ABHIGYA

ANNUAL DEPARTMENTAL MAGAZINE

2024-25

NANOCHEMISTRY

A REVOLUTION IN MEDICINAL ADVANCEMENTS



DEPARTMENT OF CHEMISTRY

SRI VENKATESWARA COLLEGE

UNIVERSITY OF DELHI

ABOUT THE THEME

In the current edition of "Abhigya", we organised the magazine on the Theme of the dynamically evolving field of "Nanochemistry and its Technology" in medicinal applications that are advancing the medical field in several aspects. Since the field impacts all areas of science and technology, it's our responsibility to introduce such a new, swiftly growing field to students to make them aware and kindle the interest of young minds who will become the upcoming scientists of the era to lead the scientific world to a better life. The implications of nanotechnology on medicine, including drug delivery systems and modern diagnostics, are focused on in the magazine, and students put their contribution with an immense effort.

This issue contains an engaging yet informative breakdown of some complex concepts of nanochemistry, further refining the art of science communication for students. Learn how cancer treatment is bolstered with the use of nanoparticles, how early detection of disease is made possible with the use of nanosensors, and how materials at the nanoscale assist in tissue regeneration. We also discuss ethical and safety implications of nanomedicine, which is a step towards responsible innovation.

We intend to open young chemists' minds with stories of groundbreaking research, with the hope that they will consider the prospects of nanochemistry. Incorporating these advancements in education will help us prepare for a world where medicine will be accurate, individualised, and efficient.

Let's look to the nanoscale to discover new frontiers of healing and innovation.

ABHIGYA

2024 - 25

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PRINCIPAL'S DESK



I am pleased to see the Department of Chemistry continuing its tradition of publishing the annual magazine ABHIGYA. The 2024–2025 edition, themed "Nanochemistry: A Revolution in Medical Advancements," focuses on a field that holds immense promise for the future of healthcare.

Nanochemistry is transforming the way we diagnose, treat, and prevent diseases, making it a highly relevant and timely topic. Each year, the department thoughtfully selects a theme that reflects some of the most pressing needs and advancements in the scientific world, encouraging students to engage with real-world challenges through academic exploration.

Over the years, ABHIGYA has grown into a valuable platform for students to showcase their scientific curiosity, creativity, and passion. This magazine not only reflects their dedication but also highlights the Department's commitment to nurturing young minds.

I extend my heartfelt congratulations to the faculty, editorial team, and student contributors for their collective efforts in bringing out this insightful and engaging edition.

Good Luck!

Prof. V.Ravi

CONVENOR'S DESK



Dear Readers,

It is with great pleasure that I present to you the latest edition of our Chemistry Department magazine, ABHIGYA, themed "Nanochemistry: A Revolution in Medical Advancements." This issue explores one of the most exciting areas of science, where chemistry at the nanoscale is redefining the future of medicine. The combination of chemistry and nanotechnology has emerged as a powerful tool in tackling some of the most pressing challenges in today's healthcare system.

Through a collection of student-contributed articles and insightful research highlights, this edition aims to showcase the remarkable innovations and ongoing breakthroughs in the field. Through this issue, our goal is to spark curiosity and inspire young minds to explore the vast possibilities that nanochemistry holds for the future of medical science.

I would like to express my heartfelt gratitude to our respected Principal for his constant encouragement and support. A sincere thanks to the dedicated editorial team, whose creativity and hard work have brought this vision to life. I also extend warm appreciation to our talented student contributors, whose articles, illustrations, and insights have added great value and vibrancy to this issue.

We hope this edition ignites scientific curiosity, encourages exploration, and deepens your appreciation for the transformative role nanochemistry plays in advancing modern medicine.

Happy reading!

Dr. Shefali Shukla

EDITORS' NOTE



MUSKAN VERMA, PREETI
(EDITORS)
B.SC. (H) CHEMISTRY, III YEAR

Abhigya's journey started with one common passion—discovering the marvels of chemistry and stirring curiosity. We explore this year a theme right at the center of scientific revolutions:

"NANOCHEMISTRY: A REVOLUTION IN MEDICINAL ADVANCEMENTS."

From dreaming up the design to writing perceptive, this magazine is a testament to tireless collaboration. Students, teachers, and mentors came together to simplify the microscopic universe of nanochemistry, where molecules and atoms are the solutions to revolutionary medical breakthroughs. Learn here how nanoparticles seek out diseases with precision, how nanosensors transform diagnostics, and how nanomaterials open the door to regenerative medicine.

This volume is more than an anthology of articles; it is a witness to our shared commitment to scientific advancement. We offer our sincerest appreciation to each contributor and mentor who helped make this possible.

As you flip through these pages, we hope to kindle not only comprehension but also a sense of duty—to use nanochemistry responsibly and advance the frontiers of medicine. Together, let us celebrate the small breakthroughs that can deliver giant leaps for humankind.

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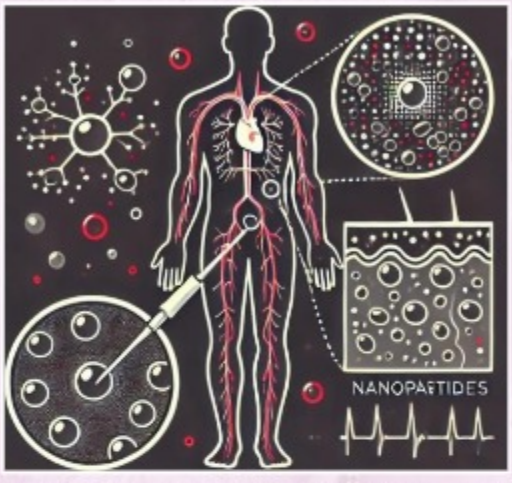
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NANOTECHNOLOGY IN BIOMEDICAL IMAGING

Pahi Talukdar, B.Sc. (H) Chemistry, II Year

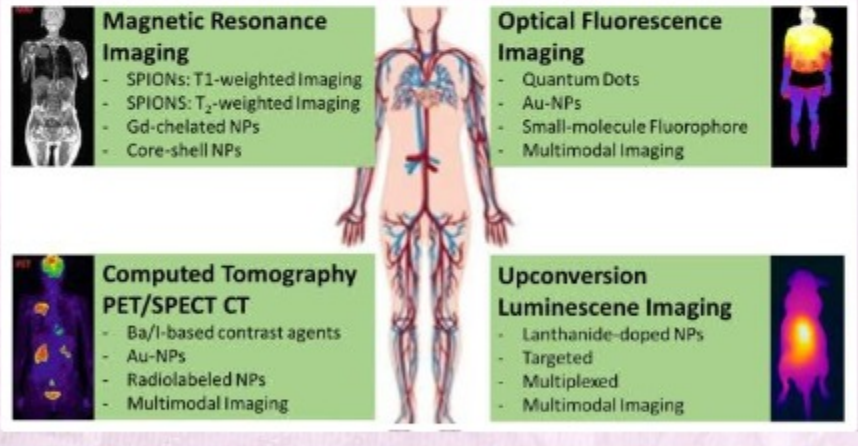
Introduction



Nanotechnology enables early disease detection by enhancing imaging techniques and improving contrast agents. It has revolutionized biomedical imaging by also improving resolution, and specificity in diagnosing diseases at the molecular and cellular levels. At the intersection of engineering, chemistry, and biology, nanotechnology leverages materials at the nanoscale—typically between 1 and 100 nanometers—to enhance imaging techniques with greater precision, sensitivity, and specificity It enables early detection, real-time monitoring, and targeted imaging of diseases like cancer, neurodegenerative disorders, and cardiovascular conditions. Conventional imaging modalities such as magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography (PET), and optical imaging have significantly contributed to medical diagnostics. This introduction sets the stage for exploring the transformative role of nanotechnology in biomedical imaging, highlighting its impact on modern medicine and the future possibilities it holds for personalized health.

The types of Nanoparticles used in Imaging are Quantum Dots (QDs), Gold Nanoparticles (AuNPs), Iron Oxide Nanoparticles (IONPs), Carbon Nanotubes (CNTs) & Graphene, Silica Nanoparticles.

Applications in Imaging Techniques:



- Magnetic Resonance Imaging (MRI): Nanoparticle-Based Contrast Agents like Iron oxide and gadolinium-based nanoparticles enhance contrast in MRI scans, improving visualization of tumours, inflammation, and neurological disorders like Alzheimer's disease. The targeted Imaging is Functionalized nanoparticles that can bind to specific biomarkers, enhancing diagnostic accuracy.
- Computed Tomography (CT): Gold and Bismuth Nanoparticles are those which enhance X-ray absorption, providing better contrast in CT scans for detecting tumours, vascular abnormalities, and infections. Longer Circulation Time: Nanoparticles can remain in the bloodstream longer, improving imaging of dynamic processes like blood flow.

- Fluorescence & Optical Imaging: Semiconductor nanoparticles provide stable, bright fluorescence for tracking molecules and cells in real-time. Silica nanoparticles are used as carriers for fluorescent dyes to enhance imaging of tumours and infections.

Advantages of Nanotechnology in Imaging

1. Higher Sensitivity & Resolution: Allows early disease detection.
2. Multimodal Imaging: Combines MRI, PET, CT, and fluorescence for comprehensive diagnostics. Targeted Imaging: Functionalized nanoparticles can bind specifically to biomarkers.
3. Minimized Toxicity: Surface modifications improve biocompatibility.

Challenges & Future Directions

1. Toxicity & Biocompatibility: Long-term effects of nanoparticles in the body need further study.
2. Regulatory Approval: FDA and other agencies require extensive safety testing.
3. Cost & Scalability: Large-scale production of nanoparticles is challenging.

In conclusion, Nanotechnology has significantly improved biomedical imaging, enabling early diagnosis, higher precision, and multimodal imaging. Furthermore, multimodal imaging has emerged as a powerful approach, combining two or more imaging techniques within a single nanoparticle system. This allows for a more comprehensive assessment of diseases, providing complementary information that enhances diagnostic precision. With ongoing advancements, nanotechnology in imaging is expected to integrate further with artificial intelligence (AI), machine learning, and big data analytics, enabling automated image interpretation and precision diagnostics. These developments will revolutionize personalized medicine, leading to faster, more accurate diagnoses and tailored treatment plans for patients.

In summary, nanotechnology has transformed biomedical imaging from a conventional diagnostic tool into an advanced, multifunctional system capable of early disease detection, real-time monitoring, and targeted therapy. As research and innovation continue, nanotechnology-based imaging will play a pivotal role in shaping the future of precision medicine and healthcare.

