

BIOSPARK

E-Newsletter of
Amity Institute of Biotechnology
May, 2017; Volume II Issue II



AMITY UNIVERSITY, GWALIOR



Issue highlights

Message from Editor in Chief

Contributory articles

Cutting edge research

Alumni corner

Company profile

Glimpses of AIB events

Message from Editor-in-Chief desk.....



Dear Readers

As it is the month of May, all the students and faculty members are busy in the end semester examinations. With the completion of another academic session, I present you another issue of BioSpark. This issue has several thought provoking articles covering a diverse range of topics of Life Sciences. The cover image narrates the very important issue, i.e. Biochemical Warfare. Biological weapons include any microorganism (such as bacteria, viruses, or fungi) or toxin found in nature that can be used to kill or injure people. The applications of biotechnology have tremendous impacts on human welfare and society.

Biotechnology and nanotechnology are two of the 21st century's most promising technologies. Biotechnology deals with metabolic and other physiological processes of biological subjects including microorganisms. Nanotechnology deals with developing materials, devices, or other structures possessing at least one dimension sized from 1 to 100 nanometers. Association of these two technologies, i.e. nanobiotechnology can play a vital role in developing and implementing many useful tools in the study of life. The multidisciplinary field of nanobiotechnology is bringing the science of the almost incomprehensibly small device closer and closer to 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. It has also information regarding admissions in Biotechnology in various institutes. We have also covered our students' selected for their internship during summers.

I congratulate all the members of Editorial Board and contributors who have associated with BioSpark and readers for showing their keen interest. As we are constantly trying to improve the newsletter, your feedback is very important for us. While the summer is on its peak, grab this issue of BioSpark. We will back again with some more interesting piece of information.

Prof. (Dr.) R. S. Tomar
Editor-in-chief
BioSpark
AIB, AUMP e-Newsletter

E-NEWS LETTER BioSpark

Editorial Board



Editor-in-Chief

Prof. (Dr.) Rajesh Singh Tomar,
Director, AIB & Dean (Academics), AUMP, Gwalior

Editors



Dr. Raghvendra Kumar Mishra
Associate Professor



Dr. Vikas Shrivastava
Associate Professor



Dr. Shuchi Kaushik
Assistant Professor



Dr. Anurag Jyoti
Assistant Professor

Reviewers



Dr. Raghvendra Saxena
Assistant Professor



Dr. Sushmita Shrivastava
Assistant professor



Dr. Pratistha Dwivedi
Assistant Professor



Dr. Manish Kumar
Assistant Professor



Mrs. Sharmistha Banerjee
Assistant Professor

URUMIN: AN ANTIFLU PEPTIDE SECRETED FROM SKIN OF INDIAN FROG

According to the World Health Organization (WHO), annual influenza epidemics affect around 5 to 15 percent of the population of the northern hemisphere. Currently, the most efficient way to prevent flu for people who are most at risk of serious complications is to have an annual vaccination. The Centre for Disease Control and Prevention (CDC) recommend that all individuals 6 months of age and older should be vaccinated against the flu every season. According to researchers from the Emory Vaccine Centre and the Rajiv Gandhi Centre for Biotechnology in India, frog slime can destroy the H1 variety of influenza viruses.



Mucus secreted from the skin of the *Hydrophylax bahuvistara* frog may kill strains of flu virus (source: news.emory.edu)

Prof. Jacob and team called one of the antiviral peptides they discovered "urumin," after a whip-like sword used many years ago in the south of India called the "urumi." The team used mild electrical stimulation to collect urumin from the skin secretions of the Indian frog *Hydrophylax bahuvistara*. Some antibacterial peptides are poisonous to mammalian cells and work by punching holes in the cell membranes. However, when viewing urumin through electron microscopy, the researchers uncovered that the peptide only disrupted the flu virus' integrity. Urumin attaches to the stem region of the viral Hemagglutinin (HA), a lollypop-shaped protein that juts out from the virus particle's surface. This protein is critical for the virus's ability to invade human cells because it's what the virus uses to latch onto them. This specificity could be valuable because current anti-influenza drugs target other parts of the virus. This region of the flu virus is also the target of the proposed universal flu vaccine, a new generation of vaccines that protect against multiple strains of flu.

