BVCPK TechMag 2022-23

Innovations in Pharmaceutical Sciences

Bharati Vidyapeeth
College of Pharmacy, Kolhapur

BHARATI VIDYAPEETH COLLEGE OF PHARMACY KOLHAPUR 1996-2021 25th ANNIVERSARY

Principal's Desk

In the first instance, I congratulate the team of Bharati Vidyapeeth College of Pharmacy, Kolhapur for their consistent efforts to bring out Technical Magazine 2022-23. I appreciate the efforts in capturing the prominent advancements and events in pharmaceutical field and compiling them into this magazine. The distinctiveness of this institute in research is very well portrayed in this magazine. It will surely offer a great platform for students to explore novel pharmaceutical technologies. I wish this issue to be insightful and memorable.

Dr. H. N. More
Principal
Bharati Vidyapeeth
College of Pharmacy, Kolhapur

My best wishes to the editorial board for their enthusiasm in this endeavor. The pharmacy program at every level imbibe knowledge and skills to students and exploration of advanced pharmaceutical technology will enhance holistic development and will build competency essential for successful professional career. Compliments to my teaching faculty for not only emphasizing on academics but also participating in several research activities that have significantly contributed overall progress of this institute. Surely, the magazine will be informative and resourceful. Once again, I congratulate team to complete this edition.

Dr. M. S. Bhatia
Vice-Principal
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Editor's Note

Hello Readers !!!

It gives me a great pleasure to share Technical Magazine as BVCPK TechMag. This magazine comprised of conventional informative scientific write ups Apart from covering conventional informative scientific write ups, the issue also features Mind Lab – a brain storming section, I encourage the readers to participate in it. I convey heartfelt thanks to all faculties for having put their thoughts and experiences into an engaging read. I would like to appreciate the efforts taken by Miss. Jidnyasa Pantwalawalkar for active participation in completing this TechMag.

We would welcome any feedback and suggestions for further improvement in TechMag for quality hearing. Happy reading !!!

Sincerely,

Mr. Rakesh P. Dhavale

Editor-In-Chief

Acknowledgement

Team BVCPK TechMag is very much thankful to Bharati Vidyapeeth College of Pharmacy, Kolhapur and management for providing a wonderful platform to explore and utilize our knowledge and skills. We wish to thank our Hon'ble Secretary, **Dr. Vishwajeet Kadam Sir, Dr. Shivajirao Kadam Sir, Dr. H. M. Kadam Sir**, for their patronage and **Dr. H. N. More Sir** advising us on the importance of enhancing the visibility of workplace that stimulated us to come out with **BVCPK TechMag**. We also thank all our colleagues and students for supporting us in making this TechMag on its completion.

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Reverse Pharmacology: A Science Redefining Drug Discovery

Mr. Deepak V. Mahuli
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Reverse Pharmacology (RP) is defined as a science of integrating documented clinical/experimental hits, into leads by trans-disciplinary exploratory studies and further developing these into drug candidates by experimental and clinical research. In RP the molecule travels a reverse path of drug discovery from 'clinics to laboratory' rather than classical 'laboratory to clinics'.

In view of current expensive and extensive drug discovery by the conventional process as well as increase in diversity and complexity of the diseases, RP can be an effective alternative approach of drug discovery. In RP the already established medications in the traditional medicines are reevaluated scientifically and the lead compounds are generated which are screened further to develop a molecule which can be taken for clinical trial. Sir Ram Nath Chopra and Gananath Sen laid the foundation of Reverse Pharmacology of medicinal plants by pursuing clinically documented effects of Ayurvedic drugs.

In the RP safety of a drug molecules stands of utmost importance and marks as a starting point whereas efficacy of the drug serves only for validation. The scope of RP is to understand the mechanisms of action at multiple levels of biological organization and to optimize safety, efficacy and acceptability of the leads in natural products, based on relevant science. RP is designed as a science of drug development by reducing three major bottlenecks of costs, time and toxicity. RP includes three phases; Experiential phase (documentation of clinical observations of the biodynamic effects of standardized traditional drugs by meticulous record keeping), Exploratory studies (For tolerability, drug-interactions, dose-range finding in ambulant patients of defined subsets of the disease and pre-clinical studies in relevant *in vitro* and *in vivo* models to evaluate the target-activity), Experimental Studies (Basic and clinical studies, at several levels of biological organization, to identify and validate the reverse pharmacological correlates of drug safety and efficacy).

Rauwolfia serpentina was a major discovery through RP. The antihypertensive and tranquillizing effects were discovered at the earliest and later various side effects such as depression, extra pyramidal syndrome, gynecomastia did also come into the scenario which later led to development new drugs like antidepressants, L-dopa, bromo-ergocriptine, and H_2 receptor blockers and drugs modulating prolactin. The drugs which were later developed are considered as a spinoff of the parent molecule.

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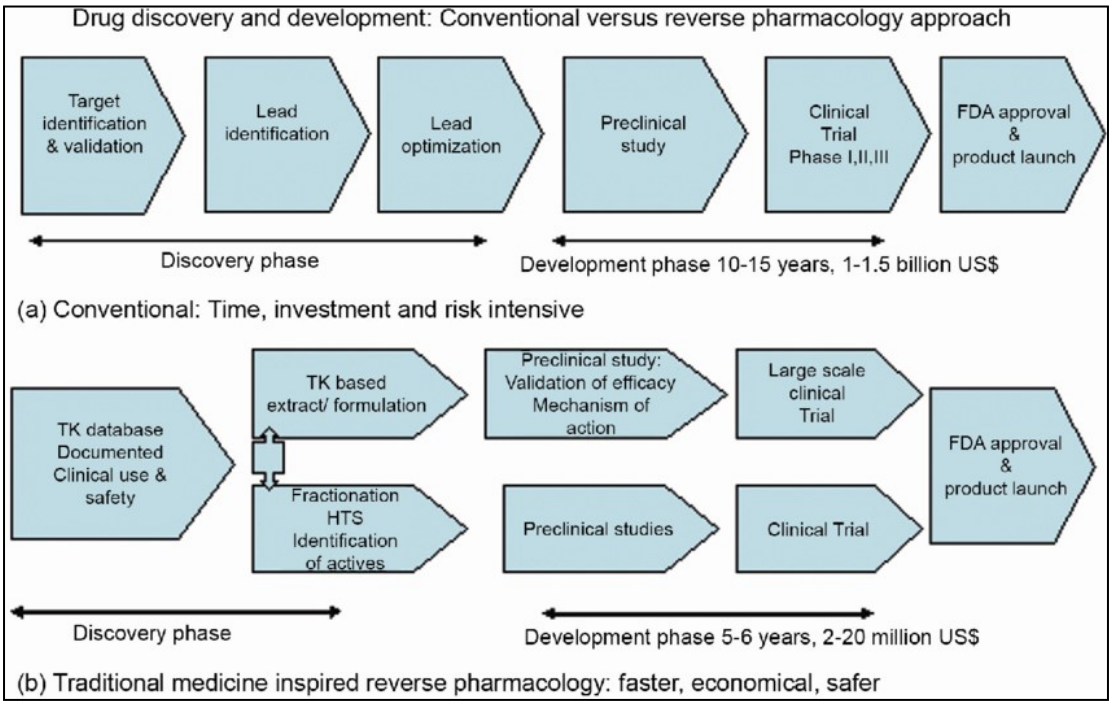
Despite a vast potential and possibilities there are some hurdles in the path of RP as the lack of documentation of the traditional medicine, most of the work in this field has remained within clinics of traditional practitioners or confined to academic research laboratories, and lack of proper identity, implementation of Good Laboratory Practices and Good manufacturing practices.

In India CSIR has started various projects based on concept of RP for the diseases like diabetes, rheumatoid and osteoarthritis and hepatoprotectives through the NMITLI. Advanced Centre for Reverse Pharmacology has been established by ICMR in collaboration with the Centre of Molecular Parasitology at the Drexel University College of Medicine, where the focus is on diabetes, musculo-skeletal disorders, malaria, cancer and neurological disorders.

As RP provides an edge over the traditional drug discovery being a time saving and economical procedure, development of molecules utilizing RP is gaining popularity and can be an effective alternative approach of drug discovery to curb the invention deficit to re-activate and rejuvenate the drug discovery pipeline.



Reference: Siddhartha Dutta, Reverse Pharmacology: A Science Redefining Drug Discovery, European Journal of Biomedical and Pharmaceutical sciences, 2019, 6(3): 245-249.

Technical Articles

CRISPR: Genome Editing Technology

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- It is a **gene-editing technology** that 'edits' the genetic code of living organisms using biochemical tools like specific proteins and RNA molecules; by **introduction** of a new gene, or **suppression** of an existing gene, through a process described as **genetic engineering.**
- **CRISPR** is short for **Clustered Regularly Interspaced Short Palindromic Repeats**, which is a reference to the clustered and repetitive sequences of DNA found in bacteria, whose natural mechanism to fight some viral diseases is replicated in this gene-editing tool.
- It opens up the possibility of **'correcting' genetic information** to cure diseases, prevent physical deformities or to even produce cosmetic enhancements.
- Jennifer Doudna and Emmanuelle Charpentier won the Nobel prize for chemistry in 2020 regarding CRISPR.

Steps:

- Identify troubled gene sequence
- An RNA molecule programmed to locate this sequence on the DNA strand (like 'find' or 'search' function).
- A special **protein called Cas9** (also called **'genetic scissors'**) breaks DNA strand at specific points to remove the bad sequence.
- **Scientists intervene during the natural auto-repair process** of the DNA strand by supplying the correct sequence of genetic codes, which attaches to the broken DNA strand. It is like cutting out the damaged part of a long zipper, and replacing it with a normally functioning part.
- It does not involve the introduction of any new gene from the outside.
- Its mechanism is often compared to the **'cut-copy-paste', or 'find-replace'** functionalities in common computer programmes.

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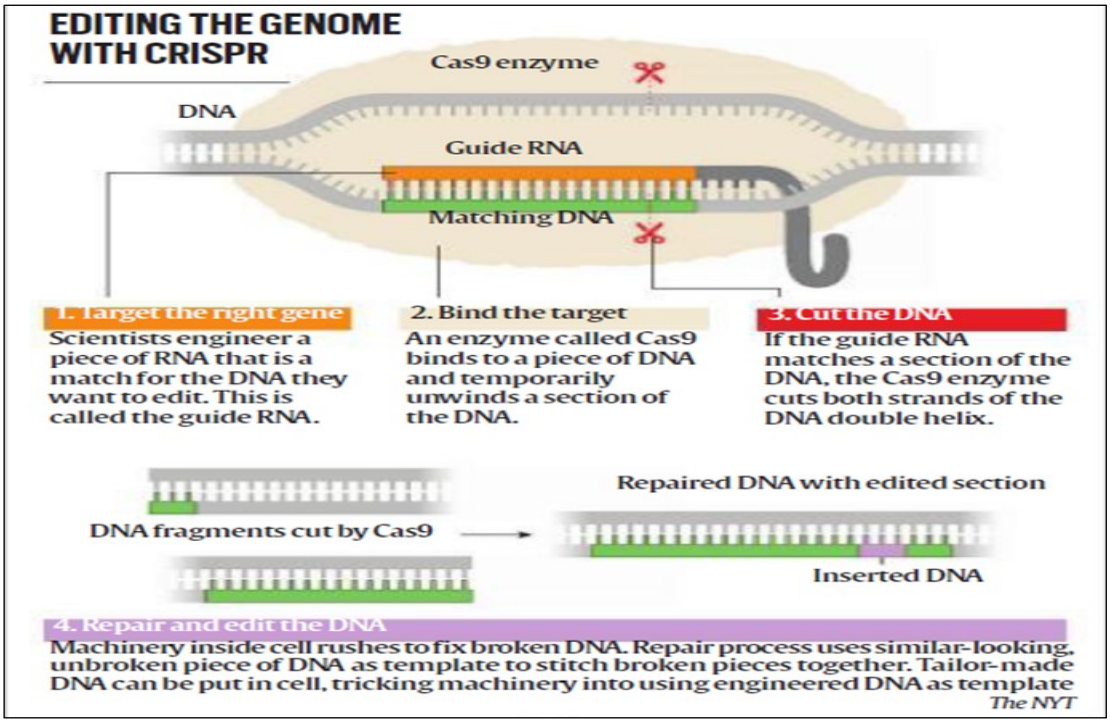

Applications:

It has near unlimited potential for permanent cures for some of the most intractable health disorders and improves the quality of human life with **remarkable efficiency**.

