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(PHARMACY INSTITUTE)

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Messages from the desk of the Editor

DR. R. MAZUMDER
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It gives us immense joy and satisfaction to introduce the first issue of 2023 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 first issue of 2023 " 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.

DR. SWARUPANJALI PADHI
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GREATER NOIDA

FACULTY FORUM

REVIEW IN MAGNETICALLY DRIVEN ACHIRAL PLANAR MICROROBOTS

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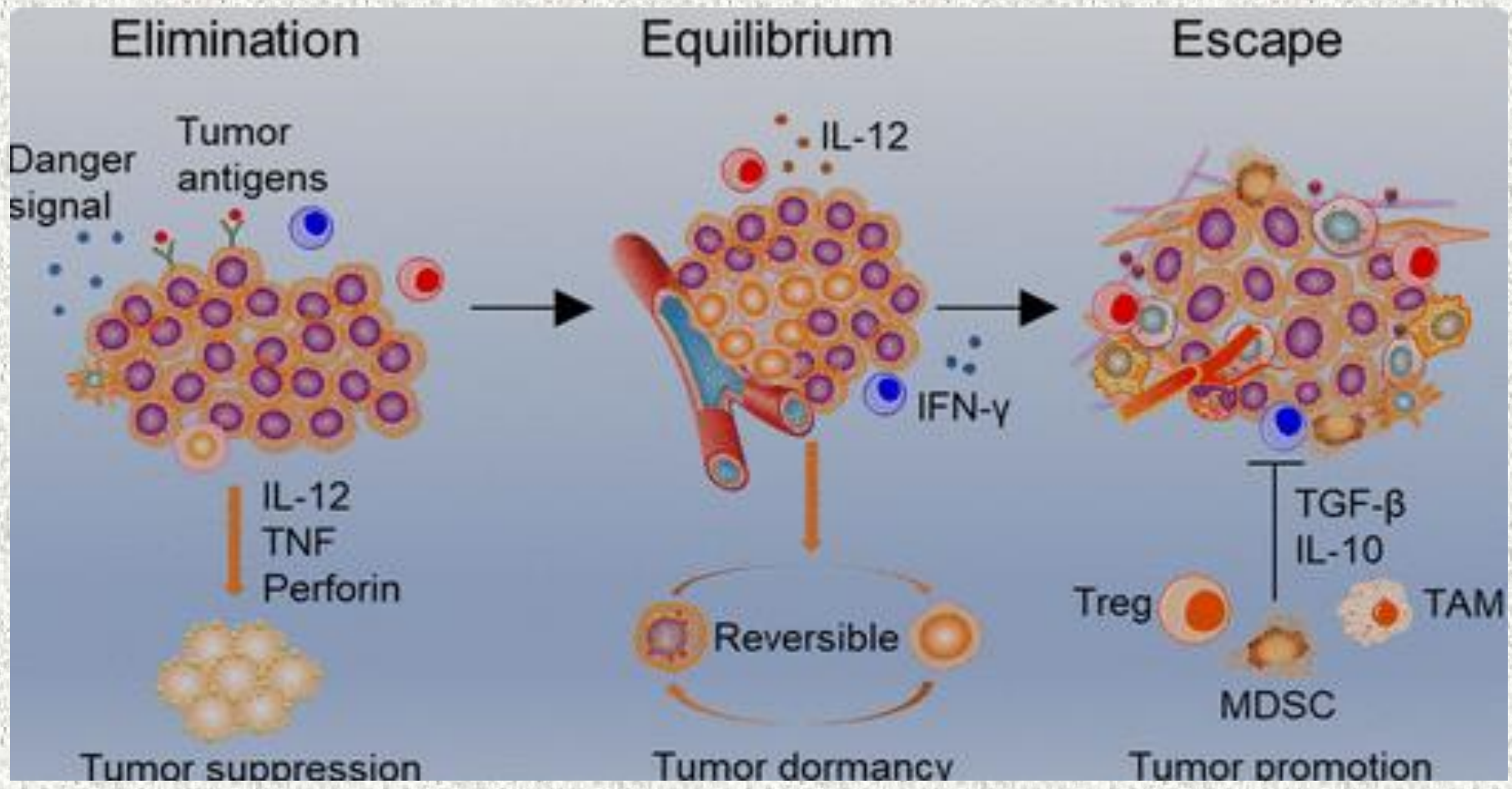
The effective propulsive capabilities of magnetically driven achiral planar microrobots under rotational or conical magnetic field actuation have attracted the attention of the formulator researcher. Additionally, by avoiding the need to construct intricate 3D structures and maintaining swimming speeds that can rival helical microrobots, propellers with achiral planar geometries offer the benefits of mass production and scalability.

