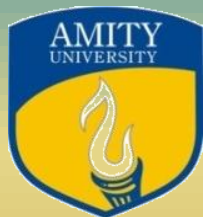


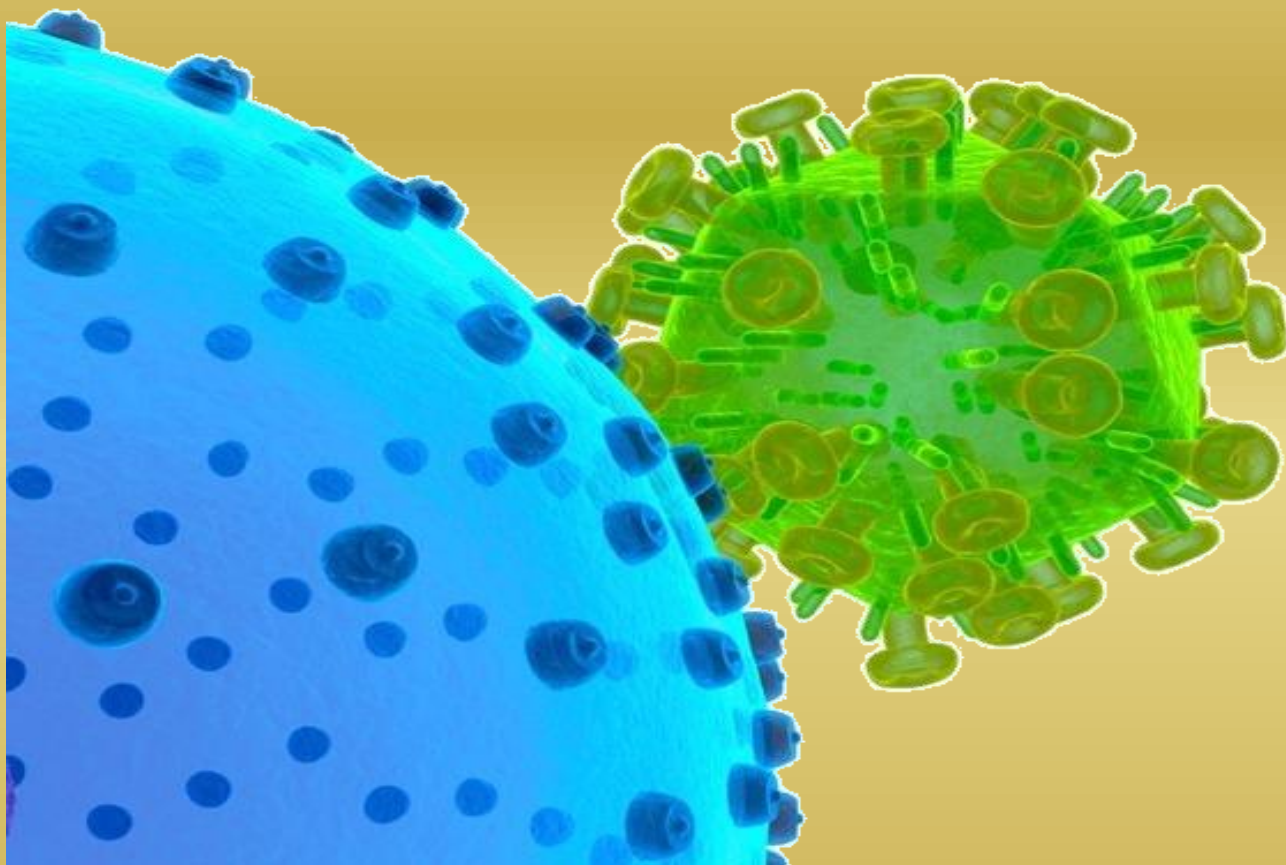
BIOSPARK



f-Newsletter of
Amity Institute of Biotechnology

September, 2017: Volume II Issue III

AMITY UNIVERSITY, GWALIOR



Issue Highlights

➤ Message from Editor-in-Chief

➤ Contributory articles

➤ Cutting-edge research

➤ Parents' corner

➤ Company profile

➤ Students corner

Cover Image: **HIV- HOST DYNAMICS** (<http://www.cell.com/cell-host-microbe/issue>)

Message from the desk of Editor-in-Chief



**Dear Readers
Greetings!**

It gives me immense pleasure, in presenting before you a new issue of Biospark e-News letter in the month of September. Since the new session has commenced and students have acclimatized in their academic ambience, therefore, the current issue of Biospark has come up as new breeze of information. This issue has several thought provoking articles and new findings covering a diverse range of topics of Life Sciences contributed mainly by the students. The cover image displayed a very important organism, i.e. Human Immuno Deficiency Virus (HIV), the principal culprit of causing Acquired Immuno Deficiency Syndrome (AIDS). The deadly virus weakens immune power of the person by reducing the number of T-Lymphocytes, one of the key cells of immune system.

Biotechnology and Nanotechnology are most promising and cutting edge technologies of 21st century. Biotechnology deals with technological application of biological systems including microorganisms whereas nanotechnology offers an opportunity to exploit the unique properties of materials at nanoscale (1-100 nanometer). Combination of both technologies can play a vital role in development, design and implementation of many novel tools to address various challenges in life sciences i.e., Agriculture, Healthcare and Environment etc. The multidisciplinary field of nanobiotechnology is bringing the science of almost incomprehensibly small devices nearer reality. BioSpark has a full share of its knowledge and information quotient as well. A concise profile of industry has been shared for the readers. The current issue also covered our students' achievements and shared views of parents' about Amity Institute of Biotechnology.

