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Vol.4

STUDENT'S CHRONICLES

AN OFFICIAL MAGAZINE OF FACULTY OF HEALTH AND LIFE SCIENCES

Explore. Learn. Create.
Shape the Future.

MAHAYOGI GORAKHNATH UNIVERSITY GORAKHPUR

Arogyadham, Balapar Road, Sonbarsa,
Gorakhpur-273007, UP , India

STUDENT'S CHRONICLES

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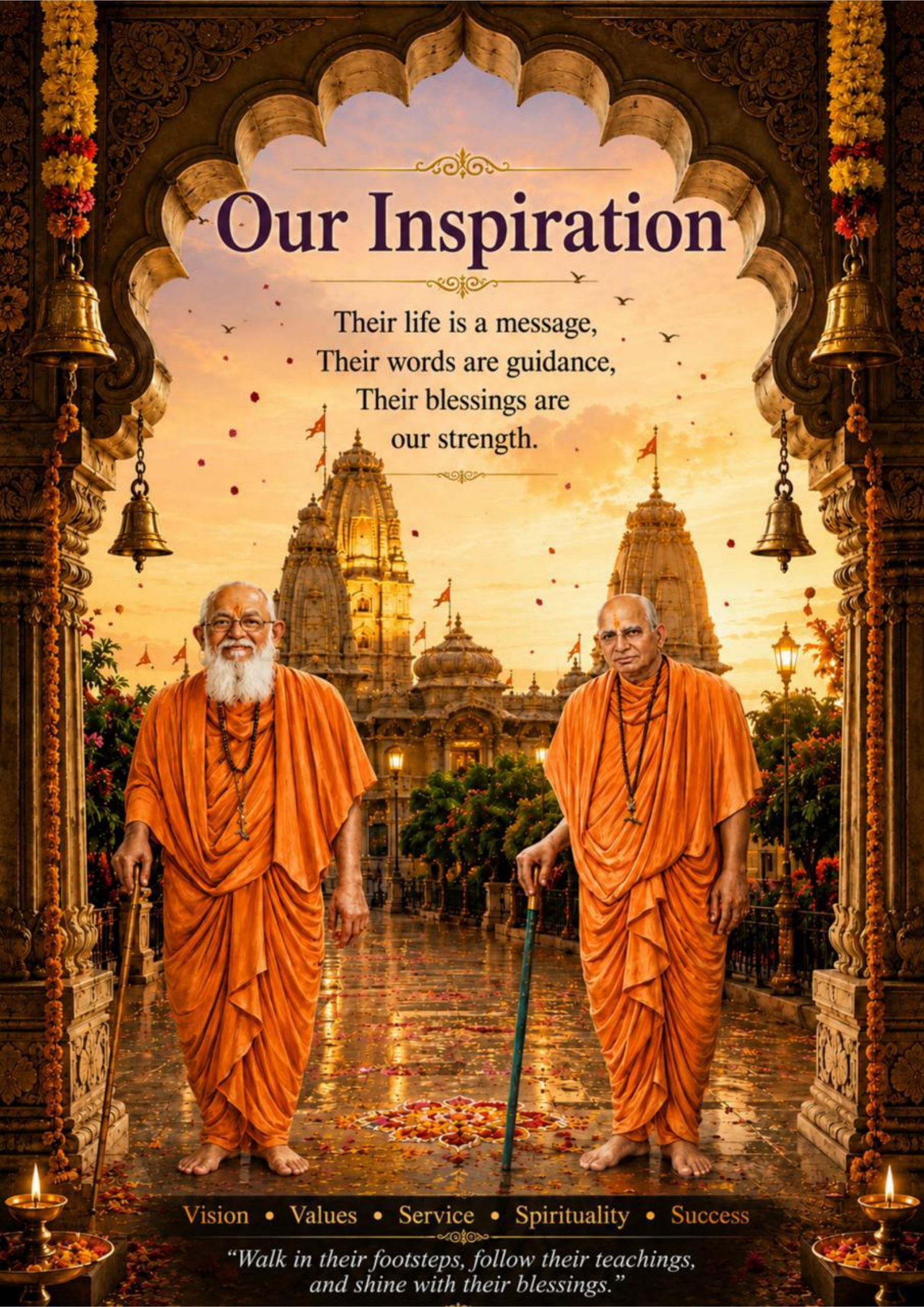
Our Inspiration
Their life is a message,
Their words are guidance,
Their blessings are
our strength.
Vision • Values • Service • Spirituality • Success
"Walk in their footsteps, follow their teachings,
and shine with their blessings."

Inspirational Leadership

Shri Yogi Adityanath Ji Maharaj

Hon'ble Chief Minister, Government of Uttar Pradesh

&

Chancellor, Mahayogi Gorakhnath University

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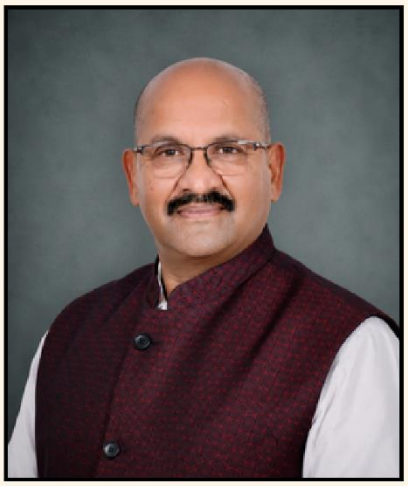

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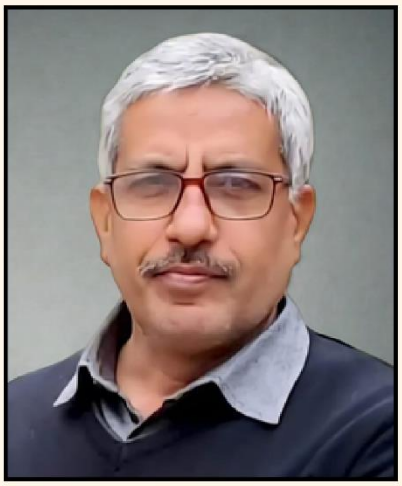

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Dean, Faculty of Health and
Life Sciences

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Principal, Maharana Pratap PG
College, Jungle Dhushan, GKP

Message From The Dean

It brings me immense joy to welcome you to the fourth volume of *Student's Chronicles: An Official Magazine of Faculty of Health and Life Sciences*. Watching this publication evolve from its initial launch into a thriving tradition has been nothing short of inspiring. It stands as a testament to the fact that scientific inquiry and creative expression are two sides of the same coin.

