Department of Chemistry
Sri Venkateswara College
University of Delhi

ABHIGYA

2021-2022

DRUG CHEMISTRY

Annual Chemistry Magazine

ABHIGYA 2021-22

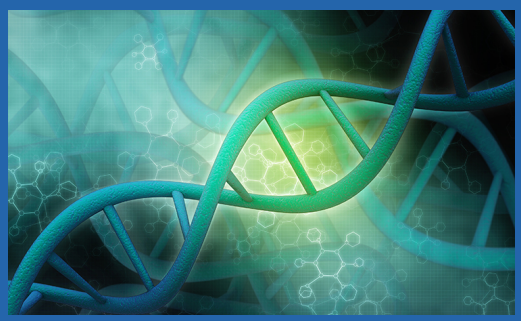
PATRON

Prof. C. Sheela Reddy

CONVENOR

Dr. Shefali Shukla

DRUG CHEMISTRY



Nothing in life is to be feared, it is only to be understood. Now is the time to understand more so that we may fear less -Marie Curie

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Prof. C. Sheela Reddy
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From the Principal's Desk

*The Chemistry Department is one of the most active departments of Sri Venkateswara College known for its constant participation in several extracurricular activities apart from classroom teaching and learning. Every year, the Chemistry Department comes up with a new edition of the Annual Magazine "**Abhigya**" which represents the epitome of the talent and educative value of the Department. It brings me immense pleasure and joy in announcing the launch of another issue of its annual magazine for the session 2021-22 with a very contemporary theme and insights into the contribution of Chemistry in medicines.*

Chemistry plays a pivotal role in the Drug Development process. It serves as the backbone for scaffolding drug discovery and enhancing the growth of the pharmaceutical industry. In fact, medicine would have never gotten as advanced as it has today without the contribution of Chemistry. Hence, Chemistry aids in understanding improved means of diagnosis and optimized techniques for the development of effective drugs. This is quite evident from the role played by chemists and Chemistry during the ongoing pandemic.

I am delighted to see the zeal and enthusiasm in the faculty of the Department in encouraging their students to learn new skills and gain additional knowledge inculcating in them the habit of thinking out of the box. I would like to appreciate the efforts of the whole team of faculty members and students and congratulate them for this issue.

C. Sheela Reddy

Prof. C. Sheela Reddy

Convenor's Desk

CONSIDER CHEMISTRY AMONG THE MOST USEFUL SCIENCE, AND BIG WITH FUTURE DISCOVERIES FOR THE UTILITY AND SAFETY OF THE HUMAN RACE.

~ Thomas Jefferson

The years 2019-2022 were full of apprehensions and uncertainty, but we, at Sri Venkateswara college have held firm and have grown together as one big SVC family. It is an absolute pride and delight for all of us to partake in the Diamond Jubilee celebration from 20th August 2021 to 20th August 2022 which speaks volumes of our resolve and will to move forward, even in these testing times. The theme of the current issue of Abhigya, the annual magazine of the Chemistry Department at SVC is "Drug development" which features the major scientific developments in the field of drug discovery and the role of chemistry in the advancement of future drugs. This magazine aims at enabling us for developing a better understanding and to realize the importance of drugs in our everyday life. This magazine also throws light on the discovery of some life-saving drugs leading to Nobel prizes. The development of a new drug for any disease is long and complicated where chemistry serves as the backbone to the framework. The journey is driven by the knowledge of the chemistry of the molecules and their association with the life process. Bringing out this issue was actually a lovely experience to see these enthusiastic and budding writers showcasing their talent not only in the form of article writing but also in deriving puzzles, quizzes, and even graphic designing. I want to take this opportunity to thank every single person who has supported us in publishing this magazine. First and foremost, I would like to thank our Principal for her encouragement and unwavering support. I express heartfelt appreciation to all student authors and faculty members of the department for their contribution to this issue. I also wish to acknowledge the hard work of the dedicated students and teachers' Editorial Board in enhancing the perfection and beautification of the magazine. I hope this edition of Abhigya would be a reading pleasure to all!

Dr. Shefali Shukla

STUDENT EDITORS

CHAHAT DHAWAN
EDITOR-IN-CHIEF
B.SC (H) CHEMISTRY III YEAR

SWETA KUMARI
CO-EDITOR
B.SC (H) CHEMISTRY II YEAR

"Every college is a store house of creative minds. Each and every student is born with a spark of creativity in them."
*When the whole world was struggling with COVID and scientists all over the globe were engaged in exploring effective vaccines and drugs to fight against the deadly disease, we, at Sri Venkateswara College, came up with an interesting idea of working on the role played by chemistry in the synthesis of drugs and their analysis. This laid the foundation for this year's edition of our annual magazine with the theme *"Role of chemistry in Drug Discovery"*.*
*Despite the hectic schedule of classes all day long in the online mode along with several extra-curricular activities as well as preparation of theory and practical exams, we along with our team of teachers and students have worked on ideas recklessly, to make it a great success. Finally, the big day has come and we are launching a fresh edition of our annual magazine *"ABHIGYA: 2021-22"*.*
This magazine's mindmap was completely laid out with our constant imaginations of chemicals wafting through our minds, colored test tubes and instruments shown in the virtual labs, and the quandary of reaction mechanisms and complex derivations taught in the online theory classes. We worked day and night giving numerous calls for articles.
It's not just about having ideas; it's more about making those ideas a reality!
We take great pride in stating that our team's sincerity and dedication have aided us in bringing this magazine to completion. We owe a great deal of gratitude to everyone who worked tirelessly as editors, designers, creators, and contributors. Also, a special thanks to our teachers for their guidance at every stage, without which we would not have known where to begin or how to work as a team to give a final shape to the magazine. We had a great experience and enjoyed every small step in working for the magazine and bringing it to its final form and we hope you enjoy reading the articles and taste the flavor of creativity in them.

Chahat Dhawan
Sweta Kumari

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Left to right: Dr. Manoj Trivedi, Dr. Aditi Gupta, Ms. Laishram Saya Devi, Dr. Shefali Shukla (Convenor), Dr. Pooja (Co-Convenor), Dr. Deepti Sharma, Dr. Balendra

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Contents

THE CHEMISTRY OF HAPPINESS

SO ARE YOU READY FOR A HAPPY CHEMICAL RIDE?

Here is the D.O.S.E of happiness- Dopamine, Oxytocin, Serotonin and Endorphin. The chemicals involve the neurotransmitters and bring a sense of joy, empathy, self-esteem, and togetherness making the practical bonds of trust. The endochrine system controls the production and release of these hormones particularly; the pituitary gland directs the rush of these hormones throughout the body.

BRIGHT AND BREEZY? YOU'VE GOT SEROTONIN TO THANK. GLOOMY AND GRUMPY? A BIG OL' HUG AND A BURST OF OXYTOCIN WILL PERK YOU UP.

Dopamine with the chemical name 4-(2-aminoethyl) benzene-1,2-diol works as a motivation capsule. The dopamine happiness comes from the brain's reward system, responsible for memory, attention, motivation, boosts self-esteem, regulates ones behavior and body movements. The chemistry is that the amino acid tyrosine converts into another amino acid, known as L-dopa and then some certain enzymes turn L-dopa into dopamine. Getting a high quality sleep, diet containing less saturated fats, regular exercise, meditation, music can boosts the release of this chemical.

Feeling butterflies?, cause oxytocin drives.

In the language of chemistry, Oxytocin is cyclic nonapeptide chemical with amino acid sequence CYIQNCPLG. It is produced by the hypothalamus part of the brain

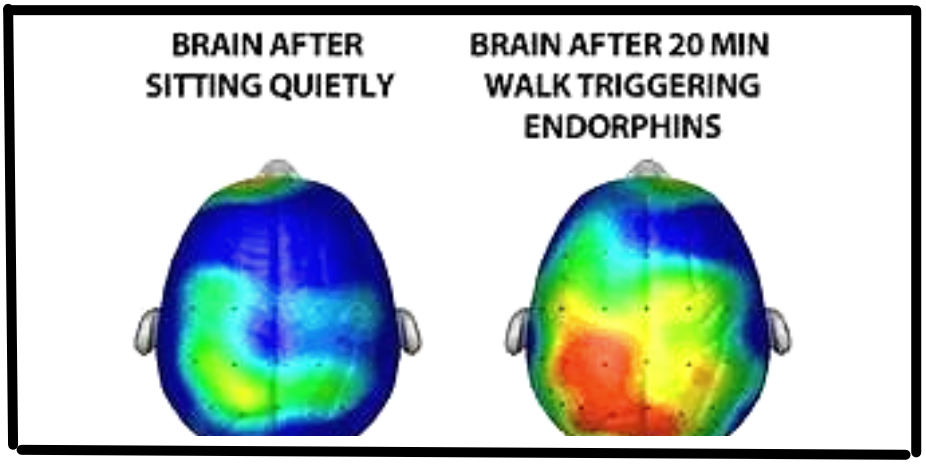
which keeps the body's internal functions in balance and then it's secreted into the bloodstream by the pituitary gland. From there, oxytocin is directed into spinal cord or other parts of the brain depending on its ultimate purpose. This chemical is linked with emotional attachments and bonding .

Researchers say oxytocin lowers the stress & anxiety and impacts the social behavior including trust, empathy, positive memories, processing of bond cues and positive communication. Some studies shows that the level of oxytocin can be relatively increased by getting a good sleep, spending time with families and pets , listening music. Increasing the levels artificially, is bit more complicated. Only the environment can make a change.

Serotonin is the chemical 5-hydroxytryptamine, derived from the amino acids and tryptophan. It occurs in the brain, gastrointestinal tract and blood platelets. This chemical is a natural mood stabilizer that helps in getting good sleep, eat, digestion, maintain bone health, stimulates nausea, heals wound, reduces anxiety and a powerful antidepressant. The level of serotonin can be increased by increasing the amino acid tryptophan supplements; spending time doing favorite hobbies can also elevate the serotonin levels. Light therapy is being adopted by people these days. Researchers have found a relation between bright light and serotonin levels.

Happiness comes from within, and the chemical driver is endorphin.

Endorphin is an endogenous opioid peptide neurochemical released after a good, hard workout. Endorphin is formed by the combination of the words "endogenous", which means within the body, and "morphine", which is an opiate pain reliever. The chemical can help relieve pain, reduce stress and is responsible for euphoric feeling. In a study it was found that the effect of the chemical endorphin can be contagious. It triggers the laughter. The levels of the chemical can be increased by doing simple exercise, walking, laughing with friends, listening music and doing meditation. It is observed from studies that feeling sympathy and doing a simple act of kindness for others can elevate the chemical release.



DIVYA YADAV
B.Sc. (H) CHEMISTRY, II YEAR

NATURE'S GIFT TO CHEMO WORLD-TAXOL

Taxol which is popularly known by its generic name paclitaxel (PTX), is a chemotherapeutic agent widely used in the treatment of specific human cancers. It is a member of the Texans family of drugs, which includes cabazitaxel and docetaxel. Since its discovery, it has been used to treat over one million patients, making it one of the most widely employed antitumoral drugs. Despite its wide use, it has certain disadvantages, one of them is the lack of sustainable and environment-friendly production based on the use of microorganisms.

