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Introduction

An acute myocardial infarction (AMI) occurs when the blood supply to a portion of the heart muscle is suddenly blocked, resulting in severe oxygen deprivation and irreversible damage to cardiac tissue. Despite advances in cardiovascular care, myocardial infarction remains a major cause of illness and death worldwide. Unlike certain tissues in the body, the adult human heart has a very limited capacity for regeneration. Consequently, the damaged myocardium is replaced by fibrous scar tissue rather than new functional cardiac muscle (Fig 1). Although this scar helps maintain structural integrity, it lacks the contractile properties of healthy myocardium. The remaining viable heart muscle must therefore compensate for the loss of function, often leading to ventricular remodelling, progressive decline in cardiac performance, and ultimately heart failure. These limitations have intensified research efforts aimed at developing innovative therapies that can promote true cardiac regeneration and restore lost myocardial function. In contrast, a small freshwater fish known as the zebrafish (Danio rerio) possesses an extraordinary ability to regenerate damaged heart tissue. Understanding the genetic mechanisms underlying this process may open new avenues for regenerative medicine and future cardiac therapies.

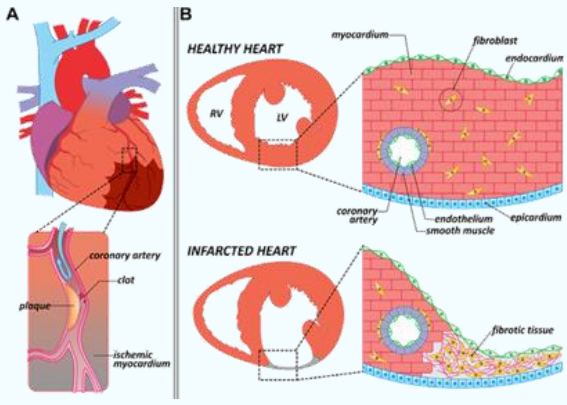

FIGURE 1 Causes and consequences of myocardial infarction in mammals. (A) Schematic representation of a human heart in which one of the coronary arteries is occluded by an atheromatous plaque (magnified area). When blood flow is interrupted, a region of the myocardium becomes ischemic (brown shade). Ischemic myocardium eventually dies and is replaced by fibrotic tissue. (B) Anatomical and histological differences between a healthy and an infarcted heart. In contrast to a healthy heart, the infarcted ventricle shows a thinning of the affected wall, in which the cardiac muscle has been replaced by fibrotic tissue. LV, left ventricle; RV, right ventricle

The Remarkable Regenerative Capacity of Zebrafish

Unlike the adult human heart, the zebrafish heart can regenerate substantial portions of its myocardium following injury. Studies have demonstrated that zebrafish can recover from the loss of up to 20% of their ventricular tissue within a few weeks, restoring both structure and function with minimal scar formation. This regenerative ability has made zebrafish an important model organism for studying tissue repair and regeneration.

The key to this phenomenon lies in the activation of specific genes and signalling pathways that stimulate existing cardiomyocytes to re-enter the cell cycle and proliferate. Rather than relying primarily on stem cells, zebrafish regenerate their hearts through the expansion of mature heart muscle cells.

Key Genes and Signalling Pathways

1. GATA4: The Master Regulator

One of the earliest genes activated following cardiac injury is GATA4, a transcription factor essential for heart development. In zebrafish, GATA4 expression increases significantly after injury and promotes cardiomyocyte proliferation. Its activation serves as an important molecular marker of cardiac regeneration.

2. Fibroblast Growth Factor (FGF) Signalling

The FGF signalling pathway plays a crucial role in stimulating cell growth and repair.

3. Vascular Endothelial Growth Factor (VEGF)

Effective regeneration requires the formation of new blood vessels to supply oxygen and nutrients to growing tissues. VEGF promotes angiogenesis in the injured heart, ensuring adequate vascular support for regenerating cardiomyocytes.

4. Retinoic Acid Signalling

Retinoic acid, a metabolite of vitamin A, is another critical mediator of heart regeneration. Following injury, cells in the epicardium and endocardium increase retinoic acid production, which stimulates cardiomyocyte proliferation and tissue remodelling.

5. Notch Signalling

Activation of Notch signalling has been shown to support myocardial regeneration by influencing both cardiomyocyte growth and vascular development.

6. Chemokine Signalling Pathways

The CXCL12-CXCR4 signalling axis directs the migration of regenerative cells to the site of injury. These molecular signals ensure that

repair mechanisms are concentrated where they are most needed.

Implications For Human Cardiac Therapy

The discovery of regenerative genes in zebrafish has generated considerable excitement in cardiovascular research. Scientists are investigating whether similar pathways can be activated in humans to promote heart repair after myocardial infarction.

Several experimental approaches are currently being explored:

- Gene therapy to stimulate cardiomyocyte proliferation.
- Small-molecule drugs targeting regenerative signalling pathways.
- Stem-cell-based regenerative therapies.
- Tissue engineering and bioengineered cardiac patches.
- RNA-based therapeutics to activate dormant regenerative programs.

Although human hearts retain limited regenerative capacity, understanding how zebrafish genes control regeneration may help overcome this biological constraint.

Challenges And Future Directions

Despite promising findings, translating zebrafish research into clinical therapies remains challenging. Human and zebrafish hearts differ significantly in structure, physiology, and regenerative potential. Furthermore, uncontrolled stimulation of cell proliferation could increase the risk of arrhythmias or tumour formation.

Future research aims to identify the precise molecular switches that enable regeneration while maintaining normal cardiac function. Advances in genomics, gene editing technologies such as CRISPR, and regenerative pharmacology are expected to accelerate progress in this field.

Conclusion

The zebrafish has emerged as a powerful model for understanding cardiac regeneration. Through the coordinated action of genes such as GATA4 and signalling pathways including FGF, VEGF, retinoic acid, and Notch, this small fish can achieve what the human heart cannot—true regeneration of damaged myocardium. As scientists continue to unravel these molecular mechanisms, lessons learned from zebrafish may ultimately lead to innovative therapies capable of repairing the injured human heart and transforming the future of cardiovascular medicine.

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Infant mortality rate: Ray of hope for Assam

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The Infant Mortality Rate (IMR) is accepted as a crude indicator of the overall health scenario of a country or a region. It is defined as the infant deaths (less than one year old baby) per thousand live births in a given time period and for a given population. The present level of IMR is 24 in India and 29 in Assam as per the Sample Registration System (SRS) bulletin published by the office of the Registrar General of India. Few years back IMR was 48 as per National Family Health Survey (NFHS-4) which was conducted in 2015-16. These impressive figures are encouraging as it motivates everyone to work better. Over 60% improvement within a period of ten years is commendable. The state health minister and the team of healthcare workers deserve the credit. The task continues and the present Chief Minister of Assam is concerned about the overall development of the region. Health of a person in general depends on many factors. From the childhood to adulthood proper care and appropriate intervention for growth is essential.

Government policy and political will need to be reinforced. A region may progress if citizens remain healthy and fit. The society has an important role in educating the children and empowering women. In the family mother is the centre force in general. She needs to understand the requirements of the family. A girl child in Assam is as good as a son. The present scenario in many other states of India is not same. In Assam traditional practices encompass hygiene and nutrition which is healthy for the people. Our ancestors knew about the various food habits in different phases of life and seasonal changes that is still practiced.

Better communication, National Health mission initiatives, institutions in remote areas of healthcare delivery etc. is bringing the change which is gradually evident. Medical College hospitals in Assam has all the departments to take care of common illnesses. The present

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Chief Minister envisaged every district of Assam to have a medical College hospital engineering College with a University and other infrastructure. Assam needs transparent governance, decentralisation and sustainable growth. The young generation of Assam should be ready to face the challenge and update the skills to remain in the ecosystem of the region.

