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Rxplore
The Newsletter
Volume 1 | Issue 1

An official biannual publication of the Central Drug Research Center, NETES Institute of Pharmaceutical Science, NEMCARE Group of Institutions, Shantipur, Mirza, Assam, India.

ARTICLES IN FOCUS

Message from the Patron

I am glad to know that the "Central Drug Research Centre" of NETES Institute of Pharmaceutical Science, NEMCARE Group of Institutions, Mirza is going to publish the first issue of scientific news letter "Rxplore".

"Central Drug Research Centre" of NIPS, NGI, Mirza was inaugurated on 8th February 2020 during the annual sports and cultural event "NEMFEST 2020" and this laboratory houses sophisticated analytical instruments and facilities for research purposes. The main objective of laboratory is to carry out high end testing, consultancy and inter-disciplinary research and also to cater the testing needs of the industry as well as academic institutions.

This Newsletter aims to encourage the faculties and young mind to develop creative as well as analytical thinking ability and inculcating a research culture at undergraduate level. This news letter also provides a platform for reporting the exploration of scientific innovation and significant finding in current research. In this occasion I extent my heartfelt wishes and gratitude to the whole editorial team of "Rxplore 2020" and all who are collectively responsible for bringing up this issue.

-Dr. Hitesh Baruah
Director, NGI

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Editorial Committee

Contents

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Rxplore
The Newsletter
Volume 1 | Issue 1

About the Institute

NEMCARE Group of Institutions (NGI) is one of the premier groups of institutions of the Northeastern part of India which aims to build a quality system of integrated education. The institution imparts quality degree & diploma in Pharmaceutical Science, Nursing & Midwifery, and Allied Health Sciences with excellence. With 70,000 sq. ft. of instructional area, state-of-the-art laboratories, fully equipped library, and modern Computer Centre, the institution envisions to impart knowledge, develop skills by inoculating critical & creative thinking among the students.

The institute houses a high-tech Central Drug Research Centre (CDRC) with a magnificent and comprehensive range of facilities. Inaugurated on 8th February 2020 during the annual sports and cultural event - "NEMFEST 2020"; this central research laboratory aims at preserving and raising the efficiency of academic research endeavors pursued in the Institute.

Mission

To excel in the fast evolving field of pharmacy education by inculcating a dynamic research environment among faculty and students.

Vision

The CDRC envisions personal and organizational academic growth of all students and faculty by fostering research endeavors. To help achieve this, we strive to:

Understand the important requirements of academic research for all-round competency of students.
Develop a sustainable robust scientific outlook among faculties for achieving formidable career goals.
Explore and develop healthcare technologies for the betterment of the field of pharmacy and society as a whole.

Collaborations & MOUs

National Institute of Pharmaceutical Education & Research (NIPER), Guwahati, Assam; for Collaborative Research.

NEMCARE Super Speciality Hospital, Bhangagarh, Guwahati, Assam; for Student Training & Placement.

Piramal Swasthya Management, Bamunimaidam, Guwahati, Assam, PIN – 781021; for Student Training & Placement.

Prasasti Institute of Indian System of Medicine, Rajgarh Road, Guwahati, Assam, PIN – 781007; for Student Training & Personal Development.

Signova Healthcare Pvt. Ltd, Guwahati, Assam, PIN – 781031; for Student Training & Industrial Visit.

JRF (India) Trust, 4-Kanaklata Path, Survey, Beltola, Guwahati, Assam, PIN – 781028; for Human-Animal Co-existence Training among students.

Cure Sure Pharma, Amerigog, Kamrup(M), Guwahati, Assam, PIN - 781023; for Student Training & Placement.

Interactions, Workshops and Seminars

Workshop on “Scope and Potential after Pharmacy” organized by NIPS, Mirza attended by 60 participants.

One-day National Seminar on "Novel innovations in Biomedical Sciences-2019" organized on 3rd May 2019 attended by 500 participants.

Workshop on “Animal House Facility” organized on 05th May 2018 attended by 22 participants.

Guest Lecture on “Pharmacovigilance Program in India” delivered by Mr. Lakshyajeet Nath, PvPI, Guwhahti Medical College & Hospital on 06th April 2018 attended by 45 participants.

Workshop on “Time Management & Team Building” organized on 02nd Feb 2018 in collaboration with ICFAI University, India attended by 20 participants.

Articles in Focus

Drug Discovery and Development: From Laboratory to Market

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The term 'Drugs' means the (i) Articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in human or animals which are recognized in the official books such as the Indian Pharmacopoeia (I.P.), British Pharmacopoeia (B.P.), United States Pharmacopoeia (U. S. P.) etc. (ii) Articles (other than food) intended to affect the structure or any function of the body of man or animal (iii) Articles intended for use as a component of any article specified above. Ordinarily, drugs are bioactive chemical compounds with desired therapeutic activity. The chemical compounds used as a drug or in a pharmaceutical preparation as components of medicinal preparations are different from those used as food items. The important requirements for a medicinal preparation containing therapeutic substances (s) are desired therapeutic activity to act against a disease, minimum or absence of side effects, safety in use, absence of any toxic impurity, and absence of any impurity that may affect the general stability of the product, absence of any accidental contamination or intentional adulteration.