- **Permanent cure to many diseases** such as **genetic** diseases caused by unwanted changes or mutations in genes like sickle cell anaemia, eye diseases including colour blindness, several types of cancer, diabetes, HIV, and liver and heart diseases or **hereditary**
- **Cure to deformities**: arising out of abnormalities in gene sequences, like stunted or slow growth, speech disorders, or inability to stand or walk.
- **Therapeutic solutions:** Not in the form of a pill or drug. Instead, some cells of every patient are extracted, the genes are edited in the laboratory, and the corrected genes are then re-injected into the patient. The changes made are **not passed on to the offspring**
- **Agriculture:** to help develop genetically modified variants with specific desirable traits.

Technical Articles

Digitization of Medicine through Health Care Mobile APPS

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Pharmaceutical companies in India and around the world are realizing that it is not enough by only producing and developing quality and affordable drugs and or treating patients Recent trend shows that they have to go beyond the physical appearance of medicines itself and offer a complete package. These are called already the "around the pill" digital offerings: digital health mobile apps, devices or services that could be prescribed by a doctor or bundled with a drug.

It is safe to say that mobile apps in the healthcare industry have made the lives of medical professionals easier. Be it emergency response, health surveillance and administration, maintaining health records, clinical documentation, treatment monitoring, or ensuring direct touch-points with patients on a regular basis; every aspect is covered with AI for the healthcare providers to transform the industry.

The advantage is that it saves a lot of time and the doctor can prepare for such a situation in advance. Also, mobile apps help healthcare providers to speed up the documentation and treatment procedure which can be a lifesaver in crucial situations.

Types Of Mobile Applications for Healthcare are listed below

- Patient medical health tracking apps
- Doctor appointment & clinical assistance apps
- Telehealth mobile apps (doctor-on-demand apps)
- Reminder apps – include medical tracking or health habit tracking apps
- Medical reference or database apps
- Monitoring apps for chronic conditions
- Diagnosis apps for preventive purposes
- Women's health apps
- Healthy lifestyle apps
- Mental health apps
- Dieting apps

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Mobile Apps Changing the Healthcare Space

1. Monitoring patient's health from a distance

In the digital healthcare era, the fitness bands that are connected to our smartphones via a health app in order to keep track of one's activities like the number of steps taken while walking or running, sleep timings, and meals taken (diet check), and so on. Moreover, the wearable technology has revolutionized healthcare by supporting patients and doctors in their critical activities like providing real-time access to their electronic health records, providing patient history, and so on. Also, many devices are present that are used to indicate any body condition like measuring blood pressure level, monitoring heart rate and glucose level, amongst others.

2. Digital visits

Healthcare mobile app services in the medical sector have replaced physical visits with digital visits. In such an era of healthcare digitization and the use of mobile apps, patients can easily find doctors within their reach and book an appointment at the spot. There are also interactive mobile apps that allow patients to ask general health questions from doctors who are available 24/7 without the need of booking appointments.

3. Easy payments

Easy and efficient payments of the bills have to be one of the key advantages of mHealthcare applications. Traditionally people had to wait in a long queue for hours to make the payment. Mobile technology for healthcare has highly secured payment methods that allow us to make instant payments for ourselves and for our loved ones.

4. Home healthcare is easily accessible

Technology has been the center stage to revolutionize home healthcare services. Not just the IT industry but medical equipments, medicines, and other healthcare requirements in the industry are determined with the help of real-time technology.

With the help of healthcare mobile apps, patients can choose for home healthcare. Not only elderly people can benefit from this but also people with different conditions like individuals who have special needs or a disability, someone who is aging and needs help to live independently, people recovering from a medical setback, or suffering from chronic diseases, etc.

5. Increased accurate reports

Doctors are human too and can make a wrong judgment but the consequences are much lethal. The application of machine-learning and data analytics in healthcare has been very useful, cases and the wrong diagnosis have reduced. With the help of machine accuracy and efficiency, correct reports can be provided to the patient.

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6. Easy access to medical reports

It is due to medical apps that the patient and the doctor can access the medical reports anytime, anywhere. In situations when a patient moves from one healthcare professional to another, this data can be accessed to make quick medical decisions.

7. Choose your doctor

The world is taking excellent benefit from these mobile apps, patients have the access to all the information they need in order to finalize a doctor for their treatment. From ratings, cost, expertise to other patient's reviews and experiences; one can choose a good doctor and take proper decisions for oneself.

Make good use of technology and stay updated!!

Technical Articles

Lumpy Skin Disease (LSD): Basics and Management

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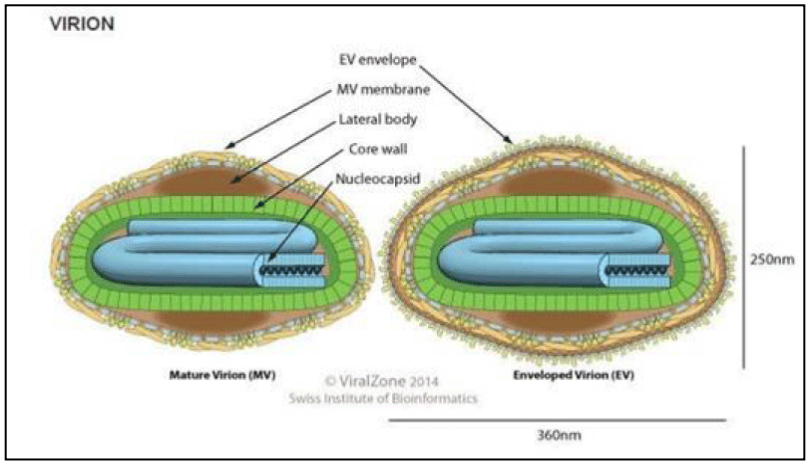
Lumpy Skin disease:

- It is a viral disease that is caused by lumpy skin disease virus (LSDV), a member of the **Capripoxvirus** genus of the Poxviridae family.
- It is caused by infection of cattle or water buffalo with the poxvirus Lumpy skin disease virus (LSDV).
- The virus is one of the three closely related species within the genus **capripoxvirus** and the other two species are **Sheeppox virus** and **Goatpox virus**.

Structure of Virus:



Background:

- As per some sources in **1929**, LSD was first described in Zambia. Over the next 85 years, it spread throughout the majority of **Africa** and into the **Middle East**. In Greece in Europe, the virus entered in **2015** and also in Caucasus and Russia. Further, the virus spread in **2016** into the east in **Balkans**, north towards **Moscow**, and west into **Kazakhstan**. LSD was first reported in India in August **2019** from Mayurbhanj, Odisha.

Disease Transmission:

The LSD transmitted,

- Through bloodsucking insects, flies, ticks
- From infected animals by the means of Nasal Discharge, Saliva and Blood
- From semen
- By ingestion of contaminated food and water

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Mortality and morbidity:

- The mortality rate for the contagion is 1.5 %
- As per the Food and Agricultural Organization (FAO), the mortality rate is < 10 % but has been reported as high as 75 %
- Morbidity rates vary greatly ranging between 1-95 %

Symptoms:

- Nodules of 2-5 cm diameter mainly around the head, neck, limbs, mammary glands of female cattle and genitals
- Lumps open up like large and deep wounds

Clinical signs:

- Fever (40-41.5^{0}C)
- Anorexia
- Reluctance to move
- Rhinitis
- Conjuctivitis
- Excess salivation
- Nodules become necrotic and ulcerative
- Pneumonia

Diagnosis:

Different techniques for LSD diagnosis

Techniques	Animal freedom from infection	Animal freedom from infection Previous to movement	Contribution in eradication policies	Confirmation of Clinical Cases	Prevalence of infection surveillance
Identification of agent					
Virus Isolation	+	++	+	+++	+
PCR	++	+++	++	+++	+
Electron microscopy	-	-	-	+	-
Immune response detection					
Virus Neutralization	++	++	++	++	++
Electron microscopy	+	+	+	+	+

Note: -: Not appropriate for the purpose; +: may be used in some situations; but its application is limited by some fac reliablity,cost,etc.; ++:appropriate method; +++:recommended method.

Prevention

- Restrict the import of animals from infected countries
- Kept in Quarantine and properly tested
- Use insecticides to control insects
- Provide good provision of drainage
- Make shed clean and dry regularly
- Monitor cattles regularly to detect the symptoms earlier
- Give vaccination to healthy animals

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Treatment:

- Treatment for this virus is still not there but the most effective means of control is prevention by vaccination.
- Also, secondary infections in the skin may be treated with Non-Steroidal Anti-**Inflammatories** (NSAIDs) and also antibiotics when appropriate.
- Different skin care medicines can be used to cure the skin wounds. For this-The animals can be cleaned with potash water.
- To prevent from allergies- Anti Histamine medicine should given through vaccination.
- Medicines which increase the immunity of cattle should be given.
- Proper and clean feeds should be provided regularly.
- Secondary bacterial infection should be prevented.

Technical Articles

Combinatorial Chemistry in Drug Discovery

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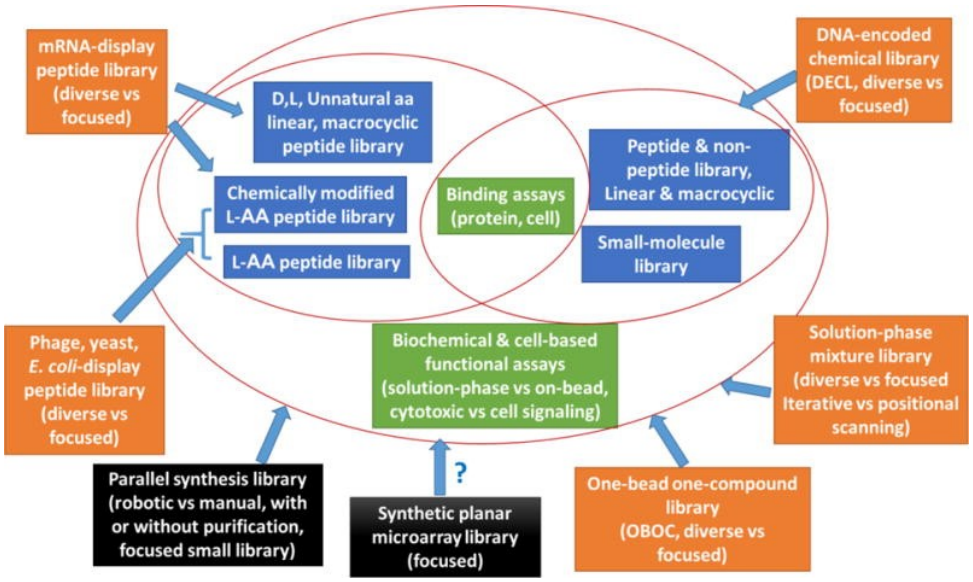
Combinatorial chemistry involves the generation of a large array of structurally diverse compounds, called a chemical library, through systematic, repetitive and covalent linkage of various "building blocks". Once prepared, the compounds in the chemical library can be screened, concurrently, for individual interactions with biological targets of interest. Positive compounds can then be identified, either directly (in position-addressable libraries) or via decoding (using genetic or chemical means). The concept of combinatorial chemistry was developed in the mid 1980's, with Geysen's multi-pin technology and Houghten's tea-bag technology to synthesize hundreds of thousands of peptides on solid support in parallel. In 1991, Lam *et al.* introduced the one-bead one-compound (OBOC) combinatorial peptide libraries and Houghten *et al.* described the solution-phase mixtures of combinatorial peptide libraries.

In 1992, Bunin and Ellman reported the first example of a small-molecule combinatorial library. In addition to being displayed on microbeads, peptides and other synthetic compounds can be displayed on planar surfaces or solid supports, such as glass, to form planar microarrays. In 1985, Smith described the phage-display peptide library method. Similar to OBOC libraries, each M13 phage displays one unique peptide entity (five copies); i.e., one-phage one-peptide. Positive phages can then be isolated for amplification, re-panning, and eventually decoding with DNA sequencing. Unlike synthetic library methods, early biological libraries (phage-display, yeast-display, polysome-display peptide libraries) are restricted to the use of the 20 natural L-amino acids and simple cyclization with disulfide bonds.



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In the mid 2000's, Frankel *et al.*, Josephson *et al.* and Murakami *et al.* reported the mRNA-display macrocyclic peptide libraries using unnatural and D-amino acids as building blocks. The latter approaches enable the generation of libraries of conformationally constrained peptides with greater chemical diversity and resistance to proteolysis, and are, thus, potentially more useful as drugs. Recent advances in DNA-encoded chemical libraries (DECLs) have allowed investigators to create and decode huge diversity small-molecule organic, peptide or macrocyclic libraries.

