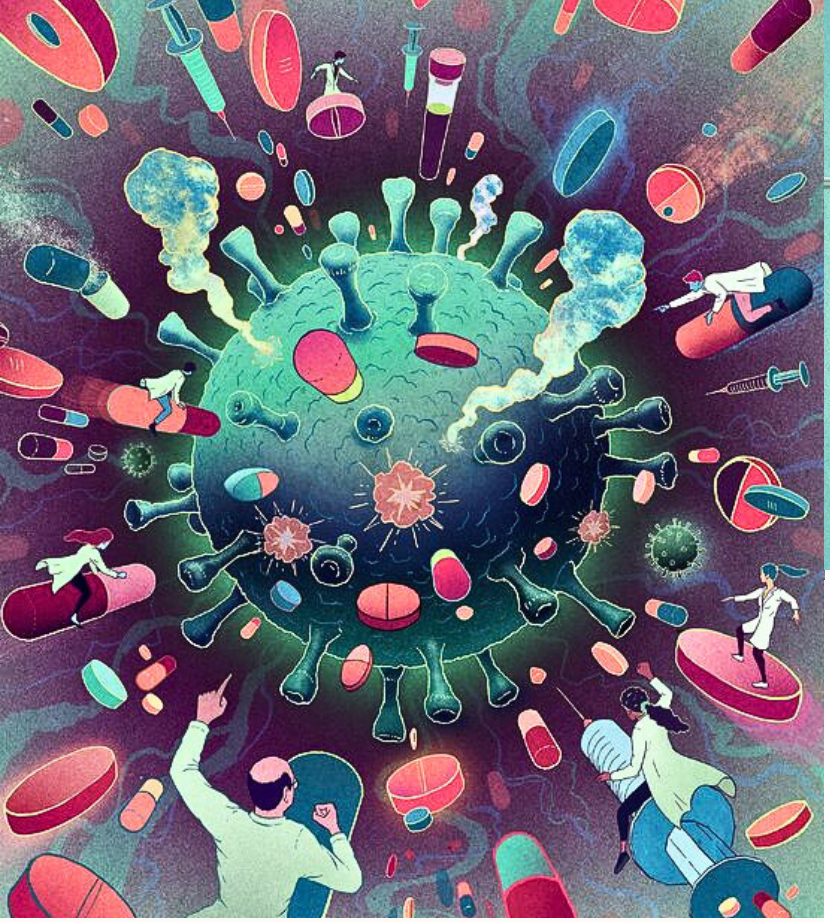

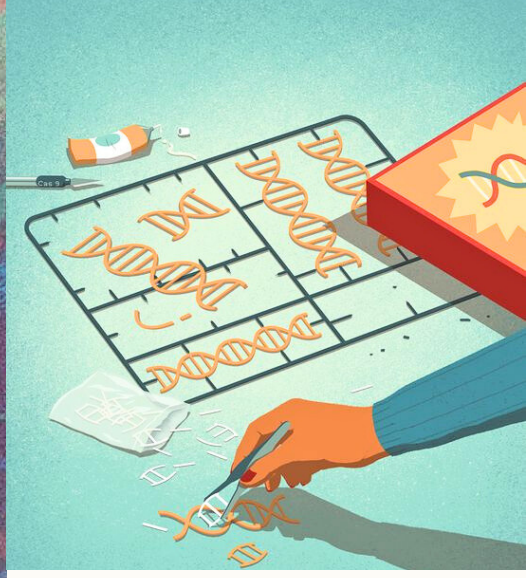

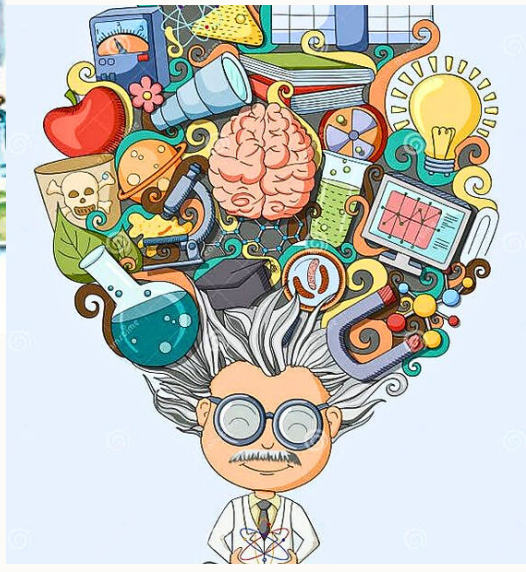

THE CATALYST

#EDITION 3

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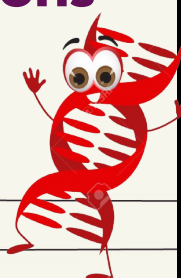


Dear readers,

As we usher in the dawn of 2024, we extend heartfelt New Year wishes filled with hope, joy, and prosperity. Welcome to the eagerly anticipated third edition of our magazine. We're delighted to share with you the diverse and enriching content curated for this edition. Our last 2 editions were about the advancements in the field of Biochemistry and Biotechnology, & the incorporation of Artificial intelligence in life sciences.

This edition exclusively consists of various articles based on recent discoveries in the field of Life Sciences. Articles like mRNA technology, Laboratory meat production, and Introduction of a Scientist will help our readers broaden their horizons. An introduction to the extraordinary research work done by our mentors is the highlight of this edition.

Moreover, we invite you to explore the inspiring stories of our star students Ms. Bhagyashree Bawankule and Mr. Akshat Hatwar, showcasing their exceptional journeys and achievements. We sincerely hope that this magazine will be a blend of knowledge and entertaining content, contributing to your personal and intellectual growth.

Warm regards,
Team Catalyst

#becreative
#thecatalyst

Sparking Change and Igniting Creativity –
A Message from Your Teacher

TEACHER'S CORNER

Dear Catalyst Contributors,

It brings me immense joy and pride to address the brilliant minds behind our student magazine, Catalyst. As your teacher, I have had the privilege of witnessing your dedication, creativity, and passion shine through your work.

The Catalyst, true to its name, serves as a potent force for change and innovation within our school community. Your articles, artwork, and ideas are the sparks that ignite conversations, inspire others, and pave the way for a more connected and enlightened student body.

Remember, every word you write, every image you capture, and every idea you express has the potential to be the catalyst for someone else's inspiration. Your contributions not only showcase your individual talents but also contribute to the collective brilliance of our college community.

In the pages of Catalyst, I encourage you to explore the uncharted realms of your imagination, challenge the status quo, and fearlessly express your unique perspectives. Let this magazine be a canvas for your thoughts, a stage for your voices, and a platform for positive change.

I look forward to witnessing the continued growth and success of Catalyst. Your enthusiasm and commitment to excellence are the driving forces behind the magazine's impact. Keep pushing boundaries, challenging norms, and, most importantly, enjoying the journey of creating something extraordinary together.

Thank you for being the catalysts for positive change within our college community.

Warm regards,

Dr. Deovrat Begde

Associate Professor,
Department of Biochemistry and Biotechnology,
Dr. Ambedkar College, Nagpur.


"Set your goals high, and don't stop till you get there."

Biotechnology

mRNA Technology: A Realised Potential

The 2023 Nobel Prize for Physiology or Medicine has been awarded to Katalin Karikó and Drew Weissman for their foundational work in mRNA vaccines, which enabled the rapid development of the COVID-19 vaccines. Their discovery of the importance of nucleoside base modification in the immune acceptance and subsequent translation of synthetic mRNA, opened the gateway for a series of dramatic developments in vaccinology.

A Brief History of Vaccines

Vaccinology has a long and storied history, dating back to the inoculation of James Phipps with material from a cowpox sore by Edward Jenner to successfully protect him from smallpox in 1796. For a long time, the principle underlying vaccines remained largely unchanged, relying on dead or disabled pathogens to stimulate an immune response from which the patient acquired a lasting immunity. This continued until it was identified that the delivery of a single protein component of a pathogen could effectively stimulate an immune response and be used as the basis for a vaccine, as exemplified by the hepatitis B vaccine.

The next step for vaccinology was conceptualised as the delivery of genetic information that encoded for viral surface proteins, encased in a harmless viral envelope, into the patient's cells. This approach would leverage the cell's protein-producing machinery to express the antigens themselves and stimulate an immune response.

DNA was chiefly the genetic language selected for early investigations into this approach due to its favourable stability compared to RNA. However, candidates relying on DNA did not translate positive results from animal models into humans, likely due to the need for it to be delivered through the cell wall and into the nucleus for it to be effective. Furthermore, this approach gives rise to safety concerns surrounding the potential integration of viral DNA into the recipient's genome.

Managing mRNA and a meeting of minds

Approaches using mRNA had been touted since the development of in vitro transcription in the 1980s, which enabled the production of synthetic mRNA without the need for cell culture. This development constituted a significant saving in the time and resources needed to produce a vaccine, as it bypassed the need for cell culture. However, initial studies of these mRNA-based vaccines revealed that they led to significant inflammation and poor rates of translation once transfected into cells.

Undeterred by the poor stability and inflammatory side effects of mRNA, Karikó continued to believe in the therapeutic promise of mRNA, persevering in her research into these molecules despite prevailing opinions at the time making the acquisition of funding highly challenging. During this period in the early 1990s, she met Weissman, an expert on dendritic cells – key cells of the immune system that are involved in vaccine-induced immune responses. Together they set out to investigate how different types of RNA interact with immune cells.

During their investigations, the pair identified that in vitro transcribed RNA stimulated the release of inflammatory signals from dendritic cells, which recognised the material as foreign. However, mammalian-derived RNA did not trigger the same response, prompting them to consider the differences between these types of RNA.

Karikó and Weissman realised that perhaps the in vitro transcribed RNA was too perfect, too synthetic and lacked the frequent chemical modifications that litter mammalian RNA transcribed in vivo. To confirm this hypothesis, they synthesised RNA with the chemically altered bases observed in nature, such as pseudouridine and N6-methyladenosine, and added them to dendritic cells.

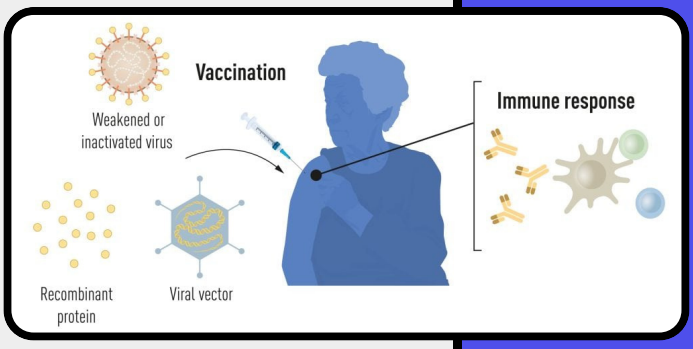


Image: Mechanism of a vaccine

The change observed was stark: inflammatory responses were significantly dampened, with different combinations of base modifications enabling the RNA to escape detection by the various receptors of dendritic cells. However, only modifications of the uridine bases led to the total avoidance of an inflammatory response from dendritic cells. Taken by the potential therapeutic impact of these findings, Karikó and Weissman published them in a paper in 2005.

Further investigations, accompanied by papers published in 2008 and 2010 identified that using modified mRNA also leads to a significant improvement in its translation and therefore protein production. This, they revealed, was in part due to the fact that the modifications prevented the activation of protein kinase R, which blocks transcription pathways and is stimulated by in vitro transcribed RNA.

The advent of mRNA vaccines

This series of discoveries made the prospect of mRNA therapeutics dramatically more desirable. Concerns surrounding efficacy and inflammation had been addressed and it didn't take long for breakthroughs in vaccine development using this approach to follow. After initial developments in the cancer research space, the first mRNA vaccine for an infectious disease, rabies, reached clinical trials in 2017. This was shortly followed by clinical trials from Moderna (MA, USA) for mRNA-based vaccines against Zika virus, a series of influenza viruses and MERS-CoV.

MERS-CoV is closely related to SARS-CoV-2 and the vaccine developed for it hinged around a section of mRNA that coded for the virus's spike protein. With these developments and existing templates for vaccines in place when SARS-CoV-2 led to the COVID-19 pandemic, the stage was set for the rapid development of the COVID-19 vaccines and within a year of the pandemic being declared, vaccines were approved and being administered.