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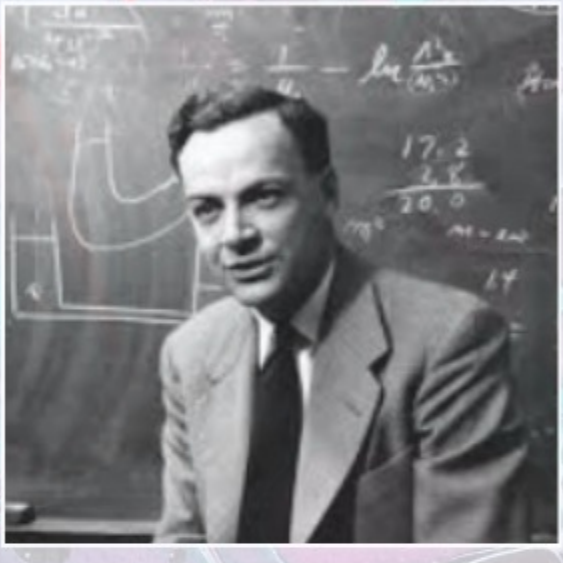
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NANOTECHNOLOGY IN DENTISTRY
THE FUTURE OF ORAL HEALTHCARE

Manpreet Singh Heer, B.Sc. (H) Chemistry, I year

Introduction:

In 1959, physicist Richard P. Feynman famously stated, "This is a development which I think cannot be avoided," referring to nanotechnology. More than six decades later, his vision is becoming a reality, particularly in the field of dentistry. The term 'nano' originates from the Greek word nanos, meaning 'dwarf,' and refers to structures as small as 10^{-9} meters—essentially working at the atomic and molecular levels. Today, dental research is harnessing nanotechnology to create advanced materials, ultra-precise treatments, and innovative diagnostic tools that could transform oral healthcare.

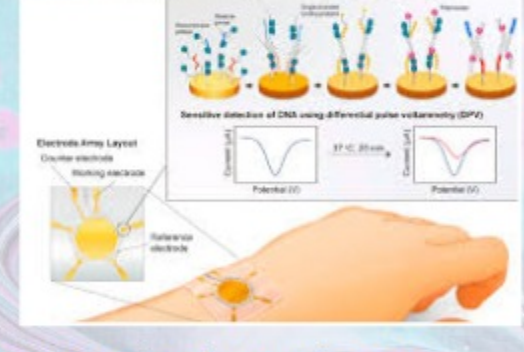


Revolutionary Nanotech Products in Dentistry Nano Aluminum Oxide Fibers and Filtration Systems

Nanostructured aluminium oxide fibres contain hydroxyl groups that generate a positive charge in water, allowing them to attract and filter out negatively charged bacteria, viruses, and organic/inorganic colloids. This property makes them highly effective in water purification, sterilization, and even dental instrument sanitation.

POSS (Polyhedral Oligomeric Silsesquioxane) in Dental Adhesives

POSS-based materials combine organic and inorganic properties, making them lightweight, durable, heat-resistant, and eco-friendly. Currently used in dental adhesives, POSS enhances bond strength between restorative materials and teeth.



Nanotechnology-based NEMS biosensors: Nanotechnology in Diagnosing Oral Cancer

These ultra-sensitive sensors detect single molecules of biomarkers, converting biochemical signals into electrical signals for rapid analysis. One application is the Oral Fluid NanoSensor Test (OFNASET), which enables early detection of oral cancer.

Oral Healthcare: A Nanotech Revolution - Conclusion & Future advancements

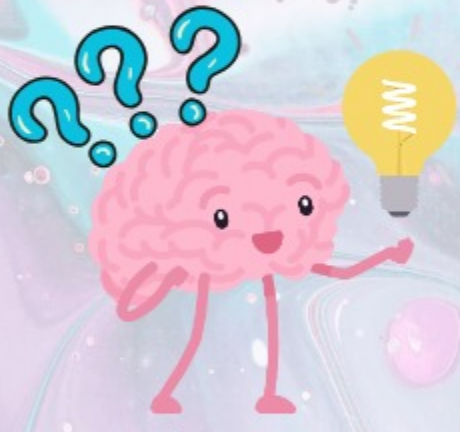
The integration of nanorobotics, advanced nanomaterials, and bioengineered restorative solutions will create a new era of personalized and minimally invasive dental care.

As dental technology evolves, the role of dentists will shift to meet the demands of precision and high-tech treatments. Nanotechnology is poised to redefine dentistry, offering groundbreaking solutions in diagnostics, treatment, and preventive care. From smart nanorobots to advanced biomaterials, these innovations promise a future where dental procedures are more effective, less invasive, and pain free.

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Who am I?



1. I'm a substance that change a color & indicate the pH. What am I?
2. I'm the only letter that doesn't appear in periodic table. What am I?
3. I'm most common isotope of hydrogen. What am I?

DID YOU KNOW?

Just like how a robot might use a camera or radar, nanorobots can be equipped with sensors that allow them to detect cancer cells in your body. These sensors can identify specific biomarkers of cancer, giving the nanobots x-ray vision for the disease.

Answers: 1.Indicator 2. J 3. Protium

NANOROBOTS IN SURGERY

REVOLUTIONIZING PRECISION WITH ETHICAL AND SAFETY CONSIDERATIONS IN MEDICAL NANOTECHNOLOGY

Bhumika Singh, B.SC. (H) Chemistry, III year

Introduction

The fusion of nanotechnology and medicine has ushered in a new era of surgical precision with the advent of nanorobots—microscopic machines designed to navigate the human body and perform intricate medical tasks. These nanorobots promise groundbreaking advancements in minimally invasive surgery, targeted drug delivery, and real-time diagnostics. However, alongside their potential, ethical and safety concerns must be addressed to ensure their responsible deployment.

Nanorobots with a size typically ranging from 1 to 100 nanometers are engineered to perform highly specialised medical functions. These include:

Precision Surgery: Nanorobots can operate with unmatched accuracy, repairing tissues at a cellular level and eliminating the need for large incisions.

Targeted Drug Delivery: Instead of systemic drug administration, nanorobots can transport medications directly to diseased cells, minimizing side effects and maximizing efficacy.

Clot and Tumour Removal: These tiny machines can dissolve blood clots or destroy tumours in hard-to-reach areas, reducing complications.

Real-Time Monitoring: Nanorobots equipped with sensors can monitor body functions, detect infections, and relay vital data to doctors.

Breakthrough Technologies Powering Nanorobots

Nanorobots are developed using cutting-edge materials like DNA origami, graphene, and biocompatible metals. Some of the most advanced nanorobotic systems include:-

- **DNA Nanobots:** These self-assembling nanorobots can deliver drugs and even trigger cell death in cancer cells.
- **Magnetically Controlled Nanobots:** These are directed using external magnetic fields to reach precise locations in the body.
- **Biohybrid Nanorobots:** Combining synthetic materials with biological components, these bots mimic natural biological processes for efficient movement and functionality.

Ethical Considerations in Medical Nanotechnology

As nanorobots enter the surgical realm, several ethical concerns arise:

- Patient Autonomy and Consent: How well can patients comprehend the risks and benefits of nanorobotic surgery? Transparent communication is essential.
- Privacy and Data Security: Nanorobots capable of real-time monitoring raise concerns about data privacy. Who has access to a patient's biological information?
- Equitable Access: Will these advanced treatments be accessible to all, or will they remain a luxury for the wealthy? Addressing disparities in healthcare access is crucial.
- Potential Misuse: Could nanorobots be exploited for unauthorized surveillance or unethical enhancements? Establishing strict regulations is necessary.

Safety Concerns and Challenges



Before nanorobots can be widely implemented, scientists must address several safety challenges:

- Biocompatibility: Ensuring that nanorobots do not trigger immune responses or toxicity in the body.
- Control and Retrieval: Developing fail-safe mechanisms to control and remove nanorobots after their task is completed.
- Long-Term Effects: Understanding the long-term impact of nanorobot interactions with human cells and tissues.
- Regulatory Approval: Medical agencies must establish rigorous testing and approval processes to ensure nanorobots meet safety standards.

The Future of Nanorobotic Surgery

Despite the challenges, nanorobots hold immense promise for revolutionizing surgery. Researchers are working on self-replicating nanorobots, AI-powered nanobots for autonomous diagnosis, and even nanoscale neural implants. As technology advances, collaboration between scientists, ethicists, and policymakers will be essential in ensuring that nanorobotics enhances medical care while prioritizing patient safety and ethical considerations

Conclusion

Nanorobots represent the next frontier in surgical precision, offering unparalleled benefits in targeted treatment and real-time diagnostics. However, their integration into healthcare must be guided by robust ethical and safety frameworks. If navigated responsibly, nanorobots could transform medicine, making once-impossible procedures a reality while ensuring fairness, security, and patient well-being.

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DID YOU KNOW?

Silver nanoparticles are not just shiny; they're also packed with potential in treating Parkinson's disease. These tiny silver particles can help protect neurons in the brain from the oxidative damage that's a hallmark of Parkinson's.

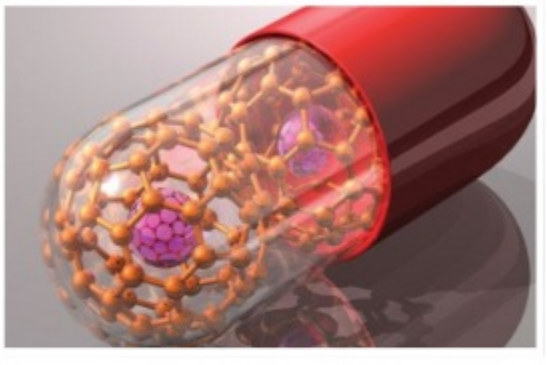
THE INVISIBLE REVOLUTION

HOW NANOSENSORS ARE CHANGING THE GAME IN EARLY DISEASE DETECTION

Akash, B. Sc. (H) Chemistry, I year

In modern medicine, something incredible is happening behind the scenes—on a scale so tiny it's almost unimaginable. This quiet revolution is being driven by nanosensors, microscopic devices made from materials like gold, silicon, and metal oxides. These tiny tools are paving the way for faster, more precise disease detection, potentially diagnosing illnesses before symptoms even appear. As chronic and infectious diseases continue to rise worldwide, nanotechnology offers an exciting solution: catching diseases early when they're most treatable.

How do Nanosensors work ?

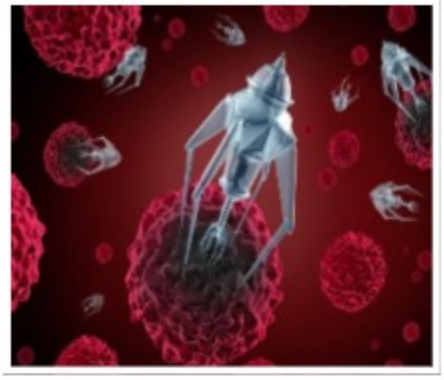


Nanosensors are designed to detect even the slightest biological, chemical, or physical changes in the body. Their small size and large surface area make them incredibly sensitive, allowing them to pick up disease markers that would otherwise go unnoticed. Gold nanoparticles (AuNPs) are highly stable and interact uniquely with light, making them ideal for detecting biomarkers. They can be coated with antibodies or DNA to specifically target molecules like cancer cells or viruses. Silicon, the backbone of modern electronics, is perfect for creating small, cost-effective sensors, with tiny silicon nanowires capable of detecting changes in electrical conductivity when a disease marker is present. Similarly, metal oxides such as zinc oxide and titanium dioxide respond to environmental changes like pH, temperature, and gas composition. For instance, zinc oxide nanowires can help identify compounds in breath that can indicate diseases like lung cancer, etc.