History

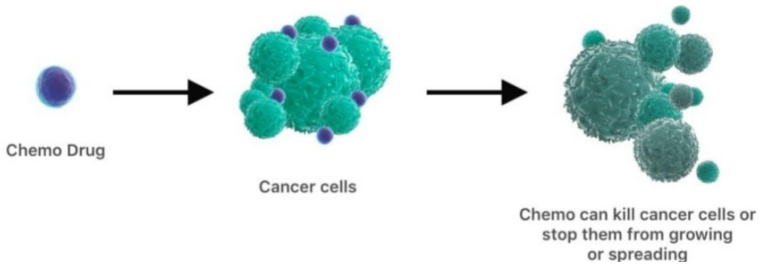
Under a contract to the US National Cancer Institute (NCI), a botanist named ArthurBarclay collected a sample of the bark of the Pacific Yew tree that went on to provide what is now the most highly prescribed drug for cancer that is Taxol.

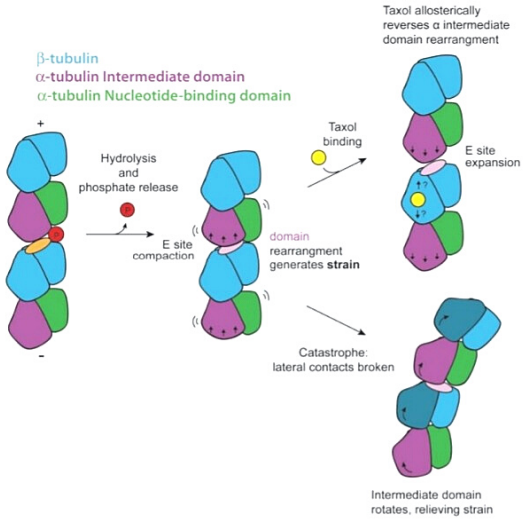
The name of the drug (Taxol) was derived from the Latin term (Taxus brevifolia) of the Pacific yew tree. In the 1960s, Dr. Johnathan L. Hartwell (NCI) identified PTX for the first time, when a screening program was carried out by NCI and the US department of agriculture for antitumor agents in the plant kingdom. The structure of PTX was published in 1971 and was first tested in patients in 1984. Due to the immense success in trials, the demand for PTX increased rapidly and this eventually led to the depletion of tree T.brevifolia. Thus, the price of Taxol increased rapidly due to less availability of the tree. In the year 1994, the US Food and Drug Administration approved the commercial use of Taxol as a medicine in the treatment of breast, ovarian and lung cancer as well as Kaposi's sarcoma. Considering all these aspects, its demand has spurred a battle over the most beneficial anti-tumor domain in history.

PREPARATION AND DOSING

Taxol is a especially versatile drug. It is clear, colorless fluid that is mixed with cremophor EL and given by infusion. A pump is necessary to infuse it properly and administered directly into the vein as it is thick and sticky. The amount of Taxol prescribed depends on many factors including weight, height, general health, and type of cancer.

HOW DOES TAXOL WORK?

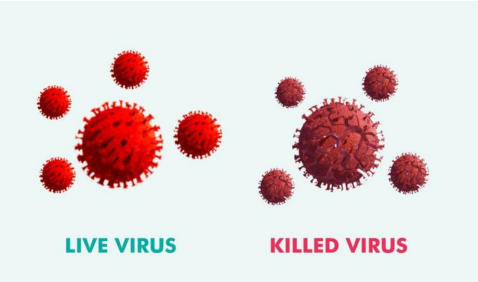




The chemo drug Taxol is a mitotic inhibitor, mitosis is the process by which a tumor cell grows. There are microtubules present in our cells, which supply the rigid, organized components of the cytoskeleton that give shape to the cells. Taxol throws into disorder the microtubules by binding with them and blocking the effect of hydrolysis. This slows down the tumor cell division.

RESEARCH AND DEVELOPMENT

There is a bright future in Taxol research. Researchers are looking for new and advanced ways of improving Taxol's use in cancer treatment. NCI is supporting several clinical trials to analyze the effect of Taxol on ovarian, peritoneal, and fallopian tube cancers. Researchers are also searching for the effect of Taxol on other types of tumors, like head and neck, prostate, bladder, cervical, esophageal, thyroid, and uterine cancers. After Taxol's success, many organizations and companies have come together to accelerate further research and create more lifesaving majestic drugs. In a combined therapy in patients with metastatic pancreatic cancer examined by the Metastatic Pancreatic Adenocarcinoma Clinical Trial (MPACT), they found that patients treated with nab-paclitaxel (a form of paclitaxel) in combination with gemcitabine lived longer than patients treated gemcitabine alone. With taxol's discovery, patients with breast and ovarian cancers have hope for treatment with better outcomes, increased life expectancy, and improved quality of life.



Live vaccines

Live vaccines contain a weakened form of the virus or bacteria. These vaccines introduce a small amount of the pathogen to prompt your body to make antibodies that would protect you from infection when you are exposed to the illness in the future

DIVYA YADAV, SHASHWAT DWIVEDI, SRISHTI YADAV
B.Sc. (H) CHEMISTRY, II YEAR

Find the word

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

ACROSS

1. The thermodynamic process that occurs at constant pressure.

2. A chemical substance (of natural or synthetic origin) that is used for curing diseases.

3. A state of matter having fixed volume but no fixed shape.

4. This is a temporary increase in the average body temperature (98.6 °F).

5. This is defined as force per unit area.

6. The only motion possessed by constituent particles of solids.

7. This refers to the center of an atom.

DOWN

8. Compounds having the hydroxyl group.

9. With an increase in temperature, surface tension _____.

10. A reaction in which reduction and oxidation take place simultaneously.

11. This element is termed as the rogue element of the periodic table

12. The number of moles of solute present in 1 liter of solution.

13. Atoms of the same element having the same atomic number but different mass numbers.

14. A system in which matter can neither be added nor removed.

Answer:
1. Isobaric 8.Alcohol
2. Medicine 9.Decreases
3. Liquid 10.Redox
4. Fever 11.Hydrogen
5. Pressure 12.Molarity
6. Vibrational 13.Isotopes
7. Nucleus 14.Closed

SHIKHA
B.Sc. (H) CHEMISTRY, II YEAR

CHEMISTRY BEHIND AYURVEDA

The term Ayurveda has been derived from the Sanskrit words "Ayur" as the life and "Veda" as science meaning science of life. Ayurveda is a natural system of medicines that originated in India more than 3000 years ago.

Ayurveda is a term that is not only well known in the Indian culture but is also slowly making its way towards the global platform. Ayurveda shouts complete harmony of the human body with the elements of nature and the surrounding environment for healthy life. Ayurvedic science not only deals with medical science but its scope goes much beyond the world of conventional science. It also includes factors like herbal medicine, body works, and surgery apart from the social, psychological, ethical, spiritual, and intellectual life of human beings.

The theory and practice of Ayurveda are pseudoscientific while the protocol is based on single and polyherbal formulations. The medicines are typically based on complex herbal compounds, minerals, and substances. If we take out some time and notice, we will find that Ayurveda is directly linked to chemistry. Ayurvedic preparations have been found to contain lead, mercury, and arsenic, substances known to be chemically useful for some particular diseases when administered in very minute quantities. Even the ancient *charaka samhita* and *sushruta samhita* gives us an insight into the relationship between chemistry and Ayurveda. Ayurvedic medicines are safe, non-invasive, and non-toxic with no side effects.

Ayurvedic medicine is also backed up by scientific evidence. The most commonly used herbs in the ayurvedic preparations are Tulsi, Guduchi, Ajwain, Brahmi, Shilajit, and Ashwagandha, etc. It has been scientifically proved also each of these herbs or spices holds a multitude of benefits - for the mind, body, and spirit. India one of the most famous Ayurvedic company Dabur manufactures Ayurvedic medicines and natural consumer products which not only help to maintain a healthy lifestyle but also promote the holistic well-being of mind and body. Most of the ancient ayurvedic books also speak about purified and processed metals, minerals and gems in the treatment because of their fast-acting, low dose, no side effect.

The importance of minerals is classified in the *maharasa, uparasa* and *sadarasa.* There is also mention of more specific diseases that are addressed by the medicinal substance such as sulfur, gold, mica and others. On the other hand, there are plenty of warnings about using metals and substances which are not prepared or purified correctly because the use of unpurified metals can cause diseases. Medical works such as the *sarngadharasamhita*, the *bhavaprakasa* and the *yogaratnakara* quote or paraphrase the earlier work's descriptions of the medical actions of substances, procedures for processing metals and recipes of treatment with different metals.

Aside from all these today in the modern world, chemistry is used in the ayurvedic herbs mineral formulation, electrochemistry of ayurveda, ayurvedic haematinic medicine, and more such topics related to Ayurveda.

GRACY PARASHAR
B.Sc. (H) CHEMISTRY, I YEAR

DRUG DISCOVERY AND DEVELOPMENT PHASES

Drugs are such an important part of our lives but we don't even spare a minute to actually think about how a drug goes through such a long journey before it reaches in the bottles kept at our home! All of us come across many different kinds of essays and news telling us about the doctors who cured dangerous diseases with the help of these medicines but these stories do not tell us much about the intellectual efforts and technical skill put behind all this. Nobody actually tries to know that the drugs kept on the shelves of the chemist shops are products of research and development of about 40 to 50 great international pharmaceutical firms in the industrialized countries.

Drug development is a multifaceted process. It takes almost 12-15 years to develop a single new drug molecule from the time it is discovered when it is available in market for treating patients.

Let us try to understand how it actually happens and expand our knowledge about drug discovery and development to a new level;

Stages of Drug Discovery and Development Include:

Target Identification

The first step in the discovery of a drug is the identification of the biological origin of a disease, and the potential targets for intervention. Identification of the target is followed by characterization of the molecular mechanisms addressed by the target.

Target Validation

Target validation is the process by which the expected molecular target – for example gene, protein, or nucleic acid of a small molecule is certified.

Lead Identification

A lead compound is a chemical compound that has pharmacological or biological activity likely to be therapeutically useful. Also called developmental candidates, the discovery and selection of lead compounds occur before the preclinical and clinical development of the candidate.

Lead Optimization

Leads are characterized with respect to pharmacodynamic, physiochemical, pharmacokinetic properties, and toxicological aspects. Once compounds with desirable in vitro profiles have been identified, these are characterized using in vivo models.

Product Characterization

When any new drug molecule shows a promising therapeutic activity, then the molecule is characterized by its size, shape, strength, weakness, use, toxicity, and biological activity.

Formulation and Development

Pharmaceutical formulation is a stage of drug development during which the physicochemical properties of Active Pharmaceutical Ingredients (APIs) are characterized to produce a bioavailable, stable and optimal dosage form for a specific administration route.

Preclinical Research

Pre-clinical research in the drug development process involves evaluation of drug 's safety and efficacy in animal species that conclude to the prospective human outcome. The pre-clinical trials also have to acquire approval by corresponding regulatory authorities.

The Investigational New Drug Process (IND)

Drug developers must file an Investigational New Drug application to FDA before commencement of clinical research. In the IND application,
developers must include Preclinical and toxicity study data, Drug manufacturing information, Previous clinical research data (if any) &Information about the investigator/ developer.

Clinical Trials

Clinical trials are conducted in people (volunteer)and intended to answer specific questions about the safety and efficacy of drugs, vaccines, other therapies, or new methods of using current treatments. Before a clinical trial begins, researchers review prior information about the drug to develop research questions and objectives.