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Likes, Shares, and Side Effects: Social Media Health Influencers and Medication Misinformation—A Growing Challenge for Clinical Pharmacology

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The New Consultation Room

It is 11:30 PM, a young woman lies in bed scrolling through Instagram. Within minutes, she encounters a video claiming that a weekly injection can help her lose weight effortlessly. A few swipes later, another influencer recommends a supplement that supposedly "detoxifies" the body. Before going to sleep, she has already made up her mind about which products she wants to try. She has not consulted a doctor. She has not read a scientific article. Elsewhere, a college student watches a video recommending antibiotics for a sore throat, while a middle-aged man purchases an expensive herbal supplement after reading claims that it can "detoxify" the body and reverse disease. None of these individuals has spoken to a doctor, pharmacist, or healthcare professional. Yet important decisions about medicines are already being made.

Over the past decade social media networks including Instagram, YouTube, Facebook, Tik-tok, and X (formerly Twitter) have been transformed into powerful conduits of health communication. They have enhanced access to health information, heightened community involvement, and offered healthcare providers new avenues to educate communities. However, they have also become fertile ground for misinformation, particularly regarding medicines and healthcare interventions. For clinical pharmacologists, this represents one of

the most important and rapidly evolving challenges of the digital age.

The Rise of the Health Influencer

Today's health influencer has a unique role to play in healthcare communication. There are doctors, pharmacists, nurses and other public health professionals, and they responsibly employ social media to simplify complex medical concepts and improve public understanding. Social media has been a central vehicle to disseminate health information and promote preventive measures during the COVID-19 pandemic. But not all health influencers have formal healthcare credentials. They draw it from popularity, charisma and large followers rather than scientific expertise. As a result, their authority has grown thin in the face of a field where visibility usually translates into credibility, when the lines between science and personal opinion are often blurred. Social media platforms do not, like scientific journals, require peer review on an ongoing basis. Information competes for eyeballs in a crowded digital marketplace where it is often engagement, not accuracy, that decides who is seen first. As a result, sensational claims tend to overwhelm cautious, evidence-based recommendations.

When Virality Outpaces Science

Speed is one of the core traits of social media. Within seconds, information travels across continents, reaching millions before experts have an opportunity to confirm its accuracy. Studies also prove the tendency of misinformation to go viral and reach more people than factually accurate information: it is more novel, emotionally engaging, and easier to understand. A claim that a particular herb "can cure diabetes naturally" might get far more attention than a detailed explanation of lifestyle modification, pharmacotherapy, and long-term glycemic control. Scientific evidence tends to develop gradually. These are clinical trials that take years to plan, recruit, analyses data, and get peer review to draw conclusions. Social media, in contrast, incentivizes immediacy. Consequently, misinformation can spread well before robust evidence is available. The result is an increasing divergence between scientific knowledge and public perception.

Medicines in the Spotlight

Medicines are one of the most popular topics discussed on social media. Weight-loss drugs, antibiotics, supplements, hormones, antidepressants and even cancer therapies are

routinely included in viral posts and videos. This phenomenon is well illustrated by the growing public interest in GLP-1 receptor agonists. Medications such as Semaglutide have transformed obesity management and demonstrated substantial clinical benefits when used appropriately. However, discussions often focus on the hyperbole of rapid weight loss on social media and, more often than not, disregard more relevant considerations such as patient selection, contraindications, adverse effects, costs, and the need for long-term medical supervision. Antibiotics remain dogged by myths just as much today. Despite numerous public health campaigns, many individuals still believe that antibiotics are effective against viral infections like the common cold and influenza. Social media can also unwittingly perpetuate these misconceptions by promoting incorrect antibiotic prescribing, increasing inappropriate use of antibiotics and the threat of antimicrobial resistance.

The Hidden Risks Behind the Screen

Misinformation about medications is not an academic problem. It can also impact patient care with real and in some cases serious consequences. There will be people who read social media recommendations and start treatment without proper medical checks, stop prescribed medications prematurely or add multiple medications to a medication list without a full understanding of how they may interact. These practices are associated with the risk of adverse drug reactions, potential therapeutic failure, and avoidable hospitalizations. Of particular concern is that dietary supplements and nutraceuticals are rapidly being pushed. Products promoted as "natural," "immune-boosting" or "detoxifying" get popular with influencer support. But much of such claim is underwritten by scant scientific evidence. This common belief is that all natural products are safe — many herbal and dietary supplements can interact with prescription medicines, and many herbal and dietary supplements can cause adverse effects. Misinformation is usually framed and packaged in confidence and simplicity, but the science behind the information is often more complicated and nuanced.

Why Does Misinformation Spread So Easily?

One of the most fascinating aspects of health misinformation is that it often succeeds not

because people are careless, but because it appeals to basic human psychology. Most individuals seek simple answers to complex health problems. They want certainty, reassurance, and quick solutions.

Social media influencers frequently provide exactly that. Statements such as "This supplement changed my life," "Doctors don't want you to know this," or "This one trick can reverse your disease" are emotionally powerful and easy to remember. Scientific medicine, however, rarely offers absolute answers. Instead, it deals with probabilities, benefits, risks, and uncertainties.

The paradox is that the more nuanced and scientifically accurate a message is, the less likely it may be to go viral. Conversely, the simpler and more sensational a claim, the greater its potential reach. This creates an environment where misinformation can sometimes spread faster than evidence-based information.

The Clinical Pharmacologist's New Battlefield

Clinical pharmacology focuses on the rational use of medicines by research, teaching, pharmacovigilance, and patient care. Their roles today have moved into the digital realm, beyond hospitals, clinics, and classrooms. Clinical pharmacologists are especially well placed to address medication misinformation as they are trained professionals in drug efficacy, safety, pharmacokinetics, pharmacodynamics, adverse drug reactions, and evidence-based therapeutics. Through public participation, investment in digital health education, and distribution of reliable information, they have a crucial role to play in fighting misinformation and improving health literacy. In many ways, social media has emerged as an entirely new arena for pharmacovigilance: a space where misinformation can spread rapidly but accurate information may also reach vast audiences.

Looking Beyond the Likes

As consumers of health information, patients must learn to evaluate online content critically. Before accepting medication advice from social media, important questions should be asked:

- Is the source qualified?
- Are scientific references provided?
- Are benefits discussed alongside risks?
- Does the information align with established clinical guidelines?
- Is the content educational or promotional?

Popularity should never be confused with credibility. While a video may accumulate millions of views and thousands of positive comments, visibility alone does not validate a medical claim. The reliability of healthcare information depends on scientific evidence, not social media engagement.

A million views do not equal a clinical trial.

Conclusion

For clinical pharmacologists, the challenge is clear. Ensuring the safe, effective, and rational use of medicines now requires engagement not only in hospitals and classrooms but also in digital spaces where health information is created, shared, and consumed. The goal is not to discourage the use of social media for health education. Rather, it is to ensure that scientific evidence remains at the center of healthcare conversations. In an era dominated by algorithms, followers, and viral trends, science must continue to be the most trusted influencer of all.

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Brensocatib: A Paradigm Shift in the Management of Bronchiectasis

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Abstract

Bronchiectasis has traditionally been managed through supportive measures and infection control strategies, with no approved disease-modifying therapies available until recently. Brensocatib, a reversible and selective inhibitor of dipeptidyl peptidase 1 (DPP1), is the first targeted oral therapy approved for the treatment of bronchiectasis. By reducing the activation of neutrophil serine proteases (NSPs), it addresses a key mechanism underlying chronic airway inflammation and structural lung damage. Clinical evidence from the Phase III ASPEN trial demonstrated a significant reduction in pulmonary exacerbations, accompanied by improvements in lung function and disease control. This review summarizes the pharmacological rationale, clinical efficacy, safety profile, and therapeutic significance of Brensocatib, highlighting its potential to transform the management paradigm of bronchiectasis and pave the way for future mechanism-based treatments.