Here, photolithography and magnetron sputter was used to create an achiral microrobot (AMR) type that was altered from earlier research and then seeded with macrophage cells. The fabricated AMRs can provide flat, nano-smooth surfaces that can induce the differentiation of M1 macrophages with a high expression of related cytokines, promoting their antitumor and tumor-targeting abilities. This is because the planar geometries of microrobots offer large, flat surfaces for the uniform coating of the metal layers. Moreover, AMRs contain negative zeta potential surfaces that facilitate pH-triggered drug release and promote the loading of positively charged drugs, like doxorubicin (DOX) through electrostatic interactions, both of which boost the AMRs' ability to target specific tumors. Ultimately, by employing 3D tumor spheroids in targeted drug delivery assays, the tumor-specific targeting of AMRs by M1 macrophages was confirmed.

REVIEW IN MAGNETICALLY DRIVEN ACHIRAL PLANAR MICROROBOTS

The creation of functioning microrobots with effective tumor-targeting capabilities will be aided by the discovery of such microrobots with immunoregulation functionality.



STUDENTS' FORUM

DEEP LEARNING IN DRUG DISCOVERY

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In the past few years, deep learning technology has achieved remarkable success in many fields especially in drug discovery research. Although the application of deep learning in pharmaceutical research has come into view some recent years, it's utility has gone beyond predicting and identifying activities of drug-like bioactive compounds as in addressing diverse problems in drug discovery.

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans. Deep learning models can recognize complex patterns in pictures, text, sounds, and other data to produce accurate insights and predictions. Over the past decade, there has been an exceptional increase in the amount of available compound activity and biomedical data in the field of research leading to the rise of new experimental methods such as HTS, parallel synthesis, and other databases. When it comes to drug discovery, the crucial problem is how to mine large-scale chemistry data efficiently.

DEEP LEARNING IN DRUG DISCOVERY

Larger data volumes in combination with increased automation technology have promoted further use of machine learning. Besides established methods such as support vector machines and neural network, which have been used to develop QSAR models for a long time, methods like matrix factorization and DL (deep learning) has also been taken in account to be used. Deep learning plays a crucial role in various drug discovery processes namely drug monitoring, peptide synthesis, legend-based virtual screening, toxicity prediction, pharmacophore modeling, quantitative structural–activity relationship (QSAR), and physiochemical activities.

For e.g. When analysing microbial related data, it shows high prediction accuracy in practice. Because deep learning algorithms are good at obtaining very complex underlying patterns in data, they are especially suitable for large. Deep learning plays a crucial role in various drug discovery processes namely drug monitoring, peptide synthesis, legend-based virtual screening, toxicity prediction, pharmacophore modeling, quantitative structural–activity relationship (QSAR), and physiochemical activities.

DEEP LEARNING IN DRUG DISCOVERY

E.g., When analyzing microbial-related data, it shows high prediction accuracy in practice. Because deep learning algorithms are good at obtaining very complex underlying patterns in data, they are especially suitable for large and high-dimensional data sets. Moreover, it is easy to update the model with the new data.