Ms. Sharmistha Banerjee
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

NANOTECHNOLOGY IN DISEASE DIAGNOSIS

The consumption of microbiologically unsafe water poses major health threats and leads to several known diseases like diarrhea, typhoid and cholera. Hence, the management of water quality is a growing need for public health and environment in the developing world. Existing methods for pathogen detection face challenges of inadequate monitoring in terms of specificity, rapidity and simplicity. Molecular methods including Polymerase Chain Reaction and its advanced version Real-Time Polymerase Chain Reaction are powerful techniques having the potential to detect pathogens in low doses. However, the requirement of sophisticated instrumentation and trained personnel makes it less applicable to field situations. The detection of target pathogens needs improvement to overcome existing drawbacks and should be based on simple, rapid, sensitive and specific methodologies.



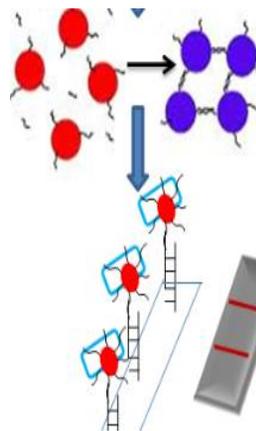
Culture based technique

- Time consuming
- Labour intensive
- Non specific



Molecular method: PCR based

- DNA based detection
- Expensive instrumentation
- Trained personnel required
- Not fit for field conditions



Nanobiotechnology: Nanoprobes for DNA

- DNA based detection (PCR products)
- Needs PCR to generate targets
- Not fit for field conditions

Nano-based detection device

- Detects whole bacteria
- Rapid and Simple
- Highly specific and sensitive
- Suitable for field conditions

One promising area is the field of nanotechnology in relevance to bio-diagnostics, where nanoparticle based assays has been developed for specific detection of bioanalytes of clinical interest. Gold nanoparticles have unique optical properties and high surface area which make them ideal candidates for developing an ideal detection system. These unique and outstanding physicochemical properties make them advantageous over conventional detection methods for diagnostic purposes. Nanobiosensors consist of a specific molecular recognition probe targeting an analyte of interest and a mean of converting that recognition event into a measurable signal. Aptamers are single-stranded oligonucleotides which can fold into three-dimensional conformations. These have unique property of binding specifically to a target molecule. As molecular recognition probes, aptamers in conjugation with gold nanoparticles have binding affinities and specificities which are explored to capture and identify specific pathogen(s) from unknown samples. Applications of aptamer based nanotechnology leads to development of later flow device for detection of pathogenic bacteria.

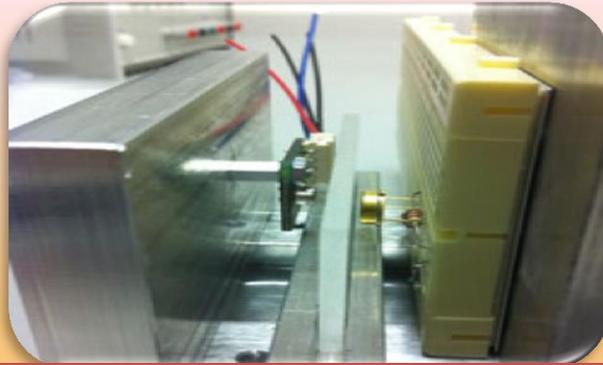


Dr. Anurag Jyoti

**Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior**

NANOTECH-ENABLED BREATHALYZER FOR DIABETICS

Researchers at Western New England University have developed a nanotech-powered breathalyzer prototype that can detect acetone levels in the breath, which is theorized to correlate to blood glucose levels. The technology, if commercialized, could do away with need for finger-prick-based testing of blood sugar.



The ability to detect acetone in the breath is derived from acetone-sensitive nanometer-thick polymeric films. Exposure to acetone causes the two polymers in the films to crosslink, changing its physicochemical nature. The breathalyzer prototype is roughly the size of a book. The researchers are working on shrinking the technology to yield a breathalyzer with a similar size to those used by police to detect blood alcohol content levels.