1. Introduction

Bronchiectasis is a chronic and progressive respiratory disorder characterized by irreversible bronchial dilatation, persistent airway infection, and ongoing neutrophil-driven inflammation. The disease imposes a considerable healthcare burden worldwide, with prevalence steadily increasing due to greater use of high-resolution computed tomography (HRCT), improved disease recognition, and an aging population with multiple respiratory comorbidities. Despite advances in diagnosis, therapeutic options have remained largely confined to symptomatic management, including airway clearance strategies, prolonged antibiotic therapy, and inhaled medications aimed at reducing exacerbations and improving quality of life.

The absence of an approved disease-modifying pharmacological therapy has represented a

major unmet clinical need. Brensocatib, developed by Insmed Inc., has emerged as the first oral inhibitor of dipeptidyl peptidase 1 (DPP1) to demonstrate significant clinical benefit in a large Phase III randomized controlled trial. Its regulatory approval represents a major advance in bronchiectasis treatment, shifting the therapeutic paradigm from symptom-focused care toward targeted modulation of the underlying inflammatory process.

2. Mechanism of Action

Brensocatib exerts its therapeutic effect through selective and reversible inhibition of dipeptidyl peptidase 1 (DPP1), also known as cathepsin C, a lysosomal enzyme essential for the activation of neutrophil serine proteases (NSPs) during neutrophil maturation within the bone marrow. These NSPs—including neutrophil elastase, proteinase 3, and cathepsin G—play a central role in mediating airway tissue damage and perpetuating inflammation in bronchiectasis.

Chronic bacterial infection, frequently caused by pathogens such as *Pseudomonas aeruginosa* and *Haemophilus influenzae*, drives excessive neutrophilic inflammation within the airways. The resulting release of active NSPs contributes to progressive structural lung injury, impaired mucociliary clearance, and recurrent exacerbations. By inhibiting DPP1 at an early stage of neutrophil development, Brensocatib reduces the production of active NSPs before they enter the circulation and subsequently the airway. This upstream approach distinguishes Brensocatib from previous anti-inflammatory therapies that attempted to neutralize proteases after their release, offering a more comprehensive strategy for limiting neutrophil-mediated tissue damage.

3. Clinical Evidence: The ASPEN Trial

The ASPEN trial (NCT04594369) was a global, randomized, double-blind, placebo-controlled Phase III study that enrolled more than 1,700 adults with non-cystic fibrosis bronchiectasis who had experienced at least two pulmonary exacerbations during the previous year. Participants were assigned to receive oral Brensocatib 10 mg, Brensocatib 25 mg, or placebo once daily for a treatment duration of 52 weeks.

The study met its primary endpoint, demonstrating a significant reduction in the annualized rate of pulmonary exacerbations in both Brensocatib treatment groups compared with placebo. The 25 mg dose produced the most robust clinical benefit, achieving an

approximate 21% relative reduction in exacerbation risk. Improvements were also observed across several secondary endpoints, including prolonged time to first exacerbation, reduced exacerbation severity, and enhanced lung function as assessed by forced expiratory volume in one second (FEV_1). The consistency of efficacy findings across multiple clinically relevant outcomes supported the selection of the 25 mg dose for regulatory approval and established Brensocatib as a promising disease-modifying therapy for bronchiectasis.

4. Safety and Tolerability

Brensocatib demonstrated a favourable safety and tolerability profile in the Phase III ASPEN trial. Treatment-emergent adverse events were generally mild to moderate in severity, with dermatological and oral manifestations being the most frequently reported. Notably, palmoplantar keratoderma and periodontitis occurred more commonly among patients receiving Brensocatib, findings that are consistent with the physiological role of DPP1 in epithelial and mucosal tissue homeostasis. These events were manageable in most cases and infrequently resulted in treatment discontinuation.

Given the central role of neutrophil serine proteases in host defence mechanisms, concerns had been raised regarding the potential for increased susceptibility to infections. However, clinical trial data did not indicate a clinically meaningful increase in infection risk. The incidence of serious infectious events, including pneumonia and sepsis, was similar between the Brensocatib and placebo groups, providing reassurance regarding the safety of long-term NSP suppression in a population already predisposed to recurrent respiratory infections.

5. Clinical Implications and Future Perspectives

The introduction of Brensocatib represents a significant shift in the therapeutic approach to bronchiectasis. Historically, disease management has focused primarily on symptom control, infection prevention, and treatment of exacerbations, largely because of the heterogeneous nature of bronchiectasis and the lack of clearly defined molecular targets. Despite diverse underlying etiologies including post-infectious disease, immune dysfunction, and idiopathic forms, excessive neutrophilic inflammation driven by neutrophil serine

proteases appears to be a common pathogenic pathway across many patient populations.

Targeting this shared inflammatory mechanism offers a novel disease-modifying strategy that may transcend traditional etiological classifications. Nevertheless, several important questions remain. Future studies should identify patient subgroups most likely to benefit from treatment, evaluate the effectiveness of Brensocatib in combination with established antimicrobial therapies, and assess the long-term consequences of sustained DPP1 inhibition beyond the duration of current clinical trials. In addition, the development of predictive biomarkers, such as sputum NSP activity and other inflammatory markers, may facilitate a more personalized approach to treatment selection and monitoring in routine clinical practice.

6. Conclusion

Brensocatib constitutes a landmark advancement in the management of bronchiectasis, a disease for which therapeutic innovation has been limited for decades. Through selective inhibition of DPP1 and subsequent suppression of neutrophil serine protease activity, the drug directly targets a key mechanism underlying chronic airway inflammation and tissue destruction. Clinical studies have demonstrated meaningful reductions in pulmonary exacerbations, accompanied by an acceptable safety profile and the convenience of once-daily oral administration.

The success of Brensocatib highlights the potential of mechanism-based therapies in bronchiectasis and supports the growing movement toward precision medicine and endotype-driven treatment strategies. As further real-world and long-term data become available, Brensocatib is poised to become an integral component of contemporary bronchiectasis care and a model for future targeted therapeutic development in chronic inflammatory lung diseases.

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Recent Advances in Congestive Cardiac Failure

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Introduction:

Heart failure (HF), as defined by the American College of Cardiology (ACC) and the American Heart Association (AHA), is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood. With an estimated prevalence of 26 million people worldwide, CHF contributes to increased healthcare costs, reduces functional capacity, and significantly affects quality of life. In India, heart failure is the commonest cardiac cause for hospitalization, with 1% of the general population being affected annually, which adds up to between 8 and 10 million patients.

Limitations of Current Therapies:

Many medications and device-based therapies have shown remarkable benefits in Heart Failure with reduced Ejection Fraction (HFrEF) but have limited efficacy in Heart Failure with Preserved Ejection Fraction (HFpEF), for which there is currently no disease-modifying therapy. Drugs such as ACE inhibitors and beta-blockers can cause side effects, including hypotension, renal dysfunction, and hyperkalemia, necessitating careful monitoring. Some patients may develop tolerance or resistance to medications over time, necessitating dosage adjustments or the addition of alternative therapies. Device-based therapies, such as LVADs and ICDs, carry risks of complications, including infections, bleeding, and device malfunction. Access to advanced treatments such as heart transplantation and LVADs is limited by donor organ availability and cost considerations. Successful heart failure management relies heavily on patient adherence to complex medication regimens, lifestyle modifications,

and follow-up appointments, which can be challenging.