The schematic diagram of the deep learning in drug discovery is shown in the figure given below

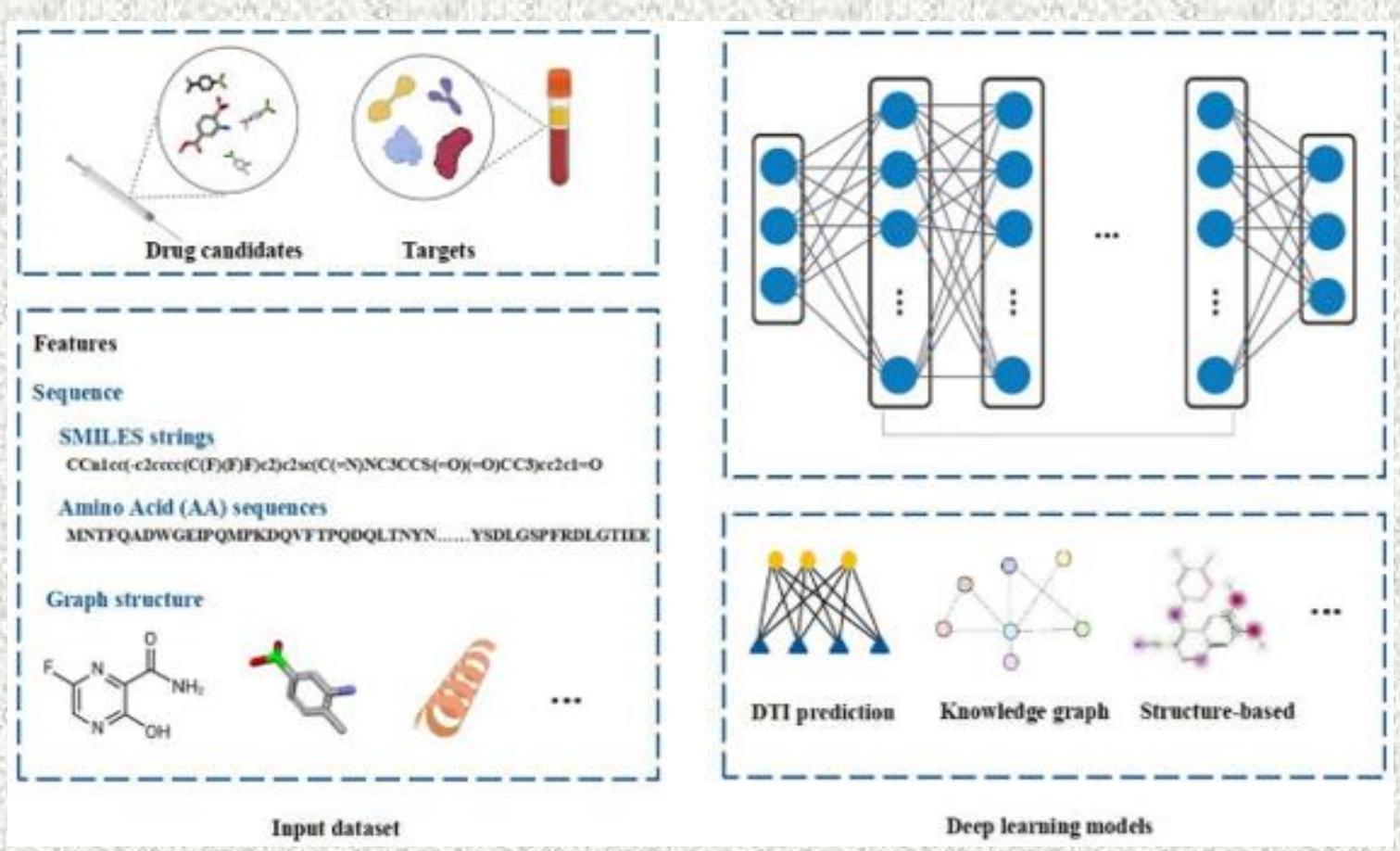

FIGURE: The schematic diagram of deep learning in drug discovery. Biochemical data from drug candidates and protein targets can be used for drug discovery. Different deep learning models can be employed to analyze the data by integrating Drug Target Interaction (DTI) prediction.