New Drug Application

A New Drug Application (NDA) expresses the full story of a drug molecule. A drug developer must include all about a drug starting from preclinical data to Phase 3 trial data in the NDA.

FDA Review and Approval

Once FDA obtains a complete NDA then FDA team of review may require about 6 to 10 months to take a pronouncement on whether to approve the NDA. If FDA governs that a drug has been revealed to be safe and effective for its proposed use, it is then essential to work with the developer for upgrade prescribing information. This is denoted as —labeling.

We had never even imagined that the pills and syrups that we use so often to cure ourselves so quickly had to go through such a long journey of hard work, hope and determination by such a large group of intellectual people before it reaches our hands. Thanks to all those people who put in so much of effort to make sure that we live a long and healthy life!

NANOMEDICINE: FUTURE MEDICINE

Nanotechnology is the engineering of materials at the nanoscale, about 1 to 100 nanometers. In the last two decades, nanotechnology has been extensively introduced for biomedical applications, including drug delivery and diagnostic imaging.

The application of large-sized materials in drug delivery presents some major challenges including in vivo instability, poor bioavailability, issues with target-specific delivery, poor solubility, poor absorption in the body, tonic effectiveness, and probable adverse effects of drugs. Therefore, adopting innovative drug delivery methods for targeting drugs to specific body parts could be an option that might solve these critical issues. Nanomedicine and nano-based drug delivery systems have paved the way to bridge the barrier of biological and physical sciences. The goal of nanomedicine is to monitor, control, construct, repair, defend, and improve human biological systems at the molecular level using engineered devices and nanostructures, to achieve medical benefit. Nanotechnology is playing an immensely important role in enhanced medicine/drug formulations, targeted arena, and controlled drug release and administration, with great success. By stimulating the body's own repair mechanisms, this method provides a variety of new solutions for the diagnosis and smart treatment.

It will enhance the early diagnosis and treatment of diseases such as cancer, diabetes, Alzheimer's, Parkinson's and cardiovascular diseases. Hopefully, preventive medicine can become a reality with the employment of nanotechnology. Nanomedicine involves the manipulation of atoms and molecules to create nanostructures that are of the same size as the biomolecules which facilitate easy penetration, easy uptake and effective interaction with human cells.

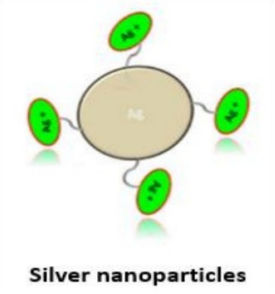
Because of the comparable size, these nano molecules can move freely in the biological system and can cross the biological barriers and thus are able to reach the targeted cells. Additionally, these nanomedicines have prolonged stay in the circulatory system which enables these drugs to reach the targeted site and be released as per the specified dosage. When biological molecules are interfaced with nanomaterials various functionalities can be added. Nanomedicines allude to the use of novel bionanomaterials such as nanoparticles, liposomes, quantum dots (QDs), metal nanoparticles, dendrimers, and carbon nanotubes (CNTs), as well as nanoshells, nanopores, and nanosuspensions for drug delivery. Some common nanocarriers, their applications, and advantages are summarized below:

(1) METAL NANOPARTICLES

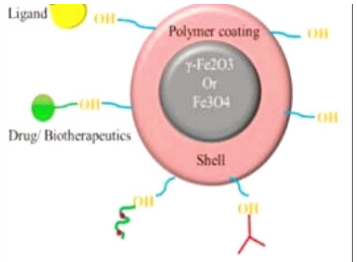
MNs are inorganic particles that are nanoscale in size (1-100 nm), particularly nanoparticles of alkali metals and noble metals, such as copper, silver, and gold, which can be either simple or composite in structure. Owing to their unique physical, chemical, and optical properties, they are becoming a more vital component in the development of novel nanodevices for a variety of physical, biological, biomedical, and pharmacological applications. For example, Gold nanoparticles have recently been shown to have the potential to treat multidrug-resistant cancers using targeted photothermal treatment in combination with a chemotherapeutic agent. Gold nanoparticles surface-functionalized with PEG, biotin, paclitaxel, and rhodamine B linked beta-cyclodextrin (beta-CD) as a theranostic platform. According to in vitro studies, gold nanoparticles exhibit a high affinity towards cancer cells. Moreover, gold nanoparticles display a significant cytotoxic effect against HeLa cancer cells.

(2) SUPERPARAMAGNETIC IRON OXIDE NANOPARTICLES

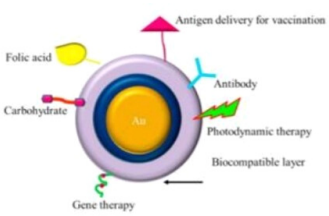
These are novel drug-delivery vehicles. SPIONs are small synthetic γ-Fe2O3 (maghemite) or Fe3O4 (magnetite) particles with a core diameter ranging from 10 to 100
nm. These magnetic particles are coated with certain suitable polymers such as dextran or polyethylene glycol, which provides a surface for conjugation of drug molecules and also improves their dispersibility and colloidal stability. SPIONs with appropriate surface chemistry have been widely used in a variety of in vivo applications like MRI contrast enhancement and drug delivery. Delivery of anticancer drugs by coupling with functionalized SPIONs to their targeted site is one of the most actively explored domains of research in the development of cancer treatment strategies. SPION-induced hyperthermia has also been employed for the localized killing of cancerous cells.



Silver nanoparticles



Superparamagnetic iron oxide

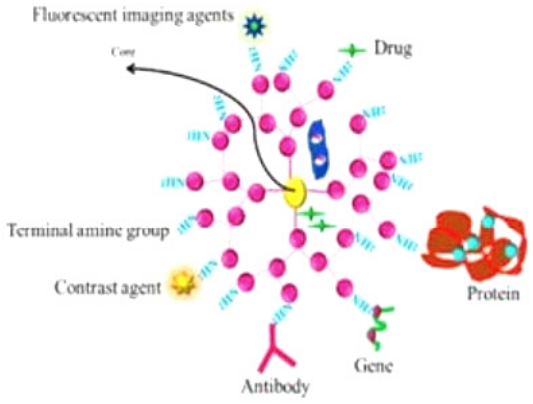


Surface-modified gold nanoparticles

Surface-modified polymeric nanoparticles

(3) POLYMERIC NANOPARTICLES

These are colloidal solid particles prepared from biodegradable polymers like chitosan (a modified natural carbohydrate polymer) and collagen or non-biodegradable polymers such as polylactic acid (PLA) and poly lactic-co-glycolic acid (PLGA)? Biodegradable polymeric nanoparticles are considered to be promising drug delivery systems because such nanoparticles provide sustained-release properties, subcellular size, and biocompatibility with tissue and cells. The drug molecules either bind to the surface as nanospheres or are encapsulated inside as nanocapsules. Chitosan, gelatin, and albumin nanoparticles are the most commonly and widely used biodegradable polymeric nanoparticles.



Dendrimer

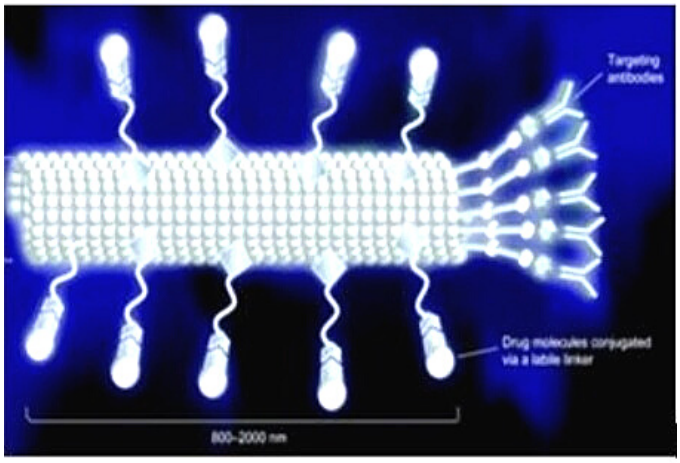
(4) DENDRIMERS

They are novel three-dimensional, highly branched, and one of the most widely explored polymeric nanocarriers, with a highly controlled architecture that is responsible for their successful employment in targeted drug delivery. The presence of a large hydrophobic cavity in dendrimers can be utilized for the entrapment of bioactive, enabling controlled and prolonged drug release. Amine terminal functionalities of dendrimers can enter into the cell because of their positive charge, while lipid membranes of the cells have a negative charge due to which dendrimers can cross several delivery barriers via active as well as passive targeting. These unique features of dendrimers render them incomparable and the most advantageous carriers in nanomedicine.

(5) CARBON NANOTUBES (CNTS)

They are unique sp2 hybridized three-dimensional tubular structures, consisting exclusively of carbon atoms arranged in a series of graphene sheets. Various unique physicochemical properties of CNTs like ultralightweight, high surface area, and excellent surface chemistry make them an ideal candidate for drug delivery. In the present scenario, the CNTs-hybrid conjugates are gaining much attention for promising delivery of bioactive in the pharmaceutical, biotechnological, and biomedical arenas. Many CNTs and dendrimer hybrids are used for delivery of antifungal and anticancer bioactive.

Since the 1990s, the list of FDA-approved nanomedicines and clinical trials has staggeringly increased. Even though regulatory mechanisms for nanomedicines along with safety assessments will be the subject of further development in the future, nanomedicine has already revolutionized the way of discovering and administering drugs in biological systems. It is expected that research and investment in this area will continue at a rapid pace, causing nanomedicine to become an integral part of mainstream medicine in the future.



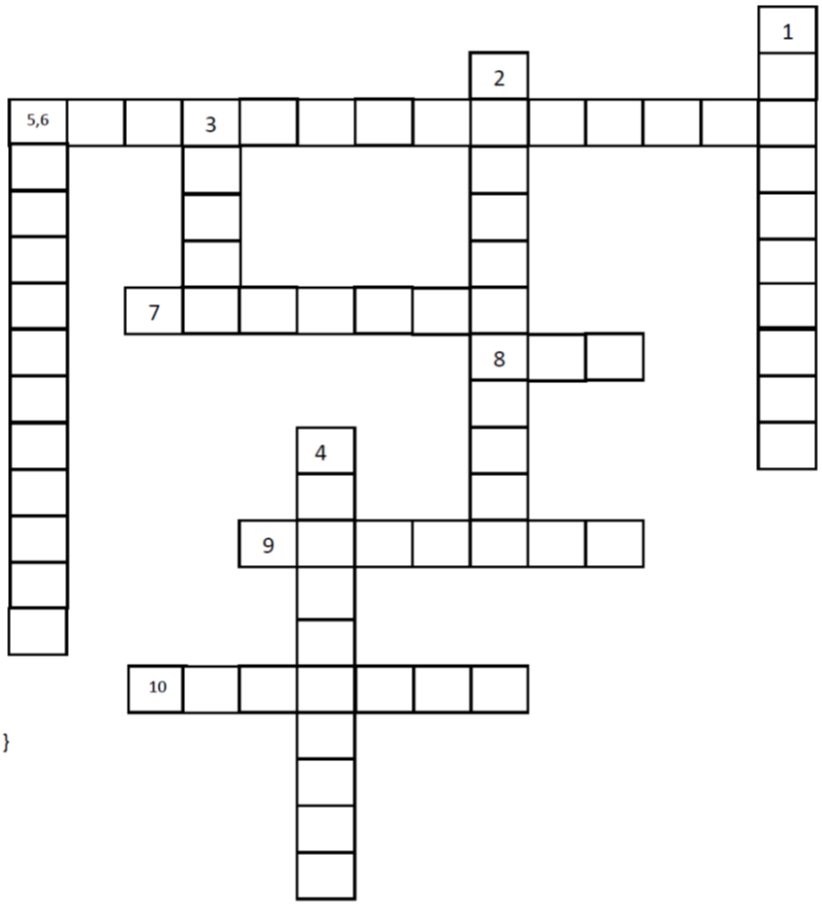
Carbon nanotubes (CNTs)

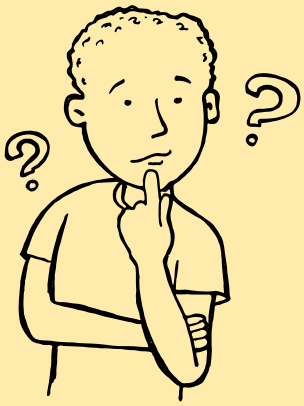
FUN FACT

- **The coca leaf, which is chewed between the cheek and jaw, provides relief from high altitude sickness, increases stamina, and obliterates tiredness. It's also consumed in tea to treat a variety of symptoms, such as headaches, toothaches, and intestinal cramps.**

MANSI
B.Sc. (H) CHEMISTRY, II YEAR

CROSSWORD





Down

1. A surface phenomenon in which a solid or rarely a liquid called adsorbent hold molecules of gas or liquids called adsorbate as a thin layer.