Without the vital work of Karikó and Weissman, the foundations on which the COVID-19 vaccines were built would not have been in place and countless more lives may have been lost to the virus. It is for this essential work, their unwavering commitment to their field and the quality of their research that they have been awarded the Nobel Prize in Physiology or Medicine.

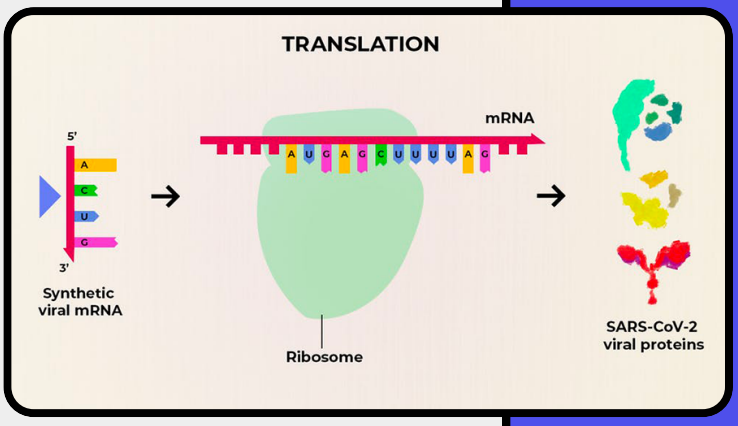
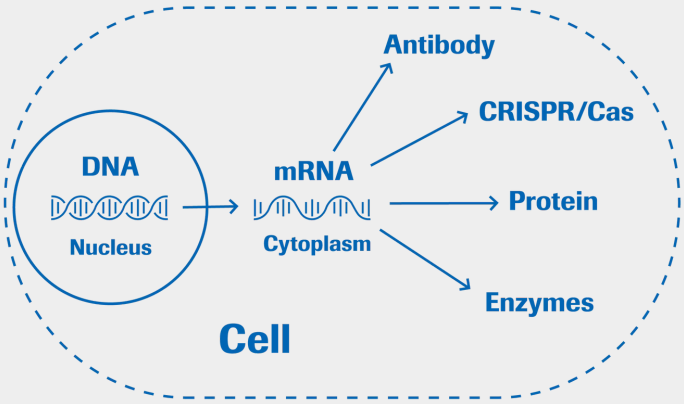
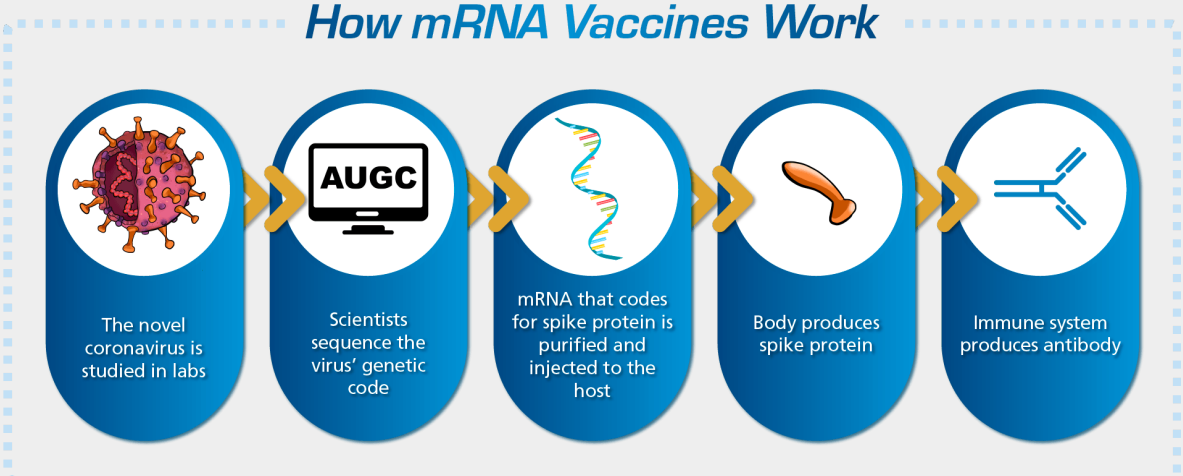


Image: Process of Translation

Related Images

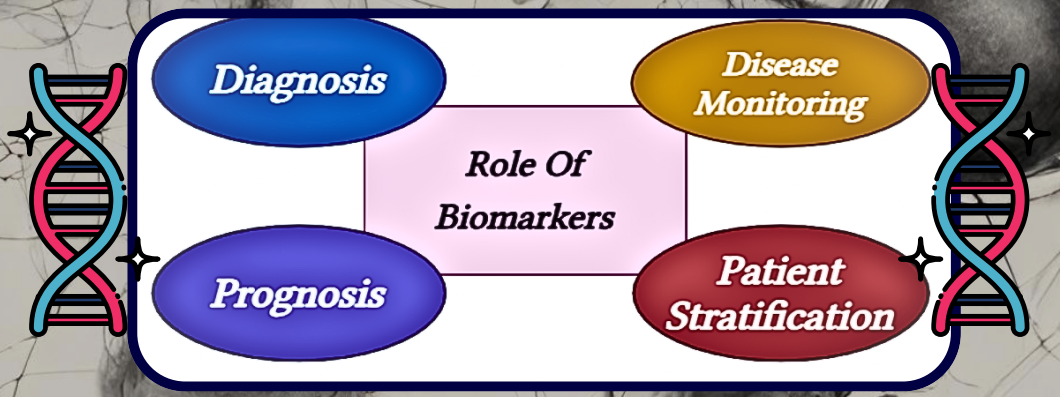




BIOMARKERS

Please give me your Autograph!!!!You will surely take a pen and give me your signatures ,right?? Now what if you get to know that your body has it's own signature just like you. These Chemical Signatures of our body are known as Biomarkers. Biomarker indicates state of health. Without knowing certain parameters we cannot detect any issues within body. Biomarkers are characteristics of the body that you can measure. For example, High cholesterol levels are a common biomarker for heart disease risk, high levels of lead in the bloodstream may indicate a need to test for nervous system and cognitive disorders, especially in children. Some Biomarkers are based on laboratory tests of blood, urine while some record changes at the cellular and molecular level. Biomarkers are very important to medicine in general.

A biomarker's classification by the FDA-NIH Biomarker Working Group can be categorized into diagnostic, monitoring, pharmacodynamic/response, predictive, prognostic, safety, and susceptibility/risk biomarkers depending on its main clinical application. Each type of biomarker can contribute to improving diagnosis, prognosis and clinical outcomes and provide complementary information about the disease or intervention .



The development of biomarkers can also enable us to understand the underlying mechanisms of disease and, therefore, identify potential new therapeutic key targets. The identification of biomarkers is appropriate at any stage of the disease's course, including the onset, recovery, and chronicity.

For an easy understanding let's learn from the example of Cancer Biomarkers:

CANCER BIOMARKERS

PROGNOSTIC
Possibility of developing a cancer. Yes or No?

DIAGNOSTIC
What type of cancer is present?

PREDICTIVE
Is the drug of suitable type for the body?

What is the right and proportional dose of the drug?

PHARMACODYNAMIC

Possibility of the cancer to appear again?

RECURRENCE

Developing new medications for different conditions can be made easier by biomarkers. A biomarker can be used by doctors during clinical trials to measure a drug's effects on patients. To determine if a medication changes any biomarkers in your body, they'll look at different biomarkers. A number of studies are looking into the possibility of using biomarkers in psychiatry. In order to treat mental health disorders, experts are researching the potential use of biomarkers for prevention, diagnosis, medication response, and drug development. By doing so, researchers can better tailor treatments to meet your specific needs. Eventually, mental health therapies could be more focused on your specific mental health condition instead of a one-size-fits-all treatment.

TYPES OF BIOMARKERS

DIAGNOSTIC BIOMARKER	*Confirmation of a disease or a condition*
MONITORING BIOMARKER	*To evaluate the extent of a disease or a medical condition*
PHARMACODYNAMIC BIOMARKER	*Clinical intervention or evaluate the response of the disease*
PREDICTIVE BIOMARKER	*To identify the possibility of clinical event after the exposure to a medicinal agent*
PROGNOSTIC BIOMARKER	*To evaluate the probability of recurrence or progression of a medical condition*
SUSCEPTIBILITY BIOMARKER	*calculating the probability of occurence of disease in a person with no issues*
SAFETY BIOMARKER	*To predict toxic adverse events induced due to a drug or environmental agent exposure*

MARINE BIOLOGY

Friends, in edition two of this magazine, we have seen the emerging field of Life Sciences. Also, we have discussed an interesting field called "ASTROBIOLOGY". We hope that those articles helped you and made you more aware of Life Sciences..

For this edition, we have come up with another interesting field present in Life Sciences – **MARINE BIOLOGY**. So, let us dive deep into the field of Marine Biology and learn pearls of wisdom through this expedition.

Marine biology is the study of marine organisms, their behaviors, and their interactions with the environment. If you have a keen interest in exploring Oceans, learning deeply about aquatic organisms, and understanding the biology of the marine world…then this field is certainly for **YOU**..! Marine biologists may study anything from the largest whale down to tiny plankton, microbes, and even the seawater itself. Marine biologists study biological oceanography and the associated fields of chemical, physical, and geological oceanography to understand marine organisms.

Marine Biology is a broad-ranging career. There are various sub-fields in this such as Marine Biology Technician, Ocean Engineering, Marine Archeology, Marine policy expert, Professor in marine ecology, Marine Biotechnology etc., Blue Biotechnology/ **Marine Biotechnology** deals with the use of technology/engineering and marine animals for developing pharmaceutical products like drugs, bioactive compounds, and enzymes.

Now, the main question is - How to become a Marine Biologists in India?

To become a Marine Biologists, students can enroll in programs like Bachelor of Science in Marine Biology. If you have your undergraduate degree in subjects like Biotechnology, Zoology, Microbiology, etc., still you can get a Master's degree in Marine Biology or any Marine-related field.

In India, we have some best colleges to pursue Marine Biology. Here, we have listed some colleges which offer various courses related to Marine Biology :

1. Pondicherry University, TamilNadu
2. Cochin University of Science and Technology, Kerela
3. National Institute of Oceanography, Panaji
4. Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.

You can get a seat in these universities through **CUET** (Common University Entrance Test) UG/PG and through various exams conducted by respective universities.

Marine Biology is an ever-evolving field. There are numerous career opportunities in this field. For example, Marine Scientists are employed by universities, international organizations, marine research institutes, government agencies, commercial companies, and not-for-profit organizations.

So, if you have the spark for Marine World within you… you can definitely think of this field as your dream career.

LABORATORY CORNER

Microtome

Invented in 1865 by **Wilhelm His, Sr.**, a **Microtome** is a specialized precision cutting instrument, which accurately and repeatedly slices sections from a block of embedded tissue. microtome is the most common instrument found in a histology laboratory. The various types of Microtome are as follows :

1. Sledge, 2. Rotary, 3. Cryomicrotome, 4. Ultramicrotome, 5. Saw, 6. Laser and 7. Vibrotome.

The most common application of Microtome is in traditional **histology** techniques. Thin slices of tissues (usually 4 μm but can be 2–10 μm) are made using Microtome and the cut tissues are then floated over a water bath, in order to eliminate wrinkles and distortion in the tissue, and picked up on a slide for further study.

Sonicator

Sonication is the act of applying sound energy via an ultrasonic bath or an ultrasonic probe to agitate particles in a sample. The equipment used for sonication is known as a **sonicator**. The instrument is based on the use of high-frequency ultrasonic waves which can travel across cell and membranes. It can be of two types:
(i) probe and (ii) bath.

Applications: For plant cell organelles isolation; reducing particle size of novel drug delivery carriers like liposomes, ethosomes, tansferosomes, and lipid nanoparticle; preparation and formation of novel drug delivery carriers; and killing of microbes in heat-labile preparations.

FALSE ADVERTISEMENT IN FOOD INDUSTRY

The **Food Safety and Standards Authority of India (FSSAI)** has uncovered food business owners who make false claims and advertisements, violating the Food Safety and Standards (Advertisements & Claims) Regulations, 2018. These regulations apply to producers and distributors of refined oils, millet products, pulses, flours, and ghee. The **Advertising Standards Council of India (ASCI)** and the Food Safety and Standards Regulations, 2018 ensure accurate, non-deceptive food commercials in all forms of food advertising, including print, television, and internet media. Food marketing must not inflate or make false claims about nutritional advantages.

