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PRESENTS

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Messages from the desk of the Editor

DR. R. MAZUMDER
PROFESSOR AND DEAN
NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY (PHARMACY INSTITUTE)
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It gives us immense joy and satisfaction to introduce the second issue of 2022 of the magazine 'Pharma Innovations'. I hope you enjoy reading the magazine which will be beneficial to enrich your knowledge in Pharmacy, medicines, and health. As always this issue is also an attempt to bring out the knowledge concealed within the students and faculty. Before looking ahead, however, I would like to offer a word of thanks to our readers, our contributors, and our editorial board for their support of the journal and its mission I hope you enjoy reading this issue as much as we have enjoyed making it.

Messages from the desk of the Associate Editor

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On behalf of the editorial board members, it is announced that the second issue of 2022 " Pharma Innovations". has been published. "Pharma Innovations" is a magazine that sturdily focuses on inspiring the faculty and students to gain knowledge and actively driving the mind toward research in health, medicines, and pharmacy. This unprejudiced attitude toward the scope of the magazine allows the reader to have a divergent and convergent aspect on different topics. Enables budding researchers to think in a rational way to make the scientific pavement.

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GREATER NOIDA

FACULTY FORUM

ROLE OF ALKALOID IN CHOLANGIOCARCINOMA BY INHIBITING FGFR2

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Cholangiocarcinoma is a type of cancer that affects the bile ducts, which are the tubes that carry bile from the liver to the small intestine. Fibroblast growth factor receptor 2 (FGFR2) is a protein that plays a role in the growth and spread of cholangiocarcinoma. Fibroblast growth factor receptor 2 (FGFR2) is a protein that is frequently overexpressed in cholangiocarcinoma and plays a critical role in its progression and metastasis. FGFR2 inhibition has emerged as a promising therapeutic strategy for the treatment of cholangiocarcinoma.

Alkaloids are a group of naturally occurring compounds that are found in many plants and have a wide range of biological activities, including anti-cancer effects. Some alkaloids have been shown to inhibit FGFR2 activity and may therefore have potential as anti-cancer agents in cholangiocarcinoma. For example, one study found that the alkaloid berberine inhibited FGFR2 activity in cholangiocarcinoma cells and suppressed their growth and metastasis. Another study showed that the alkaloid evodiamine inhibited FGFR2 signaling and induced apoptosis (programmed cell death) in cholangiocarcinoma cells. Emetine, Hermine, and marine were also used for the treatment of cholangiocarcinoma by inhibiting FGFR2

All things considered, the inhibition of FGFR2 by alkaloids may be a viable strategy for the treatment of cholangiocarcinoma, but further study is required to completely comprehend the underlying mechanisms and to create potent treatments.

STUDENTS' FORUM

A BRIEF REVIEW OF BIOSENSOR POLYMERS

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Biosensor polymers are materials designed for use in biosensors. A biosensor is an analytical device that consists of a combination of biological detecting elements like a sensor system and a transducer is termed as a biosensor. A biosensor is an analytical device containing an immobilized biological material (enzyme, antibody, nucleic acid, Hormone organelles, or whole cell) that can specifically interact with an analyte and produce physical, chemical, or electrical signals that can be measured. An analyte is a compound (e.g. glucose, urea, drug peptide) whose concentration has to be measured. In simple words, the biosensor is an analytical device that detects changes in biological processes and transforms the biological data into electrical signal. Recent advancements in biosensor design and fabrication for invasive and non-invasive monitoring of cardiovascular diseases have been demanding.

THE MAIN COMPARTMENT OF THE BIOSENSOR

1. SENSOR OR DETECTOR. :- a biochemical receptor which is a biological component(tissue , enzyme antibody , nucleic acid).It interacts with the analyte and signals the change in its composition as the electrical signal

2. TRANSDUCER:- A physical component that amplifies the biochemical signal received from the detector, alters the resulting signal into electrical, and displays in an attainable part.