The Western New England University researcher's breathalyzer design is initially the size of a book. Scientists from the Technische Universität Dresden (Germany) and Fraunhofer Electron Beam and Plasma Technology FEP are actually working on a breath-analyzing spectrometer that is so tiny it can fit into a mobile phone. Looking to the future, recently a paper published on the use of a combination of two-photon polymerization and micromolding to make small-scale barbs for tissue joining. Work is undergoing in several companies on the commercialization of 3D printing technologies and on small-scale medical device processing. These efforts will lead to new technologies for processing of medical devices that offer better functionality and longer lifetimes than current devices. Folk spoke of the pitfalls of tunnel vision- "If you don't have a broad view, it's really tough to see what else is going on. Venture capitalists and people like that, have a broader view but they are looking for investment opportunities, and not always at technology creators."

One thing for medical device designers to think about is the intersection of different technologies. One of the more interesting areas to look at, which is also one of the hardest ones, is to be looking at and anticipating intersections.

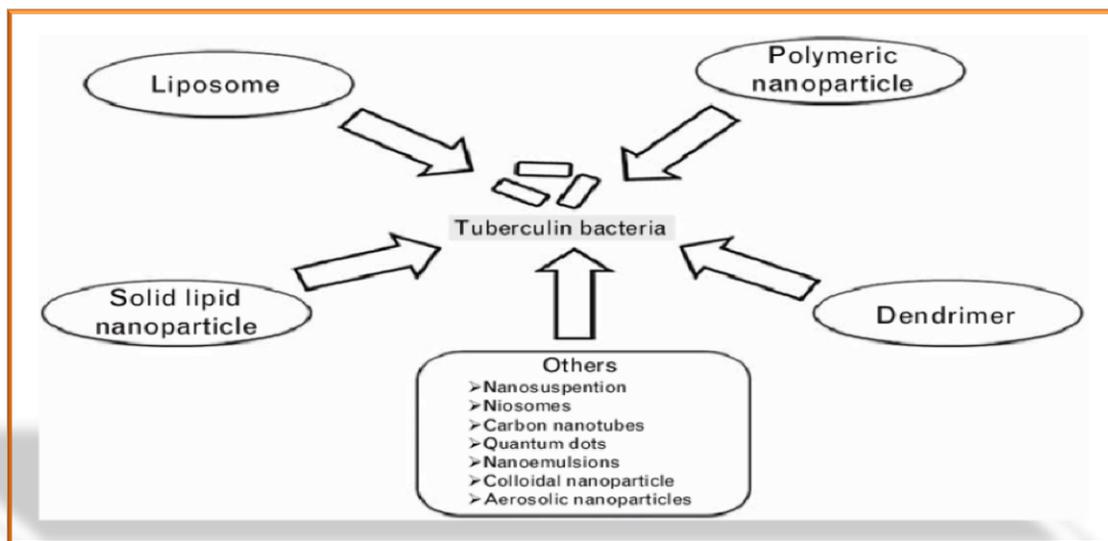


Dr. Vikas Shrivastava
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

NANOTECHNOLOGY-BASED DRUG DELIVERY SYSTEMS IN COMBATING TUBERCULOSIS

Infectious diseases are the most important health concern in developing and underdeveloped countries. The poor or impoverished population of developing countries does not have proper access to fundamental medicines.

In this scenario, the aim is to find an answer to this by searching of new and unique alternative therapeutic drug that lessen the period of treatment, reduce drug toxicity, and have longer bioavailability. Till now, the classical treatment protocols have made no major contributions to the ATD therapy. Also, an effective TB vaccine has remained equally indefinable. The goal is to find out a solution to eradicate the transmission of causative organism but this is a big problem due to the difficulty of diagnosis, multidrug resistance, and patient's low compliance to treatment.



Drug delivery systems designed by using nanotechnology have largely improved the pharmacology.