Science comes alive when we share it. Beyond lectures and laboratory experiments, true learning happens in the exchange of ideas, the courage to ask bold questions, and the passion to communicate complex truths in compelling ways. This volume captures that exact spirit showcasing how our students bridge the gap between rigorous research and imaginative storytelling.

I extend my heartfelt appreciation to the editorial board and student contributors for their remarkable dedication in bringing Volume IV to life. Sustaining this standard of excellence requires energy, vision, and teamwork.

To our readers, I encourage you to explore these pages with an open and curious mind. May the insights, artwork, and perspectives within this edition spark engaging discussions across our campus and inspire new scientific endeavors.

I wish *Student's Chronicles* continued success as it remains a bright platform for student brilliance and scholarly passion at Mahayogi Gorakhnath University Gorakhpur.

Prof. Sunil Kumar Singh
Dean
Faculty of Health and Life Sciences
Mahayogi Gorakhnath University Gorakhpur

Message From Editor Desk

Welcome to Volume 4 of *Student's Chronicles.* What started as a simple idea has grown into a living, breathing space where science, critical thought, and student creativity meet. Bringing this edition together has been an exhilarating experience, and we are thrilled to finally share it with you.

Our heartfelt gratitude goes to our Dean, **Prof. Sunil Kumar Singh**, whose unwavering support and vision continue to give our student-led platform the room to grow, take bold steps, and aim higher with every release.

We owe an equal debt of thanks to our Mentor, **Dr. Manish Kumar Tripathi**. Thank you for being our steady guide through late-night brain-blocks, offering practical wisdom, and keeping our standards high whenever our energy flagged.

To our incredible Editorial Team: this volume is a testament to your endless late nights, careful layout checks, and relentless attention to detail. Every page reflects the heart, teamwork, and passion you poured into this project.

We also extend our deepest thanks to all our authors and contributors. This issue brings together an extraordinary mix of scientific inquiry and human expression from deep dives into bioinformatics and antibiotic resistance, the potential of AI in healthcare, and eco-friendly plastic bioremediation, to thought provoking pieces on the "Bandwagon Effect" and room for thought Hindi poetry. Your voices give this magazine its true character and intellectual weight.

Finally, to our readers: this magazine was crafted for you. Whether you come looking for scientific insights or a moment of reflection, we hope these pages spark your curiosity and inspire new ideas.

Thank you for being part of our journey.

Editorial Team *Student's Chronicles Magazine*

Student's Chronicles: A Magazine of Faculty of Health and Life Sciences

Student's Chronicles Magazine is an initiative of the Faculty of Health and Life Sciences of Mahayogi Gorakhnath University Gorakhpur. It is a quarterly magazine that contains general/ scientific articles, poetry, stories, general awareness content, and social wellness-related content. The whole content of this magazine is supposed to be produced or developed by the students of the Faculty of Health and Life Sciences. The idea behind this initiative is to provide a platform for content development beyond the university curriculum for the student. Apart from this, students will also gain knowledge of the publishing process of articles by getting hands-on with Microsoft Office and different tools of computer applications that play a key role during the publishing process. It will also develop a culture of teamwork and leadership qualities among those who will work as part of the core team of this magazine.

Guidelines and rules for the contents of the magazine-

1. Every contribution to this magazine should be **original** and **self-created.**
2. Initially, the total number of pages in this magazine is 14, excluding editorial details, front, and back pages.
3. Only a single contribution is allowed per individual.
4. A maximum 800 words and one image allowed per contribution.
5. Only self-generated images are allowed to avoid copyright issues.
6. The final decision on contribution will be taken by the core editorial committee of this magazine.
7. In the core editorial committee of this magazine, there will be **six editors,** including 1 principal editor (reserved for post-graduation students), 1 editor (reserved for post-graduation students), and 4 co-editors (reserved for undergraduate students).
8. One faculty member assigned by Dean of the Faculty of Health and Life Sciences, will also work with core committee.
9. Contribution may be written in Hindi, English or Sanskrit**.**
10. The magazine's non-printable version is released in the upcoming **quarter month.** Submission must be received one month prior to release to qualify for the current edition; otherwise, they will be slated for the next. The students will send their contribution via email **(studentschronicle05@gmail.com)** by the **30th of the month preceding the quarter.**
11. The magazine accepts contribution from the following areas-
    a) General topics related to health and disease
    b) Value-added stories, prose, and poetry
    c) Indian culture and heritage
    d) General science and technology
    e) Any other topics relevant to humanity and nature

Note: Authors are responsible for their content.

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दिन बीत रहा है,
ख्वाब अभी अधूरे हैं।
कल की तलाश में,
आज भी कहाँ पूरे हैं।

भविष्य की फ़िक्र
हर पल सता रही है।
वर्तमान छूटा जा रहा है,
ये बेबसी बता रही है।

छोटी सी हथेली से
रेत फिसलती जा रही है,
अंजान इस बात से कि
मौत करीब आ रही है।

आख़िर कहाँ है जीवन का विश्राम?

समृद्धि मिश्रा
बी.एससी. बायोटेक्नोलॉजी, द्वितीय वर्ष

जन्म मिला तनधारी बनकर,
नर मादा या नारी बनकर ।
जन्मा भारतवासी बनकर,
सनातन धर्म तो अहोभाग्य से
श्रीराम कृष्ण के कृपा भाव से
मात पिता संसार मिला,
लोकधर्म व्यवहार मिला,
ज्ञान मिला विज्ञान मिला,
धन धान्य आराम मिला,
पकवानों का स्वाद मिला,
पर परिवारों में विवाद मिला ।
मिली वस्तुएं और साधन अनेक
पर मिला न कोई दिल का नेक ।
मिली कीर्ति और नाम विशेष,
फिर भी जीवन में है कुछ शेष।
सुखी मिला कोई दुखी मिला
रोगी मिला तो कोई भोगी मिला,
सबके अपने अपने काम
आखिर कहाँ है जीवन का विश्राम ?
मालिक हु मन का पर उस मन की नौकरी करता हूं,
इसी को सफलता मानकर,
ए मन ! मैं भी तेरी ही गुलामी करता हूं ।

सुनते सुनते तेरी एक दौर बीत आया ,
पर पल्ला आज भी तेरा ही भारी है।
मानो इस मन की नौकरी मेरी आज भी सरकारी है।
रिटायरमेंट की डेट अभी लेट है,
क्योंकि कामनाओं की पूर्ति का वेट है ।
पर जागो प्यारे
तेरे सामने "सत्संग" का गेट है।
ये मात्र प्रवचन नहीं ,
मानव जीवन को ईश्वर की सबसे बड़ी भेंट है ।
मन मेरा है या मन ही मै हूं?
अगर ये मन मेरा है तो
सब होते हुए भी गम क्यों है?
आज लोगों की आंखे इस बात से नम क्यों है?
मनन किया है जिसने भी इस मन पर,
उत्तर एक" सत्संग" मात्र है ।

