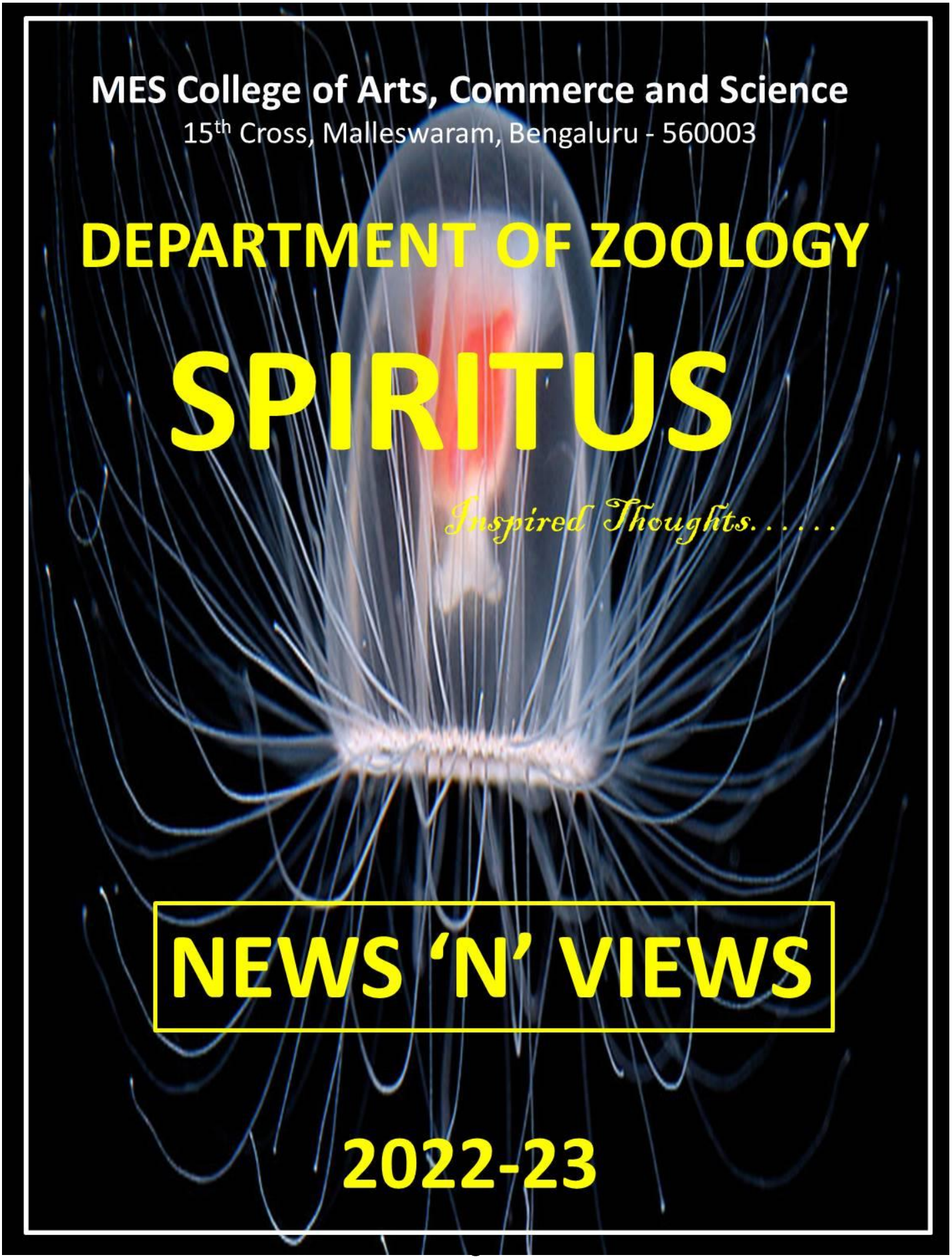
MES College of Arts, Commerce and Science
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DEPARTMENT OF ZOOLOGY
SPIRITUS
Inspired Thoughts.....
NEWS 'N' VIEWS
2022-23

PREFACE

What began as a humble activity within the department in the year 2007, supported by the enthusiasm & contribution of students, has today transformed into a notable knowledge disseminating initiative.

We at the Department of Zoology take this opportunity to share with you readers a unique collection of articles under the name “SPIRITUS“ meaning “life” in Latin. These articles are authored by our students from I, II and III B.Sc. in the form of contributions to the bulletin board maintained by the department called News “N” Views.

The bulletin board was envisaged as an ideal platform to share recent and intriguing developments, dialogues and discussions in the stream of life sciences. Any student of Zoology at the undergraduate level is welcome to contribute to the bulletin board.

With this **eighth edition** of our **e-newsletter “SPIRITUS”,** we bring to our readers, **47 articles** from the month of August 2022 to July 2023. We hope this small initiative grows into a mutually rewarding experience, for us at the Department, our students and you, dear readers!

INDEX

A SAFER BETTER TREATMENT OPTION FOR SOME YOUNGER WOMEN WITH BREAST CANCER

The initial treatment used for some younger women with an aggressive form of breast cancer may be about to change, based on results of a new clinical trial. In the trial, the combination of the targeted drug ribociclib and hormone therapy was much better at halting the growth of aggressive tumors that have spread in the body than standard treatment with the combination of chemotherapy drugs. Woman who received the reboot clip hormone therapy combination lived for twice longer without their cancer getting worse, a measure called progression free survival. They also had far fewer side effects. I believe this is practice changing said yen Shan Lu MD of national Taiwan University Hospital, who presented the result from the right choice study at the San Antonio breast cancer symposium on December 6 these data provided clear evidence that is safe it is efficacious and it can avoid a lot of toxicity he said.

A crisis requires a rapid response

The most common type of breast cancer called estrogen receptor positive HER 2 negative breast cancer is often found early and usually response well to treatment more than 80% of women who receive standard treatment will be alive without recurrence of their cancer 5 years later. However, a small proportion of patience will have disease that spread rapidly to the bones liver lungs and other organs causing symptoms or affecting organ function.

When cancer is in an organ affects its ability to function that is called visceral crisis explained Larissa Korde MD of NCI's division of cancer treatment and diagnosis who was not involved with the study. That's where there is enough tumor in another organ to be life threatening she said. For example if it is in liver the liver cannot do its work of cleaning toxins from the body. Or if it is in the lungs a patient may not be able to get enough oxygen. For people at risk of experience in a visceral crisis the standard treatment has been a combination of two chemotherapy drugs. The treatment usually strings tumor quickly but can have serious side effects spurring researchers to look for less toxic treatments. Ribociclib has become a commonly used to treatment for ER positive HER2 negative breast cancer that requires treatment beyond surgery and radiation therapy. It is a target at therapy called CDK4/6 inhibitor that shuts down certain processes that cancer cells need to divide. The combination of ribociclib with a drug to block hormones has recently become a standard treatment for postmenopausal women with hormone receptor positive HER 2 negative metastatic breast cancer that isn't immediately life threatening. But younger woman who haven't gone through menopause make up a substantial proportion of people diagnosed with breast cancer every year. The proportion of breast cancer diagnosed in younger women ranges from around 20% in the United States to close to half or even more in the middle-east and parts of Asia. However, whether ribociclib plus hormone therapy could substitute for combination chemotherapy in younger women who have an aggressive form of ER positive, HER2 negative breast cancer hasn't been clear.

Fast relief with fewer side effects

An international research team led by Dr. Lu enrolled 222 premenopausal and perimenopause women in their phase 2 clinical trial. The trial was funded by Novartis, which makes ribociclib. About half of the women were experiencing a visceral crisis at the time they joined the study. The others had metastatic tumors that were causing substantial symptoms, though not yet at the level of a crisis, or rapidly advancing diseases. The team randomly assigned the participants to receive either combination chemotherapy or ribociclib plus hormone therapy. The hormone therapy consisted of goserelin, which blocks the production of hormones by the ovaries and either letrozole and anastrozole, both of which are drugs called aromatase inhibitors.

The chemotherapy combinations could include docetaxel plus capecitabine, paclitaxel plus gemcitabine, or capecitabine plus vinorelbine, depending on the drugs normally used at the hospitals where the participants were treated. Women in both groups could continue treatment as long as tumor growth was kept at bay and the side effects were tolerable. At the San Antonio meeting Dr. Lu presented the study results that had been collected through April 2022. At that point, women who received the ribociclib combination had a median progression free survival of 2 years, versus just over one year of those in the chemotherapy group. This result is significant and clinically meaningful said Dr. Lu. Patience in the chemotherapy group had a higher risk of serious side effects including nausea, vomiting and diarrhea, than those in the ribociclib combination group. However, a drop in the number of white blood cells was more common in the women receiving the ribociclib combination. Almost 25% of those receiving chemo therapy stopped taking at least one of the drugs due to side effects, compared with only 7% of women in the ribociclib combination group.

Adding to the drift away from chemotherapy

In additional to improving progression free survival and having fewer side effects, the ribociclib combination has an additional advantage, said Dr.Korde. Unlike chemotherapy, which requires frequent visits to the clinic for infusions, both ribociclib and hormone therapy are pills at patients can take at home. That's really important quality of life, she said. The full results from the study still need to be reviewed and published before the ribociclib combination could become the standard of care, Dr. Korde added. Some caution will also need to be used in interpreting the results from the trial since the study was a smaller phase 2 trial instead of phase 3 study, Dr. Lu explain. Last phase 3 trials are usually needed to provide definitive answers about which the treatment is better.

But considering the large difference in progression free survival seen in this study people might be less likely to volunteer for another study in which they might be assigned to receive chemotherapy Dr. Korde explained. Doctor Lu agreed nothing that to conduct a phase 3 study would be quite difficult and I don't expect that in the future there will be one.

Submitted by:

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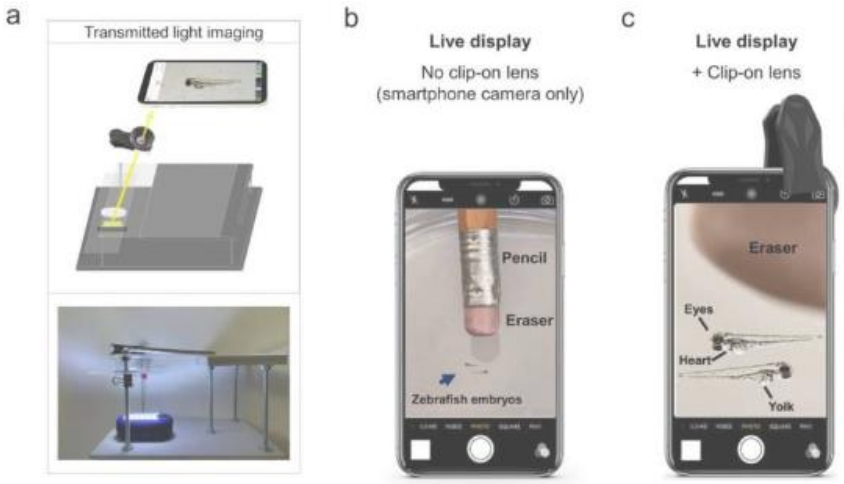
GLOWSCOPE



A Glowscope is a device that can convert a smartphone or tablet into a fluorescence microscope for less than US $50, i.e, apx 4000 INR. It can be used to image cells, tissues, and organisms under low magnification. This device will prove to be useful in schools, colleges, and some research labs, etc . The specimen needs to be stained with fluorescent stain before viewing. This invention is a win because it will help people like students to use and get to know more about a microscope easily without having to spend too much money. It also reduces the dependence on the regular microscopes. It also has a lot of benefits like showing upto five times magnification. Hence it enhances the specimen to a greater extent. It can be used to study anatomy, behavior, physiology, development, and genetic inheritance in small organisms expressing fluorescent proteins. The use of fluorescence microscopy is typically limited to well-funded institutions and biotechnology companies, research core facilities and medical laboratories because it may be unaffordable to some common people.

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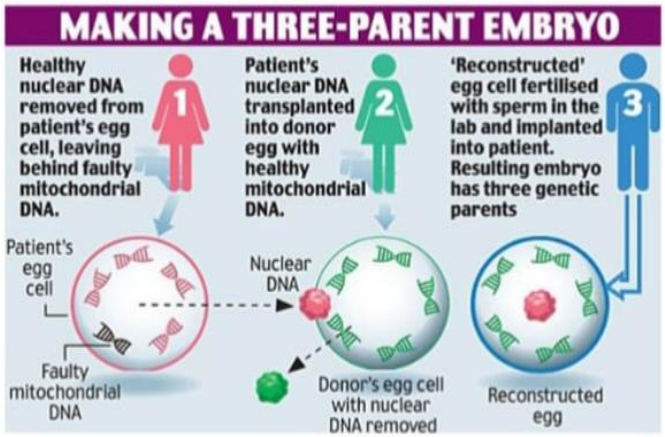
MITOCHONDRIAL REPLACEMENT THERAPY

Mitochondrial Replacement Therapy (MRT), sometimes called as mitochondrial donation, it is a technique where replacement of the mitrochondria in one or more cells to prevent or ameliorate disease. MRT originated as a special form of in vitro fertilization in which some or all of the future babies mitochondrial DNA (mtDNA) comes from a third party. This technique is used in cases when mother carry genes for mitochondrial disease. This therapy approved for use in UK. A second application is to use autologous mitochondria to replace mitochondria in damaged tissue to restore the tissue to a functional state. This has been used in clinical research in the US to treat cardiac compromised newborns.

Mitochondrial Disease:

- Certain mutations in mitochondria can lead to mitochondrial diseases, affecting energy productions and impacting various organs, including the brain, nerves, muscles, kidney, heart and liver
- This disease can result in severe symptoms such as organ failure, muscle wastage and even brain damage. Unfortunately there is no cure for mitochondrial disease but can be managed to some extent.
- Few examples of mitochondrial diseases are Leigh syndrome, Kearne- Sayre syndrome (KSS), Mitochondrial DNA Depletion Syndrome.

To address the issues of mitochondrial diseases scientist and researchers have developed advanced IVF Technique called mitochondrial replacement therapy or three parent IVF. This technique involves a complex process to ensure that the baby inherits a healthy mitochondria while carrying the genetic material from both biological parent.



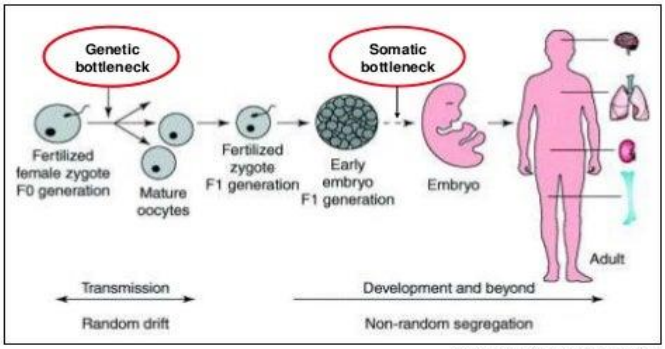
The Scientific Process:

- Identifying suitable candidates: The procedure is specifically intended for couples who wish to have their genetic child but do not want to use a donor egg.
- Selection of donar and biological parent: The biological mother, who has a mitochondrial disease, provides her egg, which are fertilized by the biological father's sperm.
- Mitochondrial replacement: The (DNA) from the donor's is extracted and replaced with the genetic material from the parent.
- Implantation and pregnancy: The modified embryo is then implanted in the uterus and carried to full term, resulting in birth of a baby free the mother's mitochondrial diseases.

Potential Side Effect: The procedure has shown promising results, it is not without minimal risks. In some cases, a small amount of faulty maternal mitochondria may be inadvertently passed on during the process.

Disease Statistics: Globally on estimated 5000 people have a genetic mitochondrial disease

Mitochondrial segregation during germline development:
the "bottleneck"



Chinnery (2002) Trends Genet 18:173

Submitted by:

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BRAIN-SPINE INTERFACE ALLOWS PARALYSED MAN TO WALK USING HIS THOUGHTS

The device which provides a connection between the brain and spinal cord, allows thoughts to control movement. A man name Gert-Jan Oskam, 12 years ago met with a cycling accident is now 40 with paralysed legs and partially paralysed arms due to damaged spinal cord in his neck. But, recently he is back on his feet and walking due to the device that creates a 'digital bridge' between his brain and the nerve below his injury. Oskam says that the implant has been life changing and he even painted while standing with the support of walker and nobody helped him. The device named Brain-Spine Interface was built on previous work by Gregorie Courtine, a neuroscientist at the Swiss Federal Institution of Technology with his colleagues. In 2018, they demonstrated that, when combined with intensive training, technology that stimulates the lower spine with electrical pulses can help people with spinal-cord injuries to walk again. Oskam was one of the participants in the trial, but after three years the improvement was seen. Now, the new implant makes use of the spinal implant which Oskam already has, and is paired with two 64-eletrode grids rest against the membrane which is covering brain. When Oskam thinks of walking, the skull implants detects electrical activity in the cortex, the outer layer of the brain. This signal is wireless and is transmitted and decoded by a computer that Oskam has in his backpack, which transmits the information to the spinal pulse generator. He says that the previous device controlled him but now he has control over the device by his thoughts i.e, he can stop, he can walk, he can climb up the staircase.

Enhanced Rehabilitation

After around 40 rehabilitation sessions using the brain-spine interface, Oskam had regained the ability to voluntarily move his legs and feet. He even adds that this was not possible after spinal stimulation alone, and suggests training session with new device recovered the nerve cells. He was even able to walk for shorter distance without using device and by using crutches. Neurologists Bruce Harland says improving the device help the people with spiral injuries and Anna Leonard says this only helps in walking but other functions like bladder and bowel control are not targeted. Antonio Lauto says less invasive devices are good because for Oskam 5 months after skull implant was removed due to infection. Jocelyne Bloch says risks involved are small compared with benefits. Now, Courtine's team is recruiting 3 people to see whether a similar device can restore arm movements.

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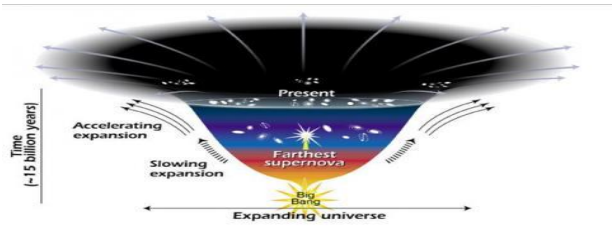
DARK MATTER AND DARK ENERGY

What Is Dark Energy?

More is unknown than is known. We know how much dark energy there is because we know how it affects the universe's expansion. Other than that, it is a complete mystery. But it is an important mystery. It turns out that roughly 68% of the universe is dark energy. Dark matter makes up about 27%. The rest - everything on Earth, everything ever observed with all of our instruments, all normal matter - adds up to less than 5% of the universe. Come to think of it, maybe it shouldn't be called "normal" matter at all since it is such a small fraction of the universe.

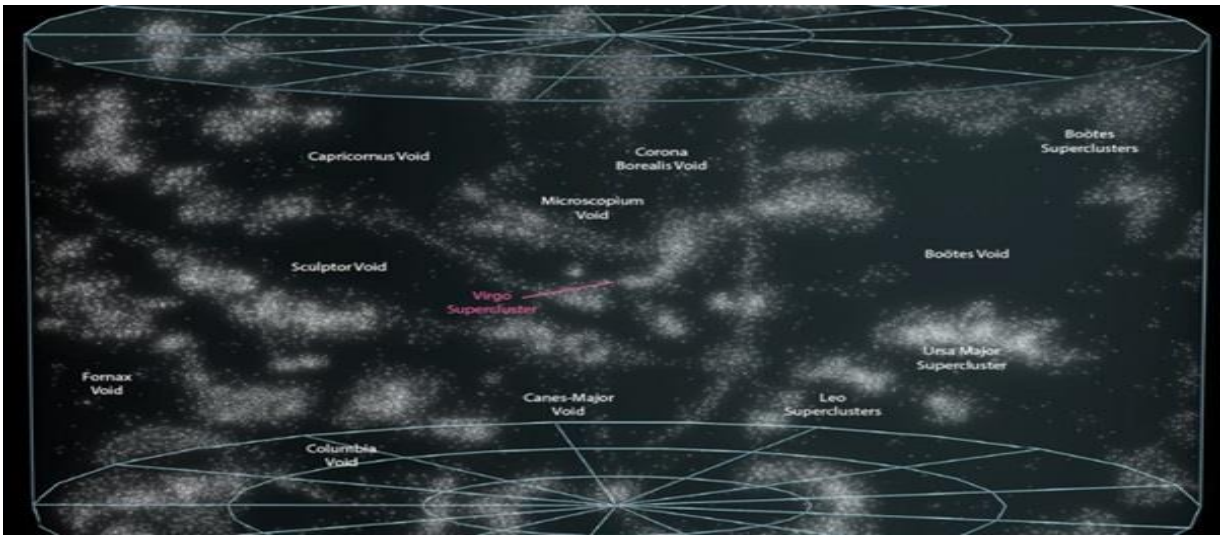


The visible universe including Earth, the sun, other stars, and galaxies is made of protons, neutrons, and electrons bundled together into atoms. Perhaps one of the most surprising discoveries of the 20th century was that this ordinary, or baryonic, matter makes up less than 5 percent of the mass of the universe.

Scientists have not yet observed dark matter directly. It doesn't interact with baryonic matter and it's completely invisible to light and other forms of electromagnetic radiation, making dark matter impossible to detect with current instruments.

What is the difference between dark matter and dark energy?

Dark matter - Works like an attractive force a kind of cosmic cement that holds our universe together. This is because dark matter does interact with gravity, but it doesn't reflect, absorb, or emit light.



Dark energy - Dark energy is the far more dominant force of the two, accounting for roughly 68 percent of the universe's total mass and energy. Dark matter makes up to 27 percent. And the rest a measly 5 percent is all the regular matter we see and interact with every day.

Submitted by:

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DESIGN OF BACTERIOPHAGE T4-BASED ARTIFICIAL VIRAL VECTORS FOR HUMAN GENOME REMODELLING

Introduction

Viruses, the most abundant organisms on Earth, possess efficient mechanisms for replication and assembly, enabling them to cause deadly infections and global pandemics. By harnessing these mechanisms, artificial viral vectors (AVVs) could be developed to perform beneficial repairs and restore human health. However, the development of AVVs has remained at an early stage. Existing viral vectors, such as adeno-associated viruses (AAVs) and lentiviruses, have limitations in delivering multiple therapeutic genes and pose safety concerns. Overcoming these challenges is crucial for the advancement of AVVs as a promising tool for complex repairs and therapeutic interventions.

De-Briefing What Is Actually Done…

An assembly-line approach is proposed for constructing artificial viral vectors (AVVs) using the structural components of bacteriophage T4. The AVVs are designed to enter human cells and carry out molecular repairs. The process involves incorporating various biomolecules, such as DNA, proteins, RNA, and ribonucleoproteins, into a 120 × 86 nm capsid shell that can accommodate large DNA segments. The AVVs are then coated with cationic lipid to facilitate efficient cell entry. These AVVs have the capacity for delivering full-length dystrophin genes and performing various molecular operations for genome remodelling, including gene editing, recombination, replacement, expression, and silencing. These customizable and multiplex AVVs have the potential to revolutionize gene therapies and personalized medicine as a new category of nanomaterial.

Here, as proof of concept, a series of T4-AVVs are assembled containing combinations of payloads to remodel the human genome in cultured cells. These include genome editing, gene recombination, gene replacement, gene expression, and gene silencing. An AVV configuration includes Cas9, Cre recombinase, two gRNAs, donor DNA, and reporter plasmids. It successfully delivers and expresses a ~17 Kbp polygene containing the full-length human dystrophin gene and three reporter genes. These lipid-coated phage AVVs with large capacity, multiplex capabilities, programmability, and phage-based nature hold promise for gene therapies and personalized medicine. This innovative approach taps into the abundance of phage nanostructures, offering new possibilities for novel delivery vehicles.

Results

Further, T4 artificial viral vectors are assembled, resulting in these T4-AVVs efficiently delivering genetic payloads into human cells, also aiding co-delivery of genes and proteins by T4-AVVs, genome editing AVVs, genome recombination AVVs, RNA delivering AVVs and finally the rewiring of the capsid exterior + interior.

Discussion

The ability to assemble virus mimics that can be directed to perform defined molecular operations in human cells remained as the holy grail of medicine. This research presents proof of such a concept. An innovative approach involves a sequential assembly-line process for constructing AVVs using well-characterized components from bacteriophage T4. Each component is engineered to fulfill a specific task in human cells, such as attachment, entry, intracellular trafficking, nuclear localization, and genome remodelling. This assembly-line method provides vast engineering possibilities and allows for customization by mixing and matching components to create AVVs with specific therapeutic capabilities. The T4-AVV platform offers a custom-buildable and plug-and-play system that distinguishes it from traditional phage and viral delivery platforms.