I, further congratulate the members of editorial board, contributors, readers and those who are directly and indirectly associated with BioSpark. In the last, I request the readers to provide their valuable suggestions and feedback, which are constant driving forces to improve BioSpark. With the hope the current issue will provide you some good piece of information, I am introducing IIIrd issue of BioSpark. We will be back again with some more informative articles and news in the next issue.

Prof. (Dr.) R. S. Tomar

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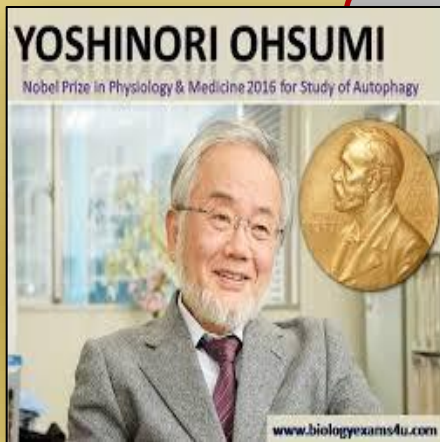


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Assistant Professor

NOBEL PRIZE FOR THE STUDY ON AUTOPHAGY



"You can answer the most basic and important questions about the nature of life through yeasts," says Dr. Yoshinori Ohsumi, the 2016 winner of the Nobel Prize in Physiology or Medicine for his work in the field of Autophagy, which describes how a cell eats itself.

Dr. Yoshinori Ohsumi is a Japanese Molecular biologist and a Professor at Tokyo Institute of Technology in Yokohama. He initiated his work in baker's yeast (*Saccharomyces cerevisiae*) long ago in 1990's. Although, the work on concerned mechanism started long ago in 1950's when Christian de Duve while studying insulin and discovered the previously unknown enzymatic organelle, which he named Lysosomes, for which he along with Albert Claude and George Palade were awarded with the Nobel Prize in Physiology or Medicine in 1974. In spite of this advancement in the field of autophagy, the mechanism of autophagy was largely unknown previously, but now it is known because of Dr. Ohsumi's work in identification of the genes actually responsible for initiating, inducing or suppressing autophagy. However, it was already known that the phenomenon of autophagy is adopted by the living cells to combat the stress conditions while starvation or nutrient deficiency occurs in case of yeast. But, the mechanism involved was still not known until Dr. Ohsumi explained it. Scientists across the world now believe that Dr. Ohsumi's work has created a paradigm shift in the field of physiology and medicine for the better understanding of diseases like Alzheimer's disease, Parkinson's disease, Type 2 Diabetes and Cancer. Dr. Ohsumi observed that, if autophagy exists in yeast then by inhibition enzymes of vacuoles, accumulation of cytoplasmic components engulfed in the vacuole would take place.

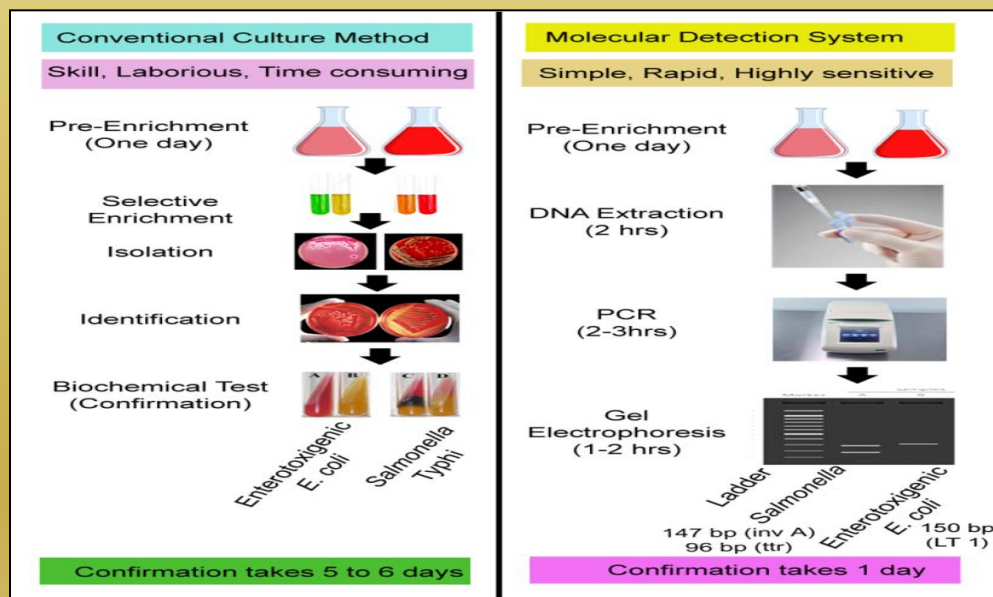


K. MEENAKSHI
B.Sc. (H) Biotech.
V sem

PATHOGEN DETECTION: CULTURE PLATE TO MOLECULAR METHODS

Quality of water is deteriorating day by day and as the concentration of pathogens increase, it further triggers the waterborne outbreaks. The presence of pathogens in water especially in rural and urban environment is among the most serious public health concerns. Enterotoxigenic *E. coli* (ETEC) and *Salmonella* ser. Typhi are the two prominent water-borne pathogens which cause diarrhea and typhoid fever.