2. Acetaminophen is another name for which drug.

3. It is a member of texane family of drugs, which include cabazitaxel and docetaxel.

4. The first antibiotics drug.

5. The study of drugs including their origin, history, uses, and properties.

Across

6. A reaction induced by light and accelerated by a catalyst.

7. It is the most common source cellular energy and a substrate for many biochemical processes.

8. In how many states the late-stage phase III trials were conducted on 220 patients admitted to 27 COVID-19 hospitals.

9. The hormone is synthesized naturally inside human body.

10. It is widely used as an analgesic for headaches across the globe and helps to prevent

Answers
Down:
1. Adsorption
2. Paracetamol
3. Taxol
4. Penicillin
5. Pharmacology
Across
6. Photocatalysis
7. Glucose
8. Ten
9. Insulin
10. Aspirin

SHIKHA
B.Sc. (H) CHEMISTRY, II YEAR

CHEMISTRY OF CULINARY HERBS AND SPICES

Herbs are obtained from the leaves of herbaceous plants While Spices are obtained from roots, flowers, fruits, seeds or bark. Spices are local to hot tropical climates and may be woody or herbaceous plants.

Herbs are the green, leafy additives of plants. They are maximum efficacious and flavorsome whilst used fresh, and they may be generally grown in temperate to warm regions. Spices are derived from any part of a plant that is not a leaf: for example, cinnamon is bark, ginger could be a root, peppercorns are unit berries, nigella is seed, cumin is a fruit, saffron is stigmas, cardamom is pods and seeds. Spices are commonly utilized in small amounts and dry form. One single plant can be an herb as well as spice. Aromatic seeds like dill are a spice, even if dill leaves are herbs. However, coriander and hamburg parsley roots, garlic and fennel bulbs are all appeared as herbs as opposed to spices. There is now enough scientific proof that spices and herbs own antioxidant, anti-in ammatory, antitumorigenic, and anticarcinogenic properties. Spices and herbs such as clove, rosemary, sage, oregano, and cinnamon are excellent sources of antioxidants with their excessive content material of phenolic compounds.

Some selected herbs & spices

Chilli PEPPERS

Bioactive components: red pepper incorporates 0.2–2% capsaicinoids that are answerable for the pungency or bite in capsicums. Capsaicin, an alkaloid, debts for approximately 50–70% of the full capsacinoids and dihydrocapasaicin for 20–25%, which, collectively with capsaicin, provides the eriest notes from midpalate to throat. Red pepper also contains newly discovered, no pungent compounds known as capsinoids and dihydrocapsiate. Red chili powder is used in preparing everyday dishes and is thus widely known, even internationally, but did you know that it is also a treasure-trove of a number of health benefits such as (a) It helps in digestion (b) Maintains blood pressure levels (c) Builds immunity and fights diseases (d) Improves Heart Health

Ginger

Bioactive additives—Ginger incorporates the following nonvolatile pungent additives: gingerols, shogaols, paradols, and zingerone. Gingerol has powerful anti-inflammatory and antioxidant effects, according to research. also help to reduce oxidative stress. It can treat many forms of nausea, especially morning sickness.

Cinnamon

Bioactive additives—Cinnamon's key additives are essential oils and other derivatives such as cinnamaldehyde, cinnamic acid and cinnamate (bark oil; 60–80%), eugenol (leaf oil; 10%), and water-soluble polyphenols (4–10%), e.g., catechin, epicatechin, procyanidin, quercetin, kaempferol, and polyphenolic polymers. The avonoids are in well-known proanthocyanins and oligomers of cinnamtannins. Cinnamon is loaded with powerful antioxidants, such as polyphenols which protect your body from oxidative damage caused by free radicals.

Turmeric

Turmeric is one of the most famous spices used these days for cooking and fitness advantages alike. Many high-quality studies show that turmeric has major benefits for your body and brain. Many of these benefits come from its main active ingredient, curcumin. Turmeric has a few anti inflammatory, antioxidant, antibacterial, antiviral, and antiparasitic advantages.

Saffron

The ancient Greeks and Romans used saffron as perfume and today this herb is also used as a cooking spice and a clothing dye. Saffron, however, is a very expensive spice. Its costliness has to do with its harvesting. Only a small amount of each saffron flower is used, and all harvesting must be done by hand. Saffron is a powerful spice high in antioxidants. It has been linked to health benefits, such as improved mood, reduced PMS symptoms and enhanced weight loss.

MEENAKSHI
B.Sc. (H) CHEMISTRY, I Year

USE OF ANTIOXIDANT MEDICAL GAS A THERAPEUTIC TOOL IN MEDICAL GAS THERAPY

Medical gas therapy refers to the release of gas for therapeutic purposes. Oxygen therapy is the most common type of medical gas therapy. In order to treat oxidative stress, medical gases can be a progressive therapeutic tool. Oxidative stress is a process of cell damage caused by excessive reactive oxygen species (ROS). As a vital signalling molecule, ROS is the key to regulating the activation of the immune system and participating in antibacterial shields. However, when the generation of ROS and the ratio of protective antioxidants are out of balance, extra ROS can cause toxic effects like it may damage all cell components, including lipids, proteins DNA which lead to cell death. Oxidative stress is caused by the imbalance between the pro-oxidant system and the antioxidant system which is correlated with many diseases like cardiovascular diseases, cancer, hypertension and neurodegenerative diseases such as Parkinson's and Alzheimer’s. Antioxidants help to remove ROS generated under conditions of oxidative stress.

NITRIC OXIDE (NO)

It reacts with iron to form a nitrosyl iron complex, which hinders the catalytic function of iron in the Fenton reaction. The effect of NO on blood vessels can improve blood supply to tissues and reduce inflammation by inhibiting p-selectin expression and leukocyte recruitment, thus protecting tissues from IR damage. Although there is a lack of high-quality clinical studies, there is currently a large body of evidence that the use of NO donor medications may be an effective way to treat IR damage in humans.

HYDROGEN (H)

Hydrogen has high diffusion coefficient and bioavailability as compared to other antioxidants. It is not toxic in both hydrophilic and lipophilic environments in tissues and can quickly reach the mitochondria which is one of the main sources of ROS. Hydrogen can selectively reduce ROS and exert a powerful cytoprotective effect. Molecular hydrogen is used in sports medicine.

CARBON MONOXIDE (CO)

IIt has anti-inflammatory and anti-apoptotic effects and has attracted attention as a medical gas. About 20 years ago, NO and CO were gases produced from cigarette smoke and discovered to be toxic air pollutants. However, today they are considered essential gases because NO and CO are mediators of important physiological actions in the body. Recent studies suggest that the provision of exogenous CO suppresses the inflammatory responses associated with various diseases including hyperoxia, organ transplant (IR) injury and more.

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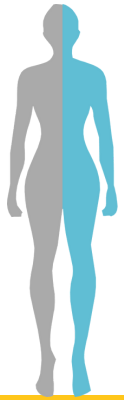
HYDROGEN SULFIDE (H2S)

Hydrogen sulphide is attracting attention as a gaseous medium involved in various processes of the nervous system, but its therapeutic potential in Alzheimer's disease (AD) has not been fully explored. The hydrogen sulphide-releasing compound ATB 346 and diallyl triad cargo weaken rat cognitive impairment, neuroinflammation and oxidative stress. The role of H2S in the pathogenesis of different diseases like neurodegenerative diseases, diabetes and heart failure is currently being studied.

Medical gases are gaseous drug molecules that can be delivered in a simple manner, requiring only the use of a ventilator circuit, a mask or a nasogastric tube to deliver the gas to the patient through the airways. The future of medical gas therapy must focus on the formation of safe and clearly defined dosing parameters and randomized controlled trials to determine the accurate symptom for the use of medical gas to treat various diseases.

- **The human body contains enough carbon to provide "lead" (graphite) for 9,000 pencils.**



2-DG: India's Indigenously Developed Anti-Covid Drug

Introduction

SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus 2020) , a novel zoonotic virus that undergoes mutational alterations, causes COVID-19, an infectious respiratory ailment. As of December 2021, the new respiratory syndrome COVID-19 had caused ~4 Lakh deaths since its emergence in early 2020. The economic and social harm is unimaginable, and it's only getting worse. Coronaviruses are a broad family of enveloped RNA viruses that infect people and cause respiratory or gastrointestinal diseases. Currently, COVID-19 patients are treated based on the disease severity. In India, moderate to severe category patients are treated with oxygen support and intravenous steroids. Drugs like remdesivir and tocilizumab are only suggested to be used in selected patients [All India Institute of Medical Sciences (AIIMS) protocol dated 17 May 2021]. Various other drugs have been tried across the globe with different outcomes. On similar lines, 2-deoxy-D-glucose (2DG) has been approved by the Indian Council of Medical Research (ICMR) on 1st May 2021.

The Medication Controller General of India (DCGI) has approved 2-deoxy-D-glucose (2-DG), an anti-Covid drug developed by INMAS, a DRDO lab in collaboration with DrReddy's Laboratories in Hyderabad, for emergency use. 2-deoxy-D-glucose (2-DG) is a glucose analog and a novel molecule. Previously, it was also used in other purposes such as diagnostic use in pet scanning, and anti-cancer therapy. 2-DG is typically used as a supplement to other treatments i.e. as adjunctive therapy. Clinical trials have shown that the medicine aids in the speedier recovery of infected patients who have been hospitalized and lessens the requirement for supplemental oxygen.

2-DG, unlike glucose, cannot undergo glycolysis because one hydroxyl group at the carbon atom C2 is replaced by a hydrogen atom. So, it's a modified glucose molecule. This medication. is administered in addition to the primary treatment.