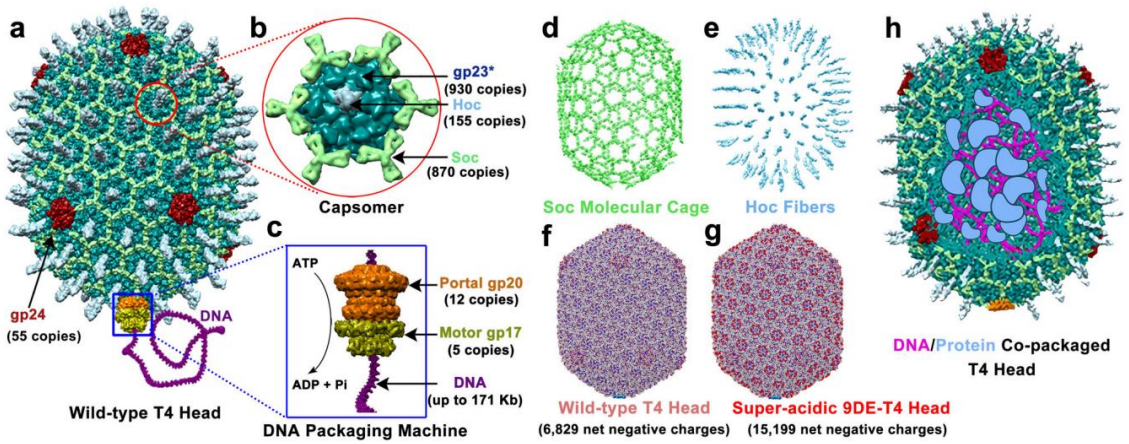
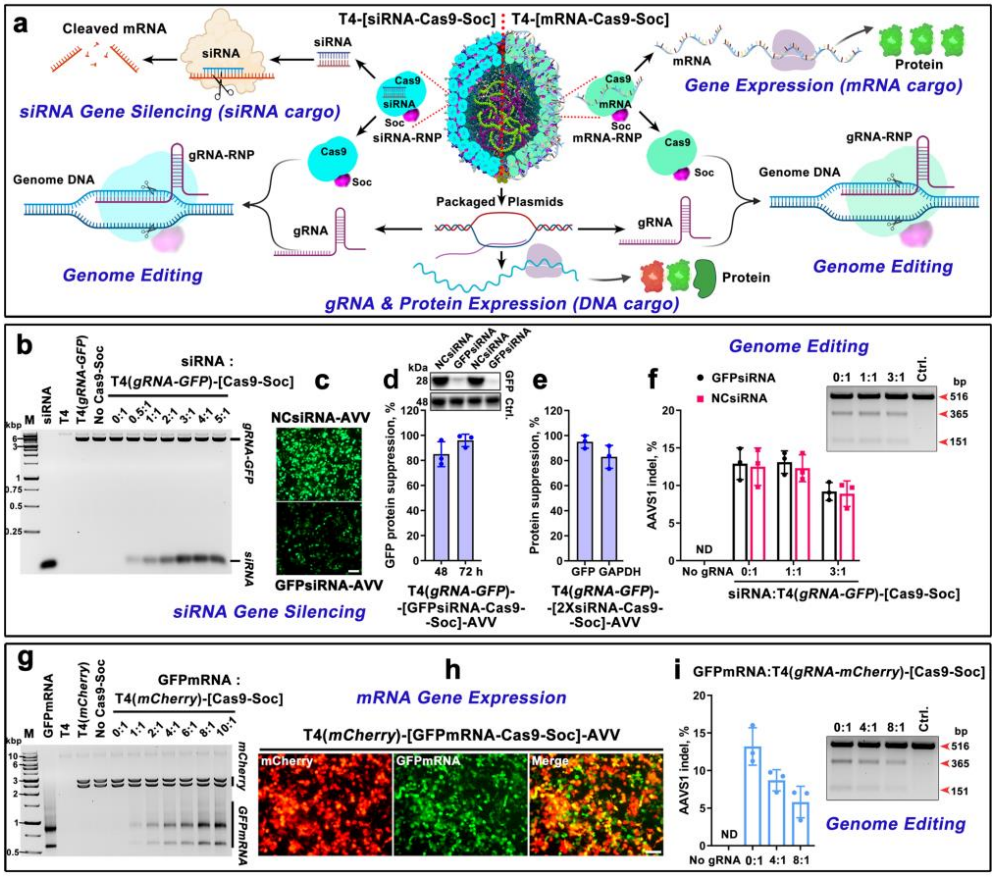


Fig. 1 | Structural components for assembly of bacteriophage T4-AVVs. **a** Structural model of phage T4 head (capsid)[44]. Pentameric gp24 vertices are shown in red. **b** Enlarged capsomer shows the hexameric arrangement of major capsid protein gp23 (dark green), Soc trimers (light green), and Hoc fiber (cyan)[44]. **c** Enlarged DNA packaging machine structural model comprised of gp20 portal dodecamer (PDB 3JA7) (brown) and pentameric gp17 DNA packaging motor (PDB 3CPE) (yellow)[24,44]. **d** Eight hundred and seventy Soc molecules assembled at the quasi-three-fold axes form a molecular cage around T4 capsid[21] (PDB 5VF3). **e** One hundred and fifty-five Hoc fibers emanate from the centers of capsomers[34] (PDB 3SHS). **f**, **g** Molecular surfaces of wild-type (WT) T4 capsid[22] (3.4 Å, PDB 7VS5) (**f**) and super-acidic 9DE-T4 capsid (3.9 Å) (**g**) are colored according to electrostatic potential. The color ranges from red, corresponding to a potential of −5 kT/e⁻, to blue, corresponding to a potential of +5 kT/e⁻. The WT-T4 capsid has 6,829 net negative charges and the 9DE-T4 capsid has 15,199 net negative charges. **h** Schematic of head packaged with foreign proteins and DNAs in its interior space.



RNA delivering AVVs

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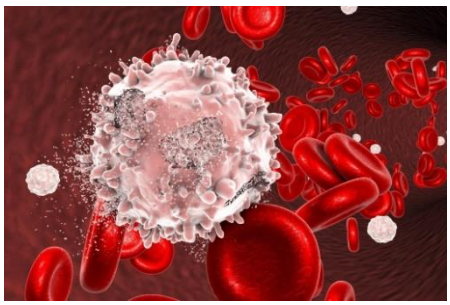
STEM CELL TRANSPLANT TO CURE BLOOD CANCER



Blood cancer irradiation method

Over one lakh new blood cancer cases are reported every year. Effective treatment methods, awareness around the disease and prevalence of myths are among the chief reasons why this disease continues to affect humankind despite so many advancements in medical science and technology. With over 1 lakh new cases reported annually, effective treatments are paramount," said Dr. Narendra Agarwal, Senior Consultant, Department of Hemato-Oncology & Bone Marrow Transplant, Rajiv Gandhi Cancer Institute and Research Centre, New Delhi.

At an event in Delhi organized by DKMS BMST Foundation India, a leading non- profit organization dedicated to the fight against blood cancer Dr Agarwal spoke about blood cancer treatment and the role of stem cell transplantation. Blood cancer poses a grave challenge in India, impacting numerous lives yearly. As a hematologist, I witness the devastating impact of blood cancer daily, and I understand the pain and urgency experienced by patients awaiting a life-saving stem cell transplant. It's time for us to step up, unite, and make a difference," Dr. Agarwal said. He stressed on the success rate of the treatment and said that timely interventions have shown successful treatment in 60-70% of the cases. With advancements in conditioning regimens, the success rate has further soared to 80%, he added. Every 5 minutes, a new instance of blood cancer or a blood disorder, such as Thalassemia or Aplastic Anemia, is diagnosed in India. Today, with over 40 million registered donors worldwide, India accounts for just 0.5 million. Thousands of patients are in dire need of a compatible stem cell donor for life- saving transplants," Patrick said. "Establishing a robust donor database can bridge the gap between patients and potential donors.

While DKMS has made significant progress in registering over 2500 people from Delhi in our database, it is evident that this number falls short in addressing the critical shortage of donors. We urge more individuals to come forward and join our cause, as every new registration brings hope to those in desperate need of a life-saving stem cell transplant," added Patrick. Cryo-preservation of cord cells of newborn babies should be done. There is a need for government regulations on these procedures which can help treat life threatening diseases like cancer." To create awareness on blood cancer, World Blood Cancer Day is observed on May 28 every year. Source: speech given by Dr Agarwal published in the times of India.

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CELL BIOLOGY

Cell biology is the study of cell structure and function, and it revolves around the concept that the cell is the fundamental unit of life. Focusing on the cell permits a detailed understanding of the tissues and organisms that sells compose. Some organisms have only one cell, while others are organized into cooperative groups with huge number of cells. On the whole, cell biology focuses on the structure and function of a cell, from the most general properties shared by all cells, to the unique, highly intercate functions particular to specialised cells.

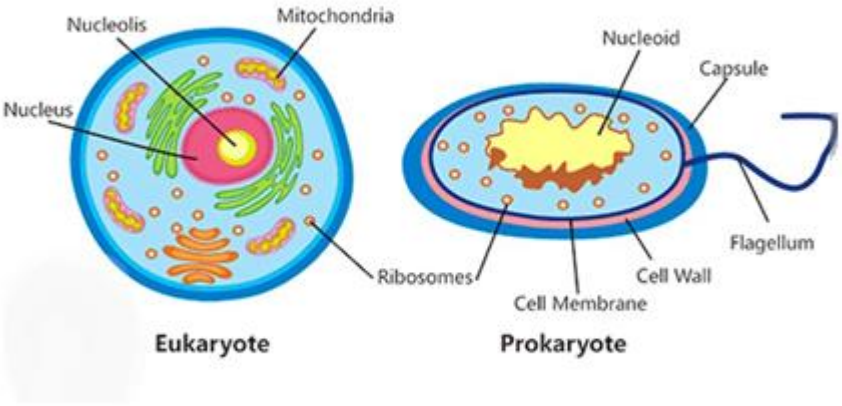
The starting point for this discipline might be considered the 1830s. Those scientists had been using microscopes for century, they were not always sure what they were looking at. Robert Hooke's initial observation in 1665 of plant cell walls in slices of cork was followed shortly by Antonie van Leeuwenhoek's first descriptions of life cells with visibly moving parts. In the 1830s two scientists who were colleagues - Schleiden, looking at plant cells, and Schwann, looking first at animal cells-provided the first clearly stated definition of the cell. Their definition stated that all living creatures both simple and complex, are made out of one or more cells, and the cell is the structural and functional unit of life a concept that became known as cell theory.

As microscopes and staining techniques improved over the 19^{th} and 20^{th} centuries, scientists were able to see more and more internal detail within cells. The microscopes used by Van Leeuwenhoek probably magnified specimens a few hundredfold. Today high-powered electron microscopes can magnify specimens more than a million times and can reveal the shapes of organelles at the scale of a micrometre and below. With a confocal microscopy a series of image can be combined allowing researchers the generally detailed three dimensional representations of cells. These improved imaging techniques have helped as better understand the wonderful complexity of cells and the structures they form.

There are several means of fields within cell biology. One is the study of cell energy and the biochemical mechanism that support cell metabolism. As cells are machines unto themselves the focus on cell energy overlaps with the pursuit of questions of how energy first arose in original primordial cells billions of years ago. Another sub field of cell biology concerns the genetics of the cell and its tight interconnection with the proteins controlling the release of a genetic information from the nucleus to the cell cytoplasm. Yet another structure of cell components known as subcellular compartments.

Cutting across many biological discipline is the additional field of cell biology concerned with cell communication and signal in comma concentrating on the messages that cells give to receive from other cells and themselves. And finally there is a field primarily concerned with the cell cycle, the rotation of faces beginning and ending with the cell division and focus on different periods of growth and DNA replication of two or more of the fields as ability to analyse cells in more complex ways expands.

In line with continually increasing disciplinary study, the recent emergence of systems biology has affected many biological disciplines; it is a methodology that encourages the analysis of living systems within the context of other systems. In the field of cell biology, systems biology has enabled the asking and answering of more complex questions, such as the interrelationships of gene regulator in networks, evolutionary relationships between genomes, and interactions between intracellular signal in networks. Ultimately, the broader a lens we take on our discovery in cell biology, the more likely we can decipher the complexity of all living systems, large and small.



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BAT STEM CELLS REVEAL HOW BATS SURVIVE IN A VIRUS-FILLED ENVIRONMENT

Bat pluripotent stem cells reveal unusual entanglement

Bats inhabit diverse ecological niches, accounting for one-fifth of all living mammalian species. They feed on fruits, nectar, arthropods, leaves, fish, small vertebrates, and blood. Its unique ability to fly, combined with the ability to navigate in darkness using laryngeal echolocation, makes bats fascinating mammals. Many bat species, such as Rhinolophidae, Hipposideridae, and Pteropodidae, can tolerate and survive virus attacks. Many viruses that are tolerated by bats, such as severe acute respiratory syndrome coronavirus (SARS-CoV), severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), henipaviruses, middle-east respiratory syndrome coronavirus (MERS-CoV) and Marburg, have high mortality rates.

Rhinolophidae.

Hipposideridae

Bats are asymptomatic and tolerant viral hosts primarily due to modulation of the innate immune response. Although bats have small genomic sizes, they contain a large diversity of ancient and contemporary viral insertions of retroviral and non-retroviral origin. This is the reason why bats demonstrate tolerant evolutionary history with their viral pathogens. Since some of the incorporated retroviral sequences are of full length and also of non-at origin, the bats' genomic sequence provides information about the bat virosphere and the risk of zoonotic spill over. In addition, analysis of a bat's genomic sequence provides mechanistic insights associated with viral resistance. There have been few studies that explore the relationship between bats and viruses. Molecular and cellular analyses are necessary to understand the evolutionary adaptations in bats to tolerate harmful viral pathogens.

Existing studies support the hypothesis that bats tolerate many viruses by acquiring specific adaptations in the innate immune system. It is interesting to observe how genomic adaptations in the bat immune system resemble viruses' process of dismantling the host responses. Viruses can effectively change host cell processes to their advantage and transform host cells into virus-producing factories Pluripotent stem cells are the founding cells of the entire embryo. During epigenetic resetting, which occurs when a cell reprograms to pluripotency, it induces transcriptional reactivation of endogenous viruses. These cells help understand how viruses interact with host cell programs. Based on the fact that bats' genome harbors the evolutionary history of many intact and full-length viral elements, there is a possibility that these genomes could also contain the blueprints for viral replication. A recent Cell journal study tested the hypothesis that bats genetically induce the virus for immune evasion and provide fertile ground for replication. This hypothesis was empirically tested using pluripotent stem cells. At present, there are no reliable cellular models to study bat biology or how they interact with viral infections. Therefore, the authors created induced pluripotent stem cells (iPSCs) from two species of bats, i.e., *Rhinolophus ferrumequinum* (the wild greater horseshoe bat) and *Myotis myotis* (the greater mouse-eared bat).

Myotis myotis

Rhinolophus ferrumequinum

In addition, a large number of endogenous viral sequences, mainly retroviruses, were present. These findings indicate that bats have mechanistically evolved to withstand a large load of viral sequences. Furthermore, it is possible that bats have considerable amounts of intertwined relationships with viruses, much more than previously assumed. As stated above, viruses can quickly adapt their replication cycles in accordance with a cell type. The current study suggested that in bats, the pluripotent state functions as an "umbrella" that can host a highly divergent viral contingent. The bat stem cell culture model provides important insights into bats' tolerance for viral infection. This model also helps elucidate the role of bats as a viral reservoir and uncover the relationship between bats and viruses. In addition, it provides rationales for virus persistence, symbiotic protection against other pathogens, immune-modulatory strategies, mammalian adaptive piRNA or CRISPR-like systems, and the progression of evolutionary processes.

Conclusion

The current study revealed the presence of a potentially significant contingent of endogenous and exogenous viral products in bat pluripotent stem cells without significantly compromising their ability to proliferate and grow. This proof-of-concept study establishes that bat stem cells could be a tantalizing model system that could help understand how bats asymptomatically tolerate the diversity of viruses. In the future, bat iPSCs and their differentiated progeny will enable us to gather more information related to bat biology and their relationship with viruses. This approach would also help understand the underlying molecular basis of bats' capacity to tolerate virus attacks.

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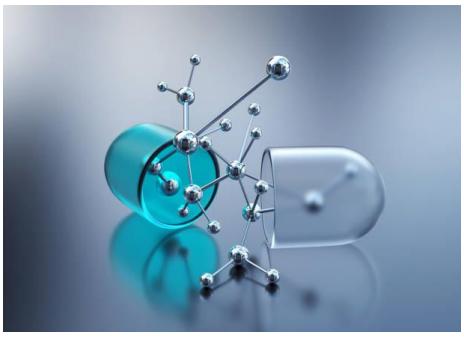
EFFECT OF NANOTECHNOLOGY ON THE RESEARCH AND DEVELOPMENT OF MEDICAL TECHNOLOGIES

Abstract

Nanomedicine refers to the area of science that combines nanotechnology with drugs or diagnostic molecules to improve the ability to target specific cells or tissues. These materials are produced on a nanoscale level and are safe to introduce into the body. Applications for nanotechnology in medicine include imaging, diagnosis, or the delivery of drugs that will help medical professionals treat various diseases.

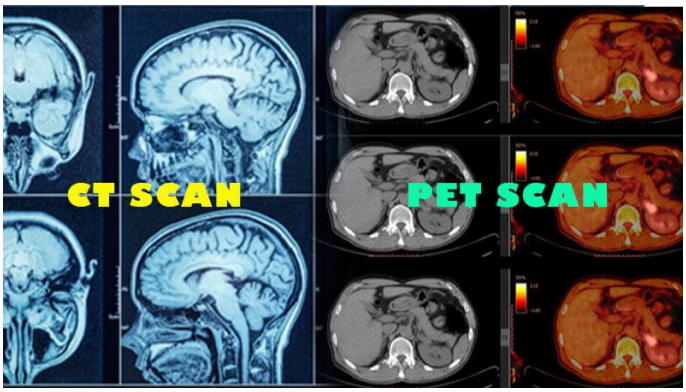


Introduction

In recent years, the field of nanotechnology has emerged as a game-changer in various industries, with healthcare being one of the most promising domains. Nanotechnology involves the manipulation and control of matter at the nanoscale, where materials exhibit unique properties and behaviors. This remarkable technology has revolutionized medical research and development, opening up unprecedented possibilities for the diagnosis, treatment, and prevention of diseases. In this article, we will explore the profound impact of nanotechnology on medical technologies and the promising future it holds.

1. Advanced Diagnostics

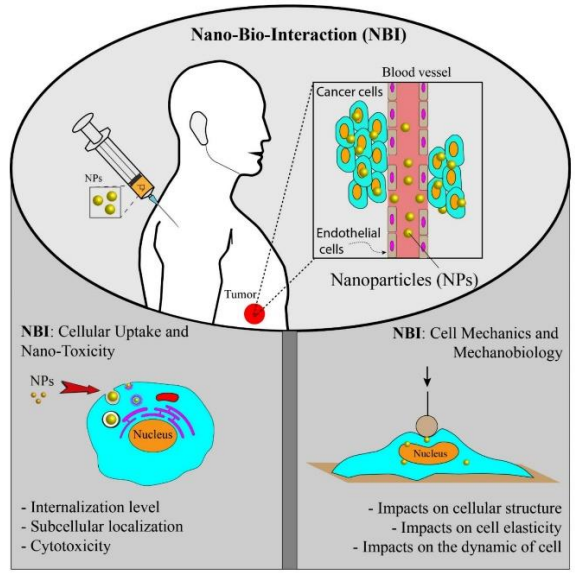
Nanotechnology has significantly enhanced diagnostic techniques, enabling early and accurate disease detection. Nanoparticles, with their large surface area-to-volume ratio and functional properties, have been employed in various imaging techniques such as magnetic resonance imaging (MRI), computed tomography (CT), and positron emission tomography (PET). These nanoparticles can be engineered to selectively target specific cells or tissues, aiding in the visualization of tumors, inflammation, and other pathological conditions with exceptional precision. Moreover, nanosensors are being developed to detect biomarkers and trace amounts of disease-related substances in body fluids. These nanoscale sensors, integrated into wearable devices or implanted directly into the body, provide real-time monitoring of vital signs and early warning signs of diseases. This level of personalized medicine promises to revolutionize the field of diagnostics.



2. Targeted Drug Delivery

One of the most significant contributions of nanotechnology to medical research is the development of targeted drug delivery systems. Conventional drug delivery often lacks specificity and efficiency, resulting in systemic side effects and suboptimal therapeutic outcomes. Nanoparticles can be engineered to encapsulate drugs, ensuring their safe transport to specific cells or tissues.

These nanoparticles can bypass biological barriers, such as the blood-brain barrier, and deliver drugs directly to the intended site of action. Additionally, surface modifications allow for active targeting by binding to specific receptors on diseased cells, enabling precise drug delivery while minimizing damage to healthy tissue. This approach increases the efficacy of treatments, reduces side effects, and enables lower drug doses, ultimately enhancing patient outcomes.

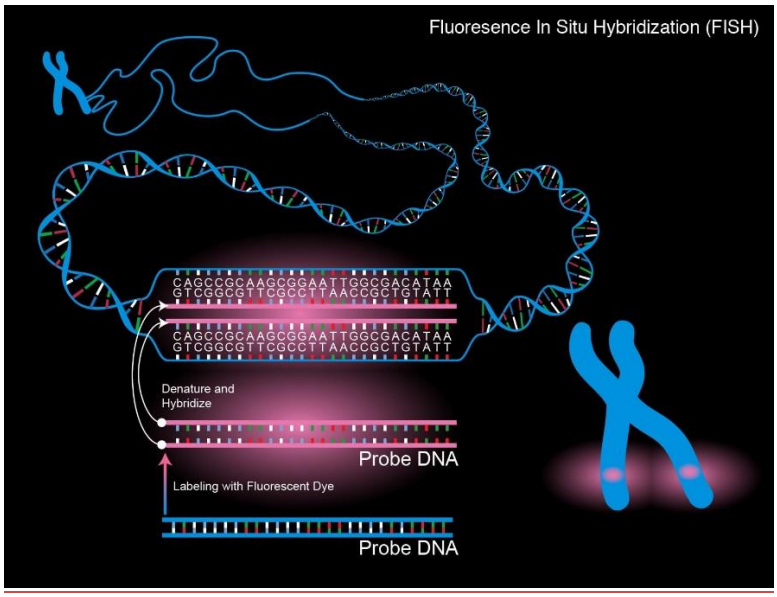


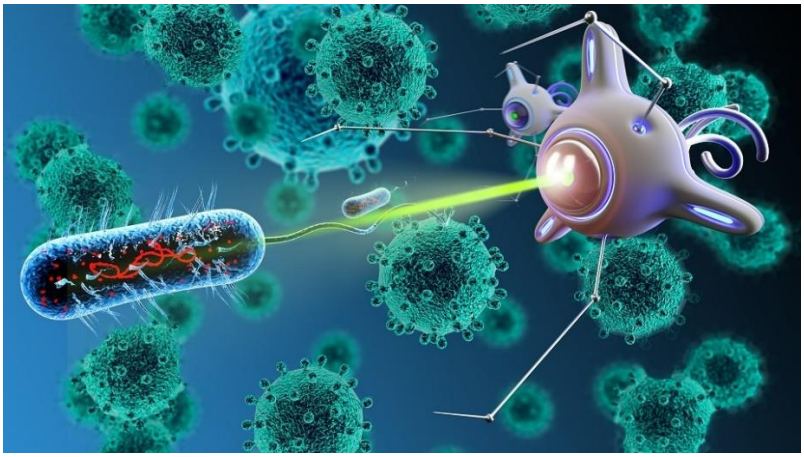
3. Regenerative Medicine

Nanotechnology has also shown tremendous potential in the field of regenerative medicine. By mimicking the natural environment of cells and tissues, nanomaterials can promote tissue regeneration and repair. Nanofibers and scaffolds can be engineered to provide structural support, promote cell adhesion, and stimulate the growth of new tissue. Furthermore, nanotechnology plays a crucial role in the development of tissue engineering and 3D bioprinting. Nanoscale bioinks containing stem cells, growth factors, and nanofibers can be precisely deposited to create complex tissue structures. This technology has the potential to revolutionize organ transplantation, enabling the creation of functional organs in the lab, reducing the reliance on donor organs, and offering hope to countless patients on waiting lists.

4. Enhanced Therapeutics

Nanotechnology has expanded the possibilities in therapeutic interventions by providing innovative approaches for drug discovery and gene therapy. Nanoparticles can be used to improve the solubility and stability of drugs, enhancing their bioavailability and therapeutic efficacy. Additionally, nanotechnology enables the targeted delivery of gene therapies, allowing for precise modulation of gene expression and treatment of genetic disorders at the molecular level. Moreover, nanotechnology-based therapies have emerged in the field of cancer treatment. Nanoparticles can deliver chemotherapy drugs directly to cancer cells while sparing healthy cells, reducing side effects and improving the overall effectiveness of treatment. Additionally, photothermal and photodynamic therapies utilize nanoparticles to selectively destroy cancer cells when exposed to light, providing a non-invasive and localized approach to cancer treatment.





Conclusion

The integration of nanotechnology info medical research and development has revolutionized the field of healthcare. From advanced diagnostics and targeted drug delivery to regenerative medicine and enhanced therapeutics, nanotechnology offers a myriad of possibilities for improving patient outcomes, reducing side effects, and enabling personalized medicine. As this exciting field continues to evolve, the synergy between nanotechnology and medical technologies holds tremendous promise for the future of healthcare, offering new hope and possibilities for patients worldwide.