The following properties of nanoparticles make them important drug carriers with technological advantages:

- Long shelf life hence high stability;
- High carrier capacity (i.e., many drug molecules both hydrophobic and hydrophilic substances can be incorporated in the particle matrix);
- Feasibility of drug administration by both oral and inhalation route and
- Enhancement of drug bioavailability

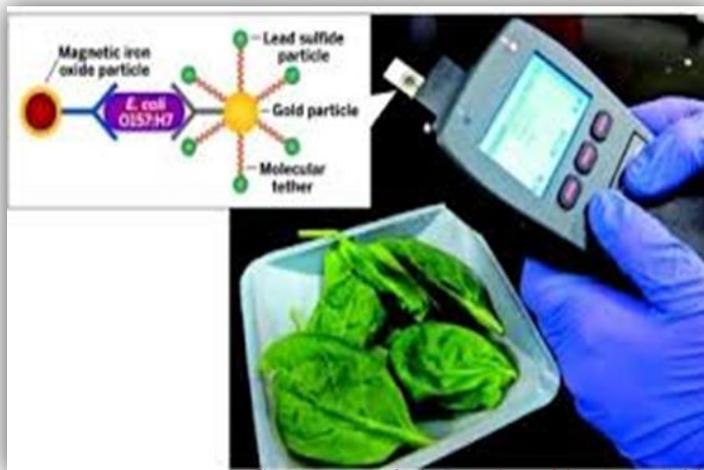
These advantages may develop new therapeutic procedures that will curtail the expenditure of treatment, improve patient acquiescence and, hence, lead to improved management & effective control of Multi Drug Resistant-TB and latent TB.



Dr. Shuchi Kaushik
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

NANOBIOSENSOR: TECHNOLOGY INNOVATION IN SUSTAINABLE AGRICULTURE

Agricultural sector is currently facing many challenges globally to attain sustainability and food security. Therefore scientific community have focussed on nanotechnology as new area in the agricultural sector, which is considered as most promising and fast evolving field. Nanobiosensor is advanced version of a biosensor consisting of compact analytical device incorporating a biological or biologically derived sensitized element linked to physicochemical transducer. Application of smart nanosensors and nanobased smart delivery systems offers better agricultural practices and their timely management, which significantly reduce the agricultural resource inputs like fertilizers, pesticides, herbicides, water etc. through effective real time monitoring of environmental variables. Nanobiosensors possess high sensitivity, towards wide variety of agrochemicals plant pathogens, virus, soil moisture and soil pH etc precisely.



Source: [google images/nanobiosensors/chip](https://www.google.com/search?q=nanobiosensors/chip)

The network of small nanobiosensors placed in the field can quickly detect plant viruses and other crop pathogens, insects, soil nutrients status, soil fertility and levels of environmental pollutants (contaminants). Nanobiosensors helps in quick response to faster remediation treatments and minimize agronomic resource inputs and maximize output, thereby help the farmers to maintaining farms and fields with precise control and timely management i.e., optimal time of sowing and harvesting of crop, irrigation of crop, application of fertilizers, pesticides and other treatments according to need by plant on the basis of physiological and environmental conditions. Thus help in enhancing crop protection, production and reduces environmental toxicity.



Dr. Raghvendra Saxena
Amity Institute of Biotechnology
Amity University Madhya Pradesh

VERMICOMPOSTING: A BENEFICIAL TECHNOLOGY FOR FARMING

Vermicomposting is the method of utilizing worms in the production of compost i.e. natural fertilizer. Earthworms are the efficient ecological contributors of nature which help in recycling of organic nutrients from dead tissues back to living organisms. The most common types of earthworms used for vermicomposting are brandling worms (*Eisenia foetida*) and red worms or red wigglers (*Lumbricus rubellus*). Earthworms feed on soil debris and after digestion this soil is converted into organic manure. Worm castings are very important to the fertility of the soil. The castings contain high amounts of nitrogen, potassium, phosphorus, calcium, and magnesium. Vermicompost is the excreta of earthworms, which is rich in humus and nutrients. We can rear earthworms artificially in a brick tank or near the stem / trunk of trees (specially horticultural trees).