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3. ELECTRICAL CIRCUIT:- The associated part which consists of a signals conditioning unit, a processor or microcontroller, and a display unit

BIOSENSOR POLYMER

Biosensor polymers are a class of smart materials designed for sensing and detecting biological molecules. These polymers are selected or engineered for their ability to interact with specific biomolecules such as proteins, enzymes, DNA, or antibodies, and convert the resulting binding or recognition event into a measurable signal often an electrical or optical one. Conducting polymer polypyrrole is the most frequently used in the design of sensors and biosensors.

COMMON TYPE OF BIOSENSOR POLYMER INCLUDES:

1. Molecularly Imprinted Polymers (MIPs): These polymers are created with specific binding sites that are molecularly imprinted to match the target biomolecule's shape and size 2. Conductive Polymers: These polymers have electrical conductivity and can be used to detect changes in conductivity when they interact with biomolecules. a). Polypyrrole:- polypyrrole is a conductive polymer with excellent electrical and mechanical characteristics owing to its greater chemical stability in air and water it has been widely studied for implantable biomedical devices in preclinical studies. Polypyrrole was used to control the delivery of multiple drugs on stimulation of the hybrid system.

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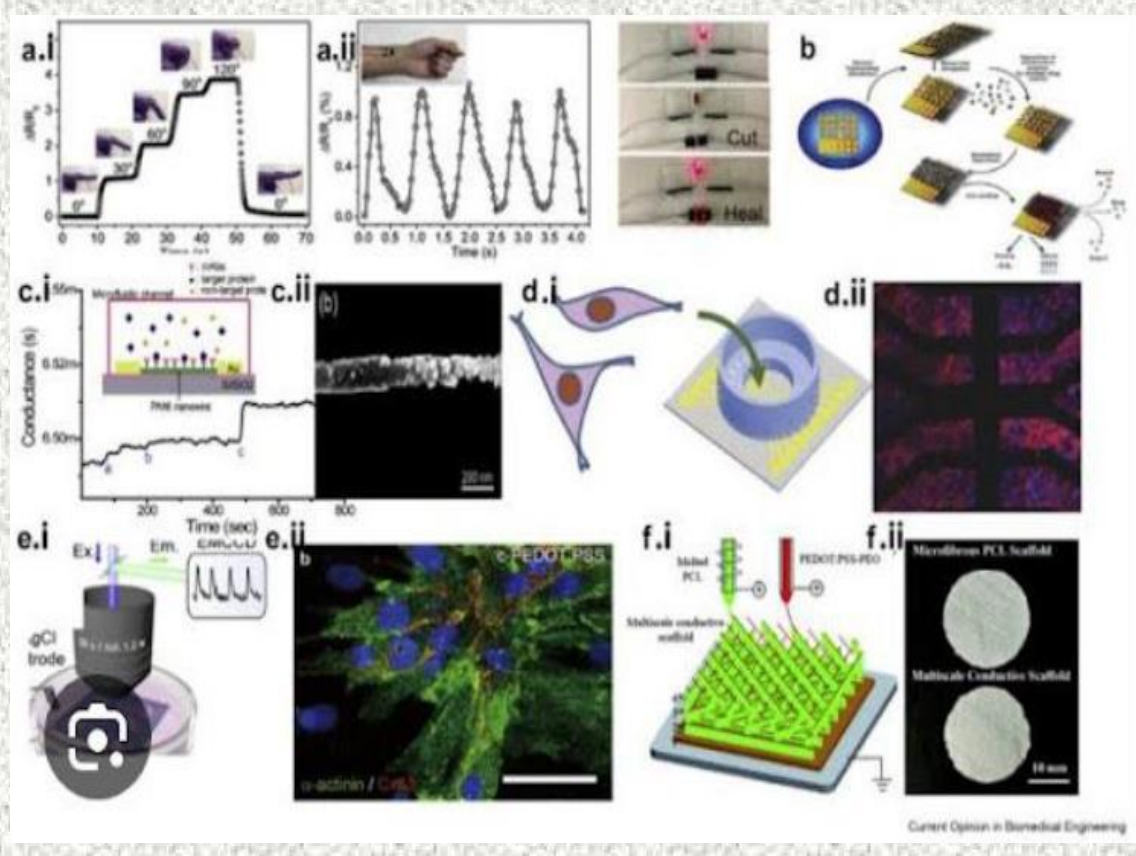
b) Polyaniline:- Polyaniline substrates have been fabricated either alone or in combination with other biomaterials to provide a suitable Matrix for cardiomyocytes which exhibits anisotropy and better electrical conductivity promotes aligned growth of cardiomyocyte mimicking native arrangement in cardiomyocytes based bioactutuator or biosensor.4. Hydrogels: Hydrophilic polymer networks that can swell and change their properties in response to the presence of specific molecules, making them useful for biosensing applications.5. Polyelectrolytes: Polymers with charged groups that can interact with oppositely charged biomolecules, enabling electrochemical biosensing.



