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Dinabandhu Andrews College

Department of Microbiology

Presents

Microbes & Us

Special Issue

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Find The Content

FROM THE EDITOR'S DESK

Dr. Swapna Mukherjee, Associate Professor, Department of Microbiology

I extend a very warm welcome to all the readers of the e-Magazine "Microbes and Us" published by the Department of Microbiology of our college.

Education is not an act of acquiring knowledge but learning a skill to lead life and forming one's personality. We, in the Department of Microbiology, focus on discovering, developing and dragging out the hidden talent lying inside our students. Through various activities all year round, we create an environment for future academicians, leaders, entrepreneurs, and professionals who possess skills and aptitudes in an array of functional disciplines.

We motivate our students to learn, to think and to express their mind and thus, to become a productive member of this ever changing global society.

This magazine is not just a collection of articles, notes and news or scientific activities that we curate but a perfect resume of what the Department of Microbiology truly stands for.

I congratulate the entire editorial team for their tireless work and the contributors for taking one step ahead on publishing this magazine.

I extend my sincere gratitude to our Principal, Dr. Somnath Mukhopadhyay and IQAC coordinator, Dr. Joy Sarkar for their encouragement and support.

We hope you enjoy reading this e-Magazine as much as we did in creating it.

MESSAGE FROM THE PRINCIPAL OF DINABANHU ANDREWS COLLEGE

Dr. Somnath Mukhopadhyay, Principal, Dinabandhu Andrews College

It is a matter of great pleasure to learn that the students of the department of Microbiology of Dinabandhu Andrews College are going to publish an e-magazine on a topic of general interest of all human beings inhabiting the planet Earth. The world has recurrently experienced the outbreak of microbe-borne diseases which severely threatened our existence on Earth. However, sincere endeavour of the scientists and medical personnel across the world negotiated with the problem and ensured healthy living of human beings from time to time. The present endeavour of the students of Microbiology of this college will certainly help us develop better understanding about the human-microbe interaction. I look forward for a brighter future of all of us.

MESSAGE FROM THE COORDINATOR OF THE IQAC

Dr. JOY SARKAR, FLS
Associate Professor, IQAC Coordinator

It's wonderful to learn that the MICROBIOLOGY Department publishes a regular in-house magazine called “Microbes and Us”. The department has my utmost respect for undertaking such a worthwhile project on behalf of the students. This will provide a forum for students to discuss the latest research in the field of Biological sciences, reminisce about their time in the department, document their academic endeavours, and welcome the newcomers to the department who were forced to stay at home during the pandemic. The department has always made it possible for students to do so by encouraging them to present at seminars and conferences. I applaud the Microbiology department’s teachers and students for embarking on this venture and wish them success.

MESSAGE FROM THE HEAD OF THE DEPARTMENT OF MICROBIOLOGY

Dr. Maitreyee Mondal, Assistant Professor & Head, Department of Microbiology

We, The Department of Microbiology, Dinabandhu Andrews College, dreamt for our departmental magazine, and our enthusiastic students invested their stupendous effort to successfully bring out the first edition of 'Microbes and Us" for the year 2023-24. It's a very proud and happy moment for our department as this magazine is a beautiful product of teamwork of all the students with the help of our inspiring, talented, helpful, caring teaching and nonteaching staffs. The most important aspect we could derive from this effort is that it brings out the various thoughts, bright concepts, innovative ideas, and creativity of the young students. My greeting is also to the editorial board to keep the good work. I am glad to welcome students with more interest in bringing the article with more bright concepts and innovative ideas in the next issue. I wish them to experience victory in all of their future endeavors.

I would like to express my gratitude and heartfelt thanks to all those who have contributed to make the effort successful. I thank the management for giving support and encouragement. I wish this attempt all success.

We hope that the esteemed readers will find the magazine interesting, intriguing and thought-provoking.

Happy reading

Diet Has a Strong Influence on the Composition of Gut Microbiome

Dr. Swapna Mukherjee, Associate professor, Department of Microbiology, Dinabandhu Andrews College.

Gut microbiota are the trillions of microorganisms that live inside everyone's digestive tract. Newborn babies get their first microbiome from their mother during birth, after which several internal and external factors like diet (especially fibre), genetics, medication, exercise, and defence molecules (the antimicrobial peptides) help shaping the community to its final composition. Due to their connection to many diseases, including inflammatory bowel diseases, obesity, diabetes, and even psychological disorders, they are now being studied extensively. The defensins are the largest group of antimicrobial peptides produced by all body surfaces, including the skin, the lungs and the gastrointestinal tract as immune system´s first line of defence against infections. They have also been thought to be essential in shaping the microbiota composition in the small intestine although their role as compared to diet, was unclear so far.

A study done by the researchers at Umeå University, Sweden, (Puértolas-Balint, F., & Schroeder, B. O, Microbiology Spectrum, 2023) showed that the diet has a much stronger influence in shaping the intestinal microbiota composition than defensins, the intestinal defence molecules produced by the body. To investigate this, the researchers used normal healthy mice and compared their microbiota composition in the small intestine to mice that could not produce functional defensins in the gut, and then both mouse groups were fed either a healthy diet or a low-fibre Western-style diet.

Analysis showed that defensins had only a very minor effect on shaping the overall microbiota composition. However, the intestinal defensins still had some effect directly at the gut wall, where the defensins are produced and secreted. A few distinct bacteria seemed to be affected by the presence of defensins, among them Dubosiella and Bifidobacteria, likely due to selective antimicrobial activity of the defensins. They also found that the combination of eating a Western-style diet and lacking functional defensins led to increased fasting blood glucose values, which indicated that defensins may help to protect against metabolic disorders when eating an unhealthy diet.