Detection of pathogens relies on predominant conventional microbiology approaches, as they suffer from numerous drawbacks. Conventional methods are simple but time consuming, laborious, expensive, has low sensitivity and has false negative result due to the presence of viable but non-culturable (VBNC) bacteria and also low number of bacteria cannot be detected by this method. These tests are unable to differentiate between pathogenic and non-pathogenic strains. Pathogen detection PCR based technology is the new advancement for the rapid detection of target bacteria using amplification of specific genes and it can detect more than one pathogen at a time. Now-a-days, a rapid sensitive method has overcome the old conventional methods as it is very much sensitive to detect low number or even a single pathogenic bacterium present in water. Pathogenic bacteria contain virulent signature gene for pathogenicity as for example ETEC contains *LT1* gene & *Salmonellae* contains *invA* & *ttr* specific virulent genes.



This method has the ability to detect even a single pathogen present in sample. PCR basically leads to the amplification of target DNA and its major steps includes denaturation, annealing and polymerization. Finally after its completion it can be visualized on gel electrophoresis.

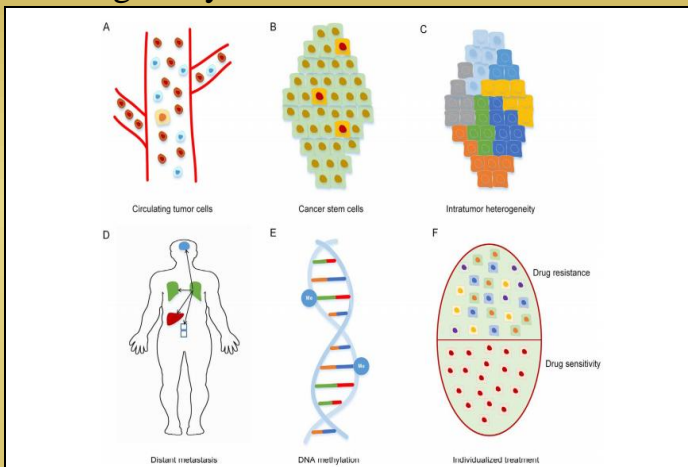


MOHIT AGARWAL
Ph.D. Scholar

APPLICATION OF SINGLE-CELL TECHNOLOGY IN CANCER RESEARCH

In 2015, the second leading cause of global deaths is cancer and was estimated to be responsible for approximately 8.8 million deaths. Nearly 1 out of 6 deaths is due to cancer happens globally. One in every 10 Indian is prone to get cancer before 75 years of age. Based on data from GLOBOCAN, worldwide cancer cases and deaths raised to nearly 14.1 million and 8.2 million, respectively in 2012 whereas it was nearly 12.7 million and 7.6 million, respectively in 2008.

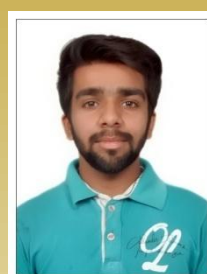
Possibility of cancer development in cancer patients is because of poor diagnosis and lack of diagnostic tools, high tumor relapse for patients with loco-regionally advanced diseases and ineffective treatment for patients with distant metastasis is another reason for such incidences. The efforts to develop advanced laboratory breakthroughs through clinical settings have been slow due to complex characteristics of cancer cells and tumor heterogeneity.



Application of single cell technology in cancer research

However, recently Single-cell technology enables the study of difference between cell types and subpopulations. It provides the means to detect rare cancer cells such as circulating tumor cells (CTCs) and cancer stem cells (CSCs). It also helps to analyze intra-tumor heterogeneity (ITH), which reveals the mechanism of tumor metastasis and investigate epigenetic alterations and ultimately guide individualized treatment strategies.

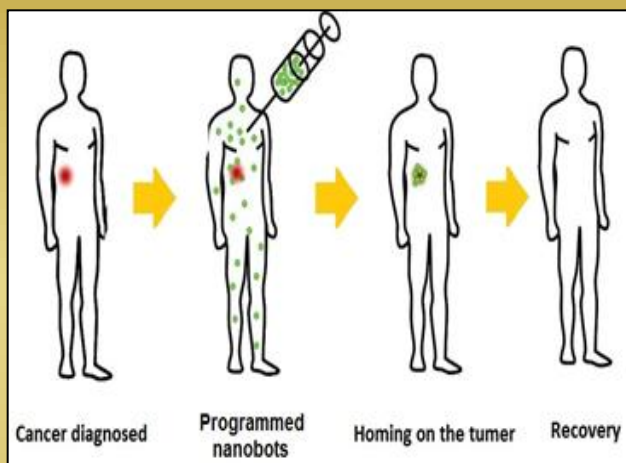
Single-cell technology is divided into two main areas: single-cell separation and single-cell analysis. Single-cell separation is the basis of single-cell analysis, which includes flow cytometry, laser capture micro-dissection (LCM) and microfluidics. Single-cell analysis includes genomic, transcriptomic and proteomic profiles of cancer cells. Among them, single-cell genomic analysis has shown the most encouraging progress in the area of early and precise cancer diagnosis.