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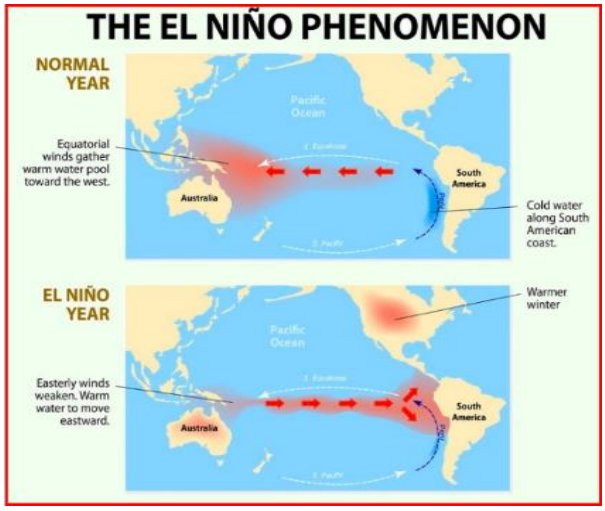
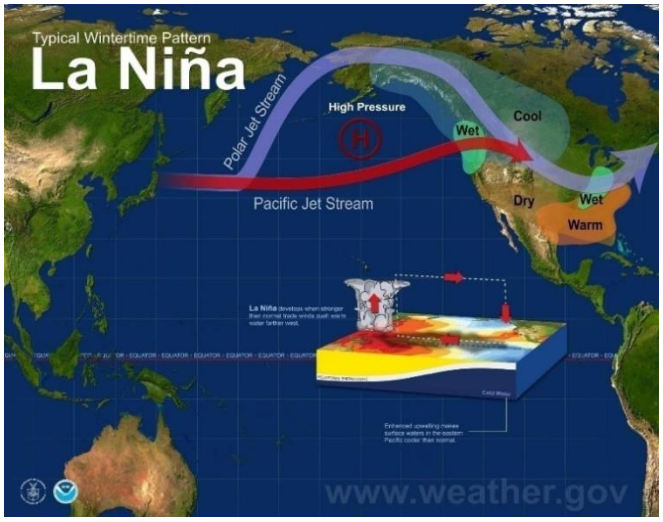
THE ODD CLIMATIC CHANGES

Introduction

Every two to seven years, an unusually warm pool of water — sometimes 4 to 5 degrees Fahrenheit (2 to 3 degrees Celsius) higher than normal — develops across the eastern tropical Pacific Ocean to create a natural short-term climate change event. This warm condition, known as El Niño. El Nino can be understood as a natural phenomenon wherein the ocean temperatures rise (warming) especially in parts of the Pacific Ocean. It is the nomenclature which is referred to for a periodic development along the coast of Peru. This development is a temporary replacement of the cold current along the coast of Peru. Another natural phenomenon, similar to El Nino is La Nina, which is also in the news these days. It is termed as opposite of the phenomenon of El Nino as it results in the 'cooling' of the ocean water in parts of the Pacific Ocean. La Niña is a weather pattern that begins in the Pacific Ocean. Warm ocean water and clouds move west during a La Niña.





Both of them also result in changes in atmospheric conditions along with oceanic changes.

Explanation: El Niño is the "warm phase" of a larger phenomenon called the El Niño-Southern Oscillation (ENSO). La Niña, the "cool phase" of ENSO, is a pattern that describes the unusual cooling of the region's surface waters.

Why are these climate patterns called "El Niño" and "La Niña"?

Centuries before it was a focus of scientific study, South American fishermen noticed warmer-than-normal coastal Pacific Ocean waters and dramatic decreases in fish catch occurring periodically around Christmas time. They nicknamed the phenomenon "El Niño" (Spanish for little boy) in connection with the celebration of the Christian holiday marking the birth of Jesus. In the 1980s, when the opposite phase of El Niño was discovered (i.e., cooler-than-normal ocean temperatures), scientists called it "La Niña" (Spanish for little girl).

What causes El Niño and La Niña to occur?

The winds near the surface in the tropical Pacific usually blow from east to west. These relatively steady winds sometimes weaken or strengthen for weeks or months in a row. Weak winds allow warm surface waters to build up in the eastern Pacific. Sometimes, but not always, the atmosphere responds to this warming with

increased rising air motion and above-average rainfall in the eastern Pacific. This coordinated change in both ocean temperatures and the atmosphere begins an El Niño event. As the event develops, the warmed waters cause the winds to weaken even further, which can cause the waters to warm even more.
During La Niña conditions, the easterly trade winds near the equator get even stronger than they usually are. Stronger winds push surface water into the western Pacific. Meanwhile, cool water from deeper in the ocean rises up in the eastern Pacific. If the cooling persists, it can inhibit rising air movement and rainfall in the eastern Pacific, beginning a La Niña event. As the event develops, the cooled waters cause the winds to strengthen even further, which can cause the waters to cool even more.

How long do El Niño and La Niña last?
El Niño and La Niña episodes typically last 9-12 months. They both tend to develop during the spring (March-June), reach peak intensity during the late autumn or winter (November-February), and then weaken during the spring or early summer (March-June). Both El Niño and La Niña can last more than a year, but it is rare for El Niño events to last longer than a year or so, while it is common for La Niña to last for two years or more. The longest El Nino in the modern record lasted 18 months, while the longest la Niña lasted 33 months. Scientists aren't sure why the duration of the two types of events can be so different.

Effects of El Nino effect and la Nina effect:
Typically, it comes around every five years and what usually happens is that warming in the oceans caused by the winds leads to diffusion of this warming all over the globe. It changes atmospheric pressures with consequences for rainfall, wind patterns, sea surface temperatures and can sometimes have a positive, and sometimes a negative effect on those systems. La Niña is a weather pattern that begins in the Pacific Ocean. Warm ocean water and clouds move west during a La Niña. This means that places like Indonesia and Australia can get much more rain than usual. And places like the southwestern United States can be very dry. Asia, Australia and Central and Southern Africa typically experience drought. In La Niña events the opposite is seen: drought in the southern US, and heavy rains in Canada and Asia. Stronger winds along the equatorial region especially in the Pacific. Decreased convection in the Pacific leading to a weaker jet stream. Conditions are more favourable for hurricanes in the Caribbean and central Atlantic area. Greater instances of tornados in those states of the US already vulnerable to them. El Niño means warmer water spreads further, and stays closer to the surface. This releases more heat into the atmosphere, creating wetter and warmer air. El Niño reduces the instances of hurricanes in the Atlantic. The hottest year on record, 2016, was an El Niño year.

Can we predict El Niño and La Niña before they occur?
Yes, scientists can often predict the onset of El Niño and La Niña several months to a year in advance, thanks to modern climate models and observation data from the Tropical Pacific Observing System like sensors on satellites, ocean buoys, and radiosondes etc., which constantly monitors changing conditions in the ocean and atmosphere.

Why is predicting El Niño and La Niña so important?
El Niño and La Niña can make extreme weather events more likely in certain regions. If we can predict El Niño and La Niña, we can predict a greater chance of the associated extreme events. Better predictions of where and when extreme weather events are likely to happen (e.g., floods and droughts) could save the United States billions of dollars in damage costs. Predicting the life cycle and strength of El Niño and La Niña is critical for helping people plan for, avoid, or mitigate potential damages in every sector of society, including agriculture, fisheries, energy, water, transportation, and health care. Advances in scientists' ability to predict future ENSO states could significantly improve U.S. economic opportunities in these vital sectors.

Can we prevent El Niño and La Niña from occurring?

No, El Niño and La Niña are naturally occurring climate patterns and humans have no direct ability to influence their onset, intensity, or duration.

Does global warming affect El Niño and La Niña?

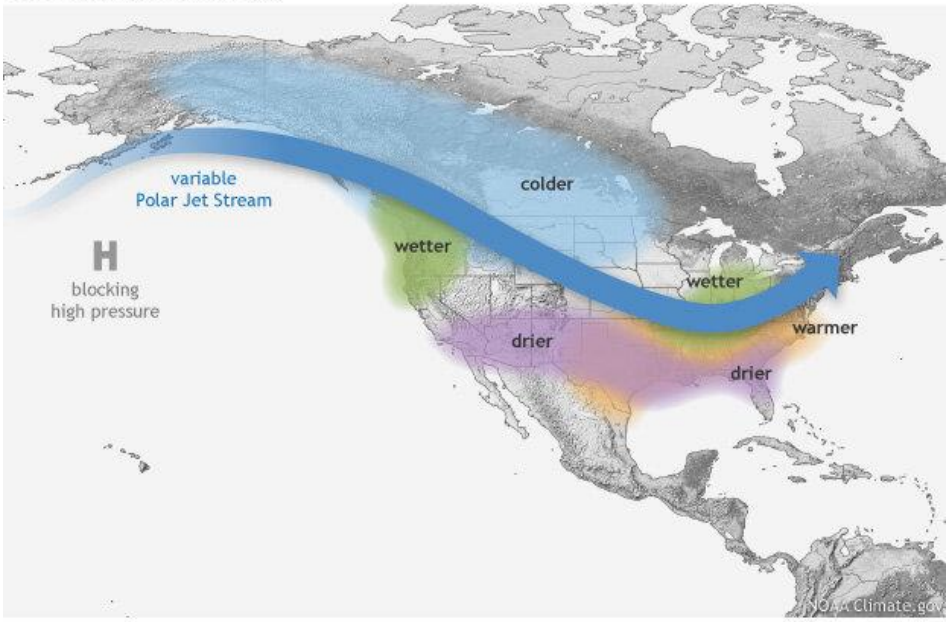
There are many ways in which global warming could affect the frequency and intensity of El Niño / La Niña, but scientists currently have low confidence in their ability to predict exactly how a warmer world affect the ENSO. Scientists have high confidence, however, that ENSO itself has been occurring for thousands of years, and will continue into the future. Global warming is likely to affect the impacts related to El Niño and La Niña, including extreme weather events. Between 2020 and 2022, the northern Hemisphere had three La Niña episodes in a row. Despite the La Niña triple, the EU's climate monitoring service says that 2022 was the fifth warmest year on record. Prof Adam Scaife from the Met Office said: "Global average temperature over the last three years has been at near record levels, but it would have been even higher without the cooling effects of a prolonged La Niña." A 0.2C temperature rise would add about 20% to the existing global temperature rise from climate change. In October 2022, Australia experienced record rainfall and flooding driven by La Niña.

Conclusion:

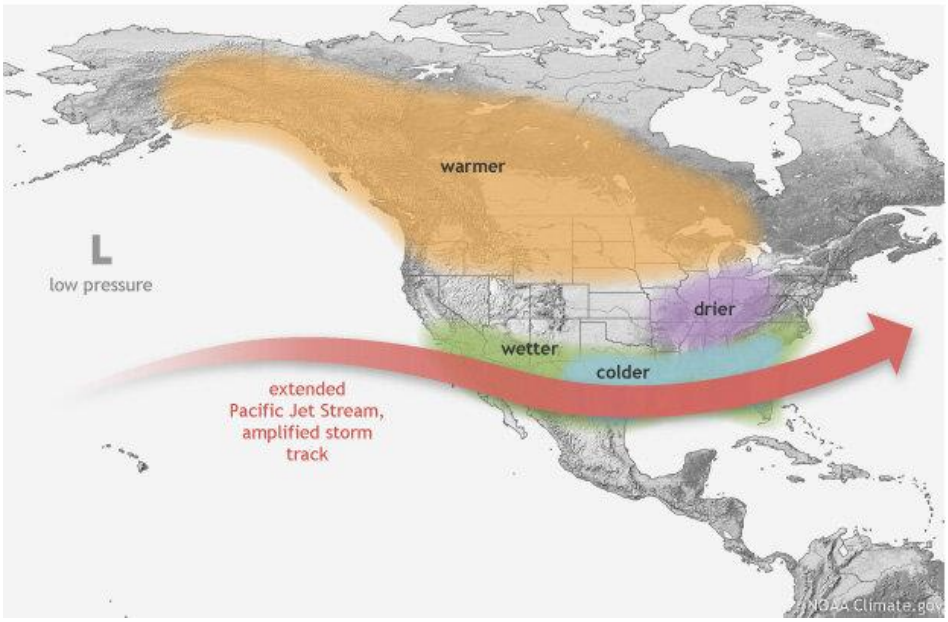
Rain clouds normally form over warm ocean water. When strong winds cause this warm water to move, the clouds and storms move, too. In normal conditions, winds above the Pacific Ocean gently push warm water west. That warm water travels from the west coast of South America all the way to Indonesia. As the warm water moves, cold water from the bottom of the ocean slowly rises up to take its place. Scientists use the Oceanic Nino Index to measure the deviations from normal sea-surface temperatures that El Niño and La Niña produce in the east-central Pacific Ocean. La Niña events are indicated by sea-surface temperature decreases of more than 0.5 degrees Celsius (0.9 degrees Fahrenheit) for at least five successive three-month seasons.

Both El Nino and La Nina has increase in the level of greenhouse gases has led to considerable heating of earth leading to global warming. During the past century, the temperature of earth has increased by 0.6^0C, most of it during the last three decades. Scientists believe that this rise in temperature is leading to deleterious changes in the environment and resulting in odd climatic changes like El Nino and La Nina, thus leading to increased melting of polar ice caps as well as of other places like the Himalayan snow caps. Over many years, this will result in a rise in sea level that can submerge many coastal areas. The total spectrum of changes that global warming can bring about is a subject that is still under active research.

WINTER LA NIÑA PATTERN



WINTER EL NIÑO PATTERN



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EVALUATION OF THE POLLUTION STATUS IN UYO DUMP SITE METROPOLIS USING AFRICAN GIANT LAND SNAIL (*Archachatina marginata)*

Introduction

Waste generation is an integral aspect of human existence that is unavoidable. It is a product of resource use process that has the capacity to be inconveniencing and harmful leading in extreme cases to pollution with resultant epidemics and catastrophic consequences. Waste is used to describe any item or object that is no longer suitable for use in the owner's or user's consideration, waste can be products or by-products of certain processes or remnants of useful items that are considered as no longer useful. Waste comes in three broad forms of solid, liquid and gaseous waste, (Jatau, 2013). Solid waste which consists of refuse, garbage, rubbish, dead animals, construction wastes, etc., may either be biodegradable or non-biodegradable, combustible or non- combustible. Examples of solid waste are; broken glasses, plastics, metals, broken blocks, food remnants, papers, wood, cloth, etc. Solid waste from households, commercial and industrial sources are called Municipal Solid Waste (MSW), and they are generally disposed off in a landfill (Environmental Protection Department, 2011). Biodegradable waste items will disintegrate with the passage of time even when left on their own but apart from creating health hazards, the rate of disintegration may be too slow for the rate of generation thereby making aesthetically unappealing. Owing to the multidimensional nature of waste and its attendant negative effects on humans, wildlife and the environment, its management is highly crucial and requires concerted effort. (Adewale and Litherland, 2011).

Waste management practices which essentially covers the collection, conveyance, processing, recycling and disposal of waste items is approached in different ways in different communities all with the same goal of maintaining sustainable environment conducive for healthy human and wildlife habitation. Generally, governments are responsible for the management of non-hazardous residential and institutional waste while, commercial and industrial wastes are managed by their producers under government's supervision. A common practice of solid waste management in Nigeria involves the collection, transportation and disposal of solid wastes at designated areas called dumpsites. Uyo metropolis dumpsite is a major repository of municipal solid waste in Akwa Ibom State. It receives domestic, industrial and institutional waste by public and private waste management operators. According to the Organization for Economic Co-operation and Development (OECD) through a document concerning pollution in 1976, Pollution is the production or introduction by man directly or indirectly of substances or energy into the environment, resulting in deleterious effects of such nature as to endanger human health, harm other living resources in the ecosystem and impair other legitimate uses of the environment. Pollution occurs when a product added to our natural environment adversely affects nature's ability to dispose it off. A pollutant is something which adversely interferes with the health, comfort, property or environment of the people. Generally, most pollutant are introduced into the environment as sewage, solid waste and as compounds used to protect plants and animals. Over the years solid waste has been introduced into Uyo Metropolis dumpsite and it is suspected that this must have elicited the pollution of the environment. (Misra and Alani, 1991).

Bio-indicators are species used to monitor the health of an environment or ecosystem. They are any biological species whose function, population or status can be used to determine ecosystem or environmental integrity of such organisms are monitored for changes be it biochemical, physiological or behavioral that may indicate a problem within the environment or ecosystem. A bio-indicator can tell one about the cumulative effect of different pollutant in the ecosystem and about how long such a problem may have been present which physical and chemical testing alone may not (Karr, 1993).

An example of such a group is the gastropods and other land and water organisms. The importance and relevance of bio-indicators rather than man-made equipments in ascertaining the health staged of an

environment is justified by the statement; there is no better indicator of the status of a species or a system than the species or system itself. Bio monitoring entails the use of the property of the organism to obtain information on certain aspects of the biosphere, (Tingey, 1989).

Giant African Land snail; Archachatina marginata is a species within the family archantinidae, a family of unusually large African terrestrial land snails. It is native to West Africa and found in humid areas, urban areas and sub lands including farmlands. It can be found aestivating underground during drier months, having a closed aperture, sealed with a solid, calcareous, white epiphragm, (Cowie et al., 2009).

Classification

Kingdom:	Animalia
Phylum:	Mollusca
Class:	Gastropoda
Super family:	Archatinoidae
Genus:	Archachatina
Species:	Archachatina marginata

Heavy metals are metals and metalloids having atomic densities greater than 5g/cm3. They include mercury, zinc, copper, cadmium, lead and nickel among others. At some levels of exposure, and absorption, they are harmful to most living things. Heavy metals are released into the environment through man's industrial, domestic and commercial activities, industrial effluents, pesticides and fungicides, as well as manure from poultry farms. Many of the sites contain significant amount of ashes due to dumping of ash and the burning of refuse on the dumpsite from time to time. The burning gets rid of organic materials and oxidizes the metals leaving the ash richer in metal content. The process of oxidation and corrosion makes the metals soluble and leached from where they are picked up by plants, thereby entering into the food chain. (Wild, 1993).

The toxicity of many metals depend on the chemical forms in the environment which can be greatly affected by the leachate quality especially pH. The heavy metals present in the leachates are considered hazardous to terrestrial lives because of their availability and toxicity, bioaccumulation tendency of characterized contents and their availability. Heavy metals may reach the terrestrial environment via the flow of this leachate and plants rooted in leachates contaminated soils. (John, 2002). Macro fauna are an important part of the soil environment. Snails, being an important macro fauna is involved in many aspects in microbial activities, nutrient cycle and crumbly structures and thus, are readily exposed to the leachate and heavy metals present in the soil. (Corlex et al., 1993). The major dumpsite solid wastes produces heavy metals continually; this is capable of migrating unto nearby farmlands and surface water. The knowledge of the composition and quality of these solid waste will give an insight into appropriate, effective and sustainable environmental protection approach. Therefore, this study will document the physical and chemical composition of heavy metals from contaminated soil in Uyo Municipal dumpsite, and measure possible effects as well as the pollution status of the dumpsite, nearby farmland and environs using African Giant Land Snail; Archachatina marginata as bio-indicator.

Significance of the study

Uyo municipal dumpsite is situated in the heart of Uyo Metropolis close to Akwa Ibom State Government House. Residential buildings, farmlands and surface water bodies are some sensitive environmental components around the dumpsite. There has been widespread concern about potential pollution emanating from the dumpsite with its attendant negative impacts on public health and the environment. It is imperative to ascertain the actual pollution status of the dumpsite to assist in the holistic management of the dumpsite in the interest of public health, aesthetic and the general well-being of the environment.

Aim and objectives

The study was aimed at evaluating the current pollution status of Uyo Metropolis dumpsite using African giant land snail Archachatina marginata as a bio- indicator.

The specific objectives of the study were:

- To assess the levels of heavy metals composition in the African giant land snail Archachatina marginata pick from dumpsite Uyo Metropolis.
- To ascertain the heavy metals content of soil at Uyo Metropolis dumpsite
- To provide scientific information on the pollution status of Uyo Metropolis dumpsite and create necessary public awareness as a prelude to the management of the dumpsite.

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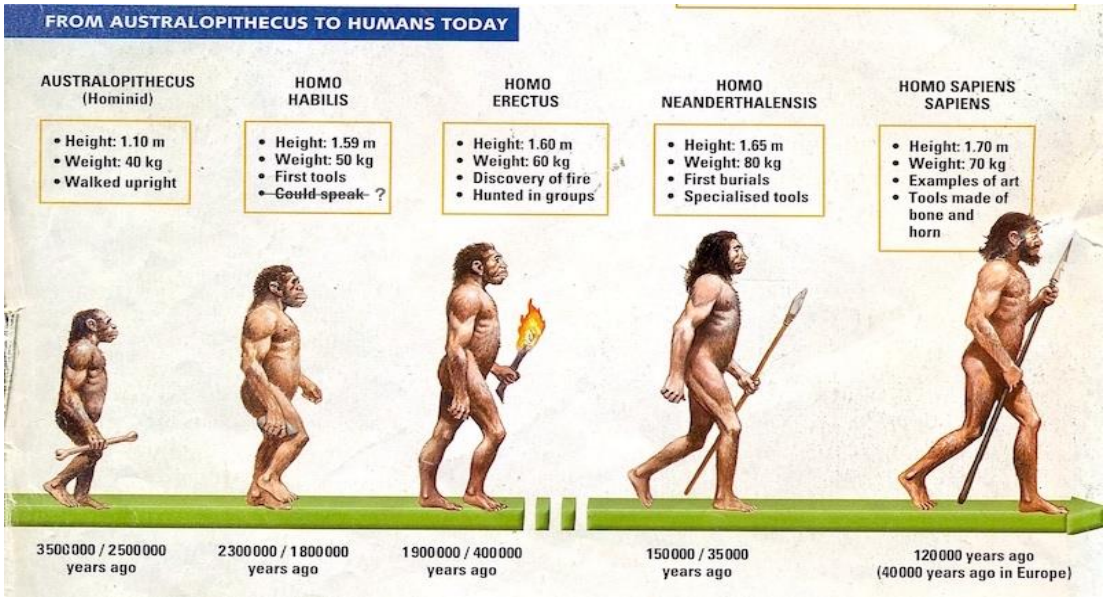
EVOLUTION OF HUMANS



Human evolution is the process by which modern humans evolved from their ape-like ancestors. This process took millions of years and involved many changes, both physical and behavioral.
The earliest known human ancestors were small, ape-like creatures that lived in Africa about 6 million years ago. These creatures were bipedal, meaning they walked upright on two legs. They also had larger brains than their ape-like ancestors. Over time, human ancestors continued to evolve. They became larger and more intelligent. They also developed new technologies, such as tools and fire. These technological advances allowed humans to spread to new areas and to adapt to different environments.

About 200,000 years ago, the first modern humans, Homo sapiens, evolved in Africa. Homo sapiens are characterized by their large brains, their upright posture, and their ability to use language. Homo sapiens eventually spread to all parts of the world. They replaced other human species, such as the Neanderthals. Homo sapiens are the only surviving human species today. The evolution of humans is a complex and fascinating process. It is a story of adaptation, change, and innovation. Humans are the product of millions of years of evolution, and we are still evolving today. The fossil record provides a wealth of information about the evolution of humans. Fossils of human ancestors have been found all over the world, and they show how humans have changed over time.

The earliest known human fossils are about 6 million years old. These fossils are of small, ape-like creatures that walked upright on two legs. They are called *Australopithecus afarensis*. *Australopithecus afarensis* was followed by a number of other human ancestors, including Homo habilis, Homo erectus, and Homo neanderthalensis. Each of these species had its own unique features. For example, Homo habilis was the first human species to make tools. Homo erectus was the first human species to walk upright outside of Africa. And Homo neanderthalensis was the first human species to evolve in Europe. The fossil record shows that humans have been evolving for millions of years. This evolution has been driven by natural selection, the process by which organisms that are better adapted to their environment are more likely to survive and reproduce.

The Role of Natural Selection

Natural selection is a powerful force that has shaped the evolution of humans. Over millions of years, natural selection has favored those human ancestors who were better able to survive and reproduce in their environment. For example, early human ancestors who were able to walk upright on two legs were more likely to escape predators and to find food. These early human ancestors were also more likely to reproduce and pass on their genes to their offspring. As a result, over time, human ancestors evolved to become bipedal. Natural selection has also favored those human ancestors who were able to make tools. Tools allowed early human ancestors to hunt more effectively and to gather food more easily. This gave early human ancestors an advantage over other animals, and it helped them to survive and reproduce.

The Future of Human Evolution

Human evolution is a continuous process. Humans are still evolving today, and it is impossible to say what the future holds. However, it is likely that humans will continue to evolve in response to the challenges of their environment. For example, humans may evolve to become more resistant to disease. Humans may also evolve to become more intelligent. And humans may evolve to become better able to adapt to new environments. The future of human evolution is uncertain, but it is likely to be exciting. Humans are a species that is constantly changing and adapting. And it is this ability to change and adapt that has allowed humans to thrive for millions of years.