A. **Drugs in Pre-Clinical Trials**:

a) LIT01-196

It is an Apelin receptor agonist. Apelin is a neuro-vasoactive peptide involved in several cardiovascular functions through a nitric oxide-mediated vasodilatory effect and positive inotropic activity. LIT01-196 in Swiss mice with permanent coronary artery ligation induced MI, showed significantly improved LV function, reduced levels of HF biomarkers, and enhanced cardiac contractility and sarcoplasmic or endoplasmic reticulum Ca^{2+}-ATPase-2 expression. LIT01-196 treatment almost doubled cardiac vascular density and maintained LV wall thickness post MI. It also significantly reduced cardiac fibrosis and fibrosis biomarkers, without decreasing arterial blood pressure.

b) SBT-255

Cardiolipin is a critical phospholipid that maintains mitochondrial structure and electron transport chain function. SBT-255 is a mitochondria-targeting tetrapeptide to treat mitochondrial dysfunction by binding to cardiolipin on the inner mitochondrial membrane. SBT-255 treatment significantly reduced infarct size and no-reflow size compared to saline in an acute rat myocardial ischemia/reperfusion model.

B. **Drugs in Phase 1 Trials**:

a) Genistein

BNIP3 (BCL2/adenovirus E1B interacting protein 3) is a receptor located on the outer mitochondrial membrane that triggers mitophagy in cardiomyocytes, often acting together with Drp1 (dynamin-related protein 1) to facilitate mitochondrial fission and degradation. Genistein binds directly to BNIP3L/NIX protein, stabilizing its dimeric conformation and promoting its expression in cardiomyocytes, which helps alleviate HFpEF by enhancing mitophagy. In Pre-clinical Trials, HFpEF was induced in C57BL/6 mice through a high-fat diet (HFD)combined with N-omega-nitro-L-arginine methyl ester (L-NAME). Genistein treatment significantly improved myocardial remodeling and heart function in HFpEF mice, as evidenced by improved echocardiographic parameters, blood pressure, and exercise performance. Histological analysis showed a reduction in myocardial damage, indicating genistein's protective effect.

The CARDIOGEN Trial is a Phase 1b/2a open-label study that aims to enroll 40 participants. Each patient will receive genistein at a dosing regimen starting with 250 mg twice daily for 4weeks, escalating to 500 mg twice daily for the subsequent 4 weeks, and 750 mg twice daily for another 4 weeks, culminating in a 6-week follow-up period. The trial started on 1st July 2024 and is estimated to be completed by 1st September 2026.

b) AMG 986

It is a novel apelin receptor (APJ) agonist. In animal models, it was found to improve cardiac contractility without adversely impacting hemodynamics. In healthy subjects and HF patients, short-term AMG 986 treatment was well tolerated. In HF with reduced ejection fraction patients, there were numerical increases in percent changes from baseline in LV ejection fraction and stroke volume by volumetric assessment with AMG 986 vs placebo.

C. **Drugs in Phase 2 Trials**:

a) AAV gene therapy

AB-1002 is composed of a chimeric cardiotropic AAV2/AAV8 vector capsid (AAV2i8) that delivers the gene sequence for the expression of the constitutively active PP1 inhibitor 1 (I-1c). Adeno-associated virus (AAV) vectors have potential for durable expression in nondividing cells, low immunogenicity and selective transduction based on the capsid protein. In porcine models of ischemic and nonischemic heart failure, the intracoronary delivery of AB-1002 significantly improved hemodynamic parameters and cardiac function. In the Phase 1 Trial, no adverse events (AEs) or serious AEs were attributed by the investigators to the study treatment. The preliminary assessments of efficacy outcomes showed improvements in the New York Heart Association class and left ventricular ejection fraction in both cohorts and improvements in peak oxygen consumption and 6-min walk test performance. The Phase 2 Trial involves an adaptive, double-blind, placebo-controlled, randomized, multi-centre trial that includes a 52-week observation and a 4-year follow-up period. Eligible patients are ≥18 years of age with non-ischaemic cardiomyopathy and New York Heart Association (NYHA) Class III heart failure symptoms.

b) AC01

Ghrelin is the endogenous ligand of the growth

hormone secretagogue receptor 1a (GHSR1a), a G-protein-coupled receptor expressed in different tissues, including the heart and cardiomyocytes. Acyl ('activated') ghrelin improved cardiac output in human HFrEF and increased contractility of mouse cardiomyocytes without increasing Ca^{2+}mobilization, suggesting a lower risk of calcium-related adverse events. AC01 is an orally available, small molecule with high affinity for the human GHSR1a receptor and potent agonistic activity.

AC01 improved CO, SV, and EF in HF mice by increasing contractility in a load-independent fashion. It increased cardiomyocyte contractility without affecting Ca^{2+} transient amplitudes, through ghrelin receptor Gαi signaling, leading to reduced phosphorylation of cardiac Troponin I. It improved left ventricular systolic function in monkeys.

Phase 1b/2a clinical trial with AC01 (GOAL-HF1) demonstrated a favorable safety and tolerability profile, with no treatment-emergent adverse events leading to discontinuation, no drug-related serious adverse events and no evidence of ischemia, new onset of sustained arrhythmias, morphological or conduction abnormalities, or clinically relevant effects of AC01 on blood pressure. Pharmacokinetics were predictable and dose-proportional, and target engagement was confirmed by a dose-dependent increase in growth hormone release.

Consistent, rapid and sustained improvements across hemodynamics, and cardiac structure and function were seen which clearly justify advancing AC01 into a Phase 2b study.

c) Pirfenidone

It attenuates fibroblast proliferation, production of fibrosis-associated proteins (TGF-β, platelet-derived growth factor and β-fibroblast growth factor) and cytokines (interleukin-1β and tumour necrosis factor-α), and reduces the increased biosynthesis and accumulation of extracellular matrix in response to pro-fibrotic mediators (i.e., TGF-β); it also blocks the proliferation and differentiation of fibroblasts into myofibroblasts by inhibiting several targets of TGF-β (Smad3, p38, Akt42), improves mitochondrial function and modulates lymphocyte activation. In hypertensive mouse models, Pirfenidone has been shown to reverse and prevent cardiac remodeling and the increased cardiac stiffness. In dog models with HF induced by high-frequency left ventricular

pacing, Pirfenidone showed a protective effect, preventing fibrosis of the atrial myocardial tissue. The Phase 2, PIROUTTE Trial shows that the primary outcome, change in myocardial extracellular volume (%) from baseline to 52 weeks, was -0.7 in the pirfenidone group compared with 0.5 in the placebo. This medication was associated with a modest reduction in myocardial fibrosis, as assessed by cardiac MRI, compared with the placebo group ($p = 0.009$).

d) Mirabegron

It causes Cardiac β3-adrenergic receptor stimulation that produces antioxidant effects that are expected to preserve NO/cGMP bioavailability and possibly protect other molecular targets that regulate excitation-contraction coupling and myocardial remodeling. In Animal models, activation of β3AR/NO decreases myocardial hypertrophy and fibrosis in response to neurohormonal or hemodynamic stresses without compromising left ventricular (LV) function, and cGMP/PKG-Ia promotes cardiac relaxation through phosphorylation of titin, troponin I, and sarcoendoplasmic reticulum calcium ATPase. The Phase 2, Beta3-LVH Trial shows that standard therapeutic Mirabegron dosage (50mg per day) resulted in no or mild HF symptoms in patients with structural heart disease.

e) Elamipretide

Cardiolipin is a critical phospholipid that maintains mitochondrial structure and electron transport chain function. Elamipretide is a mitochondria-targeting tetrapeptide to treat mitochondrial dysfunction by binding to cardiolipin on the inner mitochondrial membrane. Animal-model studies tested three months of Elamipretide therapy, which showed an improvement in skeletal muscle function and increased exercise tolerance.