AUTOIMMUNITY (AUTOIMMUNE DISEASE)

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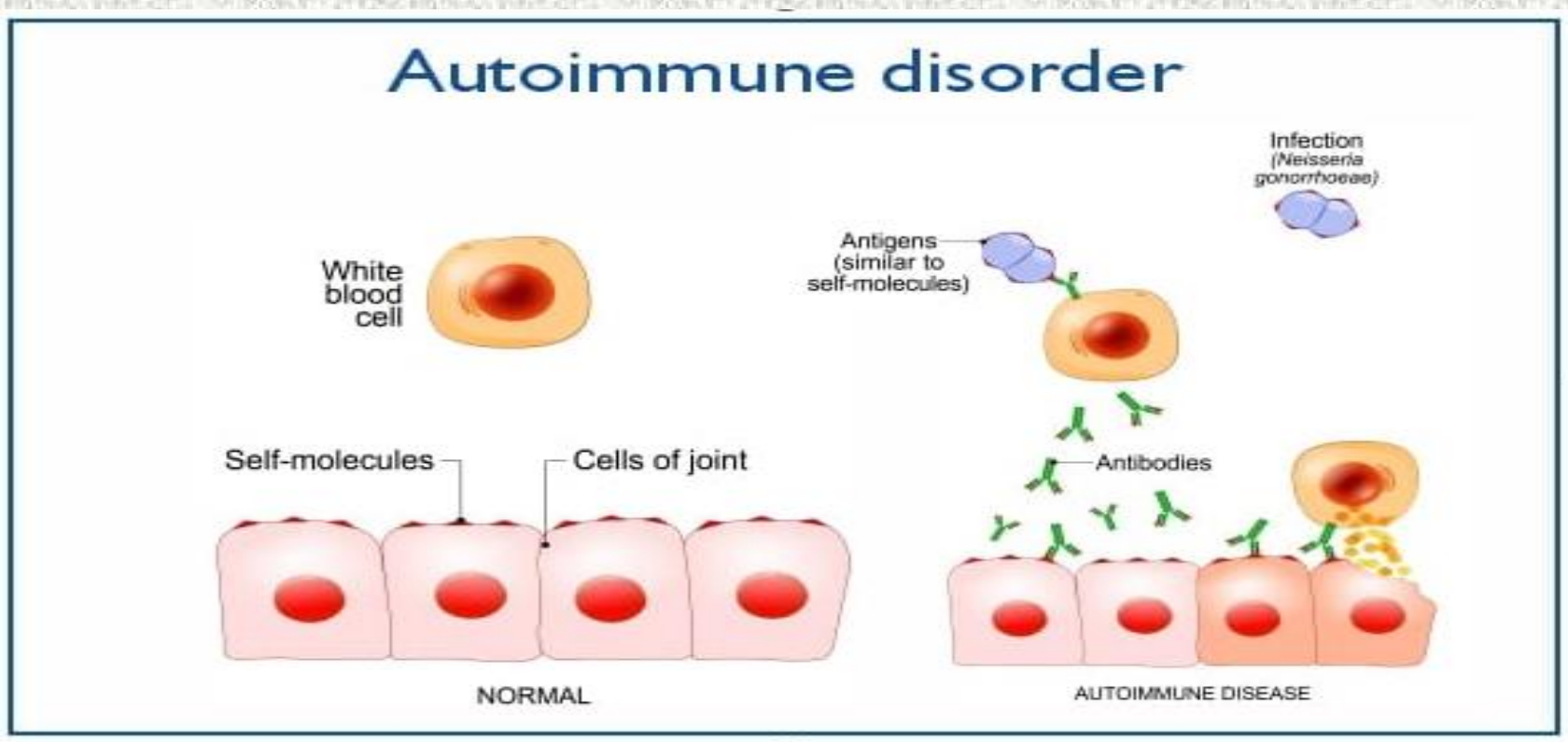
Our immune system has a natural immunological tolerance to the healthy cells of our body. This means that the white blood cells of our body do not attack the body's proteins (self-antigens). Normally our immune system has no issues distinguishing between the body's proteins and foreign antigens that come from invading pathogens. However, in certain individuals, the immune system loses this ability to differentiate between self-antigens and pathogenic antigens. This condition is called autoimmunity or autoimmune disease. Some examples of autoimmune diseases include multiple sclerosis, diabetes (type I), myasthenia gravis, and rheumatoid arthritis, among many others. In the case of myasthenia gravis, the body produces an antibody that circulates in our blood and attaches to acetylcholine receptors found on our motor neurons. This process can decrease the interaction between neurons of our nervous system and ultimately affects our ability to contract our skeletal muscles. Although this topic is heavily researched, we still do not fully understand why this takes place. Some possibilities include mutations in genes, infections by pathogens, and damage to immunologically privileged sites. Gene mutations or a genetic predisposition are believed to be one possible cause of autoimmunity. Research indicates that autoimmunity runs in families and may be passed down to offspring. Genetic mutations of DNA that code for the MHC membrane proteins may lead to autoimmune disease self-antigens.