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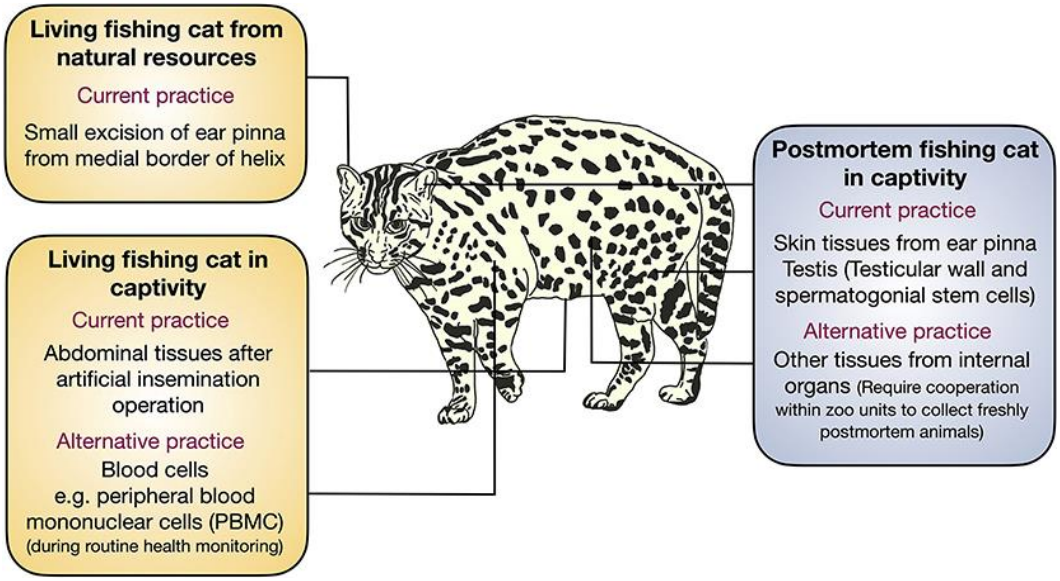
GENOME SPOTLIGHT: FISHING CAT (*Prionailurus viverrinus*)

Anyone who thinks cats hate water has never met a Fishing Cat. These midsized South and Southeast Asian cats seem at home in the water as they are on land, capable of swimming long distances both at and below the surface. In captivity, they start playing in the water as young as two months old, and when they are fully grown, about three-quarters of their diet comes from fish. Unfortunately, the wetlands they rely on are disappearing for these unique cats, and many of them are present. But they are either polluted or claimed by people. Captive Fishing cats are prone to transitional cell carcinoma (TCC). It is a lower urinary tract cancer. Researchers suspected that their vulnerability to the disease may have a genetic basis, as breeding populations were found to be relatively few animals and therefore can have low genetic diversity. But to find disease-causing genes, Genomic tools are required. These Genomic tools are now available for fishing cats.

The genome was assembled from PacBio HiFi reads with chromosomal arrangements determined using Hi-C chromatin capture. In all, 96.3 percent of the 2.46 Gb assembled genome was assigned to chromosomes and a BUSCO analysis estimated that the sequence is 93.5 percent complete. Armed with the robust genome, the researchers began the search for candidate TCC-related genes in a cohort of 11 fishing cats, 5 of which had TCC. They first searched for the cat's version of eight human genes associated with bladder cancer, observing missense variants of 4 genes in the TCC group namely; BRCA1, BRCA2, CHEK2, and ATM. But BRCA2 stood out as two missense variants of it found in all TCC-afflicted animals. However, the variants were also present in half of the control cats. So, it was not possible to conclude that the variants are responsible for the heightened risk of TCC in the animals.

The authors conclude, "Additional Genomic sampling will help clarify causative risk variants." The study serves as a template for using the vast knowledge accumulated for human diseases to tease apart the etiology of other animals' conditions, the authors say, adding that findings from such comparisons could guide mating decisions and warn human caretakers of animals at particularly high risk of future disease. And such discoveries aren't a one-way street: Findings from animals can shed light on mysteries in human health. Other researchers have noted that feline TCC shares key similarities with human cancer, so further research on TCC in fishing cats could, one day, lead to a deeper understanding of this cancer in people, which is responsible for around 95 percent of all bladder cancers and kills more than 15,000 people in the US each year.



Conclusion

To conclude, we feel that this article gives a bird's eye view of the life of a fishing cat. The genome sequencing of the Fishing Cat, an endangered feline species, has provided insights into its unique adaptations for an aquatic lifestyle and the genetic basis of its susceptibility to diseases like TCC. This research can help inform conservationists to put in effort for the species and contribute to our understanding of feline evolution.

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LIFE ON MARS

The possibility of life on Mars is a subject of interest in astrobiology due to the planet's proximity and similarities to Earth. To date, no proof of past or present life has been found on Mars. Cumulative evidence suggests that during the ancient Noachian time period, the surface environment of Mars had liquid water and may have been habitable for microorganisms, but habitable conditions do not necessarily indicate life.

Scientific searches for evidence of life began in the 19th century and continue today via telescopic investigations and deployed probes, searching for water, chemical biosignatures in the soil and rocks at the planet's surface, and biomarker gases in the atmosphere.

Mars is of particular interest for the study of the origins of life because of its similarity to the early Earth. This is especially true since Mars has a cold climate and lacks plate tectonics or continental drift, so it has remained almost unchanged since the end of the Hesperian period. At least two-thirds of Mars's surface is more than 3.5 billion years old, and it could have been habitable since 4.48 billions of years ago, 500 million years before the earliest known Earth lifeforms; Mars may thus hold the best record of the prebiotic conditions leading to life, even if life does not or has never existed there.

Following the confirmation of the past existence of surface liquid water, the Curiosity, Perseverance and Opportunity rovers started searching for evidence of past life, including a past biosphere based on autotrophic, chemotrophic, or chemolithoautotrophic microorganisms, as well as ancient water, including fluvio-lacustrine environments (plains related to ancient rivers or lakes) that may have been habitable. The search for evidence of habitability, taphonomy (related to fossils), and organic compounds on Mars is now a primary objective for space agencies.

The findings of organic compounds inside sedimentary rocks and of boron on Mars are of interest as they are precursors for prebiotic chemistry. Such findings, along with previous discoveries that liquid water was clearly present on ancient Mars, further supports the possible early habitability of Gale Crater on Mars. Currently, the surface of Mars is bathed with ionizing radiation, and Martian soil is rich in perchlorates toxic to microorganisms. Therefore, the consensus is that if life exists—or existed—on Mars, it could be found or is best preserved in the subsurface, away from present-day harsh surface processes.

Submitted by:
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NEW FINDING IN THE REPTILE KINGDOM

Psychedelic-eyed gecko

The world of reptiles is such a humongous one as we know there are many fascinating species yet to be discovered in this particular area, one such latest finding is the psychedelic-eyed gecko it is a reptile with very bright eyes, researchers found out through genetic analysis closely related to gecko species and now it's considered its own species. This magnificent creature has very beautiful distinct eyes which are in bright colours. The new species, called the lesser thorn-tailed gecko (*Strophurus spinula*), is about 2.4 inches (6.1 centimeters) long and has a dappled pattern of white and gray scales, which is also mimicked in its eyes.

The camouflaged geckos live in woodland areas across the south of Western Australia, though researchers are unsure exactly how large the newfound gecko's population is. Like all other spiny-tailed geckos, *S. spinula* can secrete a harmless and foul-smelling chemical from glands near its tail to deter potentially predatory birds from landing in overhead shrubbery, where they normally attack from. *Strophuru spinula* appears to prefer woodlands dominated by the mulga tree (*Acacia aneura*), which grows in extremely arid conditions. The researchers now want to find out why the new species prefers this habitat type. The world is a very large place to explore and these are the newest of our discoveries with lot more to explore.

Submitted by:

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THE RISE OF TOBACCO IN KARNATAKA

Tobacco is one of the most economically significant agricultural crops in the world. It is a drought tolerant, hardy and short duration crop which can be grown on soils where other crops cannot be cultivated profitably. In India, Tobacco crop is grown in an area of 0.45 M ha (0.27% of the net cultivated area) producing ~ 750 M kg of tobacco leaf. India is the 2nd largest producer and exporter. About 15 states in the country grow tobacco, significantly influencing the economy and prosperity of the farming community. FCV, Bidi, Hookah, Chewing, Cigar-wrapper, Cheroot, Burley, Oriental, HDBRG, Lanka, Pikka, Natu, Motihari, Jati etc. are the different types of tobacco grown in the country. FCV, Burley and Oriental tobacco are the major exportable types.

Tobacco provides livelihood security to 36 million people including 6 million farmers and 20 million farm labour engaged in tobacco farming besides 10 million people working in processing, manufacturing and exports, in India. India enjoys an edge over the leading tobacco producing countries in terms of low production cost, average farm and export prices. Thus, Indian tobacco is considered as ‘value for money’. India is one of the leading exporters of tobacco and occupies second place after Brazil. FCV tobacco is the major commercial crop (>95% in Mysore and Hassan Districts) grown on red sandy loams commonly known as Karnataka Light Soils (KLS). In addition, production and processing costs of tobacco are also quite low in India, thus making the Indian tobacco price-competitive and value for money. Tobacco use is a major risk factor for many chronic diseases, including cancer, lung disease, cardiovascular disease and stroke. It is one of the major causes of death and disease in India accounts for nearly 1.35 million deaths every year.

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NATURE

Introduction

Nature is all the naturally occurring things on this planet. Nature is the animals, plants, events, processes, and products of the earth that are not made by people. It is the physical world and everything that lives in it.

"Nature" is more than just a word for plants, animals, and habitats. She is a complex living organism that produces and nurtures life. That's why we call her "Mother Nature." We may view ourselves as separate from Nature, especially when we use words like "man-made" to describe something that is NOT natural. But this notion is far from the truth.

Importance of nature

Nature is the ultimate source of our living. Both living and non-living things include nature, and everyone is interdependent, which helps maintain the ecosystem. Plants, animals, and humans all depend on nature for their survival. It supplies oxygen, sunlight, soil, water, and other necessary components. Nature is the most vital gift of God. It is the ultimate solution to all the needs of humans as well as other living beings. It maintains a food chain and balances the ecosystem. It underpins our economy, our society, indeed our very existence. Our forests, rivers, oceans and soils provide us with the food we eat, the air we breathe, the water we irrigate our crops with. We also rely on them for numerous other goods and services we depend on for our health, happiness and prosperity.

How to conserve nature?

Conservation of nature means the preservation of forests, land, water bodies, and minerals, fuels, natural gases, etc. And to make sure that all these continue to be available in abundance. Thus all these natural resources make life worth living on Earth. Life would not be imaginable without air, water, sunlight as well as other natural resources present on the earth. By using reusable packaging such as lunch boxes and reusable water bottles and coffee mugs, you are reducing the amount of litter entering the environment. Shopping for second hand items is a great way of reusing that reduces waste and also saves you money.

Submitted by
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WHY INDIA'S FIRST COW IS A GAME CHANGER

All births are special, but Ganga's was a milestone. The Gir calf born on March 16 this year is the first clone of a cow in India. Scientists who created Ganga at the National Dairy Research Institute (NDRI) in Karnal, Haryana, hope cloning will spur the breeding of indigenous cows, whose numbers have dwindled with cross-breeding, adoption of high-yielding exotic breeds and exports. " Indigenous animals, such as the Gir cow, are disease-resistant and well adapted to the hot and humid climate of the country. Cloning technology has the potential to meet the requirement of higher milk-producing indigenous cattle for Indian dairy farmers", Dr Himanshu Pathak, director general of the Indian Council of Agricultural Research (ICAR), under which NDRI functions, told TOI.

Long wait to clone cow

Ganga weighed a healthy 32kg at birth and has passed behavioural, physiological, genetic and other tests. But it's taken scientists years to get this far. In February 2009, ICAR-NDRI had made history with Samrupa, the world's first cloned riverine buffalo calf. Although Samrupa succumbed to a lung infection five days after birth, India has cloned 26 other animals since then. Cloning a cow, however took the longest, mainly due to religious sensitivities. "For buffaloes, we could approach slaughter-houses and get the oocyte (an mature ovum or egg cell). The same could not be done for cows", former NDRI director Dr MS Chauhan told TOI. In 2018 scientists got access to a new non-invasive technology called ovum pick-up(OPU) that could be used to separate oocytes from cows without harming them. "Just as we punch the ears of cows during their registration, cells are extracted using a similar technique. There's zero harm to the animal," said NDRI senior scientist Dr Naresh Selokar. "We studied the technique for a while and applied for approvals and clearances before undertaking it. And in 2021, we finally launched the project (to clone Ganga)," said Chauhan, now vice chancellor of GB Pant Agricultural University in Pantnagar, Uttarakhand. In the meantime, scientists had improved their somatic cell nuclear transfer (SCNT) technology for transferring the nucleus of a body cell into the cytoplasm of an enucleated (without nucleus) egg. For Ganga, the somatic cells came from the tail of a Gir cow, and the OPU-derived oocyte, which was enucleated, from a Sahiwal cow. For cloning, scientists alter the DNA structure of the oocyte and then mature it into the embryo. "This allows us to determine what properties the cloned animal will most likely possess. Our purpose was the calf should be able to weather tough climatic conditions and also be high milk yielding," said Selokar. For Ganga, the fertilised egg was matured into an embryo over nine days and then transferred to a surrogate animal for development. "Cloning is not new but the way we did it without harming the animal and without the need for any semen is trailblazing," said Dr Manoj Kumar Singh, another senior scientist at NDRI. NDRI claims the technique will be scaled up and more calves will be cloned as the technology is refined. Scientists will also make policy recommendations to pave the way for commercial cloning in India.

Why they chose gir cow?

Traditional Indian cow breeds like Gir, Sahiwal and Red Sindhi are primarily draught animals with relatively high milk yields. After the Green Revolution, increasing mechanization of agriculture had made these breeds uneconomical, so farmers tried cross-breeding for higher milk output, but the hybrids turned out to be more susceptible to diseases like the lumpy skin disease. That's why, in 2021 NDRI Karnal collaborated with Uttarakhand Livestock Development Board(ULDB), Dehradun, to initiate improvement of indigenous cow breeds through cloning. "When we sat down to identify the most superior breed, Gir was undoubtedly the champion. It's a stout breed and was once abundantly found in India. It can withstand harsh weather. Above all, it is a high milk-yielding breed. For this reason it was taken to Brazil where it brought about the White Revolution," Dr Selokar said. "Gir and Sahiwal cows have the potential to increase milk production by 2-3

times. While a typical Indian cow averages 4-5 litres a day, these breeds can produce 15-20 litres a day," he added.

When will tech reach farmers

Lab results are important but the ultimate goal is to help farmers. So, why haven't the benefits of cloning reached them 14 years after the birth of Garima, a cloned buffalo that "has given birth to seven healthy offspring," according to Dr Chauhan? "We wanted to be sure that we are not producing any biohazard. It took us a decade to conduct multiple litmus tests to ensure that animals are cloned ethically and can add value to livestock farming. Now, we are taking it up to the masses with a pilot project being rolled out in Nuh in Haryana," said Dr Tirtha Kumar Data, director at Hisar-based Central Institute for Research on Buffaloes(ICAR-CIRB). Last year, ICAR-CIRB and the Union government's department of biotechnology had started a two-year project for the mass adoption of artificial insemination using cloned bulls. Dr PS Yadav, principal scientist at CIRB, said the Nuh pilot project will aim for the birth of 2000 calves. The calves will be studied for a few years to plan a strategy for the large-scale adoption of cloning. The OPU technique used to produce Ganga will also be used to clone Gir bulls, each of which can inseminate 40 cows. At present, only 30% of the cattle are artificially inseminated as high quality bull semen is hard to get. "Once we produce a pool of healthy elite bulls, artificial insemination can reach up to 70%. So, our farmers will have a good stock of healthy and high milk yielding cows." said Dr. Selokar.

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NEWLY FOUND PTSD MECHANISM IN FEMALES

PTSD (Post-Traumatic Stress Disorder) is a psychological disorder that some people develop after witnessing a traumatic event i.e., scary, dangerous, or shocking event. It is a 'Trauma and Stressor-related disorder'. It causes extreme fear and anxiety, and sometimes even panic attacks when the person suffering from PTSD witnesses a triggering stimulus. The triggering stimulus is usually related to the traumatic event. It is a very serious and a complicated psychological disorder disabling and affects the individual's day-to-day activities.
PTSD is more prevalent in females than in males, which means that females are more susceptible to developing this disorder when compared to men. There are various factors that lead to this conclusion.

Several different proteins are synthesized in our body every day. Most of the proteins are common in both males and females. A protein called 'ubiquitin' is also one such protein, but its function in the female brain was found to be surprising. The researchers from Virginia Tech, US, recently discovered a certain form of the protein to be selective in forming fear memories in females. It is the first time a molecule is selectively involved in forming fear-based memories in a particular sex. It is also, in fact, very rare to find mechanisms specific to a particular sex when the underlying factors of PTSD are considered.

PTSD has a varied approach of treatment, including pharmacological approaches. It was found that the said form of ubiquitin, K-63, can be manipulated. Hence, the discovery of this mechanism is really helpful in clinical settings. The discovery of this form of the protein in females may have been a breakthrough discovery for the treatment of PTSD leading to better treatment option for the disorder. Originally, this study was published in *'Molecular Psychiatry'*, a journal. The article regarding this study was published in Deccan Herald on May 20th, 2023.

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PATHOLOGY IN CAPTIVE WILD FELIDS AT GERMAN ,ZOOLOGICAL GARDENS

Introduction

Wild felid populations are rapidly decreasing in their natural habitat due to various factors including comprehensive biosphere changes, poaching, and exposure to infectious agents. With regard to these emerging changes in wild felid biodiversity, many of them are classified as endangered species by the International Union for Conservation of Nature and Natural Resources, IUCN. In parallel, many wild felids are housed in zoological gardens worldwide and represent a theoretical source of genetic material to recruit animals for reintroduction into the wild. These collections may have high stability due to individual nursing and lifelong Monitoring. However, they can be affected by several disorders triggered by environmental factors, genetic changes and infectious agents. Therefore, knowledge about the frequency of diseases, including those in aged individuals, is important for clinicians, biologists and pathologists. Neoplastic diseases may cause high morbidity and mortality in several captive wildlife species. An increased rate of neoplasms may further be indicative of the presence of infectious agents, genetic aberrations or an adverse environment. In captive wild felids, a wide range of different neoplasms has been described, most of which are reported as single cases. Only a few studies focused on tumor prevalence in larger populations of wild felids and all publically available data originate from zoological gardens in the United States. Chronic Nephropathy is common in aged domestic and non-domestic cats and might also constitute an issue in geriatrics of captive wild field.

Data of 38 captive wild felids originating from eight German Zoological gardens were reviewed retrospectively. Animals included 18 tigers (Panthera tigris), 8 Leopards (Panthera pardus), 7 Lions (Panthera leo), 3 cheetahs (Acinonyx jubatus) and 2 Cougars (Puma concolor) comprising 24 female and 14 male individuals with age ranging from 0.5 To 22 years (median: 13 years). Except cougars, animal species were housed in more than one Zoological garden. The animals were necropsied between 2004 and 2013 at the Department of Pathology, University of Veterinary Medicine Hannover, and Staatliches Veterinäruntersuchungsamt Arnsberg, North Rhine-Westphalia. The time between death and post-mortem Examination ranged from 0 to 5 days

Statistical analysis

Statistical analysis was performed using R version 3.1.2. Age of animals and urea concentration in the anterior eye chamber were tested for normal distribution by evaluating histograms, Q-Q plots and applying Shapiro-Wilk test. As the age was not normally distributed ($p < 0.01$), median, minimal and maximal values were given in the manuscript. The impact of age, sex and species on the presence of pathologic findings was assessed in multifactorial logistic regression analysis. Significance was tested by the likelihood ratio test. For $p < 0.05$, the odds ratio (OR) is given for age increased by 1 or changes in sex (e.g. male compared to female), respectively. For impact of species, significant likelihood ratio tests were followed by pairwise comparison of distinct species using the Wald test and the OR is given for $P < 0.05$. The impact of FIV infection on the frequency of pathologic lesions was assessed similarly. It has to be considered that differences in lifespan between individual felid species may have an impact on the development of various lesions, however this need to be analyzed in a larger cohort. Cohen's kappa statistics followed by testing the null-hypothesis that the estimated kappa is related to chance, as well as the Bangdiwala's agreement chart were used to determine agreement between several findings. This procedure was also applied to test for association of several findings with an increased (> 50 mg/dl) urea concentration in the anterior eye chamber. For $P < 0.05$, judgement of the estimated kappa was made as follows: if kappa is between 0 and 0.2, "slight agreement", if 0.2–0.4, "fair agreement", if 0.4–0.6, "moderate agreement", if 0.6–0.8,"substantial agreement", if 0.8–1.0, "almost perfect agreement"

Discussion

The present study aimed to investigate macroscopic and Histologic findings in 38 captive wild felids (18 tigers *Panthera tigris*, 8 leopards *Panthera pardus*, 7 lions *Panthera leo*, 3 cheetahs *Acinonyx jubatus* and two cougars *Puma concolor*) which died between 2004–2013 in German zoological gardens. The most frequently Observed lesions consisted of inflammation and Degeneration of the kidney (87%), various neoplasms (50%), enteritis (34%) and pneumonia (32%). In addition, a degenerative encephalopathy in one tiger resembling large felid leukoen-cephalomyelopathy is described. With a median time interval of 1 day

Conclusion

In summary, chronic nephropathy characterized by tubular alterations, interstitial nephritis and glomerular lesions was a common finding in captive wild felids. Neoplastic lesions [5/28, 3:05 PM] Prathiksha. B: predominantly affecting endocrine, genital, lymphoreticular organs, the pleura as well as the Alimentary tract were detected in 50% of the investigated animals. Uterine/ovarian leiomyoma,Thyroid gland adenoma/carcinoma, pleural mesothelioma, oral papilloma, hemangiosarcoma and pancreatic islet cell tumor Represented the most common tumor types. Several inflamma-tory and/or degenerative lesions of kidney, lung, intestine, brain as well as the presence of hyperplasia and neoplasia were associated with age of wild felids. Enteritis and pneumonia were the most common inflammatory changes. Large felid leukoencephalomyelopathy is a rare salient lesion which has not been described in Germany before and should be considered as possible differential for degenerative diseases of the CNS. The prevalence of FeLV, FIV and Helicobacter sp. In captive wild felids is very low to negligible in German zoological and these organisms seem to play little to No pathogenic role**.**

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SUPERBUGS

In today's world of advancing technology and health care services human civilization is benefitting immensely with longer life expectancy and better medical services. With the development of more advanced and sophisticated equipment and techniques, new methods of tackling diseases and treating them are emerging actively. Antibiotics have saved many lives since their discovery in the 1920s and are a widely used mode of treatment till date. However, their excessive and indiscriminate use has given rise to a new problem- Superbugs.

Superbugs are germs that have become resistant to drugs that had been developed to kill them. The term was coined by the media and they include a wide range of bacteria and fungi. The formation of these superbugs is partly due to their natural evolution and the overuse of antibiotics. Pathogens, in general, multiply rapidly and manage to overpower the body's immune system leading to infection. Due to this, they undergo genetic mutations rapidly and show a lot of variations. When a certain antibiotic is prescribed to kill them, most of them die and a few of them manage to survive and develop resistance against that particular drug. When they multiply, a large population of pathogens that is resistant to the antibiotic emerges and another drug, in stronger dosage is required to kill them. Gradually, the strains of pathogens formed become resistant to majority of the antibiotics and emerge as superbugs. Additionally, certain pathogens possess phenotypic resistance against some drugs which makes them immune to these drugs without any genetic mutation.

According to the Centers for Disease Control and Prevention (CDC), USA more than 35,000 deaths a year occur due to antibiotic resistant infections. Some of the high-risk pathogens include *Clostridioides difficile*, *Acinetobacter*, *Candida auris, Enterobacteriaceae*, *Neisseria gonorrhoeae* etc. Many strains of superbugs that have developed resistance to sanitizers and alcohol-based disinfectants originate from hospitals. In case of infection due to superbugs, no distinct symptoms are observed but the person will not respond well to treatment and their symptoms may get further aggravated. In such cases, doctors enquire about the past medications taken, health history and travel records. Tests are also conducted to determine the presence of a superbug. As superbugs are antibiotic-resistant, they spread naturally and cannot be stopped completely but can be slowed down in many ways. The best method to tackle these antibiotic-resistant germs is by preventing them from occurring so rapidly.

Centers for Disease Control and Prevention (CDC) has recommended the following ways to prevent the occurrence of superbugs:

- Washing hands with warm water and soap regularly.
- Completely drying your hands after washing them.
- Avoiding coughing or sneezing into the hands.
- Washing hands after handling raw animal products.
- Washing hands after interacting with someone who is sick, or avoiding contact, if possible.
- Not sharing personal items such as razors, towels etc.
- Only using antibacterial soaps or sanitizers when necessary.
- Practicing safe sex with barrier protection to help prevent antibiotic resistant gonorrhea.
- Cooking foods to safe temperatures, which can help kill any germs that may be present.

The life style of an individual play an important role too. The complete details about this resistance is still not known but researchers are working to create new and more effective antibiotics which can combat the superbugs. In 2019, a study in a journal- 'Advanced Science' found that antioxidants from cranberries may help prevent the formation of superbugs. This antioxidant, proanthocyanidin, may help make some antibiotics

more effective by getting around bacteria's natural resistances. However, there are also many drugs which can eliminate this resistance to some extent.

As a society, we must do our bit to prevent the formation of these superbugs. Antibiotics must be used only when absolutely necessary and the prescribed course must be completed. Antibiotics must not be used to treat fungal infections as this could contribute to the development of drug resistant strains in fungi. Latest research also suggests that methods to treat infections caused by superbugs can be developed. Nature has bestowed every organism with special characters to help them survive. Every time we fall sick, we must give our immune system a chance to fight it off naturally. This would eventually enhance our immunity and drastically reduce the emergence of these superbugs. When humans try to interfere excessively with nature, the results are unexpected and unnerving.