SHUBHAM MAHAJAN
B.Sc. (H) Biotech.
III semester

NANOROBOTS - NEW REVOLUTION IN CANCER TREATMENT

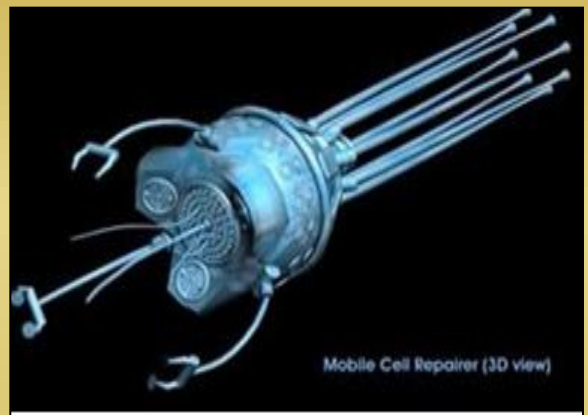
Nanorobotics is a emerging area of nanotechnology. A nanorobot is a machine that can build and manipulate things precisely at an atomic level. Nanorobotics permits robots for presicions and interactions of different function with nano scale objects, all the robots with nanoscaling are operated at nanoscale resolution.



Detection of Cancer

Nanorobots have individual sensors which makes it efficient for the treatment of various important diseases. Several companies are trying to find the precise way to cure cancer (To operate ribonucleic acid and block genes which are responsible for cancer). Though, this is the first devised mechanism which is capable to enter in a cell and operate at the level of RNA.

Once they are in the cells the chemical sensor gives the signals to dissolve and when nanoparticles are softened they let free some substances which stimulate the RNA of each cell disabling the gene accountable to cancer. Exactly, what the nanoparticles neutralize is the ribonucleic reductase, the protein related with the cancer development which is fabricated by the disabled gene. Therefore, nanorobots used in medicine are predicted to have potential in diagnosis.



Nanorobots

An exhaustive development effort could have been employed for the representation of the micro robot which can be prepared within a year or two, and this would definitely progress the development of nanotechnology. Although nanorobotics makes structure of the robot complex but it facilitate the device with extra ordinary intelligence and efficiency.



RAUNAK RAI
B.Tech. Biotech.
V sem

‘SUPER ALGAE’

TO PROTECT WORLD’S CORALS FROM BLEACHING

“**M**utualistic organisms can be particularly susceptible to climate change associated stress, as their survival is often limited by the most vulnerable partner.”

Global Warming results in elevated seawater temperature and therefore a coral-algal mutualism (is affected, causing bleaching of the *Symbiodinium sp.* Scientists at University of South Wales, Australia have developed stress tolerant (thermostable) dinoflagellate algae using genetic engineering tools so as to mitigate stress induced bleaching.

Scientists have first tailored genetic engineering framework to be applied to *Symbiodinium*. Now this framework was comprehensively tested and optimized. “This is a tall order that will be greatly benefited by collaborative efforts,” researchers said.

Since the naturally occurring partnership is highly susceptible to 'bleaching' (stress-induced symbiosis breakdown and potentially coral death), therefore stress-tolerant symbionts may mitigate bleaching and save corals.



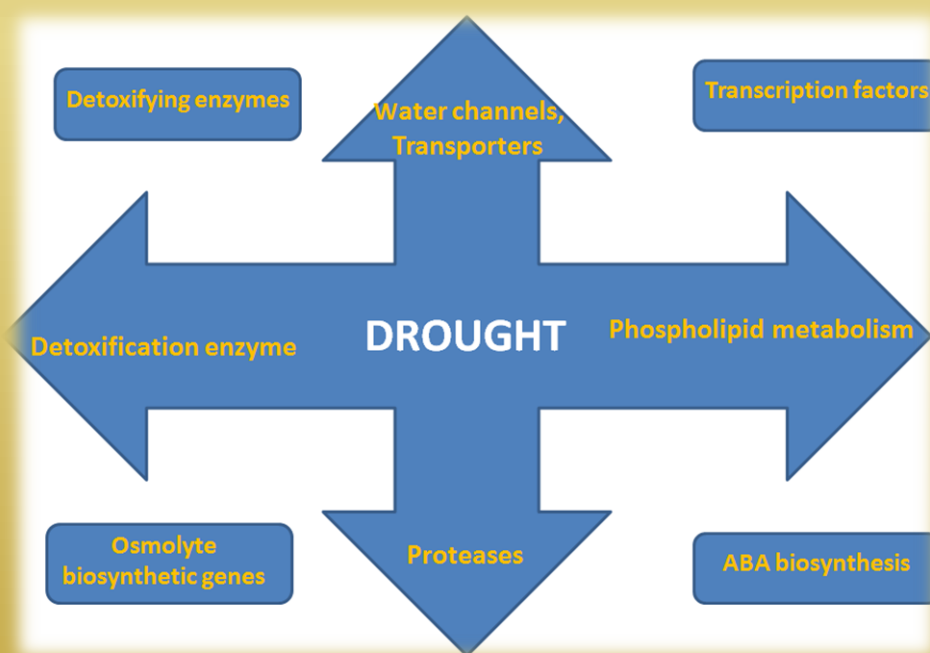
Different species of *Symbiodinium sp.* have large genetic variation and diverse thermal tolerances which effect the bleaching tolerance of corals. The researchers used sequencing data from *Symbiodinium* to design genetic engineering strategies for enhancing stress tolerance of *Symbiodinium*, which may reduce coral bleaching due to rising ocean temperatures.