References: Ruiwu Liu, Xiaocen Li, and Kit S. Lam, Combinatorial Chemistry in Drug Discovery, Curr Opin Chem Biol. 2017 Jun; 38: 117–126.

Technical Articles

Need of Standardization of Herbal Medicines

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Medicinal plants play a key role in global health. Despite the great advances made by modern medicine in recent decades, plants still make a significant contribution to health care. Even in ancient cultures, tribal people methodically collected information about herbs and developed well-defined herbal pharmacopoeias. Physical evidence of the use of herbal remedies was found about 60,000 years ago in the cemetery of a Neanderthal man discovered in 1960 in a cave in northern Iraq. The Assembly of the World Health Organization shall assume its responsibilities for taking account of its law, policy formulation, regulations and national measures to ensure the use of safety and the effectiveness of traditional medicine. The WHO has listed some terms related to herbal medicines according to its definitions. Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products. In some countries, herbal medicines may traditionally contain natural organic or inorganic active substances that are not of plant origin (for example, animal and mineral materials). Herbs include raw plant material such as leaves, seeds, stems, flowers, fruits, wood, bark, roots, rhizomes or other parts of the plant, which may be whole, crushed or powdered. Herbal materials include fresh juices, gums, fixed oils, essential oils, resins and dry powders of herbs. Herbal preparations are the basis for finished herbal products and may include comminuted or powdered herbal materials, or extracts, tinctures and fatty oils of herbal materials herbs .Finished herbal products consist of herbal preparations made from one or more herbs.However, finished products or mixture herbal products to which chemically defined active substances have been added, including synthetic compounds and/or isolated constituents from herbal materials, are not considered to be herbal (WHO guideline, 2000).

According to WHO (1996a ab, 1992), standardization and quality control of herbs is a process involving physico-chemical evaluation of a raw drug, which includes aspects such as raw material selection and handling, safety assessment, efficacy and stability of the finished product, safety and risk documentation based on experience, providing information about the product to the consumer and its promotion. During the manufacture, formulation, storage, packaging, transport and distribution of a medicinal product, it may change the efficacy, safety, stability, and therefore the standardization of herbal medicinal products is a necessity of an era for the actual process . Phytochemical standardization consists of all possible information generated in relation to the chemical fractions present in the herbal medicinal product. Hence, purpose of standardization of herbal medicine includes the following:

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1. Preliminary testing for the presence of different chemical groups.
2. Quantification of chemical groups of interest (e.g., total alkaloids, total phenolics, total triterpenic acids, total tannins),
3. Establishment of fingerprint profiles.
3. Multiple marker-based fingerprint profiles.
4. Quantification of important chemical constituents

WHO Guidelines for herbal drugs standardization and Evaluation

Techniques involved in standardization of crude drugs

1. Preliminary Evaluation- Sampling, Foreign determination, determination of total fiber.
2. Morphological Evaluation- Colour, odour, taste, size , shape, extra features.
3. Microscopical evaluation- Qualitative histological evaluation of types of tissues, quantitative assessment of palisade ratio, vein-islet, vein termination, stomatal index, stomatal number and Lycopodium spore method
4. Physical qualitative evaluation- Solubility refractive index, optical rotation, melting point, boiling point, density, viscosity, chromatographic and spectroscopic evaluation :
5. Physical quantitative evaluation- Ash values, Extractive values, Moisture content and Volatile oil determination.
6. Chemical Evaluation-To detect different classes of phytochemicals, quantitative determination of phytochemicals, assay
7. Biological Evaluation- Swelling Index, Hemolytic index, Bitterness value, Foaming index, Total tannins value
8. Toxicological Evaluation- Determination of pesticides, Determination of arsenic and heavy metals, Determination radioactive contamination, Determination of aflatoxins
9. Pharmacological Evaluation- Animal activity, Animal organ or tissue activity.
10. Analytical Evaluation- Chromatographic-TLC, Paper, HPTLC, HPLC AND GC and spectroscopic evaluation.

Reference: Prajkta Tambare, Firoj Tamboli, Harinath More. Standardization of Herbal Drugs: An Overview. International Journal of Pharmacognosy and Pharmaceutical Sciences. 2021; 3(1):9-12.

Technical Articles

Are microbes on the space station different from those on Earth?

Mr. Rakesh P. Dhavale
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The presence of microbes on the International Space Station (ISS) — a human-made, sealed environment with unnatural conditions such as microgravity — has always piqued the curiosity of scientists. Are space-dwelling microbes very different from their earth-stationed counterparts? Can these microbes cause astronauts to fall sick? Do the microbes on the ISS — it is believed to host some 55 varieties — interact with one other?

Now, researchers from the Indian Institute of Technology Madras and their collaborators at the National Aeronautics and Space Administration have published a study on interactions between these microbes. The paper, published in the journal *Microbiome*, used metabolic models of the microbes to assess the interactions.

The researchers started with computer-based metabolic models of each type of microbe. These models represented the entire network of metabolic reactions happening inside a microbe and were derived from their DNA sequences. They then looked for small molecules or metabolites that an organism could possibly get from another. These metabolites determine the type of interaction between two types of microbes.

A good analogy for this would be road networks of two States and their interconnections, says Karthik Raman, one of the authors of the paper. The road networks are unique to the State, but the interconnections determine to what extent traffic in one State impacts that in the other.

he researchers found a variety of interactions: parasitism, where one microbe feeds off another; competition, where two microbes fight for the same resources; or amensalism, where one microbe harms another without benefiting itself.

The researchers took two approaches to network modelling: the graph theory approach and the constraint-based modelling. The former allows researchers to see the broad strokes of interactions between microbes; the latter lets them see which microbe will outgrow the other.

The high level of interaction between the microbes surprised the researchers. "The microbes are not just hanging around, but they seem to really have a community structure and are helping each other survive," says Raman, Associate Professor, Biotechnology, IIT Madras. For example, they found *Salmonella and Entero-bacteriaceae* were helping other organisms grow.

Of the many interactions that the researchers found, they experimentally validated one in microgravity conditions. The modelling-based analysis had shown that the bacterium *Klebsiella* had a parasitic interaction with the fungus *Aspergillus*. To prove this prediction, *Klebsiella and Aspergillus* were cultured or grown together in simulated microgravity conditions.

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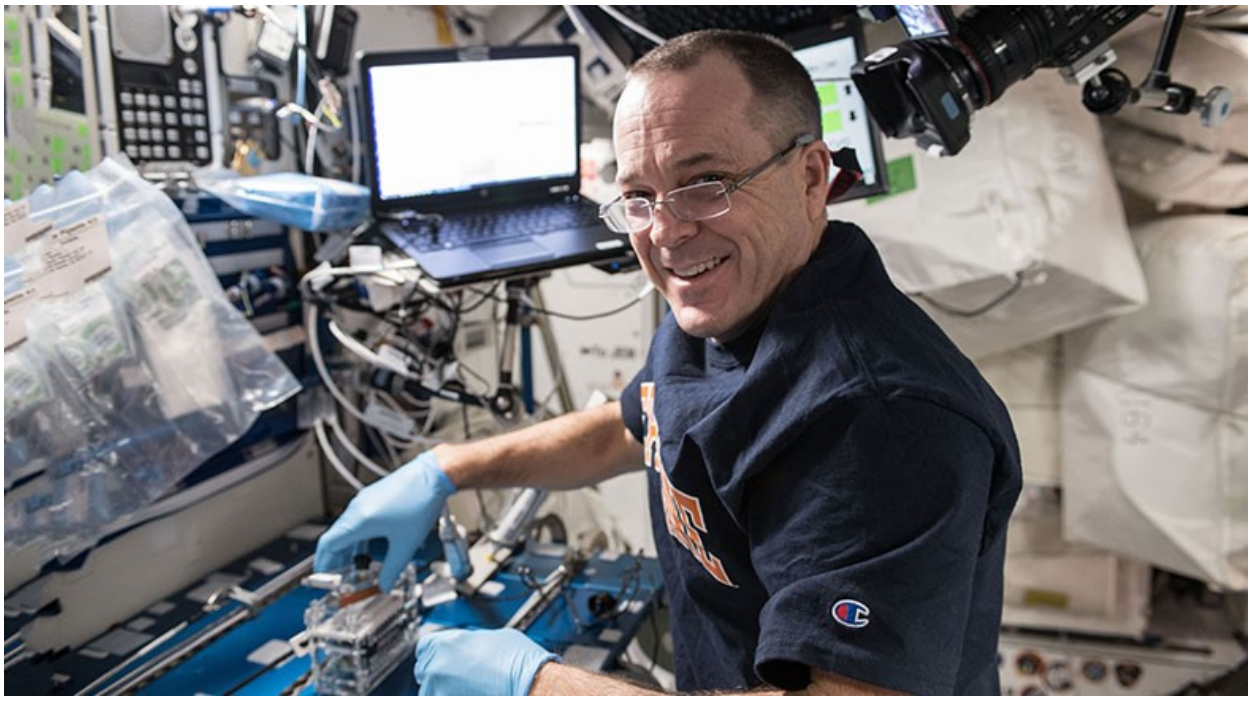
Using electron micrography the researchers found the *Klebsiella* negatively affected the morphology of *Aspergillus* and degenerated its biofilm forming structures.

Knowledge of these interactions can help in "targeted disinfections" in the ISS, says Raman. Since the microbes are embedded in a community, disrupting some key players could potentially disrupt the entire community. Going ahead, the team now wants to look at microbial communities and their interactions at the spacecraft assembly facility. They also want to use their network modelling methods to study a variety of other microbial communities.



An astronaut swabs surfaces in the International Space Station to collect microbe samples.

"Since the microbes are embedded in a community, disrupting some key players could potentially disrupt the entire community."

Reference: IIT Madras, Shaastra : vol 01 issue 04 :: Jul - Aug 2022

Technical Articles

Good Laboratory Practice: Implementation in basic scientific research

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Good Laboratory Practice (GLP) refers to the concept of quality system which is concerned with organized organizational process and defines and guides upon the conditions under which non clinical health and environment studies are planned, performed, monitored, recorded, reported and archived for risk assessment process as per OECD 1997guidelines. GLP implementation will help to enable, validate, reproduce and build reliability of toxicity testing data. US Food and Drug Administration (FDA) for the first time in 1978 introduced GLP regulations to eliminate fraud and poor laboratory activities in toxicity studies. Organization of Economic Cooperation and Development (OECD) introduced GLP guidelines internationally in 1981 to facilitate different toxicity studies and to generate quality data for human and environmental risk analysis. The OECD guidelines cover organization, personnel, test facility, quality assurance system, test system, test item, standard operating procedures, performance recording and reporting of study under GLP principles. International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH), has also provided the guidelines for the quality, safety and efficacy assessment of pharmaceuticals and has stated GLP as a pre-condition for the successful registration of pharmaceuticals internationally. Non-clinical studies that are carried out under GLP conditions produce quality data and helps for taking better regulatory decision.

The inability to reproduce research findings is a long-standing problem in scientific research. Scientists all over the globe generally think that GLP principles are implemented for toxicity studies and should be followed only for regulatory compliance purpose. But in the current context it is rather an assurance for the quality system, that the test data are generated under the controlled conditions. GLP regulations and the implementation procedures are extensive and complex in nature. These regulations are not just an approved label or quality symbol to satisfy the study sponsor or the regulatory authorities. However, today GLP can be applied to broad disciplines of science to cater to the needs of the experimental objectives, generation of quality data and animal based assay procedure reproducibility. Considering its significance, it can now be applied in academics; industries as well as government set ups throughout the world. GLP is the best way to promote the reliability, reproducibility of the test data and hence facilitates the international acceptability of the test data. Now it is the need if time that GLP principles should be transtated and implemented beyond regulatory studies. Thus, it can provide a way for better understanding of scientific problems, providing better solutions and help to maintain a good human and environmental health.

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World Health Organization (WHO) initiative advocated the quality practices in basic biomedical research. It emphasizes that irrespective of place and purpose of scientific work GLP quality standard should be implemented. Several scientific publications have raised the serious concerns about the reproducibility and predictability of microarray data. It was suggested that the implementation of GLP principles can help the researchers to generate quality data in microarray experiments, because multistage experimental procedures are involved and each step can influence the quality as well as the reliability of experimental data It has been recommended that these principles should be implemented for finished products in pharmaceutical industries to maintain both quality control and quality assurance. Finally it should be remembered that passion for good science and research should not be lost in a set of defined principles just for the regulatory settings and compliances.