"सदगुरुदेव"का मिलना ही
परम आनंदधाम है ।
इसलिए सुनो, सुनाओ ,अपनाओ
जीवन का यह सूत्र एक
मन की नहीं "मनीषी" की मानेंगे,
हम खुदको और राष्ट्र को सत्संग से संवारेंगे ।

भारत की बेटी की पुकार

श्रीयम चौरसिया
बी.एससी. बायोटेक्नोलॉजी, द्वितीय वर्ष

मैं आज उन चीखों की आवाज बन कर आई हूँ, जो रात के अंधेरे में दबा दी जाती है। आप उन सभी नन्ही जान की आवाज़ बनकर आई हूँ , जो बेगुनाह होने के बावजूद भी कई सवालो के नीचे टूट जाती है। भारत में हर 16 मिनट में एक रेप केस रिपोर्ट होता है। पर असली सवाल ये है कि कितने केस रिपोर्ट नहीं हो रहे!

तो लिखा है कि .....

मै नन्ही सी जान हूँ,
दिल में छोटा अरमान हूँ।
पर दुनिया की खबरे सुनकर,
कभी डर कभी हैरान हूँ।
निर्भया दीदी याद आती है,
उनकी चीख हवा में समाती है।
सोचा था देश जाग चुका होगा,
पर 2025 में एक डॉक्टर बेटी फिर वही कहानी सुनाती है।
कब तक बेटियाँ काँपेंगी,
कब तक माएँ रात भर जागेंगी?
कब तक सड़के सवाल बनकर हमसे चुपचाप पूछेगा-
कब बदलेगा समाज?
कब खत्म होगी त्रास?

मैं छोटी हूँ, पर जानती हू अपराधी सोच से जन्म लेते है।
समाजी चुप्पी में पलते है।
कानून की धिमी चाल से वे और भी ताकत पाते हैं,
हमारी खामोशी में उनके सारे गुनाह छिप जाते है।
मेरे नन्हे हाथ अब काँपते नहीं,
डर की आग में थकते नहीं।

अब गुस्सा मुझसे कहता है-

"बहुत हुआ अब और नहीं"

रात के सन्नाटो में जब चीख भी खो जाती है एक बेटी की साँसो मे;
जब मुठ्ठी बंध जाती है, हर उम्मीद सो जाती है।

और पूछते है!!!

वो हाथ जो रक्षा के थे, क्यों जालिम बन गए?
वो रास्ते जो अपनो के थे, क्यों काँटो से भर गएँ?
"नारी का सम्मान करो" - ये नारे लगते रहते हैं।
और धरती पर रोज, क्यों उनके सपने जलते है?
जख्म हो जो तन पर है,
जख्म हो जो मन पर है,
क्यो मरहम नहीं उनका,
ये दाग जो जीवन पर है?
निर्भया की चीखें कानों में गूँजती रहती हैं।
फिर भी कितनी निर्भया,
इस देश में पैदा होती है?

और अंत में -

"जब सज़ा मौत की लागू होगी सारे दोषी लड़को पर,
फिर कोई लड़की नहीं मिलेगी खून से लतपत सड़को पर,
तो आओ प्रण लो मेरे साथ,
और ये आवाहन करो।
अपनी मर्यादा को समझो नारी का सम्मान करो!!!"

The Bandwagon Effect: Are We Thinking or Just Following?

Anshita Singh
M.Sc. Biotechnology, 2nd Year

You open Instagram for just five minutes.
One reel then another and suddenly everyone seems to be talking about the same thing-same song, same opinion, same trend.
By the end of it, you're not just watching it.
You're thinking about it. Maybe even agreeing with it.
But pause for a second-
Was it really everyone or just what was shown to you?
This is where the bandwagon effect quietly takes over.
The bandwagon effect is our tendency to follow what the majority is doing. It's that inner voice that says, "If so many people believe this, it must be true." And honestly, it makes sense. As humans, we're wired to belong. Standing with the crowd feels safe. Standing alone? Not so much.
But today, this "crowd" is not always real.
Social media has changed the game. It doesn't just reflect reality-it edits it, filters it, and sometimes completely distorts it. A few viral posts can make an idea look like a global opinion. A handful of influencers can make something seem like a universal truth.
In reality, things are something else, but they appear to be something different.
What you see as a "trend" might just be a carefully amplified version of something much smaller. But once it looks big, people start joining in. And that's the catch-
We don't just follow trends; we build them by believing in them.
Likes, shares, and views have become our new measure of truth. If something has millions of views, we assume it's worth our attention-or worse, our agreement. But popularity is not the same as authenticity.
And then comes FOMO-the fear of missing out.
When everyone around us seems to be part of something, not joining in feels like being left behind. So we participate. We repost. We agree. Not always because we truly want to-but because we don't want to feel excluded.
Slowly, this becomes a habit.
We start liking what others like.
Believing what others believe.
Becoming a version of ourselves shaped more by trends rather than our own thoughts.
And the scariest part?
We don't even realize it's happening.
Now, the bandwagon effect isn't always negative. It can bring people together, spread awareness, and even drive positive change. But when combined with a world where reality can be manipulated so easily, it becomes something we need to be careful about.

So the next time you see something "trending," don't just accept it.
Ask yourself:
"Is this truly popular, or just made to look popular?"
"Do I actually believe this, or am I just following the noise?"
Because in a world full of voices, the real challenge is to have your own.

Is Technology Making Gen Z Smarter or Lazier?

Tannu Yadav
B.Sc. Biotechnology, 2nd Year

Why Gen Z is the Most Conscious Yet Most Stressed Generation?

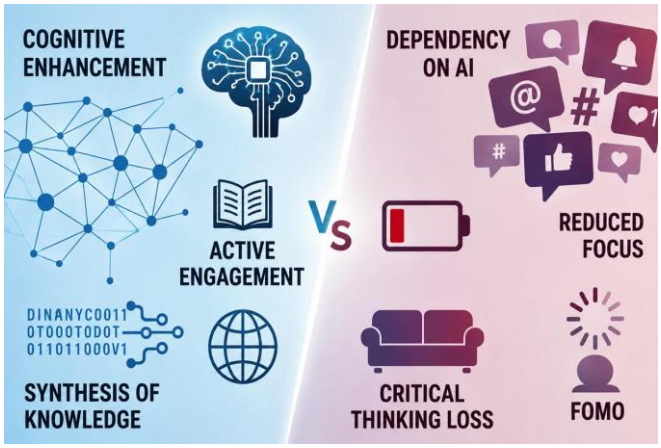
Gen Z (Generation Z) born between 1997 and 2012. The first generation who grow up with smart phones, internet and technology? They are known as the first "Digital Natives". From smart phones and social media to Artificial Intelligence and many online learning platforms. Technology changes the way of learning, thinking and understanding of this generation. This transformation raises an important question is Technology making Gen Z smarter or lazier?