Mechanism of 2-DG

2DG, a potential anti-cancer agent, which had been used earlier as an anti-cancer molecule has been found to have antiviral properties also. As viruses rely on host cell machinery for growth, it triggers metabolic reprogramming to facilitate virus multiplication. Glucose is the most common source of energy for cells. But it needs a transporter to get into the cells because it's a hydrophilic molecule. Inside the cell, glucose produces energy in the form of ATPs by undergoing various biological cycles such as glycolysis. 2-DG gets into the cell the same way as glucose but later it doesn't enter the glycolysis as it can not be converted to fructose-6-phosphate (as obtained by normal glucose). It is speculated that in the host body, SARS-CoV-2 cells cause a stress response that activates increased glucose uptake which ultimately helps in the replication of the virus. Therefore, cells with triggered higher glucose uptake have also a higher uptake of 2-DG. In this way, it leads to the accumulation of the compound 2-DG (as this molecule does not enter the glycolytic cycle to produce energy) and hence it has an inhibitory effect. So in this way, the glycolysis process is inhibited and therefore energy stores such as ATP are exhausted and the cell ultimately dies.

Advantages of 2DG over other treatment methods

2-DG is a simple molecule and relatively easy to develop, cost-effective measure as it is a glucose analog and hence potentially the production can be achieved on a larger scale. Various studies have revealed that the drug accumulates in virus-infected cells only, leaving the normal cells. The drug is available in sachet form which can be taken orally with water. There seems to be no concern for decay in shelf life as it is available in sachet/powder form and can be stored at room temperature (recommended to be stored under 25°C), so can be shipped easily from one part of the world to other.

Clinical trials of the drug

The phase I trial administered in April 2020 determined that the patients treated with 2-DG showed negative RT-PCR results. In May 2020, (CDSCO) of the authorized phase II clinical trials to test the safety and potency of the 2-DG drug in COVID-19 patients. From May to October 2020, (DRDO) along with Dr. Reddy's Laboratories (DRL) performed a phase II trial on 110 patients in two stages, Phase II-A (2-DG) and phase II-B (SOC). On differing the results for drug 2-DG and SOC, it was remarked that the patients who got 2-DG shots attained normalization of certain vital signs parameters 2.5 days earlier than those treated only with SOC. The phase III trial which was performed in November 2020 on 220 patients, showed that a substantially large percentage of patients who received 2-DG evolved free from external oxygen dependency by Day 3 as described by those treated with SOC.

Limitations of the drug

- Some of the shortcomings associated with 2DG which may hamper the universal acceptance of this
- drug as anti-covid therapy include:
- A small sample size of patients in the trial phase. Though there is enough data on the safety and good tolerability of 2-DG in humans, most of the available literature on 2-DG is in vitro and lacks extensive human trials so far, so a concrete inference is difficult to extrapolate from this study
- Patients with severe Comorbidity, multi-organ failure, and transplants were not included in the study. The Noninclusion of such patients in clinical trials limits the usage of the drug molecules. No data is available on the side effects of the potential drug.

Conclusion

The indigenously developed Anti-covid-19 drug is one of the first therapeutic molecules which functions by inhibiting the replication of the virus and also reduces the need for external oxygen in the body of the patient. The drug which comes in a powdered form in a sachet is taken orally by dissolving in water. The emergency approval of the drug came when India is fighting against the Coronavirus that has disrupted healthcare infrastructure across the country. We hope this drug will be very effective against the infection and with the help of this, we will be able to win over the disease.

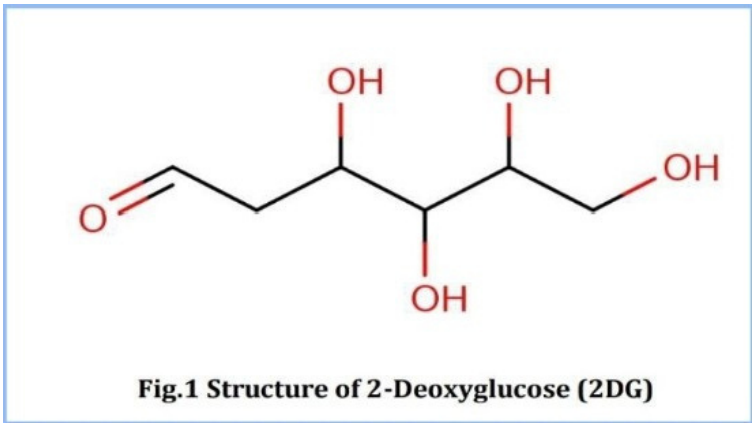
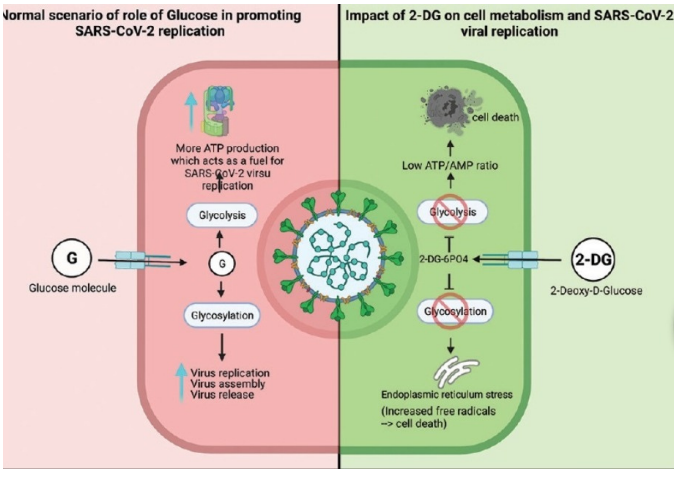


Fig.1 Structure of 2-Deoxyglucose (2DG)



Ankita Kumari, Anshuman Aditya Sahoo, Mayank Dhawal
B.Sc. (H) Chemistry, II Year

PATHOGENESIS OF HEPATIC FIBROSIS: CELLULAR AND MOLECULAR DRIVERS

Hepatic fibrosis is the final common pathway for the most chronic liver disease. In hepatic fibrosis excessive connective tissue accumulates in liver causing fibrosis (overgrowth, hardening, or scarring of various tissues) progress, disruptive hepatic architecture and eventually function. As a result, the regenerating hepatocytes attempted to replace and repair damaged tissue. Such disruption results in widespread "cirrhosis". It is associated with cancer.

In its initial stages, fibrosis can regress if the cause is reversible. After months or years of chronic or repeated injury, fibrosis became permanent.

The drugs and chemical with hepatic effect

Alcohol, Chlorpromazine, isoniazid, methotrenate, methyldopa, oxyyphenisatine, tolbutamide, amiodarone.

Symptoms of hepatic fibrosis-

It does not cause any symptoms. Symptoms may result from the disorder causing fibrosis or once fibrosis progresses to cirrhosis form complication of portal hypertension. These symptoms include jaundice, variceal bleeding and Ascites.

Noninvasive test-

The test like ultrasound, CT, MRI are used for detection of fibrosis, cirrhosis and portal hypertension.

BThese tests have not been valid for pregnant patients. Such treatment may include antiviral drugs to eliminate hepatitis B virus or hepatitis C virus in chronic virus hepatitis

Factors associated with fibrosis-

- Several factors have been clearly shown to be associated with fibrosis progression rate such as duration of infection, consumption of alcohol, HIV coinfection and low CD4 count. The risk of fibrosis increments and the treatment diminishes as the age and span of disease increases. In summary, fibrosis progression accelerates with age, sex and alcohol consumption. The ability to assess fibrosis stage using non-aggressive biochemical markers will likely allow other factors related to fibrosis progression to be identified in the near future.

Hepatic fibrosis can be triggered by the hepatitis virus or alcohol. The cell responsible for hepatic fibrosis activated myofibroblast, hepatic fibrosis strongly associated with oxidative stress and chronic inflammation. There are estimated 350 million and 180 million carriers of hepatitis B (HBV) and hepatitis C (HCV), chronic hepatitis B, alcoholic liver disease and non- alcoholic fatty liver disease. There were many deaths reported in Japan deaths due to hepatic cirrhosis and found around 15,000 per year. Liver fibrosis is a significant health problem over worldwide and mortality attribute to cirrhosis and primary liver cancer of around 1.5 millions deaths per year.

TANU SAHU and SHREYA RASTOGI
B.Sc.(H) CHEMISTRY, I YEAR

ANTI ANXIETY DRUG: BENZODIAZEPINE

Living with anxiety is like being followed by a voice. It knows all your insecurities and uses them against you. It causes loudest voice in the room which can only hear by you.

It is little wonder that stress levels today are higher than ever across the whole world. Overloaded work schedules, juggling family and a career and making ends meet financially can all lead to anxiety and can affect nearly everyone from time to time. Anxiety is a universal experience. It is an exaggerated feeling of apprehension, uncertainty and fear. It is an unpleasant state of tension with an anticipation of imminent danger. Today, 49 million adults in India suffer from anxiety and it is the most common mental illness in the United States. Untreated anxiety can get worse and cause more stress in a person's life. However, anxiety is highly treatable with therapy, natural remedies, lifestyle changes and medications. Benzodiazepines are a group of medications that can help reduce anxiety and make it easier to sleep. Use of benzodiazepines is advantageous because they have a quick onset of action and are generally well tolerated. They are also used as a muscle relaxant, to induce sedation for surgery and other medical procedures, and in the treatment of seizures and alcohol withdrawal. Benzodiazepines are also called minor tranquillizers, sedatives or hypnotics. They are the most widely prescribed psychoactive drugs in the world.

clonazepam

Benzodiazepines most commonly used for anxiety disorders are clonazepam (Rivotril), alprazolam (Xanax) and lorazepam (Ativan). Also used are bromazepam (Lectopam), oxazepam (Serax), chlordiazepoxide (once marketed as Librium), clorazepate (Tranxene) and diazepam (Valium). They work by enhancing the effect of neurotransmitter known as gamma-aminobutyric acid or GABA. Neurotransmitter are chemicals that communicate messages between brain cells. These messages can have either a stimulating or a calming effect. GABA is a neurotransmitter that sends calming messages to the body. When a person feels anxious, overstimulation occurs in the brain. When people take benzodiazepines, the brain will send messages to counter this overstimulation. This activity can reduce the symptoms of anxiety. Benzodiazepines can help treat mental health and neurological conditions, but also it is essential to use them with care. It also has some side effects which include drowsiness, confusion, dizziness, impaired coordination, increasing the risk of falls and accidents. Therefore, it is essential to follow doctor's instructions regarding the usage of this drug. Also, overdose of it can lead to low breathing rate, confusion and difficulty thinking, slurred speech, loss of muscle control and even coma-like situations too.