Technical Articles

‘Hot’ graphene reveals migration of carbon atoms

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A carbon atom (highlighted in orange) migrating on the surface of graphene at elevated temperature towards a vacancy, racing against a scanning electron beam (green-yellow glow) nearing the same position. The migration of carbon atoms on the surface of the nanomaterial graphene was recently measured for the first time. Although the atoms move too swiftly to be directly observed with an electron microscope, their effect on the stability of the material can now be determined indirectly while the material is heated on a microscopic hot plate.

Carbon is an element essential to all known life and exists in nature primarily as graphite or diamond. Over the past decades, material scientists have created many novel forms of carbon that include fullerenes, carbon nanotubes, and graphene. Graphene in particular has been the subject of intensive research, not only because of its superlative properties but also because it is particularly well-suited for experiments and modeling. However, it has not been possible to measure some fundamental processes, including the motion of carbon atoms on its surface. This random migration is the atomic origin of the phenomenon of diffusion.

Diffusion refers to the natural motion of particles such as atoms or molecules in gases, liquids or solids. In the atmosphere and the oceans, this phenomenon ensures an even distribution of oxygen and salt. In the technical industries, it is of central importance for steel production, lithium-ion batteries, and fuel cells, to name just a few examples. In materials science, diffusion at the surface of solids explains how certain catalytic reactions proceed and many crystalline materials including graphene are grown.

Surface diffusion rates generally depend on temperature: the warmer, the faster the atoms migrate. In principle, by measuring this speed at different temperatures, we can determine the energy barrier that describes how easy it is for the atoms to hope from one site on the surface to the next. However, this is impossible by direct imaging if they do not stay put for long enough, which is the case for carbon atoms on graphene. Thus, until now, our understanding has relied on computer simulations. The new study overcomes this difficulty by indirectly measuring their effect while heating the material on a microscopic hot plate inside an electron microscope.

By visualizing the atomic structure of graphene with electrons while occasionally kicking out atoms, the researchers could determine how fast carbon atoms on the surface must be moving to explain the filling of the resulting holes at elevated temperatures. By combining electron microscopy, computer simulations, and an understanding of the interplay of the imaging process with the diffusion, an estimate for the energy barrier could be measured.

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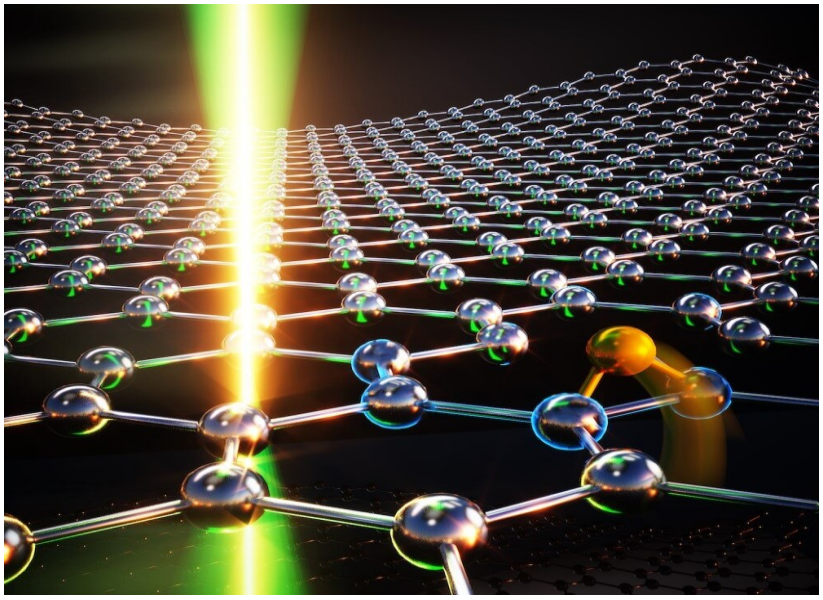

After careful analysis, 0.33 electron volts value was pinpointed, somewhat lower than expected," lead author Andreas Postl states. The study is also an example of serendipity in research, as the team's original goal was to measure the temperature dependence of this irradiation damage.

Technical Articles

Nanocarriers for ocular drug delivery: Future Perspective

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Anterior segment diseases such as cataracts, glaucoma, dry eye, and other infectious can ultimately lead to poor eyesight or blindness. For treating these conditions, eye drops are mostly prescribed but tear fluid generation, lacrimal drainage, and barrier functions limit the efficacy of the administered drugs. Drug delivery through films, hydrogels, and implants may improve the ocular residence time. However, these approaches can obstruct the vision and cause inconvenience to patients. Long-term contact with the carrier material in implants may compromise the safety of the ocular tissue. The reported preclinical and clinical outcomes for nanocarriers provide future hope for safer and effective drug delivery for treating anterior segment diseases. However, targeting nanocarriers to the posterior part is challenging and there is a need to deliver therapeutics via a suitable delivery system that can overcome the ocular barriers. Currently, injectable formulations are administered to treat chronic retinal disorders. For example, AMD requires anti-VEGF treatment by intravitreal injection, and it requires repeated administration, and expert medical supervision, while lacking patient compliance. Intravitreal nanomedicine injection can deliver the drug directly to the retina by overcoming the clearance of the drug molecule in the vitreous region. This nanomedicine can stay in the vitreous region and provide prolonged salutary drug concentrations to the target site. Intravitreal delivery of nanomedicines can reduce the dose and dosing frequency, and employing less invasive techniques can reduce the medical burden for patients and healthcare professionals. The delivery of nanocarriers larger than 300 nm to the posterior part of the eye increases aggregation and causes disturbance to the vision. A particle size of less than 300 nm not only decreased the chances of aggregation but also improved the release and drug loading, which are of major importance. All these considerations are the bottleneck for the ocular delivery of nanoparticles.

In addition to the scale-up of nano-drug delivery systems, controlled drug release from implants, nano wafers, and 3D printed hydrogel technology has also been explored for the treatment of retinal diseases. The safety, scale-up, and reproducibility of nanomedicine are essential for reaching commercial scale. Most biodegradable and natural polymers are considered safe for drug delivery but detailed toxicity studies need to be performed before commercial acceptance. Some nanocarrier preparation techniques have been investigated for scale-up and large-scale production but there is a need to further explore more techniques that are simple, feasible, and provide regulatory acceptable nanomedicines.

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Nanotechnology has the potential to add innovative functionality and provide superior therapeutic efficacy over conventional ocular drug delivery systems. The overall global ophthalmic drugs market was valued at approximately USD 25.03 billion in 2017 and is expected to generate revenue of around USD 34.52 billion by the end of 2024, growing at a compound annual growth rate of around 4.7% between 2018 and 2024. This reflects the huge scope of ocular products for abbreviated new drug applications in future.

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Technical Articles

Biosurfactants from Microbial world

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The majority of microorganisms' natural habitats are oligotrophic in kind, with nutrition added sporadically as a result of rotting, mortality, or drying out of material and decomposition, which causes competition for food sources. As a result, microbial cells are continuously exposed to environmental changes, which encourages their extracellular components to work in accordance with the niche. Microbial size and area also offer them a high surface-to-volume ratio for efficient nutrient uptake and waste discharge. It is well known that many microorganisms produce a range of biosurfactants. Major ecological processes in the environment are controlled by microbial interactions in various niches that can produce biomolecules like enzymes, biosurfactants, extracellular organic acids or peroxides, as well as quorum-sensing and quenching capabilities. Biofilms are microbial assemblages and aggregates that are produced because of their natural affinity for interfaces and their capacity to manufacture amphipathic surface-active agents (or biosurfactants) for occupying these niches. These amphipathic biomolecules create a "conditioning layer" on the surfaces, altering their initial characteristics and affecting the interactions between microbes and the surface. Low molecular weight biosurfactants and high molecular weight bioemulsifiers are two classic categories for the biosurfactants. In the previous two decades, research on biosurfactants has grown significantly, especially in the last ten years.

Microbially derived biosurfactants and bioemulsifiers are effective substitutes for their chemical counterparts. There have been reports of microbial biosurfactants from freshwater and marine ecosystems in addition to terrestrial ones. There have been numerous reports of bacteria making biosurfactants, but it has been challenging to generalise their biochemical characteristics, the genes involved, or their function in microbe physiology. There have been publications outlining the many functions and prospective uses of biosurfactants, as well as about 255 patents as of 2006. Since then, the number of biosurfactant patents has grown dramatically, from about 250 in 2006 to more than 850 in 2019. Industrial biosurfactant production is still in its infancy at the moment, and the difficulties posed in this regard are brought on by the high cost of microbial cultivation to biosurfactant recovery (cultivation, production, purification and recovery). Although genetic engineering can boost the production of biosurfactants, consumers do not embrace the usage of genetically modified organisms (GMO). Biosurfactants have already been used in businesses as green surfactants produced using microorganisms and chemical transformation/synthesis processes, either alone or in combination with commercially available surfactants.

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The exploration of new areas for biosurfactant research, such as bioinformatics and biosynthesis/chemical synthesis tools, requires advancements. With expanded manufacturing, the rapidly evolving discipline of chemical and biological engineering can help broaden the range of useful biosurfactants. The present review provides the fundamental framework for future research, biosurfactant use, and synthesis. Surfactants are currently used in a wide range of cosmetic and health care goods, including toothpaste, infant products, antacids, acne pads, deodorants, and lens solutions. Biosurfactants can work as emulsifiers, immunomodulators, antiproliferative agents with anticancer properties, antiviral biomolecules, and therapeutic compounds for treating immunological disorders.

Technical Articles

Methods and applications of machine learning in structure-based drug discovery: Homology modelling

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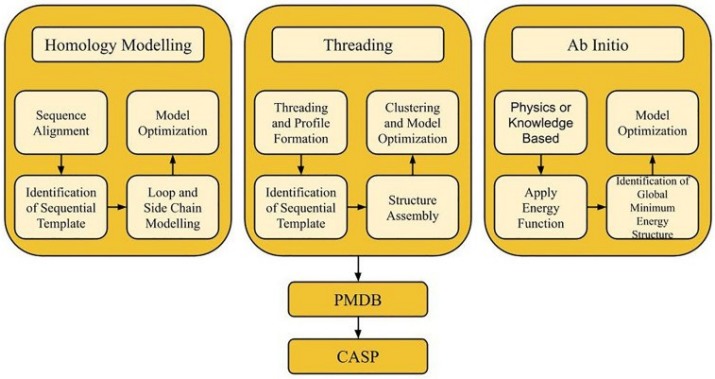
Homology modeling or comparative modeling process is an in silico approach that works with the concept that the two homologous sequences form similar protein structures Fig. 1. It is used to model a protein structure if the similarity score of the query sequence and target sequence is > 30% identity. Sequence alignment can be done by submitting the query sequence to BLAST to identify such similarity scores. Besides, PSI-BLAST helps us to identify the homologs by applying position-specific scoring matrices. Thus, even the evolutionarily distantly related homologs can also be identified through an iterative process of sequence alignment. Finally, the topmost protein sequence with maximum similarity score and lower *e*-value will be selected as a template sequence, and their corresponding 3D template structure can be retrieved from the PDB database. Here *e*-value stands for "expect value," which indicates the probability of occurrence by chance, and their threshold value is fixed to be e^{-5}. Thus the *e*-value is indirectly proportional to the significance of the match between the query and identified hit sequences. Based on the chosen template sequence, the new structure is modeled using various online servers such as the Swiss model, Modeler, etc.

After modeling the new structure, the outputs are validated by generating the Ramachandran plot. Based on the percentage of residues that fall under the allowed regions in the Ramachandran plot, the accuracy of the final structure is identified. PROCHECK is a highly applicable program to check the accuracy of the newly modeled protein. CASP-13 experiments announce I-TASSER, GALAXY, ALPHAFOLD, RAPTORX, ROSETTA, etc., as the topmost rank holders for performing the homology modeling. Even though the recent computational developments are cutting-edge there is no single comprehensive tool to model the new structure of proteins.



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Technical Articles

Urinary Tract Infection - Prevalence and Recent Advances

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Urinary tract infection (UTI) is a common disease among young and mature adults. It is more prevalent among females as the chances of colonization of microbes are greater due a short and wider urethra. The main causes are catheterization, anatomical abnormalities, and behavioral factors. The risk factors may include lack of immunity, lack of hygiene, intercourse with multiple partners, and the postmenopausal phase.