Real-World Applications of Nanosensors in Healthcare Nanosensors aren't just cool in theory —they're already making an impact across medicine. Nanosensors are revolutionizing early disease detection, offering precise and rapid diagnostics. In cancer detection, gold nanoparticles have enabled a urine test developed by MIT with 90% accuracy for early-stage colorectal cancer, while silicon nanowires in blood tests can track circulating tumour cells, providing real-time insights into cancer progression.

Similarly, for neurodegenerative diseases like Alzheimer's and Parkinson's, silicon nanowires have shown potential in detecting Alzheimer's biomarkers a decade before symptoms appear, and gold nanoparticles are being developed to identify early Parkinson's signs through specific proteins in the blood. The COVID-19 pandemic underscored the need for rapid infectious disease tests, leading to innovations like graphene oxide sensors that detect COVID-19 in under 10 minutes and gold nanoparticles capable of identifying multiple pathogens, including influenza, HIV, and hepatitis, in a single test. Nanosensors are also transforming chronic disease monitoring through wearable technology—silicon-based glucose sensors in patches offer a painless alternative for diabetes management, while gold nanoparticles in smartwatches can track early heart disease biomarkers, enabling proactive health interventions.

Hurdles in Nanotechnology



While nanosensors hold immense potential, several challenges must be addressed. Mass production remains expensive and technically complex, making widespread adoption difficult. Safety is another concern, as scientists must ensure these tiny devices do not trigger immune reactions. Regulatory approvals are also a hurdle, with only a few nanosensors receiving official clearance due to uncertainties about their long-term effects. Additionally, as nanosensors become more advanced and integrate with AI, patient data security and privacy will become critical issues requiring stringent safeguards.

Future of Nanosensors: A Promising Path

The future of nanosensors lies in their integration with AI, smartphones, and wearable technology, enabling real-time health monitoring and personalized medicine. Imagine an app that connects to a nanosensor patch, providing instant health updates, or AI-powered diagnostics that analyze nanosensor data to predict disease risks and recommend treatments. These sensors could also track a patient's response to medications, ensuring more tailored therapies. Startups like Nanox and Glympse Bio are already pioneering these innovations, pushing nanosensors toward revolutionizing healthcare, from early cancer detection to real-time disease tracking, in ways we are only beginning to imagine. Final thoughts on nanotechnology.

Nanotechnology is transforming healthcare by shifting the focus from treatment to prevention. Nanosensors have the potential to save millions of lives and lower healthcare costs through early disease detection. However, realizing this potential requires collaboration between scientists, doctors, and policymakers to address technical and ethical challenges.

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DID YOU KNOW?

Nanoparticles are so small they can be designed like jewelers, carefully building and shaping the scaffolds needed for tissue regeneration. These "nano-jewelers" can deliver drugs or materials in a way that helps your body rebuild tissue with precision.

NANOTECHNOLOGY IN ORTHOPEDIC IMPLANTS

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

Technological advancements continue to reshape various fields, leading to significant improvements in healthcare and education. One such breakthrough is the use of nanotechnology in orthopaedic implants, which enhances durability, promotes faster healing, and reduces the risk of infections [1]. Orthopaedic implants are commonly used in joint replacements, including hip and knee procedures. These replacements are essential for restoring mobility and improving the quality of life for patients suffering from degenerative bone diseases or injuries. However, traditional implants have faced challenges such as wear, infection risks, and poor integration with natural bone.

Nanomaterials are engineered at the atomic or molecular scale to enhance the surface properties of implants, improving biocompatibility, reducing infection rates, and increasing durability. Nanocoating on implant surfaces mimics the structure of natural bone, promoting stronger integration and faster healing. Silver or titanium dioxide nanoparticles help prevent bacterial infections, a major concern in orthopaedic surgery. Nano-enhanced materials reduce friction and wear, extending the lifespan of implants and minimizing the need for revision surgeries. Advanced nanotechnology enables implants to be equipped with sensors that monitor stress, strain, or early signs of infection, allowing for proactive medical intervention. This version improves readability while maintaining accuracy. [2]

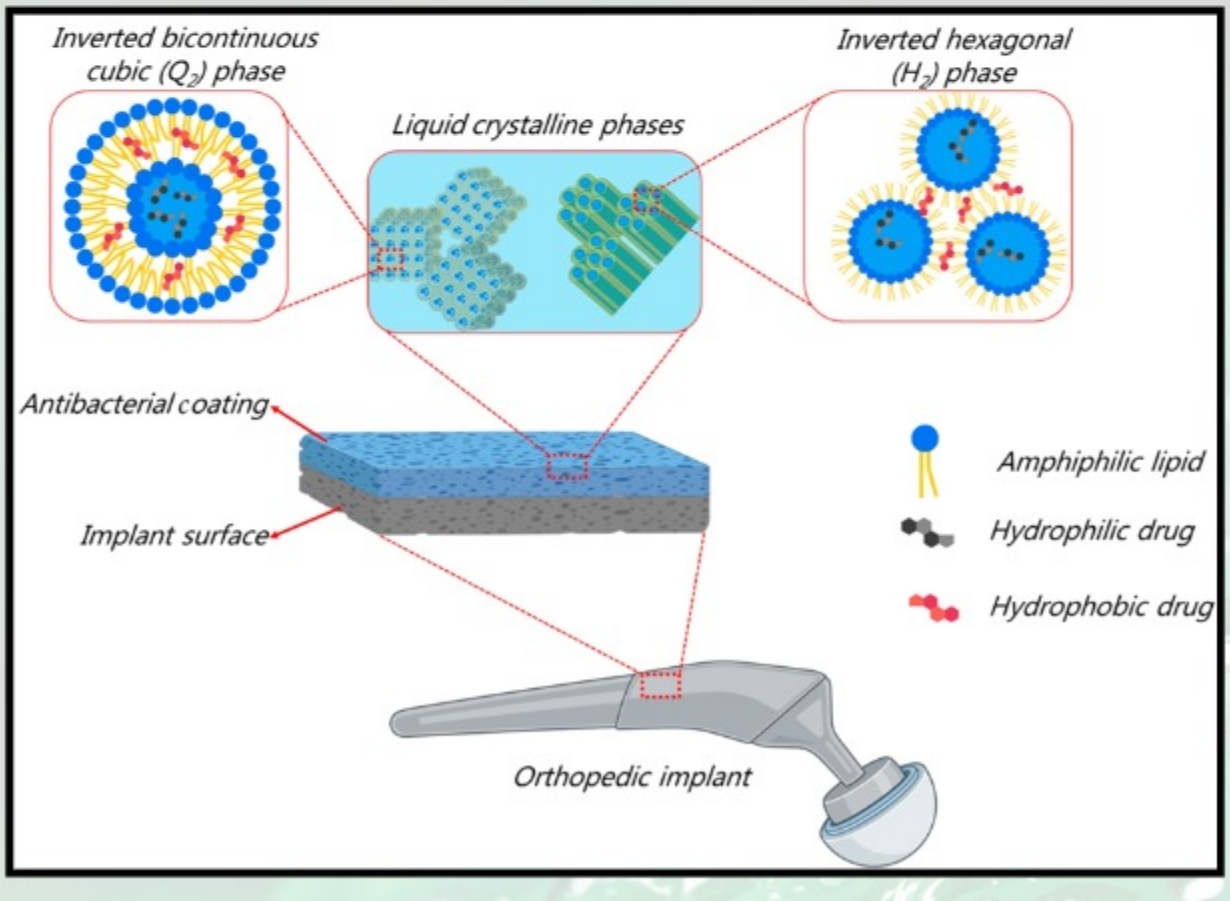


Figure 1. Comparison between[1] traditional implant and nanotechnology-enhanced implant.

Numerous novel tools are made available by nanotechnology for orthopaedic applications [3]. The critical applications are osteochondral defects, meniscus repair and regeneration, osteochondral implant materials, and vertebral disks. It is crucial to deliver targeted drugs used to treat bone tumours. A significant factor in total joint replacement failure is the possibility of aseptic loosening (TJRs). Materials with nanotextured surfaces enhance osteoblast adhesion and osteointegration and are also helpful for treating bone defects. The human body's physical characteristics and nanoscale aspects promote cell development and tissue regeneration. The use of implant coating materials, surface characterizing alterations, bone replacement materials, and tissue engineering techniques is some of the methods available to lower implant failure rates, prevent problems, and extend the life of the implants. Nanostructured implant coatings offer thermal insulation, preventing wear, corrosion, and erosion [4].

Data-driven insights help education policymakers refine curricula, allocate resources effectively, and improve overall learning environments. Similarly, nanotechnology is redefining orthopaedic implants by making them more durable, biocompatible, and intelligent for future generations. Likewise, the compilation of achievement data in education is helping to create more effective learning strategies, ensuring that both teachers and students reach their full potential

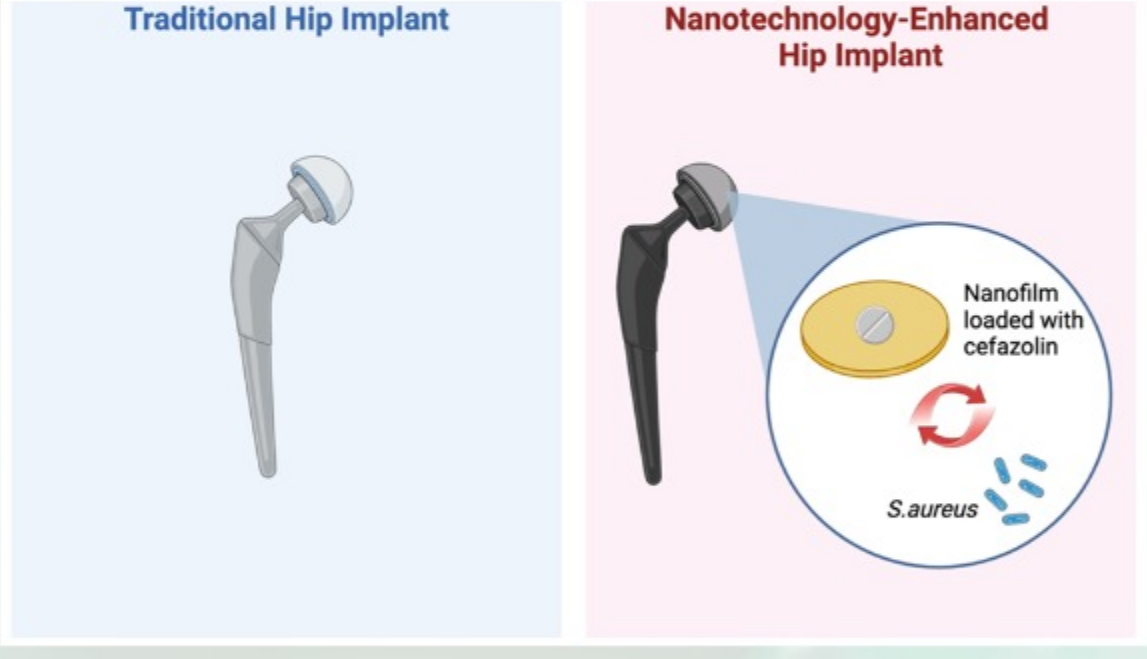


Figure 2. Nano coating on orthopedic implant surface

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NANOTECHNOLOGY
UNLOCKING NEW POSSIBILITIES FOR TREATING GENETIC DISORDER

Ayush Rai, B. Sc. (H) Chemistry, II Year

Nanotechnology is rapidly emerging as a transformative tool in medicine, particularly in the treatment of genetic disorders and various diseases. The use of nanoparticles (NPs) and nanomaterials is opening up new possibilities for enhancing the efficacy of gene therapy, with significant applications in ocular, infectious, and inflammatory diseases. By leveraging the unique properties of nanostructures, researchers are exploring novel ways to optimize drug delivery systems, improve vaccine efficacy, and enable advanced diagnostic tools.