Here Is an Analysis of How Technology Shapes Gen Z

It improves the productivity and solve the problems within few seconds or minutes. With just few clicks they can access online courses, learning apps, educational videos; research papers allow Gen Z to learn new skills. Whether it's coding, graphic designing, or even complex science concepts to understand easily. This easy method made them more aware, informed and adaptable compare to millennials. Technology enhances their multitasking skills, a single person can handle multiple tasks at once-chatting, searching, and studying simultaneously. AI made them to work smarter not harder.

On the side, the same technology can also lead to distraction and reduces focus. Endless scrolling on social media online gaming, reducing physical activities. This can have made Gen Z lazier. Over depending on technology can reduce critical thinking and diminishing the problem solving skills and intellectual skills.

Researchers say that Gen Z may become the first generation in modern history to show lower IQ than their parents due to dependency on AI.



Gen Z are very closely connected to **FOMO (fear of missing out)** because of technology. If not managed well it often leads to stress and comparison. While for many it can push people to stay engaged and motivated.
Many are now shifted towards **JOMO (joy of missing out)** enjoying their own space.

Conclusion

So the Gen Z Are Smarter or lazier?

The truth lies somewhere in between. Technology is just a tool neither Good nor bad. Dependency and use can decide whether they are Smarter or lazier. The use of technology in disciplined manner and wisely used can made them more intelligent, skilled and globally connected.
But, when it is misused or overused in wrong way it can leads to laziness and distractions. Ultimately, it's not technology that defines Gen Z, but how they choose to use it.

AI: The Bullet Train of Modern Healthcare

Ankita Yadav
M.Sc. Biotechnology, 2nd Year

Introduction

In today's digital age, the healthcare sector is undergoing a major transformation. From minor surgical procedures to complex open-heart surgeries, the contributions of AI (Artificial Intelligence) and robotics are visible everywhere. In a country like India, grappling with the challenges of its massive population and healthcare infrastructure, AI has emerged as a ray of hope. Adopting AI to bridge the gap between medical access and quality care is no longer just an option, but a necessity. We can say that AI is coming like a bullet train in the healthcare sector.

Robot-assisted surgery is enhancing precision and outcomes in modern operation theatres.

The Human-Machine Synergy:

There's often a fear among healthcare workers: will AI replace them? This is a misconception. AI can never understand the humanity, pain, and empathy that are the true hallmarks of a doctor. AI accelerates and empowers our labs and hospitals, not replacing doctors.

It acts as a "co-pilot" that helps doctors make better decisions through data-driven insights.

Efficiency in Diagnosis and Treatment:

The biggest advantage of AI is accuracy and early detection. Patients no longer need to stand in long lines or wait days for a diagnosis. Several modern applications are transforming healthcare today.

- **Robot-Assisted Surgeries:** This increases precision in surgery and speeds up patient recovery. Rural Healthcare Access: Telemedicine and remote monitoring are bringing top-quality medical advice to every village in India.

- **Artificial Wombs (Neonatal Care):** For extremely premature babies (born at 22-24 weeks), new liquid-based life support systems are being developed. These mimic the amniotic environment, allowing fragile lungs to develop safely - a miracle of modern bio-engineering.

● **Breaking Language Barriers:** A doctor may not know every regional language, but AI understands every language, making doctor-patient interactions much smoother and more effective.

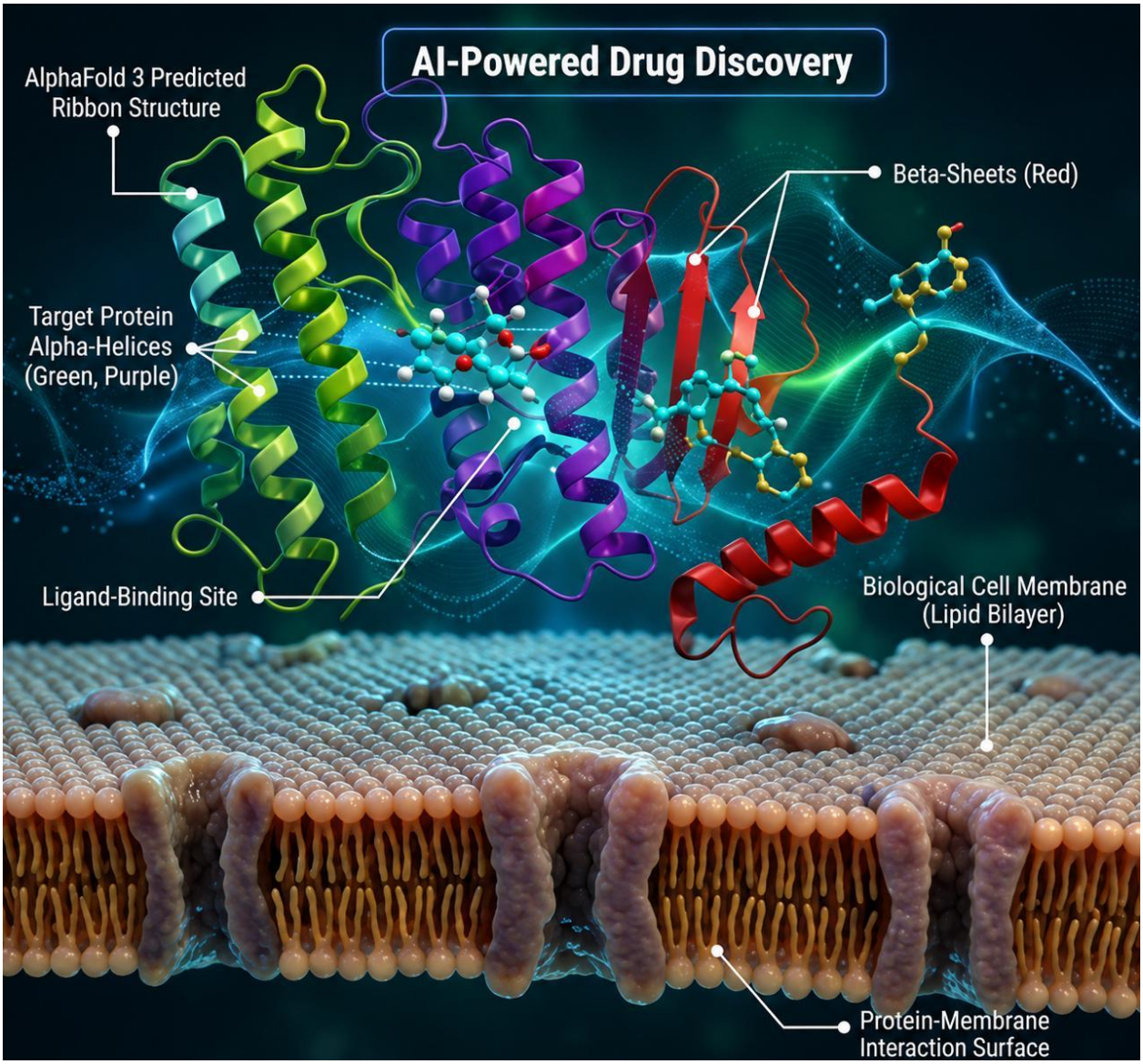
The Power of Prediction: AlphaFold 3 and Drug Discovery