Biosensor polymers play a crucial role in the development of sensitive and selective biosensors for various applications, including medical diagnostics, environmental monitoring, and food safety testing. Researchers continue to explore new materials and techniques to improve the performance of biosensors for a wide range of applications

HISTORICAL PERSPECTIVE OF TRADITIONAL INDIGENOUS MEDICAL PRACTICES: THE CURRENT RENAISSANCE AND CONSERVATION OF HERBAL RESOURCES

Aabish Ahmad Bhat
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Herbalism is a traditional medicinal or folk medicine practice based on the use of plants and plant extracts. Herbs/plants, the major components of traditional materia medica in the world, are one of the main forms of life on earth. It is estimated that there are about 350,000 species of existing plants (including seed plants, bryophytes, and ferns), among which 287,655 species have been identified as of 2004. Herbal medicine (HM), also called botanical medicine, phytomedicine, or phytotherapy, refers to herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other materials as active ingredients. The plant parts used in herbal therapy include seeds, berries, roots, leaves, fruits, bark, flowers, or even whole plants. The man was mainly dependent on crude botanical material for medical needs to retain vitality and cure diseases. Prior to the introduction of aspirin derived from Spiraea ulmaria which was already prescribed for fever and swelling in Egyptian papyri and recommended by the Greek Hippocrates for pain and fever.

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Herbs are staging a comeback and herbal “renaissance” occurs all over the world. According to the World Health Organization, 75% of the world’s population uses herbs for basic healthcare needs. Moreover, many conventional/pharmaceutical drugs are derived directly from both natural and traditional remedies distributed around the world. Up to now the practice of herbal medicine entails the use of more than 53,000 species and a number of these are facing the threat of extinction due to over-exploitation.

INDIAN HERBAL MEDICINE (IHM)

Indian medicine/material (IM/IMM/IMH) also called Ayurvedic medicine/materia medica (AYM/AYMM), belongs to the traditional health care and longevity systems. Because the belief that “everything can be a drug” is deeply rooted in Indian culture, Ayurvedic physicians made use of an extensive collection of medications, herbs/plants, and even the urine of animals and described their effects meticulously. Currently,70% of Indians still rely on IM for their primary health care.

In India, the history of using plant resources for treating diseases can be dated back to 6,000 to 4,000 BCE, the Buddhist period. AYM has a vast literature in Sanskrit and various Indian languages, covering various aspects of diseases, therapeutics, and pharmacy.

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PLANT SPECIES IN INDIA AND IHM

India possesses almost 8% of the estimated biodiversity of the world with around 126,000 species; there are about 400 families of flowering plants in the world at least 315 of these can be found in India. Currently, about 45000 species are found in the Indian sub-continent 3,500 species of plants are of medicinal value; 500 medicinal plant species are used by the contemporary Ayurvedic industry; 80% of the medicinal plant's species are procured from wild areas and 10% of medicinal plants involved in active trade are obtained from cultivation in farms.