In recent years, nanotechnology-based approaches have gained traction in the development of vaccines, especially in response to global health crises. Notably, the COVID-19 pandemic accelerated the use of nanomaterials in vaccine formulations. For instance, vaccines such as BioNTech/Pfizer and Moderna's mRNA-based vaccines utilize lipid nanoparticles to deliver the genetic material to cells, triggering an immune response. These approaches mark a significant shift in vaccine technology and are paving the way for more efficient treatments for other viral infections.

Nanoparticles like silver (AgNPs), selenium (SeNPs), and other metal-based nanoparticles (e.g., ND50, NK99, and TPNT1) have demonstrated remarkable antibacterial and antiviral properties, both in therapeutic applications and environmental disinfection. These NPs are also being explored for targeted drug delivery systems, which can increase the precision and efficiency of treatments while minimizing side effects. By encapsulating drugs in nanoparticles, these systems ensure that the active agents are delivered directly to the site of action, improving therapeutic outcomes.

Among the most promising nanostructures for drug delivery are polymer nanoparticles, which can be tailored for specific purposes based on their size, surface charge, and composition. Additionally, self-assembled nanoparticles, including ferritin family proteins and virus-like particles (VLPs), offer unique advantages. Ferritin-based NPs are biodegradable, while VLPs can mimic viral structures, helping to initiate immune responses. These features have made VLPs particularly valuable in vaccine development.

Exosomes, small vesicles secreted by cells, also show great potential in the field of nanomedicine. These nanoscale particles carry proteins, nucleic acids, and other molecular signals that play crucial roles in intercellular communication. Due to their ability to transfer information and regulate cellular functions, exosomes are being harnessed in drug delivery, molecular imaging, tissue engineering, and disease diagnostics.



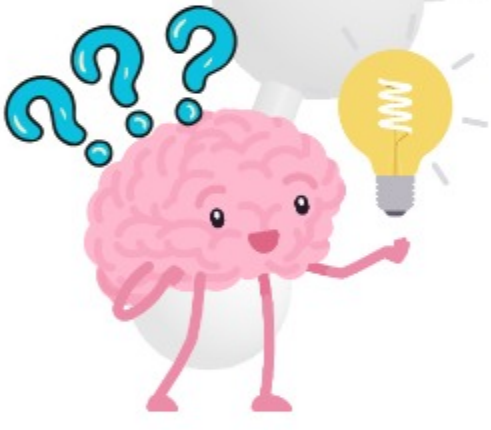
Figure 1. The Role of Nanotechnology in Drug Delivery and Diagnostics

In summary, nanotechnology is revolutionizing the field of medicine, particularly in the targeted treatment of genetic disorders and complex diseases. By improving the precision of drug delivery, enhancing vaccine formulations, and providing novel diagnostic tools, nanotechnology is unlocking new frontiers in personalized medicine, offering hope for more effective treatments with fewer side effects.

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- *Nanotechnology in Medicine: Revolutionising Drug Delivery and Diagnostics.*

Who am I?



1. What metallic nanoparticles are widely used in drug delivery systems?
2. Which nanomaterial is known for its exceptional strength and conductivity?
3. What property of nanoparticles allows them to enter cells easily?

DID YOU KNOW?

Who says doctors need to be big to make a big impact? Nanotechnology might just be training a new generation of doctors—nano-doctors, to be exact. These microscopic physicians can slip past barriers and directly heal cells, making them the cutest, most efficient docs ever. Plus, no waiting rooms!

Answers: 1.Gold nanoparticles 2.Graphene Small size and large surface area

NANOMATERIALS IN CANCER TREATMENT

A NEW ERA OF PRECISION MEDICINE

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

Chemotherapy and Chemo Treatment for Cancer

Chemotherapy is a drug treatment that uses powerful chemicals to kill fast-growing cells in your body. Cancer remains a leading cause of death worldwide, with chemotherapy being one of the most widely used treatments. However, traditional chemotherapy lacks specificity, attacking both cancerous and healthy cells, leading to severe side effects such as organ toxicity and immune suppression. Additionally, many tumours develop resistance to chemotherapy, making treatment ineffective over time. Scientists like Robert Langer and Omid Farokhzad have pioneered nanotechnology-based drug delivery systems to address these limitations. Their research has paved the way for a revolutionary approach to cancer treatment, enabling targeted drug delivery, overcoming resistance mechanisms, and advancing personalized immunotherapies. These nanoscale innovations promise to improve drug efficacy, reduce side effects, and enhance patient outcomes. The various nanoparticles used in the chemo treatment is depicted in Figure 1a.

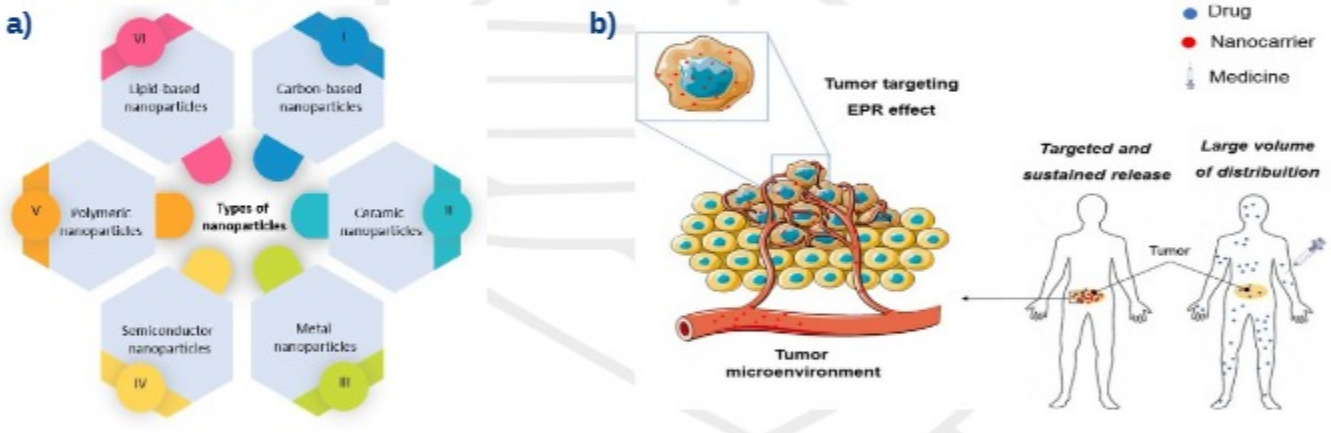


Figure 1 (a) various nanoparticles used in the chemo treatment and (b) Enhanced Permeability and Retention (EPR) effect

Targeted Drug Delivery: Enhancing Treatment Precision

Nanomaterials, which are engineered particles ranging from 1 to 100 nanometers, allow for targeted drug delivery, ensuring chemotherapy drugs reach tumor cells while minimizing damage to healthy tissues (Figure 1b).

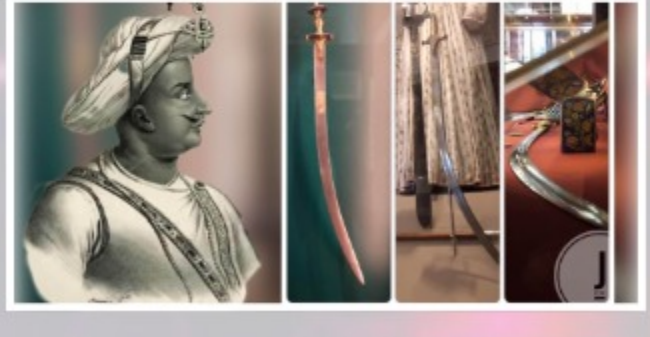
Passive targeting exploits the Enhanced Permeability and Retention (EPR) effect, which allows nanoparticles to accumulate at tumour sites. For example, Doxil®, a liposomal formulation of doxorubicin, have demonstrated improved tumour targeting with reduced toxicity. Active targeting involves nanoparticles functionalized with ligands that bind specifically to cancer cell receptors. Abraxane®, an albumin-bound paclitaxel nanoparticle, is another example that increases drug retention in tumours by targeting SPARC proteins. Moreover, stimuli-responsive nanoparticles release drugs only under specific conditions, like acidic pH or near-infrared (NIR) light.

"The science of today is the technology of tomorrow." – Edward Teller

ANCIENT INDIAN ORIGINS OF NANOTECHNOLOGY

Piyush, B.Sc. (H) Chemistry, II Year

Nanotechnology may sound like a modern scientific breakthrough, but its roots can be traced back to ancient India. From the crafting of high-quality swords to the development of special medicinal formulations, ancient Indian scholars and artisans had an impressive understanding of manipulating materials at the microscopic level. Even though they didn't have advanced microscopes or electron beams, their practical applications of nanotechnology were nothing short of remarkable. There are plenty of examples of nanotechnology in ancient Indian culture. One of the most fascinating examples of ancient Indian nanotechnology is the making of the Wootz steel—a high-carbon steel used in the legendary Damascus swords. These swords were famous for their incredible strength, sharpness, and ability to cut through other metals. Recent studies have shown that Wootz steel contained carbon nanotubes, which contributed to its superior properties. It has also been reported that carbon nanotubes were found in the sword of Tipu Sultan and in the Ajanta Paintings.