"FSSAI FINDS 32 NEW CASES OF MISLEADING ADS, CLAIMS BY FOOD BIZ OPERATOR"

CLAIMS ON RESEARCH SHOWS EATING A LOW-FAT BREAKFAST LIKE THE PRODUCT TEND TO SLIMMER WHICH IS DECEPTIVE IN NATURE

REALITY: Research on adults barely showed any difference in weight and BMI, no matter whether they ate breakfast or not. It depend on how healthy and balanced your diet is for the rest of the day and how active you are.

"ASCI PROCESSES COMPLAINTS AGAINST 415 ADVERTISEMENTS"

CLAIMED THEY WERE BETTER FOR STAMINA BUILDING THAN REGULAR CHOCOLATE DRINKS AND MADE CHILDREN TALLER, STRONGER AND SHARPER.

REALITY: The FSSAI said these claims were "misleading, and no study has been submitted" to back the claims.

CLAIMS THE OIL UNDERGOES 7-STAGE EUROPEAN REFINING TECHNOLOGY 'SURAKSHA SHAKTI'.

REALITY: FSSAI has found the claim misleading

COMPLAN CLAIMS IT HELPS KIDS TO GROW TWO TIMES TALLER THAN BEFORE.
COMPLAN MEMORY CLAIMS OF BOOSTING MEMORY

REALITY: Currently facing prosecution as they have no study to back up their claim

COMPLAN CLAIMS IT HELPS KIDS TO GROW TWO TIMES TALLER THAN BEFORE.
COMPLAN MEMORY CLAIMS OF BOOSTING MEMORY

REALITY: ASCI has found the claim misleading

"FOOD REGULATOR EXPOSES ADS MARRED BY BOGUS CLAIMS ON NUTRITIONAL VALUE, PREPARES TO PROSECUTE 19 CASES"

WORLD'S MOST HAPPIEST VS UNHAPPIEST COUNTRY

The first **World Happiness Report** or **WHI** was released on the 1st of April 2012 by the United Nations General Assembly and since then 20th March has been observed as the International Day of Happiness. The consensus helps different governments to view "Happiness" as an operational objective to work upon.
Researchers collect and analyze data over three years and the countries are ranked on the basis on 6 main factors:

GDP PER CAPITA

The data is crucial for assessing economic prosperity, as it estimates the value of a company's products and services, directly impacting population well-being.

SOCIAL SUPPORT

A significant factor in determining happiness since everyone needs reliable individuals around them. Therefore, lack of such leads to depression and misery.

HEALTHY LIFE EXPECTANCY

Higher life expectancy indicates healthier populations and better healthcare accessibility in countries with better physical well-being.

FREEDOM TO MAKE LIFE CHOICES

Citizens desire freedom, including basic rights like travel, voting, career choices, which are essential for their happiness.

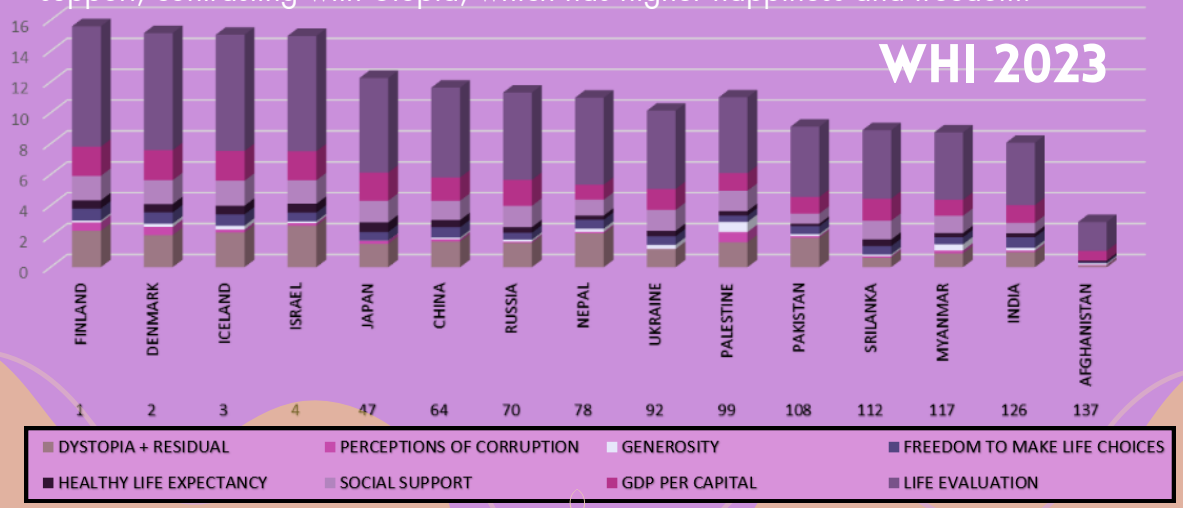
GENEROSITY

WHI defines generosity as people's willingness to donate to charities based on GDP per capita, which directly correlates with prosperity and happiness.

PERCEPTION OF CORRUPTION

Corruption in businesses and governments leads to increased transaction costs, inefficient investments, human rights violations, social injustice, poor economic performance, and lower individual happiness.

Another important factor is **Dystopia**. Dystopia is an imaginary country with the world's least-happy people, comparing all countries based on six key variables. It has the lowest incomes, life expectancy, generosity, corruption, freedom, and social support, contrasting with Utopia, which has higher happiness and freedom.



SIX YEARS IN A ROW, FINLAND HAS RANKED 1ST IN THE WHI AS THE WORLD'S HAPPIEST COUNTRY WHILE AFGHANISTAN HAS RANKED AS THE MOST UNHAPPIEST COUNTRY FOR THREE CONSECUTIVE YEARS.

- Afghanistan's constitution was abrogated by the Taliban in 2021 leading in limitation of freedom.
- Since 2021 crises like political illegitimacy, economic crises, and justice access issues have led to a lack of services such as fundamental rights like freedom of expression, work, education, and health services often denied or restricted, causing severe suffering thus, affecting many people.
- Women have been denied basic rights such as education, freedom of expression, and government positions, highlighting the ongoing struggle against problems, disturbances, and inequalities in the country over the past two years.

Now imagine living under such conditions. It's no better than a cage. A cage which they cannot escape and if they tried there would be harsh consequences. Envisioning life under such conditions is no better than living in a cage. A cage which can not be escaped without severe consequences.

- Finns live a humble, minimalist lifestyle, enjoying small pleasures without boasting about wealth, living happily together without class distinction and prioritizing nature's benefits for well-being and creativity.
- Finnish people are known for their trustworthiness and honesty, which contribute to higher levels of trust and happiness.
- Finland's work culture is known for its low hierarchy, respect for opinions, and openness to feedback. Employees have the right to adjust working hours, enhancing job satisfaction, efficiency, and happiness.
- Finland provides free education from pre-primary to university, eliminating the psychological and financial burden on parents. It is also the country have the least amount of corruption.

India ranks 127th in the World Happiness Index (WHI), making it one of the unhappiest countries. How do we get our country out of this mess? Certain lessons must be drawn from Finland. It is known as the world's happiest country not because of technological developments or organizational productivity, but because of its principles. We must recognize how crucial such minor qualities are to our pleasure. We can increase our pleasure by being respectful, affectionate, trustworthy, and connected to nature. Another thing to understand is that happiness is not an individual choice, but that our social and political environments must be transformed as well.

// Bio-chemistry

MSG: Is It Actually Bad For You?

// Dig into the seasoning known as MSG, and find out how this flavouring was developed and if it's actually bad for your health.

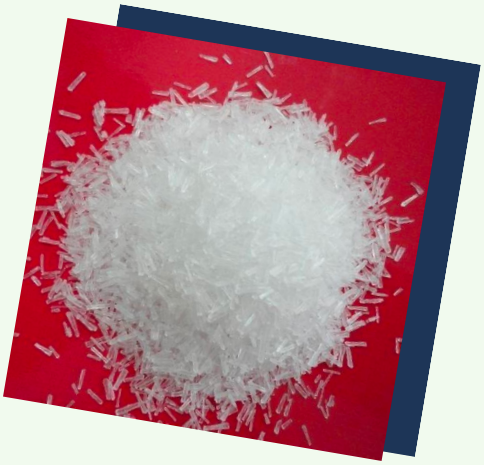
Psst...It is definitely in your midnight snacks.

In 1968, Dr. Robert Ho Man Kwok felt ill after dinner at a Chinese restaurant. He wrote a letter detailing his symptoms to a prestigious medical journal, pondering whether his illness had resulted from eating monosodium glutamate — also known as MSG.

Kwok's connection between his headache and this common seasoning in American Chinese cuisine was just a hunch. But his letter would dramatically change the world's relationship with MSG, inspiring international panic, biased science, and sensationalist journalism for the next 40 years. So what is this mysterious seasoning? Where does it come from, and is it actually bad for you?

So, what is monosodium glutamate?

MSG is a mixture of two common substances. Sodium, which is well-established as an essential part of our diet, and glutamate, a very common amino acid found in numerous plant and animal proteins. Glutamate plays a key role in our digestion, muscle function, and immune system. Around the time of Dr. Kwok's letter, it had been identified as an important part of our brain chemistry. Our body produces enough glutamate for all these processes, but the molecule is also present in our diet. You can taste its signature savoury flavour in foods like mushrooms, cheese, tomatoes, and broth. Chasing this rich flavour is what led to MSG's invention in 1908.

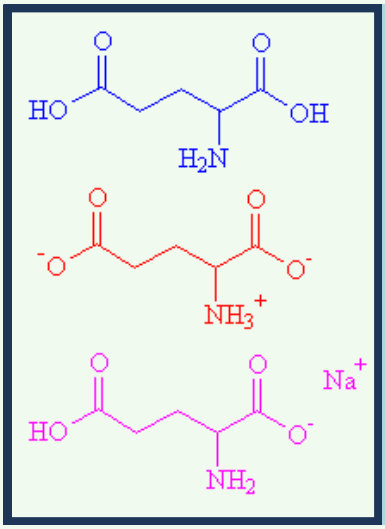


A Japanese chemist named Dr. Ikeda Kikunae was trying to isolate the molecule responsible for a unique flavour he called "umami," meaning "a pleasant, savoury taste." Today, umami is recognised as one of the five basic tastes in food science. Each basic taste is produced by a unique molecular mechanism that can't be replicated by combining other known tastes.

In the case of umami, those mechanisms arise when we cook or ferment certain foods, breaking down their proteins and releasing amino acids like glutamate. But Ikeda found a savoury shortcut to producing this chemical reaction. By isolating high quantities of glutamate from a bowl of noodle broth and combining them with another flavour enhancer like sodium, he created a seasoning that instantly increased the umami of any dish. The result was a major success.

By the 1930s, MSG was a kitchen staple across most of Asia; and by the mid-20th century, it could be found in commercial food production worldwide. But when Dr. Kwok's letter was published, the outrage was immediate. Researchers and citizens demanded a scientific enquiry into the popular additive. On one hand, this wasn't unreasonable. The substance hadn't been tested for toxicity, and its health impacts were largely unknown. However, it's likely many people weren't responding to a lack of food safety regulation, but rather the letter's title: "Chinese Restaurant Syndrome".

While MSG was commonly used in numerous cuisines, many Americans had longstanding prejudices against Asian eating customs, labelling them as exotic or dangerous. These stigmas fuelled racially biased journalism, and spread fear that eating at Chinese restaurants could make you sick. This prejudiced reporting extended to numerous studies about MSG and umami, the results of which were much less conclusive than the headlines suggested. For example, when a 1969 study found that injecting mice with MSG caused severe damage to their retina and brain, some news outlets jumped to proclaim that eating MSG could cause brain damage. Similarly, while some studies reported that excess glutamate could lead to problems like Alzheimer's, these conditions were later found to be caused by internal glutamate imbalances, unrelated to the MSG we eat.