Of the 700 plant species commonly used in the herbal industry, 90% of them are collected from the wild, and about 50% of tropical forests, the treasure house of plant, and animal diversity have already been destroyed. The Red Data Book of India in 1997 has 427 entries of endangered species of which 28 are considered extinct 124, are endangered, 81 are vulnerable, 100 are rare and 34 are insufficiently known species.

The Red Data Book of India released in 2012 described 3,947 species as " critically endangered ", 5,766 as "endangered", and more than 10,000 species as vulnerable".

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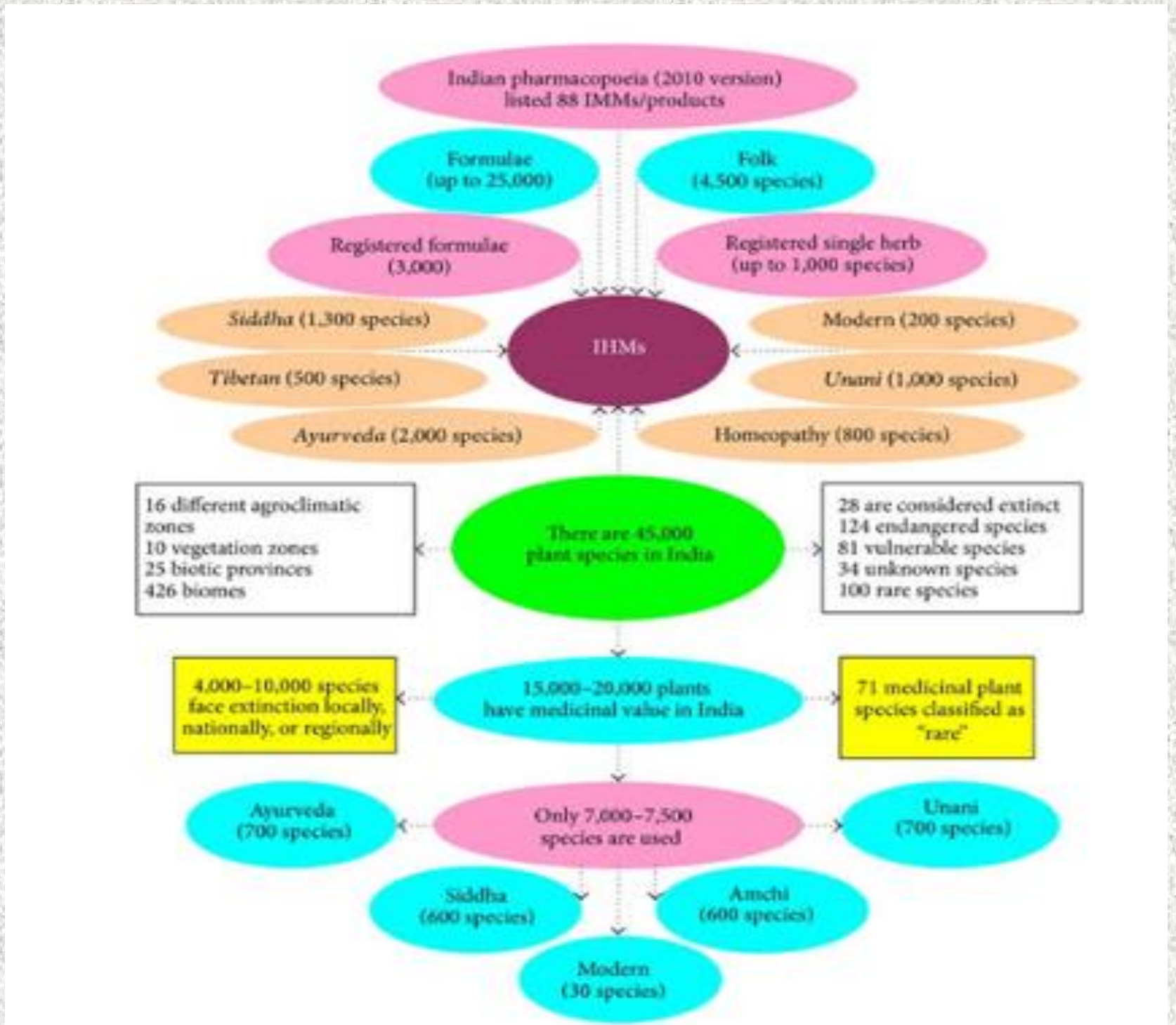