"Nature needs no help, just no interference."
~B.J. Palmer

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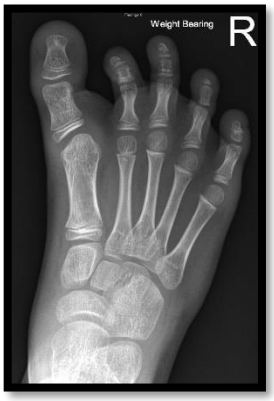
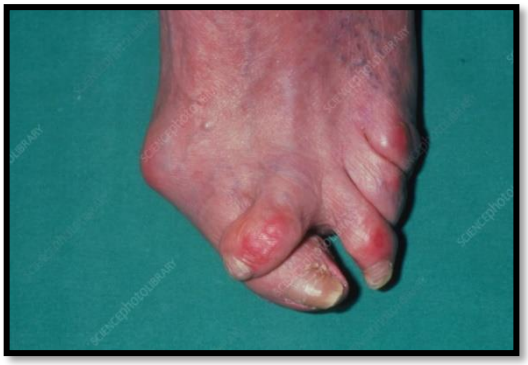
FIBRODYSPLASIA OSSIFICANS PROGRESSIVA DISEASE

Abstract
Fibrodysplasia ossificans progressiva (FOP) is a severe, heritable disorder of connective tissue characterized by congenital malformations of the great toes and progressive heterotopic ossification. It has a worldwide prevalence of around 1/2 million and has no ethnic, racial, gender, or geographic predilection. FOP causes sporadic episodes of painful soft tissue swellings (flare-ups) in the first decade of life, often precipitated by injury, injections, viral infection, muscular stretching, falls, or fatigue. Atypical forms of FOP present with one or more atypical features or major variations in one or both classic defining features. Classic FOP is caused by a recurrent activating mutation in the gene ACVR1/ALK2, while atypical FOP patients also have heterozygous ACVR1 missense mutations in conserved amino acids. FOP is diagnosed through clinical evaluation and genetic testing, with differential diagnosis including progressive osseous heteroplasia, osteosarcoma, lymphedema, soft tissue sarcoma, desmoid tumors, aggressive juvenile fibromatosis, and non-hereditary heterotopic ossification. There is no definitive treatment, but a brief 4-day course of high-dose corticosteroids can help reduce inflammation and tissue edema. Preventative management focuses on prophylactic measures against falls, respiratory decline, and viral infections.

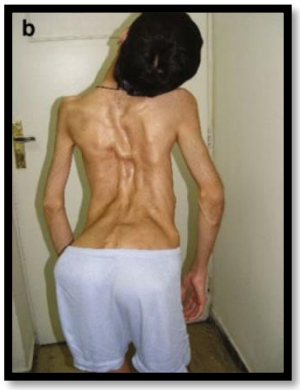
Definition
A very crippling connective tissue illness known as fibrodysplasia ossificans progressiva (FOP) (Mendelian Inheritance in Man [MIM] #135100) [1] is characterised by congenital abnormalities of the great toes. (hallux varus, a first metatarsal malformation, and/or monophalangism) and progressive heterotopic ossification (HO), which develops qualitatively normal bone in distinctive extraskeletal places. Prior to ventral, appendicular, caudal, and distal body regions, the dorsal, axial, cranial, and proximal anatomic locations are involved.



FOP is extremely uncommon, with only about 1 instance per 2 million people worldwide. There hasn't been any mention of any racial, ethnic, or regional propensity.



The most incapacitating ectopic skeletogenesis disorder is FOP. With the exception of congenital abnormalities of the great toes, infants with FOP appear normal at birth. The first decade of life is typically marked by intermittent episodes of uncomfortable soft tissue swellings (flare-ups), which are frequently mistaken for tumours. Exacerbations can change skeletal muscles, tendons, ligaments, fascia, and aponeuroses through an endochondral process into ribbons, sheets, and plates of heterotopic bone that span the joints, lock them in place, and make movement impossible. This occurs even though some exacerbations spontaneously regress. FOP is a condition characterized by the loss of bone in the ventral, appendicular, caudal, and distal regions. It can be caused by trauma, overexertion, fatigue, and infections. Immobility is cumulative, and most patients are wheelchair-bound by the second decade of life. FOP spares muscles in the diaphragm, tongue, and extra-ocular regions, as well as cardiac and smooth muscles. Neck stiffness is an early finding, and cervical spine abnormalities are common. FOP can lead to severe weight loss, pneumonia, and right-sided heart failure resulting from thoracic insufficiency syndrome (TIS). FOP-like HO and toe malformations can cause significant leg swelling, hearing loss, and atypical features. Atypical FOP patients are categorized as FOP-plus or FOP variants, with features such as intraarticular synovial osteochondromatosis, degenerative joint disease, sparse/thin scalp hair, mild cognitive impairment, and anatomic abnormalities of the cerebellum.

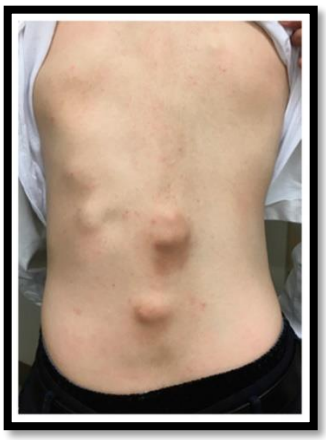


A large body of research supports dysregulated bone morphogenetic protein (BMP) signaling in the pathogenesis of FOP. A single common heterozygous mutation (617G>A; R206H) has been identified in the cytoplasmic domain of activin receptor IA/activin-likekinase 2 (ACVR1/ALK2), a BMP type I receptor, in affected individuals of five small multigenerational families and sporadically affected individuals with classic FOP features. All atypical FOP patients have heterozygous ACVR1 missense mutations in conserved amino acids. The involvement of the inflammatory component of the immune system plays a critical role in FOP. Early FOP lesions, macrophages, lymphocytes, and mast cells, as well as macrophage and lymphocyte-associated death of skeletal muscle, support the involvement of the innate immune system in the pathogenesis of FOP.

Diagnosis and diagnostic methods

Clinical suspicion of FOP early in life, based on malformed great toes, can lead to early clinical diagnosis and avoid harmful diagnostic and treatment procedures. Plain x-rays can confirm subtle great toe abnormalities and the presence of HO, while sophisticated imaging studies are superfluous. Confirmatory genetic testing is available in clinical and research laboratories.

Differential Diagnosis



FOP is a genetic condition that differs from progressive osseous heteroplasia (POH), a rare genetic condition characterized by cutaneous ossification. POH typically presents during childhood and progresses to subcutaneous and deep connective tissues, without Albright hereditary osteodystrophy (AHO) or hormone resistance. FOP is distinguished from POH by congenital malformation, preosseous inflammation, and lack of cutaneous ossification. Acquired HO is rare in young children and often occurs at periarticular sites or blunt trauma. FOP is often misdiagnosed as aggressive juvenile fibromatosis, lymphedema, or soft tissue sarcoma.

Genetic counseling

FOP, a genetic disorder resulting from a new mutation, can be inherited from either parent and can be life-threatening during pregnancy. Specific risks to the mother include FOP flare-ups, breathing difficulties, and childbirth complications. Caesarian section is necessary due to pelvic deformity, joint fusions, and decreased birth canal plasticity. General anesthesia for Caesarian delivery is also risky, and phlebitis and pulmonary embolism are possible. The use of amniocentesis may cause complications in the mother.Specific risks to the child include FOP, prematurity, severe fetal distress, cerebral palsy, and complications from general anesthesia. A team skilled in resuscitation of high-risk infants should be present during delivery.

Preventative measures

In children, restricting activity to less interactive play may reduce falls, but strict avoidance of high-risk circumstances may compromise independence and make it unacceptable for patients. Physical rehabilitation should focus on enhancing daily living activities and avoiding passive range of motion, which could lead to disease flare-ups. Strategies include modification of activity, improvement in household safety, use of ambulatory devices, and protective headgear. Prophylactic measures, such as incentive spirometry and appropriate immunizations, can decrease morbidity and mortality associated with thoracic insufficiency syndrome. Intramuscular injections, including immunizations, should be avoided, but subcutaneous injections and routine venipuncture pose little risk. Preventive oral and dental health care measures are essential, with successful anesthesia in mandibular primary teeth achieved through infiltration through the dental pulp. Hearing aids can diminish developmental problems in children, and surgical attempts to remove heterotopic bone should not be attempted.

Disease name and synonyms

Fibrodysplasia ossificans progressiva (ORPHA337) Myositis ossificans progressiva (ORPHA337)

Submitted by:

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THE FASCINATING WORLD OF PLANTS: EXPLORING THEIR WONDERS

Introduction

Plants are an essential part of our planet, offering a multitude of benefits necessary for life. From towering trees to delicate flowers, plants come in a variety of forms, colors, and adaptations. In this article, we will delve into the captivating world of plants, uncovering their incredible abilities and the crucial role they play in supporting ecosystems and human life.

Photosynthesis: The Green Engine of Life

Photosynthesis is the process where plants use sunlight to convert carbon dioxide and water into energy-rich glucose. This amazing process not only fuels a plant's growth and survival but also produces oxygen as a byproduct, which is vital for all living organisms. Understanding photosynthesis helps us appreciate the significance of plants in maintaining the balance of gases in our atmosphere.

Biodiversity and Ecosystems

Plants form the foundation of terrestrial ecosystems, providing food, shelter, and habitats for countless organisms. They promote biodiversity by creating microhabitats and facilitating important relationships such as pollination and seed dispersal. Exploring these intricate plant-animal interactions reveals the interconnectedness of life on Earth

Adaptations: Surviving and Thriving

Plants have evolved an incredible range of adaptations to thrive in different environments. Some plants can store water or tolerate high levels of salt to survive in extreme conditions. Others have developed structures like thorns, spines, or chemical defenses to protect themselves. These adaptations highlight the remarkable resilience and diversity of plant life.

Conclusion

Plants are not only aesthetically pleasing but also crucial for our planet's well-being. They provide oxygen, support biodiversity, and adapt to various environments. By understanding and appreciating the wonders of plants, we can develop a deeper respect for the natural world and work towards preserving and protecting these invaluable resources.

Submitted by:

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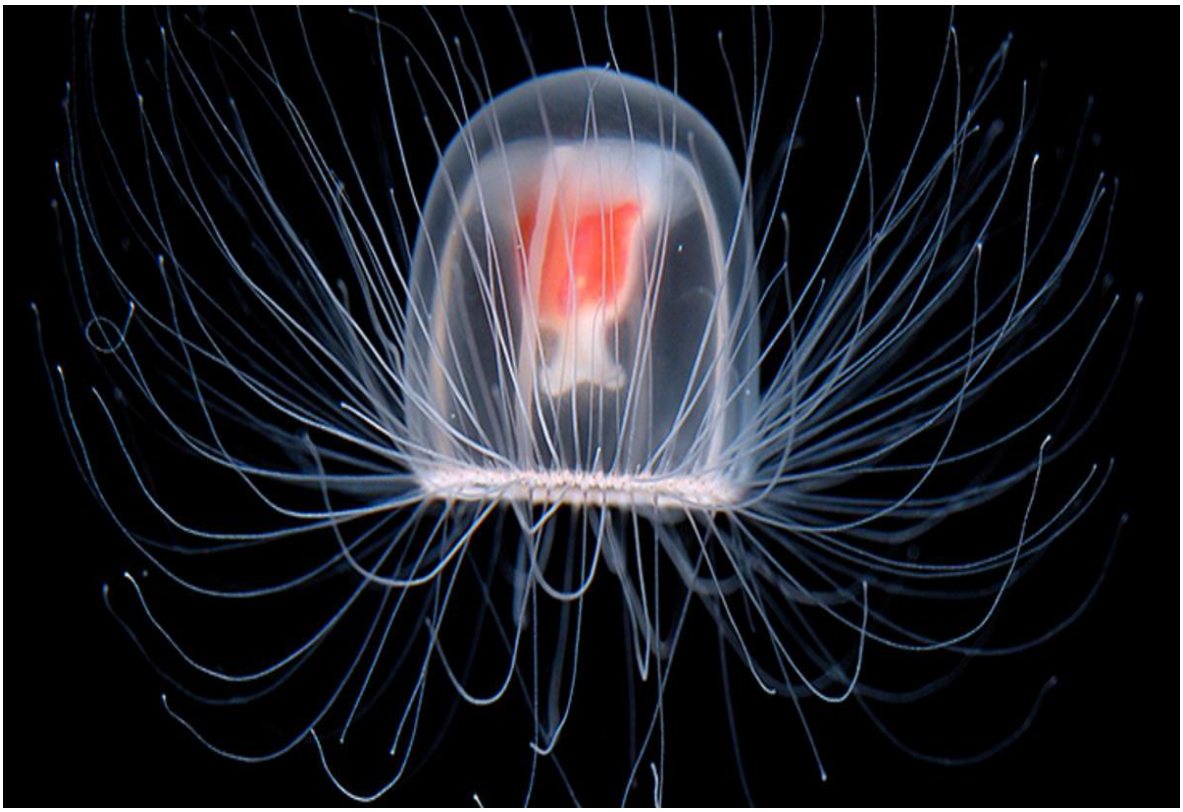
THE IMMORTAL JELLYFISH

It's one thing to survive in harsh environments, but quite another to hit the reset button when faced with an imminent threat. Only one animal is known to have this remarkable ability: a species of jellyfish, *Turritopsis dohrnii*, first discovered in the 1880s in the Mediterranean Sea and highlighted as a uniquely enduring organism in the exhibition.

Classification

Kingdom:	Animalia
Phylum:	Cnidaria
Class:	Hydrozoa
Order:	Anthoathecata
Family:	Oceaniidae
Genus:	*Turritopsis*
Species:	*dohrnii*



Turritopsis dohrnii, the so-called "immortal jellyfish," can hit the reset button and revert to an earlier developmental stage if it is injured or otherwise threatened.

Like all jellyfish, *Turritopsis dohrnii* begins life as a larva, called a planula, which develops from a called a planula, which develops from a fertilized egg. A planula swims at first, then settles on the sea floor and grows into a cylindrical colony of polyps. These ultimately spawn free-swimming, genetically identical medusae—the animals we recognize as jellyfish—which grow to adulthood in a matter of weeks.

Fully grown, *Turritopsis dohrnii* is only about 4.5 mm (0.18 inches) across, smaller than a pinky nail. A bright-red stomach is visible in the middle of its transparent bell, and the edges are lined with up to 90 white tentacles. These tiny, transparent creatures have an extraordinary survival skill, though. In response to physical damage or even starvation, they take a leap back in their development process, transforming back into a polyp. In a process that looks remarkably like immortality, the born-again polyp colony eventually buds and releases medusae that are genetically identical to the injured adult. In fact, since this phenomenon was first observed in the 1990s, the species has come to be called "the immortal jellyfish."

The cellular mechanism behind it—a rare process known as transdifferentiation—is of particular interest to scientists for its potential applications in medicine. By undergoing transdifferentiation, an adult cell, one that is specialized for a particular tissue, can become an entirely different type of specialized cell. It's an efficient way of cell recycling and an important area of study in stem cell research that could help scientists replace cells that have been damaged by disease.

As for *Turritopsis dohrnii*, this jelly is not only an extraordinary survivor. It's also an increasingly aggressive invader. Marine species have long been known to hitch rides around the world in the ballasts of ships. Researchers have recently identified the immortal jellyfish as an "excellent hitchhiker," particularly well-suited to surviving long trips on cargo ships.

In the same study, researchers also documented essentially genetically identical *Turritopsis dohrnii* individuals distributed across the world's oceans, raising an intriguing question about the nature of mortality—if all of an organism's cells are replaced, is it still the same individual? The genes are the same, of course—and in biology, that may be enough to declare a winner.

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TUBERCULOSIS

Introduction

Tuberculosis is an infectious disease that most often affects the lungs and it is caused by a type of bacteria. It spreads through the air when infected people cough, sneeze, or spit.

Symptoms

Tuberculosis is also known as TB infection ,there are many symptoms for this disease few are common but few are major ,cough ,sneeze and feeling sick, night sweats ,weight loss ,fatigue are some of the common symptoms of the tuberculosis disease ,but few conditions may lead to severe health risks

- Diabetes (high sugar level)
- Weakened immune system
- Malnourished
- Usage of tobacco

Diagnosis, treatment and prevention

Tuberculosis may be a simple disease by its symptoms, but have a major health risks .A tuberculin skin test interferon gamma release assay can be used to identify people with infection. Tuberculosis is particularly difficult to diagnose with the children. Tuberculosis is a disease treated with antibiotics. The most common antibiotics used are isoniazid ,rifampin, pyrazinamide , ethambutol ,streptomycin. Tuberculosis does not respond to any standard drugs, hence more toxic medicines should be taken along with other antibiotics. Seek medical help if you have a prolonged cough, fever, weight loss .Get tested with TB infection if you are increased risk .practice a good hygiene. Special measures like respirators and ventilation are important to reduce infection in healthcare.

Impact

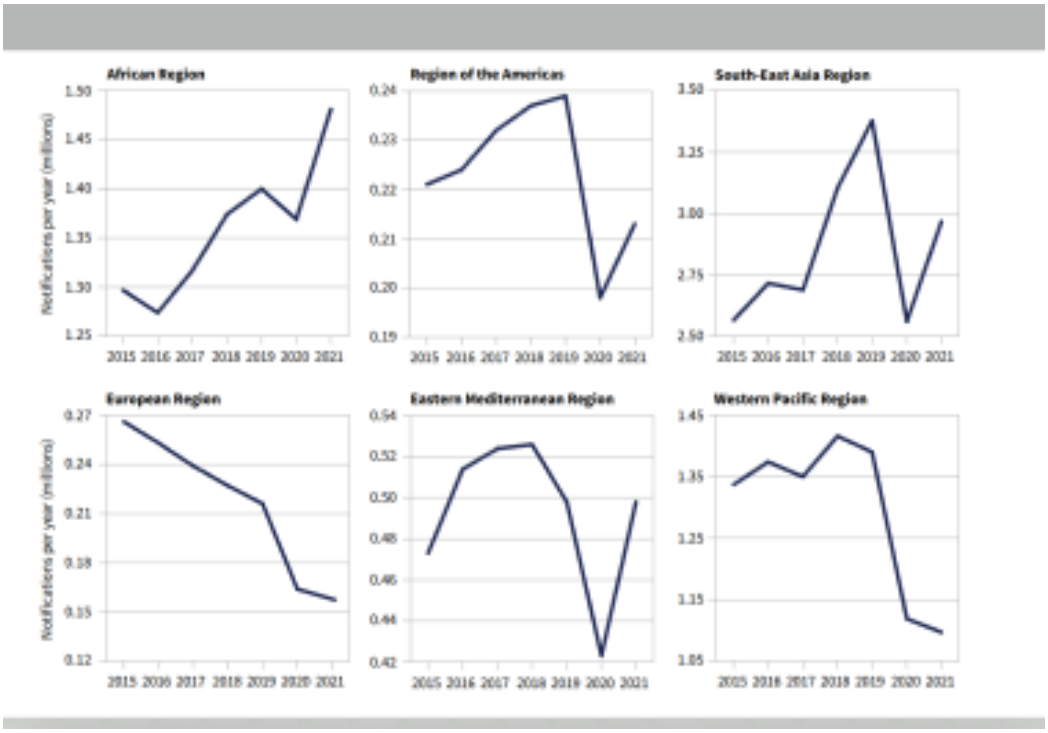
Tuberculosis mostly affects adults in their most productive years. However all age groups are at risk. TB occurs in every part of the world .most of the cases of TB were in south east Asian region -46%, African region -23%, western pacific -18% .Around 80% of new TB cases are occurred in the 30 high countries like India, Democratic Republic Of Congo, Indonesia, Nigeria etc. As in the past decades, most of the spendings on TB services were from the domestics sources .The main source to fight the diseases like AIDS , malaria ,TB was the global fund . The United states of America was the largest contributor of funding to the Global fund. For research and development, according to the Treatment Action Group, only US$ 0.9 billion were available in 2021 of the US$ 2 billion required per year to accelerate the development of new tools. At least an extra US$ 1.1 billion per year is needed to accelerate the development of new tools.

World Health Organization

WHO is making its best to spread awareness and to avoid the spread of TB, as TB was the infection that was wide spread from years long ago many steps are also taken to eradicate the disease.

- Providing global leadership to end TB through strategy development, political and multisectoral engagement, strengthening review and accountability, advocacy, and partnerships, including with civil society.
- Shaping the TB research and innovation agenda and stimulating the generation, translation and dissemination of knowledge;
- Setting norms and standards on TB prevention and care and promoting and facilitating their implementation;
- Developing and promoting ethical and evidence-based policy options for TB prevention and care ,ensuring the provision of specialized technical support to Member States and partners jointly

with WHO regional and country offices, catalyzing change, and building sustainable capacity; and monitoring and reporting on the status of the TB epidemic and progress in financing and implementation of the response at global, regional and country levels



The raise and fall of tuberculosis disease in the different regions of the world.(*with reference from WHO article 2023, February 3rd)*

Mortality

Russia has achieved particularly dramatic progress with a decline in its TB mortality rate—from 61.9 per 100,000 in 1965 to 2.7 per 100,000 in 1993; however, mortality rate increased to 24 per 100,000 in 2005 and then recoiled to 11 per 100,000 by 2015 . China has achieved particularly dramatic progress, with about an 80% reduction in its TB mortality rate between 1990 and 2010.The number of new cases has declined by 17% between 2004 and 2014. In 2007, the country with the highest estimated incidence rate of TB was Eswatini, with 1,200 cases per 100,000 people. In 2017, the country with the highest estimated incidence rate as a population was Lesotho, with 665 cases per 100,000 people. As of 2017, India had the largest total incidence, with an estimated 2,740,000 cases. According to the World Health Organization (WHO), in 2000–2015, India's estimated mortality rate dropped from 55 to 36 per 100,000 population per year with estimated 480 thousand people died of TB in 2015. In India a major proportion of tuberculosis patients are being treated by private partners and private hospital.

All together tuberculosis is a communicating disease, caused due to bacteria. There are three stages of TB exposure, latent and active disease, the first stage can be cured easily but next two stages are difficult. This disease is increasing rapidly after Covid. As the saying prevention is better than cure, we all must try to avoid the disease, at initial stages with proper care and hygiene.

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CARDIAC ARREST

Abstract
The modern treatment of cardiac arrest is an increasingly complex medical procedure with a rapidly changing array of therapeutic approaches designed to restore life to victims of sudden death. The 2 primary goals of providing artificial circulation and defibrillation to halt ventricular fibrillation remain of paramount importance for saving lives. They have undergone significant improvements in technology and dissemination into the community subsequent to their establishment 60 years ago. The evolution of artificial circulation includes efforts to optimize manual cardiopulmonary resuscitation, external mechanical cardiopulmonary resuscitation devices designed to augment circulation, and may soon advance further into the rapid deployment of specially designed internal emergency cardiopulmonary bypass devices. The development of defibrillation technologies has progressed from bulky internal defibrillators paddles applied directly to the heart, to manually controlled external defibrillators, to automatic external defibrillators that can now be obtained over-the-counter for widespread use in the community or home. But the modern treatment of cardiac arrest now involves more than merely providing circulation and defibrillation. As suggested by a 3-phase model of treatment, newer approaches targeting patients who have had a more prolonged cardiac arrest include treatment of the metabolic phase of cardiac arrest with therapeutic hypothermia, agents to treat or prevent reperfusion injury, new strategies specifically focused on pulseless electric activity, which is the presenting rhythm in at least one third of cardiac arrests, and aggressive post resuscitation care. There are discoveries at the cellular and molecular level about ischemia and reperfusion pathobiology that may be translated into future new therapies. On the near horizon is the combination of advanced cardiopulmonary bypass plus a cocktail of multiple agents targeted at restoration of normal metabolism and prevention of reperfusion injury, as this holds the promise of restoring life to many patients for whom our current therapies fail.

Introduction
Sudden cardiac arrest (SCA) is an important public health challenge. Despite a dramatic decrease in the age-adjusted risk of sudden cardiac death, the cumulative number of fatal SCA cases in the United States remains large. Estimates range from <170 000 fatal SCA cases per year to >450 000; a figure in the range of 300 000 to 370 000 per year is likely the best current estimate. SCA seems to account for ≈50% of all cardiovascular deaths, and it is estimated that 50% of the SCAs are the first clinical expression of previously undiagnosed heart disease. Most out-of-hospital cardiac arrests (80%) occur in private homes or other living facilities. Electric mechanisms associated with SCA are broadly classified into tachyarrhythmia and non-tachyarrhythmia categories, the latter including pulseless electric activity (PEA, formerly referred to as electromechanical dissociation), a systole, extreme bradycardia, and other mechanisms, often associated with no cardiac factors. This article aims to review the cardiac rhythms associated with sudden death, the pathophysiology involved in cardiac resuscitation, and the current state of resuscitation science and techniques.

Ventricular Fibrillation
In 2002, Weisfeldt proposed a 3-phase time-dependent model for treatment of cardiac arrest from ventricular fibrillation (VF) and pulseless ventricular tachycardia (VT) that remains at the forefront of our current treatment paradigm.5 The first or electric phase of cardiac arrest lasts for ≈5 minutes and is characterized by the need for rapid defibrillation as the top priority. Indeed survival rates for out of hospital cardiac arrest can exceed 60% for patients within this early electric phase. The second or circulatory phase of cardiac arrest lasts from ≈5 to 10 minutes after initiation of VF. It appears during this circulatory phase that the best therapy is to first give a brief period of vigorous chest compressions (between 100 and 300, the exact duration is not really known), followed by defibrillation. This implies that during this phase the immediate treatment of VF is not

traditional defibrillation first, but rather chest compression first. The concept is that the initial vigorous chest compressions provide blood flow to the myocardium that improve the chances of successful defibrillation and long-term survival. This concept is not currently incorporated within the American Heart Association guidelines in part because it is not possible to know exactly which phase a person is in and it would make the teaching of advanced cardiac life support (ACLS) even more complicated. Weisfeldt also speculated on the existence of a third or metabolic phase of cardiac arrest that begins ≈10 minutes after the arrest. The treatment of patients who have remained without circulation for a prolonged cardiac arrest interval is difficult and in practice most deaths from cardiac arrest are from within this phase. During this metabolic phase, the model suggests that both compression and defibrillation are no longer sufficient therapies to routinely save lives of cardiac arrest victims. Metabolic resuscitation of some form is optimally required. It is during this phase that salvage therapies such as cardiopulmonary bypass plus metabolic drug combinations are required with components directed toward prevention and correction of reperfusion injury. A more detailed discussion of this metabolic phase and reperfusion injury is included in the second half of this article.