MRINALINI SINGH
B. Sc. (H) Biotech.
V Sem

DROUGHT TOLERANT GENES IN PLANTS

About 50 years ago scientists observe dramatic increase in the environment from its normal rate ever recorded in history and this change is termed as global warming. It resulted in creating many problems for the human race. One of the major problems is drought, which has increased due to climate change and so, as a result crop cultivation in such condition is very difficult. Therefore, for tolerance of drought they should be grown in small amount of water. Many scientists developed genetically engineered plants using genes encoding proteins which control water regulatory networks in plants. These proteins include transcription factors, protein kinases, receptor like kinases, enzymes which are related to osmoprotectant or plant hormone synthesis. Such findings help in enhancing drought tolerance in plants leading to increased crop production, but still drought stress has major adverse impact on plant height, growth and crop production. Several researches are still going in this direction to deal with drought stress and for better results, we hope that in future we would not have to face drought associated decline in crop production.

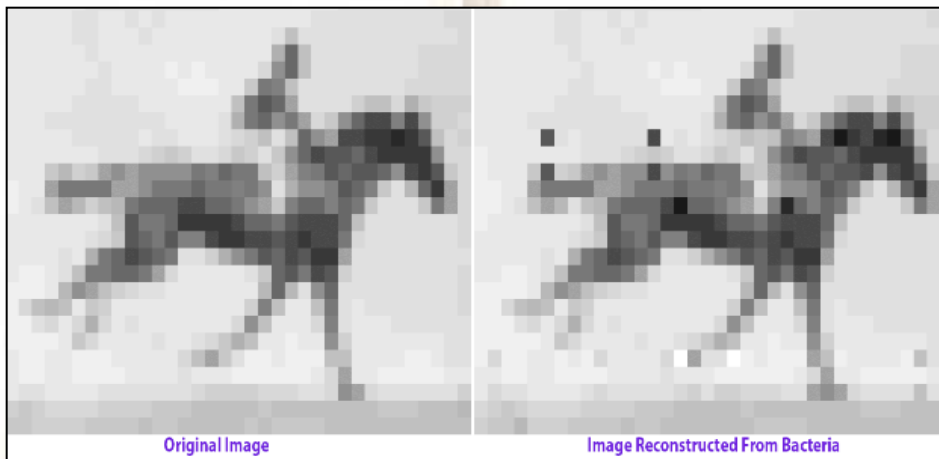


ANKIT SINGH
B.Sc. (H) Biotech.
III sem

THE BOOK OF LIFE

We all may have come across a saying that 'life is like a book' now science made this analogy of literature a reality, all thanks to some geeks working in biotech labs, altering and playing with gene sequences. Some of us may have come across an interesting headline "video stored in live bacteria" this new discovery is also acknowledged by prestigious journals like NATURE. Recently 'Nature' published it with the title "CRISPR-Cas encoding of a digital movie into the population of living bacteria" a team of scientists in Harvard university has used the CRISPR genome editing tool to encode a video in live bacteria.

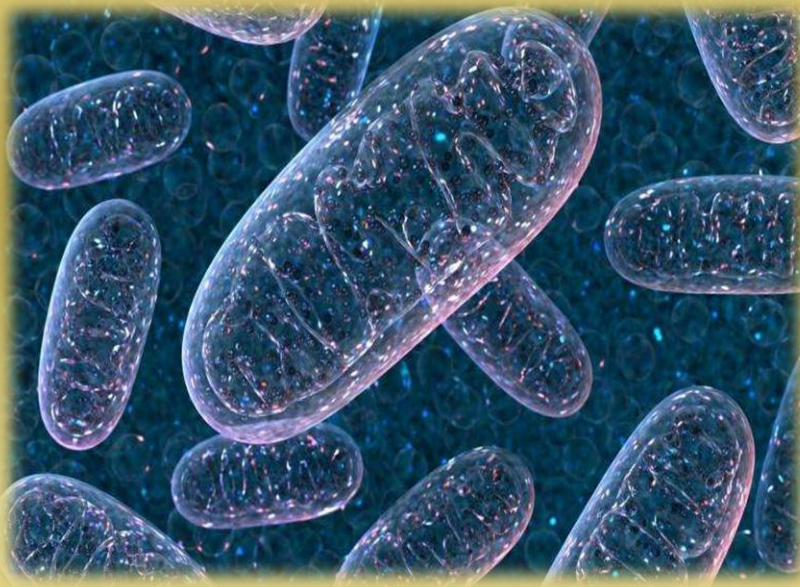
Now couldn't we store some data in the genome and later retrieve it? The answer is YES by CRISPR (Clustered Regularly Interspaced Short Palindrome Repeats) technique. The scientists followed a simple procedure they converted a picture into a GIF file of 5 frames, then they encoded base pairs sequences for each pixel of that particular image. After doing that they incorporated this information into bacterial genome of *E. coli*. and they retrieved that image through sequencing the genome and later decoding it by using pre-defined computer algorithms.