At a technical level, AI is revolutionizing molecular biology. AI-powered machine learning algorithms can now predict how a small molecule will bind to a targeted protein, which is crucial for drug discovery.

AlphaFold 3 is the most prominent example of this, representing a major leap forward in the world of research. While discovering antibiotics like penicillium used to take years, today, thanks to AI's precise estimations, predicting new treatments and drug combinations is a matter of seconds.

Conclusion

The need of the hour is for all our doctors and healthcare professionals to learn and understand AI. AI is not our competitor, but our greatest ally. If we use this technology correctly, we can build a healthy and "Smart Healthcare System" that serves everyone, from cities to the remotest corners of India.



Visualizing the complex 3D protein structure prediction, a capability pioneered by tools likes AlphaFold 3.

Playing God in a Petri Dish: Biotechnology as Humanity's Divine Ambition

Sumit Kumar Vishwakarma
B.Sc. Biotechnology, 2nd Year

There is an old warning embedded in nearly every mythological tradition: do not reach too far. Prometheus stole fire and was chained to a rock for eternity. Icarus flew too close to the sun and plummeted into the sea. The builders of Babel were scattered across the earth for daring to construct a tower that touched the heavens. Yet here we are, pipettes in hand, CRISPR sequences loaded, embryos frozen in liquid nitrogen reaching anyway. Biotechnology is not merely a scientific discipline. It is humanity's most audacious theological statement: that life itself is editable, that death is a problem to be engineered away, and that the boundaries separating the created from the Creator are, at best, negotiable.

The Oldest Ambition

The desire to control life is as old as human consciousness. Ancient healers, alchemists, and priests all sought dominion over the forces that animate and extinguish living things. What makes biotechnology different is not the ambition that has always been there, but the toolkit. For the first time in history, we are not praying for dominion over nature; we are coding it. The discovery of DNA's double helix in 1953 was not just a scientific breakthrough. It was the moment humanity found the source code of life and realized, with a mixture of terror and delight, that it could be rewritten.

Every subsequent advance, recombinant DNA, gene therapy, synthetic biology, cloning has been a deeper keystroke into that code. We have given insulin to diabetics by engineering bacteria to produce it. We have resurrected the possibility of eradicating diseases that have tormented humanity for millennia.

These are not small things. These are godlike things, performed in fluorescent-lit laboratories by people in latex gloves.

CRISPR and the Grammar of Creation

Nothing illustrates biotechnology's divine pretension more clearly than CRISPR-Cas9. Originally a bacterial immune defense mechanism, scientists repurposed it into a molecular scalpel capable of cutting and rewriting DNA with unprecedented precision. With CRISPR, researchers have edited human embryos, potentially eliminated heritable diseases, and begun treating conditions like sickle cell anemia that were once considered permanent sentences. But CRISPR does more than heal. It raises a question that no previous generation of scientists has had to seriously answer: if we can design a human being, should we? The specter of "designer babies", children engineered for intelligence, height, athletic ability, or aesthetic preference is no longer science fiction. It is a regulatory and ethical negotiation happening right now. This is not medicine anymore. This is authorship. And authorship of human life is, by almost any theological or philosophical tradition, the exclusive domain of God.

Synthetic Biology: Writing Life from Scratch

If CRISPR is editing the text of life, synthetic biology is writing entirely new chapters. Scientists have already constructed synthetic bacterium with entirely human-designed genomes. They have created organisms that incorporate artificial base pairs not found anywhere in natural DNA, expanding the very alphabet of life.

The J. Craig Venter Institute's creation of the first synthetic cell was described, with only slight hyperbole, as "creating life." What else would you call it?
Synthetic biology's proponents argue that this work will yield revolutionary medicines, clean fuels, and biodegradable materials. They are probably right. But the philosophical dimension cannot be contained in a list of applications. When a human being sits down and designs a living organism from first principles, something has shifted in the cosmic hierarchy or at least in our understanding of it. The line between the engineer and the Creator has not merely blurred; it has been submitted for peer review.

The Quest for Immortality

Perhaps the most explicitly theological frontier in biotechnology is the war on aging. Researchers are investigating telomere extension, senolytics, epigenetic reprogramming, and a host of other mechanisms aimed not just at treating disease but at reversing the aging process itself. Some prominent scientists speak openly about achieving "longevity escape velocity", the point at which medical advances extend life expectancy faster than time passes, making death, in theory, optional. Death has always been the great equalizer, the proof that human beings are not gods. Every religion is in some sense architecture built around mortality, a way of making meaning from the fact that we end. Biotechnology is now attacking that architecture at the foundation. If death is merely a biological malfunction to be corrected rather than a metaphysical inevitability to be accepted, the entire framework of human meaning-making shakes. This is not a side effect of the science. It is the science's most radical implication.

Baby Steps, Not a Leap

And yet, the word "baby steps" in the framing of this question is important, and honest. For all its extraordinary achievements, biotechnology remains humbling in its limitations.

We can edit a gene but cannot yet predict all the downstream consequences of doing so. We can extend the life of a worm by manipulating certain pathways, but aging in a human being is a symphony of interconnected systems we have barely begun to understand. We created a synthetic cell, but we did not create life ex nihilo, we required an existing biochemical toolkit, billions of years in the making, to do it.

These are baby steps not because they are small in fact they are enormous but because they are the first staggering movements of a species that has just discovered what it might one day become. The gap between our current capabilities and genuine omnipotence over life remains vast. But the direction of travel is unmistakable.