Prevention of Sudden Cardiac Arrest

Sudden cardiac arrest (SCA) – when the heart unexpectedly stops beating – is important to treat within minutes. It is different than a heart attack, because a heart attack happens when blood flow is blocked, but the heart has not stopped beating. Immediate application of an automated external defibrillator (AED), found in many public locations, can be lifesaving.

1. Sudden Cardiac Arrest Survivors

People who have survived SCA are at high risk of having another one. Doctor may recommend a procedure for an implantable cardioverter defibrillator (ICD), which is surgically place under the skin in your chest or abdomen. It monitors your heartbeat and provides an electric shock to restore normal rhythm if it detects a dangerous rhythm.

2. High Risk Categories for Sudden Cardiac Arrest

Your doctor may prescribe a beta blocker, statin or other type of medication to help reduce the risk for cardiac arrest if you have the following conditions:

1. Ischemic heart disease and/or a recent heart attack
2. Diabetes
3. Heart disease or a prior stroke
4. High LDL cholesterol
5. High blood pressure

Treatments for coronary heart disease, such as coronary angioplasty or artery bypass may also help lower risk for SCA. A heart healthy lifestyle is recommended for all conditions. Talk with doctor about the preventive recommendations that are best for you.

3. No Immediate Symptoms

A heart healthy lifestyle can help reduce risk for many conditions, including sudden cardiac arrest. Practice the following for optimal health:

1. Maintain a healthy weight
2. No smoking
3. Eat a healthy, balanced diet
4. Get at least 150 minutes per week of moderate exercise
5. Manage stress

6. Care in an Emergency

Signs of a heart attack or sudden cardiac arrest can be similar. Some people experience the following within an hour of SCA:

1. Chest pain
2. Difficulty breathing
3. Nausea or vomiting
4. Fainting (preceded by a racing heartbeat or feeling of dizziness/lightheaded)
5. Suspect of heart attack call 911 immediately.

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ONE OF THE UNSOLVED PROBLEMS IN BIOLOGY: HANDEDNESS

Handedness

It is unclear how handedness develops, what purpose it serves, why right handedness is far more common, and why left-handedness exists. Like most aspects of human traits, handedness is complex and appears to be influenced by multiple factors, including genetics and environment. Handedness, or hand preference, is the tendency to be more skilled and comfortable using one hand instead of the other for tasks such as writing and throwing a ball. Although the percentage varies worldwide, in Western countries, 85 to 90 percent of people are right-handed and 10 to 15 percent of people are left-handed. Mixed-handedness (preferring different hands for different tasks) and ambidextrousness (the ability to perform tasks equally well with either hand) are uncommon.

Hand preference becomes increasingly apparent in early childhood and tends to be consistent throughout life. However, little is known about its biological basis. Hand preference probably arises as part of the developmental process that differentiates the right and left sides of the body (called right-left asymmetry). More specifically, handedness appears to be related to differences between the right and left halves of the brain. The right hemisphere controls movement on the left side of the body, while the left hemisphere controls movement on the right side of the body. It was initially thought that a single gene controlled handedness. However, more recent studies suggest that multiple genes, perhaps up to 40, contribute to this trait. Each of these genes likely has a weak effect by itself, but together they play a significant role in establishing hand preference. Studies suggest that at least some of these genes help determine the overall right-left asymmetry of the body starting in the earliest stages of development. So far, researchers have identified only a few of the many genes thought to influence handedness. Studies suggest that other factors also contribute to handedness.

The prenatal environment and cultural influences may play a role. Like many complex traits, handedness does not have a simple pattern of inheritance. Children of left-handed parents are more likely to be left-handed than are children of right-handed parents. However, because the overall chance of being left-handed is relatively low, most children of left-handed parents are righthanded. Identical twins are more likely than non-identical twins (or other siblings) to both be righthanded or left-handed, but many twins have opposite hand preferences.

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RISING TIDES: THE DEVASTATING ECOLOGICAL IMPACT OF FLOODS AND THE QUEST FOR RESILIENCE

The flood-like situation in the river basins has seen on Tuesday by the discharge of water from the reservoirs in Vijayapura and Vijayanagara districts into Krishna and Tungabhadra river. Not only the inflow but also sharply rose heavy rains in catchment areas. And this happened to the Lal Bahadur Shastri Dam at Almatti in Vijayanagara district. The water of about 98,995 cusec is being let into Krishna river from kallol barrage on the Karnataka-Maharashtra border, and compelling the authorities to open all the 26 crest gates of the dam at Almatti reservoir and to release the water into the river of about 1lakh cusec. The water is already being released into the right bank canal of about 45,000 cusec, while through the crest gates the water is released about 55,000 cusec. The dam's maximum height is 519.60 meters but the water level has reached 517.28 meters, which will create an issue. On the other side the inflow to the Hipparagi dam is 90,000 cusec and the discharge is 89,000 cusec of water. From the Tungabhadra dam 2,000 cusec of water is being released into the river by its 10 gates near Hosapete. And the reservoir's storage capacity is 10.5.788 tmcft but the inflow is 85,000 cusec of water.

People Killed

Due to this water discharge three persons were killed in the Uttara kannada and Vijayanagara district.Rukmini Vithal Machyak(37) and Sridevi Vithal Machak(13), residents of Murkawad in Haliyal taluk of Uttara kannada district and Hanumanthappa(28), a resident of Uttara Bevanahalli in Harapanahalli taluk of vijayanagara district were killed after walls of their house collapsed on them on Tuesday that is 12 th july, 2022 morning and the household articles were also damaged in the incident. Due to a landslide occurred in july 11 the vehicular movement on State Highway 34 that passes through the Anashi Ghatta in Joida taluk of Uttara Kannada district has been banned.

Bridges under water

The relocation of livestock and irrigation pump sets the farmers on the banks of Krishna, Doodhganga and Vedganga rivers in Belagavi district to a safer place as inflow into river Krishna and its tributaries rose dye to the continuous rains in the western ghats and the Konkan region of Maharashtra. The officials clarified that Krishna river is swollen due to heavy rain and no heavy discharge from any of the reservoirs in Maharashtra.The Gokak-Shingnapur bridge across river Ghataprabha on the outskirts of Gokak town was submerged and seven bridges across the districts were also submerged in the river.

STATE

DECCAN HERALD
Wednesday
July 13, 2022

Water discharge from dams trigger flood threat in 2 NK districts

Farmers shift livestock, materials from river banks

BENGALURU, DHNS

Discharge of water into Krishna and Tungabhadra rivers from reservoirs in Vijayapura and Vijayanagara districts on Tuesday triggered flood-like situation in the river basins.

The inflow to the Lal Bahadur Shastri Dam at Almatti in Vijayapura district and to the reservoir near Hosapete in Vijayanagara district sharply rose following heavy rains in the catchment areas.

About 98,995 cusec of water is being let into Krishna river from Kallol Barrage on the Karnataka-Maharashtra border, compelling the authorities to open all 26 crest gates of the dam at Almatti reservoir and release 1 lakh cusec of water into the river.

About 45,000 cusec of water is being released into the right bank canal, while 55,000 cusec of water is being released through the crest gates.

The water level has reached 517.28 metres. The dam's maximum height is 519.60 metres.

While the inflow to the Hipparagi dam is 90,000 cusec, the discharge is 89,000 cusec of water.

About 2,0000 cusec of water is being released into the river from Tungabhadra dam from 10 gates near Hosapete.

The inflow is 85,000 cusec of water. The reservoir's storage capacity is 10.5.788 tmcft.

Three killed

Three persons were killed after walls of houses came crashing down on them in the Uttara Kannada and Vijayanagara districts.

Rukmini Vithal Machak (37) and Sridevi Vithal Machak (13), residents of Murkawad in Haliyal taluk of Uttara Kannada district, were killed after walls of their house collapsed on them on Tuesday morning.

Hanumanthappa (28), a resident of U Bevinahalli in Harapanahalli taluk of Vijayanagara district was killed when the wall of his house fell on him. Household articles were also damaged in the incident.

Vehicular movement on State Highway 34 that passes through the Anashi Ghatta in Joida taluk of Uttara Kannada district has been banned due to a landslide that occurred on July 11.

Bridges under water

Farmers on the banks of Krishna, Doodhganga and Vedganga rivers in Belagavi district relocated livestock and irrigation pump sets to safer places as inflow into river Krishna and its tributaries rose due to continuous rains in the Western Ghats and the Konkan region of Maharashtra.

There is no heavy discharge from any of the reservoirs in Maharashtra. Krishna river and its tributaries have swollen due to heavy rains, officials clarified.

Seven bridges across the districts were submerged in rivers on Tuesday. Gokak Shingalapur bridge across river Ghataprabha on the outskirts of Gokak town was submerged.

A huge quantity of water is discharged from Hipparagi dam of Rabakavi in Banahatti taluk, Bagalkot district.

Flash floods submerge Datta temple at Kalloli in Chikkodi taluk in Belagavi district on Tuesday.

About one lakh cusec of water flows into River Krishna from the Lal Bahadur Shastri Dam at Alamatti in Vijayapura district on Tuesday. DH PHOTO/CHANDRASHEKHAR KOLEKAR

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SMALL CHARGES CARRIED BY INDIVIDUAL INSECTS

According to seven sources a study published on October 24th suggests that the electricity naturally produced by swarming insects like honeybees and locusts.

Researchers already knew that bees and other insects carry small charges, but Hunting tells new scientists that they were "kind of surprised to see that [the honey bee swarm] had a massive effect." The Earth's atmosphere is always electrified to a greater or lesser extent, even in fair weather away from thunderstorms. Fossil evidence of paleolightning (Harland and Hacker, 1966) indicates this is unlikely to be a new phenomenon geologically, and therefore the atmospheric electric field can be regarded as a fundamental atmospheric property. Bee swarms can generate an electrical charge up to (1,000) volts per meter, with denser swarms leading to stronger electrical field, (some honey bee swarms generate electrical charges stronger than storms). The function of electrical charges generated by bees and bee swarms is unknown.

Honeybees, for instance, collect a positive charge as their wings which beat more than (200) times a second that rub against molecules in the air, and use it to attract negatively charged pollen; they can also detect and modify the electric fields of flowers. Honey bees are able to track changes in electric fields in order to navigate to flowers.

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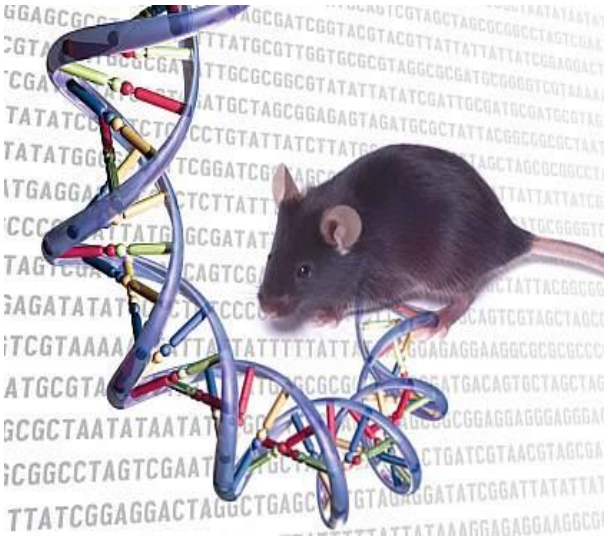
COMPARISION OF THE GENOMES OF HUMAN AND MOUSE LAYS THE FOUNDATION OF GENOME

The extensive similarities between the genomes of human and model organisms are the foundation of much of modern biology, with model organism experimentation permitting valuable insights into biological function and the etiology of human disease. In contrast, differences are the result of evolutionary adaptation. A recent comparison of the draft sequences of mouse and human genomes has shed light on the selective forces that have predominated in their resent evolutionary histories. In particular, mouse – specific clusters of homologues associated with roles in reproduction, immunity and host defence appear to be under diversifying positive selective pressure, as indicated by high ratios of non- synonymous to synonymous substitution rates. These clusters are also frequently punctuated by homologous pseudogenes. They thus have experienced numerous gene death, as well as gene birth, events. These regions appear, therefore, to have borne the burnt of adaptive evolution that underlies physiological and behavioural innovation in mice. We predict that the availability of numerous animal genomes will give rise to a new field of genome zoology in which differences in animal physiology and ethology are illuminated by the study of genomic sequence variations.



World of DNA (i.e., set of DNA's) is known as Genome. All the Living Organisms from Grass to Elephants have their identical Genome. It is the Structural arrangement of DNA's to build and maintain the organism. High similarities between genomes of human and model organisms has lead a major role in much of the modern biology, many experimentation are being conducted on model organisms for various benefits, for example Testing of medicines on mouse. Both the human and mouse genomes are composed of around 3.1 billion base pairs (chemical letters). About 5 percent of the sequence is composed of protein coding regions (genes). More than 90 percent of the genome are composed of non- coding DNA. The Human genome is vast comprising of approximately 3.2 billion base pairs whereas comparatively, mouse genome is slightly smaller comprising of around 2.7 billion base pairs. Despite of this variation in size of genome both possess similar protein encoded genes which is necessary for the organism's function and development. Additionally, both genomes are organized into chromosomes, humans have 23 pairs of chromosomes while mouse have 20 pairs of chromosomes. Humans and mice share common ancestors who had existed long years ago around 75 to 80 million years ago. Over time due to evolutionary pressures and genetic variations both led to the development of two distinct species with unique traits. Even though we can trace genetic similarity between humans and mice of approximately 85%, differences in gene organization and the presence of specific genes in each genome are noticeable. We can observe that crucial genes which are responsible for fundamental cellular processes, such as DNA replication and protein synthesis are similar in both the organisms. The study of these

conserved elements in mice provides an opportunity for the researchers to gain insights into human biology and diseases. as mentioned in the example mice are frequently used as model organisms for medical and scientific research due to their genetic and physiological similarities to humans. Comparative genomics between humans and mice has significantly advanced to present situation for understanding of genetic diseases. Many human diseases are supplement to mice, which makes invaluable element to study human conditions. Only by manipulating mouse genome to mimic human genetic diseases, scientist can investigate disease mechanisms and test some potential therapies. This approach has resulted in significant development in cancer research, neurodegenerative diseases, cardiovascular disorders and many other fields. Gene regulation is one of the area divergence between mouse and human genomes. Genes may be similar in both but the regulatory sequences that control their expression can differ. These regulatory differences may contribute to the distinct phenotypic traits observed in humans and mice. Crucial insights can be acquired in the intricate relationship between genotype and phenotype by understanding these variations. Although genes make up a small part of genome, non- coding DNA which were once also known as “Junk DNA” constitute significant part. But controversial to its title, we know that it plays a significant role in genome function and genome regulation. Some of the non- coding DNA elements including regulatory regions and repetitive sequences are common in human and mice genome. Study of these non- coding regions can provide knowledge of their functional significance evolutionary implications. The comparative analysis of the human and mouse genomes has been very useful in advancing our knowledge of genetics, evolution and human biology. Despite of differences in genome size, structure and gene regulation the fundamental genetic elements and underlying mechanisms are conserved. By the study of both similarities and differences, researchers are able to drive medical discoveries for the benefit of both humans and mice. Ongoing study of these genomes will unleash the new insights into the complexities of life and pave the way for future scientific developments.

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SELECTION AND VALIDATION OF REFERENCE GENES FOR THE NORMALIZATION OF QUANTITATIVE REAL-TIME PCR IN DIFFERENT MUSCLE TISSUE OF RABBIT

With the development of molecular biology technologies, the quantification of gene expression has been performed with omics technologies at different levels. However, reverse transcription quantitative real-time PCR (RT-qPCR) remains the most commonly used method to measure the transcriptional abundance of target genes due to its high efficiency, sensitivity and specificity. The reliability of RT-qPCR depends on the normalization of mRNA abundance by using selected, stably expressed reference genes. Thus, the selection and use of stable reference genes in RT-qPCR analyses are key for determining the accurate expression patterns of genes.

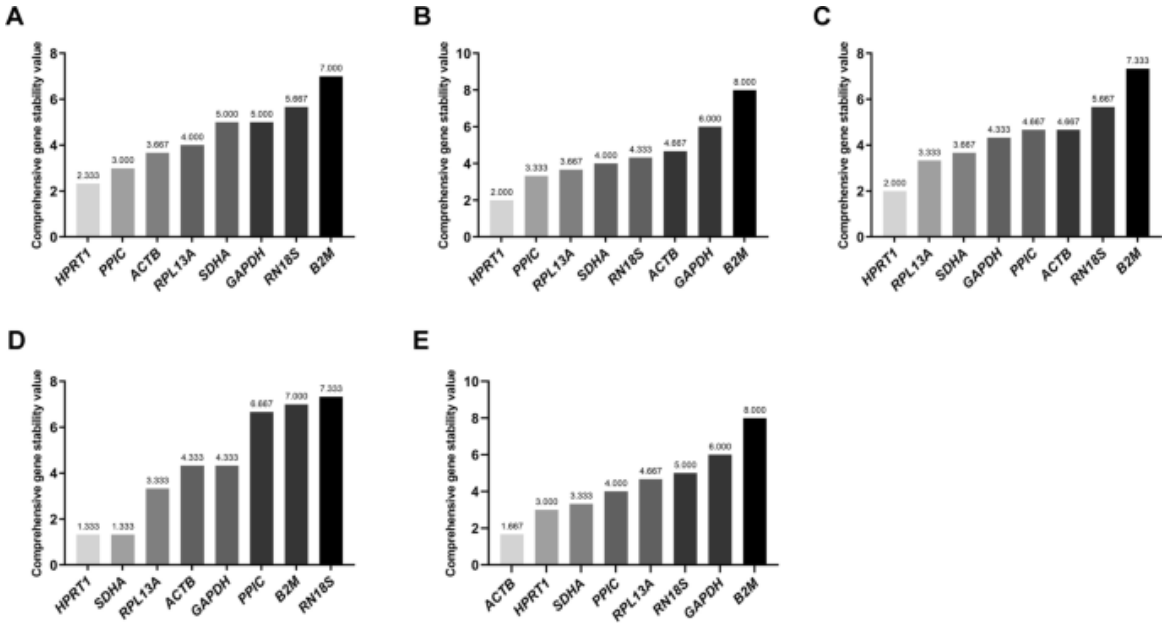
Methods

Animals And Tissue Sample: In this experiment, the rabbits were purchased from rabbit breeding grounds of Yufei, Zhengzhou, China. Rabbits were raised in the separate cage (35cm x 45cm x 45cm) and kept the temperature at 20-25 degree celcius under 12h:12h photoperiod. All rabbits were in good health and provided ad libitum access to commercial pellet diets and water.

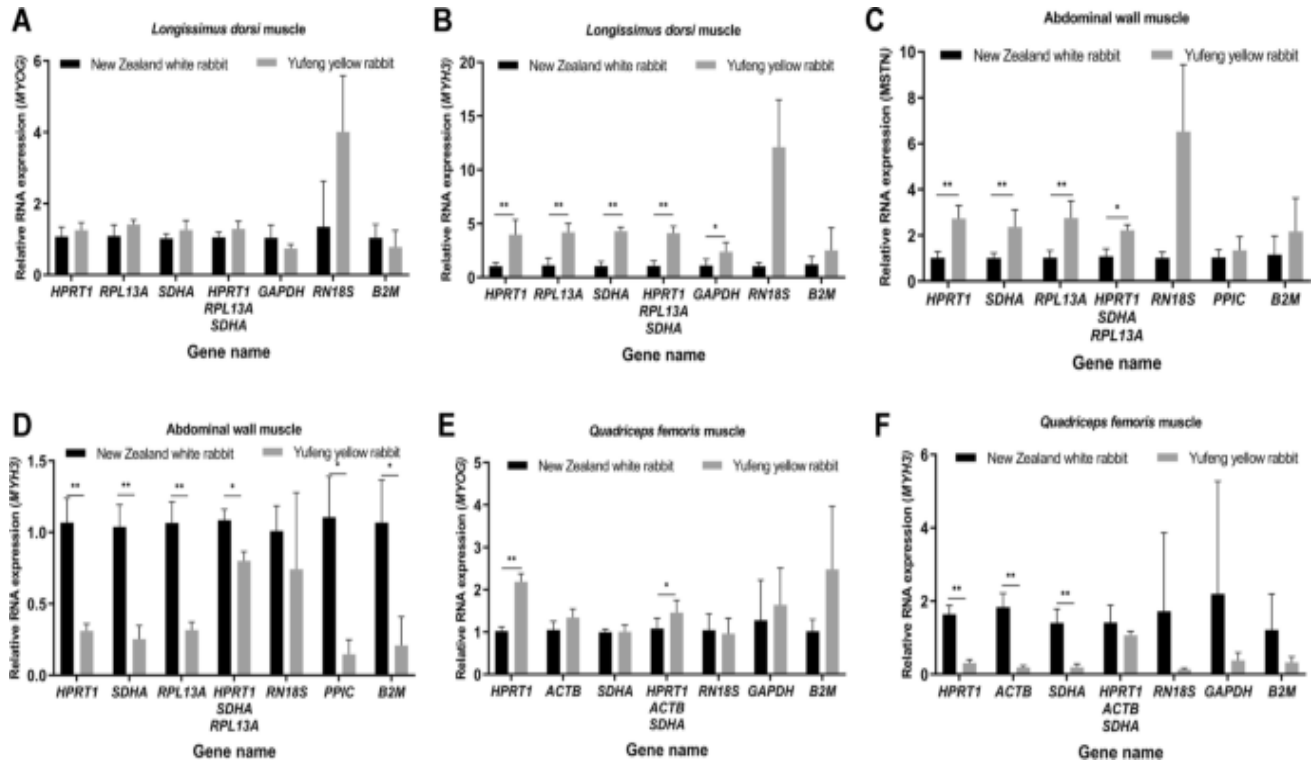
RNA isolation and cDNA synthesis: Total RNA isolation was performed by using TRIzol (TransGen, China) according to the manufacturer's instructions. The qualitative and quantitative assessment of the isolated RNA was performed using a spectrophotometer. Qualified RNA was reverse transcribed into cDNA using Prime script.

Quantitative Real Time RT-PCR: The reaction as performed as follows: At 95 degree Celsius for 30 sec to activate the polymerase, followed by 40 cycles of denaturation at 95 degree Celsius for 10 sec, annealing at 60 degree Celsius for 30 sec and extenxion at 72 degree Celsius for 30 sec. Gene specific primers of PPIC, HPRT1, ACTB, RPL13A, GAPDH, SDHA, RN18S, B2M, MYOG, MYH3, and MSTN genes were designed by using Primer 6.0 software according to rabbit gene sequence published in GenBank.

Gene expression stability analysis of eight candidate reference genes:



The stability of the eight candidate reference genes was determined by using the mathematical algorithms geNorm. NormFinder and BestKeeper. In this experiment, a low average experession stability value in geNorm and NormFinder indicated a more stable expression of the reference gene



Submitted by:

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Manjunath DK (II B.Sc CZ)

ANT PUPAE FEEDS ADULTS, LARVAE WITH SECRETED LIQUID

The molting fluid of ant pupae functions as "metabolic currency" in the ant colony and may have enabled the evolution of eusociality. How complex ant societies emerged among ants solitary ancestors remains one of the big mysteries of social insect biology. Ants are eusocial, meaning that they have overlapping generations, collective breeding brood care, and reproductive division of labour within the nest. Now researchers at the Rockefeller University have discovered a way that metabolic interdependence among members of an ant colony may have evolved. Ant pupae, which are equivalent to the chrysalis stage of the butterfly produce a milk like substance derived from molting fluid that is eaten by both adult ants and larvae. Typically, when insects molt, they secrete a fluid that's simply resorbed by the animal when the molt is completed. But in ants, this nutrition rich substance serves as a kind of " metabolic currency " within the colony and may have played a role in the ants evolutionary transition from a group of loosely cooperating individuals into a truly integrated super organism, according to research that was published in NATURE today. " it is really neat study, because it is identifying a new type of social transfer that no one had even noticed before", says Adria Le Boeuf, who studies mouth to mouth fluid exchange behavior (trophallaxis) in ants at the university of Fribourg in Switzerland and who didnt work on the new study. In ant colonies queens produce but the workers do not, and for years it had been a mystery why some individuals would forget the opportunity to reproduce to support a queen instead. More than a century ago, the pioneering myrmecologist William Morton Wheeler suggested that nutrition sharing could be a key factor in the evolution of super organisms, but the idea did not gain much traction of time, according to Kazuki Tsuji, which studies the evolutionary ecology of social insects at the university of the Ryukyus in Japan and was not involved in the study.

Later in the 1960s and 70s, British biologist W.D.Hamlinton's KIN SELECTIONS THEORY , which postulated that some organisms may prioritize helping their genetic relatives reproduce over reproducing themselves, provided a genetic framework to explain how this kind of altruism could evolve. But the old hypothesis about the role of nutrition sharing method overlooked until relatively recently, says Tsuji. Now," our consensus is that nutrition is a kind of blood or metabolic currency in the super organism,"he explains. Still most nutritional exchanges were thought to happen between adults, and nobody had previously observed these transfers among pupae, larvae, and adults. When the adults are reintroduced to the pupae, they immediately drink the fluid, removing it from the pupae. In the colony, the adults drink the fluid as it is secreted, so it never accumulates. The researchers also found that pupae become susceptible to fungal infections if the fluid accumulates for too long, explains Kronaurer, so they depend on the adults to remove it.