IMMUNOSUPPRESSANT

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Immunosuppressant or anti-rejection drugs are used to prevent various autoimmune diseases such as myasthenia gravis, lupus, arthritis, rheumatoid arthritis, or in case of organ transplant rejections. Immunosuppressant drugs reduce the strength of the immune response in the body and are used to make the body less likely to oppose the transplanted organ. In solid organ transplantation, immunosuppressive agents are needed to activate early-stage immunosuppression, manage end-stage immunosuppression, and immunosuppression, or for the maintenance of organ rejection. Since immunosuppressive drugs inhibit the entire immune system non-selectively, there are possibilities that suppressing immune surveillance may lead to the development of immunodeficiency-induced infections against pathological agents and malignancy. To use the immunosuppressants safely and effectively, we must follow the indications and dosage, and be familiar with the side effects. However, these drugs also carry an increased risk of infection, cancers, and specific adverse side effects specific to each agent, especially in pregnant women and patients with reproductive problems. The coronavirus disease has given positive outcomes to immunosuppressive drugs, being a hot topic of debate. Transplant centers around the world utilize multiple immunosuppression protocols; nevertheless, each patient can require an individually formulated immunosuppression regimen to balance the advantages and potential disadvantages of treatment to eliminate the possibility of recurrence of their primary disease.

LIQUID CRYSTALS USED IN THE PHARMACY

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Some organic solids having long rod-like molecularities do not melt to give liquid substance directly passed through an intermediate state is called a **liquid crystal state.**

Liquid crystal name is given by **Lehmann**.

These are thermodynamically stable and possess long shelf life. These are molecular structure, rigidness of long axis, and strong dipole moment or easily polarizable substance.

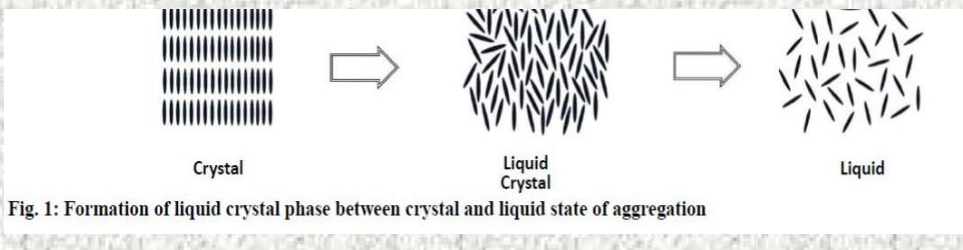

Fig. 1: Formation of liquid crystal phase between crystal and liquid state of aggregation

As we know liquid crystals are the intermediate of liquid and solid state. The liquid state is associated with the ability to flow, whereas the solid state is characterized by an ordered and crystalline structure. But Liquid crystals have different molecular arrangements than liquid and solid states.

Liquid crystal is **anisotropic** in nature which means they have different chemical and physical properties in different direction. Liquid crystal was first discovered by **Friedrich Reinitizer.** In 1888, He examined the physicochemical properties of various derivatives of cholesterol and found that cholesteryl benzoate does not melt in the same mammary as other compounds, but has two melting points

LIQUID CRYSTALS USED IN THE PHARMACY

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At 145°C it melts into a cloudy liquid and at 178.5°C it melts again and cloudy becomes clear. Many scientists gave their contributions but did not give the exact information about liquid crystals. A scientist named **Lehmann** started a systemic study and was able to make observations in polarized light and his microscope was provided with a hot stage which enabled high temperature observation.