The bioactive compounds may be obtained either from nature or may be produced by completely synthetic procedures. Some of the bioactive compounds obtained from nature are useful directly as drug in the original natural form while many others are modified to produce semi-synthetic compounds. The technological and regulatory processes involved in the discovery of a drug followed by the development of suitable formulation product pass through several well defined, critical and highly expensive stages. The discovery and introduction of a New Chemical Entity (NCE) into the market as therapeutic agent has become now a multidisciplinary, time consuming and costly work with massive documentation. Even, the applications of modern developed technological and industrial operations are unable to bring down the cost and the time necessary in the drug discovery and development processes. Also, the applications of such modern technology are unable to raise the success rate to a desired level.

As per a rough estimation, the average cost involved in the discovery and development of a new drug up to the stage of marketing, considering both direct and indirect expenditures, is now more than Rs. 7,000 Crores. Normally, on an average, such a new drug development programme takes 12 years of time for clinical investigations up to the Phase III clinical trial. The drug discovery and development research programmes being carried out in different Research Organizations, Pharmaceutical Companies and Academic Institutions/ Universities across the world come up with thousands of compounds annually, produced either by synthetic or semi-synthetic procedures or isolated from natural sources in the laboratories. As mentioned, due to the low success rate, approximately for every 5000 such compounds synthesized, semi-synthetically produced or isolated from natural sources and screened for desired therapeutic properties at the clinical study, only one compound become eligible to get approval to enter into the market. Though, many of such compounds have been projected as very good drug candidates in the pre-clinical development stage, they fail to pass through the clinical phases.

Over the last few decades, the drug discovery and development research has witnessed many new major changes in the regulatory approval procedures in different countries. The strict regulatory approval provisions for marketing a new drug as a therapeutic agent require the clearance in number of important aspects including the safety and efficacy of the product and each stage in the approval process may take a considerable length of time. It is estimated that every day of delay in obtaining marketing authorization costs approximately Rs. 5 Crores for the company involved in the drug development work.

The drug discovery and design programme starts with the search for bioactive compound against a particular disease. The search may be made in the natural resources or may be produced by purely synthetic methods. Many natural compounds as well as synthesized compounds prepared with efficient planned procedures may have enough potency with other desired properties against the targeted disease as indicated by experiments carried out using animals, microbial cultures or any other form of preliminary screening. This stage of the work is called Pre-clinical study. Sometimes, many other compounds serve as lead compounds and subjected to chemical modification (or Molecular manipulation) to develop as a drug of desired potency and safety with necessary pharmacokinetic-pharmacodynamic properties. Even, the highly potent existing drugs used in any other therapeutic purpose are often subjected to chemical modification processes with various objectives in the drug development programmes.

A drug discovery and development programme against a specific ailment, usually consists of the following major stages:

(i) The search for lead compound
(ii) Necessary molecular manipulation of lead compound (exploration and exploitation of the identified lead compound)
(iii) Design of pharmaceutical application forms (Dosage forms) of the drug
(iv) Design of dosage regimens
(v) Clinical evaluations

The strategies usually adopted by the medicinal chemists in the search procedure to find out potent or lead bioactive compound are:

(i) Isolation and identification of chemical compounds from natural sources, for example, isolation and identification of targeted bioactive phytoconstituents from medicinal plants having use in folklore treatment systems for the particular disease.
(ii) Accidental detection of biological activity of chemical compounds against a specific disease.
(iii) Testing of metabolites of existing drugs for a possible biological activity.
(iv) Exploitation of side effects of existing drugs for a possible therapeutic activity.
(v) Testing of intermediates of drug synthesis for a possible biological activity.
(vi) Random screening for biological activities in a group of already compounds.
(vii) Hypothesis based design of new chemical structures followed by screening for possible therapeutic activity.
(viii) Study of mechanism of action of other drugs and design of compounds based on such mechanism.

Lead compound is a chemical entity with observable bioactivity against a disease. The lead compounds may possess weak biological activity against the targeted ailment and may possess unwanted side effects or other undesired pharmacokinetic-pharmacodynamic properties. During the chemical modification stage, the lead compounds are subjected to rational and purposeful modification of the chemical structure. The chemical modification strategy may have one or more of the following targets in the process of making more useful drug from lead molecules:

(i) Increase of the therapeutic action
(ii) Modification to produce orally active compounds
(iii) Increase of lipid solubility
(iv) Reduction of drug cost
(v) Alteration of metabolism
(vi) Change of spectrum of action
(vii) Elimination or minimization of side effects
(viii) Species or organ selectivity in action
(ix) Modulation of pharmacokinetic properties

The molecular manipulation work of lead compounds involves synthesis and testing of large number of analogs of the lead molecule. Usually, the compounds with high biological activity and desired safety profile are selected and are carried forward to the next stage of drug development work. As such, a drug must have the desired specificity against the targeted disease with minimum side effects. It should show reproducible effects, and considerably longer therapeutic action (to reduce the number of doses necessary to treat the particular disease), and the drug formulation (tablets, capsules, injectables, ointment, etc.) should have desirable properties for convenient mode of administration by the patient. The developed formulation must have adequate stability at various environmental conditions and variations such as light, heat and moisture. The drug should be capable of resisting any change during the necessary process operations such as compression, solubility, miscibility or pro-drug formulation procedures depending on the dosage form. The drugs which are usually prescribed for long time administration should preferably be available in oral dosage forms or topical dosage form. In case of failure at any stage of the work, the targeted modification of the lead compound is suggested to be dropped from the programme and it can be tried again by applying suitable alternative modification in the lead compound.