The headlines weren't just a product of prejudiced reporters. Throughout the late 60s and early 70s, many doctors also considered "Chinese Restaurant Syndrome" to be a legitimate ailment. Fortunately, today's MSG researchers no longer see the additive in this discriminatory way. Recent studies have established the vital role glutamate plays in our metabolism, and some researchers even think MSG is a healthier alternative to added fat and sodium.

Many are investigating whether regular consumption of MSG could be linked to obesity, and it is possible that binging MSG produces headaches, chest pains, or heart palpitations for some people. But for most diners, a moderate amount of this savoury seasoning seems like a safe way to make life a little tastier.

TISSUE ENGINEERING

It is commonly understood that tissue engineering is "a field combining engineering and life sciences to develop biological substitutes that restore, maintain, or improve the function of biological tissues or entire organs", as explained by Langer and Vacanti.

Tissue engineering is a specific branch that lies under biomedical engineering. It encompasses a wide variety of scientific fields, such as cell biology, molecular biology, medicine, chemistry, and material science. Rather than treating damaged tissues or organs, its aim is to regenerate them or repair them if they are damaged through injury or genetics.

In order for tissue engineering to succeed, four factors must be present

I. THE CORRECT CELLS
II. THE ENVIRONMENT
III. THE RIGHT BIOMOLECULE
IV. PHYSICAL AND CHEMICAL FORCES TO INFLUENCE CELL DEVELOPMENT

For tissue engineering approaches to be successful, cells are an essential component. For the creation and replacement of new tissues, tissue engineering uses cells as an approach. Examples include fibroblasts used for skin repair or renewal, chondrocytes used for cartilage repair (MACI–FDA approved product), and hepatocytes used in liver support systems. Cells can be extracted from a primary source of cells, such as stem cells, or they can be taken from a patient directly. A structure called scaffold {provides strength} is a supporting structure made from donor's tissue or from natural/synthetic polymers. This structure provides a residence for the cells and biomolecules

APPLICATIONS

#Used for regeneration of damaged cells
#Used in surgeries to transplant skin
#Used to analyze the effect of certain chemicals or drugs
#Used for In vitro meat {Lab Grown Meat}
#Used in cardiovascular repair, nueral repair, skeletal muscle repair, etc.

FIRST INDIAN WOMAN TO EARN A PHD

DR. KAMALA SOHONIE

REMEMBERING DR. KAMALA SOHONIE, AN INDIAN BIOCHEMIST AND HER REMARKABLE WORK IN THE FIELD OF BIOCHEMISTRY.

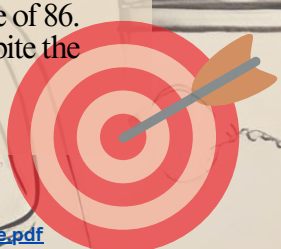
Who was Kamala Sohonie?

Kamala Sohonie was a quiet, unassuming person. A woman of few words. To look at her one would think that the stream of her life also must have been quiet, easy, uneventful. It was not so, she had many hurdles to cross. Many rapids to pass, before she could be known as a 'Woman in Science'. That too when she had full support from her family. Her father and uncle were chemists who had studied at the Tata Institute of Sciences (now IISc, Bengaluru).

So the young girl decided that she was destined to be a renowned chemist . Sohonie graduated in 1933 with a BSc degree in Chemistry and Physics from Bombay University, topping the merit list.

A PROMPT REFUSAL Sohonie faced rejection from CV Raman when she applied for an MSc degree at IISc. Determined, she confronted Raman and challenged him to allow her admission. Raman reluctantly agreed but imposed several conditions, including probation and restriction on her status as a student. Kamala accepted these terms, but one can only imagine her indignation at them. The first hurdle in her pursuit in science was crossed (1933). At the Institute of Science, Bangalore, she worked very hard. After observing her for a year, Raman was satisfied about her sincerity and discipline. She was allowed to do regular research in Bio-chemistry. Sohonie completed her course with distinction and secured admission to Cambridge University, where she completed her PhD in just 14 months. Her research focused on potatoes, leading to the discovery of the enzyme 'Cytochrome C' and its role in cellular respiration. Returning to India, Sohonie served as the head of the Department of Biochemistry at Lady Hardinge College, New Delhi. She worked at the Nutrition Research Lab, Coonoor, and the Royal Institute of Science in Mumbai, studying various food items to identify their nutrients.

Using the above research, she conducted pioneering research on neera, the sap extracted from various palm tree species, at the suggestion of the first Indian president. It was discovered that "neera contains a large amount of vitamin A and C, along with iron, and that vitamin C can survive concentration in palm jaggery and molasses." This discovery laid the foundation for jaggery and molasses to be used as cheap dietary supplements. This discovery led to a critical humanitarian use: Nowadays, neera is often used as a strength booster for malnourished children." It is Dr Sohonie's incredible and innovative work that earned her the Rashtrapati Award from the President of India. In 1998, Kamala Sohonie passed away at the age of 86. She unquestionably has managed to remain substantial over the decades despite the prejudiced gender ideas of her time.



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https://www.ias.ac.in/public/Resources/Initiatives/Women_in_Science/Contributors/kamalasohonie.pdf

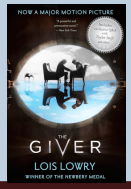
Curious Search

Fahrenheit 451

~By Ray Bradbury

"Frightening in its implications... Mr. Bradbury's account of this insane world which peers many alarming resemblances to our own is fascinating"

-The New York Times



The Giver

~By Lois Lowry

"The final flight for survival is as riveting as it is inevitable. This tightly plotted story and its believable characters will stay with the readers for a long time"

-The New York Times

Life As We Knew It

~By Susan Beth Pfeffer

"This book transcends their premises with terrifyingly well-imagined future and superb characterization. Riveting"

-John Green, Author

The Time Machine

~By H. G. Wells

" The time machine is the greatest of all works of pure science fiction"

-National Review Online

Dune

~By Frank Herbet

"One of the monuments of modern science fiction"

-Chicago Tribune

Brushing too soon after eating or drinking can soften the tooth enamel

DO YOU KNOW??

MONTHLY SCIENCE

Mini-robots modelled on insects:

Researchers at Washington State University have created the smallest, lightest, and fastest fully functional micro-robots to date – a mini-bug and a **water strider**. Weighing eight and 55 milligrams, these insect-like robots hold potential applications in **artificial pollination**, search and rescue, environmental monitoring, micro-fabrication, and robotic-assisted surgery. The **mini-bug** and water strider can move at about 6 mm/sec, utilizing tiny actuators made of **"shape memory"** alloy wires. The actuator, developed by PhD student Conor **Trygstad**, is the smallest and fastest ever for micro-robotics, allowing the robots to move with remarkable agility. The researchers aim to create fully autonomous robots and explore water strider-type robots that can move both on and under water surfaces, using **tiny batteries** or catalytic combustion for power.

Thinning of brain region may signal dementia risk 5–10 years before symptoms

Researchers from UT Health San Antonio report conveys that thinning ribbon of brain tissue known as **cortical gray matter** could serve as an accurate **biomarker** for dementia, indicating th**e disease 5 to 10 years before symptoms manifest**. The study, published in **Alzheimer's & Dementia:** The Journal of the Alzheimer's Association, involved MRI brain imaging of 1,000 participants from the Framingham Heart Study in Massachusetts and 500 individuals from a California cohort. The study, led by C.Satizabal, PhD, observed a consistent correlation between thinner cortical gray matter and higher dementia risk across diverse populations. The researchers aim to explore risk factors associated with this thinning, including cardiovascular risk factors, diet, genetics, and environmental pollutants. The potential **application** of this biomarker in clinical trials and therapeutic development is also noted, providing promising early detection and intervention.

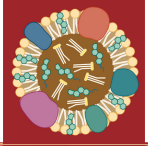
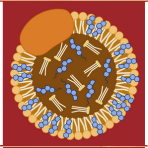
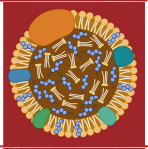
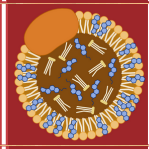
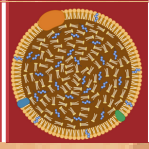
source: Sciencedaily

IS GOOD CHOLESTEROL TRULY GOOD?

BREAKING DOWN THE RESEARCH

Cholesterol is one of the most important constituents of the lipid fraction of the human body. It is a sterol which forms many of the important hormones in the body as well as is a fundamental element of cell membrane. It is produced by the liver and is transported through the bloodstream in the form of Lipoproteins.

DEPENDING UPON THE NUMBER THEY CAN BE EITHER BENEFICIAL OR HARMFUL TO US. SOME OF THEM ARE AS FOLLOWS:OR HARMFUL TO US. SOME OF THEM ARE AS FOLLOWS:

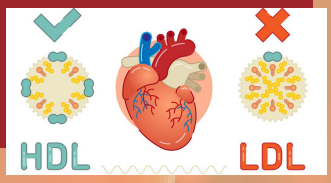
HDL		The "good cholesterol," transports cholesterol back to the liver reducing cardiovascular disease risk by eliminating LDL, or bad cholesterol from the arteries. High HDL levels are beneficial.
LDL		The “bad” cholesterol” carries cholesterol that accumulates as plaque inside blood vessels which can make blood vessels too narrow for blood to flow freely.
VLDL		Another type of “bad cholesterol.” These carry triglycerides and to a lesser degree, cholesterol to your tissues.
IDL		Triglyceride-rich lipoprotein secreted by the liver that transports a variety of triglyceride fats and cholesterol and, like LDL.
CHYLOMICRON		Produced by enterocytes from dietary lipids, these are very large molecules which aid in Triglyceride transportation.

HOW DOES LDL AFFECT OUR BODY?

Lipoprotein (a), often known as LP(a), is a low-density lipoprotein. A second protein known as apo(a) or apolipoprotein loops around it in small portions called the Kringles. These loops make LDL particles sticky, causing LP(a) to accumulate in blood vessels, increasing the risk of cardiovascular disease and 'Atherosclerosis'.

Is HDL really the “GOOD CHOLESTEROL’?

A lower risk of heart disease is usually connected with a greater HDL level. But is measuring just HDL level actually worth it? Although having more HDL than LDL is normally helpful, there are some elements that influence how HDL functions in our bodies and how much we require of it.



A study at the University of Pittsburgh Graduate School of Public Health suggests that the traditional method of measuring HDL may not necessarily reduce the risk of cardiovascular disease in older women.

The researchers looked at data from 1138 women aged 45 to 84 who took part in the Multi-Ethnic project of Atherosclerosis (MESA), a medical research project supported by National Institutes of Health (NIH).

The study found that physiological changes in women's sex hormones, lipids, body fat deposition, and vascular health as they approach menopause could cause chronic inflammation over time, affecting the quality of HDL particles. The researchers also investigated how the age at which women entered postmenopause and the period since transitioning may influence the expected cardio-protective correlations of HDL measurements. They found that higher HDL cholesterol was associated with an increased risk of atherosclerosis in women who were older at menopause and had been postmenopausal for at least 10 years.

High total HDL cholesterol levels in postmenopausal women may conceal a high risk of heart disease.

A study by Harvard School of Public Health researchers in 2012 found that HDL cholesterol may not protect against coronary heart disease due to the presence of a proinflammatory protein called apolipoprotein C-III (apoC-III). The study, led by Sacks and Majken Jensen, investigated whether the presence of apoC-III on HDL cholesterol affected its heart-protective qualities and whether it could differentiate HDL cholesterol into two subclasses: those that protect against future heart disease risk and those that do not.

In 1989 and 1990 blood samples from 32,826 women and 18,225 men were taken. It was found that two subtypes of HDL, total HDL with apoC-III and HDL without apoC-III, have inverse relationships with the incidence of coronary heart disease (CHD) in healthy men and women. The predominant HDL type, which lacks apoC-III, was associated with CHD, but a modest percentage of HDL cholesterol with apoC-III on its surface was associated with a higher risk of future CHD. Men and women with HDL apoC-III levels in the top 20% of the population had a 60% increased risk of CHD.

Both studies concluded that simply measuring HDL cholesterol will not tell us if a person is at risk of heart disease or not. A complete test that involves more than just the standard HDL-LDL testing, as found in the Pittsburg study, is required. If the test reveals whether HDL is present with or without apoC-III, it may be a better predictor of heart disease risk than the simpler measure of total HDL.