The young ant larvae need this fluid, too. In fact, inside the colonies, the workers take young ant larvae and put them onto the pupae so they too can drink the molting fluid."nobody really knows what young ant larvae feed on,"Kronauer says. It turns out they are completely rely on the pupal secretion; without it,: they have completely stunted growth and the survival goes down a lot. So it is really this milk like fluid for the larvae," he says. The researchers conducted a proteomic analysis of the fluid, which not only confirmed that it was molting fluid replaced with enzymes that help break down the ants discarded cuticle, but that is also contained hormones and neuro active substances which Kronaurer suspects could impact caste development of the larvae and the behavior of adults. Tsuji adds that pupae have long been considered "useless" because this life stage is generally immobile and quiescent. Maybe that's why the interactions between pupae and the other life stages had not been noticed before he suggests. In spite of its simplicity, "this is the most surprisingly, simply amazing finding."

Submitted by:

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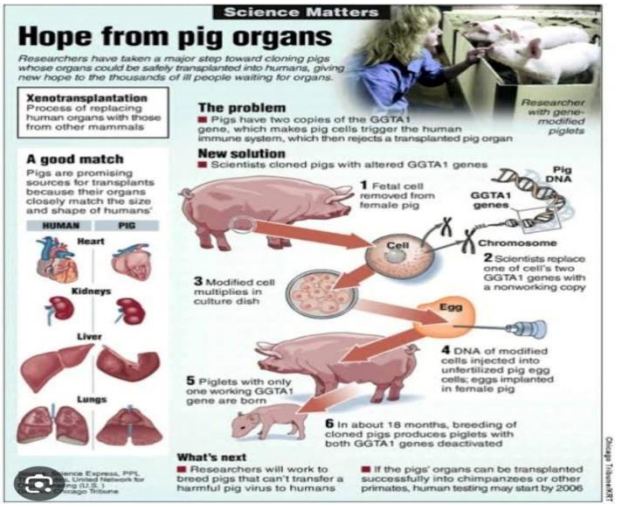
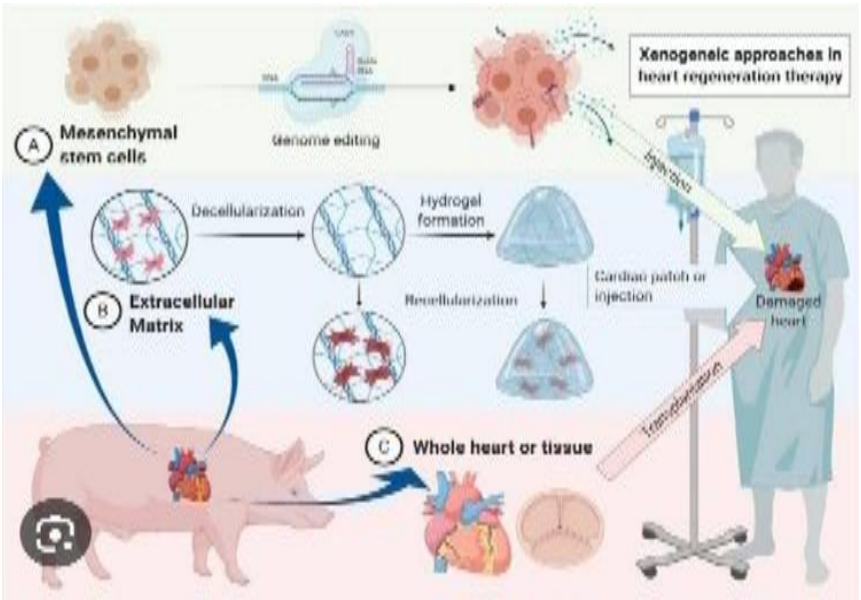
ANIMAL ORGANS FOR HUMAN TRANSPLANTATION

Introduction

Solid organ transplantation has been, by most measures, a phenomenal success. Nonetheless, the field is plagued by extreme shortages of available organs from a very limited number of donors. One potential solution to this organ availability crisis is the use of animals as organ donors for humans (xenotransplantation). Though the concept remains theoretical, significant advances are being made in the field of genetics and in our understanding of the immunological barriers to xenotransplantation. With these advances also comes increased knowledge about the potential risks of xenotransplants, especially disease transmission. The eventual clinical application of animal-to-human transplants will require a careful, balanced appraisal of these issues.



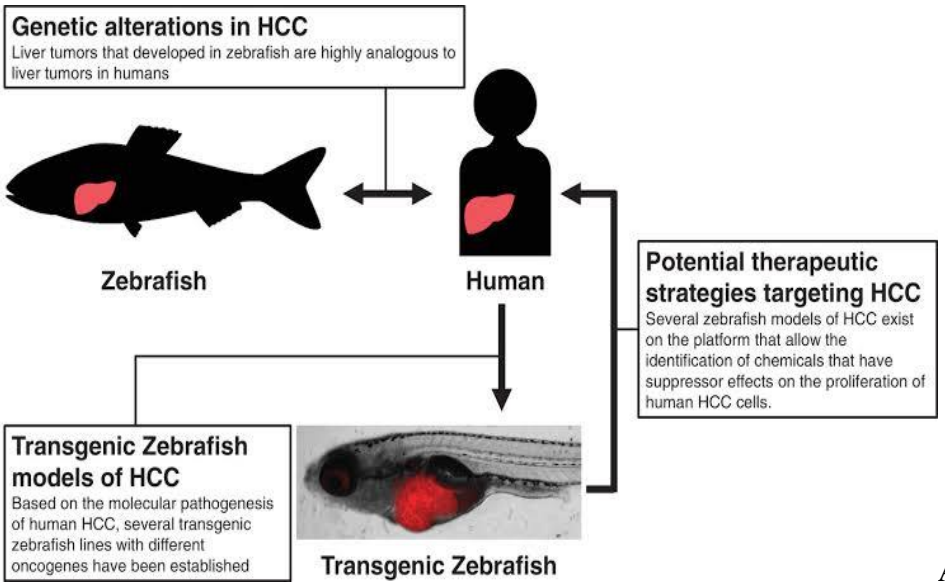
History



Organ transplantation has been one of the phenomenal success stories of the latter part of the 20th century. For decades the province of a few bold researchers and clinicians who often captured the public's attention, this

field is now solidly entrenched in modern medical therapy. Since the early 1980s, hundreds of thousands of patients have received new kidneys, livers, and hearts. Other organs (lung, pancreas, and intestine) are also routinely transplanted, albeit in smaller numbers. The clinical results of these interventions have meant the restoration of meaningful, productive, and active lives to recipients of all organs.

The "Ideal" Donor Animal



A

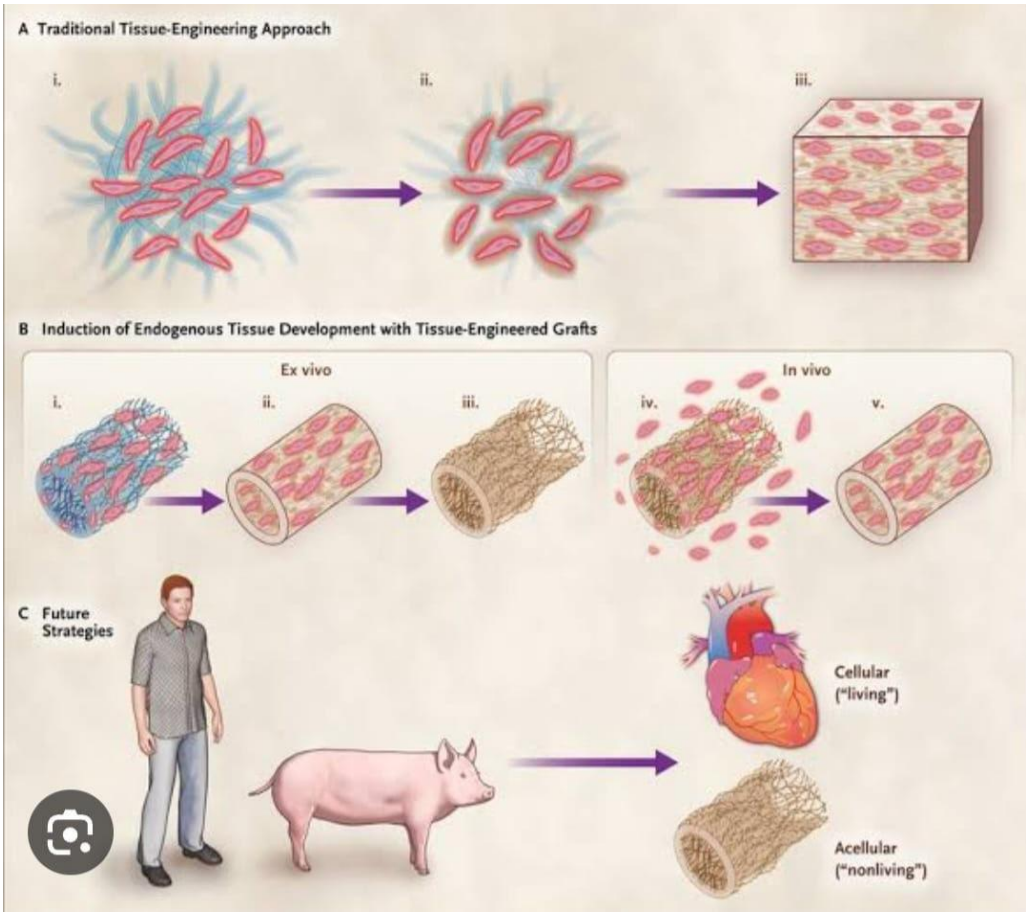
Long list emerges when we consider the preferred characteristics of animals appropriate to be organ donors for humans. First, the animal should be of compatible anatomy and physiology for the intended organ to function well in humans. Next, no possibility of cross-species infection should exist. In fact, an ideal animal donor organ should resist human diseases as well. Further, this animal species should be inexpensive to feed and breed, with short gestation times and multiple births per litter to achieve economies of scale. Such an animal should also present no immunologic barriers to transplantation into humans.

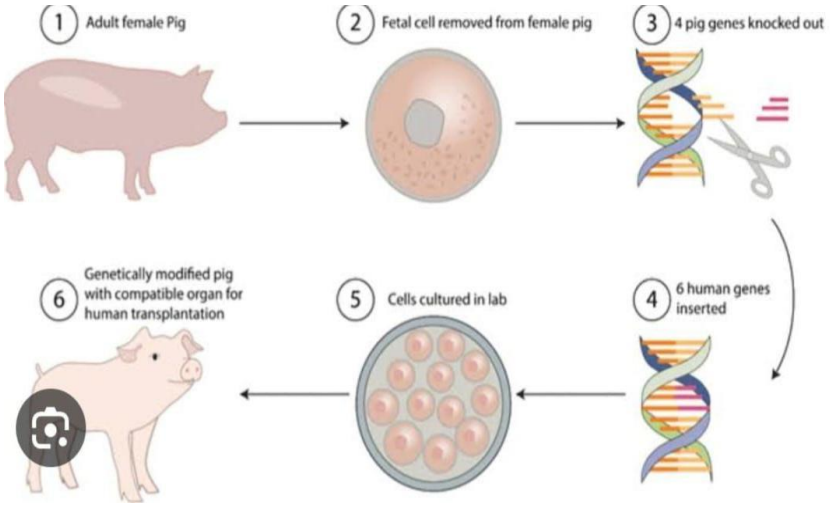
Immunologic Barriers And Preclinical Results

The use of pig organs as xenografts came one step closer to reality with the discovery in humans of naturally occurring antibodies cross-reacting with porcine cells, including, importantly, the porcine vascular endothelium . These xenoreactive antibodies are both IgM and IgG's, may exist as the result of crossreactivity with enteric bacteria, and are found in humans and Old World monkeys. They bind in the pig with an α 1,3-galactose carbohydrate residue, which morphologically resembles the ABO blood group antigens.

Conclusion

Animal Organs for human transplantation has been by most measures a phenomenal success xenotransplantation involves the direct insert of potential infected cells tissues or organs into humans the most successful transplantation is the pig insulin transplantation into human.





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HUMAN PANGENOME REFERENCE WILL ENABLE MORE COMPLETE AND EQUITABLE UNDERSTANDING OF GENOMIC DIVERSITY

TOWARDS A COMPLETE REFERENCE OF HUMAN GENOME DIVERSITY

HUMAN PANGENOME

This article was published on May 10, 2023 by University of California – Santa Cruz. This draft was of the 1st human pangenome by scientists.

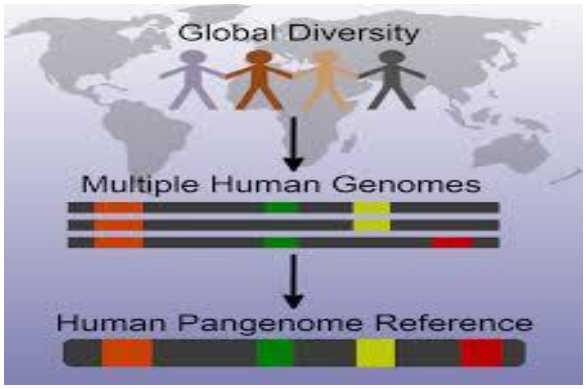
It helps and serves as a reference for genomics that has been an observation of 47 peoples' genetic material from different ancestral backgrounds for more accurate understanding of worldwide genomic diversity. The genome differs from person to person about 0.4%. Study of individual genome to standard reference genome helps to derive results. But it can be reference biased to the Genome Analysis. Individual genomes present in the pangenome reference contains haplotype – resolved information, meaning it can confidently distinguish two parental sets of chromosomes, having this information helps scientists understand various genes and diseases are inherited.

Human Pangenome is a continuation of decades-long efforts from scientists at UC Santa Cruz to understand the biological code that underlies human life. The pangenome is a representation of human genetic diversity that was not possible with a single reference genome. It is highly accurate, more complete and increases the detection of variants in the human genome. It was produced by the Human Pangenome Reference Consortium (HPRC) and is available for use in an assembly hub on the UCSC Genome Browser. The pangenome reference is a reference that combines the genomes of 47 individuals from various ancestral backgrounds to provide a more accurate point of comparison for variation that is present in some populations but not others. Genetic variation can be small, consisting of differences of just one or a few DNA bases: or large structural variants, classified as variants that are 50 base pairs or larger. The pangenome reference adds 119 million new bases, 90 million of which are structural variants. This allows researchers to study regions in the genome for which there was previously no reference and associate structural variants with disease. It also increases the detection of structural variants by 104 percent and the accuracy of calling small variants by 34 percent.

An illustration diagram showing diverse characters among Homo sapiens

The pangenome was created through the development of advanced computational techniques to align multiple genome sequences into one, usable reference in a structure called a pangenome graph. Paten and researchers in the UCSC Computational Genomics lab helped lead the HPRC efforts to develop the algorithmic methods needed to create this pangenome graph structure. The pangenome reference is of extremely high quality and accuracy, covering more than 99 percent of each human genome with more than 99 percent accuracy. To check for and correct errors, the individual genomes that have been sequenced and assembled move through multiple tools, including a reliability pipeline developed by Asri. The pangenome graph structure allows researchers to view differences in the various reference sequences as diverging areas in otherwise shared paths.

The draft pangenome was sourced from individuals who participated in the 1000 Genomes Project (1000G). The HPRC team is focused on outreach to ensure that the pangenome is a useful resource that will be utilized in clinics around the world. The ethics team is working to anticipate challenging issues and guide informed consent, prioritize the study of different samples, explore possible regulatory issues pertaining to clinical adoption, and work with international and Indigenous communities to incorporate their genome sequences.



Comparison of Genome of a number of people and a reference sequence

The Goal of Human Pangenome Reference It is to broaden the representation of a reference resource to be more inclusive and more equitable for studying the human species, as a collection of references and not just one.

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CLIMATE CHANGE HAS DRIVEN BUTTERFLIES AND MOTHS TO HIGHER HIMALAYAS

Climate change is the term used to describe any change in a region's typical temperature or weather. Humans are experiencing more unwelcome rainfall, hotter summers, and harsher winters than ever as a result. The temperature may sharply increase as a result of climate change. Climate change is making the planet's environment worse. All life on the world will perish if global temperatures continue to rise in the future. On Earth, the equilibrium between life and the environment will be upset. The numerous flora and wildlife species will go extinct. Drought and flood disasters will be more frequent. Following the acceleration of industrialization and modernization, climate change became sensitive.

Rising average temperatures in the Himalayan region have driven several dozen species of butterfly and moth to habitats higher up the mountains, a new study commissioned by the government has found.

The findings of the study will be used as a baseline indicator to track the impact of climate change on animal species over the coming decade, officials said. The Himalayas are home to more than 35 per cent of Lepidoptera — the order of insects that includes butterflies and moths – species found in India.

The study found that at least 17 species of butterfly have moved upwards in the Himalayan slopes. The difference in their current and previous heights was 1000 metres. Butterflies are sensitive species. Therefore, they are always considered as good indicators of long-term climate change. The study also found that there has been a decline of 91% of moths in the Himalayan slopes of Uttarakhand, Himachal Pradesh and Jammu and Kashmir.

Reasons for the upward movement of the species

- The ice caps and glaciers are receding. This is leading to scarcity of water and has been a major reason for the shift of Lepidoptera.
- The increase in global average temperature led to the altitudinal shift in vegetation. The grasses and shrubs, the main food crops of the Lepidoptera are now found in higher altitudes
- The human habitation at the base of the hills has increased. The biggest hotspots Darjeeling and Shimla have been encroached and the space for butterflies has reduced.
- Poaching: One Red Apollo butterfly sell at 100 pounds in international markets.

Conclusion

There are numerous reasons why the climate is rapidly changing. This transformation has been largely influenced by both natural and human influences. The burning of fossil fuels, car pollution, deforestation, animal rearing, etc. are a few examples of man-made activities that contribute to climate change. The primary cause of climate change is greenhouse gases. Natural disasters like volcanic eruptions and floods, among others, are to blame for causing climate change. Therefore, we have to prevent the man-made causes.

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Ashmitha Aparna (I B.Sc ZBt)

SHIFTS IN MUTATION SPECTRA ENHANCE ACCESS TO BENEFICIAL MUTATION

Mutations are important because they provide raw material for evolution. Some types of mutations occur more than others, and the strength of such mutational bias varies across species. It is not clear how this variation arises. Mutation spectra refers to the specific types of mutations that occur in a population. Shifts in mutation spectra can occur due to various factors, such as changes in environmental conditions, alterations in DNA repair mechanism. Or the introduction of mutagenic genes. These shifts can have important implications for the accessibility and occurrence of beneficial mutations within a population.

Beneficial mutations are genetic changes that confer a selective advantage to the organism, improving its fitness and increasing its chances of survival and reproduction. Such mutations are crucial for driving evolutionary process and adaptations to changing environments. However beneficial mutations are relatively rare events compared to neutral and deleterious mutations. The immediate effects of changing the mutation bias of *Escherichia coli* and used simulations to understand the long-term effects were experimentally measured. Altering mutational bias is beneficial whenever the new bias increases sampling of mutational classes was previously under sampled. It is also shown that that historically, bacteria have often experienced such beneficial bias switches. Thus, the work demonstrates the importance of mutational biases in evolution. By allowing exploration of new mutational space, altered mutation biases could drive rapid adaptation.

Biased mutation spectra are pervasive, with wide variation in the magnitude of mutational biases that influence genome evolution and adaptation. How do such diverse biases evolve? The experiments show that changing the mutation spectrum allows populations to sample previously under sampled mutational space, including beneficial mutations. The resulting shift in the distribution of fitness effects is advantageous: Beneficial mutation supply and beneficial pleiotropy both increases, while deleterious load reduces. More broadly, simulations indicate that reducing or reversing the direction of a long-term bias is always selectively favoured. Such changes in mutation bias can occur easily via altered function of DNA repair genes. A phylogenetic analysis shows that these genes are repeatedly gained and lost in bacterial lineages, leading to frequent bias shifts in opposite directions. Thus, shifts in mutation spectra may evolve under selection and can directly alter the outcome of adaptive evolution by facilitating access to beneficial mutations.

It’s important to note that while shifts in mutation spectra can increase the probability of beneficial mutations, their ultimate impact on evolutionary outcomes depends on several other factors. These include the strength of selection, genetic drift, population size, and the presence of other constraints on adaptation. The interplay between mutation, selection, and other evolutionary forces shapes the long-term dynamics of beneficial mutations in a population.

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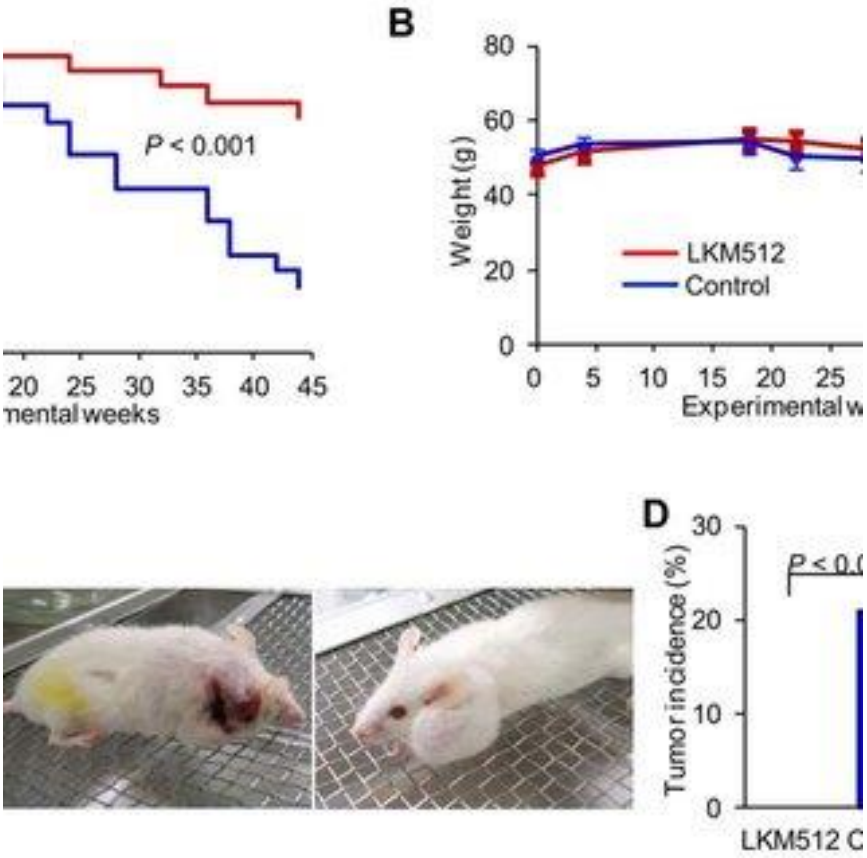
RESEARCHERS FIND OXYGEN RESTRICTION EXTENDS LIFESPAN (IN LAB MICE)

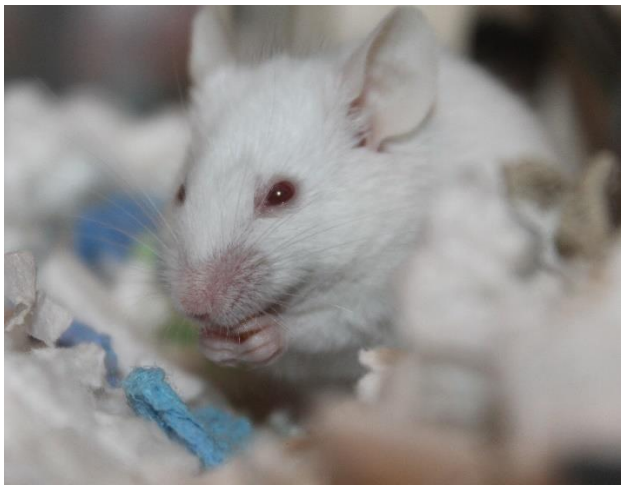
Researchers have found that reduced oxygen intake, or "oxygen restriction," is linked to a longer lifespan in lab mice. Mice in oxygen-restricted environments lived about 50% longer than those in normal conditions, showing delayed aging-associated neurological deficits. This suggests a new potential anti-aging strategy beyond known methods like dietary restriction. Further study is required to determine its human applications.

For the first time, researchers have shown that reduced oxygen intake, or "oxygen restriction," is associated with longer lifespan in lab mice, highlighting its anti-aging potential. Robert Rogers of Massachusetts General Hospital in Boston and colleagues present these findings in a study published on May 23rd in the open access journal PLOS Biology. Oxygen restriction has also been linked to longer lifespan in yeast, nematodes, and fruit flies. However, its effects in mammals have been unknown. Research efforts to extend healthy lifespan have identified a number of chemical compounds and other interventions that show promising effects in mammalian lab animals— for instance, the drug metformin or dietary restriction. To explore the anti-aging potential of oxygen restriction in mammals, Rogers and colleagues conducted lab experiments with mice bred to age more quickly than other mice while showing classic signs of mammalian aging throughout their bodies.