GAYATRI
B.Sc. (H) Chemistry, I Year

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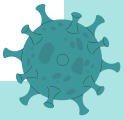

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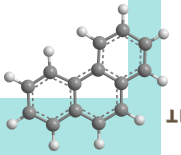

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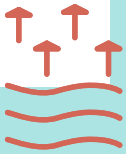

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ANSWERS:

SAY NO TO DRUG

DRUGS DESTROY FAMILIES

NANOTECHNOLOGY

PARACETAMOL

ANTI-COVID DRUG

INORGANIC LOVES EXCEPTIONS

NICOTINE

WATER PURIFICATION

ELEVATION IN BOILING POINT

REDOX REACTION

CONICAL FLASK

BIOMOLECULES

PERIODIC TABLE

CHROMATOGRAPHY

ALKALI METAL

EVAPORATION

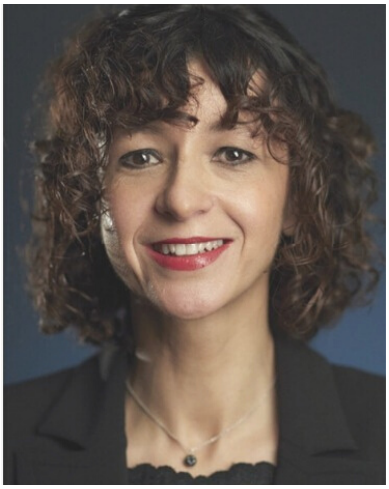
VAN DER WAALS FORCE

THERMOCHEMISTRY

CHEMISTRY NOBEL LAUREATES

YEAR 2020

EMMANUELLE CHARPENTIER



Emmanuelle Charpentier was born in Juvisy-sur-Orge, France in 1968, received her Doctorate degree in 1995 from the Pasteur Institute in Paris, France and is currently Director of the Max Planck Unit for Sciences Pathogens, Berlin, Germany. n 2020, the Nobel Prize in Chemistry was jointly awarded to Emmanuelle Charpentier and Jennifer A. Doudna for developing the CRISPR / Cas9 system, a method of genome editing. This technological revolution has brought about advances not only in basic research of life science, but also in other fields such as medicine, material science, and biotechnology. This allows researchers to modify the DNA of animals, plants, and microorganisms with great precision.

JENNIFER A. DOUDNA

Jennifer A. Doudna was born in Washington, DC, USA in 1964, has received her Doctorate degree from Harvard Medical School in Boston, USA in 1989 and is currently Professor at the University of California, Berkeley and Investigator at the Howard Hughes Medical Institute.

WORK

Organisms' life processes are governed by genes, which are made up of DNA segments. In year 2012, Emmanuelle Charpentier and Jennifer Doudna established a technique for high precision gene alterations. They used bacteria's immunological defences, which inhibit viruses by cutting their DNA apart with a sort of genetic scissors. They were able to develop a tool that can be used to cut any DNA molecule at a predefined place by isolating and simplifying the molecular components of the gene scissors. The CRISPR/Cas9 gene scissors have the potential to lead to new scientific discoveries, improved crops, and new weapons in the battle against cancer and hereditary disorders.

An unknown molecule termed tracrRNA was produced by Emmanuelle Charpentier who was investigating a bacteria named Streptococcuspyogenes. Further study has revealed that this tracrRNA is a component of the bacterial immune system, aiding in the destruction of bacterial viral DNA. In 2011, she disclosed her findings.

In the same year, she and Jennifer Doudna succeeded in re-creating and reprogramming bacterial scissors. Charpentier and Doudna subsequently showed that the scissors may be used to cut a desired DNA molecule at a desired position. When researchers want to discover out about the inner functioning of life, they need to alter genes in cells. It used to be time-consuming, challenging and even impossible task. With CRISPR/Cas9 genetic scissors, it is now possible to change the code of life over the course of a few weeks.

YEAR 2021

Recently, Benjamin List and David W. C. MacMillan has been awarded the Nobel Prize in Chemistry 2021 for their extraordinary achievement of developing a precise new tool for molecular construction: organocatalysis. Their research has a great impact on pharmaceutical revolution, and has also made chemistry greener.

BENJAMIN LIST

Benjamin List was born in Washington, DC, USA on 11th January1968, has received his Doctorate degree under supervision of Johann Mulzer from University of Frankfurt in 1997 and is currently Max-Planck-Institut für Kohlenforschung, Mülheim an der Ruhr, Germany; Honorary Professor, University of Cologne. Also, his research includes new concepts for chemical synthesis and catalysis.

DAVID W.C. MACMILLAN

David W. C. MacMillan born in 1968 in Bellshill, UK, received his Doctorate degree in 1996 from the University of California, Irvine, USA and is currently Professor at Princeton University, USA.

WORK

Catalysts are indeed the most essential tool for chemists to synthesize various compounds that can be capable of storing energy in batteries, for preparing other durable materials and many other applications.

For a long time, experts considered that only two types of catalysts in principle are present i.e. metals and enzymes. However, in 2000, Benjamin List and David MacMillan separately developed a third form of catalysis. It is known as asymmetric organocatalysis, and is built on small organic molecules.

Organic catalysts contain a stable framework of carbon atoms to which more active chemical groups can connect. These frequently contain common components such as oxygen, nitrogen, sulphur, or phosphorus, also they are environmentally beneficial and affordable. The tremendous growth in the usage of organic catalysts is largely owing to their ability to drive asymmetric catalysis. herein, the two constructed molecules are a mirror image of each other. Chemists often require only one of these, particularly when developing pharmaceuticals. Since the year 2000, organocatalysis has advanced at an incredible rate. Benjamin List and David MacMillan continue to be pioneers in the area, demonstrating that organic catalysts may be utilized to drive a wide range of chemical processes. Researchers may now more effectively create everything from novel medicine to compounds that can capture light in solar cells using these processes. this remarks Organocatalysts to be the most value to humanity.

LEAD OPTIMIZATION IN DRUG DISCOVERY

Lead optimization is a 4-step process used in drug discoveries.

The main steps in lead optimization are:

1. TARGET IDENTIFICATION AND VALIDATION OR SCREENING

A drug target is a molecular structure that, when modulated with a drug, leads to the desired therapeutic effect in a disease state. The process begins with identifying the function of a possible therapeutic target(gene/protein) and its role in the disease. This process can be done by various approaches, including affinity chromatography, expression cloning, etc. After the identification, it must be validated. Validation is a long and stepwise process that employs both in vitro and in vivo models mimicking the desired target in diseased patients. This aims to ensure proof-of-concept and feasibility of the target in the desired therapeutic area.

Approaches:

• Genetic manipulation of target genes(in vitro)
-Knocking down/out/in the gene
• Antibodies
-Interacting with the target with high affinity and blocking further instructions
• Chemical genomics
-Chemical approaches against genome encoding protein

2. LEAD DISCOVERY

A hit compound is a lead compound that shows the desired type of activity in a compound screen. The main motive is to identify molecules that interact with the drug target.

Approaches:

• High through put screening
- Screening of the entire compound library against the drug target
• Knowledge based screening
-selecting from the chemical library smaller subsets of molecules with potential activity at the target protein
• Fragment Screening
-making very small molecular weight compound libraries which are screened at high concentrations

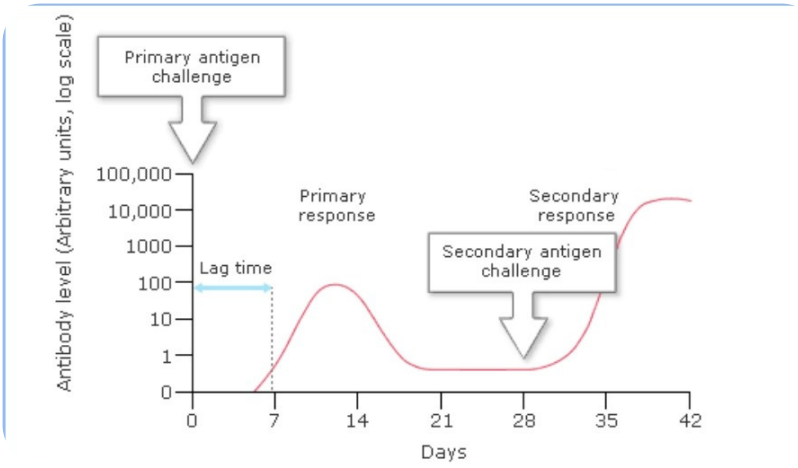
3. LEAD OPTIMIZATION

As the final stage in the preclinical drug discovery process, the main goal of the lead optimization phase is to maintain the desired properties of the drug's main components. Identified lead molecules are used as the starting point for detailed chemical modifications in order to further improve their target specificity and selectivity and their pharmacokinetic and safety profiles while maintaining the favorable properties of the lead compounds. If necessary, the chemical structures of the lead compounds identified during this stage can be altered to improve their selectivity and specificity towards a given target. For example, lead optimization in drug metabolism studies typically involves both in vitro and in vivo assays that assess the drug metabolism and pharmacokinetic (DMPK) properties. Once the properties of the optimized lead molecule, are acceptable, the lead optimization phase results in a candidate drug that may be either a small molecule or a biological product.

By the time you feel thirsty, you've already lost about 1% of your body's water.

WHAT IS PHARMACOLOGY?

PHARMACOLOGY IS THE STUDY OF DRUGS INCLUDING THEIR ORIGINS, HISTORY, USES, AND PROPERTIES. IT MAINLY FOCUSES ON THE ACTIONS OF DRUGS ON THE BODY. THE WORD PHARMACOLOGY COMES FROM THE GREEK WORDS PHARMAKOS, MEANING MEDICINE OR DRUG, AND LOGOS, MEANING STUDY.



DRUG AND THEIR EFFECTS ON BODY

Have you ever wondered what drugs are and how they react with our bodies? A drug is a chemical substance that affects the physiological processes of the body.

It is necessary for Pharmacologists to know how chemical molecules will interact with the body after we swallow a pill or the doctor offers America associate injection. If the compound isn't of the proper size or form, it's going to not act the means we would like it to and might even worsen our case. Think of the drug as a key, after we need the key to acting, wish to unlock a knob; we want to style that key to be of a selected size, shape, and composition. By composition, I mean that the key may well be of the proper size and form, however, if it's created out of a chunk of printer paper, does one suppose that may unlock the door? No! You need a special chemical composition, a gilded one to open the door. When a drug is meant, we want it to own a chemical structure that may act because of the body that features being absorbed by the body and latching onto a receptor on a cell so that the cell is signaled to perform or stop acting.

A DRUG AND DIFFERENT MEDICINES

Pharmacology is going a long way from fact to - understanding how a chemical can affect the body. It is likewise concerning how chemical substances can have an effect on different chemicals once goes within the body. Let me give you a clear-cut example. There is a drug known as Carafate, additionally known as sucralfate. It is a type of sucrose sulfate-aluminum complex, for the chemistry geeks out there.

Sucralfate is hired to shield the GI tract once a doctor suspects a patient has an ulcer. An ulcer is quite simply an illness inside the lining of the gastrointestinal tract, in this situation.

Sucralfate is swallowed by the patient as a slurry or a pill. The aspect is through its mechanism of action (the way it works in the body), it also prohibits many other drugs from either being properly absorbed or activated when swallowed. It's similar to how a windbreaker stops the wind from getting through, except in this case it's a drug that stops other drugs from getting into the body or doing what they're supposed to.