The UTI can be categorized as either acute (limited to the bladder) or chronic (pyelonephritis) and also as uncomplicated; when it occurs in healthy, non-pregnant women with normal urinary tract structure and function, and complicated; when it occurs in pregnant, diabetic individuals with abnormal urinary tract structure. Symptoms of UTI are dysuria, urinary urgency, frequent urination, fever, and myalgia, and if the infection is not treated properly it leads to pyelonephritis. Transmission of microbes to the GIT or the kidney can lead to further complications. The most common pathogens causing UTI are *Escherichia coli, Klebsiella pneumoniae, Enterococcus species., Streptococcus agalactiae, Proteus mirabilis, Staphylococcus saprophyticus, Viridans streptococci, Klebsiella oxytoca, Pseudomonas aeruginosa* to list a few. Among these microbes, *E. coli* contributes to about 86% of the UTIs. UTI can occur in all seasons, however, a spike in the infection can be observed during warm summer. In India, the incidence of UTI is prevalent in all parts of the country, regardless of weather conditions or seasons. The chances of UTI relapse are very common. Approximately 25% of women have a recurrent infection (may be due to behavioral factors or lack of proper treatment) either by the same pathogen or by another pathogen.

In the pathogenesis of UTI there is role of microbial factors like exotoxins such as hemolysin, cytotoxic factor type 1, and colonization factors and, host factors such as short urethra in females, abnormal function of the prostate in males, usage of a spermicide, lower level of estrogen in post-menopausal women, and neurogenic bladder. UTI is also associated with prostatic hyperplasia, genetic abnormalities like a defect in the CXCR1 gene expression, and history of hypospadias. The common methods of diagnosis for UTI are Standard Urine Culture, Colony forming units-based testing, and use of a dipstick that detects leukocyte esterase and nitrate reductase activity. If the Bacterial count of the urine sample is $\geq 10^4$ c.f.u./ml can be considered as an infected urine sample accompanied by microscopic examination of the urine. UTI can be prevented by following a hygienic lifestyle that includes drinking enough amount of water and also avoiding unsafe sexual intercourse with multiple partners.

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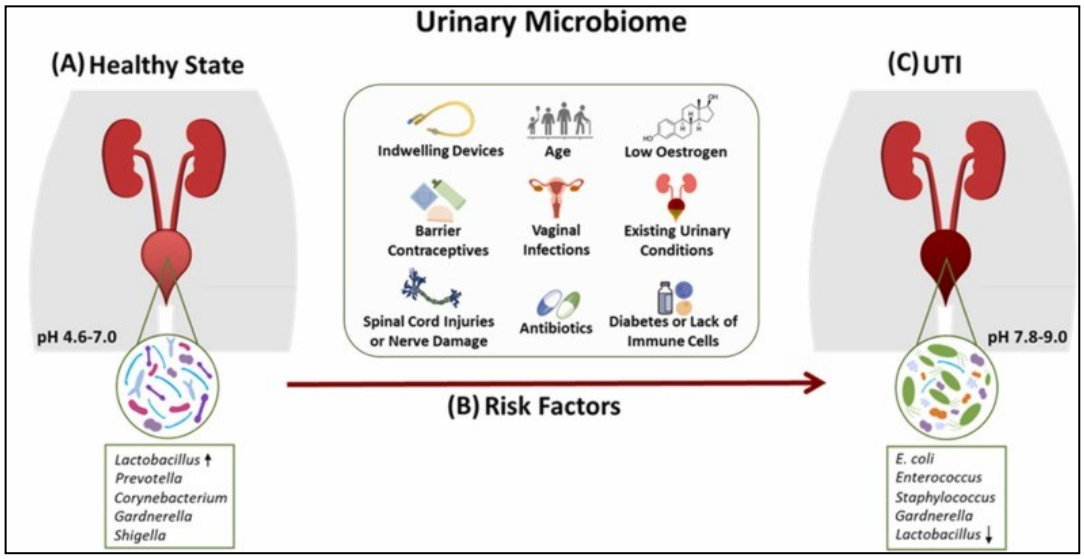
UTI treatment currently relies heavily on antibiotics like Gentamycin, Fluoroquinolones, Nitrofurantoin, Amikacin, and Co-trimoxazole. But the major drawback of using antibiotics is that the pathogens can become resistant and overcome the activity of the antibiotics. Various vaccines are turning out to be good candidates to treat UTI. Various herbal formulations containing fruits/herbs extracts of Cranberry, Arctostaphylos uva-ursi, Juniperus species, Mahonia aquifolium,, and Hydrastis Canadensis are becoming promising candidates against uropathogens by showing anti-bacterial, anti-biofilm, and anti-adhesive activity. UTI is termed as Mutrakrucha in Ayurveda. Trinetrakhya Ras, Varunadilauh, Mutrakruchhantak Ras, Trunpanchmula, Gokshurkwath, Haritakyadiyog, Duralabhadikashaya, Eladi Churna, Tarkeshwar Ras, Varundya Lauh and Chandrakala Ras are the ayurvedic formulation used for treating UTI. Along with herbal medicines the homeopathic preparations of Phosphorus, Platinum metallicum, Collibacillinum, and Causticum and Unani formulations like mucilage of Althaea ocinalis, Sphaeranthus indicus, Euphorbia hypericifolia, Tribulus terrestris, Sharbat Anarshireen, Citrullus vulgaris, and Cucumis melo seeds are used to treat UTI. Recent studies shows nanoparticles synthesized from various plant extracts are showing promising effects in treating UTI.



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Technical Articles

Advancement in Solid Dosage Manufacturing Processes

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Solid dosage forms powders, tablets and capsules etc. have been widely used for delivering active ingredients i.e. drugs due to their convenience and consequent patient compliance. One of the prominent solid formulations, tablet formulations which provide a unit dose which is either immediate drug release or modified release or is taste masked are some of the most popular and extensively explored aspects of oral solid dosage form development. Tablet manufacturing is a multistep process and hence is a complex process with many potential variables. The processes and parameters associated with tablet manufacture are still not fully understood. Extensive research is ongoing to develop understanding in all areas of the tablet manufacturing process.

The last few years have seen the development of novel tabletting technologies which improve machine performance. These advances in machine design aim to overcome limitations associated with conventional manufacturing approaches such as the denaturation of thermolabile active ingredients, material wastage, multiple processing steps and elevated costs due to protracted processing time, labour and maintenance of equipment. Developments relating to engineering and machine design have also been implemented in the pharmaceutical industry. The concept of quality by design has been applied to enhance productivity by the application of novel process analytical technologies that track quality attributes of formulations. These also can document data as a function of input variables (materials and process) in a real time manner.

Advances in tablet manufacturing processes: Dry granulation technology includes pneumatic dry granulation (PDG) which employs the classical roller compaction technique in combination with a proprietary pneumatic system to develop granules with better flowability and compressibility. Another, Hot melt extrusion (HME) involves blending of formulation components along a rotary screw(s) inside a barrel at high temperature. The molten blend is passed through an extruder and extrudates can be pelletized or compressed into tablets Next, extrusion-spheronization, accomplishes granulation in four steps; preparation of wet mass, shaping the granules and forming extrudates (extrusion), breaking up the extrudates and forming spheres (spheronization) and finally drying of formed pellets. Injection moulding, this approach involves fusion of the formulation components, injection of liquifies mass into a closed mould, solidification and detachment of this mixture. The moulded mass is occasionally subjected to curing to achieve desired mechanical. The coprecipitation method involves solubilization of the formulation contents in a solvent, followed by addition of an antisolvent at a specific rate under constant stirring to obtain a precipitate.

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Finally, Nanotechnology-based fabrication approaches include development of nanoparticle or nanofiber incorporated tablets. Most widely used methods for fabricating nanoparticles/nanofibers include precipitation, nanomilling and electrospinning. However, the continuous manufacturing approach presents several quality and regulatory challenges, such as sampling strategy, product collection or rejection, batch release and recalls, control strategy and traceability of raw materials, all of which have to be overcome.

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Technical Articles

Nanorobotics role in Pharmaceutical Sciences

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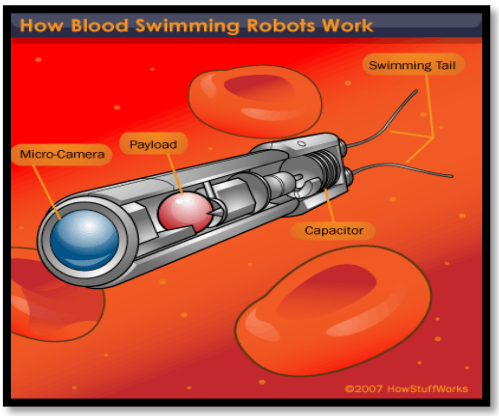
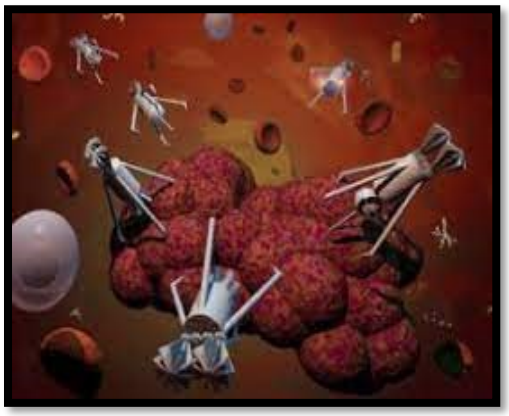
Nanorobotics is the technology of creating machines or robots at or close to the scale of a nanometre (10^{-9} metres), machines constructed at the molecular level (nanomachines) may be used to cure the human body of its various ills. This application of nanotechnology to the field of medicine is commonly called as nanomedicine. Nanotechnology promises futuristic applications such as microscopic robots that assemble other machines or travel inside the body to deliver drugs or do microsurgery. Taking inspiration from the biological motors of living cells, chemists are learning how to utilize protein dynamics to power microsize and nanosize machines with catalytic reactions. Nanorobot's toolkit contains features like medicine cavity containing medicine, probes, knives and chisels to remove blockages and plaque, microwave emitters and ultrasonic signal generators to destroy cancerous cells, two electrodes generating an electric current, heating the cell up until it dies, powerful lasers could burn away harmful material like arterial plaque. To cure skin diseases, a cream containing nanorobots may be used which remove the right amount of dead skin, remove excess oils, add missing oils, apply the right amounts of natural moisturising compounds, and even achieve the elusive goal of 'deep pore cleaning'. other fields of applications are to clean the wounds, to break the kidney stones, to treat gout, for parasite removal, for cancer treatment, treatment of arteriosclerosis.

A new approach within advanced graphics simulations is presented for the problem of nano-assembly automation and its application for medicine. The problem under study concentrates its main focus on nanorobot control design for molecular manipulation and the use of evolutionary agents as a suitable way to enable the robustness on the proposed model. Thereby the presented works summarize as well distinct aspects of some techniques required to achieve successful integrated system design and 3D simulation visualization in real time.





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Technical Articles

Nanocarriers for ocular drug delivery: Current status and translational opportunity

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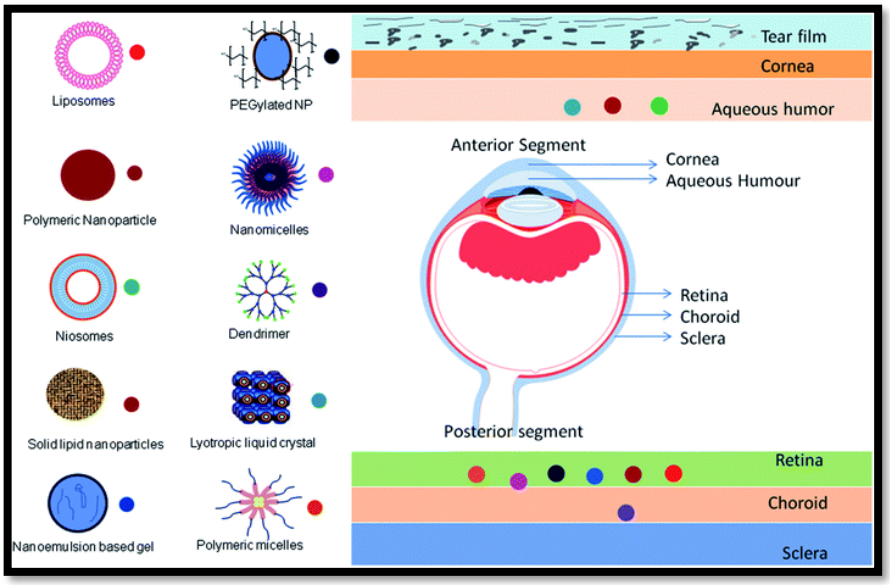
Vision and quality of life are significantly impacted by ocular illnesses. It is difficult for formulation scientists to transport drugs to the tissues of the eye. Physiological barriers (nasolacrimal drainage, blinking), anatomical barriers (static and dynamic), efflux pumps, and metabolic barriers are the main obstacles to medication delivery to the anterior and posterior parts. The many layers of the cornea, sclera, and blood-aqueous barriers are considered static barriers, whereas conjunctival blood flow, lymphatic clearance, and tear drainage are considered dynamic barriers. Systemically administered drugs cannot cross the blood-retinal barrier (BRB) into the retina because of its tight junctions. It has been discovered that nanocarriers are effective at resolving the problems with traditional ocular dosage forms. Numerous nanocarriers have been studied for enhanced penetration and efficient targeted drug administration to various ocular locations, including liposomes, niosomes, nanomicelles, lipidic nanocarriers, polymeric nanoparticles, and dendrimers. Additionally, scale-up and clinical status is also addressed to understand the current scenario for ophthalmic drug delivery.