AUTOIMMUNITY (AUTOIMMUNE DISEASE)

•When an individual is infected by a pathogen, that pathogen may contain or produce antigens that resemble the self-antigens of the healthy cells our body. When the pathogenic antigens induce the immune system to produce antibodies, the antibodies may then attack healthy cells.

•For instance streptococcal infections can produce antigens that have similar epitopes compared to self-antigens found in our hearts. This can lead to rheumatic heart disease. Certain places of our body are out of reach to the majority of our white blood cells because they contain virtually no blood and lymph vessels. The cornea and our brain are two examples.

Physical damage to these privileged places can release self-antigens that have not yet been encountered by our immune system, leading to an autoimmune response that can destroy those areas.



A REVIEW ON SOLID DISPERSION

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Absorption of the drug and its therapeutic effectiveness are affected by solubility which is a significant physiochemical factor. Poor aqueous solubility can lead to failure in the formulation development process. One of the most promising and efficient techniques for solubility enhancement is solid dispersion formulation. According to Chiou and Reigelman, a solid dispersion system can be defined as " the dispersion of one or more active ingredients in an inert carrier or matrix at solid state prepared by melting solvent or melting solvent method ". The drug is hydrophobic in nature whereas the matrix is hydrophilic. The matrix can be either crystalline or amorphous. As per the biopharmaceutical classification system class II drugs have are with low solubility and high permeability and are promising candidates for the improvement of bioavailability by solid dispersion. On the basis of recent advancements in solid dispersion, they can be classified as

1. First-generation solid dispersion: The solid dispersion that could be prepared by using crystalline carriers. Examples: Urea and Sugar In this type, thermodynamically stable crystalline solid dispersion gets formed which releases the drug slowly. The dissolution rate is faster in the case of amorphous solid dispersions

2. Second generation solid dispersion: These contain amorphous like PVP, PEG, Cellulose derivatives. According to the physical state of drug, amorphous solid dispersion can be classified as amorphous solid suspensions and amorphous solid solutions (glass solutions) , Amorphous solid suspension consists of two separate phases while amorphous solid solutions contain molecularly homogeneous mixture of both the drug and amorphous carriers.

3. Third generation solid dispersion: These consists of carriers having surface activity or emulsifying properties. Uses of surfactant or emulsifiers not only improves the dissolution profile of drug but also improves physical and chemical stability of drug in solid dispersion. Examples: inulin, poloxamer 4. Fourth generation solid dispersion: These type of dispersions can be referred as controlled release solid dispersion. It contain poorly water soluble drug with a short biological half life . the carriers used are either water soluble or water insoluble. The examples of water soluble carriers are : ethyl cellulose , HPC etc. The enhancement of oral bioavailability of poorly water soluble drugs remains one of the most challenging aspect of drug development various enhancers like co-solvent, surfactant aids in solubility enhancement . These significantly help improve the bioavailability and bioequivalence .