By feeding these earthworms with biomass and watching properly the food (bio-mass) of earthworms, we can produce the required quantities of vermicompost. Vermicompost is rich in beneficial microflora such as a fixers, P- solubilizers, cellulose decomposing micro-flora etc. in addition to improve soil environment. It also contains earthworm cocoons and increases the population and activity of earthworm in the soil. It neutralizes the soil protection. It prevents nutrient losses and increases the use efficiency of chemical fertilizers. Vermicompost is free from pathogens, toxic elements, weed seeds etc. It minimizes the incidence of pest and diseases and enhances the decomposition of organic matter in soil. It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc. Due to efficient fertility power through castings, earthworms are considered as farmer's friend.

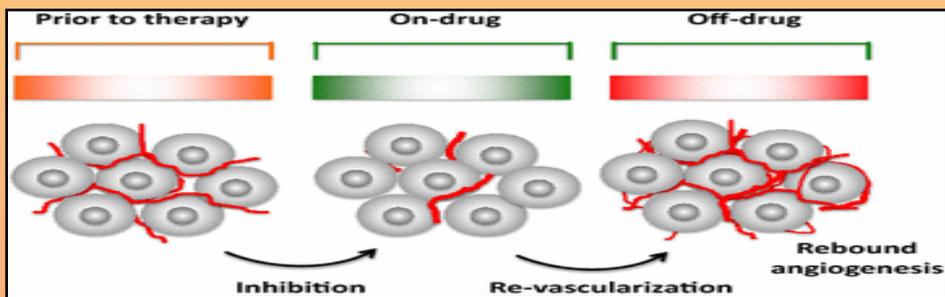


Dr. Shushmita Srivastava
Amity Institute of Biotechnology
Amity University Madhya Pradesh

ANTI-ANGIOGENIC INHIBITORS: AN EFFECTIVE DRUG FOR CANCER

Angiogenesis is the formation of new blood vessels from pre-existing ones. The process is controlled by chemical signals in the body. Other chemical signals, called angiogenic inhibitors, interfere with blood vessel formation. Normally, the stimulating and inhibiting effects of these chemical signals are balanced so that blood vessels form only when and where they are needed.

Angiogenesis plays a critical role in the growth and spread of cancer. Blood supply is necessary for tumors to grow beyond a few millimeters in size. Tumors can cause this blood supply to form by giving off chemical signals that stimulate angiogenesis. The resulting new blood vessels “feed” growing tumors with oxygen and nutrients, allowing the cancer cells to invade nearby tissue, to move throughout the body, and to form new colonies of cancer cells, called metastases.



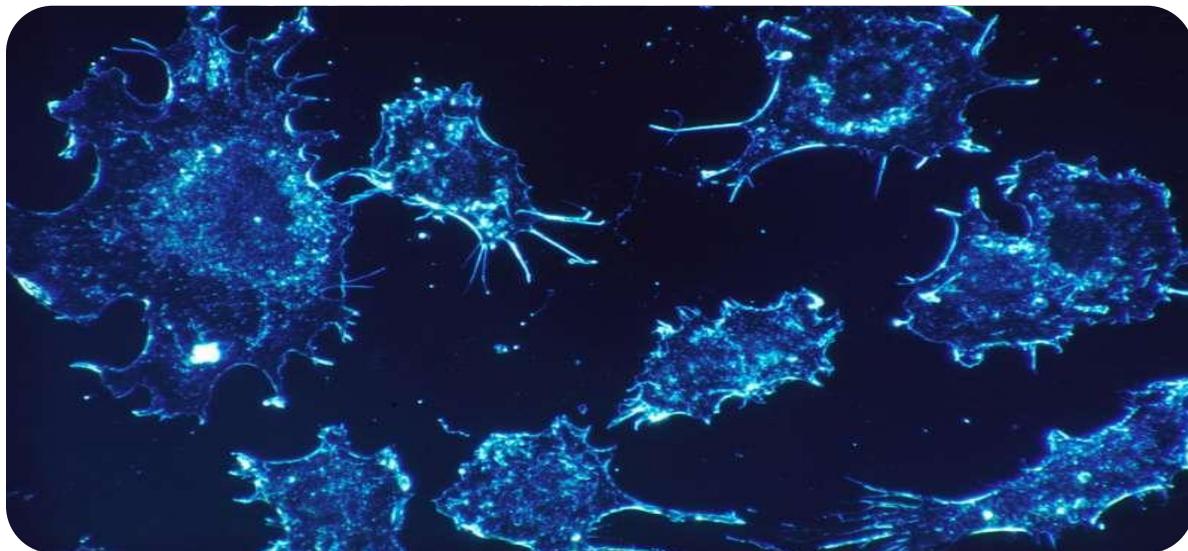
Angiogenesis requires the binding of signaling molecules, such as vascular endothelial growth factor (VEGF), to receptors on the surface of normal endothelial cells. When VEGF and other endothelial growth factors bind to their receptors on endothelial cells, signals within these cells are initiated that promote the growth and survival of new blood vessels. Angiogenic inhibitors interfere with various steps in this process. Treating cancer by blocking tumor angiogenesis, which was proposed by Judah Folkman nearly 45 years ago is now an universally accepted therapy. In contrast to antibody-based and soluble receptor-based biologics, small chemical compound-based drugs are far less specific. The most commonly used tyrosine kinase inhibitors (TKIs) that block VEGFR-mediated signaling pathways are small chemical molecules targeting a broad spectrum of kinases.