During the pre-clinical study period, biological activity evaluation and safety testing on animals must be carried out after developing the formulation in a suitable dosage form of the compound. It may take time ranging from few months to years in the study of shorter and longer effects. Necessary approval from the ethical committee as per the regulatory guidelines should be obtained to conduct experiments on animals and the ethical procedure should be followed as per the guidelines while conducting such experiments.

After completing the preclinical study successfully, the company or the organization involved in the particular drug discovery or development programme may submit 'Investigational New Drug Application' (INDA) to the regulatory authorities (For example, DCGI in India, FDA in USA etc.) with detailed documented data of preclinical study for obtaining authorization to administer an investigational drug product to human.

On receipt of approval from the regulatory authority on the INDA, the organization may begin investigation on human (Clinical trials) to determine efficacy of the drug and dose, and to study the safety, side effects, other desired properties of the drug in human. The clinical study consists of the following phases:

Phase I: The main objective of the Phase I clinical study is to examine safety of the formulated drug in humans, and healthy volunteers are engaged in this phase of study. In addition to examination of safety aspects, various parameters of the drug product such as drug absorption into the body, distribution and metabolism in the body, drug/ metabolite excretion from the body are evaluated. This phase of study utilizes less number of healthy volunteers, usually less than one hundred. Approximately, one in two thousand five hundred (1 in 2,500) drug candidates become successful to satisfy the requirements and can move to the phase-II clinical study. Here, an important point is that anticancer drugs are never tested on healthy volunteers because of serious drug associated side effects.

Phase II: The objectives of Phase-II study are to test the efficacy of the drug against the target disease, to determine acceptable dose range and to examine short time side effects. Patients suffering from the particular disease are engaged in this phase of study. The study employs randomized double blind placebo controlled procedures and takes approximately two years of time to complete the study. Regulatory agency may expedite the process in special circumstances; for example, if the particular drug is developed to target a disease which requires urgent therapeutic intervention because of not having effective therapeutic alternatives. The study is carried out on several hundred diseased patients. Necessary regulatory ethical guidelines must be followed during this phase of study.

Phase III: The Phase-III clinical study is basically a scale-up study of Phase-II results for larger population and under less controlled conditions. Ranging from few hundreds to thousands of patients are engaged in this phase of study and approximately 3 years of time period is necessary to complete the study.

After successful completion of the Phase-III clinical study, the developing organization submits 'New Drug Application' (NDA) to obtain approval from regulatory authorities to market and sale the new drug product. The massive documentation made and submitted by the developing organization (typically 2, 50, 000 pages) to the regulatory body are examined and reviewed, and the regulatory authorities take approximately one year time either to approve as per the request to market the new drug product, or to reject the application. However, the regulatory authorities may also approve it for restricted use or may suggest for more testing. If it is approved for marketing, the organization/ company involved in the development of the drug product shall carry out the Clinical Phase-IV study during the initial marketing period.

Phase IV: This phase of clinical study starts after receiving approval against the NDA from the regulatory body to release the drug product in the market. During this phase of study, the developing organization collects information from selected patient population, and makes detail study on the effectiveness and other specific issues of the product.

The company or the organization that involved in the whole process of discovery of the drug molecule and the development of suitable dosage form (successful completion of the necessary preclinical and clinical phases of study) with the investment of large amount of money, acquires the exclusive right for marketing the product for 20 years (Patent period). After the expiry of this patent period only, other companies may enter into marketing of the drug product by submitting an application called 'Abbreviated New Drug Application' (ANDA) to the regulatory authorities for necessary approval to market as a generic drug product.

The modern technological developments have changed the research on drug discovery and development to a specialized research area with high sophistication. The whole process requires the involvement of experts from different subject areas such as physical and organic chemistry, pharmacology, biochemistry, statistics in addition to the pivotal role played by medicinal chemists. As per the modern concept, the drug discovery programme starts with the identification of disease factor(s) by isolation of the responsible protein or biomolecules and development of procedure for their assay and characterization. The research for discovery or development of suitable drug to act on these proteins or biomolecules is then undertaken. Now the drug discovery and development research is equipped with modern techniques such as Molecular Modelling, Combinatorial Chemistry, High Throughput Screening Techniques, and software based activity screening, ADMET study etc. by which hundreds of compounds can be brought into consideration at a time. The Virtual Screening techniques with tissue and computer models have replaced the time consuming animal testing procedures at the initial stage and also can help to avoid the rigorous experimental work on animals with the killing of large number of laboratory animals.

On successful completion of the clinical phases (Phase-I to Phase-IV) and after completing necessary approval procedures of the regulatory authorities, the drug product would be available in the market as approved medicine to use against a particular disease.

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Articles in Focus

Higher education opportunities and challenges: post COVID-19

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"The great thing in this world is not so much where you stand, as in what direction you are moving."