These illustrations from ancient India suggest that Indian metallurgists unknowingly mastered the manipulation of materials at the nanoscale over 2,000 years ago. Another significant example comes from the field of Ayurveda. Ancient Indian physici-

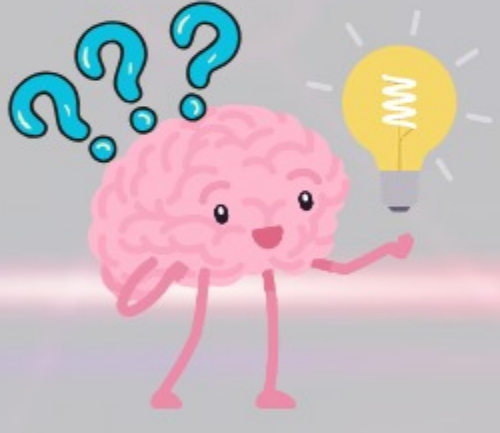


-ans created bhasmas (metallic ash formulations) that had astonishing medicinal properties. Bhasma is claimed to be biologically produced nanoparticles, which are prescribed with several other medicines of Ayurveda. These bhasmas, such as Swarna Bhasma (Gold Ash), were prepared using precise heat treatments and purification techniques that converted metals into nanoparticles, making them highly bioavailable. Modern research has confirmed that these nano-sized particles were easily absorbed by the body, proving the scientific accuracy of ancient Indian medicine. The ancient application of nanomedicine in the form of Ayurvedic Bhasma throws light on the safer usage of present nanomedicine for a living being and the environment. The brilliance of ancient Indian nanotechnology was not limited to metallurgy and medicine. The construction of temples and sculptures using special stone treatments is another striking example. Many temple surfaces were found coated with fine nanostructured layers,

preserving their inscriptions and preventing weathering for centuries. Indian artisans also used nanoscale techniques in ancient Indian architecture and textiles. The famous Muslin fabric from Bengal, once considered the finest and lightest fabric in the world, was woven using special techniques that manipulated fibre structures at the microscopic level. Similarly, water-resistant and stain-proof cloths were developed using herbal nanocoatings, a practice that is now being rediscovered in modern fabric technology. Researchers have found evidence of carbon nanotubes in pottery from Keeladi, India, dating back to 600–300 BC, which indicates early use of nanomaterials.

While nanotechnology is considered a modern marvel, ancient India had already laid its foundation centuries ago. Whether in metallurgy, medicine, architecture, or textiles, Indian scholars unknowingly practiced what we now recognize as nanoscience. Their deep understanding of material properties and innovative techniques showcases the remarkable scientific knowledge of ancient times. As modern science progresses, revisiting these ancient techniques can offer valuable insights into sustainable and efficient nanotechnological applications.

Who am I?



1. Name the nanocarrier used in some COVID-19 vaccines.
2. Which element's nanoparticles are known for strong antimicrobial properties?
3. What's a common polymer used to make nanoparticles?

DID YOU KNOW?

Rasa Shastra, a branch of Ayurveda, discusses the preparation of medicines by grinding metals like gold and silver into ultra-fine particles. These "nanomedicines" were believed to boost vitality, treat diseases, and even prolong life

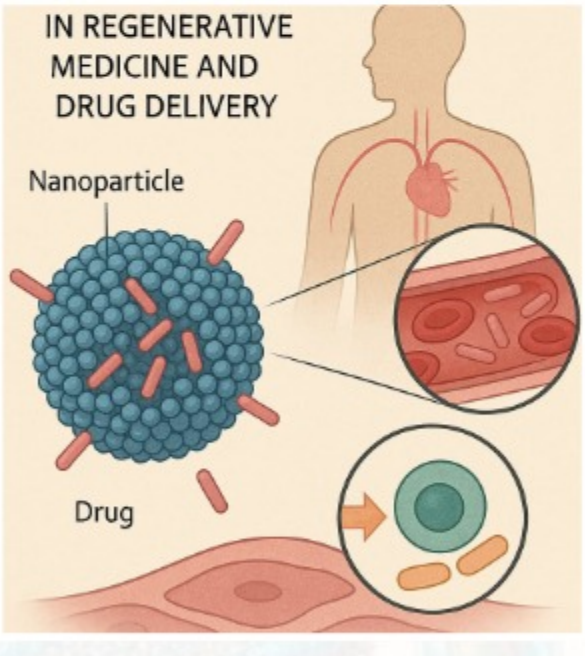
Answers: 1. Lipid nanoparticles 2. Silver 3. PLGA (poly lactic-co-glycolic acid)

NANOPARTICLE DRUG DELIVERY

ADVANCEMENT IN NANOTECHNOLOGY FOR REVOLUTIONIZING REGENERATIVE MEDICINE

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

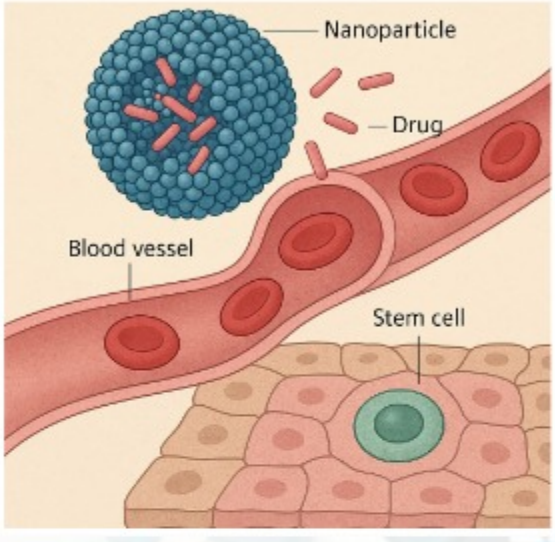
Regenerative medicine aims to restore, repair, or replace damaged tissues and organs, offering new hope for treating chronic diseases and injuries. Nanotechnology has emerged as a key player in this field, providing innovative solutions for targeted drug delivery, cell tracking, and tissue engineering. I'll now rewrite the underlined portions to ensure authenticity while preserving their original meaning. The recent advancements in nanotechnology, particularly in its integration with biology and medicine, have opened new frontiers in tissue and organ regeneration. These innovative nanoengineering approaches provide promising biomedical applications that could significantly impact healthcare on both personal and global levels, ultimately reducing economic burdens associated with medical treatments. Since biomolecules typically measure between 0.2 nm and 200 nm, they naturally align with the 1 to 100 nm scale of nanotechnology. This size compatibility allows for precise manipulation at the molecular level, enabling researchers to develop highly efficient nanostructures. Scientific studies indicate that cells interact with nanoscale modifications in their extracellular environment, which in turn influences cellular behaviour. Notably, biomimetic surface patterns alone have been shown to guide stem cell differentiation, eliminating the need for external biochemical signals. Such findings emphasize the transformative role of nanoengineering in biomedical sciences.



Nanotechnology is widely employed in various regenerative medicine applications, such as controlled drug delivery, scaffold-based tissue regeneration, and real-time cellular tracking. Nanoparticles serve as highly effective carriers for therapeutic compounds, ensuring targeted delivery with minimal side effects. Several widely used nanomaterials in healthcare include dendrimers, liposomes, polymer-based nanoparticles, quantum dots, micelles, carbon nanotubes, and polymeric nanoparticles. These materials contribute to medical advancements in wound healing, surgical textiles, and implantable devices. Researchers are also exploring the development of intelligent wound dressings that dissolve once tissue regeneration is complete.

Nanomaterials further enhance tissue engineering by replicating the body's extracellular matrix, fostering cell adhesion, proliferation, and differentiation. These scaffold-based technologies are particularly beneficial for regenerating bones, muscles, cardiovascular tissues, and neural structures. In addition, nanotechnology facilitates real-time tracking of stem cells and immune cells by tagging them with nanoparticles, allowing scientists to monitor their movement, survival, and integration within tissues.

Breakthroughs in biomedical nanotechnology have led to significant developments in treating conditions such as diabetes, infectious diseases, immunotherapy, and cancer. Scientists are also exploring the creation of cell-responsive scaffolds using nano-composite bio-inks, along with direct cell printing onto biomaterial structures. These advances signal a new era in precision medicine, where treatments are designed at the molecular level to revolutionize HealthCare.

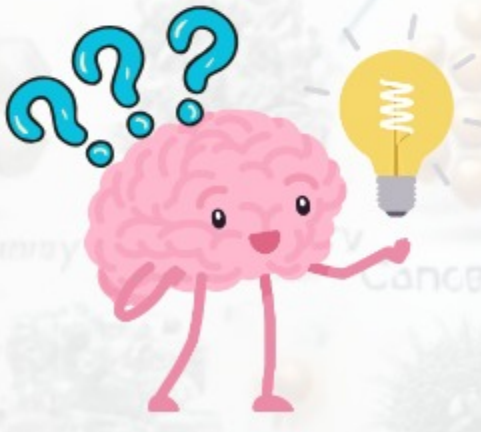


Lastly, there is increasing interest in developing biological construction methods and functional traits such as sensing, movement, and dynamic shape transformation. As research continues to unlock the full potential of nanoparticles in regenerative medicine and drug delivery, we stand on the brink of a healthcare revolution-one where precision medicine is not just a goal but reality , refining how we heal and treat diseases at the molecular level.

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Who am I?



1. What is one limitation of using nanoparticles in medicine?
2. What property of gold nanoparticles makes them suitable for biosensors?
3. What kind of nanoparticles are used in sunscreen?

Answers: 1.Potential toxicity or immune reaction 2.Surface plasmon resonance 3.Titanium dioxide or zinc oxide nanoparticles

ROLE OF METALLIC NANOPARTICLES IN TREATING ALZHEIMER'S AND PARKINSON'S DISEASES

Nandini Pabreja, B. Sc. (H) Chemistry, III Year

The emergence of nanotechnology in different areas, such as biomedical applications, including lifestyle diseases like diabetes, hypertension, and chronic kidney disease, neurodegenerative diseases like Alzheimer's disease (AD), Parkinson's disease, and different types of cancers. One of the most utilized drug delivery systems employs metal nanoparticle systems, as they offer various benefits because of their enhanced physicochemical properties as compared to bulk metals. The second most common cause, after cancer, that affects the mortality rate is neurodegenerative disease. So, specific and targeted drug delivery systems are required for maximum therapeutic benefits. Because of their improved bioavailability, biocompatibility, and blood-brain barrier penetration, metal nanoparticles are the recommended drug delivery method.

When metal nanoparticles are administered into the body, they are easily absorbed by different organs of the body, including the brain (Behera et.al., 2023). This quality is achieved due to their high surface area, size ranging from 1-200 nm, and unique physicochemical characteristics compared to bulk metal. A variety of delivery methods, including oral, intratracheal, intravenous, intraperitoneal, and intranasal, can be used to supplement these nanoparticles.