They found that the mice in the oxygen-restricted environment lived about 50 percent longer than the mice in normal oxygen levels, with a median lifespan of 23.6 weeks compared to 15.7 weeks. The oxygen-restricted mice also had delayed onset of aging-associated neurological deficits. The researchers compared the lifespans of mice living at normal atmospheric oxygen levels (about 21 percent) to the lifespans of mice that, at 4 weeks of age, had been moved to a living environment with a lower proportion of oxygen (11 percent – similar to that experienced at an altitude of 5000 meters). Prior research has shown that dietary restriction extends the lifespan of the same kind of fast-aging mice used in this new study. These findings support the anti-aging potential of oxygen restriction in mammals, perhaps including humans. However, extensive additional research will be needed to clarify its potential benefits and illuminate the molecular mechanisms by which it operates.

Therefore, the researchers wondered if oxygen restriction extended their lifespan simply by causing the mice to eat more. However, they found that oxygen restriction did not affect food intake, suggesting other mechanisms were at play. Rogers adds, "We find that chronic continuous hypoxia (11% oxygen, equivalent to what would be experienced at Everest Base Camp) extends lifespan by 50% and delays the onset of neurologic debility in a mouse aging model. While caloric restriction is the most widely effective and well-studied intervention to increase lifespan and health span, this is the first time that 'oxygen restriction' has been demonstrated as beneficial in a mammalian aging model.





Submitted by:

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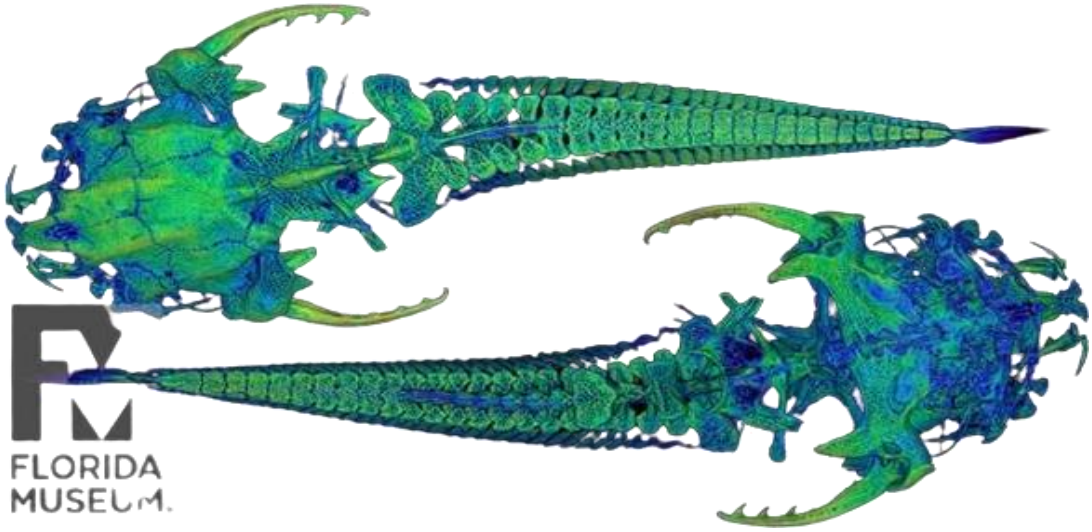
CLIMATE CHANGE AFFECTS FISH BONES

Climate change is causing dramatic change to global temperatures. Over the next century the global average temperature is predicted to increase by around 2^0C (degree). The consequences of climate change are already being observed in many different ways in many different species. For example, rising temperatures have altered the time of the year at which many insects, fish, birds and mammals breed, migrate and hibernate.

During the earth's 4.5 billion year history the climate has changed repeatedly. However, the rate at which humans are currently changing the climate is leading many researchers to worry about whether species will be able to evolve and adapt rapidly enough to survive. Essentially, we see climate change leading to an increase in extreme weather events and a less predictable climate overall.

Researchers in the laboratory of Dr. Kevin Parsons at the University of Glasgow have been investigating how fish adapt to higher temperatures and how this in turn may impact their ability to react to environmental changes. These researchers specifically looked at how climate change may affect fish bone development. They found that fish developing at higher temperatures had thicker bones and fewer vertebrate than those developing under colder conditions. This could have profound impacts on a range of characteristics that are important for survival. For example,in laboratory simulations it was discovered that fish with more vertebrae were better able to evade predators.

This research reveals that it is crucial to consider how climate change and human influence directly affect the phenotype of organisms. If global temperatures increase at a rate so rapid that evolutionary adaptation through natural selection is not possible, then we must look at how species respond to environmental change within a lifetime of the individual. The environment around us affects the phenotype in many different ways. It is up to us to investigate the different ways climate change might impact the phenotypes of species around the world.



Submitted by:

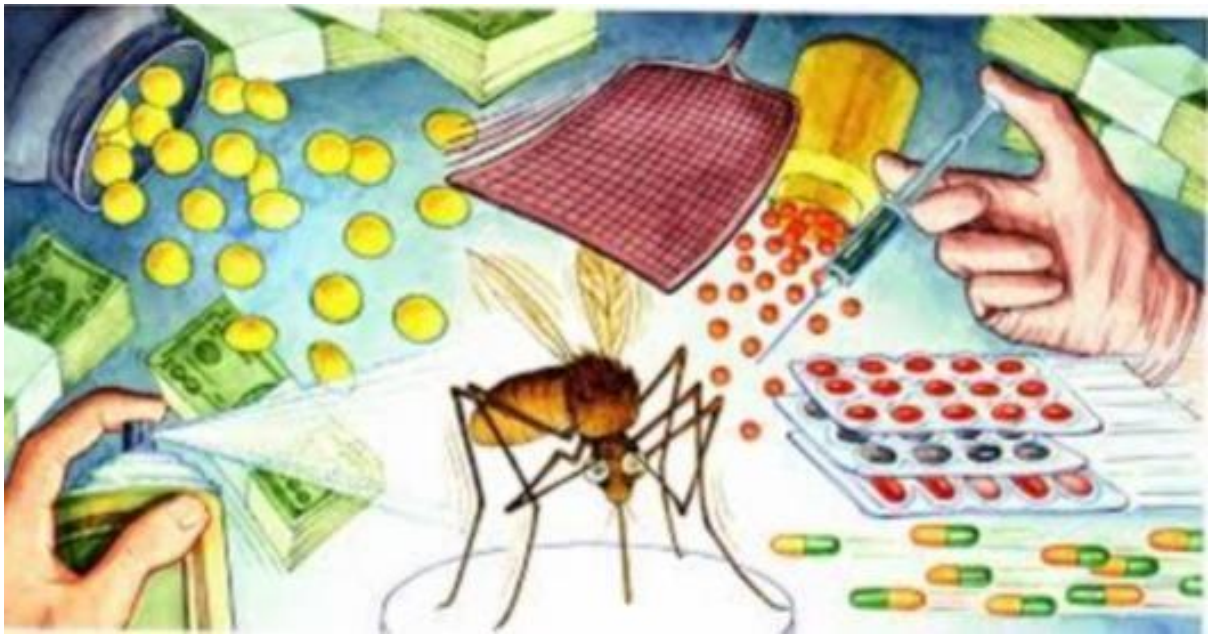
Kavana S (II B.Sc CZ)

A FIGHT TO THE DEATH

Scientists should at long last be able to see a route to the total eradication of malaria. Malaria has been infecting humans for over 5,000 years and even now, more than a century after scientists discovered that malaria is transmitted by mosquitoes, some 800,000 people a year still die from the disease, many of them children. All the more cheering, then, that scientists can now list the tools, including new drugs and innovative vaccines, which could work alongside more traditional methods of keeping mosquitoes at bay to eliminate malaria. The battle can't be won for many decades and absolutely requires that the current enthusiasm for the fight does not dim. However, in 2011 "eradication" is no longer just a rallying cry but a realistic possibility. Prime ministers, rock stars, eager activists and the wealthy gates foundation have all taken up the cause of controlling malaria, with donor money growing fivefold over the past five years. Progress in basic research comes alongside successes in distributing free, insecticide treated bed-nets and artemisinin therapies, together they have sent malaria death rates tumbling where effective organizations has been possible. In Zambia malaria deaths have fallen by over 60% and in Rwanda and Zanzibar childhood mortality has been halved since the introduction of proper control measures.

A magic bullet which kills every last parasite isn't necessary to defeat malaria. Rather, the transmission rate needs to be pushed down so that each malaria infection is passed on to less than one new person and the disease gradually dies out. Used skilfully, every way of attacking the parasite will help; but new weapons are still needed. By early 2011, both the malaria eradication research agenda, an international scientific group which is identifying the tools needed to eradicate malaria globally, and the Malaria Elimination Group (MEG), which provides practical advice for countries where elimination is already feasible, will have published maps for the route ahead.

The malaria parasite is a terrible foe. The diseases begins with the bite of an infected mosquito when a small number of parasites enter into the skin. They traced on to the liver and remain hidden away. Multiplying rapidly, until there are tens of thousands of them. Then they transform and infect red blood cells. Inside these cells, the parasites feast on haemoglobin and multiply still further, periodically breaking out to infect yet more blood cells. Soon a single person contains billions of the parasites and the symptoms of malaria begin. At each outbreak, the waste from the broken red blood cells poisons the body, triggering a high fever. Finally, the parasite returns to a mosquito when the insect bites an infected person. The parasite is hard for the body's immune defences.



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BIOTECH IN DAIRY INDUSTRY

Dairy Fermentation owes their historical origin to the exploitation, from as long as 9000 years ago, of the random and accidental infection and souring of milk by the then unrecognized lactic acid-producing bacteria. This process involves metabolic conversion of milk sugar, lactose, into lactic acid which contributes towards flavour development and has a major role in preventing the growth of spoilage and pathogenic bacteria.

This provides the basis for preserving the solids in surplus milk for later consumption. Until the end of the nineteenth century the production fermented milk products was essentially artisanal in nature and the role of bacteria was not understood. However, at this time a number of scientists in Europe and the U.S identified various lactic acid producing bacteria in fermented milk products.

These bacteria were isolated, subjected to rudimentary characterization and ultimately made commercially available as starter cultures for industrial use. The lactic acid bacteria represent a group of genetically diverse but functionally related microorganisms, and are used in the production of a range of other foods in addition to fermented dairy products [for example meats, vegetables and fodder]. Those used in the dairy industry belong to the mesophillic or thermohillic classes. The former group, producing the majority of fermented milk products, include *Lactococcus lactic* subsp, *lactis* and *cremoris*, and *Leuconostoc* mesenseroides and dextranicum.

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AOH1996 - A SELECTIVE CANCER CELL KILLING AND TUMOR SUPPRESSION DRUG

Role of PCNA in Cells

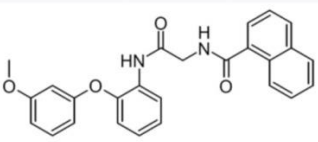
PCNA is a conserved multi-faceted protein in eukaryotes with a critical role in DNA replication and repair and has been historically used as a marker for tumour progression. DNA replication stress is a key hallmark of cancer cells that have been exploited as a therapeutic strategy to induce further DNA damage leading to catastrophic consequences for cancer cells.

How does AOH1996 works

AOH1996 was created to target a post-translationally modified isoform of PCNA, termed caPCNA, which is found in cancer cells. PCNA is crucial in the body for DNA repair, but targeting it is difficult because of its role in healthy cells but by selectively targeting caPCNA, it may be possible to kill cancer cells without affecting healthy tissues. The in vitro testing showed that AOH1996 inhibited the growth and inducing cell cycle arrest causing apoptotic cell death in a wide variety of cancer cells, but has no effect on several normal cell types. In mouse and dog animal models, there were no observed side effects or toxicity even at six times the effective dose.

Application of the Drug

The largest cancer research and treatment organisations in the US, announced that the first patient to receive novel cancer medicine AOH1996, is doing well. Clinical trial is open at Los Angeles, Its objective is to determine the maximum tolerated dose of the pill AOH1996, and to evaluate the medicine for preliminary efficacy.



Formula	$C_{26}H_{22}N_2O_4$
Molar mass	426.472 g·mol^{-1}

IUPAC name
N-[2-[2-(3-methoxyphenoxy)anilino]-2-oxoethyl]naphthalene-1-carboxamide

Eligible patients include adults with solid tumours who have not found standard treatments effective. Participating patients will be asked to take the medication in pill form twice a day. While initial results are promising, the research so far has only concluded that AOH1996 can suppress tumour growth in cell and animal models - with the first phase of a clinical trial in humans now under way. The pill has been shown to be effective in treating cells derived from breast, prostate, brain, ovarian, cervical, skin and lung cancers. Let us hope for the drug to be a successful one and could be implemented to the working society without any side effects.

Submitted by:
Aditya Singh (II B.Sc. BZ)

VACCINE

Introduction

Vaccination is a proven and one of the most cost-effective child survival intervention. All countries in the world have an immunization programme to deliver selected vaccines to the targeted beneficiaries, specially focusing on pregnant women, infants and children, who are at a high risk of diseases preventable by vaccines. There are at least 27 causative agents against which vaccines are available and many more agents are targeted for development of vaccines. The number of antigens in the immunization programme varies from country to country; however, there are a few selected antigens against diphtheria, pertussis, tetanus, poliomyelitis, measles, hepatitis B which are part of immunization programme in most of the countries in the world. The first vaccine (small pox) was discovered in 1798. The most striking success of these efforts has been the eradication of smallpox disease from the planet. Though a proven cost-effective preventive intervention, the benefits of immunization is not reaching many children who are at the maximum risk of the diseases preventable by these vaccines. Majority of the children who do not receive these vaccines live in developing countries. As per the recent nation-wide survey data, of the targeted annual cohort of 26 million infants in India, only 61 per cent had received all due vaccines.

Understandably, the implementation of vaccination programme and ensuring that the benefits of vaccines reach to each and every possible beneficiary is a challenging task. This review documents the history of vaccines and vaccination in India and analyses the events of past to provide policy direction for the vaccination efforts in the country. The focus is on broader events and it does not address detailed operational aspects of immunization programme in the country; however, the selected global timelines and events have been referred to provide a context and perspective.

Ancient times till first documented smallpox vaccination in India in 1802

The history of vaccines and vaccination starts with the first effort to prevent disease in the society. Smallpox (like many other infectious diseases including measles) was well known since ancient times and believed to have originated in India or Egypt, over 3,000 years ago. This was subject of observation for many learned minds and physicians such as Thucydides in 430 BC and Rhazes (also known as Abu Bakr) in 910 AD who reported that people affected by smallpox were protected from the future infections. Abu Bakr also gave the initial (and probably the first) account of distinguishing measles and smallpox in 900 AD. From India, there are a few descriptions of occurrence of disease; however, one of the best recorded smallpox epidemics was reported from Goa in 1545 AD, when an estimated 8,000 children died14. Historians and physicians have sometimes referred smallpox as 'Indian Plague', which suggests that the disease might be widely prevalent in India in the earlier times.

Vaccination in India (1900-94)

The beginning of twentieth century witnessed a few socio-scientific-geopolitical events, which had lasting effect on vaccination efforts in the country. These changes were:

- Outbreak of cholera and plague in India (1896-1907) and the services of already limited number of vaccinators were diverted to epidemic control efforts,
- New scientific understanding that two doses of smallpox vaccine would be needed for long lasting protection. It was a challenge considering that it meant convincing people to get vaccinated twice with perceived inconvenient and painful procedure.

- New scientific understanding that two doses of smallpox vaccine would be needed for long lasting protection. It was a challenge considering that it meant convincing people to get vaccinated twice with perceive inconvenient and painful procedure.

- Most significantly, the Government of India Act of 1919, which devolved a number of administrative powers from Centre to Provinces, by which the local self-governments were assigned the responsibilities of providing health services, including smallpox vaccination. (The health service delivery being a State subject in India has an origin in this Act).

Submitted by:

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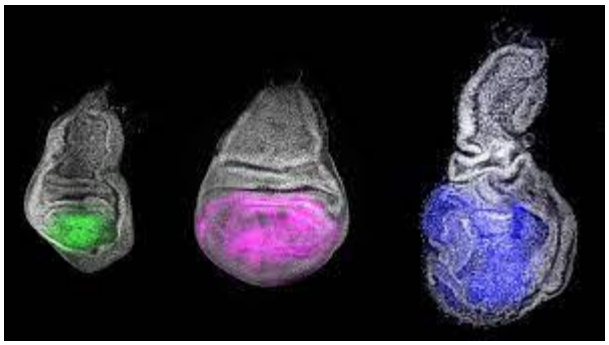
Monica S. (II B.Sc. ZP)
Sneha M. (II B.Sc. ZP)

CHINMO – "THE YOUTH GENE"

A new study published on eLife and led by the Institute for Evolutionary Biology (IBE, CSIC-UPF) and the IRB Barcelona, has revealed that the Chinmo gene is responsible for establishing the juvenile stage in insects. It also confirms that the Br-C and E93 genes play a regulatory role in insect maturity. These genes, which are also present in humans, act as a promoter and as a suppressor, respectively, of cancerous processes.

The results of the research, which was carried out with the fruit fly *Drosophila melanogaster* and the cockroach *Blatella germanica*, reveal that these genes have been conserved throughout the evolution of insects. Therefore, it is believed that they could play a key role in the evolution of metamorphosis.



The Chinmo, Br-C, and E93 genes are the hands of the biological clock in insects

Insects that undergo complete metamorphosis, such as flies, go through the following three stages of development: the embryo, which is formed inside the egg; the larva (juvenile stage), which grows in several phases; and the pupa, which is the stage that encompasses metamorphosis and the formation of the adult organism.

Previous studies had discovered that the Br-C gene determines pupal formation in insects. In 2019, the same IBE team that has led this study described the essential function of E93 to complete metamorphosis in insects and initiate the maturation of the tissues that go on to form the adult. However, the gene responsible for determining the juvenile stage was unknown until now. This study has now identified the Chinmo gene as the main precursor of this stage in insects.

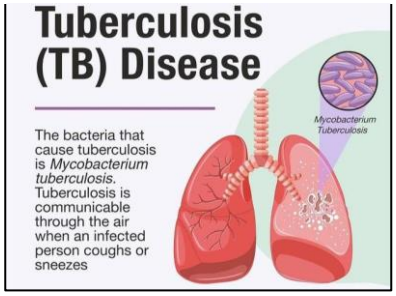
Submitted by:

Vijay K R (II B.Sc. ZP)

IN TUBERCULOSIS DETECTION, SMEAR MICROSCOPY SHARE STILL HOLDS SWAY

Source of Article: The Hindu

Tuberculosis, long known to be a cause of morbidity and mortality throughout the world, the past several decades has been a neglected disease in both industrialized and developing countries. However, it is now attracting renewed interest, and significant efforts to revive controlled activities are currently on the process. This is occurring largely because of the increased incidence of tuberculosis in many HIV - epidemic countries, the availability and proven effectiveness of short course chemotherapy and the realization that tuberculosis control is one of the most cost effective health interventions in developing countries. The present update describes the overall global situation of tuberculosis in 1990 and its trends since 1974. Several epidemiological indicators are used to describe both magnitude and trends; the most important are the prevalence of infection, notification of cases and deaths and projections made using simple epidemiological models.



According to WHO Global TB report 2022, over 40% of 10.6 million people globally who developed TB in 2021 and not diagnosed. India along Indonesia and the Philippines accounted for 67% drop in the number of people with TB being diagnosed in 2020. The COVID -19 pandemic was responsible for the steep fall in the number of people diagnosed in 2020 & 2021. When people tested TB, sputum smear microscopy with about 50% sensitivity has been used for diagnosis in a majority of the cases in India, thus leading to a huge number of missed TB cases. Besides lower sensitivity, smear microscopy is ill-equipped to diagnose rifampicin resistance. Molecular tests are not only more sensitive than smear microscopy, they also help to identify rifampicin resistance. Yet, India has been relying on smear microscopy for the initial diagnosis.

Early diagnosis of all TB patients is further complicated by the absence of symptoms such as cough, cold. According to the 2019- 2021 TB prevalence survey report, nearly 43% of the TB cases in the survey would have been missed if a chest X - ray has not been included. In case of sub- clinical TB, patients may show no clinical symptoms but may still be infections.

However, as per the WHO, people infected with TB bacteria but not yet ill with disease cannot transmit bacteria.

Submitted by:

Chandana.N (II B.Sc, CZ)

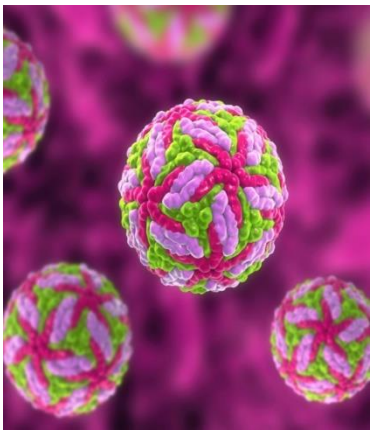
POWASSAN VIRUS INFECTION- TICK BORNE DISEASE

We all love pets, especially dogs. We know that dogs are prone to have ticks and fleas on their body all over. Now I want to enlighten you about the cons of having tick on dogs and how that might affect humans.
The Powassan virus is a tick-borne illness that can cause serious neurological symptoms. In humans, ranging from mild flu-like symptoms to more severe neurological issues. It is transmitted through tick bites, so it's important to be vigilant and take precautions when outdoors. Powasaan virus was first found in POWASSAN, ONTARIO, CANADA in 1958. It was named after the town where it was discovered by Daphne Clarance. A person in the USA has died from the rare powassan virus, marking the first fatal case in the country, according to the main centre for disease control and prevention.

These are spread to humans by the bite of an infected deer tick, dog tick, squirrel tick, not just ticks but external parasites that live by feeding on the blood of mammals, birds and sometimes reptiles and amphibians.

Review: These are indeed rare and serious but according to my opinion I would say that this virus has the potential to take down the human clan and now that we know this disease exists we can take precautions and there is no particular treatment or vaccine, stay healthy and fit so the immune system present in our body will take care

Ticks Found in Dog



Powassan Virus

I would like to conclude by saying viruses can be deadful but we are supposed to be cautions and safe and not to stop loving dogs or pets

Submitted by:

Leena Bharani S R (II year ZBt)

BREAST CANCER

Breast cancer is the most common cancer among women in the United States, with over 252,710 new cases diagnosed in 2022. However, early detection and treatment can greatly improve the chances of survival. In the United States, breast cancer is the second-leading cause of cancer death in women, after lung cancer. It's also the leading cause of cancer death among women ages 35 to 54.

What is breast cancer?

Breast cancer is a disease in which cells in the breast grow out of control. These cells can form a tumor, which is a lump of tissue. Breast cancer can spread to other parts of the body, such as the bones, liver, and lungs. Breast cancer originates in your breast tissue. It occurs when breast cells mutate (change) and grow out of control, creating a mass of tissue (tumor). Like other cancers, breast cancer can invade and grow into the tissue surrounding your breast. It can also travel to other parts of your body and form new tumors. When this happens, it's called metastasis.

The risk factors for breast cancer include:

- Age: The risk of breast cancer increases with age.
- Family history: Women who have a family history of breast cancer are at an increased risk.
- Personal history: Women who have had breast cancer in one breast are at an increased risk of developing breast cancer in the other breast.
- Other factors: Other factors that may increase the risk of breast cancer include being overweight or obese, having dense breasts, and having certain genetic mutations.

What are the signs and symptoms of breast cancer?

The most common sign of breast cancer is a lump in the breast. Other signs and symptoms of breast cancer may include:

- Change in the size, shape, or texture of the breast.
- Dimpling of the skin, a change in the color of the skin of the breast, nipple discharge, a persistent pain in the breast or armpit.

How is breast cancer diagnosed?

If you find a lump in your breast or have any of the other signs or symptoms of breast cancer, it is important to see a doctor right away. The doctor will perform a physical exam and may order tests such as a mammogram, ultrasound or biopsy.

How is breast cancer treated?

The treatment for breast cancer depends on the stage of the cancer, the type of cancer, and the patient's overall health. Treatment options may include surgery, radiation therapy, chemotherapy, or hormone therapy.

What are the chances of survival for breast cancer?

The chances of survival for breast cancer depend on the stage of the cancer at the time of diagnosis. The five-year survival rate for women with early-stage breast cancer is over 90%. The five-year survival rate for women with late-stage breast cancer is about 25%.

How can we prevent breast cancer?

There is no sure way to prevent breast cancer, but there are things you can do to reduce your risk, such as: Regular mammogram check, maintaining a healthy weight, exercising regularly, eating a healthy diet, limiting alcohol intake, not smoking. There are several different types of breast cancer, including:

- Infiltrating (invasive) ductal carcinoma. Starting in your milk ducts of your breast, this cancer breaks through the wall of your duct and spreads to surrounding breast tissue. Making up about 80% of all cases, this is the most common type of breast cancer.
- Ductal carcinoma in situ. Also called Stage 0 breast cancer, ductal carcinoma in situ is considered by some to be precancerous because the cells haven't spread beyond your milk ducts.
- Infiltrating (invasive) lobular carcinoma. This cancer forms in the lobules of your breast (where breast milk production takes place) and has spread to surrounding breast tissue. It accounts for 10% to 15% of breast cancers.
- Lobular carcinoma in situ is a precancerous condition in which there areabnormal cells in the lobules of your breast.
- Triple negative breast cancer (TNBC). Making up about 15% of all cases, triple negative breast cancer is one of the most challenging breast cancers to treat.
- Inflammatory breast cancer. Rare and aggressive, this type of cancer resembles an infection.
- Paget's disease of the breast. This cancer affects the skin of your nipple and areola (the skin around your nipple.

Conclusion

Breast cancer is a serious disease, but it is also a treatable disease. Early detection and treatment are important for improving the chances of survival. There are many resources available to support women with breast cancer.

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