The Phase 2, PROGRESS-HF trial showed improvements in mitochondrial function and quality of life.

D. **Drugs in Phase 3 Trials**:

a) Recombinant human neuregulin-1

It is a non-selective agonist of the ERBB system, binding to both ERBB3 and ERBB4 receptors. It reduces cell death and hypertrophy in cardiomyocytes and decreases collagen production in cardiac fibroblasts in an ERBB4-dependent manner.

In wild-type mice, it inhibits angiotensin II-induced fibrosis in both males and females. It

reduces heart damage caused by doxorubicin and myocardial infarction in females, but not in ERBB4- null mice. Phase 2 Clinical Trials have shown that Recombinant human neuregulin-1 effectively enhances heart function, reverses the remodeling of the left ventricular, and reduces all-cause mortality in heart failure. More importantly, Recombinant human neuregulin-1 can significantly reduce the mortality of heart failure subjects with baseline NT- proBNP level ≤1600 fmol/mL and NYHA class II to III. A phase 3, multicenter, Randomized, Double-blinded, placebo-controlled trial is being conducted to evaluate Chronic Systolic Heart Failure on Standard HF Therapy. In this phase III study, the investigators will further confirm the efficacy of Recombinant human neuregulin-1 in reducing the death rate of heart failure subjects with baseline NT-proBNP levels between 600 pg/mL and 1700 pg/mL and NYHA class II to III.

b) Mesenchymal Precursor Cell Therapy

MPCs are a well-characterized STRO-1/STRO-3+ stem cell population with greater immunomodulatory activity than STRO-1-negative mesenchymal stromal cells. MPCs can bind the proinflammatory cytokines produced at high levels in the myocardium of patients with HFrEF, resulting in the release of factors that are anti-inflammatory and induce microvascular network formation (i.e., neovascularization). MPCs reversed endothelial dysfunction within coronary arteries and peripheral arteries in the setting of systemic inflammation, as well as induced angiogenesis and arteriogenesis within cardiac muscle in animal models of HFrEF. Results from a phase 2 dose-finding study suggested that MPCs may reduce major adverse cardiovascular events (MACE) associated with HFrEF. The Phase 3, DREAM-HF trial-MPCs increased left ventricular ejection fraction from baseline to 12 months, especially in patients with inflammation. MPCs decreased the risk of myocardial infarction or stroke by 58% and the risk of 3-point major adverse cardiovascular events by 60%. Dual RMAT (Regenerative Medicine Advanced Therapy) designations from the FDA, Revascor® represents the most advanced cellular therapy approach for patients with ischemic heart failure and reduced ejection fraction (HFrEF).

c) RNA Therapeutics

Vutrisiran is a subcutaneously administered

RNA interference therapeutic agent that inhibits the production of hepatic transthyretin. Transthyretin amyloidosis with cardiomyopathy (ATTR-CM) is a progressive, fatal disease. Key pathological processes in HF, including dysregulated calcium handling, myocardial fibrosis, oxidative stress, inflammation and aberrant signaling, are targeted. Phase 1 Clinical Trials showed that Vutrisiran treatment achieved potent and sustained transthyretin (TTR) reduction in a dose-dependent manner, with a mean maximum TTR reduction of 57 to 97%, maintained for ≥ 90 days post dose. It was rapidly absorbed (peak plasma concentration 3–5 hours post dose), had a short plasma half-life (4.2–7.5 hours), and plasma concentrations increased in a dose-proportional manner. Acceptable safety profile; the most common treatment-related adverse event was mild, transient injection site reactions in four (6.7%) Vutrisiran-treated subjects. HELIOS-B is a Phase 3, Randomized, Double-blind, Placebo-controlled, Multicenter Study: Vutrisiran treatment led to a lower risk of death from any cause and recurrent cardiovascular events and a lower risk of death from any cause through 42 months. In the overall population, treatment with Vutrisiran resulted in less of a decline in the distance covered on the 6-minute walk test than placebo and less of a decline in the Kansas City Cardiomyopathy Questionnaire–Overall Summary (KCCQ-OS) score.

d) The Special Case of Omecamtiv mecarbil

It is a selective cardiac myosin activator. The FDA has not approved omecamtiv mecarbil. The manufacturer, Cytokinetics, received a Complete Response Letter (CRL) on February 28, 2023, declining its approval for treating chronic heart failure with reduced ejection fraction (HFrEF). The GALACTIC-HF Trial was a Phase 3 trial that showed that there was no significant difference between groups (omecamtiv mecarbil and placebo) in the change from baseline on the Kansas City Cardiomyopathy Questionnaire total symptom score. At week 24, the change from baseline for the median N-terminal pro–B-type natriuretic peptide level was 10% lower in the omecamtiv mecarbil group than in the placebo group; the median cardiac troponin I level was 4 ng per liter higher. The frequency of cardiac ischemic and ventricular arrhythmia events was similar in the two groups.

The FDA cited insufficient evidence of effectiveness and required a new clinical trial.

Cytokinetics indicated they do not plan to conduct a new trial, focusing instead on other drug candidates.

E. **Approved Drugs**:

a) Finerenone

It is a non-steroidal mineralocorticoid receptor antagonist (MRA).

The FINEARTS-HF Phase 3 trial that followed 6001 patients for a median of 32 months assessed the efficacy and safety of Finerenone on morbidity and mortality in patients with HF and left ventricular ejection fraction (LVEF) ≥40%. Finerenone achieved a 16% relative risk reduction of the composite primary endpoint of CV death and total HF events, defined as hospitalization for HF or an urgent HF visit, compared to placebo on top of standard of care (RR=0.84, 95% CI: 0.74-0.95, p=0.007). The greatest benefit was observed in patients enrolled soon after a recent HF event (within 7 days: RR: 0.74, 95% CI: 0.57– 0.95; 7 days to 3 months: RR: 0.79, 95% CI: 0.64–0.97). On July 14, 2025, Bayer announced that the U.S. Food and Drug Administration (FDA) approved Finerenone to treat patients with heart failure (HF) with left ventricular ejection fraction (LVEF) ≥40%. The recommended starting dosage is 10 mg or 20 mg orally once daily based on eGFR and serum potassium thresholds. The dose can be increased after 4 weeks to the target dose of 20 mg or 40 mg once daily for HF with LVEF ≥ 40% based on eGFR and serum potassium thresholds. Tablets may be taken with or without food. Adverse effects comprise hyperkalemia (9.7%), hypotension (7.6%) and hyponatremia (1.9%)

b) Sotagliflozin

It is a sodium-glucose cotransporter 2 (SGLT2) inhibitor. The FDA approved Sotagliflozin on May 26, 2023. It is indicated to reduce the risk of cardiovascular death, hospitalization for heart failure, and urgent heart failure visits in adults with heart failure or type 2 diabetes mellitus, chronic kidney disease, and other cardiovascular risk factors. Volume status must be corrected before starting Sotagliflozin. The recommended starting dose of Sotagliflozin is 200 mg orally once daily, not more than one hour before the first meal of the day and up-titration must be done after at least 2 weeks to 400 mg orally once daily as tolerated. In patients with decompensated heart failure, dosing must be begun when patients are hemodynamically stable.

The common adverse reactions are Urinary tract infection (11.5%), Diarrhea (8.4%),

Hypoglycemia (7.7%), Dizziness (3.3%) and Genital mycotic infection (2.4%).

c) Ferric Carboxymaltose

It is an iron replacement product.

In the HEART-FID Phase 3 Trial, the primary hierarchical composite outcome (death, hospitalization for heart failure, and 6-minute walk distance) was marginally improved with IV ferric carboxymaltose vs. placebo.