Classification of liquid crystals on the basis of the generation

1. **Lyotropic liquid crystal**

These are the mixtures of amphiphilic molecules of solvent and these are prepared in the presence of solvent. These are generated by temperature variations in a liquid state.

2. **Thermotropic liquid crystal**

It is generated by variations in the temperature of the liquid state. These are anisotropic in nature that possess a mesophase. Most of these have several sub-phases

- **Nematic phase =** The Nematic **word comes from Greek which means** “thread”. In this phase, liquid crystals have no positional order, but they self-align to have long-range directional order with their long axis roughly parallel

LIQUID CRYSTALS USED IN THE PHARMACY

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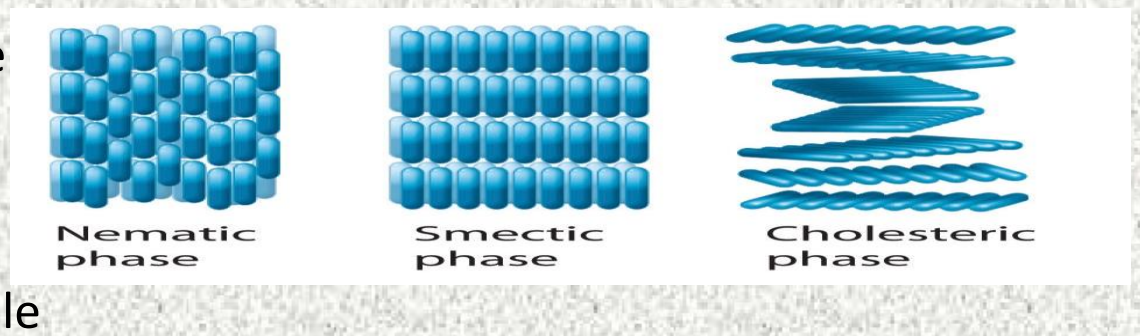
- **Smectic phase:** The word smectic means having soap-like properties. The long axis of all molecules is parallel to one another and perpendicular to the plane of the layer
- **Cholesteric phase:** Liquid crystals with helical structure which are therefore chiral. They are organized in layers with no positional ordering within the laye



The ideal properties of liquid crystals are :

1. Liquid crystal can flow due to the transition phase.
2. Discotic phases are flat having disc-like molecule which has a core adjacent to the aromatic ring.
3. Large number of compounds exhibit one or several liquid crystal phases.
4. They are so cloudy in appearance that they scatter in the same way as colloids.

Applications of liquid crystals in pharmacy

Biological and chemical sensing :

They have been successfully demonstrated to sense and analyze various bacteria and viruses. They are useful for detecting charged macromolecules in the solution. They are figured out and utilized to support the growth of mammalian cells.

LIQUID CRYSTALS USED IN THE PHARMACY

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Controlled drug delivery:

They prevent the fast release of drugs dissolved in the oil phase of the emulsion. Microscopic observation under polarized light shows the exceptional thickness of the liquid crystalline lamellar layer around the oil droplets.

Cancer therapeutics:

In vitro, cubosomes have been loaded with Cancer drugs like fluorouracil, or sorafenib. Tumor cells have a more acidic environment making pH stimuli useful for payload delivery of chemotherapeutics.

Vaccines :

Cubosomes are also an agent in vaccines. Cubosomes are loaded with antigens and subsequently delivered appropriately by incorporating immunostimulants such as polysaccharides into the cubosome membrane.

Solubility of the drug:

Liquid crystals are used to make stable hydrocarbon foam. Hydrocarbon foam has been difficult to produce in the past. The hydrocarbon and surfactants can dissolve in each other and surfactants can’t dissolve in water.