SIDDARTH SINGH TOMAR
B. Tech. Biotech.
III sem

MITOCHONDRIA BEHIND THE BLOOD CELL FORMATION

New Northwestern Medicine research published in *Nature Cell Biology* has shown that mitochondria, traditionally known for their role in energy production in cells, also play an important role in hematopoiesis, that is a process of our body for producing new blood cells.



"Since, mitochondria is always viewed as an ATP (Energy) producing organelle, there is evidence that mitochondria can dictate cell function or fate independent of ATP production. The idea was established that mitochondria are signaling organelles." explained principal investigator Navdeep Chandel, Ph.D, David W. Cugell Professor of Medicine in the Division of Pulmonary and Critical Care Medicine.

In the current study, Chandel's team, including post-doctoral fellow Elena Ansó, Ph.D and graduate students Sam Weinberg and Lauren Diebold, demonstrated that mitochondria control hematopoietic stem cell fate by preventing the generation of a metabolite called 2-hydroxyglutarate (2HG). The scientists showed that mice with stem cells deficient in mitochondrial function cannot generate blood cells due to elevated levels of 2HG, which causes histone and DNA hyper-methylation.

It has been demonstrated by Chandel et al that initiation of erythropoiesis, the production of red blood cells specifically, requires functional mitochondria.

Dr. Chandel, who recently wrote a review in *Nature Cell Biology* highlighted this idea that metabolism dictates stem cell fate, which is a rapidly evolving subject matter. An important implication of this work is that diseases linked to mitochondrial dysfunction like neurodegeneration or normal aging process might be due to elevation in metabolites like 2HG.

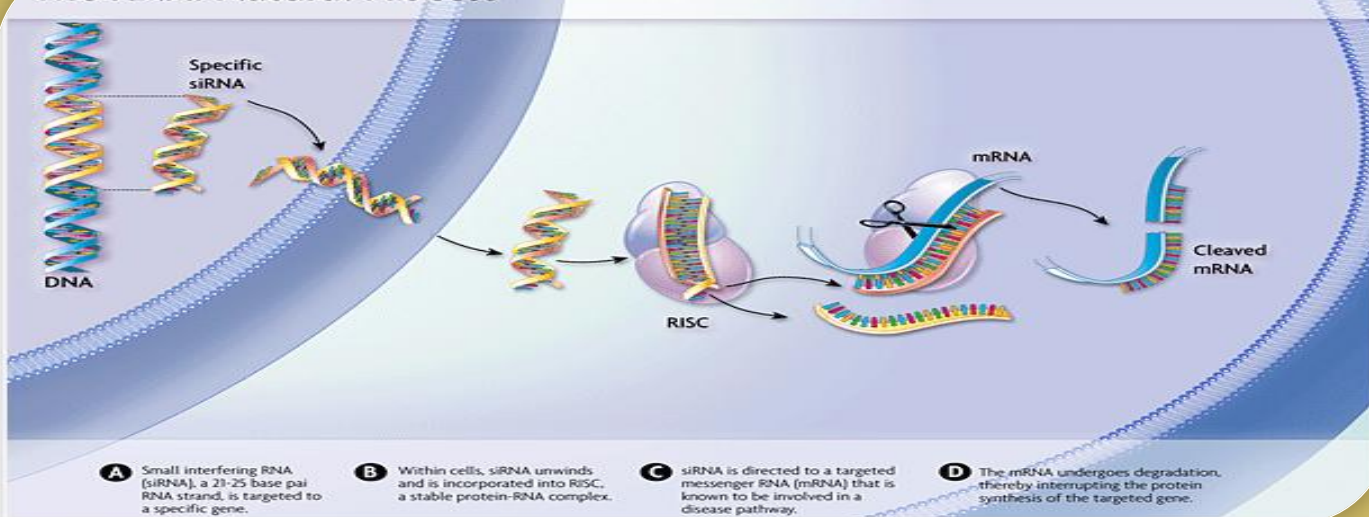


AARUSHI SHARMA
B.Tech. Biotech.
VII sem

RECENT ADVANCES IN RNAi THERAPEUTICS USING NANOTECHNOLOGY

In this new era, we have come across various methods for the treatment of disease ranging from chemotherapy, radiotherapy, immunotherapy and all are found to exist with certain limitations. But our cell has its own unique method to prevent the expression of genes through 21-25 nucleotide double stranded RNA also called as small interfering RNA (siRNA) which is responsible for post-transcriptional gene silencing. We are familiar with this technique since past decades, but its therapeutics application was very limited despite its high silencing efficiency and on-target specificity. However, nanotechnology has overcome some of its limitation like poor intercellular delivery, limited blood stability, immunogenicity and unwanted off targeting effects through structural and chemical modifications and enhancing its intracellular delivery by nanocarriers.

The RNAi Natural Process



Conjugating siRNA with different substances has also increased its application. Like Aptamer-siRNA which show high specificity and adherence capability against target protein-expressing cells can be used for tumour treatment. Similarly, pRNA nanoparticle in association with siRNA exhibit silencing mechanism against the CD4 over expressing cells. pRNA nanoparticle has the ability to carry multiple siRNAs which result in the increase in efficiency. Likewise, RNA nanoring carries 6 siRNA simultaneously which results in multiple gene targeting at the same time or targeting 6 different regions of one gene, which has increased its gene silencing efficiency. Although most of them are still in Phase I but it still holds hopes to bring revolution in modern medicine.