-Oliver Wendell Holmes

The COVID 19 pandemic has changed human psychology and behavior around the world. It has a long term impact on the perception, thinking, and functioning way of all sectors including the higher and technical education sector. Both the education sectors are now undergoing a forced tectonic shift. This pandemic forced not only millions of students to drive out from their Universities, colleges and institutes, enforced professors restrained to their home. Higher and Technical education system is now shattered, traumatized as most of the universities, colleges and institutes were unprepared dipping millions of students into a vortex of uncertainty. A stratum of complexity and confusion shaded over all the stakeholders of the higher and technical education sector especially faculty members and students. There was a sudden de facto switch to virtual teaching, learning and evaluation system in higher and technical education, grappling a huge number of teachers and students into the online mode to overcome the pressure of not losing academic time and re-invent teaching-learning process. If we analyze the evolution of the Indian education system from ancient times, this total technology-oriented teaching-learning paradigm may be identified as a fourth-dimensional change over 5000 years of Indian civilization. The first structured system was the Gurukul system (one master to a few pupils), then the traditional university system (one to many learners); ancient Thkhyashila, Nalanda to present days mainstream traditional universities, and thirdly distance learning (one to larger number learners of the different spectrum, age, etc) with larger flexibility, inclusiveness, affordability, and openness.

The success of online teaching, learning, and evaluation system technically depends upon two prime components – suitable user-friendly software platform and proper connectivity from both ends. In a developing country like India, a major sector of students doesn't have access to high internet facilities (demographic profile may vary in Private University and Govt University [based on urban and rural/remote areas). Therefore, this is the high time for our government to develop a robust high-speed communication network throughout the country covering every remote corner. It should be provided at low cost to the students who are truly economically backward.

Another problem with higher and technical education is that it mostly laboratory oriented. The curriculum of online education should be designed keeping in mind that laboratories and workshops are the pillars of skill development and therefore students should not be deprived of the laboratory experience. Post Covid-19 era opens up an opportunity to transform the higher education system by re-designing of curriculum, collaborations, skill development and faculty involvement.

Assumptions

- Vision planning will co-exist with and complement strategic planning.
- In-person, on-campus instruction will not begin until the Jan 2021.
- Blended Learning Will Dramatically Increase
- Online Education Will Be a Strategic Priority at Every Institution

- Out-of-date business models will be retired.
- Poorly endowed colleges and universities will merge with other institutions.
- Several colleges and universities worldwide will be forced to close.

Opportunities

- Vision planning will supplement strategic planning.
- Combination of both the in-person and online learning
- New business models and financing options will bring stability to the 'bottom line'.
- Collaboration, not competition, will be embraced by all members of the academy.

Challenges

- Creating a vision for what university will 'look like' post COVID-19 era.
- Adopting different dynamic and scientific academic approaches based on data.
- Creating new academic, financial and recruitment models.
- Re-designing academic and financial priorities.

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Articles in Focus

Management And Control of Vector Species of Mosquito

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Preface: Arthropods form a major group of disease vectors with mosquitoes (Table.1), flies, black flies, sand flies, lice, fleas, ticks and mites transmitting a number of important diseases. The transmission of Pathogens by arthropod (insect) vectors are some of the most dangerous and unpredictable on earth. The impact of such vectors increased as the human population grew. Numerous such vectors are haematophagous, which feed on blood at some or all stages of their lives. Vector borne diseases affect two third of the world's population and cause mortality in millions every year. It is believed that mosquitoes rank as man's most important insect pest. They scourge us with their vicious biting attacks and continuous singing, but more serious are the diseases that they transmit to man and animals.

Vector control is very important part of global as well as the provincial malaria control programs. The success of this strategy would entirely depend on a systematic review of the available information on vector species, their identification and also the knowledge of their biology. In this article efforts have been made to the describe various control methods for controlling of vectors and vector borne diseases.

1- Mosquito management or control of mosquito borne diseases:

1.1. Mosquito vector surveillance: Mosquito vector surveillance is used to regulate fluctuations in the geographical distribution and density of the mosquito vector, evaluate control program, obtain relative measurements of the mosquito vector population over time and facilitate appropriate and timely decision regarding intervention. It may also assist to identify parts of high density infestation or period of population upsurge.

1.2. Larval and adult surveys: Larval surveillance and management could be an essential element of any effective integrated mosquito management (IMM) program as a result of once mosquitoes area unit eliminated before changing into adults, they can't create a nuisance or disease problem. Mosquito surveillance includes the weekly trapping of adult mosquitoes by dividing a program space like a town, county, or industrial facility into management zones.

1.3. Morphological identification of mosquito samples: The correct identification of collected mosquito vectors is the first step in the direction of implementing an effective control programme (Erlank et al., 2018). Conventionally, for malaria control, this was based on the morphological differences observed in the adults and larvae between different mosquito species.

1.4. Repellents (herbal): The repellent for mosquito is an ingredient applied to skin, clothing, or other surfaces which discourages mosquito from landing or biting on that surface. The traditional definition describes a repellent as a thing that causes oriented movement away from a source, essentially the opposite of an attractant which is a thing that causes oriented movement towards a source (Dethier et al., 1960). Repellent express themselves through two modes of action and contact repellents have to be contacted by the arthropod, where's as vapour or volatile repellent is detected in air (White, 2006).

Table-1. List of Mosquito species and different mosquito borne diseases

S.NO.	VECTORS OF DISEASES	DISEASES
1	*Aedes* 	• *Chikungunya* • *Dengue fever* • *Lymphatic filariasis* • *Rift Valley fever* • *Yellow fever* • *Zika*
2	*Anopheles* 	• *Malaria* • *Lymphatic filariasis*
3	*Culex* 	• *Japanese encephalitis* • *Lymphatic filariasis* • *West Nile fever*

1.5. Personal protection: Personal protection is one of the approaches to preventing mosquito bites, the repellent play important role in the protection against arthropods, because they can be used anywhere, anytime and play an important role in the preventing the vector borne diseases by reducing man-vector contact. Insect repellents are applied in various forms as directly to the skin, to clothing or other fabrics and other surfaces. They are recommended for people standing or sleeping outdoors at night for work or leisure and those working during day time (Fradin, 1998). There are two kinds of repellents: synthetic and natural (plant-derived) repellents.