Ms. Sharmistha Banerjee
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

THE TUMOUR-SHRINKING NANOPARTICLES TO FIGHT CANCER

A Mayo Clinic research team has developed a new type of cancer-fighting nanoparticle aimed at shrinking breast cancer tumors, while also preventing recurrence of the disease. Mice that received an injection with the nanoparticle showed a 70 to 80 percent reduction in tumor size. Most significantly, mice treated with these nanoparticles showed resistance to future tumor recurrence, even when exposed to cancer cells a month later.



The results show that the newly designed nanoparticle produced potent anti-tumor immune responses to HER2-positive breast cancers. Breast cancers with higher levels of HER2 protein are known to grow aggressively and spread more quickly than those without the mutation. Animals treated with these nanoparticles showed a lasting anti-cancer effect. "Unlike existing cancer immunotherapies that target only a portion of the immune system, custom-designed nanomaterials actively engage the entire immune system to kill cancer cells, prompting the body to create its own memory system to minimize tumor recurrence. These nanomedicines can be expanded to target different types of cancer and other human diseases, including neurovascular and neurodegenerative disorders." Future studies in the lab will explore the ability of the nanoparticle to prevent long-term recurrence of tumors, including metastases at sites distant from the primary tumor. What's more, the nanoparticle is designed to be modular, meaning it can carry molecules to fight other types of disease.



Pallavi Singh Chauhan
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

BACTERIAL FOLIAR SPRAY ENHANCE PLANT GROWTH AND CROP YIELD

Microorganisms such as bacteria are important to promote the circulation of plant nutrients and reduce the need of chemical fertilizers as much as possible. Intensive farming practices require extensive use of chemical fertilizers, which are costly and create environmental problems, for warranting high yield and quality. Hence, there has recently been a resurgence of interest in environmentally friendly, sustainable and organic agricultural practices. Because of the reason, use of bio-fertilizers containing beneficial microorganisms instead of inorganic chemicals is positively known to affect on plant growth in terms of supplying of plant nutrients and may help to sustain environmental health and soil productivity. A number of inoculated bacterial species mostly associated with the plant rhizosphere have been tested and found to be beneficial for plant growth, yield and crop quality so far. They have been called plant growth promoting rhizobacteria (PGPR).