CULTURED MEAT PRODUCTION IN LABS

A CLOSER LOOK

Though Singapore was the first country to legalize lab-grown meat nearly two and half years ago, the fledgling industry continues to face supply issues and public acceptance hurdles, experts say. As a result of the decision, San Francisco-based startup Eat Just is now able to sell lab-grown chicken meat.

The consumption of meat has existed since the beginning of time. If we see the global consumption of meat it is around 365 million tons, while in top meat eating countries like US, Australia per year around 120kg/person is consumed.

This increase in meat consumption day by day is contributing to climate catastrophe. Foods derived from plants are generally associated with lower greenhouse gas emissions compared to those derived from animals. Take the example of rice. The production of one kilogram of the staple releases 4.45 kilograms of carbon dioxide - less than half that of poultry. Consequently, avoiding meat altogether can reduce your carbon footprint considerably. It is estimated that meat consumption is responsible for 1.1 tons of carbon dioxide equivalent each year on a global scale.

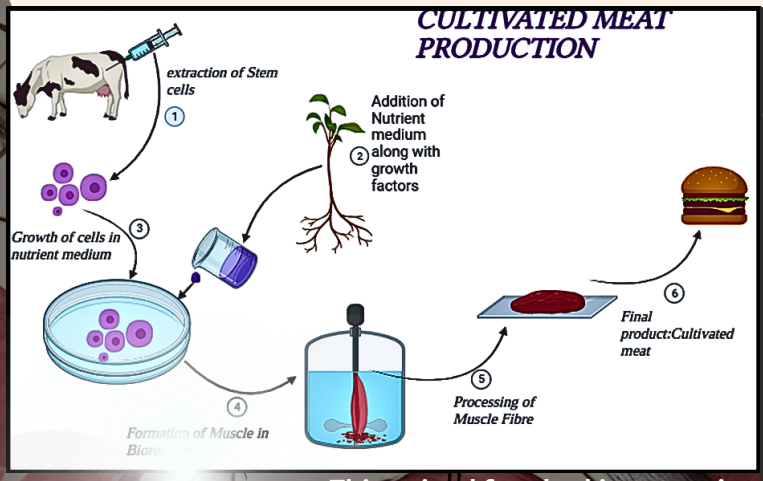
Now in all this what if you got to know that you can eat meat without slaughtering any animals? Interesting right?

Traditionally, meat has been sourced from animals, but scientists have recently discovered a way to change this. Animal meat can now be grown in a lab, completely outside of its body. This is known as lab-grown meat, or cultured meat. But do factory farms really need to be replaced by this technology? Lets go on journey where we will get to know some interesting things about Lab Grown Meats{LGM}.

HOW IS MEAT GROWN IN A LABORATORY?

This complex yet fascinating process starts with Stem Cells. Stem cells are multipotent cells that have the capacity to become almost any type of cell in a body. Lets take an example of a cow, the stem cells are are harvested from its primary source that is a cow and then are isolated and kept in a large bioreactor where these cells are enriched with nutrients along with various amino acids and growth hormones.

One of the key ingredient in this process is FBS [Fetal bovine serum] which helps in preventing the replicating cells from committing suicide in the bioreactor which is not there home place to grow. After replication these cells can be made into any desired cells by adding required growth factors(for eg. muscle or fat). And a lot of cells are required to mush together to form one burger. The origin of cell does not matter the process is same for all types of meats.



A GLARING TISSUE

- The cells of these meats show similar characteristic to cancer cell.
- Not have any immune response against various infections
- FBS costs a lot of money but synthetic alternative will be more expensive

This animal free looking meat is actually not animal free. The key ingredient Fbs is actually collected from the blood of foetus of a dying slaughter cow. To make one lab grown meat burger around 50L of Fbs is required. A single foetus can yield between 150 to 550 ml Fbs only, so calculating around 90 to 333 cow foetus are needed for JUST ONE burger.

Lab grown meat is really a web of complex economics as the procedure is way more expensive than buying a burger in your favourite restaurant. This is how this technology is mixed in controversy. But there is always a hope, many technical analysts are trying to cut down the costs and lowering the production costs of the product. New technologies are almost always prohibitively expensive. And it will continue to be quite expensive for some time.

Antibiotic Resistance: A Growing Issue

// Take a closer look at the challenges of antibiotic resistance and what we can do to prevent losing this vital medicine.

Antibiotics: behind the scenes, they enable much of modern medicine. We use them to cure infectious diseases, but also to safely facilitate everything from surgery to chemotherapy to organ transplants. Without antibiotics, even routine medical procedures can lead to life-threatening infections. And we're at risk of losing them.

Antibiotics are chemicals that prevent the growth of bacteria. Unfortunately, some bacteria have become resistant to all currently available antibiotics. At the same time, we've stopped discovering new ones. Still, there's hope that we can get ahead of the problem. But first, how did we get into this situation?

The first widely used antibiotic was penicillin, discovered in 1928 by Alexander Fleming. In his 1945 Nobel Prize acceptance speech, Fleming warned that bacterial resistance had the potential to ruin the miracle of antibiotics. He was right: in the 1940s and 50s, resistant bacteria already began to appear. From then until the 1980s, pharmaceutical companies countered the problem of resistance by discovering many new antibiotics. At first this was a highly successful — and highly profitable — enterprise. Over time, a couple things changed.

Newly discovered antibiotics were often only effective for a narrow spectrum of infections, whereas the first ones had been broadly applicable.

This isn't a problem in itself, but it does mean that fewer doses of these drugs could be sold— making them less profitable. In the early days, antibiotics were heavily overprescribed, including for viral infections they had no effect on. Scrutiny around prescriptions increased, which is good, but also lowered sales. At the same time, companies began to develop more drugs that are taken over a patient's lifetime, like blood pressure and cholesterol medications, and later anti-depressants and anti-anxiety medications. Because they are taken indefinitely, these drugs more profitable.

By the mid-1980s, no new chemical classes of antibiotics were discovered. But bacteria continued to acquire resistance and pass it along by sharing genetic information between individual bacteria and even across species. Now bacteria that are resistant to many antibiotics are common, and increasingly some strains are resistant to all our current drugs. So, what can we do about this?

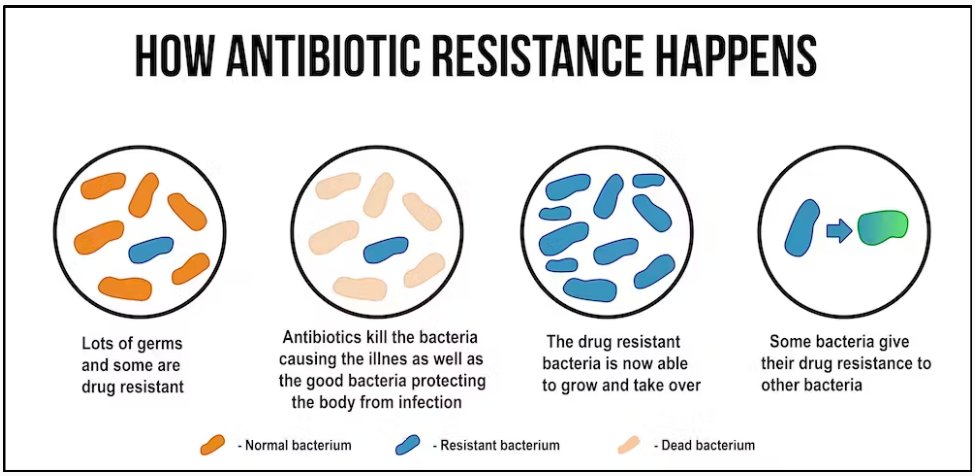
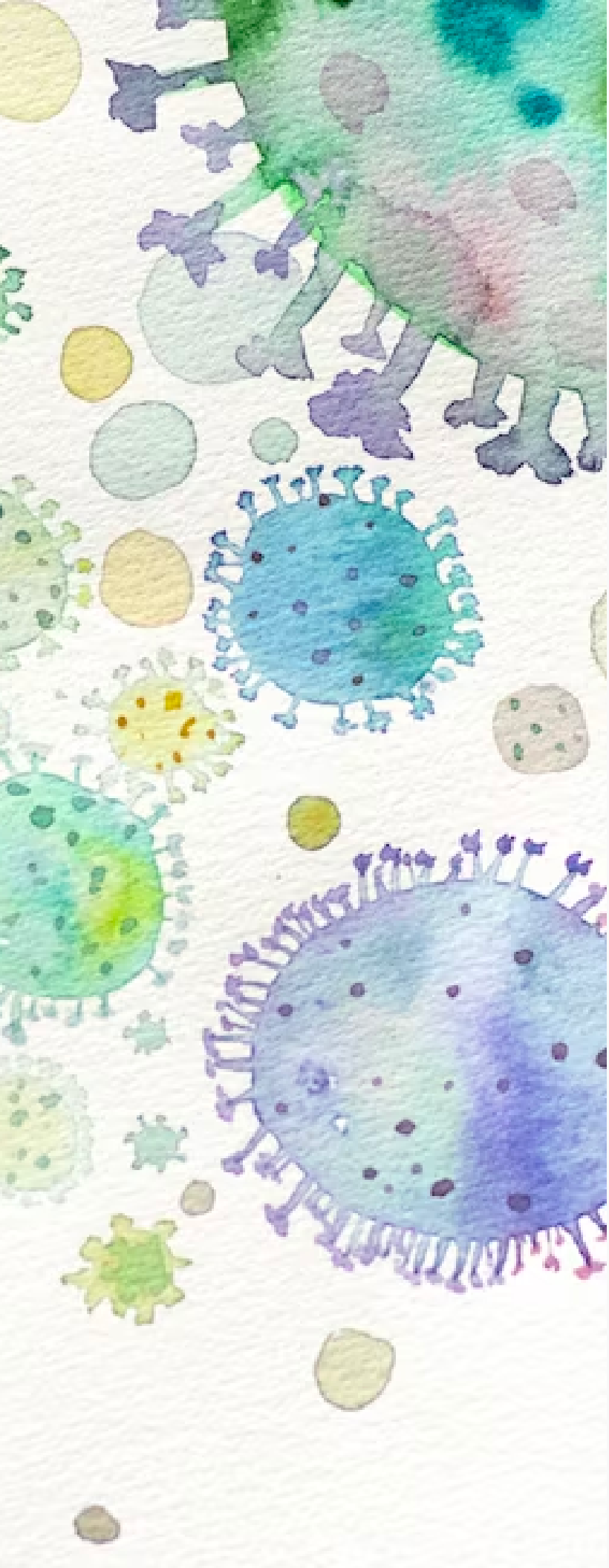


Image: Mechanism and nature of antibiotic resistance

We need to control the use of existing antibiotics, create new ones, combat resistance to new and existing drugs, and find new ways to fight bacterial infections. The largest consumer of antibiotics is agriculture, which uses antibiotics not only to treat infections but to promote the growth of food animals. Using large volumes of antibiotics increases the bacteria's exposure to the antibiotics and therefore their opportunity to develop resistance. Many bacteria that are common in animals, like salmonella, can also infect humans, and drug-resistant versions can pass to us through the food chain and spread through international trade and travel networks.

In terms of finding new antibiotics, nature offers the most promising new compounds. Organisms like other microbes and fungi have evolved over millions of years to live in competitive environments — meaning they often contain antibiotic compounds to give them a survival advantage over certain bacteria. We can also package antibiotics with molecules that inhibit resistance. One way bacteria develop resistance is through proteins of their own that degrade the drug. By packaging the antibiotic with molecules that block the degraders, the antibiotic can do its job. Phages, viruses that attack bacteria but don't affect humans, are one promising new avenue to combat bacterial infections. Developing vaccines for common infections, meanwhile, can help prevent disease in the first place.

The biggest challenge to all these approaches is funding, which is woefully inadequate across the globe. Antibiotics are so unprofitable that many large pharmaceutical companies have stopped trying to develop them. Meanwhile, smaller companies that successfully bring new antibiotics to market often still go bankrupt, like the American start up Achaogen. New therapeutic techniques like phages and vaccines face the same fundamental problem as traditional antibiotics: if they're working well, they're used just once, which makes it difficult to make money. And to successfully counteract resistance in the long term, we'll need to use new antibiotics sparingly— lowering the profits for their creators even further.