1.6. Chemical control: The use of insecticides for the control of malaria and other vector borne diseases acquired great impetus with the advent of DDT and other organochlorine compounds in the late 1940s. Their use in public health increased in extent and intensity with the worldwide program of malaria eradication which was initiated in 1956. The residual insecticidal effect of some of these chemicals made it possible to sustain an attack on the malaria vectors by means of the periodic indoor spraying of house. The advantage of chemical methods of mosquito control are that they can be organised within a short period of time are effective, and can produced quick results at reasonably low cost. The application of chemicals for mosquito control should be planned with care and based on adequate knowledge of vector bionomics and disease epidemiology, as most chemical are toxic to man and are costly. More importantly, only a limited number of safe and effective pesticides are available for public health use; this is specially so for those with long residual effect.

1.7. Biological methods: Biological methods of mosquito control basically consist in the utilization of natural enemies of the mosquito and of biological toxics to achieve an effective control. Several organisms i.e. larvivorous fish, invertebrate predators, nematode, protozoa & fungi and bacteria have proved effective against mosquito larvae.

1.8. Mosquito net: As per CDC (Centres for diseases control and prevention) the most powerful means of preventing malaria is sleeping under a mosquito net, specifically a long-lasting insecticide treated net (LLIN). Disease malaria is transmitted by certain mosquitoes when they bite. These vector mosquitoes bite people to get a blood meal. The malaria parasite then passes from the infected mosquito to the person being bitten. Anopheles mosquito naturally bite between 10 o'clock at night and 4 o'clock in the morning and that's one of the most important things we have on our side: if we can protect people in affected areas when they sleep at night we have a very good chance of preventing them contracting malaria.

Conclusion: An important factor of a Mosquito Management Program (MMP) is Integrated Mosquito Management (IMM). This is the implementation of a number of mosquito control tools and techniques to collectively contribute to the management of mosquitoes in a way that may reduce reliance on chemicals to decrease mosquito numbers and risk of disease, taking into account environmental impact, cost effectiveness and sustainability.

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Source of mosquito photos: Wikipedia.

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Articles in Focus

Antimicrobial peptides as a potent alternative to existing antibiotics

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Antimicrobial therapeutics can be termed as the most substantial class of chemotherapy as per their utility in modern medicine (Aminov, 2010). The origin of antimicrobial chemotherapy, dates back to ancient civilizations (Aminov, 2010), that refers to documented use of herbs, honey, and mouldy bread while treating infectious cases (Gould, 2016). However, the start of contemporary antimicrobials can is credited to the finding of Pyocyanase, that was used to treat various ailments (Gould, 2016). Later, Alexander Fleming was acknowledged as the discoverer of Penicillin which was known as one of the initial therapeutics in antimicrobial category (Gould, 2016).

After the discovery of penicillin, there was a remarkable period of antimicrobial discovery, that is also known as the golden era of antimicrobial therapeutics. During this era there was a substantial addition of over 2 dozen molecules that is still used in present therapeutic regimen (Martin II et al., 2020). Nevertheless, a steep decline of effective antibiotics due to improper use was causing the rise of drug resistant pathogens. Drug resistant microbes can be categorized as multidrug resistant (MDR), extensively drug resistant (XDR) and pan drug resistant (PDR) species. Among them, the PDR is the most resistant form that is known to survive against the present class of effective antibiotics (Magiorakos et al., 2012). Drug resistant microbes are reportedly causing an approximate mortality of 7 lakhs individuals globally (Celia M. Manaia, 2020). Additionally, these figures are expected to accelerate up to 3 crore individuals by 2050 (Tucker et al., 2018). In contrast, the last candidate of a potential antibiotics against Gram negative bacteria dates back to 40 years. Furthermore, the decreased number of new probable antibiotics in drug discovery platform aggravates the compromised clinical scenario (Tucker et al., 2018). Therefore, the urgent need of substitutes to ant-infectives is a primary concern for the clinicians and scientists across the globe.

There are a probable lot of antibiotics substitutes such as probiotics, lysins, bacteriophages, antibodies, vaccines and peptide-based antibiotics/ antimicrobial peptides (AMPs) with variable activity against pathogens (Czaplewski et al., 2016). Among them, AMPs are a potential class of molecule with prominent microbicidal activity. Some of the noted molecules of these class are defensins, cathelicidins, cecropins, pleurocidins, piscidins that inherently exist in various species of recent times. The broad-spectrum nature with tunable characteristics and lesser probabilities of resistance development are the striking features, that fascinates the researchers to use them as a probable replacement/ alternative to existing antibiotics. Naturally, AMPs are the inherent molecules of innate immune systems. They possess amphipathic property with differential hydrophobic as well as cationic character. They are majorly known to act through preferential rupturing of microbial membrane due to inherent anionic character of microbial species. AMPs are reportedly known to lyse the bacterial membrane through barrel stave, toroidal pore, carpet and disordered toroidal pore (Hazam, Goyal, & Ramakrishnan, 2019; Melo, Ferre, & Castanho, 2009).