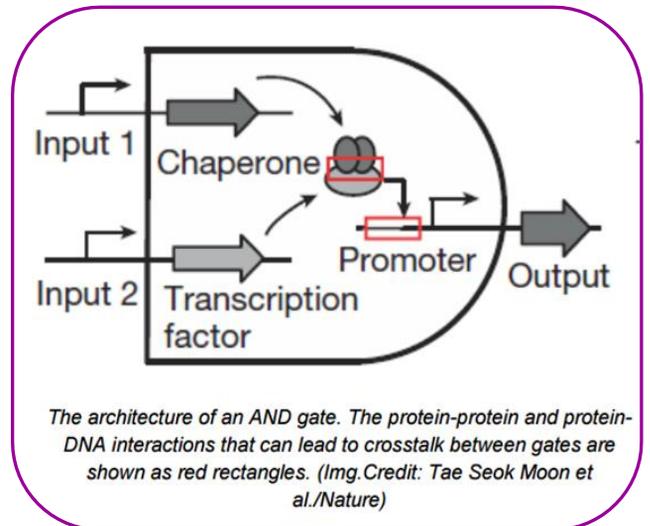
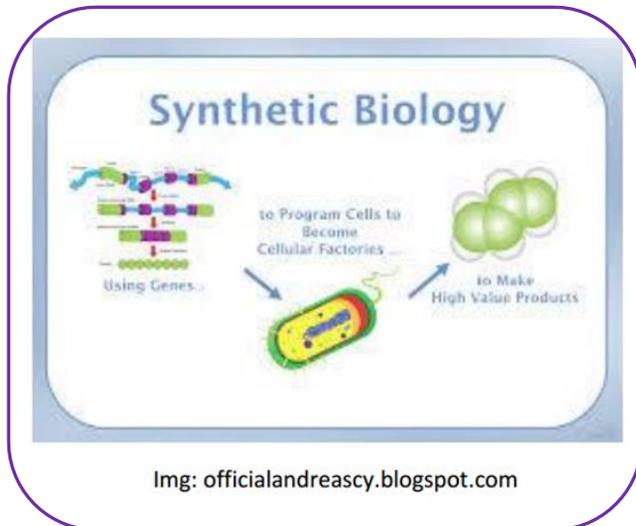
The foliar spray to the agriculture fields creating a revolution in farming. The effects of bacterial applications depend on the crop species. Bacterial application is safe, effective and easily adopted by farmers. The results of several studies showed that many plant growth promoting bacteria like *Pantoea agglomerans* FF, *Acinetobacter baumannii* CD-1, *Bacillus subtilis* BA-142 and MFD-2 have a great potential to increase plant growth in every respect. They increase the crop yield, growth and mineral contents of vegetable species and other crops. Such bacterial strains have the potential to benefit farmers in many ways and hence, its importance must be recognized by farmers as well as researchers. Therefore, they may be put to good use as spray biofertilizer for vegetable production and other crops in sustainable and especially ecological agricultural systems.



Aditi Jain
Student (B.Tech Biotech IVth sem)
Amity Institute of Biotechnology,
Amity University Madhya Pradesh, Gwalior

“SYNTHETIC BIOLOGY”- AN EVOLUTIONARY FIELD OF BIOTECHNOLOGY

The “Synthetic Biology”- An evolutionary field of Biotechnology According to a definition given by the UK Royal Society, "Synthetic biology is an emerging area of research that can broadly be described as the design and construction of novel artificial biological pathways, organisms or devices, or the redesign of existing natural biological systems."



Synthetic Biology is an exciting area of Biological Research and Technology that combines Science and Engineering. It encompasses a variety of different approaches, methodologies, and disciplines with a variety of definitions, as no widely accepted definitions exist. The common goal of this stream is the Design and Construction of new Biological Functions and Systems that are naturally not found in Nature. The simplest of all would be to say that synthetic biology is the application of engineering principles to the fundamental components of biology. This field is so exciting that it provides the future student researchers with the multitude of possibilities and give them a deeper insight into the “research of life”. Formerly, it focuses upon the approach of Biology, inserting man-made DNA into a living cell and Chemistry, working on gene synthesis as an extension of Synthetic Chemistry. The latter focus includes Engineering, building the new Biological System as a platform for various Technologies and rewriting, rebuilding the natural systems to provide the engineered surrogates.