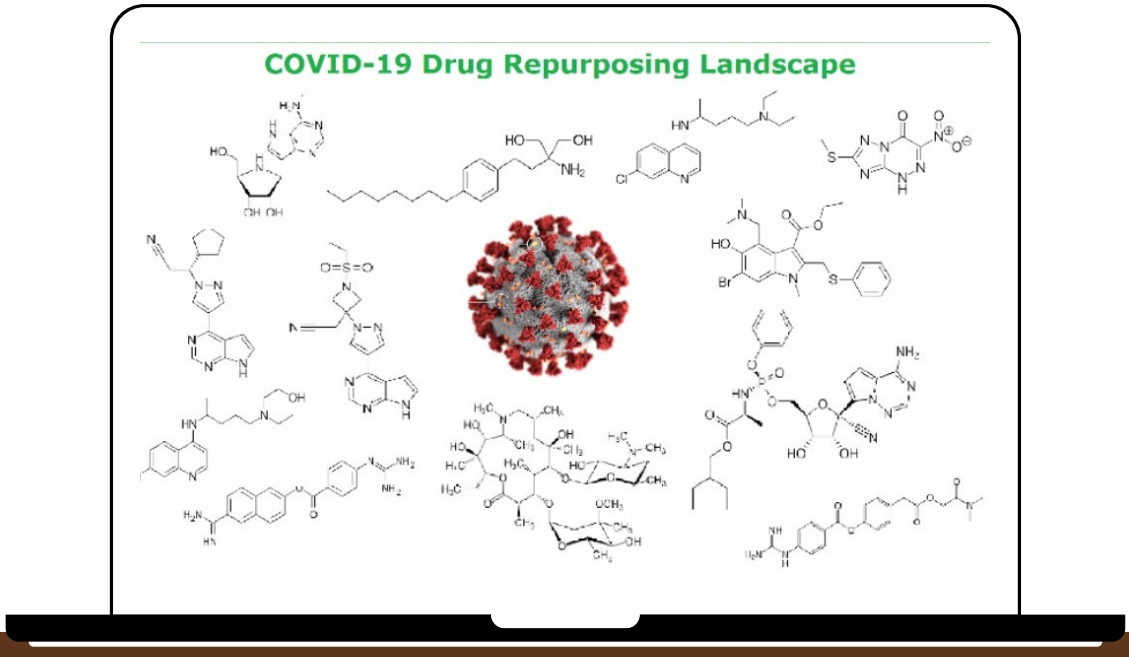
HOW DOES A VACCINE WORKS?

The vaccine works through the mechanism of the secondary response of immunity. When the body encounters any pathogens for the first time the response generated is primary in which the antigen-presenting cells present the antigenic epitope on their surface to T cell and various cytokines and mediators are released but this process takes time and is slow whereas the second exposure of the same pathogen or its part will take less time as well as abruptly explosive and very effective.

USE OF CHEMISTRY IN CONQUERING THE COVID-19

The COVID-19 pandemic has seen scientists perform unimaginable feats in an exceedingly short quantity of your time, from developing tests to new varieties of vaccines. Despite these victories, specialists' square measure still operates to develop a good medicinal drug to kill the SARS-CoV-2 virus. a canopy story in Chemical & Engineering News, the weekly newsmagazine of the Yankee Chemical Society, details the challenges of and progress toward making a drug that might facilitate the globe conquer COVID-19.

Creating a replacement antiviral may be a difficult business. Viruses change and replicate quickly, and their structures take issue greatly even at intervals identical category, writes Senior Editor Laura Howes. Most antivirals have to be compelled to target a particular microorganism supermolecule to be effective, which means that every virus usually needs its drug to treat it. Another challenge is proving that the drug works, 1st in cells and animals, then humans. And whereas diseases like HIV, AIDS, and viral hepatitis have LED to new advances in antiviral development, there's less of a marketplace for different acute microorganism infections due to value and wish. The present pandemic has created a way of urgency in making new antivirals; however, progress continues to be comparatively slow compared with different developments, like testing and vaccines.



RAHUL KUMAR AND MOHAMMAD ANAS QURESHI
B.SC. (H) CHEMISTRY, II YEAR

Major Breakthrough in Drugs

"CURIOSITY IS MORE IMPORTANT THAN KNOWLEDGE" - ALBERT EINSTEIN

Smallpox vaccine 1796

Discovered by- *Sir Edward Jenner*

The smallpox vaccine was the first vaccine to be developed against a contagious disease. It causes almost five million deaths every year. With the development of this vaccine, smallpox was eradicated in 1980.

Aspirin 1897

Discovered by- *Sir Felix Hoffman*

Before the discovery of man-made insulin, it was extracted from animals. It regulates the metabolism of carbohydrates, fats, and protein by promoting the absorption of glucose from the blood into the liver, fat, and skeletal muscle cells.

Insulin 1921

Discovered by-Sir Frederick G Banting (pictured), Charles H Best and JJR Macleod

This hormone is synthesized naturally inside the human body. One of the twentieth century's greatest medical discoveries, it remains the only effective treatment for people with diabetes.

Penicillin 1928

Discovered by- *Sir Alexander Fleming*

Penicillin is a group of antibacterial drugs that attack a wide range of bacteria. The discovery and manufacture of penicillin have changed the face of medicine, as these drugs have saved millions of lives.

Chlorpromazine 1951

Discovered by- *Sir Paul Charpentier*

The world's first antipsychotic pill was life-changing for schizophrenia patients. Other uses include the treatment of the bipolar disorder, severe behavioral problems in children including those with attention deficit hyperactivity disorder, nausea, and vomiting, anxiety before surgery.

Lipitor (Atorvastatin) 1985

Discovered by- *Bruce Roth*

Atorvastatin is a statin medication used to prevent cardiovascular disease in those at high risk and to treat abnormal lipid levels. It has become the world's top-selling statin within 3 years of release.

Saquinavir 1987

Discovered by- *Swiss Company Roche*

Antiviral treatment for HIV & AIDS, it had an important role in multi-drug combination therapy known as highly active antiretroviral therapy (HAART) and increased life expectancy of HIV patients.

Prozac (Fluoxetine) 1988

Discovered by- *Ray Fuller, David Wong, and Bryan Molloy.*

Fluoxetine is a selective serotonin reuptake inhibitor (SSRI) antidepressant. Fluoxetine inhibits the uptake of serotonin by nerve cells (neurons) and helps people with depression, panic, anxiety, or obsessive-compulsive symptoms by-95.

Meet the Staff

Teaching

First-row-left to right: Dr. Akanksha Gupta, Dr. Komal Agarwal, Dr. Aditi Gupta, Dr. Shikha Gulati, Dr. Vinita Kapoor, Dr. Sharda Pasricha, Dr.Vibha Saxena, Dr.Sanjay Kumar, Dr. Mercy Kutty Jacob, Mr. H.C.Tandon, Dr. Pragya Gahlot, Dr. Rekha Yadav, Dr. Deepti Sharma, Ms. Laishram Saya Devi, Dr. Shefali Shukla, Dr. Pooja, Second-row-left to right: Dr. Rangarajan T. M., Mr. Harsh Vardhan Meena, Dr. Devendra Kumar Verma, Dr. Chandra Sekhar Tekuri, Dr. Manoj Trivedi, Dr. Balendra

Non-Teaching

Left to right- Mr. M. Venkatpathi Rao, Mr. K. Vijay Kumar, Mr. Vinod Kumar, Mr. M. P. Yadav, Mr. Anil Kumar, Mr. U. N. Prasad, Mr. K. Ch. Adinarayana, Mr. K. Vasantha Rao, Mr. Neeraj Kumar, Ms. Anjna Bansal, Mr. B. Ramachandra Rao, Mr. Shitla Prasad Kashyap, Mr. M. Venkateshwara Rao

Students' Achievement

Batch 2018 -2021

Ayush Mongia

B.Sc.(H) Chemistry 3rd year

Recipient of Erasmus Mundus Scholarship for joint Master's degree in Chemical Nano Engineering at France, Poland and Italy.

Himanshi

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 13

Tanmay

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 53

Ashtha Kocchar

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 355

Monika

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 300

Akansha

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 128

Himanshu Kumar

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 121

Shubhi Dwivedi

B.Sc.(H) Chemistry 3rd year

IIT JAM AIR- 382

Batch 2019-2022

Chahat Dhawan

B.Sc.(H) Chemistry 3rd year

Got Placed at UpGrad (Noida), President of Spirit of Youth Foundation (NGO)-2021.

Aryan Arora

B.Sc.(H) Chemistry 3rd year

Got the best oral presentation in the International Conference for Soil Contamination Research under the theme 'Empowering academics through innovative research'

Shivanshu Verma

B.Sc.(H) Chemistry 3rd year

President of Sprit of Youth Foundation (NGO)-2022.

Kartika Goyal

B.Sc.(H) Chemistry 3rd year

intern in Quality Control at Indian Herb Specialties Pvt. Ltd. (Saharanpur).