All-cause mortality was 8.6% with IV ferric carboxymaltose vs. 10.3% with placebo. Heart failure hospitalizations were 13.3% with IV ferric carboxymaltose vs. 14.8% with placebo. Change in 6-minute walk distance was 8 m with IV ferric carboxymaltose vs. 4 m with placebo.

It is indicated for the treatment of iron deficiency in adult patients with heart failure and New York Heart Association class II/III to improve exercise capacity.

On June 5, 2023, the FDA approved the ferric Carboxymaltose injection (Injectafer) for the treatment of iron deficiency in adult patients with heart failure (HF) and iron deficiency, making it the first and only intravenous (IV) iron replacement therapy indicated for this patient population. Injectafer treatment may be repeated if iron deficiency in heart failure reoccurs.

The adverse reactions consist of Nausea (7.2%), Hypertension (4%), Flushing (4%), Erythema (3%), Hypophosphatemia (2.1%), Dizziness (2.1%), Hepatic enzyme increased (1.2%) and Rash (1%).

Conclusion:

Obstacles in medical treatment for heart failure encompass both the presently recognized guideline-directed medical treatments and innovative approaches, including gene therapies. Insufficient patient awareness of the significance of adherence to GDMT, coupled with challenges in obtaining outpatient visits and visiting cardiovascular specialists for GDMT up-titration every 1 to 2 weeks, impedes access to appropriate patient care.

As far as novel therapies are concerned, factors such as anatomical and biological difficulties for targeting cardiomyocytes, along with presented immunogenicity against administered vectors, play a role in observed responses.

Gene therapies using adenovirus have been shown to induce potent CD8+ T-cell immune responses, while AAV-based therapies have

also been reported to induce T-cell-mediated immune responses resulting in liver injury.

Therefore, a multidisciplinary, patient-centered approach is essential to improve patient outcomes and reduce the global burden of HF.

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NEMPSule

Amylin Based Therapies for Weight Management

Dr. Sarmistha Dutta
Associate Professor &Head
Department of Pharmacology
Tezpur Medical College and Hospital

Amylin (Islet Amyloid Polypeptide, IAPP) is a 37-amino-acid peptide hormone secreted by the pancreatic β-cells along with insulin in response to food intake.

A. Physiological Actions:

1. Delays gastric emptying

- Slows the entry of nutrients into the intestine.
- Reduces postprandial glucose spikes.

2. Suppresses glucagon secretion

- Particularly after meals.
- Decreases hepatic glucose production.

3. Promotes satiety

- Acts on the brain, especially the area postrema and hypothalamus.
- Reduces food intake and appetite.

4. Regulates postprandial glucose levels

- Works synergistically with insulin.

B. Clinically Important Amylin:

1. Pramlintide

•Synthetic analogue of amylin.

•Used as an adjunct to insulin therapy in both type 1 and type 2 diabetes.

•Administered by subcutaneous injection before meals.

Adverse Effects: Nausea, Vomiting, Reduced appetite, Risk of hypoglycemia when used with insulin

2. Cagrilintide

•Long-acting amylin receptor agonist.

•Under development for obesity management.

•Produces significant weight loss, especially when combined with GLP-1 agonists such as Semaglutide.

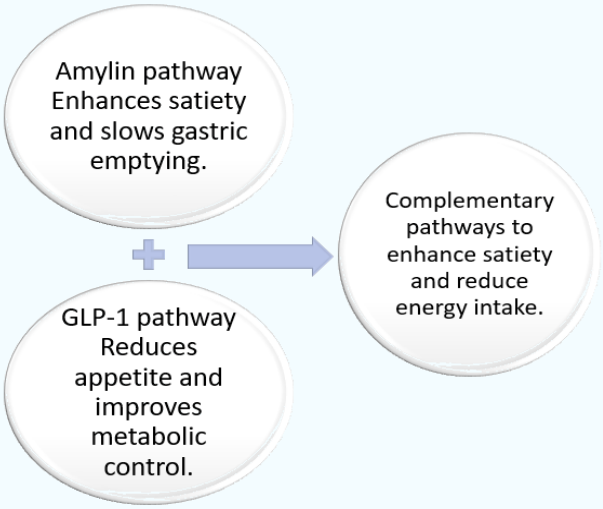
3. Combination Therapy

•Cagrilintide + Semaglutide (CagriSema)

•Late-stage development

•Combines an amylin analogue with a GLP-1 receptor agonist

Rationale:



Potential benefit

• Weight loss appears greater than with either agent alone, making this one of the most promising emerging obesity treatments.

References:

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NEMPSule

Alloxan and Maida: Revisiting a Persistent Public Health Concern

Dr. Vineet Tiwari, Demonstrator,
Department of Pharmacology
Tezpur Medical College and Hospital

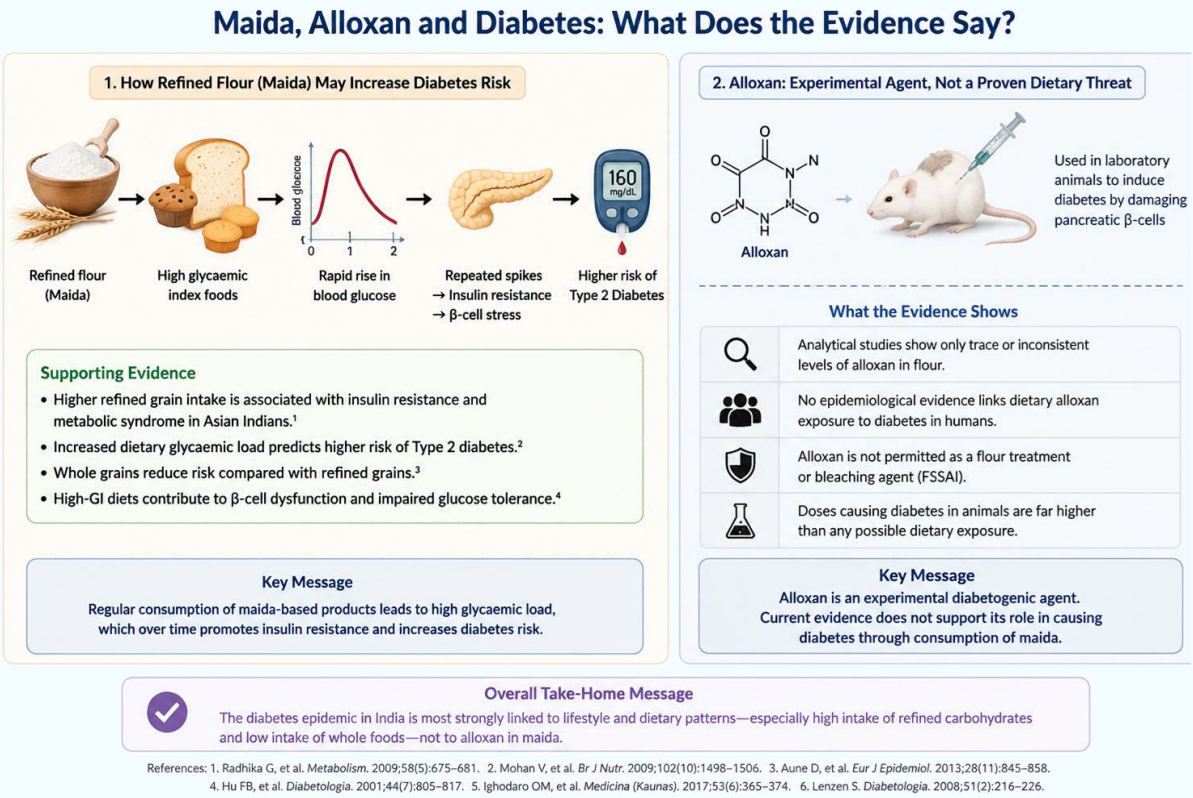
India also known as the Diabetic capital is home to one of the largest populations of individuals living with diabetes mellitus.