RIYA SINGH
B.Sc. (H) Biotech.
III sem

RISK ASSESSMENT AND BIOSAFETY IN BIOTECHNOLOGY DEVELOPMENT

Biosafety is keeping the community, laboratory, the workers involved in laboratories safe and environment safety is being a crosscutting need for all research activities as well as it is an important research and policy area with medical, political and security consequences. As biosafety is attracting attention day by day because it may be a limiting factor in the development of advanced biotechnology. Biosafety is being used in certain areas i.e., mosquito control, agriculture, pollution remediation, mining biofuels.



BIO SAFETY LEVELS (WHO)

- BSL 1** : Suitable for work involving well characterised agents not known to cause disease in healthy adult humans and of minimal potential hazard to laboratory personnel and the environment.
- BSL 2** : Suitable for work involving agents of moderate potential hazard to personnel and the environment.
- BSL3** : Suitable for work with infectious agents which may cause serious or potentially lethal disease as a result of exposure via inhalation.
- BSL 4** : Suitable for work involving exotic infectious agents that pose a high risk of life threatening disease and can be transmitted as an aerosol and for which there is no vaccine or therapy.



MANSA SINGH
B.Sc. (H) Biotech.
III sem

PLASMA: THE NEW HORIZON OF AGRICULTURE

Nowadays food and food security is a biggest challenge for humanity. The whole world is producing food by various scientific means. With the goal of mass food production and sustainable agricultural methods, world is looking for more advancement in this field. Researchers developed many tools and techniques to overcome the problem of food production and storage. Various techniques are available for mass production of crops and more geeks are continuously working on various tools and techniques. In this scenario, Plasma agriculture is a completely new approach for crop production. At the time of germination and seedling stage, pathogens and various stress factors affecting the growth of the plant can be modified by using plasma which directly affect the production of crops. Non-thermal plasma is useful to reduce such stress conditions and helps in the inactivation of pathogenic microorganisms and acceleration of seed germination and growth of the crop also by activating air and water with the fourth stage of matter PLASMA that increase the yield along with several other advantages.

The plasma treated water has more Nitrogen which is an essential element in plant growth and development. Nitrogen is also very important during the germination phase. The plasma treated water has the ability to control the pH and increased efficiency of use of the water. During storage of fruits and vegetables ethylene oxide causes the spoilage problem. The plasma treatment is also beneficial for the removal of the ethylene oxide which results into the healthy storage of the fruits and vegetables. It shows that the plasma has a huge potential in production and prolonged storage of crops.

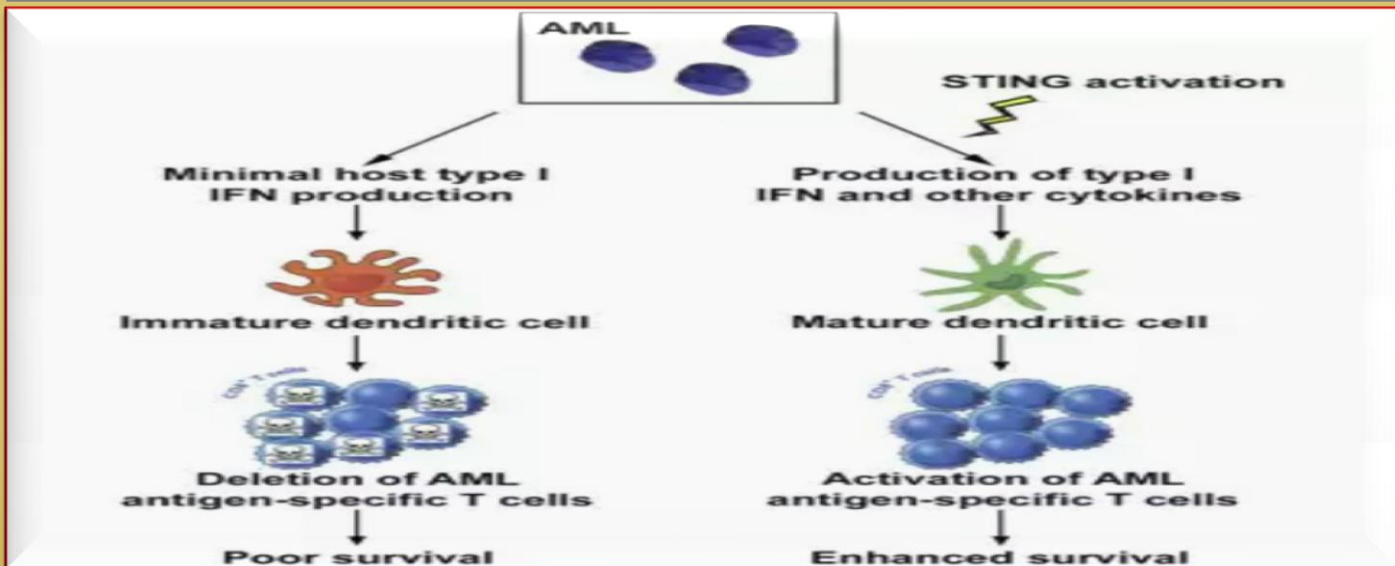


DIWAKAR ARODIYA
B. Tech. Biotech.
III sem

NEW GENERATION CELL BASED IMMUNOTHERAPY FOR MYELOID LEUKEMIA

This cell based immunotherapy develop healthy immune system in the patient body by producing helper T-cells. Development of dendritic cells from hematopoietic stem cell leads to complete removal of residual disease from the body of a person suffering from acute myeloid leukemia. New generation dendritic cell will be developed in 3-4 days with toll like receptor and then this combined with Wills Tumor suppressor gene 1 RNA (wt1RNA) with some stimulus, which stimulate acute myeloid leukemia specific immune response .