The Moral Weight of the Journey

What makes this moment so extraordinary and so dangerous is that the baby taking these steps has not yet developed the moral reasoning to match its motor skills. The science is advancing faster than our ethical frameworks, our regulatory systems, or our philosophical traditions can accommodate. We are making decisions about the nature of life, the limits of intervention, and the definition of humanity with tools that have outpaced our wisdom.

This is not an argument for stopping. The fire Prometheus stole also cooked food, warmed homes, and forged tools that built civilizations. The question was never whether to have fire. The question was always what to do with it. Biotechnology's divine ambition is neither good nor evil in itself. It is a mirror reflecting back at us who we are, what we value, and whether we are, at last, ready for the responsibility that comes with the power to write life.

The gods, in all the old stories, were powerful. What made them gods was not their power, but what they chose to do with it.

Decoding Antibiotic Resistance: A Bioinformatics Approach Using *Klebsiella pneumoniae*

Shubham Maddhesiya
Alumnus of Biotechnology

Introduction

Antibiotic resistance has become a major global health concern, threatening the effectiveness of treatments that were once considered reliable. Bacterial pathogens are rapidly evolving mechanisms to survive antibiotic exposure, making infections harder to treat. Among these, *Klebsiella pneumoniae* is a clinically significant organism commonly associated with hospital-acquired infections and multidrug resistance. Understanding the genetic basis of this resistance is essential, and bioinformatics provides an efficient way to explore these mechanisms.

What is Antibiotic Resistance?

Antibiotic resistance (AMR) refers to the ability of bacteria to survive and grow even in the presence of drugs designed to kill them. This resistance arises due to genetic changes, either through mutations or by acquiring resistance genes from other bacteria. These genes can encode proteins that degrade antibiotics, modify drug targets, or actively pump antibiotics out of the cell, reducing their effectiveness.

Role of Bioinformatics in AMR Analysis

Traditionally, studying AMR required laboratory-based experiments, which can be time-consuming and resource-intensive. With the advancement of genomic technologies and the availability of databases such as the National Center for Biotechnology Information (NCBI), bioinformatics has emerged as a powerful alternative. It enables the analysis of genomic sequences to identify resistance genes, study their distribution, and understand their functional roles using computational tools.

Methodological Approach Using *Klebsiella pneumonia*

In this study-oriented analysis, a complete genome of *Klebsiella pneumoniae* was examined using publicly available data. The genome consists of a chromosome along with multiple plasmids, which are known to carry important resistance genes.

Sequence analysis was performed using BLAST (Basic Local Alignment Search Tool), where genomic sequences were compared against known resistance gene databases.

This approach allows the identification of gene sequences that match previously characterized AMR determinants, providing insights into the resistance profile of the organism.

Key Findings and Observations

The analysis indicated that antibiotic resistance in *Klebsiella pneumoniae* is multifactorial. Several types of resistance genes were identified, including those responsible for producing beta-lactamase enzymes, which can inactivate a wide range of antibiotics.

In addition, genes associated with efflux pump systems were observed, which help bacteria expel antibiotics from their cells. The presence of plasmid-borne genes further highlighted the role of horizontal gene transfer in spreading resistance across bacterial populations.

These findings emphasize that resistance is not driven by a single factor but by a complex interaction of multiple genetic elements.

Tiny Bacteria, Big Solution: Nature's Answer to Plastic Pollution

Shreya Singh
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Globally, plastic pollution has grown to be a major issue, particularly in rivers, lakes, and oceans. Large volumes of plastic debris end up in water bodies every day, where they stay for years since they are difficult to decompose. Scientists have been looking for eco-friendly and natural solutions to this issue, and one promising one comes from something we can't even see with our own eyes: bacteria.

In recent study, scientists investigated the possibility that bacteria found in aquatic habitats could aid in the degradation of plastics. They gathered over 200 water samples from various locations, such as rivers, canals, and seas. They separated hundreds of distinct bacteria from these samples. It's interesting to note that several of these microscopic organisms were able to interact with plastic in addition to thriving in contaminated water.

Approximately one-third of these bacteria were able to partially degrade plastic when tested in a lab. These bacteria created unique enzymes, which are organic chemical instruments that can gradually erode and damage plastic materials. Lipase, protease, and esterase are a few key enzymes that aid in the breakdown of complicated materials into simpler ones.

Additionally, the researchers found that different surroundings differ from one another. Compared to freshwater samples, seawater samples displayed a wider range of bacteria. The presence of more active bacteria during warmer seasons, such as summer, suggests that environmental factors have a significant impact on the rate at which plastic can decompose.

Out of all the microbes examined, several were very effective in breaking down plastic. Among them were ***Enterobacter cloacae*** and ***Micrococcus luteus***. The scientists created a **"bacterial consortium"** by combining several of the most potent types of bacteria rather than relying just on one. This indicates a group of various bacteria cooperating. Compared to individual bacteria functioning alone, this cooperation proved to be far more successful.

Enterobacter cloacae

Micrococcus luteus

The researchers employed cutting-edge scientific instruments to verify whether plastic was truly degrading.

Under a microscope, they saw alterations on the plastic's surface and identified chemical shifts in its structure. The findings unequivocally demonstrated that the bacteria were actively breaking down the plastic rather than merely adhering to it. More intriguingly, compared to fresh plastics, weathered plastics - plastics that have already been exposed to the environment - were simpler for bacteria to decompose.

The bacterial consortium was able to break down a variety of polymers, including common ones like **PET** (used in bottles) and **polyethylene** (used in plastic bags). This demonstrates that a variety of plastic wastes can be addressed by natural microbial populations.

This research offers hope for a sustainable future in which hazardous chemicals can be replaced by natural biological mechanisms to reduce pollution.

We may employ bacteria as **"living tools"** to clean our surroundings rather than depending solely on physical or chemical techniques. To use this technique on a big scale, as in wastewater systems or oceans, further research is necessary, according to scientists.

To put it simply, the study suggests that nature may already have the answer to the plastic pollution problem; all we need to do is better understand it and use it responsibly.

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Why Vaccination Matters?

Aayushi Pandey
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Introduction

A lot of times as a child, we all have thought - why do we have to get so many injections since birth just to protect ourselves from diseases we never might get? The answer is simple; we don't get to hear about those diseases because we fought it. While diseases such as smallpox, polio, diphtheria, and measles caused widespread suffering and death in the past, these same injections we feared as children have been what have been saving us from those diseases till now. In a more technical term, we call them vaccines.
Vaccination has saved millions of lives around the world, increased life expectancy and improved health around the globe yet a lot of misconceptions and fears continue to surround vaccines. Understanding why vaccination is important and how it works helps us to avoid any misinformation and have a better healthcare experience as well.