Rapid urbanization, sedentary lifestyles, and changing dietary habits have contributed significantly to this growing burden. Among dietary factors, refined carbohydrates such as polished rice and refined wheat flour (maida) have frequently been implicated because of their high glycaemic index and low fibre content.

In recent years, another concern has emerged in public discussions: the claim that maida contains alloxan, a chemical capable of inducing diabetes. While this belief has gained considerable attention through media reports and social media discussions, scientific evidence presents a more nuanced picture. Maida is produced by removing the bran and germ portions of wheat during milling, leaving primarily the starchy endosperm.

This refining process improves texture and shelf life but also removes much of the fibre, vitamins, and minerals naturally present in whole wheat. Foods prepared from maida are rapidly digested and absorbed, resulting in higher postprandial glucose excursions. Over time, repeated exposure to high-glycaemic foods may contribute to insulin resistance and metabolic dysfunction.

Evidence from Indian studies supports this association. In the Chennai Urban Rural Epidemiology Study (CURES), higher refined grain intake was associated with insulin resistance and metabolic syndrome among urban Asian Indians. Individuals with the highest refined grain consumption demonstrated significantly greater metabolic risk compared with those consuming lower amounts. Similar observations have been reported in studies evaluating dietary transitions in India, where increased reliance



on refined carbohydrates has paralleled rising rates of obesity and type 2 diabetes.

The concern regarding alloxan stems from its well-established role in experimental pharmacology. Alloxan is a diabetogenic compound widely used in laboratory animals to induce diabetes for research purposes. Following administration, alloxan selectively accumulates in pancreatic beta cells through glucose transport mechanisms and generates reactive oxygen species, leading to oxidative damage and beta-cell destruction. This property makes it useful for creating experimental models of insulin-deficient diabetes.

Because of this known diabetogenic effect, claims periodically arise suggesting that alloxan may be present in commercially available maida and could therefore contribute to diabetes in humans. However, a careful examination of the available evidence does not support such a conclusion. Experimental studies demonstrating alloxan toxicity involve doses that are substantially higher than any levels that have been reported in food products. Furthermore, the biological response observed

in laboratory animals cannot be directly extrapolated to human dietary exposure.

Another important consideration is that human beta cells appear less susceptible to alloxan than those of commonly used laboratory rodents. Differences in cellular transport mechanisms and metabolic handling of the compound may influence toxicity. Consequently, the presence of diabetogenic effects in animal models should not be interpreted as evidence that ordinary dietary exposure causes diabetes in humans.

Analytical investigations examining flour products have produced inconsistent findings regarding the presence of alloxan. Some studies have reported trace amounts, whereas others failed to detect it altogether. Variations in analytical methodology, sample selection, and detection limits make direct comparison difficult. More importantly, there is currently no epidemiological evidence linking dietary alloxan exposure with the development of diabetes in human populations.

Regulatory authorities have also addressed this issue. The Food Safety and Standards Authority of India (FSSAI) does not permit the use of alloxan as a flour treatment or bleaching agent. Existing food safety regulations therefore provide an additional layer of protection against intentional incorporation of the compound into flour products.

From a public health perspective, focusing exclusively on alloxan may divert attention from more important and well-established dietary determinants of diabetes. The metabolic effects of refined carbohydrates are supported by substantially stronger evidence than theories involving chemical contamination. Diets rich in whole grains, legumes, fruits, vegetables, and minimally processed foods have consistently demonstrated favorable effects on glycemic control and metabolic health. Substitution studies replacing refined grains with whole-grain alternatives have shown improvements in glucose metabolism and insulin sensitivity.

In conclusion, available scientific evidence suggests that the relationship between maida consumption and diabetes is primarily explained by nutritional and metabolic factors rather than by alloxan exposure. While alloxan remains an important experimental diabetogenic agent, current evidence does not support its role as a significant contributor to diabetes through dietary consumption of maida. Public health efforts should therefore continue to emphasize dietary quality, reduction of refined carbohydrate intake, and

promotion of whole-grain alternatives as practical strategies for addressing the growing diabetes burden in India.

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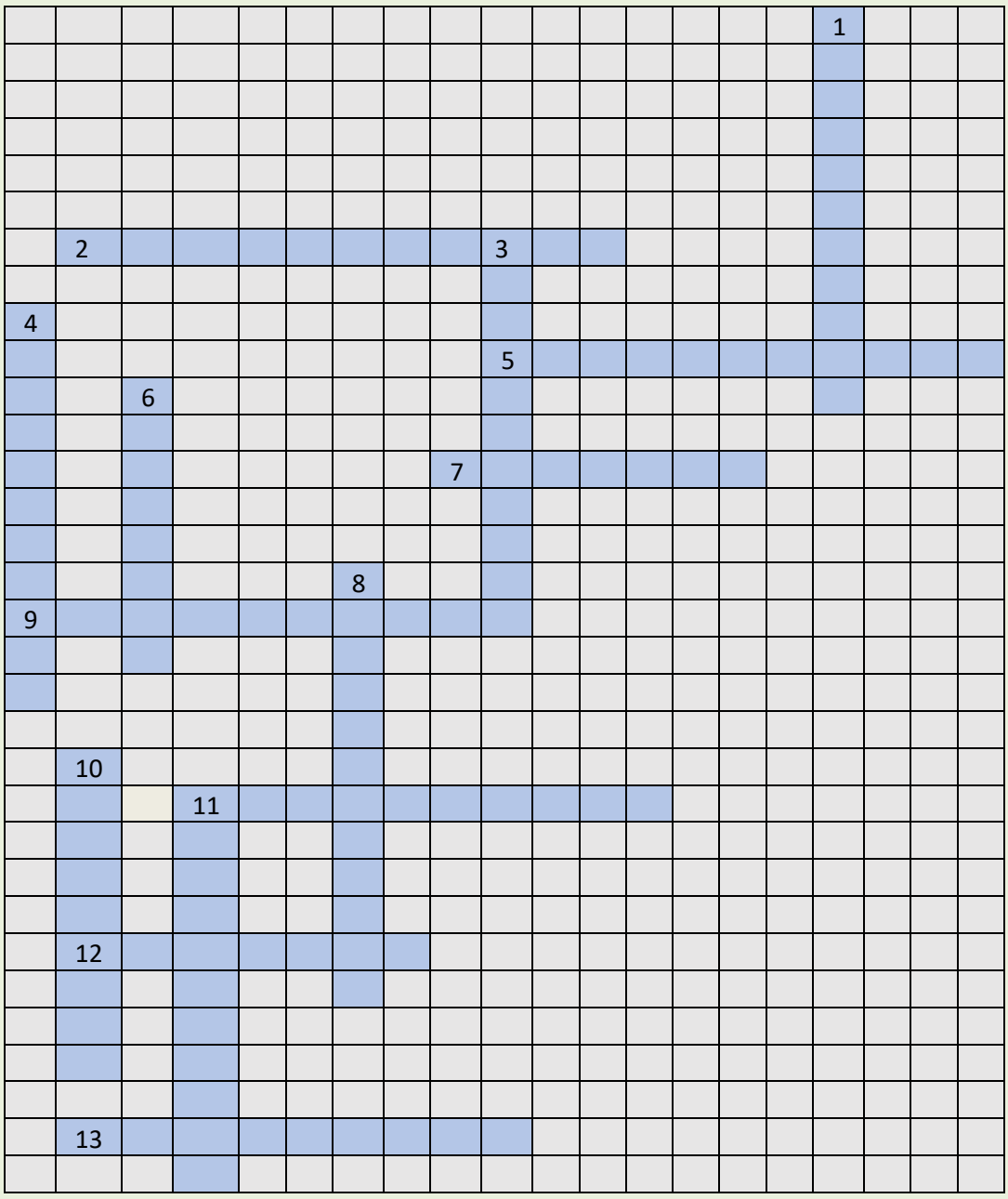
FUN CORNER

PUZZLE YOUR WAY
THROUGH PHARMACOLOGY!