The aim of producing new generation dendritic vaccine is to completely remove minimal residual disease which is left after the treatment through chemotherapy. Because of the property of newly developed dendritic cell which stimulates the immune response to an antigen or modulate it towards the desired immune response there is decrease in the rate of relapse and gives overall benefit in the survival. Thus, it has the potential to be more successful than peptide vaccination for the complete cure of myeloid leukemia.



The response which is developed by dendritic cell is highly dependent on their capacity to secrete IL-12p70 (cytokines) which helps in shifting of CD4⁺ cells into the direction of T-helper cells, that further leads to the production of CD8⁺ cytotoxic T-lymphocyte which is responsible for the death of tumor cells and initiates the production of myeloid cells .



SONAM OJHA
B. Tech. Biotech.
III sem



Our child has grown a lot with us. But it was time to move up further in his life. And so, in Amity we found the capacity to nurture him with values and ethics which should be seen in an astute person like him. Every time we spoke to his teachers and mentor, we were updated well about his class activities and his academic progress. The discipline of the institution has turned our son as a mature individual. On the whole, sending our child to Amity was a wise decision and we can see his future blossoming with good opportunities and happiness.



SANJEEV MAHAJAN
F/o Shubham Mahajan
B.Sc. (H) Biotech. III sem

Amity University Madhya Pradesh is one of the renowned University in Madhya Pradesh offering excellent curriculum of B. Tech. in Biotechnology. The faculty members of the university are well educated and knowledgeable who can give good guidance and can help the student to enlighten their future.



SWAPNIL AWASTHI
F/o Suchita Awasthi
B.Tech. Biotech. V sem

I want to express my hearty views about Amity University Madhya Pradesh. As my daughter and my son both are studying in Amity since 2015, I found Amity, the best place I have chosen for my children and it is a very renowned university as well. I am very much satisfied from it's rules and regulations which tells student to attend the class regularly.



ANIL UPPAL
F/o Amulya Uppal
B.Tech. Biotech. V sem

Piramal is a global business conglomerate which has various sectors such as healthcare, life sciences, drug discovery, healthcare information management, glass packaging, financial services and real estate. Piramal group acquired Gujarat Glass Limited, a manufacturer of glass packaging for pharmaceutical and cosmetic products, followed by Ceylon Glass in 1999. In 1988, the group bought Nicholas Laboratories, the company which later flourished and by 2010 reached the highest valuation in the market. Piramal's heritage brand 'Saridon' won prestigious Emvie award. Piramal Enterprises Ltd. was awarded the Emerging Medical Equipment Company of the Year Award by Frost & Sullivan in the 5th Annual India Healthcare Excellence Awards-2013.

Piramal Enterprises acquired the brand Caladryl in India. Caladryl is an anti-pruritic solution known for dermatosis application for minor skin irritations and itching. This acquisition enabled Piramal Enterprises to widen its consumer products portfolio in the skin care segment. Ajay G Piramal is the Chairman of the company. The Group comprises 4 key companies: Piramal Enterprises Ltd, Piramal Glass, Piramal Realty and Piramal Foundation.



1. Piramal Enterprises Ltd, (PEL) formerly known as Piramal Healthcare Ltd, is the largest company of Piramal Group.
2. Piramal Glass is a manufacturer of glass packaging for the pharmaceuticals, foods & beverages (F&B) and cosmetics & perfumery (C&P) industries services.
3. Piramal Realty is a fully owned real estate venture of Piramal Group. The group developed India's first mall, Cross Roads at South Mumbai.
4. Piramal Foundation is a private philanthropic foundation established in 2006. Piramal Foundation has undertaken projects like Piramal Swasthya, Sarvajal, Pratham etc.

STUDENTS' CORNER

Amity Institute of Biotechnology (AIB) is dedicated for students to make them more knowledgeable and research oriented along with various edges of personality development. Institute aims to nurture and to exploit the potential of all the students. Institute is well equipped with modern and sophisticated instruments and therefore students are technically tuned during their curriculum. AIB is committed to develop their students competent enough not only for achieving good academic records but also to qualify different national competitive examinations. Some recent outcomes from student side is documented below:

Raunak Rai, student of B. Tech Biotech V semester has published a research paper in a reputed international journal from his summer internship work.

“*In- silico* approach for enhanced photo- fermentative biohydrogen production” *Trends in Biosciences*, 2017; 10 (29): 6131- 6137.



Suchi Agrawal, student of B.Sc. VI Semester Biotechnology qualified JAM-2017 and selected in IIT Indore for higher studies.



Sailee S. Asolkar, student of B. Tech Biotech VIII Semester cleared all India entrance exam of Pune University and got selected for integrated PhD programme.



Photo courtesy- Abhishek Lohiya, B.Sc. (H) Biotech V Sem