Metal nanoparticles can induce neurotoxicity and can aggravate AD-like pathology by various mechanisms, like inducing oxidative stress, neuroinflammation, and cell death (**Fig. 1**); however, some metals, like Au, Se, and Zn, possess beneficial effects that can treat AD effectively. By controlling the release of mitochondrial cytochrome C, metal nanoparticles can prevent the generation of reactive nitrogen species (RNS) and ROS. This is one way that metal nanoparticles can provide neuroprotection by controlling various metabolic processes. Metal nanoparticles suppress microgliosis or activation of microglia and macrophages in the brain cells (Torres et.al., 2021)

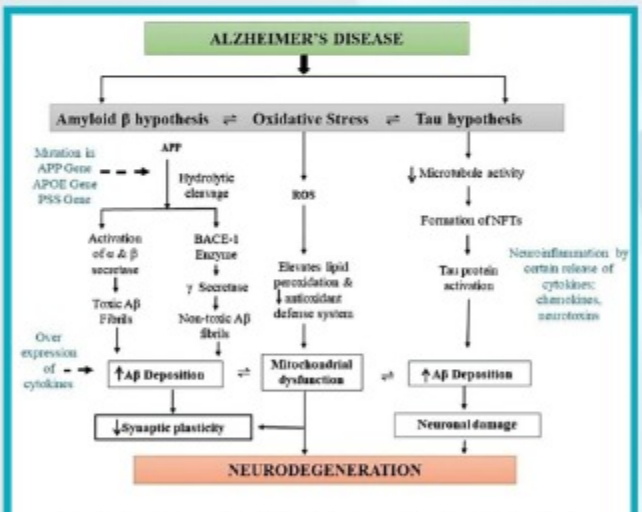


Figure 1. Diagrammatic representation of pathogenesis of Alzheimer's disease (AD).

Role of nanoparticles in treating Parkinson's Disease

Aromatic L-amino acid decarboxylase in the brain converts oral L-DOPA, the main treatment for reducing motor symptoms, to DA. Unfortunately, only around 1% of given L-DOPA reaches the brain due to fast degradation and decarboxylation before it can reach the brain, giving it a brief half-life of about 50 minutes. Other medications used to treat Parkinson's disease (PD) have poor pharmacokinetics, limited bioavailability, and trouble crossing the blood-brain barrier (BBB). One intriguing way to deal with these issues in PD therapy is to reformulate medications in NPs (Fig. 2). Drug biodistribution can be improved, therapeutic compounds can be shielded from deterioration, the required dosage can be decreased, and ligands can be added for more effective targeted delivery when using NPs as drug carriers (van Vliet et.al, 2023).

In recent years, AuNPs have been used as catalysts in chemical reactions, simulating the actions of natural enzymes; they have catalase-like activities by reducing H_2O_2 to water and oxygen, superoxide dismutase-like activities by removing O_2, and peroxidase-like activities by catalyzing oxidation reactions with peroxides. A gold-based nanoformulation, 13-nm AuNPs CNM-Au8® in drinkable bicarbonate solution, is being studied for the treatment of neurodegenerative disorders, including Parkinson's disease.

CNM-Au8® exhibits catalytic properties that help alleviate cellular energy deficits and reduce oxidative stress; the AuNPs have demonstrated the ability to convert NADH into NAD+, a critical component in cellular energy production; in animal models of demyelination, CNM-Au8® has shown promise in improving remyelination and motor functions (Grancharova et.al., 2024).

Challenges and Future Perspectives

One of the main issues in the current situation is the characterization and quality evaluation of metal nanoparticles with reference to their safety and effectiveness. Designing metal-based therapeutics or theranostics from the metal-involved pathogenesis necessitates some possible directions, including 1) finding new targets, 2) creating stimuli-responsive targeted theranostics, and 3) combining metal-complexes, metal-chelators, or metal-nanoparticles in combination or pairs. Metal nanoparticles and metal chelators or complexes may work in concert to produce a multipurpose therapeutic effect. (Burlec et.al., 2023).

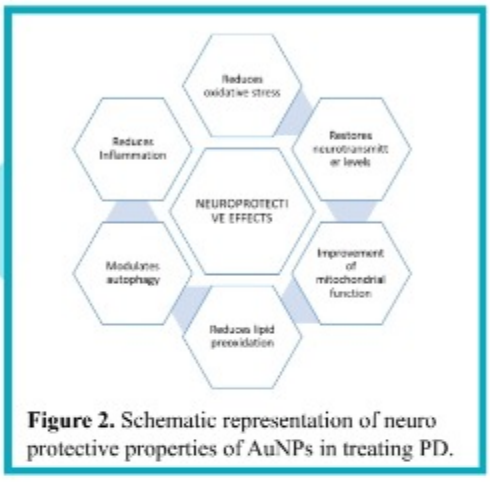


Figure 2. Schematic representation of neuro protective properties of AuNPs in treating PD.

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NANOROBOTS IN CANCER TREATMENTS
FUTURE ADVANCES IN MEDICAL SCIENCES

Pratha , B. Sc. (H) Chemistry, II Year

Cancer remains a major global health challenge, affecting millions of people each year. Traditional treatments like chemotherapy, radiation, and surgery often come with significant side effects and limitations. However, recent advancements in nanotechnologies in medicine, nanorobots, are swiftly emerging and offer a revolutionary approach to cancer treatment by providing precise, targeted therapy with minimal damage to healthy tissues (Figure 1). These tiny machines, engineered at the nanoscale (1–100 nanometers), have the potential to detect, target, and eliminate cancer cells efficiently.1

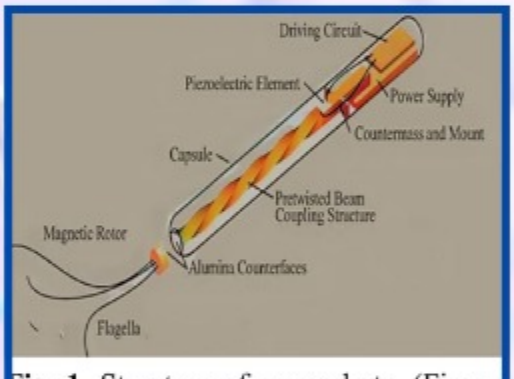


Fig. 1. Structure of nanorobots. (Figure courtesy: give ref. Where you have taken

Medical nanorobots are designed to navigate through the human body and perform specific therapeutic functions. Their key applications in cancer treatment include: Targeted drug delivery: Directly transporting chemotherapy drugs to cancer cells, and reducing toxicity and side effects. Cancer cell destruction: Physically or chemically eliminating cancer cells without harming healthy tissues. Early detection and diagnosis: Identifying cancerous cells at early stages for better treatment outcomes. Immunotherapy enhancement: Assisting the immune system in fighting tumours more effectively. These nanorobots can be powered by chemical reactions, magnetic fields, or even the body's own biological processes to move efficiently toward cancerous tissues (Figure 2).

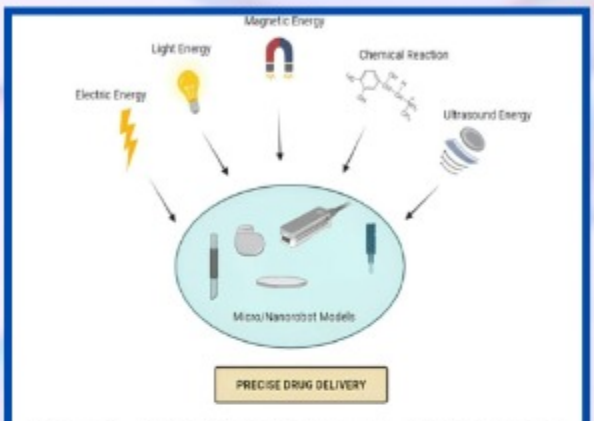


Fig. 2. Energy sources to design and develop micro/nanorobots for precise drug delivery.

Recent advances in Nanorobot technology

1. Targeted Drug Delivery

One of the most promising applications of nanorobots is their ability to deliver drugs precisely to cancer cells. Scientists have developed DNA-based nanorobots that open and release drugs only when they detect cancer-specific biomarkers. This approach minimizes damage to healthy cells and improves the effectiveness of chemotherapy.

2. Magnetically Controlled Nanorobots

Researchers have created magnetic nanorobots that can be guided by external magnetic fields to reach tumour sites. Once at the target, they can release drugs, perform localized therapy, or even physically break apart cancer cells. This method enhances drug concentration at tumour sites and reduces systemic toxicity.

3. Biohybrid Nanorobots

Recent advancements in biohybrid nanorobots involve using natural biological materials, such as bacteria or red blood cells, combined with synthetic nanomaterials. Engineered bacteria-based nanorobots, for instance, can penetrate deep into tumour tissues, delivering drugs to areas that are difficult to reach with conventional treatments.

4. Self-Propelled Nanorobots

Scientists have also developed enzyme-powered nanorobots that use body fluids, such as glucose or urea, as fuel for movement. These nanorobots can navigate through the bloodstream autonomously and reach tumours more efficiently, improving the precision of cancer treatment.

5. Photothermal and Radiofrequency Therapy

Nanorobots coated with gold nanoparticles can absorb infrared light and convert it into heat, selectively destroying cancer cells through photothermal therapy. Similarly, some nanorobots respond to radiofrequency waves, generating localized heat to kill tumours while sparing surrounding tissues.

Challenges and Future Prospects

Despite their immense potential, several challenges must be addressed before nanorobots can be widely used in cancer treatment: *Biocompatibility and safety*: Ensuring nanorobots do not trigger harmful immune responses or accumulate in organs. *Precise navigation and control*: Improving the ability of nanorobots to accurately reach tumour cells. *Mass production and cost*: Developing scalable, cost-effective methods for manufacturing nanorobots. *Clinical trials and regulatory approval*: Conducting rigorous testing to ensure safety and effectiveness in humans.

The Future of Cancer Treatment with Nanorobots

The integration of artificial intelligence (AI) with nanorobots is expected to further enhance their ability to detect, diagnose, and treat cancer in real-time. Future advancements may lead to self-adaptive nanorobots that adjust their treatment strategies based on patient responses. Additionally, nanorobots could be used for non-invasive biopsies, real-time monitoring of tumour progression, and even assisting in nanorobotic-assisted surgeries.

In summary, Medical nanorobots represent a groundbreaking advancement in the fight against cancer, offering precise, efficient, and less toxic treatment options. The future holds great promise for the use of nanorobots in cancer treatment and various medical applications. As advancements in materials science, bioengineering, information technology, and other related disciplines continue to evolve, the integration of these fields will enable nanorobots to overcome existing technical challenges. This will lead to more precise, efficient, and safer treatment options for diseases. Additionally, nanomedicine, which blends science and technology, is set to enhance the development of personalized medicine and preventive health management, ushering in a new era of health care. Representing the forefront of technology, nanorobots not only show immense potential in medicine but also play a crucial role in fostering social progress and enhancing human health. As research deepens and technology advances, nanorobots are expected to become increasingly vital in contributing to the well-being of humanity.