LIQUID CRYSTALS USED IN THE PHARMACY

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Dermal applications

Drug molecules and pharmaceutical excipients with amphiphilic character can easily form Lyotropic mesophases that are particularly for surfactants and used as emulsifiers in dermal formulations. These are also used in cosmetics and pharmaceuticals. These formulations get enhanced penetration through the skin

Solubility enhancement of poorly soluble drugs:

Many substances are more soluble In lyotropic liquid crystals. An example is Hydrocortisone. It is often taken in topical Applications, but its uses have been limited.

Photopolymerization of the lyotropic liquid crystalline system

A novel route to nano-structured material is through the use of lyotropic liquid crystals that possess highly ordered nanostructure. Lyotropic liquid crystals lack the necessary physical robustness This phase morphology onto other materials such as organic polymer would give a nanostructure retained as part of a robust polymeric matrix.

Colloidal dispersion:

Liquid crystalline structure can be found to disperse in water in the presence of an additional stabilizer which forms submicrometer soft particles that retain the internal structure of the liquid crystal molecular phase.

LIQUID CRYSTALS USED IN THE PHARMACY

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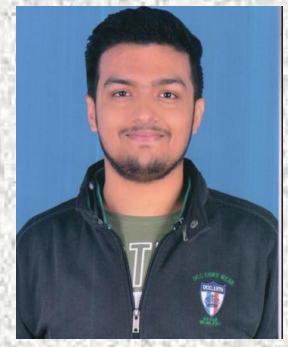
Smectic nanoparticles

Colloidal smectic nanoparticles are emerging as carrier systems for lipophilic drugs due to their liquid crystalline nature. An example is cholesteryl myristate.

Liquid crystal technology has a major effect in many areas of science, pharmacy, and engineering as well as device technology. The drug delivery to the site of the target can be achieved by using a liquid crystal system. The objective is to provide information on the development of a targeted drug delivery system, depth information on pharmaceutical liquid crystal technology, its classification, and applications in the pharmaceutical field.

NIOSOMES A NOVEL DRUG DELIVERY SYSTEM



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Niosomes, a novel class of lipid-based vesicular carriers, has garnered significant attention in the field of drug delivery due to their potential to enhance therapeutic outcomes. These nano-sized structures are composed of non-ionic surfactants and cholesterol, forming closed bilayer vesicles reminiscent of liposomes. Niosomes exhibit remarkable versatility in encapsulating a wide range of hydrophilic and hydrophobic compounds, making them attractive vehicles for targeted and controlled drug release.

The unique physicochemical properties of niosomes contribute to their appeal. Their composition allows for easy modulation of size, charge, and membrane fluidity, crucial factors influencing drug encapsulation efficiency and release kinetics. Additionally, niosomes exhibit biocompatibility and biodegradability, minimizing the risk of adverse reactions and enabling their use in various pharmaceutical applications.

One of the pivotal advantages of niosomes is their ability to encapsulate both water-soluble and lipid-soluble drugs, addressing challenges associated with the delivery of diverse therapeutic agents. This capability opens avenues for the co-delivery of synergistic drugs, reducing dosing frequencies, and enhancing therapeutic efficacy while minimizing side effects. Moreover, niosomes can protect encapsulated drugs from degradation, improving stability and increasing the shelf life of sensitive compounds.

NIOSOMES A NOVEL DRUG DELIVERY SYSTEM

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Niosomes can be surface-modified to achieve targeted drug delivery, further enhancing their clinical relevance. Ligands or antibodies conjugated to the niosomal surface can facilitate specific interactions with target cells, tissues, or receptors, leading to improved drug accumulation at the desired site and reducing off-target effects.

In conclusion, niosomes present a promising platform in the realm of drug delivery due to their flexible composition, biocompatibility, and potential for targeted release. Ongoing research aims to optimize niosomal formulations, refining their physicochemical properties and exploring innovative surface modification strategies. As this field progresses, niosomes hold the potential to revolutionize the delivery of a wide range of therapeutics, fostering advancements in patient care and treatment outcomes.

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