There are various potential AMPs, that have been reported to possess, promising antimicrobial activity in in-vitro and in-vivo studies. Yet, the probability of clinical utility of these group of molecules is halted due to major limitations (Chen & Lu, 2020). AMPs are degraded by inherent physiological enzymes. Other than that, the physiological ion and compromised pharmacokinetic properties are major challenges for the researchers in recent times (Chen & Lu, 2020). However, a series of modifications by researches have possible solutions for the noted drawbacks. In principle approaches like, PEGylation, sulphide bridging, acetylation of peptide terminals, stapling, cyclization, macromolecular, insertion of D-amino acids have shown promising outcomes (Fosgerau & Hoffmann, 2015). The constant modifications for the development of newer molecules with enhanced efficacy is a constant process for the development of newer AMPs for clinical application.

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Eminent personalities at NGI

Dr. Chandrakant Kokate
M. Pharm. (Pharmacognosy), Ph.D.
Current Affiliation: National Advisor, Society of Pharmacognosy. Former Vice-Chancellor, KLE University, Belgaum, India.
Agenda: Guest Lecture on "Emerging Trends in Pharmacy"
Date: 06th Sept 2017.

Leena Mehendale
Former IAS, Pune Maharashtra.
Current Affiliation: Member-Administrative at Central Administrative Tribunal, Bangalore bench, Karnataka.
Agenda: Lecture on "Save Assamese Script on computers".
Date: 03rd April 2018.

Dr. Raghuram Kandivalla
M. Pharm. (Pharmacology), Ph.D.
Current Affiliation: Post Doctoral Researcher, James Graham Brown Cancer Center, Louisville, United States.
Agenda: Guest Lecture on "Nervous System".
Date: 31st March 2018.

Dr. Prakash Kishore Hazam
M. Pharm. (Natural Product Research), Ph.D.
Current Affiliation: Post Doctoral Researcher, Institute of Cellular and Organismic Biology, Taipei, Taiwan, PRC.
Agenda: Guest Lecture
Date: 23rd February 2017.

Achievements of Faculty Members

Dr. Manoj Kumar Deka, Assistant Professor, NIPS, Mirza; received prestigious INSA Visiting Scientist Fellowship 2020-21 by the Indian National Science Academy, New Delhi.

Mr. Ripunjoy Bordoloi, Assistant Professor, NIPS, Mirza; got recognized as FDA approved Analytical Chemist by the Govt. of Assam.

Dr. Nilutpal Sharma Bora, Assistant Professor, NIPS, Mirza; received the Dr. S. N. Dube Best paper award 2019 for the paper entitled "Amelioration of UV- radiation-induced photoaging by a combinational sunscreen formulation via aversion of oxidative collagen degradation and promotion of TGF-β-Smad-mediated collagen production" in Nov 2019.

Ms. Banshongdor H Mawlieh, Assistant Professor, NIPS, Mirza; received the best oral presentation award at "Two-days National Seminar on Recent Trends in Diabetes Research – Emerging Drug Delivery Technologies & Novel Strategies" on 6th & 7th Mar 2018.

Mr. Kunal Bhattacharya, Assistant Professor, NIPS, Mirza; received 2nd position in oral presentation of "ADTU Pharmacon 2019" organized by Assam Down Town University, Assam on March 2019.

Mr. Lakshyajeet Nath, Assistant Professor, NIPS, Mirza; successfully completed a 5-day Training Programme on "Bio Medical Instrumentation" conducted from 02-06 Mar 2020 at NITTTR Kolkata, Extension Centre, Guwahati – 21.

Mr Lakshyajeet Nath (L) and Mr Kunal Bhattacharya (R), Assistant Professor, NIPS, Mirza; were selected for the CSIR-NEIST, Jorhat Summer Research Training Programme, 2020 which started from 20th June, 2020. Both the faculty are working on different projects assigned by CSIR-NEIST.

Ongoing Research Projects

Design and evaluation of plant derived oil Encapsulated Lipid Nanoformulated Topical Gel to mititgate a WHO neglected disease "Mycetome" in rural areas of Assam
Principal Investigator: Dr. Manoj Kumar Deka, Assistant Professor, Department of Pharmaceutical Chemistry.

Development and evaluation of naturally derived phytoconstituent loaded Solid Lipid Nanoparticles based gel for Anti-inflammatory activity
Principal Investigator: Ms. Chanam Melody Devi, Assistant Professor, Department of Pharmaceutics.

Phytochemical Analysis of *Dendrocine sinuata* (Blume).
Principal Investigator: Mr. Kaushik Nandan Dutta, Assistant Professor, Department of Pharmacognosy.

Formulation and evaluation of Herbal Antifungal Gel from the peel extract of banana species obtained in North East India
Principal Investigator: Mr. Ripunjoy Bordoloi, Assistant Professor, Department of Pharmaceutics.

Pharmacognostic profiling and pharmacological exploration of selected edible plants of Northeast India.
Principal Investigator: Dr. Nilutpal Sharma Bora, Assistant Professor, Department of Pharmacognosy.

Pharmacognostic profiling and biological activities exploration of leaves of Garcinia species (thekera).
Principal Investigator: Ms. Deepsikha Bharali, Assistant Professor, Department of Pharmaceutical Chemistry.

Antidiabetic evaluation of extract of selected edible plants of Northeast India.
Principal Investigator: Mr. Abdul Mukit Barbhuiya, Assistant Professor, Department of Pharmacology.