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Technical Articles

Network Technology in Pharmaceuticals

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Internet of Things in the pharmaceutical sector is a revolutionary fighter. It aids pharmaceutical manufacturing, warehousing, packaging and supply chain management. IoT helps in enhancing the quality of product, reducing the errors in it, and increasing the productivity of pharmaceuticals.

From the initial to the intermediate process, IoT aids the different activities of pharmaceutical industries. It supervises the different unit operations, monitors real-time data, enhances product efficiency, and improves visibility to enhance operational effectiveness.

From helping the pharmaceutical employees to plan their daily work programs to helping them with the knowledge of drugs and active ingredients. The Internet of Things has assisted the whole pharma sector.

Even modern pharmacists rely on Information Technology (IT) and IoT for their practice. With advances in technology in the R & D sector, the pharmaceutical industry has switched itself to technology-based frameworks.

Some of important sectors where IoT and IT have influenced the pharmaceutical manufacturing and pharma plant are as below:

Industrial Mechanics

IoT helps in improving industrial machines and mechanics. The pharma IoT monitoring sensors help in monitoring machines and feed all relevant facility data into a single dashboard.

By observing it alerts the supervisors about the abnormal conditions and the necessary maintenance requirements. They also connect the automatic shut offs and handle critical conditions related to mechanics.

Material Tracking

Another advantage of IoT in pharmaceuticals is material tracking. IoT connects the devices to the internet and network, the connected devices can easily track the availability of materials in real-time. It assists better inventory controls and reduces the cost by controlling the waste generation.

Logistics

After the manufacturing of the products, the pharmaceutical industry transports the final goods from the manufacturing area to the market. Here also sensors are fitted that track the finished products and supply chain.

Optimize the Clinical Trials

Before manufacturing or producing any new drugs in the market, the drug has to undergo several clinical trial phases. Clinical trials are also managed by IoT connected devices. IoT techniques help in monitoring the effects of experimental medication in real-time management.

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Regulatory compliance

From a small to large, all scale pharmaceutical processes are required to be well-established and well-documented. IoT connected devices continuously send data to the servers. This real-time data is maintained at the end and analyzed later to check if it meets the quality standards. This also reduces the amount of manual paperwork and risk of errors.

Smart Equipments

Another application of IoT in the pharma sector is smart wearable equipment and dedicated mobile apps. These devices encourage patient adherence and incentivize. In earlier times, the medical crisis of a patient is detected after so long, sometimes, during final stages. But IoT by real-time monitoring of data detect the early signs of a serious medical event.

Smart pills and implanted devices

Smart pills are the tiny pills, basically the latest invention of pharmacy science. Implanted devices are the devices that are injected into the patient's body. They help in detecting even the smallest change in the patient's body. This helps in preventing the serious threats and risks.

Rich Insights

The real-time data collected by the IoT connected devices can be sent to a data analytics software. This helps in analyzing the data in a rich way. The data analytics software helps in identifying the weaker area of the field and the most efficient too. By pinpointing the inefficiencies, IoT indirectly helps in improving the overall pharmaceutical process by boosting productivity and profitability.

Thus, from preventative maintenance to supply control, IoT is easing every branch of pharmacy. If we keep pharmaceutical manufacturing aside, IoT with benefits like e-prescription, online doctor consultants, advanced therapies and treatment has improved medical science too. Technology has truly resulted in digitisation and modernisation in many fields. Whether it may be in the field of medicine or agriculture or electronics, technology has resulted in a global revolution.

Make use of latest Technology and let us benefit!!

Technical Articles

A Rare Bombay Blood Group

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Bombay blood group is the rarest blood group in the world. It is a blood group which shows absence of A,B,H antigens on red cells and presence of anti- A,anti-B and potent wide thermal range anti-Hantibodies in serum reacting with all O blood group. Dr. Y.M. Bhende first discovered Bombay blood group in 1952 at Bombay in India.

Characteristics of Bombay Blood

- Absence of H, A, and B antigens; NO agglutination with anti-A, anti-B, or anti-H lectin.
- Presence of anti-A, anti-B, anti-AB and potent wide thermal range anti-H in the serum.
- A, B, H non-secretor (no A, B, or H substances present in saliva)
- Absence of H enzyme in serum and H antigen on red cells.
- Presence of A or B enzymes in serum and red cells.
- A recessive mode of inheritance.
- Red cells of the Bombay group are compatible only with the serum from another Bombay

Oh Phenotype (Bombay) This phenotype occurs when two hh genes are inherited at the Hh locus.These individuals possess normal A or B genes but are unable to express them because they lack the gene necessary for production of H antigen, the required precursor for A and B. These individuals will transmit the normal A or B gene to offspring. The h term "Bombay" used for O phenotype because examples of such RBCs were first discovered in Bombay, India. Symbol Oh denotes the phenotype because results obtained in ABO grouping mimic those of group O persons.The RBCs are not agglutinated by anti-A, -B or -A,B. The serum agglutinates the reverse A and B cells.Generally not recognized until the serum is tested against group O cells in the antibody screen and agglutinates all O cells tested.Because these individuals lack A, B and H antigens, they form potent anti-A, -B, -A,B and anti-H, which is the most clinically significant. These individuals can only be transfused with Bombay blood which occurs in <0.01% of the population. Confirmatory testing for O .Test patient with anti-H lectin Ulex europaeus. Normal group O cells are strongly agglutinated while Oh cells are not agglutinated. The patient's serum will agglutinate all blood types (A, B, AB and O). The patient's serum will fail to agglutinate Oh cells

Transfusion Compatibility Individuals with Bombay blood group can donate to all ABO blood group people and can only accept from Bombay blood group people. The Bombay anti-H is an IgM antibody that can bind complement and caused red cell lysis.Because the H antigen is common to all ABO blood group, Bombay blood is incompatible with all ABO donors.

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Given that this condition is very rare, any person with this blood group who needs an urgent blood transfusion will probably be unable to get it, as no blood bank would have any stock. Those anticipating the need for blood transfusion (e.g. in scheduled surgery) may bank blood for their own use (i.e. an autologous blood donation), but this option is not available in case of accidental injury.

Prevalence

At present about 0.0004% of the general human population have Bombay blood group, though in some places such as Mumbai local populations can have occurrences as much as .01% of inhabitants. People with this blood group are found in Maharashtra and some places of Karnataka which lies at the border of Maharashtra. In a recent study an incidence of 1 in 33 among Kutia Kondh tribe, 1 in 127 in Kondh tribe and 1 in 1244 among the tribal populations of Orissa is found. This is the highest incidence of Bombay blood group so far reported from India.. The incidence of this phenotype as 1 in 13,000 individuals in Mumbai . An incidence of 1 in 7600 after screening a large number of samples in Mumbai. In Maharashtra, reported the incidence of the Bombay phenotype as 1 in 45007 Incidence is 1 in 18,404 amongst Indians settled in South Africa. Of the 179 cases 112 (62.6%) cases belonged to the state of Maharashtra. A slightly higher frequency of the Bombay phenotype was also found in the neighboring state of Karnataka (14 cases), Andhra Pradesh (8 cases), Goa (6 cases), Gujarat (5 cases), Uttar Pradesh (5 cases), and so on in the decreasing order 8. The incidence of the Bombay phenotype is high in those states of India where consanguineous marriages are more prevalent.

Blood Group	Forward Group			Reverse Group		
	Anti-A	Anti-B	Anti-A,B	A1 Cells	B Cells	O Cells
A	+	–	+	–	+	–
B	–	+	+	+	–	–
AB	+	+	+	–	–	–
O	–	–	–	+	+	–
Bombay	–	–	–	+	+	+

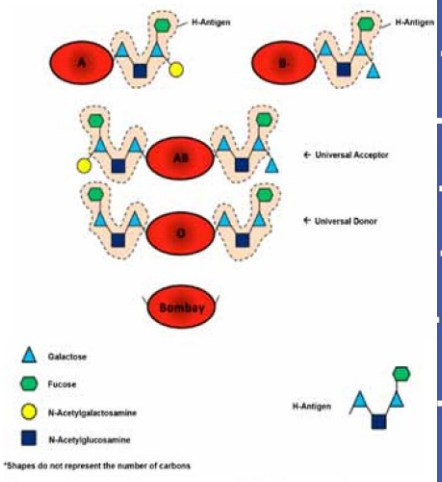

Figure 1: Structural components of blood group phenotype.

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Patent Published-2021

"Lisinopril Ion-Pair Topical Gel for improvement of permeability and cardiovascular diseases management"

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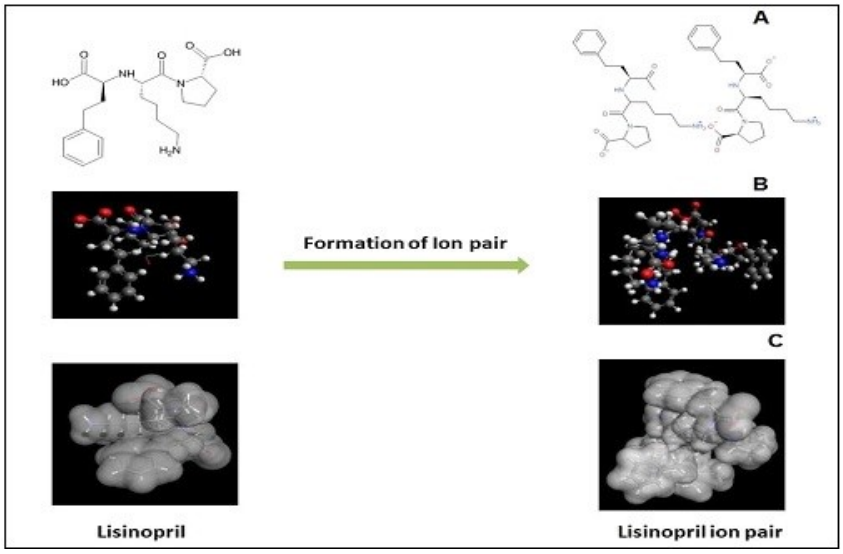
Reportedly, oral bioavailability of the lisinopril is 25 to 30%, assigned to its poor permeability. Hence, the aim of current investigation was to formulate transdermal ion-pair gel using permeation enhancer for enhanced delivery of lisinopril. Initially, formation of ion- pair is corroborated using Fourier Transform Infrared (FTIR) Spectroscopy, Differential Scanning Calorimetry (DSC), X-ray Diffraction (XRD), Zeta Potential, particle size analysis, Oil/Water partition coefficient study *etc*. Optimization of formulation was done using 3^2 factorial design. Total nine batches (F1-F9) were prepared and effect of propylene glycol (X_1)and carbopol 934 (X_2) was systemically investigated on gel viscosity (Y_1) and permeability through rabbit's skin at 8h (Y_2). Propylene glycol exhibited non-significant ($p>0.05$) effecton both gel viscosity and skin permeability whereas carbopol 934 demonstrated significant ($p<0.05$) positive and negative effect on both respectively. Viscosity of all the lisinopril ion- pair gel (F1-F9) was ranging between 17.24 ± 2.16 Pa.s (Batch F9) to 7.54 ± 1.34 Pa.s (BatchF4). *Ex-vivo* permeability of all the prepared batches (F1-F9) across excised rabbit's skin was ranging between 85.93 ± 1.26% (Batch F4) to 62.17 ± 1.57% (Batch F9). Remarkably, optimized formulation (F4) exhibited 1.7 folds improvement in skin permeability than plain lisinopril gel. Conclusively, study demonstrated ion pair formation is a promising strategy forsignificantly improving the skin permeability of lisinopril.