What is Vaccine?

A vaccine is a biological preparation that helps in building active acquired immunity against a specific infectious disease. According to WHO (world health organization) - vaccination is a simple and effective way of protecting you against harmful diseases. It uses your body's natural defense system to build resistance against specific infections. Vaccines train your immune system to create antibodies, just as it does when it's exposed to a disease. However, because vaccines contain only killed or weakened forms of germs like viruses or bacteria, they do not cause the disease or put you at risk of its complications. Most vaccines are given by an injection, but some are given orally (by mouth) or sprayed into the nose.

Types of Vaccine

Scientists use different technologies to safely trigger an immune response, which are -

1. mRNA: It uses genetic instructions (messenger RNA) to teach cells how to make a protein that triggers an immune response. E.g., Pfizer-BioNTech and Moderna COVID-19 vaccines.
2. Live: attenuated: It uses a weakened version of the actual virus or bacteria. They produce long-lasting immunity, often with 1-2 doses. E.g., MMR (Measles, Mumps, and Rubella), chickenpox, yellow fever.
3. Inactivated: It uses germs that have been killed with chemicals or heat. Safer for immunocompromised individuals but may require booster shots. E.g., Flu shot (injectable), polio (IPV), hepatitis A.
4. Subunit/Protein vaccines: It uses only specific pieces of the germ, like its sugar or proteins. E.g., Hepatitis B, whooping cough (pertussis component), shingles (Shingrix).
5. Toxoid: It uses weakened toxins produced by the bacteria rather than the bacteria itself. E.g., Tetanus vaccine, diphtheria.
6. Conjugate Vaccines: It links a weak antigen to a stronger one to boost immune response, especially in young children. E.g., Hib (Haemophilus influenzae type b), meningococcal.
7. Viral Vector Vaccines: It uses a modified, harmless virus to deliver genetic instructions into cells. E.g., Johnson & Johnson COVID-19, some Ebola vaccines.
8. VLP (Virus Like Particle): It uses empty shells that mimic the pathogen structure without any genetic material. E.g., HPV vaccine (Gardasil).

Why Vaccination Matters?

Vaccination is not only a personal health choice but a public health strategy with profound social benefits. Without vaccines, we are at risk of serious illness and disability from diseases like measles, meningitis, pneumonia, tetanus and polio. Many of these diseases can be life-threatening. WHO estimates that childhood vaccines alone save over 4 million lives every year? Although some diseases may have become uncommon, the germs that cause them continue to circulate in some or all parts of the world. In today's world, infectious diseases can easily cross borders, and infect anyone who is not protected. Two key reasons to get vaccinated are to protect ourselves and to protect those around us. Because not everyone can be vaccinated - including very young babies, those who are seriously ill or have certain allergies - they depend on others being vaccinated to ensure they are also safe from vaccine-preventable diseases.

How does the immune system normally fight infections?

The immune system consists of two major components.

1. Innate immunity
2. Adaptive immunity

Innate Immunity

This is the body's first line of defense. It is fast, general, present from birth but it lacks specificity. It includes physical barriers (skin, mucus), fever, and phagocytic cells like macrophages and neutrophils. It doesn't remember past infections.

Adaptive Immunity

They are slower but targeted. The immune system learns to recognize specific pathogens and creates immunological memory. Divided into:

1. Humoral immunity - B-cells produce antibodies to neutralize pathogens
2. Cell-mediated immunity - T-cells directly attack infected cells

The Molecular Mechanism of Vaccination

When a vaccine is introduced, it initiates a precise cascade of molecular and cellular events that ultimately produce immunological memory.

- The vaccine-derived antigen enters the human body.
- The antigen is then captured by specialised cells called antigen-presenting cells(APCs), particularly dendritic cells. These cells process the antigen into smaller peptide fragments.
- Fragments are displayed on the protein called Major Histocompatibility complex(MHC) molecules.
- Naive T-cell recognise this antigen-MHC complex through T-cell receptors.
- This complex then activates the helper T-cells ($CD4^+$ T-cells). These then release cytokines.
- Cytokines help to stimulate B-cells carrying receptors specific to the same antigen.
- Activated B-cells undergo clonal expansion and produce a large number of identical cells. Out of which some differentiate into- plasma cells, which secrete antigen-specific antibodies. These antibodies are capable of neutralizing pathogens. While others differentiate into memory B-cells.
- Similarly, activated T-cells produce memory T-cells which persist long after the vaccination.

If an individual encounters an actual pathogen, these memory cells respond rapidly and eliminate the pathogen before the symptoms arise.
This phenomenon is known as immunological memory and forms the biological basis of vaccination.

Understanding Herd Immunity

Vaccines not only protect the people who receive them but also those who don't. When enough of the population is immune through vaccination or prior infections, pathogen spread is slower, protecting those who can't be vaccinated. This indirect protection is called herd immunity.

Herd immunity is important for-

- Newborn infants who can't be vaccinated
- Individuals undergoing chemotherapy
- Organ transplant recipients
- People with certain immune deficiencies

Vaccine Safety

One of the most common concerns about vaccines are the safety issues related to them. Vaccines undergo multiple stages of evaluation:

- Preclinical Research: scientists first assess the safety and effectiveness of the vaccine in the laboratory settings.

- Clinical Trials: Human testing occurs in phases involving progressively larger groups of participants to evaluate dosage, efficacy, and potential side effects.

- Regulatory approval: National and international regulatory agencies review the evidence before authorizing public use.

- Post-Marketing Surveillance: Even after the vaccines are released in the market, they are constantly monitored for any serious side-effects. Vaccines, like any other medical inventions, carry some side effects like soreness at the site of injection or fever. But these are mild and do not cause any adverse health effects. Any serious side effects are extremely rare.

Addressing Vaccine Hesitancy

Rapid spread of misinformation, concerns regarding the side-effects of vaccines, mistrust in institutions or misunderstanding about how the vaccine works has created hesitancy about the use of vaccines worldwide.

Addressing these concerns with empathy, providing proper scientific evidence and encouraging transparent and open communication between healthcare providers and patients can help build trust and improve vaccine acceptance.

Lessons from Covid-19 Pandemic

The COVID-19 pandemic showed how important vaccines are and how powerful biotechnology can be.
Scientists used years of earlier research to develop vaccines very quickly. New technologies, such as MRNA vaccines, worked well and showed promise for future medicine.
The pandemic also showed that infectious diseases can spread across borders easily, and that countries need to work together to protect public health.