SELF-MICRO EMULSIFYING DRUG DELIVERY SYSTEM (SMEDDS)

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A self-micro emulsifying Drug delivery system (SMEDDS) is a drug delivery system that uses a micro-emulsion achieved by chemical rather than mechanical means. Micro-emulsions have significant potential for use in drug delivery, and SMEDDS are the best of these systems. SMEDDS are of particular value in increasing the absorption of lipophilic drugs taken orally. SMEDDS are mixtures of natural or synthetic oils, solid or liquid surfactants, or one or more hydrophilic solvents and co-solvents/surfactants that have a unique ability to form fine oil-in-water (o/w) microemulsions upon mild agitation followed by dilution in aqueous media, such as GI fluids. SMEDDS spread readily in the GI tract, and the digestive motility of the stomach and the intestine provides the agitation necessary for self-emulsification. SMEDDS can be encapsulated in hard or soft gelatin capsules or can be converted to a solid state (solid SEDDS/SMEDDS). In recent years, much attention has been focused on oral dosage forms using a self-emulsifying drug delivery system (SMEDDS) to improve the solubility and absorption of poorly water-soluble drugs. SMEDDS consists of a mixture of drugs, oils, surfactants, and/or other additives. Gentle mixing of these ingredients in aqueous media generates micro-emulsions with droplet sizes in the range of 10-100 nm. SMEDDS has been shown to improve the absorption of drugs by rapid self-micro emulsification in the stomach, with the micro-emulsion droplets subsequently dispersing in the gastrointestinal tract to reach sites of absorption.

SELF-MICRO EMULSIFYING DRUG DELIVERY SYSTEM (SMEDDS)

The resultant small droplet size from SMEDDS provides a large interfacial surface area for drug release and absorption, and the specific components of SMEDDS promote the intestinal lymphatic transport of drugs. Oral absorption of several drugs has been enhanced by SMEDDS.SMEDDS is known to improve dissolution characteristics of a poorly water-soluble drug since they maintain the drug in a solubilized state in the GI tract. As a conclusive note, we can say that SMEDDS can be potentially used for delivering a poorly water-soluble drug.

ROLE OF BIOCOMPATIBLE POLYMERS IN PHARMACY

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The concept of biocompatibility is crucial for various fields including medicine, pharmacy, and biochemical engineering where materials and products interact with biological systems such as implants, drug delivery systems, and medical devices.

The term biocompatibility is a derivative of two words namely – “bio” and “compatibility “, where the word bio means a living system or organisms and compatibility means the ability to work together in harmony because of well-matched characteristics i.e., in general, biocompatibility refers to the ability of the of a substance, material or medical devices to interact with biological system.