One possible solution is to shift profits away from the volume of antibiotics sold. For example, the United Kingdom is testing a model where healthcare providers purchase antibiotic subscriptions. While governments are looking for ways to incentivise antibiotic development, these programs are still in the early stages. Countries around the world will need to do much more— but with enough investment in antibiotic development and controlled use of our current drugs, we can still get ahead of resistance.

RESEARCH INSIGHTS

TO STUDY THE NEOPTERIN LEVEL AS BIOMARKERS IN PROGNOSIS OF SILICOSIS

India's industrialization, globalization, child labor, poor legislation, and informal sector have led to increased work-related hazards, resulting in inadequate data on occupational diseases like silicosis, COPD, and musculoskeletal injuries. Over half a million workers in over 300,000 factories are affected, despite the World Health Organization and International Labour Organization's public awareness campaign to eliminate silicosis in 1995. Silicosis, caused by long-term exposure to silica dust, leads to respiratory inflammation and fibrosis, reducing breathing ability. This study aims to identify new treatment strategies by observing oxidative stress and biochemical changes in patients' peripheral blood. Neopterin, a marker for cell-mediated immune response, is produced by host macrophages and dendritic cells. The study aims to investigate the biochemical changes of miners exposed to dust, including early detection of Neopterin in silicosis and its prognosis, and establish an enzymatic correlation between oxidative stress and silicosis, using Human Macrophage Cell lines. The study found that exposure to silica dust causes significant oxidative stress in human macrophage cells, leading to increased Neopterin levels. Serum Neopterin may be used as a prognostic biomarker for early detection of silicosis.

Dr. (Mrs.) B. A. Mehere Ma'am,
Principal, Dr. Ambedkar College, Nagpur.

ADIPOKINES IN INSULIN RESISTANCE

Obesity is a chronic metabolic disease that affects both the pediatric and adult populations. Adipose tissue acts as an endocrine organ that secretes various adipokines involved in fat mass regulation and energy balance via modulating the metabolic signaling pathways. Altered secretion of adipokines promotes multiple complications, including insulin resistance. The primary mechanism of action that underlines the involvement of adipokines in the development of insulin resistance includes phosphorylation/de-phosphorylation of insulin receptor substrate-1 (IRS-1) facilitate by other signalling molecules like a suppressor of cytokine signalling 1 (SOCS-1). Adipokines mediated insulin resistance further contribute to the development of atherosclerosis, dyslipidemia, fatty liver disease, cancer etc. Thus, it is important to target the role of resistin, lipocalin-2, RBP-4, chemerin, TNF-alpha and IL-6 adipokines in the progression of insulin resistance.

https://www.biotech-asia.org/vol18no2/adipokines-in-insulin-resistance-current-updates/

Dr. Utpal Dongre Sir,
HOD, Department of Biochemistry & Biotechnology, DACN.

Nisin Appears to Rescue the Cognitive Impairment in Drosophila melanogaster Caused Due to Amyloid Beta 42 Peptide Induced Neurotoxicity

Host gut microbiome is well acknowledged for its influence on neurodevelopmental and behavioural aspects but the information about underlying signaling mechanisms is vague. Research output envisaging neuroprotective activities of the molecules preferentially of bacterial origin, viz. Lanthionines, hints towards an interoceptive communication between gut bacteria and the brain. The human gut microbiome is well known to harbor the bacteria actively involved in lanthionine containing peptides (Lantibiotics) production.

We thus attempted to demonstrate the neuroprotective potential of Nisin, an autoinducer pheromone lantibiotic peptide of probiotic origin, in germfree (GF) Drosophila melanogaster. The GF flies were modeled to express transgenic human amyloid-β42(Aβ42) peptides in brain considering Aβ42's principal role in formation of neurofibrillary plaques and associated neurodegeneration.

Dr. Deovrat Begde Sir,
Associate Professor, Department of Biochemistry & Biotechnology, DACN.

EFFECT OF FLUORESCEIN ANGIOGRAPHY ON KIDNEY FUNCTION

Fluorescein angiography is a common diagnostic procedure for diabetic retinopathy, a complication of type 2 Diabetes Mellitus often coexisting with Chronic Kidney Disease (CKD). This is the first research study which involves assessing serum creatinine and early acute kidney injury biomarkers, specifically Serum Cystatin-C, in pre and post-angiography samples from diabetic patients. The research, involving 70 diabetic patients, indicates no significant changes in serum creatinine levels post-angiography. While seven patients experienced a slight increase in Serum Creatinine within 72 hours of fluorescein administration, the overall study suggests that fluorescein angiography had no significant impact on kidney function.

https://ijpsr.com/bft-article/investigations-on-the-effect-of-fluorescein-angiography-on-renal-function-in-diabetic-retinopathy-patients/

Mr. Pradip Hirapure Sir,
Assistant Professor, Department of Biochemistry & Biotechnology, DACN.

MS. BHAGYASHREE BAWANKULE

M.Sc. Biotechnology, Dr. Ambedkar College, Nagpur (2021-2023)

ACHIEVEMENTS

- **RTMNU Gold Medalist in M.Sc Biotechnology (University Summer 2023)**
- **CSIR NET 2022 Qualified (LS) with 95.67 percentile**
- **IIT JAM, GAT B (AIR 96) Qualified**
- **Stood First CRISPR-based course.**

How did you manage your studies with Dissertation work and practicals?

To know how to utilize the given time is a real challenge. During our semesters, we get ample amount of time to study. Also, our college completes our whole practical of the respective semester in the first two months. So, that's an opportunity to prepare notes and study. In my case, I used this time as a blessing for the preparation of my M.Sc. exams.

What was your study pattern while pursuing a Masters in Biotechnology?

Well, In M.Sc. you do not get any readymade notes or books. There are some important standard Reference books. My main focus was always on clearing concepts. By referring to many standard books, I used to make notes on each topic. In this way, I focused more on concepts and practiced answer writing as well.

What is the secret behind your consistent academic achievements?

The answer to your question lies in the question itself. 'Consistency' is the key to achieve great academic milestones. The only thing I follow is- If I'm working on something, I'll give my 100% in it. Remember one thing, your real competition is with yourself and not with others. I tried to improve myself from my past versions and this helped me to achieve more and more. As I told earlier, I used to utilize the time given for examination preparation for making notes. During my M.Sc. I prepared my personal notes and it helped me a lot in clearing concepts and scoring more in the University Examination.

How was your Dissertation experience at our college?

My dissertation experience was phenomenal. I learned many new skills and gained a lot of practical knowledge. According to me, a Dissertation at the M.Sc. level is not only about doing a project and getting results but it is more than that. Gaining knowledge about various instruments, understanding how a research experiment works, and developing technical skills is what I focused on.

How was your academic journey at Dr. Ambedkar College?

My journey of Five years at Dr. Ambedkar College was truly memorable. Starting from my B.Sc. I have always received enormous support from all the teachers. Being admitted to this amazing college was a decision I'll never regret..!

What are your future plans?

When I was in my M.Sc. first year, I gave my first CSIR NET attempt and I scored 95.67 percentile (LS Qualified). Now, I'm again preparing for the CSIR NET December 2023 session and am aiming to get selected for JRF.

What message would you like to your juniors?

Whatever you are doing, give your best. Try to focus more on clearing concepts than scoring marks. I know scoring good marks is equally important, but clearing all basic concepts will help you in the long run. If you work hard, the results are always going to be on your side, just believe in yourself..!

MR. AKSHAT HATWAR

B.Sc. Biotechnology, Dr. Ambedkar College, Nagpur (2020-2023)

Tell us something about yourself and your journey till now?

I had a journey just like everyone out there. I was preparing for NEET in my intermediate, but somehow I landed up in biotechnology. Well, it's also one of my choices which I think is the most wonderful among them. I joined Dr. Ambedkar College to pursue my career, and just like everyone I also faced issues due to the pandemic. However, when offline classes started, I had that burning passion within myself to work hard and get into the field of research. And here I am now at Central University of Hyderabad pursuing an Integrated Ph.D. course in Biochemistry and Molecular Biology.

As we all know you are among the University Toppers, and you did a fantastic job in your competitive exams, were there any difficulties in managing the semester and competitive exams together?

Well, to be honest, when I was in my second year I was advised by our teachers not to compromise with semester exams when preparing for competitive ones. One must maintain a balance. One thing important for any examination is how you build your basic concept of an area. I improved my concepts in the second year. But the third year was exhausting as we used to have theory classes, practicals, and then after going home the remaining time was only left for studying. Time management is the real key to stress management too. Things might get hectic but try to endure till the end by managing your time in a synchronised manner.

What motivates you to stay put on your career path?

My dream is the driving force. I want to enter that amazing research world where everything is out of the box. When I look back again I think I move Forward from the satisfaction of performing well. I keep my arms open for new things, I always want to explore myself.

Well, so now you are in HCU how's your acquaintance with life there? What is the study environment like?

Well, I am feeling satisfied for a moment as you mentioned just now. But on a daily basis, students should never be satisfied after completing a goal because many times it stops life, just like here Life is really hectic, competition is cruel and again there is a lot to study. And yes at first I thought about how will I be able to fit in here, but later I realised there is no need to worry if I just keep working on myself. To help you here there is a really good staff who always welcomes you for knowledge exchange.

ACHIEVEMENTS

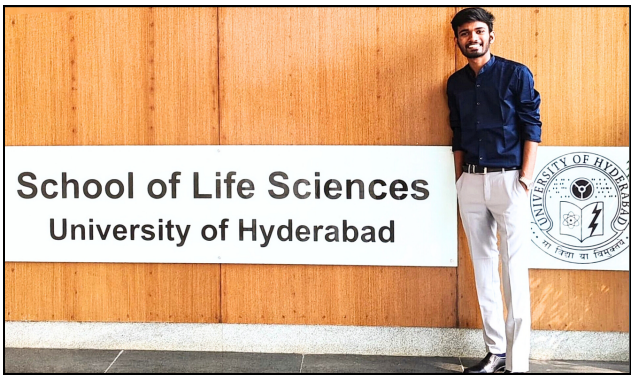
- **Qualified Various M.Sc Entrance Examinations like IIT-JAM, GAT-B, CUET, NIV, and JNCASR**
- **Second Merit in RTMNU Summer Examination 2023**
- **President of American Chemical Society, International Student Chapter, DACN (2022-onwards)**
- **Received INSPIRE-SHE; Department of Science and Technology, GOI**
- **Stood 1st in National Level Quiz competition on G20 Presidency**
- **Stood 1st State Level Science Talent Search Examination**

How was your experience at Dr. Ambedkar College ?

Do pandemic didn't allow me to jump faster but once I jumped into this world I felt like I was at home. The friends and moments with them were too precious. I love the department and my teachers a lot. They were strict yet friendly. Once you go to a higher educational institute you will feel the gap in communication between teachers and students, but I never felt it here. That's why I call it a safe place, a feeling like home.

What message would you give to our dear readers?

One must enjoy learning. The process of learning is the most magical thing that you can experience. Make a habit of asking questions, it improves your knowledge and perspective. In this space, you can grasp things as much as you can. So shape your mind to be patient and find solutions if you are stuck somewhere.



ARTICLES

WRITTEN BY THE STUDENTS OF DEPARTMENT OF BIOCHEMISTRY AND BIOTECHNOLOGY

ARTERIOVENOUS MALFORMATIONS

"Vascular malformations are rare conditions affecting the vascular system. They are of four types: venous malformation, lymphatic malformations, venolymphatic malformations, arteriovenous malformations(AVM's)".

Arteriovenous malformations is a tangle of blood vessels that irregularly connects arteries and veins, **disturbing blood flow and oxygen circulation.** These are congenital, which account for only 1.5% of vascular abnormalities with 50% occurrence in **the oral or maxillofacial region.**

They have a normal rate of endothelial cell turnover at the time of birth but become noticeable in later age. Their rapid enlargement is **triggered by trauma or hormonal changes** during puberty or pregnancy. The enlargement of these AVMs is due to changes in pressure flow, dilation of vascular channels, shunting, and collateral proliferation rather than cellular proliferation. No one knows why AVM's form. However some experts believe that the risk of developing AVMs could be genetic abnormalities that are either in local tissue or inherited.