The Future of Vaccination

Vaccinology continues to evolve.
Scientists are currently exploring vaccines for:

- HIV
- Malaria
- Certain cancers
- Alzheimer's disease
- Personalized cancer immunotherapies

Advances in genomics, bioinformatics, and synthetic biology are expanding the possibilities of preventive medicine.

The future may bring safer, more effective, and more accessible vaccines capable of addressing some of humanity's most challenging diseases.

Algae Bioreactors: The Future for Medical Oxygen Cylinder

Shana Ansari
B.Sc. Biotechnology, 2nd Year

Introduction

Oxygen cylinder is a lifesaving support system – a fine line between life & death. Oxygen cylinders provide life-sustaining oxygen during critical moments such as in emergency situations or during a pandemic-where human depend entirely upon them. During the COVID crisis, when oxygen cylinders were running out, that single cylinder was not merely a cylinder-rather, it was a ray of hope that kept us alive. Therefore, we must always remain prepared for such difficult situations in the future. I have analysed about algae bioreactors, and considering their diverse applications, I wondered: could we potentially use them as a substitute for oxygen cylinders? This article illustrates how, in the future, algae bioreactors could be utilized by overcoming their current limitations.

Working principle of algae bioreactors

An Algae bioreactor is an isolated system wherein algae (Chlorella, Spirulina, etc.) are used to germinate in controlled conditions to produce oxygen via photosynthesis.
Algae are placed in a bioreactor where is add light, carbon dioxide water. Now algae utilize this with a natural process called as photosynthesis. In this context carbon dioxide is absorbed utilizes light energy, and reacts with water.

Sunlight + CO_2 + Nutrients
↓
Algae
↓
Photosynthesis
↓
Biomass + O_2

Having observed this, it has become clear how oxygen is being released; now, let us take a look at its current applications.

- Water waste management
- Production of nutritional supplements e
- Biofuel production (developing stage)
- Air purifier (limitation and experimental)
- Life supporting supplement in space

Based on the current application, it has become evident that the oxygen being released from the algae bioreactor is being utilized quite effectively.

However, the oxygen generating ability of algae bioreactors open the door of developing alternative oxygen supply cylinder.
To achieve this, it is required to make a system that can be function as oxygen cylinder.

Designing an Algae based oxygen transfer model

For this concept to work the system need to be properly collect oxygen, purify, stored effectively and it must me deliver properly.

Methodology:

Oxygen collection - The oxygen released from an algal bioreactor can be collected in a separate system to prevent its loss and to enable its utilization for further processing.

Oxygen purification- The collected gas won't be pure. It can have contaminants. So it is necessary to purify it by passing it through a membrane.

Storage - Pure oxygen should be stored in compressed cylinders. This ensures to store higher oxygen as the pressure inside cylinder is increased.

Regulated supply - Now, it is essential to properly deliver the stored oxygen to the patient. This requires a regulator to monitor the oxygen flow and determine the precise quantity to be administered. The supply must be secure, and the dosage must be absolutely accurate.

To analyze its viability, it can be compared with typical oxygen cylinder

Oxygen cylinder - An oxygen cylinder provides highly pure gas, immediately and continuously.
It is fixed system.

It will be available at the exact moment it is needed.

Cylinder suitable for emergency use as it is available in form of cylinder.

Algae bioreactor - In an algae bioreactor, pure oxygen cannot be obtained without purification; it must be purified using an appropriate setup.

It depends over parameters like:

- Light
- Temperature
- Co2

If this condition not present, then production will be affected.
It is not suitable for emergency use.

Limitations and how to overcome them:

Low oxygen production: - Photosynthesis happens naturally. It can be a problem if factors, like light, CO2 and temperature are inadequate. This can slow down oxygen production rate.

Solution - use artificial light which have to red and blue light wavelength. It will increase efficiency of photosynthesis.

Carbon dioxide concentration: - The atmosphere has little CO2. Sufficient amount of CO2 is required for photosynthesis to work well.

Solution - CO2 must be supplied continuously.

Temperature: - Temperature fluctuations reduce enzyme efficiency, making photosynthesis unstable.

Solution - maintenance of optimum temperature.

Contamination risk

Solution - use proper sterile closed bioreactor.

Thus by ensuring the efficient production of oxygen, controlled CO2 concentration, and optimal temperature and contamination levels within an algal bioreactor - a cylinder-based system can be established to collect and compress O2; however, at present, this remains merely an auxiliary system.

Conclusion

An algae bioreactor cannot be directly used as an alternative for oxygen cylinder, however by combining it with engineering system, it can be designed to function as similar to a cylinder. Algae bioreactors produce oxygen with the help of photosynthesis and its byproduct can be collected, purified, compressed, store, and then transported to patient. In this way, such a system holds the potential to become a sustainable and supportive oxygen supply solution in the future.

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Drug Discovery Spotlight

OUTSMARTING THE SUPERBUG: INDIA'S ANSWER TO AMR

For decades, global healthcare has faced a silent pandemic: Antimicrobial Resistance (AMR). Gram-negative "superbugs" have evolved defense mechanisms, producing β-lactamase enzymes that destroy standard antibiotics before they can penetrate the cell wall. Traditional treatment pipelines have stalled, leaving clinicians with zero options against multi-drug resistant (MDR) hospital infections.

The question is no longer just *"What antibiotic do we have?"*

It is *"Can the antibiotic outsmart the bacterium?"*

ZAYNICH (Cefepime-Zidebactam), a novel combination therapy developed by Indian biotech firm Wockhardt. Unlike standard drugs that simply add a passive enzyme inhibitor, Zaynich utilizes Zidebactam, a first-in-class non-β-lactam enhancer with a dual-action mechanism.

The Dual-Action Mechanism

1. **The Decoy Effect**: Zidebactam binds with ultra-high affinity to class A, C, and D β-lactamases, neutralizing the bacterial defense shield.
2. **The Direct Attack**: Simultaneously, it targets Penicillin-Binding Protein 2 (PBP2), working synergistically with Cefepime (which targets PBP3) to destroy the bacterial cell wall structural integrity.

Habil Khorakiwala
Founder, Wockhardt
Wockhardt has invested in the development of novel antibacterial approaches aimed at addressing drug-resistant infections.

A Global Milestone By attacking two distinct bacterial targets at once, Zaynich bypasses traditional resistance pathways. Even in cases where bacteria produce extreme enzyme levels, the synergistic "PBP2 + PBP3" double-strike forces rapid bacterial lysis.

Zaynich has marked a historic milestone: a drug engineered in India gaining breakthrough regulatory pathways globally to treat life-threatening infections, proving that smart molecular design can outpace bacterial evolution.

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