CROSSWORD

HOW TO DO: Read each clue carefully and fill the grid with the correct Pharmacology term, writing one letter per box.



Across

2. Oral direct Factor Xa inhibitor used for stroke prevention in atrial fibrillation.

5. Classic xanthine oxidase inhibitor used for chronic gout management.

7. Cardiac glycoside with a narrow therapeutic window that inhibits the Na+/K+-ATPase pump.

9. Prototype proton pump inhibitor that covalently binds to the H+/K+-ATPase pump.

11. Thiazide-like diuretic uniquely effective in severe renal failure (GFR=15 ml/min).

12. Cornerstone non-selective irreversible NSAID acetylating active serine residues on COX elements to provide antiplatelet security.

13. Primary bactericidal antitubercular agent that targets mycolic acid synthesis.

Down

1. It is in a class of medications called HIV integrase inhibitors.

3. Diarylquinoline entity targeting mycobacterial ATP synthase; carries strict warnings for black- box QTc prolongation.

4. Glycoproteins with potent antiviral, immunomodulatory, and antiproliferative properties.

6. $GABA_B$ receptor agonist used to treat severe spasticity.

8. Macrolide antibiotic with an exceptionally long tissue half-life.

10. Foundational local anesthetic class prototype antiarrhythmic serving historically as a Class IB option for ventricular tachycardias.

11. Synthetic prostaglandin PGE1 analog used to prevent NSAID-induced gastric ulcers.

Curated by: Dr Joonmoni Lahon

WORD SCRAMBLE

Unscramble the adverse effects and identify the drug:

1. IGNVIGLA ERYLAPISAHP:
2. MHUTISSRI:
3. YSNTSGUMA:
4. DIPOPIAL:
5. SOATEAOIMCAL:
6. ATYIINECERTTOG:

Which drug commonly causes all of the above adverse effects?

Your answer: _____

Curated by: Dr Sukainnya Buragohain

WORD SEARCH

HOW TO DO: Find and circle all the hidden toxicology-related words in the grid. Words may appear horizontally, vertically, diagonally, forwards, or backwards.

K	R	F	U	F	R	N	E	N	K	V	D	R	Q	K
G	L	L	A	A	Y	B	A	Y	C	T	C	X	V	W
G	Z	U	M	T	K	E	B	L	K	Z	D	W	I	E
L	O	M	B	R	Q	G	B	B	O	I	P	E	U	N
U	P	A	I	O	Y	R	B	V	K	X	S	O	F	I
C	C	Z	F	P	S	X	G	G	N	A	O	F	G	M
A	C	E	T	I	L	C	Y	S	T	E	I	N	E	A
G	M	N	O	N	P	A	T	R	I	T	Q	V	E	X
O	U	I	L	E	Y	B	O	N	G	B	D	H	Y	O
N	V	L	X	F	R	P	N	Z	W	O	E	U	T	R
B	A	M	U	Z	I	C	U	R	A	D	I	P	U	E
P	C	C	Y	Z	L	E	U	K	A	J	E	R	A	F
R	P	B	Q	F	O	M	E	P	I	Z	O	L	E	E
E	N	I	M	G	I	T	S	O	S	Y	H	P	G	D
P	E	N	I	C	I	L	L	A	M	I	N	E	X	H

Find the antidotes for:

1. Paracetamol overdose.
2. Opioid overdose.
3. Benzodiazepine overdose.
4. Organophosphate compound poisoning.
5. Direct Thrombin Inhibitor Dabigatran when life-threatening bleeding occurs.
6. Acute iron poisoning or chronic iron overload.
7. Methanol or Ethylene Glycol (antifreeze) poisoning.
8. Beta-blocker overdose.
9. Severe central anticholinergic syndrome.
10. Copper poisoning (including chronic accumulation seen in Wilson's disease) and lead poisoning.

Curated by: Dr Sukainnya Buragohain

Solution to CROSSWORD

																[1]R			
																A			
																L			
																T			
																E			
																G			
	[2]R	I	V	A	R	O	X	A	[3]B	A	N					R			
									E							A			
[4]I									D							V			
N									[5]A	L	L	O	P	U	R	I	N	O	L
T		[6]B							Q							R			
E		A							U										
R		C						[7]D	I	G	O	X	I	N					
F		L							L										
E		O							I										
R		F				[8]A			N										
[9]O	M	E	P	R	A	Z	O	L	E										
N		N				I													
S						T													
						H													
	[10]L					R													
	I		[11]M	E	T	O	L	A	Z	O	N	E							
	D		I			M													
	O		S			Y													
	C		O			C													
	[12]A	S	P	I	R	I	N												
	I		R			N													
	N		O																
	E		S																
			T																
	[13]I	S	O	N	I	A	Z	I	D										
			L																

Solution to WORD SCRAMBLE

1. GINGIVAL HYPERPLASIA
2. HIRSUTISM
3. NYSTAGMUS
4. DIPLOPIA
5. OSTEOMALACIA
6. TERATOGENICITY

Answer: PHENYTOIN 💊

Solution to WORD SEARCH

K	R	F	U	F	R	N	E	N	K	V	D	R	Q	K
G	L	L	A	A	Y	B	A	Y	C	T	C	X	V	W
G	Z	U	M	R	K	E	B	L	K	Z	D	W	I	E
L	O	M	B	B	Q	G	B	B	O	I	P	E	U	N
U	P	A	I	Q	Y	R	B	V	K	X	S	O	F	I
C	C	Z	F	O	S	X	G	G	N	A	O	F	G	M
A	C	E	T	Y	L	C	Y	S	T	E	I	N	E	A
G	M	N	O	H	P	A	T	R	I	T	Q	V	E	X
O	U	I	L	D	Y	B	O	N	G	B	D	H	Y	O
N	V	L	X	E	R	P	N	Z	W	O	E	U	T	R
B	A	M	U	Z	I	C	U	R	A	D	I	P	U	E
P	C	C	Y	N	L	E	U	K	A	J	E	R	A	F
R	P	B	E	F	O	M	E	P	I	Z	O	L	E	E
E	N	I	M	G	I	T	S	O	S	Y	H	P	G	D
P	E	N	I	C	I	L	L	A	M	I	N	E	X	H

Accolades

Congratulations to our NEMPS members on their well-deserved accolades and outstanding achievements.

Dr. Mukundam Borah, Assistant Professor, Department of Pharmacology, Gauhati Medical College and a Life member of NEMPS was conferred the "MPS Most Promising Young Pharmacologist Award 2026" at the annual international conference of Medical Pharmacologists Society held at CDSIMER, Bangalore on 21st May 2026.

Dr. Gayatri Sarma, Associate Professor, Department of Pharmacology, Assam Medical College and Hospital, Dibrugarh and Scientific Secretary, NEMPS, was nominated by the Scientific Committee of Medical Pharmacologists Society to serve as a member of the Quiz Organizing Committee and Quiz Master for the National Pharmacology Quiz at the International Conference of Medical Pharmacologists Society, MPSCON2026 held at Dr. Chandramma Dayananda Sagar Institute of Medical Education and Research (CDSIMER), a unit of Dayananda Sagar University, Bangalore South District, Karnataka, India from 20th to 22nd May, 2026. This nomination was in recognition of her outstanding academic leadership, expertise, and sustained contributions to the discipline of Pharmacology.