A study about the pattern of Adverse Effects of various chemotherapeutic agents used in different types of cancers in a tertiary care hospital of North East India.
Principal Investigator: Mr. Lakshyajeet Nath, Assistant Professor, Department of Pharmacology.

Pharmacognostic profiling and biological activities of edible pea varieties of Northeast India
Principal Investigator: Ms. Barnali Gogoi, Assistant Professor, Department of Pharmacognosy.

Evaluation of wound healing activity of some indigenous medicinal plants from Meghalaya: A comprehensive validation studies incorporating in vivo, in silico and biochemical investigation
Principal Investigator: Ms. Banshongdor H Mawlieh, Assistant Professor, Department of Pharmacology.

Pharmacognostic profiling and pharmacological evaluation of leaves of selected Citrus species of Assam
Principal Investigator: Mrs. Babita Deka, Assistant Professor, Department of Pharmaceutical Chemistry.

Registered Doctoral Scholars

Mr. Koushik Nandan Dutta
University: SSUHS,Guwahati,Assam
Supervisor: Dr.Mangala Lahkar
Registration Date: November 2018

Mr. Bikash Saikia
University: ADTU,Guwahati,Assam
Supervisor: Dr. Mrinmoy Basak
Registration Date: 2019

Mr. Ripunjoy Bordoloi
University: ASTU,Guwahati,Assam
Supervisor: Dr. Abdul Baquee Ahmed
Registration Date: November 2018

Mrs. Barnali Gogoi
University: Dibrugarh University,Assam
Supervisors: Dr Hemanta Kumar Sharma &
Dr Manobjyoti Bordoloi
Registration Date: June 2016

Mr. Abdul Mukit Barbhuiya
University: ASTU,Guwahati,Assam
Supervisor: Dr. Damiki Laloo
Status: Coursework completed

Mrs. Babita Deka
University: SSUHS,Guwahati,Assam
Supervisor: Dr. Apurba Talukdar
Status: Coursework completed

Ms. Pooja Patowary
University: Dibrugarh University,Assam
Supervisors: Dr. Hans Raj Bhatt
Status: Coursework completed

Global News on Research & Development

Vitamin D deficiency is prevalent in severe COVID-19

Deepsikha Bharali, Babita Deka
NETES Institute of Pharmaceutical Science, Mirza, Kamrup, Assam

The entire world is in the grip of the COVID-19 pandemic. Evidences supporting the role of vitamin D in reducing risk of COVID-19, includes that the outbreak occurred in winter season, as in this time 25-hydroxyvitamin D (25(OH)D) concentrations are lowest. Studies showed that the number of cases in the Southern Hemisphere in the end of summer is low. In Europe, COVID-19 has been severe in Italy, Spain and Greece, but much less in Scandinavian countries. Vitamin D insufficiency (VDI) data showing that Italy, Spain and Greece have VDI rates of 70-90% vs. 15-30% in Norway and Denmark. Scandinavian diets contain more vitamin D due to higher fatty fish intake and dairy products supplementation with vitamin D. To reduce the risk of infection, people at risk of COVID-19 can take 10,000 IU/d of vitamin D3 for a few weeks to rapidly raise 25(OH)D concentrations. For treatment of COVID-19, higher vitamin D3 doses might be useful. Randomized controlled trials and large population studies can help to evaluate the effect of vitamin D to combat the COVID-19 pandemic.

New understanding of asthma medicines could improve future treatment

Lakshyajeet Nath, Abdul Mukit Barbhuiya
NETES Institute of Pharmaceutical Science, Mirza, Kamrup, Assam

Lung diseases such as asthma are a major global health burden, with an estimated 330 million asthma sufferers worldwide. The most effective treatments are through direct inhalation of medicine to the lungs. However, generating the aerosols for inhalation is a scientific challenge because of the limited knowledge of the microstructure of drug products before they are aerosolised.

New research has revealed new insights into common asthma aerosol treatments to aid the drug's future improvements which could benefit hundreds of millions of global sufferers. Scientists at University of Manchester, demonstrate how they have used x-ray CT scanning to quantify the tiny microstructures of individual particles from the drug product at the nano-scale.

This is the first time that the 3D microstructure has been revealed and gives scientists and pharmaceutical producers a better understanding of the behaviour of the drug product under aerosolisation. The lead scientist said that they have been able to visualise a drug-blend in 3D, and see the interplay between drug and non-drug particles in the medicine which is important for final quality control of asthma medicines to check the actual amount of drug and to help formulate improved asthma medications.

The work was made possible through the high-resolution X-ray computed tomography (XCT) instruments in the word leading Henry Moseley X-ray Imaging Facility (HMXIF) at The University of Manchester that provide the capability to analyse a sample at up to 50 nanometres in resolution. This is particularly important for the inhalation medicines which require aersolisation to generate particles small enough to be adsorb via the lungs. In this project the particles measured less than 5 µm to reach the deepest parts of the lungs.