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The Nobel Prize Chemistry 2024

Credit: Ankita, B.Sc. (H) Chemistry, 3rd year



David Baker
University of Washington, WA



Demis Hassabis
CEO Google DeepMind
London, UK



John Jumper
Google DeepMind
London, UK

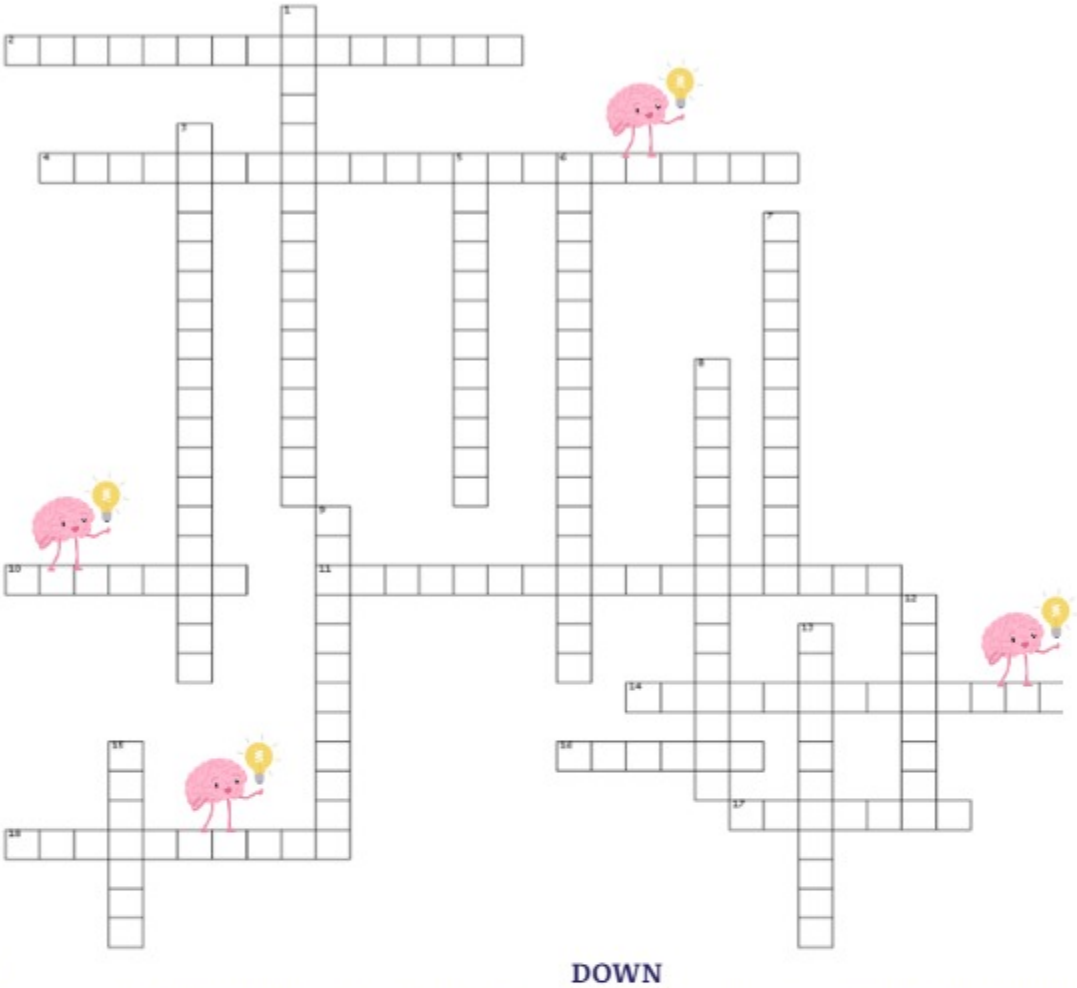
The Nobel Prize in Chemistry 2024 was awarded to **David Baker for computational protein design and Demis Hassabis, and John Jumper for protein structure prediction.**

- The 2024 Nobel Prize in Chemistry celebrates the power of artificial intelligence in unravelling the mysteries of life. Through groundbreaking work in protein design and structure prediction, scientists have opened new frontiers in medicine and biotechnology, proving that the fusion of human ingenuity and AI can reshape the future of science.

- The award honors breakthroughs in protein structure prediction and design. The team (Demis Hassabis & John Jumper, DeepMind) used AI model called "AlphaFold2" to predict protein structures with near-experimental accuracy, solving a long-standing challenge and reducing analysis time from years to hours. AlphaFold2 evaluates the amino acid structures and their interactions with each other. "David Baker's lab" (University of Washington) developed computational tools, including "RoseTTAFold", to design novel proteins with specific functions that do not occur naturally.

- The work has transformative impacts on medicine and science, aiding drug discovery, vaccine development, and enzyme engineering. AI-driven advancements make protein research faster, cheaper, and more accessible, accelerating global research and deepening our understanding of diseases, genetics, and cellular processes.

CROSSWORD



ACROSS

2. The _____ mechanism of metal nanoparticles facilitates the brain-targeted drug delivery for AD.
4. Nanorobots can be powered by _____
10. The COVID-19 pandemic accelerated the use of nanomaterials in _____formulations.
11. The main property of metal nanoparticles in targeting neurodegenerative diseases is _____.
14. Nanostructured_____ fibers containing hydroxyl groups are effectively used in water purification, sterilization, and even dental instrument sanitation.
16. _____and gold NPs can be functionalized with specific ligands or antibodies to make biomarkers associated with Alzheimer's and Parkinson's diseases.
17. Nano size refers to particles' dimensions less than _____ nanometers.
18. The Oral Fluid NanoSensor Test (OFNASET) enables early detection of _____.

DOWN

1. _____mechanism enables nanorobots to detect tumor microenvironments and initiate site-specific therapeutic actions.
3. _____and _____ nanoparticles are mainly used in the MRI application.
5. The science of today is the technology of tomorrow by _____.
6. CT scan is referred to as _____.
7. _____nanoparticles provide stable, bright fluorescence for tracking molecules and cells in real-time.
8. An ancient Indian Damascus sword was made up of Wootz steel, which contains_____ .
9. _____who is pioneered nanotechnology-based drug delivery systems.
12. Particles in _____are used to deliver drugs directly to diseased cells.
13. _____have the potential to save millions of lives by early disease detection.
15. Early use of carbon nanotubes, dating back to 600–300 BC, in pottery found from a place _____, India.

Answers :
1. Nanosize 2. Iron oxide and gadolinium 3. Stimuli-responsive 4. External magnetic fields 5. Hundred 6. Keeladi 7. Carbon nanotubes 8. Neuroprotective 9. BloodBrain Barrier 10. Silver 11. Vaccine 12. Nanosensors 13. Oralcancer 14. Aluminumoxide 15. Computed Tomography 16. Semiconductor 17. RobertLangerEdwardTeller

RASAGYA: THE CHEMICAL SOCIETY
AN INTRODUCTION



As the Student President of the Chemical Society "Rasagya", I am honored to be part of the organizing team for a year filled with academic learning, exploration, and growth. Every seminar, workshop, lecture, and event we organized was driven by a common purpose — to go beyond academics and foster the holistic development of our fellow students.

At the Department of Chemistry, we have always been provided with platforms where education is not just about mastering concepts, but also about nurturing curiosity, creativity, leadership, teamwork, and a spirit of innovation. Through these activities, we aimed to create opportunities for students to engage with new ideas, apply their knowledge, and develop skills that will empower them in every walk of life.

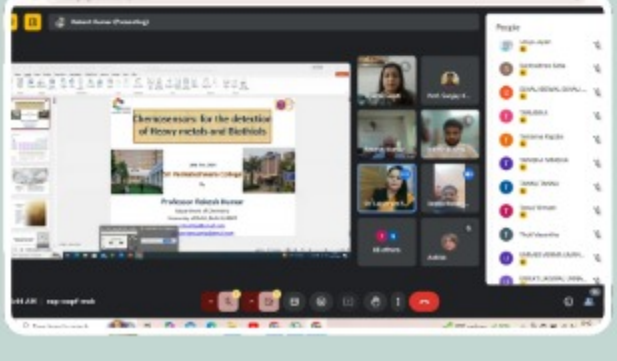
I am sincerely grateful to our faculty mentors, student volunteers, and all participants who brought their energy, enthusiasm, and dedication to every initiative.

THE CHEMICAL SOCIETY ACTIVITIES

INAUGURAL LECTURE

The Chemical Society of Sri Venkateswara College organized its "Inaugural Lecture" on **20th November 2024**, in online mode on the topic "**Chemosensors: for the Detection of Heavy Metals and Biothiols**". The lecture was delivered by **Prof. Rakesh Kumar**, Professor, Department of Chemistry, University of Delhi, who shared his deep insights and expertise with the students. The session began with a brief introduction highlighting the vital role of chemistry in environmental monitoring and public health. Professor Kumar then elaborated on the significance of chemosensors and their application in detecting hazardous heavy metals and biothiols, which pose serious risks to both human health and the environment. His lecture served as a valuable source of knowledge and motivation, encouraging the budding chemists to explore the immense potential of analytical chemistry in solving real-world problems.





WORKSHOP ON RESEARCH METHODOLOGY

On 21 and 22 February 2025, Rasagya - The Chemical Society successfully hosted an engaging and educational "**Research Workshop**", tailored specifically for third-year chemistry students. The workshop focused on providing hands-on experience in advanced experimental techniques, research methodologies, and analytical tools. Led by esteemed faculty members, the workshop featured interactive sessions designed to bridge the gap between theoretical knowledge and practical applications. The event witnessed enthusiastic participation, fostering a learning environment. Students shared their insights, posed thought-provoking questions, and developed practical skills .





INTERNATIONAL SEMINAR





Rasagya, The Chemical Society, successfully organized an international seminar on **16th April, 2025,** on the intriguing and highly relevant topic "**Electrochemical Sensors, Energy, Sustainability: Small Devices with a Big Mission.**" The seminar was graced by the presence of the esteemed speaker, "**Prof. Itthipon Jeerapan** from Prince of Songkla University, Thailand", a renowned researcher in the field of electrochemical devices and sustainable technologies. The seminar proved to be highly engaging and intellectually stimulating for both students and faculty. A lively question-and-answer session followed the lecture, allowing students to interact directly with the speaker.

ALUMNI INTERACTION

The Chemical Society hosted an online "ALUMNI INTERACTION" on April 19, 2025. The event was conducted in an online format. Distinguished graduates Mr. Naveen Goyal, Ms. Pragya Malik, Dr. Vanika Aggarwal and Dr. Kirti Rawal were invited to the interaction. The interaction provided an invaluable platform for current students to connect with accomplished alumni, offering a unique blend of networking, mentorship, and insight into diverse career paths in the field of chemistry.

Each speaker shared their professional journeys, shedding light on opportunities in academia, industry, research, and beyond. There was an interactive Q&A session, addressing student queries and offering perspectives on skill development, higher education, competitive exams, and emerging career domains in chemistry.