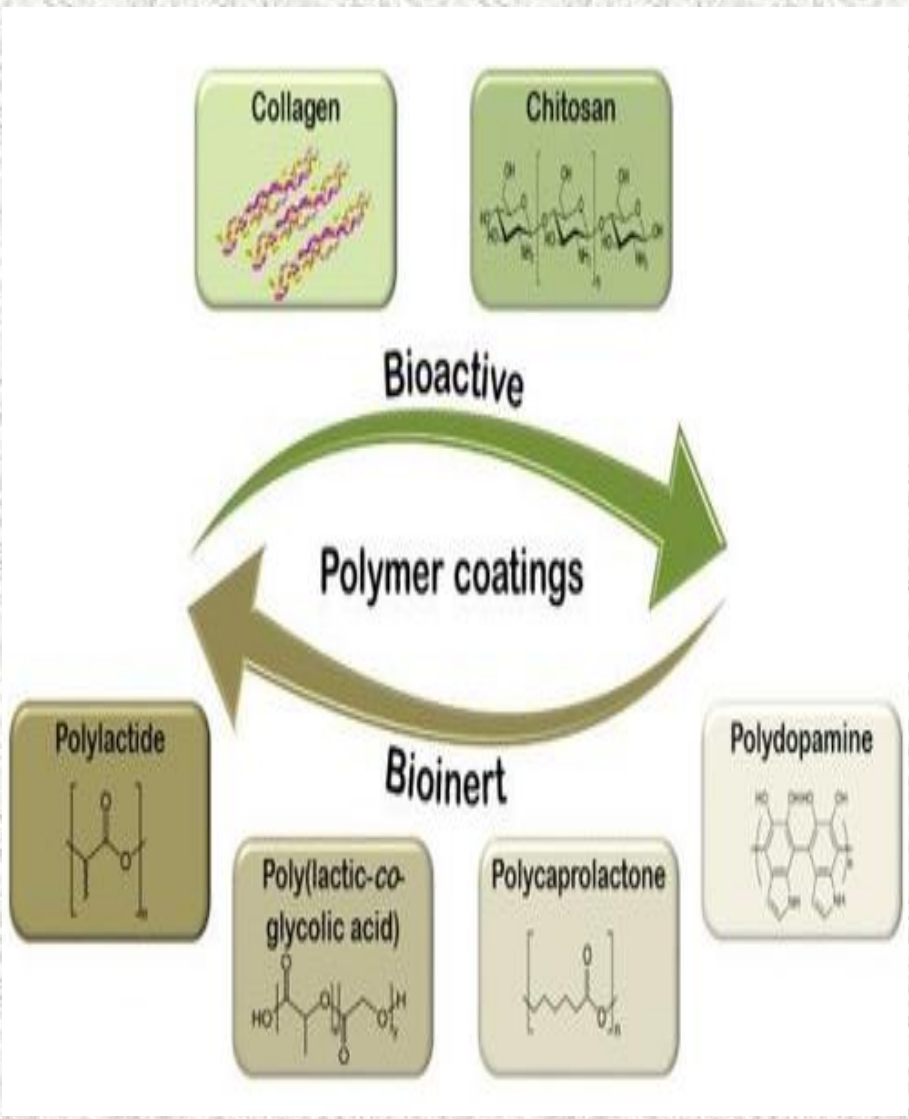
However, in terms of the medical or pharmaceutical field, it is typically used to define the suitability of a polymer which can be either plastics, metals, ceramics, or other devices that when exposed to the human body and body fluids do not produce any kind of toxicity, inflammation or immune response within the human body

which means these polymers are well tolerated by the body these types of polymers are now termed as biocompatible polymers.

ROLE OF BIOCOMPATIBLE POLYMERS IN PHARMACY

A biocompatible polymer has got vast role which is not just limited to ensuring patient safety but also to improving the body functions without altering its normal functioning and triggering allergies or other side effects. It encompasses advances in tissue culture, tissue scaffolds, implantation, artificial grafts, wound fabrication, controlled drug delivery, bone filler material, etc. Biocompatible polymers are both synthetic (man-made) and natural polymers that aid in the close vicinity of a living system or work in intimacy with living cells.

These are used to gauge, treat, boost, or substitute any tissue, organ, or function of the body. Biocompatible polymers are a category of promising materials used in gene delivery systems too. Biopolymers have brought effective and attainable targets in pharmaceutics and therapeutics. There are huge numbers of biopolymers reported in the literature that have been used effectively and extensively, some well-known biopolymers such as polylactic-co-glycolic acid, poly(ε-caprolactone) (PCL), polyLactic Acid, poly3-hydroxybutyrate-co-3- hydroxyvalerate (PHBV), Chitosan and Cellulose are used in the therapeutic measure for many biomedical applications.



Like any other medical or pharmaceutical products that are designed the main aim or purpose of biocompatible polymers or medical devices are to function effectively within the body without compromising the health and well-being of the individual.

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and
Keep Learning

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