Palak Rawat
Institute National de la recherche Agronomique
France
 [Alumni, Amity Institute of Biotechnology,
 Amity University Madhya Pradesh, Gwalior]

PANACEA BIOTECH



India's leading research-based health management company with established research, manufacturing and marketing capabilities is referred as Panacea Biotec Limited (PBL), which was incorporated on 2nd February 1984 under the name of Panacea Drug (P) Ltd. It is the second largest vaccine producer in India which has the product portfolio of highly innovative prescription products in important therapeutic areas such as pain management, diabetes management, renal-disease management, anti-osteoporosis, anti-tubercular, gastro-intestinal care products and vaccines. Panacea Biotec is a research based pharmaceutical and health management company involved in research, manufacturing, and marketing of pharmaceutical formulations, vaccines, and natural products. Panacea Biotec has introduced the next generation inactivated polio vaccine (eIPV) via a collaboration with the Netherland Vaccine Institute. It is focused on nephrology therapy in the highly specialized organ transplantation and dialysis management segments. It offers a range of pre-transplant and post-transplant therapies. Procure SBU of the company promotes brands with special focus on orthopedicians, surgeons, dentists, ENT specialists and gastroenterologists, along with consulting physicians and general physicians. Growcare is the respiratory and pediatric business of Panacea Biotec. It has plans to foray into the oncology segment to provide treatment for cancer, viz, breast cancer, brain tumor, ovarian cancer, pancreatic cancer, prostate cancer and colorectal cancer. 'Oncotrust' would be the new strategic business unit (SBU) which would be responsible for marketing these drugs. The company feels that it would be able to launch a novel drug delivery based anti-cancer drug in the near future. Even the effective drugs have been prepared for prostate cancer and Diabetes Type II.

Panacea Biotec consistently focuses on merging cutting-edge science and technology with its unwavering commitment to spread good health and healthy living. The company has collaborations and tie-ups with leading national and international research and commercial organisations and pharmaceutical companies to attain the mutual aim of better-quality healthcare. Drug firm Panacea Biotec has launched Easysix™, a liquid hexavalent combination vaccine indicated for immunisation of newborn babies against common preventable diseases. The company focuses on Innovation, Research and Development.

Amity Institute of Biotechnology is dedicated to enlighten and explore young minds with academic cum research background. Department aims to nurture the potential of all the students. The department is well equipped with modern and sophisticated instruments. Department is committed to develop their students competent enough not only for achieving good academic records but also to qualify national competitive examinations like CSIR, ICAR, ICMR NET , GATE, JRF/Lectureship.

Student cleared GATE-2017: Komal Shivnani, B.Tech Biotech VIII sem

Student awarded with DBT Fellowship during dissertation:

Gagan Jyot Kaur, M.Sc. Biotech IV sem

Student awarded with INSA fellowship for dissertation:

Suchi Agrawal, B.Sc. Biotech VI sem

Summer Internship/Dissertation by AIB Students (B.Tech, B.Sc and M.Sc/M.Tech. Biotech)

- | | |
|--|--|
| •National institute for cancer prevention and research (NICPR) | Mrinalini Parmar, Nandini S. Rathaur, Meenakshi |
| •Banaras Hindu University, Varanasi | Suchi Agrawal, Aditi Jain, Suchita, Tanya, Bhawna, Nidhi |
| •Delhi University | Pooja, Ayush, Shruti, Khushbu |
| •Barkatullah University, Bhopal | Snehal Khamba, Raunak Rai |
| •IIT, Delhi | Aarushi Sharma |
| •Jamia Hamdard, New Delhi | Shweta Thakur |
| •DRDE, Gwalior | Harshit Agrawal |
| •Indian Agricultural Research Institute (IARI) | Sailee S. asolkar, Ayushi |
| •IISER (Indian Institute of science education and research) | Aditi bhadauria, Aditi Pandey |
| •CSIR-NBRI (National Botanical research Institute) | Priya |

Student educational tour to National Institute of Plant genome research (NIPGR)

On 2nd March 2017 a total 31 undergraduate and post graduate students visited esteemed laboratory of NIPGR (a DBT research Institute) in JNU campus.



Glimpses of Educational Tour at NIPGR



Glimpses of AIB farewell-2017