Teachers' Achievement

Book Chapters

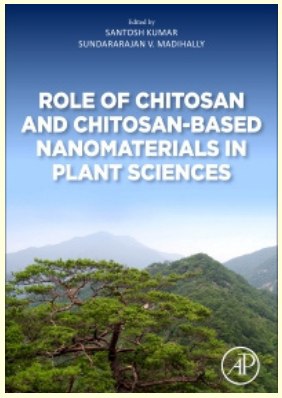
Prof. Sanjay Batra: 10 chapters

Dr. Shefali Shukla: 02 chapters

Dr. Shikha Gulati: 10 chapters

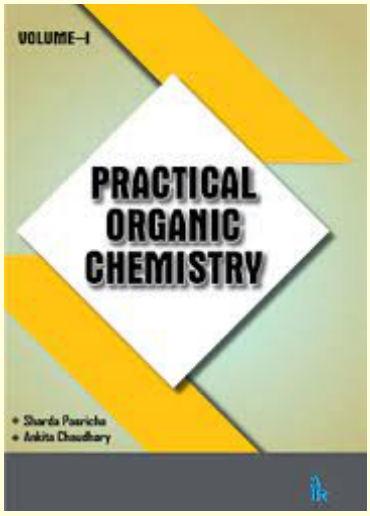
Dr. Manoj Trivedi: 2 chapters

Ms. Laishram Saya Devi: 1 chapter

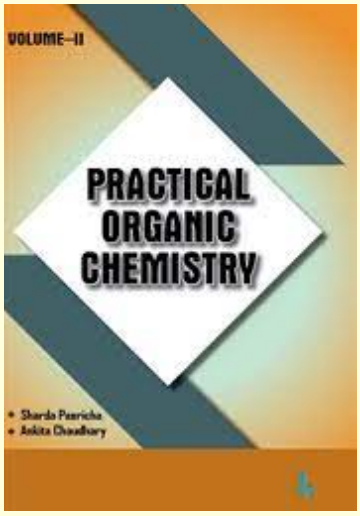


Dr. Devendra Kumar Verma: 01 chapter

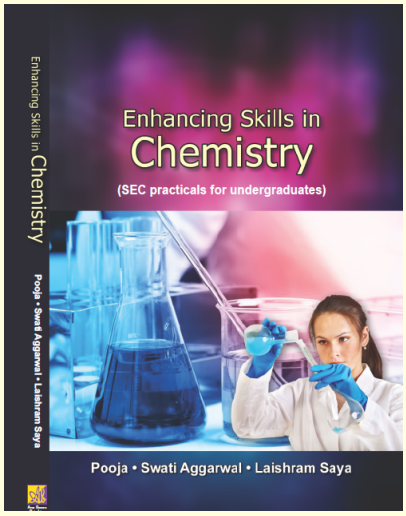
Books Authored



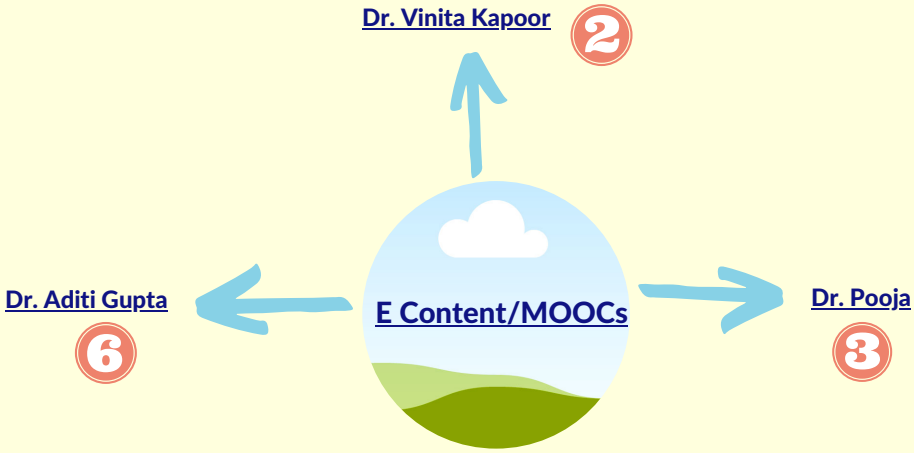
Dr. Sharda Pasricha



Dr. Sharda Pasricha

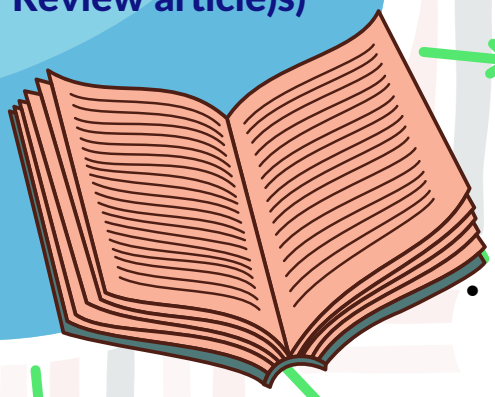


Dr. Pooja
Ms. Laishram Saya Devi



Publications

(Research article/ Review article)s)



- Prof. Sanjay Kumar — 2
- Dr. Sharda Pasricha — 3
- Dr. Shefali Shukla — 2
- Dr. Aditi Gupta — 1
- Dr. Shikha Gulati — 1
- Dr. Balendra — 4
- Dr. Pooja — 1
- Dr. Komal Agarwal — 1
- Ms. Laishram Saya Devi — 5
- Dr. Akanksha Gupta — 3
- Dr. Manoj Trivedi — 5
- Dr. Rangarajan T. M. — 7
- Dr. Devendra Kumar Verma — 4

THE CHEMICAL SOCIETY

Prof. Sanjay Kumar

The Chemical Society is the most dynamic and vibrant wing of the Chemistry Department hosting several extracurricular activities such as seminars, lectures, workshops, industrial visits, trips, etc. throughout the year with an aim to provide students with an ideal platform for getting exposure to the latest developments and challenges in the field of chemistry and its related sciences. Such activities not only provide an opportunity for enhancing the bonding between the students and teachers apart from the normal teaching-learning curriculum but also serve as a platform for developing their social skills, boosting their self-confidence, and building leadership skills in students, all while having fun.

Even during the critical time of the pandemic, the Society has remained active with a number of online activities like lecture series (webinars), alumni interaction sessions, career counseling sessions, competitions, workshops, etc to enlighten the young minds.

The Chemical Society organizes various lectures by eminent scientists, opening with Dr. V. Krishnamoorthy Memorial lecture annually where several eminent personalities are invited to deliver talks. This year, on 15th September 2021, a lecture was delivered on “Chemical Entities in Modern Medicine” by Dr. Anil Kumar Mishra, Director, Institute of Nuclear Medicine and Allied Science (INMAS) DRDO. The program was chaired by Dr. A. Shankara Reddy, Padma Shree awardee and former Principal, Sri Venkateshwara College. Nanotechnology is one of the most promising technologies of this era that holds prominent potential in various aspects. In this milieu, an interesting and thought-provoking webinar on the topic “Nanomedicine: Advances, Opportunities, and Challenges” was held on April 20, 2021, in which Professor Mark T. Swihart, a renowned scientist at the State University of New York at Buffalo in the United States of America, enlightened the students with the importance of Nanomedicine in modern science and its potential applications. In order to inculcate students with the interest and importance of research in today’s world and how it affects everyday life, the chemical society also organized a much-needed webinar on "Research: The Need of the Hour" on August 2, 2021, by Dr. S. K. Varshney, an advisor and head of the DST's International Cooperation Division. In continuation to the talks on nanotechnology, a webinar on “Nanotechnology to Combat Climate Change for a Clean, Green, Resilient World” was organized on 27th August 2021. Prof. Vivek Polshettiwar of the Tata Institute of Fundamental Research (TIFR) in Mumbai spoke about the concepts of DNFS and DFNS, Black gold, and how nanotechnology can combat climate change.

A skill enhancement workshop entitled “Drawing, analyzing & computational skills: scientific softwares for education, research & publication” was held on 7-8th October 2021 which was aimed at imparting computational skills on the use of various scientific softwares that are essential for students or researchers to pursue a career in scientific research. In addition, to foster the creativity of UG students in scientific areas, a virtual animated intercollege doodle challenge competition on the theme "Green Innovations in Nanotechnology" was organized for which the winners were awarded with exciting prizes on 5th September 2021.

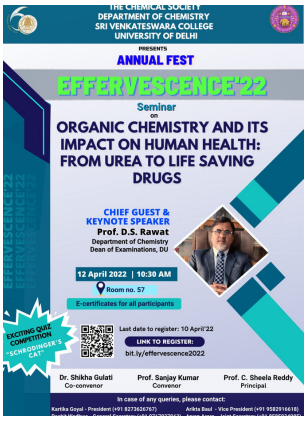
EFFERVESCENCE'22

The Chemical Society, Department of Chemistry, Sri Venkateswara College organized “Effervescence 2022”- The Annual Fest of the Chemistry Department. The event was graced by honorable Prof. D.S. Rawat, Professor and Dean of Examinations, University of Delhi, who delivered a talk on “Organic chemistry and its impact on human health: From urea to life-saving drugs.” The lecture was followed by an Intercollege quiz competition, which had participation not only from our college but also from many other colleges across Delhi University

ORGANIC CHEMISTRY AND ITS IMPACT ON HUMAN HEALTH: FROM UREA TO LIFE SAVING DRUGS

Prof. D. S. Rawat, Department of Chemistry, started his lecture with some interesting historic incidents and observations which lead to the development of molecules with medicinal importance. He presented to students how the medication is manufactured in the laboratory and how it reaches the market after passing through the various phases, in a very easy manner. In the lecture, Prof. also stressed upon how the functionality of the molecules and the importance of isomerism could drastically affect the working of drug molecules in the treatment of diseases. More than 100 undergraduate students attended the lecture and actively interacted with him. Students were astounded to learn about the various developmental stages of a drug molecule and its journey from the lab to the shelves.

The lecture was highly informative and thought-provoking which enlightened the students about the scope and jobs opportunity in the field of medicinal and therapeutic chemistry and had given them an insight about how mankind had come so far in medicinal production

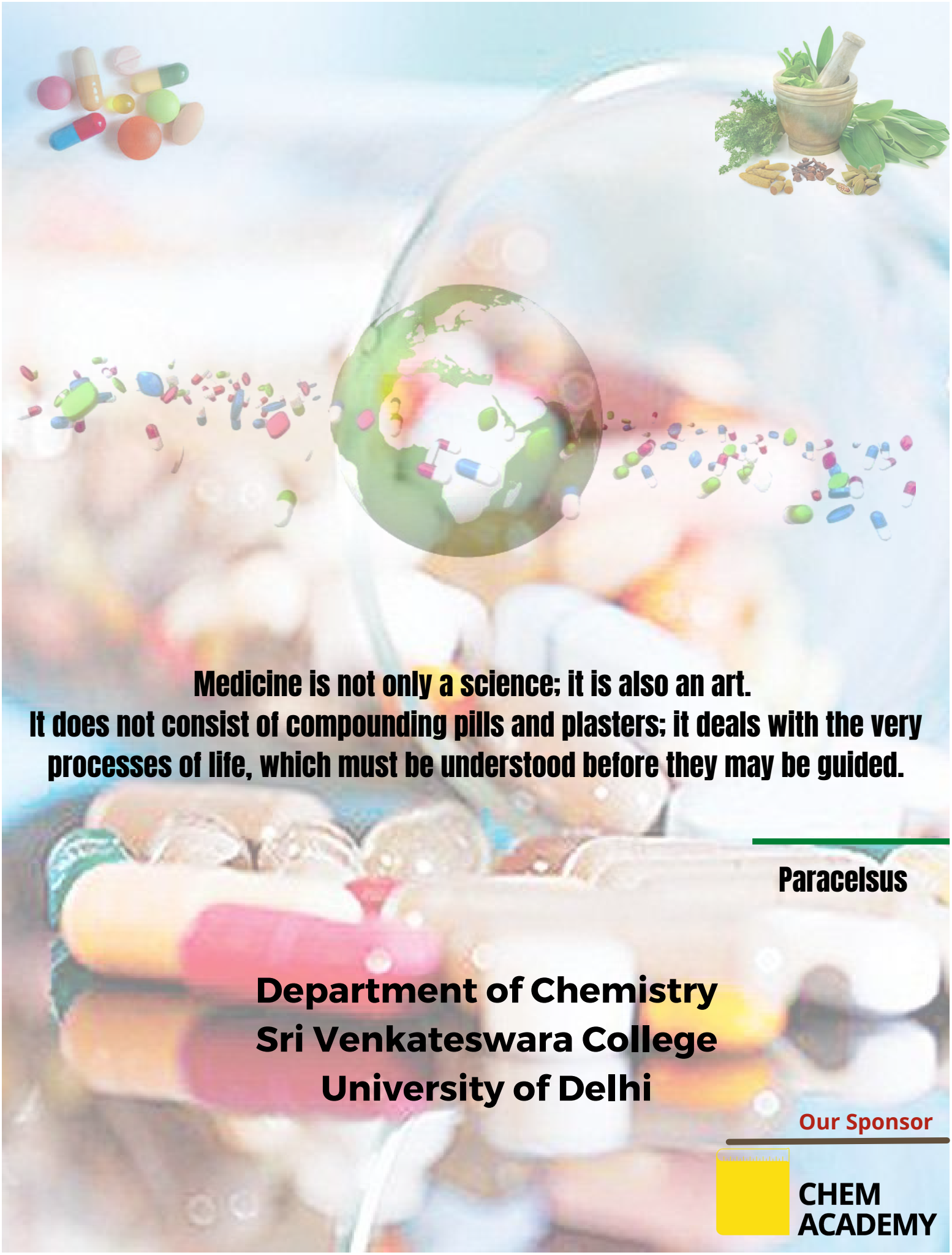


“The art of medicine consists of amusing the patient while nature cures the disease.”

— Voltaire

Freshers

4TH MARCH 2022



Medicine is not only a science; it is also an art.
It does not consist of compounding pills and plasters; it deals with the very processes of life, which must be understood before they may be guided.

Paracelsus

Department of Chemistry
Sri Venkateswara College
University of Delhi

Our Sponsor

CHEM ACADEMY