AVMs cause pain swelling and depending upon their location they may also result in oral substantial bleeding. In severe cases, they can be stressful for the heart, due to the rapid shunting of blood from arteries to veins. Some of the inborn genetic syndromes associated with AVMs are **Cobb's syndrome, Wyburn Mason syndrome, & Parkes Weber syndrome**.

AVM's can be close to the surface of skin which can be seen by physical examinations, but deeper AVM's are difficult to diagnose. Such AVMs can be diagnosed with the help of medical techniques such as MRI or CT scan. They can be treated by surgeries, but it is usually **difficult** for surgeons to completely **remove them,** since the centre of AVM's **develops new connections** and can help them **regrow**. Other methods such as **embolizations** can be an option for managing AVM. It blocks or damages the abnormal feeding arteries while preserving normal arteries. But they can **only reduce the size of AVMs** but cannot make them go away completely. Sometimes they may be for other infections or disorders. Because of severe life-threatening complications, such as **potential massive hemorrhage** associated with AVM doctors should be aware of them and their fatal outcomes so that necessary investigations should be always carried out before performing any other treatment.

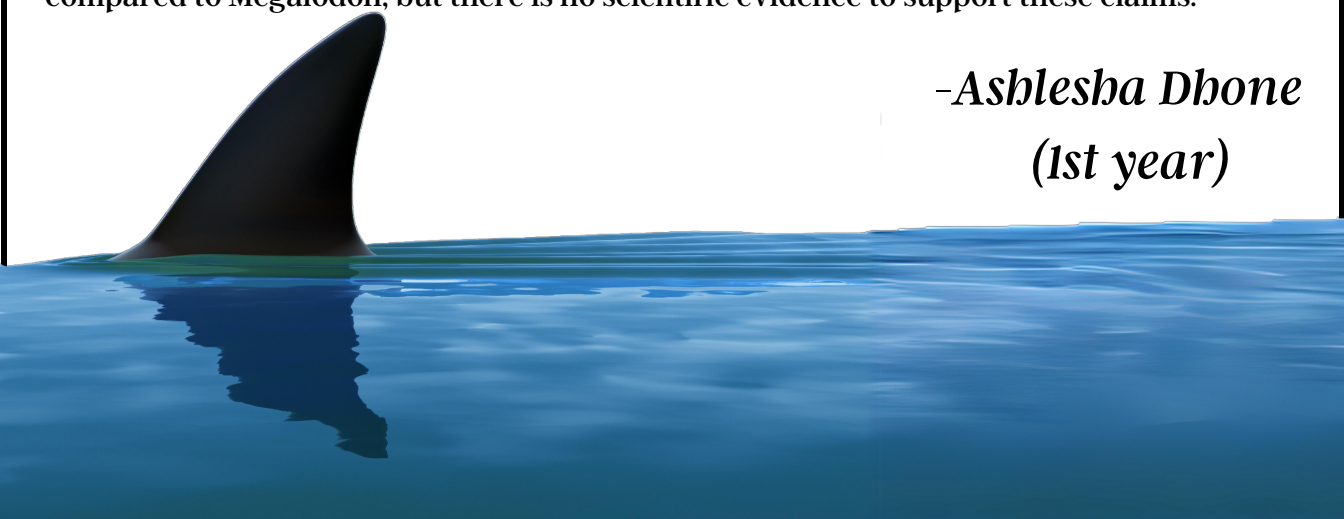
-Shruti Wankhede
(3rd year)

"Megalodon Resurrected: A Dive into Prehistoric Seas"

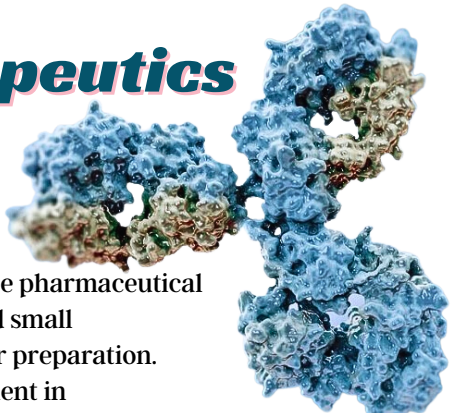
"Megalodon" refers to an **extinct species of shark** that lived approximately 23 to 3.6 million years ago during the **Cenozoic Era**. It is often described as one of the world's largest and most fearsome predators, measuring **82 to 100 feet long**. It had a body shape similar to that of modern great white sharks but on a much larger scale.
Furthermore, it had a robust and streamlined body, powerful jaws filled with large, serrated teeth, and a tail fin for swimming. Its **teeth were triangular** and could grow to be over **7 inches in length**. Large marine mammals like whales, seals, and sea cows were their primary prey.
The powerful jaws and teeth of these predators allowed them to bite through bones and blubber easily.

They went **extinct** around **3.6 million years ago**, at the end of the **Pliocene Epoch.** Several factors may contribute to its extinction, including changes in oceanic conditions and competition with other predators. Megalodon fossils have been found in various parts of the world. These **fossils** consisted mainly of **teeth, vertebrae**, and occasionally, some other **skeletal elements.**
Megalodon has captured the popular imagination and has been featured in numerous books, documentaries, and movies. Some of these portrayals have exaggerated its size and abilities for dramatic effect. It's important to note that Megalodon is extinct and is not a contemporary species. Some people have claimed to have seen giant sharks that have been compared to Megalodon, but there is no scientific evidence to support these claims.

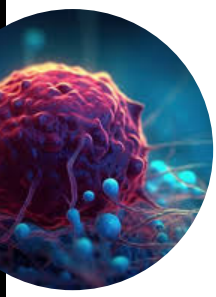
-Ashlesha Dhone
(1st year)



Advancement in Biotherapeutics and Multiomics



Biotherapeutics research is among the fastest-growing segments in the pharmaceutical industry. These are very much different from the commonly prepared small molecules of medicines, biotherapeutics involve living systems in their preparation. Recombinant DNA technology like growth factors provides advancement in therapeutic antibodies & proteins. These have successful records of treating life-threatening or chronic diseases. They have solely become an integral part of modern medicine and are increasingly used to treat and prevent serious diseases, illnesses, and infections. ***"WHO states that biotherapeutics technology describes biological processes that have been engineered".*** Talking about the applications, the typical one is preparing biological products from genetically engineered cells & antibodies cells & and antibodies initially extracted from tissues are included with recombinant DNA technology. High concentrated material preparation changed how biotherapeutic field & encompassing therapeutic materials were produced.



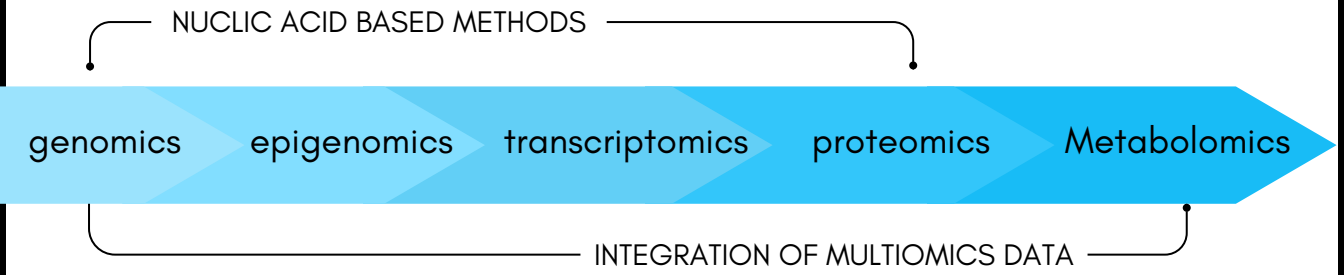
APPLICATION IN CANCER :

- It helped 350 million people around the globe.
- It plays a crucial role in the development of biomarkers that help predict the risk of cancer.
- Assist diagnosis and inform treatment plans by **INTERNATIONAL FEDERATION OF PHARMACEUTICAL MANUFACTURES & ASSOCIATION.**

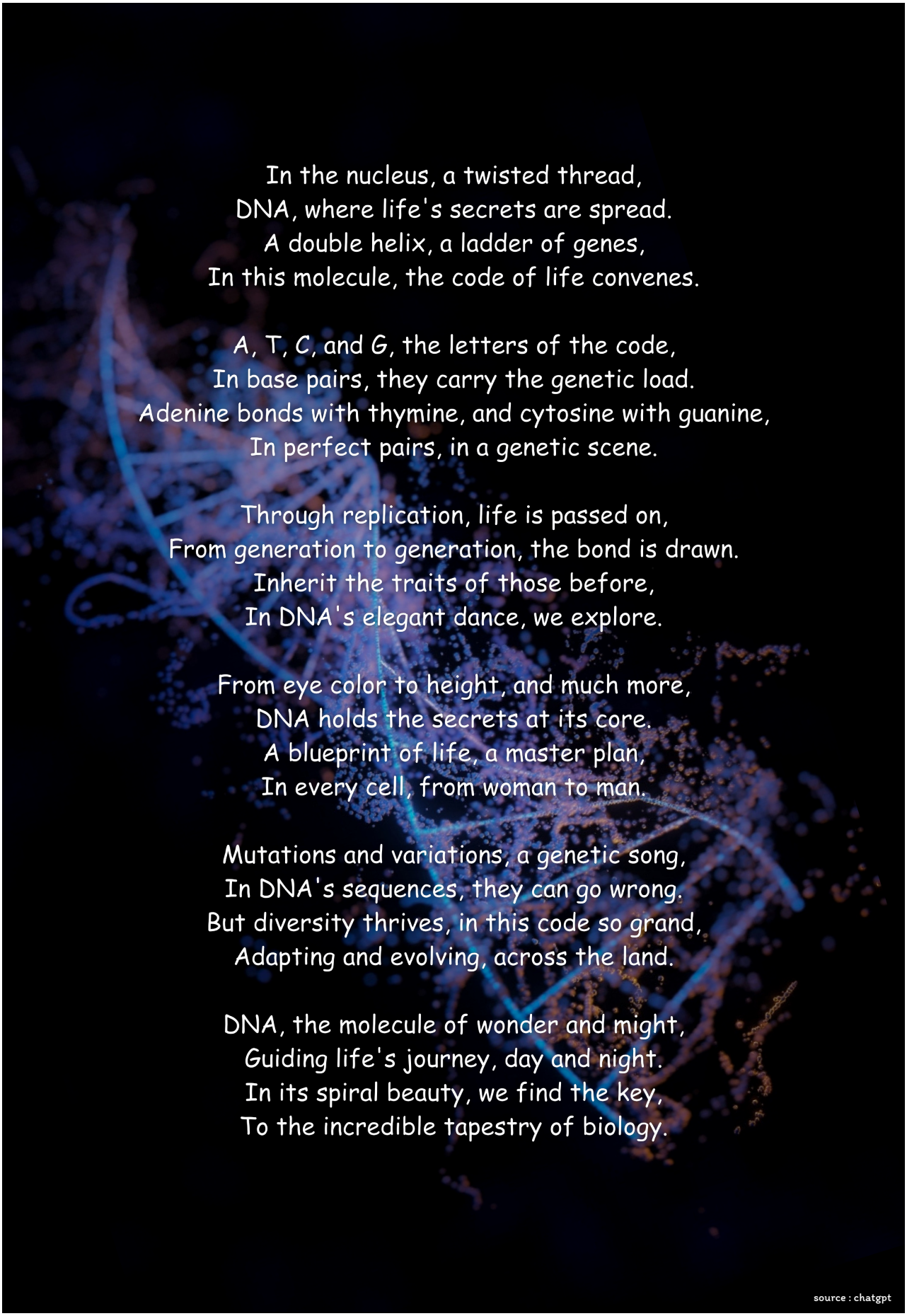
According to reports of 2020 biotech has recently crossed $163 billion annual growth surpassed by 8%. Advancing medicines from gene cell therapy and antibody–drug conjugated offer promise for disease remission and regenerative medicine.

MULTIOMIC :

This refers to kind of technologies which induces genomics, transcriptions, proteomics, metabolomics, epigenetics, and macrobiotics. These technologies advance the way scientists have developed BIOTHERAPEUTICS. The advent of multiomics is making it possible for scientists to probe the more complex & transient molecular changes that underpin the course of disease and response to treatment, helping us better select the right drug target. This technology can be used to predict what a drug molecule does in a cell with a greater certainty.