Formation of Lisinopril ion-pair, (A) 2D structure (B) ball and stick model and (C) space field model

Technical Articles

Patent Published-2022

Construction of Curcumin-Bael Fruit Gum Electrospun Nanofibers

Dr. Dinanath T. Gaikwad, Miss. Kajal S. Shinde, Dr. Kirankumar K. Sharma
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(12) PATENT APPLICATION PUBLICATION
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(54) Title of the invention : CONSTRUCTION OF CURCUMIN-BAEL FRUIT GUM ELECTROSPUN NANOFIBERS

(51) International classification	:D01D0005000000, A61K0047340000, D04H0001728000, C08G0018670000, A61L0027180000
(86) International Application No Filing Date	:NA :NA
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(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

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(57) Abstract :
The impact of nanotechnology on health science is far-reaching. The potential role of nanofibers in biomedical applications such as drug release and tissue engineering has recently been explored. Electrospinning studies have provided in-depth -insights into the fabrication of lightweight, ultrafine, porous and biofunctional nanofibers for applications in wound dressings, drug release, tissue engineering, and more. Curcumin [1,7 bis (4 hydroxy 3methoxyphenyl) 1,6 heptadiene 3, 5 Dione] has been identified as an antioxidant, antibacterial, anti-inflammatory, and pharmaceutical property as an inhibitor of tumorigenesis and metastasis. It is a phenolic compound. Due to its hydrophobicity and its consequent low bioavailability, new transport carriers using electrospinning technology have been studied. Bael fruit gum (BFG) has been reported to have excellent protection against a wide range of pathogens, including antibacterial, antitumor, antiviral, anti-inflammatory and antifungal. It possesses better aqueous solubility and water retaining capacities due to presence of high D-galactosecontent and galactouronic acid. Considering above facts study attempted to construct the curcumin-bael fruit gum electrospun nanofibers as a suitable carrier for drug delivery.

Figure 1: Bael fruit gum

No. of Pages : 14 No. of Claims : 5

Technical Articles

Patent Granted -2022

Analytical Method for ß-Secretase estimation from biological fluids

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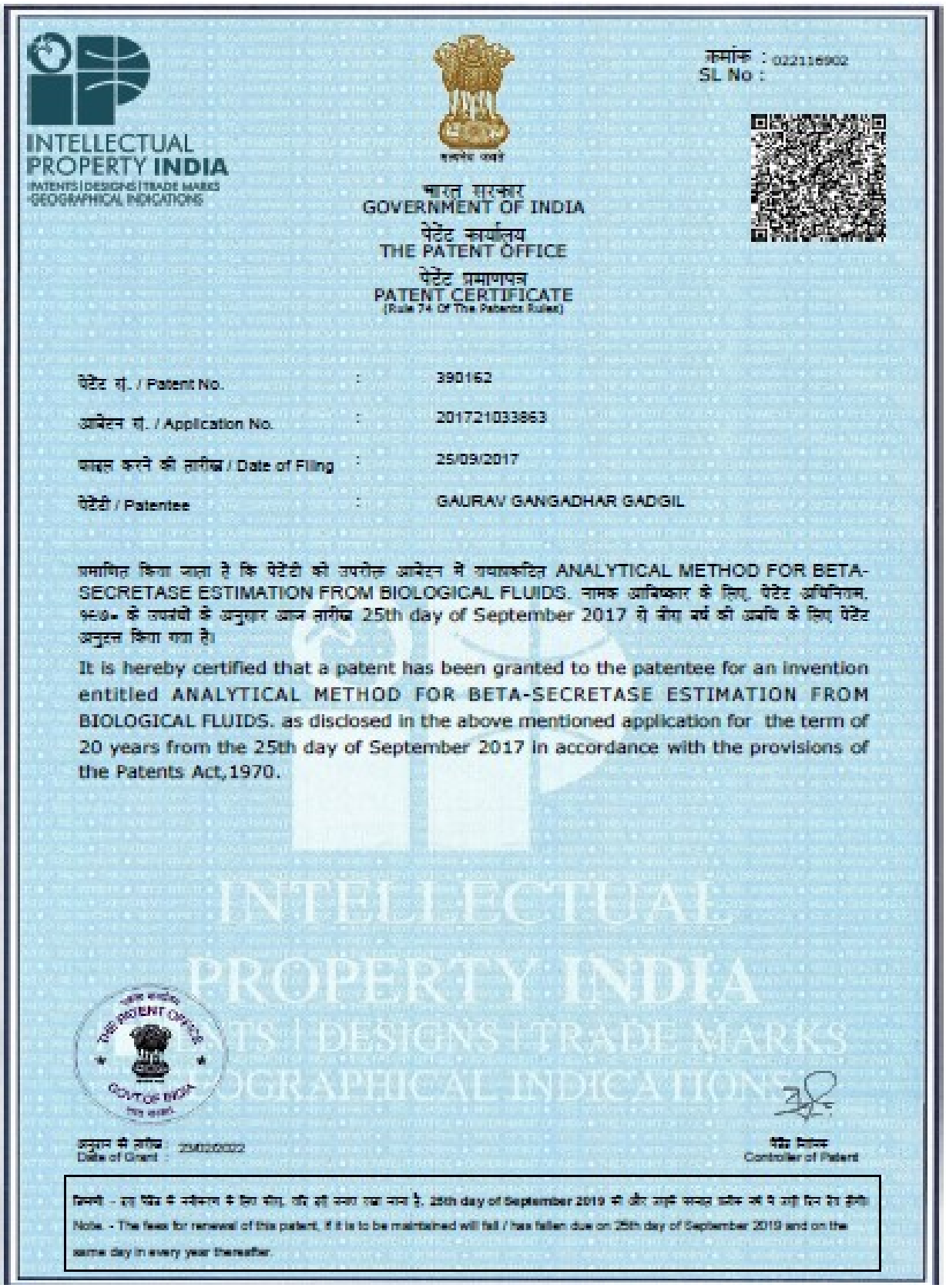
Bharati Vidyapeeth College of Pharmacy, Kolhapur



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PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

क्रमांक : 022116902
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GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE
पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

पेटेंट सं. / Patent No.	:	390162
आवेदन सं. / Application No.	:	201721033863
फाइल करने की तारीख / Date of Filing	:	25/09/2017
पेटेंटी / Patentee	:	GAURAV GANGADHAR GADGIL

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में वर्णनकृत ANALYTICAL METHOD FOR BETA-SECRETASE ESTIMATION FROM BIOLOGICAL FLUIDS. नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 25th day of September 2017 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled ANALYTICAL METHOD FOR BETA-SECRETASE ESTIMATION FROM BIOLOGICAL FLUIDS. as disclosed in the above mentioned application for the term of 20 years from the 25th day of September 2017 in accordance with the provisions of the Patents Act,1970.

THE PATENT OFFICE GOVT OF INDIA

अनुदान की तारीख : 25/03/2022
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए शुल्क, यदि इसे बनाए रखा जाना है, 25th day of September 2019 को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 25th day of September 2019 and on the same day in every year thereafter.

Technical Articles

Book Chapter Published-2022

Pharmacognostic account & Phytochemical Screening of Argemone Mexicana Linn.

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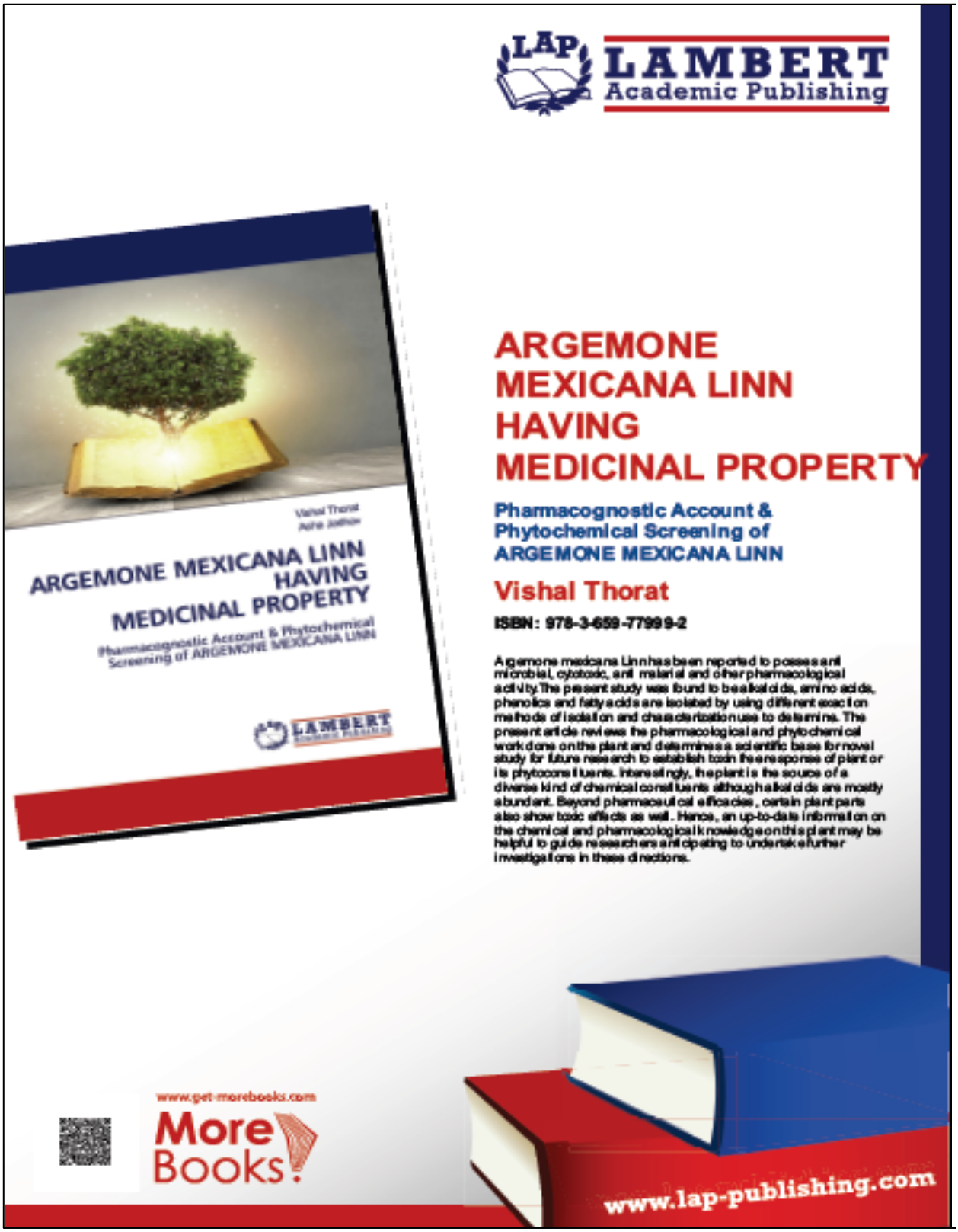
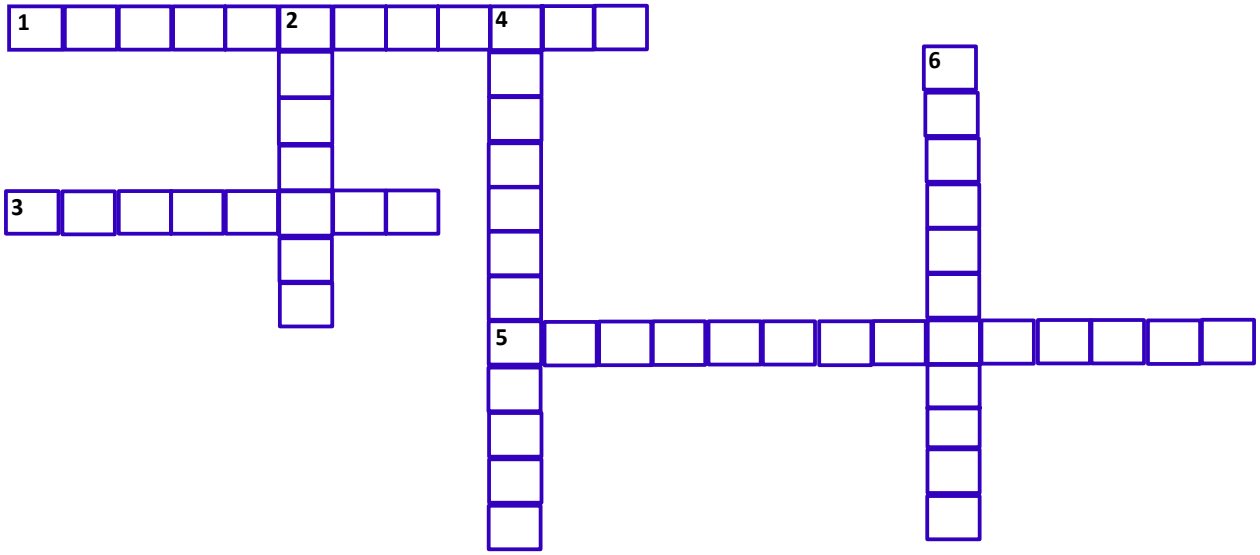
Bharati Vidyapeeth College of Pharmacy, Kolhapur