Global News on Research & Development

Pipeline clinical-phase vaccine candidates for COVID-19

Barnali Gogoi, Pooja Patowary
NETES Institute of Pharmaceutical Science, Mirza, Kamrup, Assam

Coronavirus or COVID-19 which was first identified in Wuhan, China is now a pandemic globally affecting almost 215 countries or territories. As per World Health Organization (WHO) situation report-122 published on 21st May 2020, COVID-19 has so far infected 4,893,186 people and has claimed 323,256 lives globally. The genetic sequence of SARS-CoV-2, the corona virus that causes COVID-19, was published on 11 January 2020, triggering intense global Research and Development activity to develop a vaccine against the disease. The most advanced candidates that have recently moved into clinical development, includes mRNA-1273(LNP-encapsulated mRNA vaccine encoding S protein) from Moderna (Phase I) , Ad5-nCoV(Adenovirus type 5 vector that expresses S protein) from CanSino Biologicals(Phase I), INO-4800(DNA plasmid encoding S protein delivered by electroporation) from Inovio(Phase I) ,LV-SMENP-DC(DCs modified with lentiviral vector expressing synthetic minigene based on domains of selected viral proteins; administered with antigen-specific CTLs) and pathogen-specific aAPC(aAPCs modified with lentiviral vector expressing synthetic minigene based on domains of selected viral proteins) from Shenzhen Geno-Immune Medical Institute(Phase I). A striking feature of the vaccine development landscape for COVID-19 is the range of technology platforms being evaluated, including nucleic acid (DNA and RNA), virus-like particle, peptide, viral vector (replicating and non-replicating), recombinant protein, live attenuated virus and inactivated virus approaches.

Activation of estrogen receptor for stopping the growth of pancreatic cancer cells

Kunal Bhattacharya, Chanam Melody Devi
NETES Institute of Pharmaceutical Science, Mirza, Kamrup, Assam

Recent studies by researchers at the Perelman School of Medicine at the University of Pennsylvania and Penn's Abramson Cancer Center on human and mouse pancreatic cancer models published in Cellular and Molecular Gastroenterology and Hepatology shows that activation of G protein-coupled estrogen receptor (GPER) which is found on many cancer and normal cells not only stops the growth of pancreatic cancer cells but also make the tumors more visible to the immune system which helps the modern immunotherapy to tackle pancreatic cancer. In some models the activation of GPER stopped the growth of tumors and made them more susceptible to anti-PD-1 immunotherapy, showing the translational potential to increase the efficacy of certain treatments used in cancers where PD-1 inhibitors were not very effective.

The activity of most of the drugs used in cancer treatment in the present scenario depends on blocking the activity of cellular proteins which is needed for the growth of tumor cells. Therefore, these drugs cause major side effects. Whereas, the GPER approach used in this study is similar to a naturally occurring the process to which the human body is already accustomed too, making it safer than the traditional drug therapies.

Global News on Research & Development

Scientists shed light on action of key tuberculosis drug

Lakshyajeet Nath
NETES Institute of Pharmaceutical Science, Mirza, Kamrup, Assam

Tuberculosis (TB) remains a global health challenge, responsible for around 1.5 million deaths each year, with particularly high incidence in India, China and Indonesia. There is an urgency to better understand how effective drugs work against the disease because of the emergence and spread of new strains including multi-drug resistant and extensively resistant strains. A study led by scientists at the University of Birmingham has shed fresh light on how a key front-line drug kills the tuberculosis bacterium which paves the way for development of new antibiotic drugs targeted at emerging strains of TB. The drug, ethambutol has been a mainstay in the fight against TB since its discovery in 1961. Despite this, the drug's 'mode of action' -- the way it kills the bacterium -- has not been fully confirmed by scientists. In this study, the research team succeeded in confirming that particular groups of proteins within the TB bacterium, called Emb proteins, are targeted by ethambutol. Although the importance of these proteins had previously been recognised, a lack of structural and biochemical data had prevented scientists from confirming precisely how the drug targets them. The study, carried out in collaboration with scientists from ShanghaiTech, in China, and the University of Queensland in Australia, succeeds in overcoming this barrier. Researchers used cryogenic electron microscopy and x-ray imaging to study the structures of a series of Emb proteins for the first time. They were able to show how different Emb proteins were responsible for specific physiological functions producing crucial components of the TB cell wall. They were also able to show how ethambutol binds to and inactivates these Emb proteins.. The lead scientist of the work believed that this exciting breakthrough will inform a range of medical researchers from a wide range of disciplines and most importantly, scientists in the pharmaceutical industry aiming to develop new TB antibiotics targeting this unique set of proteins for the first time.

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Articles published by faculties of NIPS Mirza

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Chanam Melody Devi, Lilima Nath Laldinchhana, Abhinab Goswami, and Himal Barakoti. "Formulation and Evaluation of Gastro Retentive Floating Tablets of Diclofenac Sodium Based on Effervescent Technology." International Journal of Pharmacy and Biological Sciences (2019): 9(3).

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Pooja Patowary, Dipak Chetia, Jahnabi Kalita, Mithun Rudrapal. "Synthesis of flavonoid derivative as antimalarial agents." Indian Journal of Heterocyclic Chemistry (2019): 29(1).

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Articles published by faculties of NIPS Mirza

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Daphisha Marbaniang, Ratna Jyoti Das, Paulami Pal, Ananta Saikia, Manash Pratim Pathak, Santa Mandal, Nilutpal Sharma Bora, Anup Kumar Das, Pronobesh Chattopadhyay, Subhabrata Ray, Bhaskar Mazumder. "Extended Release Floating Microballoons Containing Clerodendrum colebrookianum Extract: In vitro in vivo Evaluation." Indian Journal of Pharmaceutical Education and Research (2019): 53(3).

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