-Ananya Barutkar
(1st year)



In the nucleus, a twisted thread,
DNA, where life's secrets are spread.
A double helix, a ladder of genes,
In this molecule, the code of life convenes.

A, T, C, and G, the letters of the code,
In base pairs, they carry the genetic load.
Adenine bonds with thymine, and cytosine with guanine,
In perfect pairs, in a genetic scene.

Through replication, life is passed on,
From generation to generation, the bond is drawn.
Inherit the traits of those before,
In DNA's elegant dance, we explore.

From eye color to height, and much more,
DNA holds the secrets at its core.
A blueprint of life, a master plan,
In every cell, from woman to man.

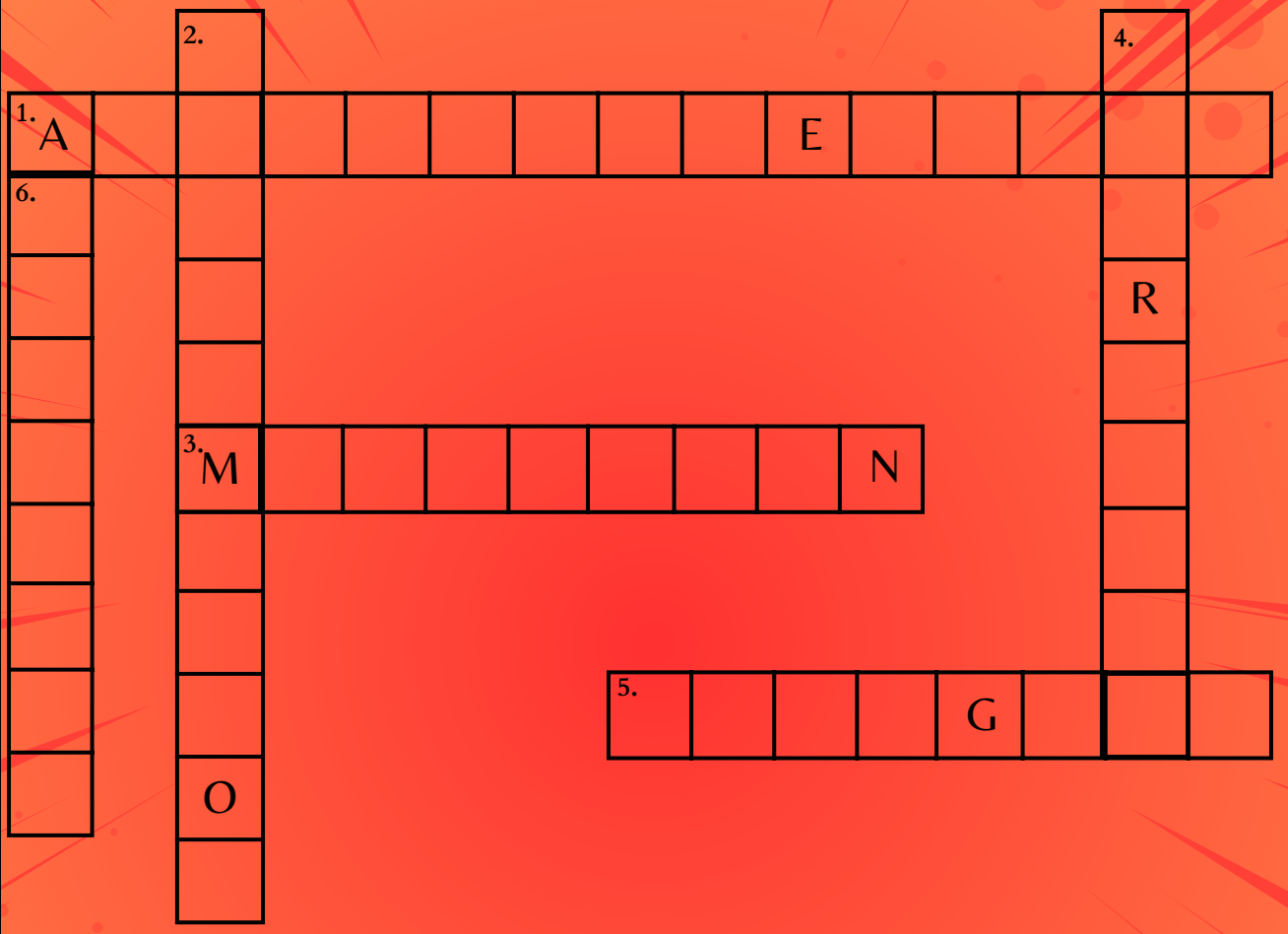
Mutations and variations, a genetic song,
In DNA's sequences, they can go wrong.
But diversity thrives, in this code so grand,
Adapting and evolving, across the land.

DNA, the molecule of wonder and might,
Guiding life's journey, day and night.
In its spiral beauty, we find the key,
To the incredible tapestry of biology.

source : chatgpt

Catalyst Reflections!

-let's test how much do u remember?



Across:

1)University of Pittsburgh stated that higher HDL level was associated with increased risk of?

3) Extinct species of shark?

5) Name the protein which loops in small portions around lipoproteins.

Down:

2) Which type of lipoprotein is produced by enterocytes?

4) Which is the most common instrument found in histology laboratory?

6) Name the device developed by Conor Trygstand, that provides agilities to mini robots.

Answers: 1) Atherosclerosis 2) Chylomicron 3) Megalodon 4) Microtome 5) Kringles 6) Acturay

WORD SCRAMBLE

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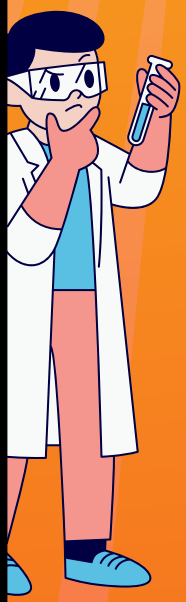

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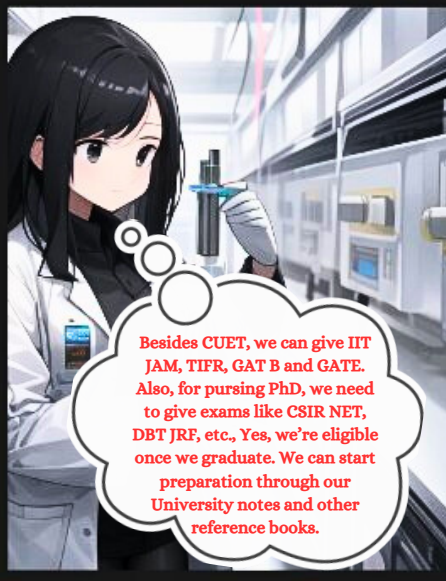
Answers: 1) Genetic 2) Resistance 3) Seasoning 4)Prognostic Biomarker 5) Chondrocytes 6) fetal bovine serum 7) vaccinology

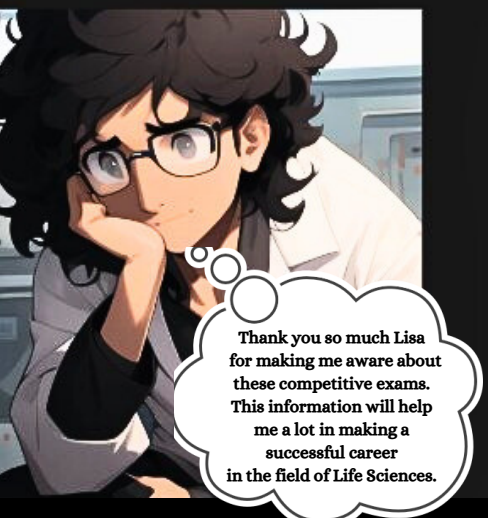
BIOMICS


Hey Lisa, yesterday I was reading our departmental magazine – The Catalyst. There was this article on Marine Biology which gave me decent information about the field. But, it was given that, after our graduation we need to give an exam called CUET... Have you heard about this exam?


Yes Raj, I've heard about this exam. There are some more exams for pursuing Masters from some top ranked universities.


Really? What are those.. and are we eligible to give these exams? How can I apply and How should I prepare?


Besides CUET, we can give IIT JAM, TIFR, GAT B and GATE. Also, for pursing PhD, we need to give exams like CSIR NET, DBT JRF, etc., Yes, we're eligible once we graduate. We can start preparation through our University notes and other reference books.


Thank you so much Lisa for making me aware about these competitive exams. This information will help me a lot in making a successful career in the field of Life Sciences.


My pleasure Raj..! Also, to get more information you can check websites of mentioned exams. All the details are mentioned on the official websites.
ALL THE BEST !!!

The completion of this magazine would not have been possible without the support and assistance of many. We extend our sincere appreciation to our esteemed Principal, Dr. (Mrs.) B. A. Mehere Ma'am, and the college for providing us with the necessary resources and facilities to create this magazine. We are grateful for the unwavering support and guidance of Dr. Utpal Dongre Sir, the Head of the Biochemistry and Biotechnology Department.

Our gratitude extends to Dr. Deovrat Begde Sir for his words of encouragement and valuable recommendations. We also thank Mr. Pradip Hirapure Sir and Ms. Rita Lakkakul Ma'am for their continual guidance and support.

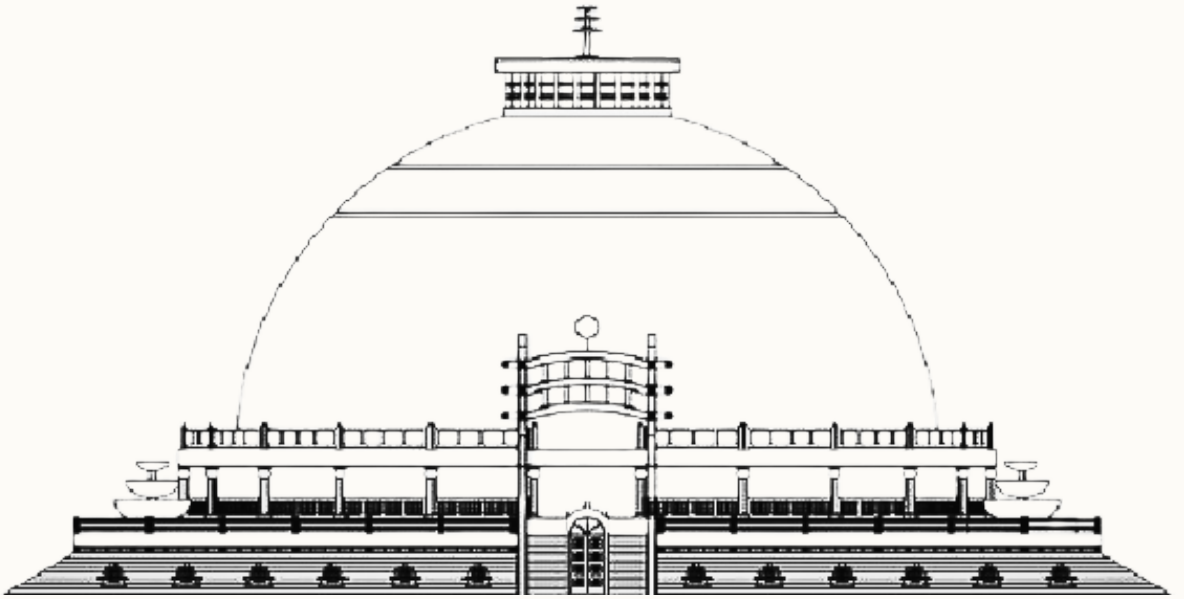
We extend our appreciation to Ms. Bhagyashree Bawankule and Mr. Akshat Hatwar for their invaluable time and guidance. Finally, we thank all the students who contributed to this magazine; your efforts and contributions were paramount to its success.

TEAM CATALYST

KANCHAN DEOGHARE
DIKSHA DAYMA
ANISHA RAHATE
MAYURI DESHMUKH
SUDHANSH CINTHRAY

THE CATALYST IS GROWING !!

TEAM CATALYST INVITES YOU ON THIS EXCITING JOURNEY...
TOGETHER, LET'S UNDERSTAND THE MAGIC OF SCIENCE AND SHAPE OUR CREATIVITY...!



THE CATALYST

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