JASHN-E-RASAYAN ANNUAL FEST, 2025

Rasagya-The Chemical Society, hosted its annual fest Jashn-e-Rasayan over two dynamic days, from April **03 to 04 April, 2025**. The event was a vibrant display of the passion and innovation of its members. Featuring seven exciting events, the fest celebrated the diverse and fascinating world of chemistry in all its forms.



The festival began with a thought-provoking **"Inaugural Lecture on sustainable development"**, delivered by **Prof. Shivkant Kukreti**. His insights into chemistry's role in securing our future inspired students to think beyond academics and embrace environmental responsibility through scientific innovation. The session marked a powerful start to the celebration.

With minds racing and buzzers blazing, **"The Science Sprint"** (Quiz) tested speed, logic, and chemistry knowledge. Participants battled across multiple rounds, solving puzzles and answering concept-driven questions. The event was a great success, fostering excitement for science in a competitive yet fun atmosphere. The air buzzed with anticipation as teams vied for the prestigious title of quiz champions.



In the exciting **"Mad Scientist"** event, students turned ordinary lab equipment into tools of discovery. Live experiments, chemical reactions, and creative demonstrations wowed the audience. It was a successful platform where science was seen, heard, and felt in its most exciting form.









"Chemovate" showcased student innovations focusing on sustainable and futuristic chemical solutions. From alternative energy models to eco-friendly materials, the event celebrated creativity backed by scientific thinking.

Creativity and wit came alive in **"Ad Mad"**, where students presented quirky, humorous ads for fictional chemical products. The event blended advertising with chemistry, resulting in laughter and applause. It was a fresh, engaging experience that highlighted both imagination and understanding.





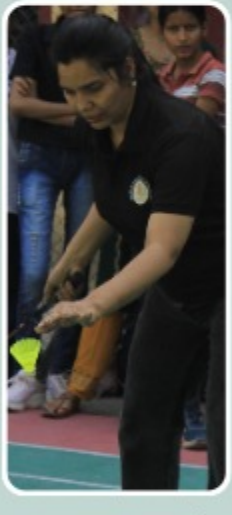
As the dawn of the second day illuminated the horizon, minds converged once again, Clues, riddles, and a race against time defined the thrilling **"Treasure Hunt"**. Teams explored, decoded, and competed using their problem-solving skills and chemistry knowledge. Successfully conducted, the event was a fun-filled, intellectually stimulating challenge that energized the entire crowd.

The intense **"Badminton Match"** was played among the teachers and students in a lively, competitive atmosphere. With smashing rallies and roaring cheers, the game strengthened student-teacher bonds. Conducted exclusively for the department, it was a spirited success full of teamwork and sportsmanship.









The **"Interdepartmental Cricket"** Match delivered thrilling overs, strong teamwork, and unmatched energy. Teachers and students gave their best in this friendly face-off, creating an unforgettable sporting memory. The event was a resounding success, adding excitement to the academic fest.



MEET THE STAFF

Teaching



Left to right

Top row: Dr. Murali Mohan Achari Kamsali, Dr. Ravindra Kr. Upadhyay, Dr. Vinita Kapoor, Dr. Thoti Vasantha, Dr. Shikha Gulati, Dr. Meena Bisht, Dr. Neelam Kumari, Dr. Seella Ramanaiah, Dr. Ramavath Janraj Naik, Dr. Yenugu Veeramanohara Reddy

Bottom Row: Mr. Harshvardhan Meena, Dr. Pooja, Dr. Rangarajan T.M., Prof. Sanjay Batra, Dr. Mercy Kutty Jacob, Prof. Sharda Pasricha, Dr. Vibha Saxena, Dr. Shefali Shukla, Dr. Pragya Gahlot, Dr. Rekha Yadav, Ms. Laisharam Saya Devi, Dr. Chandra Sekhar Tekuri

Non-Teaching

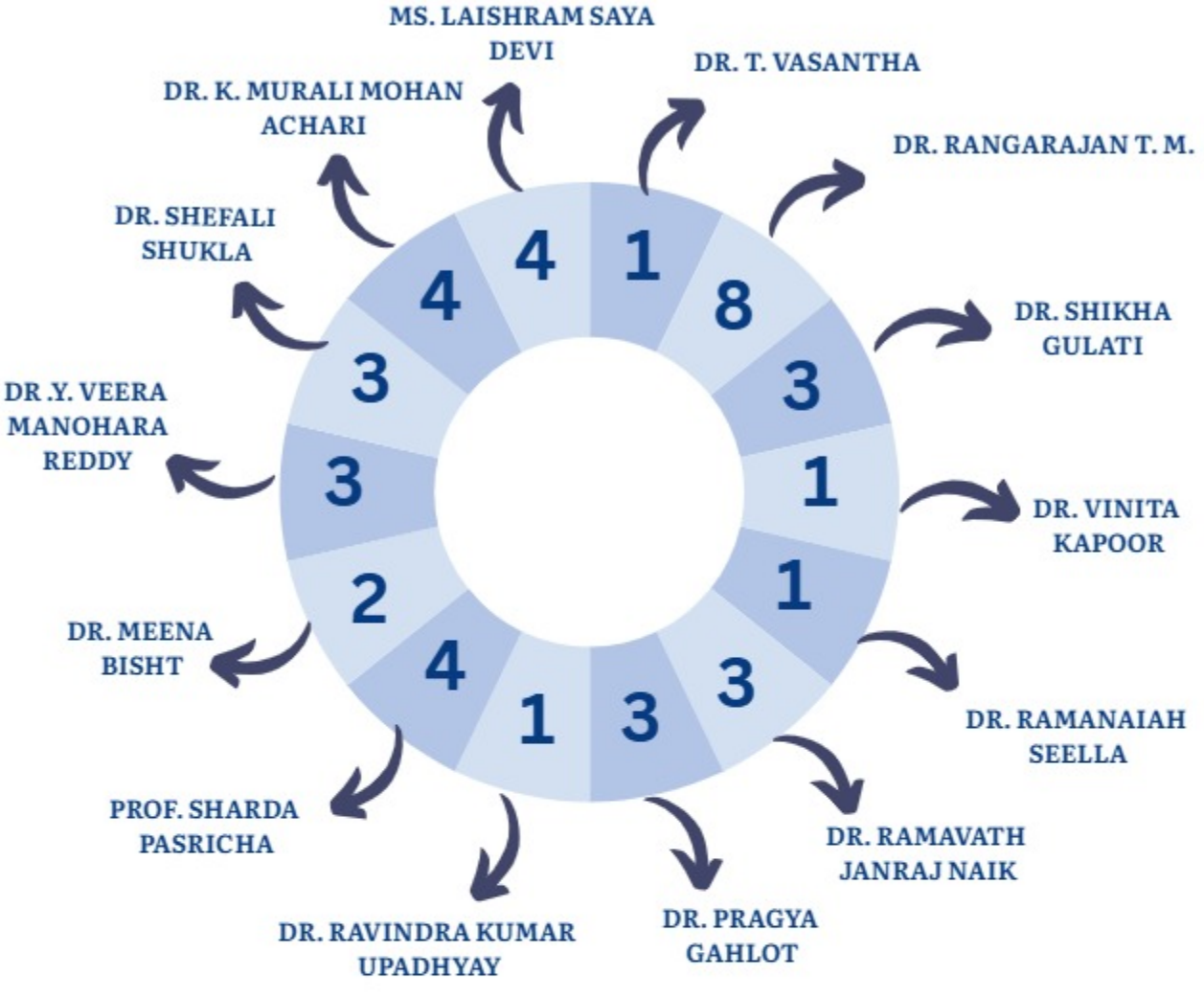


Left to right

Top Row: Ashish Giri, Vishal bhardwaj, Nikhil, Baljeet, Ramniwas

Bottom Row: Neetu, Jatin, Anil Kumar, Sachin, M Venkatpati Rao, M V Rao, Shitla Prasad, Vijay Kumar, K C H Adinarayna, Anjana

TEACHERS' ACHIEVEMENTS



BOOK CHAPTERS

7	DR. SHIKHA GULATI	4	DR. POOJA	1	DR. K. MURALI MOHAN ACHARI

AWARDS

PROF. SHARDA PASRICHA
Divine Wisdom Award for Spiritual Education 2025

DR. REKHA YADAV
Professor Animesh Chakravorty Young Scientist Award

DR. T. VASANTHA
1. Prestigious Professor Harsh Manchanda Young Scientist Award for the year 2024 in ITS .
2. Divine Wisdom Award for Spiritual Education. 2025

Dr. RAMANAIAH SEELLA
Prof. Shantilal Oswal Young Scientist Award from the Indian Thermodynamics Society for his significant contribution in the area of Thermodynamics

STUDENTS' ACHIEVEMENTS

Ishant Singh Shankhwar (I Year)

- Secured 2nd position (four times) in University/College Western Acapella Music Competitions





Harsh Pahuja (III Year)

- **Review paper-** Optimal exploitation of supported heterogenized Pd nanoparticles for CC cross-coupling reactions
- Emerging viable solvent systems for transition-metal-catalyzed cross-coupling reactions

Aryan Goel (III Year)

- Secured AIR 74 in JAM competitive exam 2025





Saumitra Singh Raghuvansh (III Year)

- Secured AIR 265 in JAM competitive exam 2025

Tanya Virmani (III Year)

- Secured AIR 1406 in JAM competitive exam
- General Secretary-Rasagya: The chemical society (2024-25)





Sushant yadav (III Year)

- Secured AIR 1636 in JAM competitive exam, 2025

Preeti (III Year)

- Secured AIR 2016 in JAM competitive exam, 2025
- Core Coordinator-Brainiacs, 2024-25





Neelam Choudhary (III Year)

- Secured AIR 2122 in JAM competitive exam, 2025

Shrinidhi Singh (III Year)

- Vice President of MILAN: The Yoga & Meditation Society, 2024-25





Ojal Awasthi (III Year)

- Content and Research Head-Equal Opportunity Cell , SVC

Muskan Verma (III Year)

- Production Head-TEDx, SVC



FRESHERS'24





Every student looks forward to the fresher's celebration from the moment of admission. It's a thoughtful way for second and third year students to extend a hearty welcome to newcomers. The freshmen party is the first chance for new students to meet seniors, form friendships, and become acquainted with the college. On 10th Oct 2024, the department of chemistry hosted the freshers party 2024. Various excited games and activities were planned for that day. The event was a perfect blend of excitement and bonding. The energy, laughter, and enthusiasm set the tone for an amazing year ahead. Looking back, it was just the first chapter of countless memories made.

TEACHER'S DAY, 2024



In India, the teachers' day was first commemorated in 1962. The day was declared to honor Dr. Sarvepalli Radhakrishnan's birth anniversary. We celebrated Teachers' Day with great enthusiasm in our chemistry department. Everything was planned by the students . A few students offered succinct remarks regarding this exceptional experience.



Students performed dance and other cultural arts to display their talents. Additionally, the students prepared a few fun games for the teachers to keep them occupied. Every teacher expressed gratitude and enjoyment for the presentation.





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