Technical Articles

Mind Lab

Solve the Crossworld and Sudoku Puzzles



Across

1. I am an anticancer drug also used for rheumatoid arthritis
3. I am a popular drink which was invented by a pharmacist
5. Food drug interaction of MAO inhibitors

Down

2. Congenital malformation causing intellectual disabilities
4. I can facilitate absorption of oral iron preparation
6. This drug will cause a risk blood dyscrasias

SUDOKU PUZZLE

						8	6	
6		7		1			4	
	5			8	3			
4								
	3				4		1	
	6		5				3	
3							2	9
				5	6			
		6		4		1		8

Technical Articles

Patents from College

Sr. No.	Title	Granted/Publication Date	Name of the Inventor/s	Month & Year (DDMMYYYY)
01	Construction of Curcumin-Bael Fruit Gumelectrospun Nanofibers	Published 202221030754	1. Gaikwad Dinanath Tukaram 2. Shinde Kajal Sunil 3. Sharma Kiran Kumar	30/05/2022
02	Analytical Method For Beta-Secretase Estimation From Biological Fluids.	Published 201721033863 Granted 390162	Gaurav Gangadhar Gadgil Manish Sudesh Bhatia Rakesh Pandit Dhavale	25/02/2022
03	An Empirical System For Risk Assessment Of Mental Illness Disorders Using Neural Network Diagnostic	Granted South Africa Patent Application No 2022/02141 09/12/2021	Mr. Zatin Gupta, Dr. P.Tharmaraj, Dr.J.Shakina, Dr Rahul Dubey, Dr. Durgacharan Arun Bhagwat, Dr Umesh Kumar Pandey, Dr Saurabh Pal, Dr Shikha Gupta	12/02/2022
04	Virtual Doctor to Detect Patent Heart Beat and Body Temperature Monitoring	Granted Indian Patent Application No. 202141057189	G. Jayalakshmi, Sai Venkata Raman T., O. Rama Devi, D. Saravanan, Anjali Suresh, Prasanna Mohan, Jagatheesan Alagesan, Fatima M Inamdar, Durgacharan Arun Bhagwat, Anitha Padigapati, D. Stalin David	04/02/2022
05	A Tissue-Based Study For Analyzing The Effect Of Drugs Applied Externally	Published 202221007261	Shri. Rahul Shivaji Adnaik, Sachin Ashok Pishawikar, Pratibha Rahul Adnaik, Rutuja Rajendra Shah, Rohan Rajnikant Vakhariya,Vyankatesh Ravindra Dharanguttikar, Swapnali Ashok Thorat, Neha Shamrao Salunkhe, Priyanka Avinash Samudre, Amol Manik Patil	10/02/2022

Technical Articles

Sr. No.	Title	Granted/Publication Date	Name of the Inventor/s	Month & Year (DDMMYYYY)
06	A Process For Preparing Stable Sustained Release Topical Composition Of Euphorbia Tithymaloides.	Published 202221024039	Dr. Rohan Sharadanand Phatak,Dr. Vijay R. Salunkhe; Mr. Pramod A. Patil; Mr. Vyankatesh R. Dharanguttikar; Ms. Swapnali Ashok Thorat, Dr. Atul R. Chopade	06/05/2022
07	Artificial intelligence based approach along with nanoscale for accurate diagnosis and detection of skin cancer using biometric sensors	Published 202231054865	Santosh Kumar Dash, Firoj Allauddin Tamboli, Ajit Kumar Varma, Ms. Vinita Titkey, Mr. Rahul Singh, Rajarshi Nath, Dr.Shashikant Ramrao Sitre, Shambo Panda, Reechik Bandyopadhyay, Ashutosh Padhan, Abdul Sayeed Khan, Dr Nabin Karna,	30/09/2022
08	Integrating the techniques of computer vision along with machine learning algorithms to detect the disease of plant based on leaf structure	Published 202241054867	Dr C Sasikala, Dr.S.Mythili, Dr.Vinda Manjramkar, Dr.M.Praveena, Dr Shrikant B Mane, Dr Mohiuddin Noorulhaq Quadri, Dr. Firoj Allauddin Tamboli, Dr. Shubhangi N. Ghate, Dr. Ravindra Namdeorao Jogekar, Deepak Kumar Awasthi, Dr. Devvret Verma, Dr.A.Sasi Kumar	30/09/2022

Technical Articles

Book Chapters and Books Published from College

Sr. No.	Title	Authors	National/ International	Publisher	Month & Year
1.	Pharma Marketing Management	Dr. Ashok Hajare & Mr. Kiran S. Patil	National	Career Publications Nashik	01/02/022
2.	Practical Handbook of Herbal Drug Technology	Dr. Ramling G. Patrakar, Dr. Omprakash G. Bhusnure, Dr. Firoj A. Tamboli, Dr. Harinath N. More	National	Pritam	Feb 2022
3.	Practical book of HAP-I	Asha Jadhav Sandeep Patil Snehal Tarlekar	National	Notion	15-03-2022
4.	Book Chapter on - Pharmacological evaluation of Indigenous plant for Anti-asthmatics	Vishal Thorat Asha Jadhav	National	LAP Lambert Academic Publishing	02/03/2022
6.	Book -Ayurvedic remedies of tuberculosis Chapter-Ayurvedic remedies for candidiasis and tuberculosis	Dr. Firoj A Tamboli*, Dr. Harinath N More, Shubham J Kamble, Srushti S Dhanal, Anagha S Ajagekar,	National	Academic Decipher Press	Mar 2022
8.	Book Chapter on Pharmacokinetics of Drug-in-polymer matrix based nanoparticulate drug delivery system	Sopan Nangare, Prashant Patil, Ashwini Patil, Prashant Deshmukh, Trupti Powar, Jidnyasa Pantwalawalkar, Zamir Khan, Rahul Tade, Jayvadan K Patel, Pravin Patil	International	Springer	08/03/2022
9.	Formulation and Evaluation of Expandable Gastroretentive Tablet	Anilkumar J. Shinde Harinath N. More	International	Lap Lambert Academic Publishing	28 April 2022
10.	Design And Development of Mucoadhesive Microspheres	Anilkumar J. Shinde Harinath N. More	International	Lap Lambert Academic Publishing	18 April 2022
11.	Design, Development and QSAR studies of 1,2,4-triazole compounds	Snehal Ashtekar, Pradnya Mane, Aditya Arvindekar	International	Lap-Lambert Academic Publishing	26-05-2022

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Research Publications in Indexed Journals 2022

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2. Smita Tukaram Kumbhar, Ravikant Yashwantrao Patil, Manish Sudesh Bhatia, Prafulla Balkrushna Choudhari, Vinod Limbraj Gaikwad, Synthesis and characterization of chitosan nanoparticles decorated with folate and loaded with Dasatinib for targeting folate receptors in cancer cells, Open Nano, 2022, 7, 100043.
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5. Ravindra G Gaikwad, Anilkumar J Shinde, Ashok A Hajare, Herbal Treatment for Management of Psoriasis: An Overview, Research Journal of Pharmacy and Technology, 2022, 15, 3, 1385-1392.
6. Manish Wani, Pradeep Rodge, Akshay Baheti, Satish Polshettiwar, Tanaji Nandgude, Firoj Tamboli, Preformulation studies of Glipizide: First step towards developing stable Osmotic Drug Delivery System, Research Journal of Pharmacy and Technology, 2022, 15, 1, 29-34.
7. Prakash Jadhav, Pramod Patil, Durgacharan Bhagwat, Vinay Gaikwad, Piyush Pradeep Mehta, Recent advances in orthogonal analytical techniques for microstructural understanding of inhalable particles: Present status and future perspective, Journal of Drug Delivery Science and Technology, 2022, 68, 103089.
8. Rohankumar Chavan, Vishal H. Thorat , Firoj A. Tamboli, Asha S. Jadhav, Phytochemical analysis and antimicrobial activity of Lantana camara, International Journal of Pharmaceutical Chemistry and Analysis, 2022, 8(4), 171-173.
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10. Asha Jadhav, Firoj A. Tamboli, Rohankumar Chavan , Vishal H. Thorat , Ajit Patil , Shital Jadhav, Antitussive effect of Celosia argentea granule formulation on SO2 gas-induced cough in experimental animals, Indian Journal of Pharmacy and Pharmacology, 2022, 8(4), 24-32.
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22. Namdeo Jadhav, Jidnyasa Pantwalawalkar, Ramesh Sawant, Afrin Attar, Dipali Lohar, Pallavi Kadane, Kanchan Ghadage, Development of Progesterone Oily Suspension Using Moringa Oil and Neusilin US2, Journal of Pharmaceutical Innovation, 2022, 17(2), 534-545.
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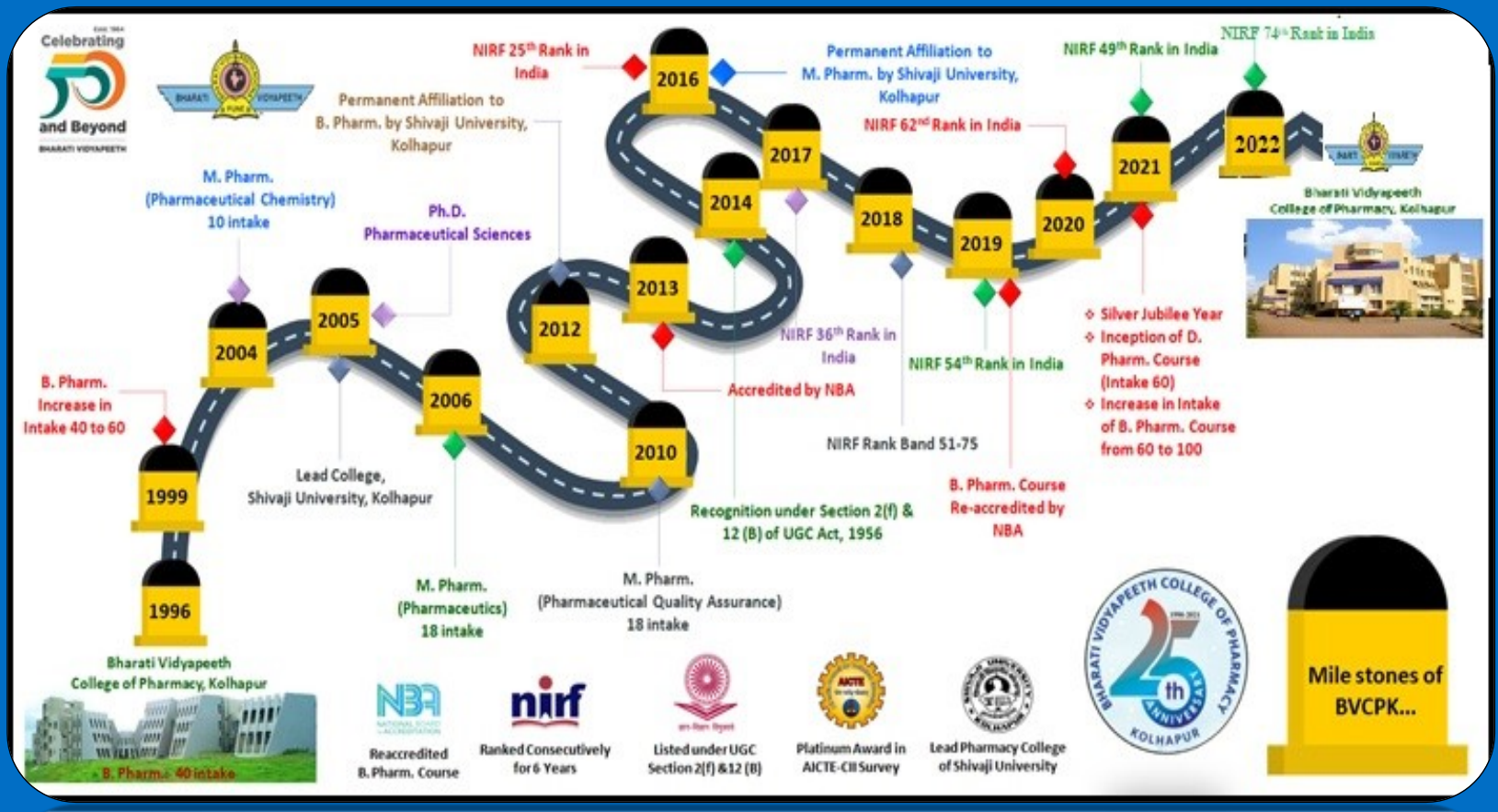

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