Therefore, it can be said from the result that to positively modulate the microbiota composition one should focus on diet than increasing production of own host defense molecules, defensins. However, it is possible that especially early in life, when the microbiota community is not fully matured yet, defensins may have a stronger effect on the microbial composition. Still, increasing the production of defensins may be a valuable option to prevent the development of metabolic disorders.

Can Plants Develop Cancer?

Dr. Tanmay Ghosh, Assistant Professor,
Department of Microbiology.

We usually say that an animal has cancer when it has a tumour, a clump of cells that multiply out of control. If we accept that as the definition of cancer then, yes, "Plants can get Cancer."

Plant tumours share some similarities with human cancers. Plant tumours are disorganised lumps of cells, similar to human cancers. They are often caused by problems with levels of the hormone's auxin and cytokinin. Cell replication is strictly regulated in animals and plants by genes that are amazingly similar in both groups. Auxin and cytokinins, as well as human hormones like oestrogen, can interact with these cell cycle genes.

When the hormones are out of balance, cells can start to multiply out of control. These cell cycle genes can mutate and stop functioning properly, causing cancers in animals. Plants are less likely to fall victim to these random mutations because they have many copies of most cell cycle genes, so another version can take over if one is put out of action. The bacterium Agrobacterium tumefaciens causes tumours called crown galls in many species of plant. The bacterium inserts its own DNA into the plant and messes up its growth hormones (auxin and cytokinin), creating an Agrobacterium-friendly tumour where it can live happily ever after.

It's rarely fatal but can cause some yield loss in perennial crops like fruit trees because gall production steals energy that could have been used to make more delicious apples or cherries. Fungi like *Ustilago maydis* can produce tumours in a similar way. *U. maydis* causes corn smut, turning ears of corn into the strangely grey and deformed Mexican delicacy known as huitlacoche. Geminiviruses cause tumours by directly interfering with cell replication in plants

Although it's uncommon, certain types of plants are quite prone to spontaneous tumours too. In a fun twist of fate, tobacco (Nicotiana) plants are particularly prone to developing cancer; when two species cross-breed with each other, the resulting offspring often develop tumours because of hormone regulation problems.Plants also have a few other fail safes to protect themselves from potential cancerous cells:Brain tumours are one of the deadliest human cancers, with an 85% mortality rate after five years.

The brain is such a vital organ that we cannot survive without it, but plants can regrow any damaged organs reducing the impact of a tumour. Plant cells are totipotent, which means they can develop into any cell type. If too many cells are produced in a leaf they can be incorporated into a normal structure. Each cell will be smaller than normal to maintain roughly the correct leaf shape overall.Plant cells are contained within a cell wall. Cancer cells can't squeeze into neighbouring tissues, so the tumour is restricted to one area. Plant veins are different to humans too; only water and things dissolved within it can move through the vascular system. Tumour cells can't cause new tumours elsewhere.Infections, unstable hormones and plain old mutations can cause plant cells to override regulation and begin to divide, but cell walls and a dynamic body plan means plants are able to stop tumours from spreading uncontrollably or doing too much damage.

Story of "Saheb"

Dr. Maitreyee Mondal, Assistant Professor,
Department of Microbiology.

It was almost 25 long years ago, I saw him in a village ground playing with a bunch of kids, during my visit to my aunt's place. And that scene took all my attention; a fully white boy (skin and hair), whom I was thinking as a foreigner (British??), was playing and talking with the local village kids in Bengali. The whole situation caught me by surprise. I asked my cousin sister about him; "Is this boy a foreigner?" According to my sister, he was Saheb, her neighbour, belongs to a Bengali family and his parents and all the relatives are "normal" (dark skinned, black hair). She added, Saheb was very jovial and loved to play, but unfortunately his vision is very poor. At that time with my little knowledge of genetics I concluded that, he must have any predecessor from foreign origin, meaning he was carrying genes from any foreign ancestor, proving this idiom true "A little knowledge is a dangerous thing".

One of the Sahebs with his parents

Much water was flowed under the bridge. Just after completing my post-graduation, when I was going to be started my Ph.D. research work, I was selected for the work on a genetic disorder named "Oculocutaneous Albinism (OCA)". And once I started reading about OCA, a mixed feeling of surprise, excitement embraced me. At that very moment, suddenly Saheb appeared in front of my eyes and I felt myself as Archimedes, screaming 'Eureka…Eureka'

Now before going to the main topic, i.e. Oculocutaneous Albinism, I should give some basic idea about human pigmentation and disorders related to it. Human pigmentation varies widely between world populations.

Nucleotide variations in several genes have been implicated as the cause of differential pigment (melanin) production. Pigmentation disorders are disturbances of human skin colour, either lighter or darker than normal or blotchy or discoloured which may be related to loss of melanocytes (melanin producing cells) or the inability of melanocytes to produce melanin or transport melanosomes correctly (hypopigmentation) or production of higher level of melanin (hyperpigmentation). Hyperpigmentation can be caused by many factors, from too much sunbathing to drug reactions or poor nutrition or may even be genetic. Wounds and scars also can develop darker patches of skin. In hypopigmentation, the body does not produce enough melanin. Albinism, for example, is an inherited condition that causes a lack of pigment and albinos have light skin, white or pale-yellow hair, and light blue or gray eyes. Pityriasis alba and vitilgo are few other diseases related with hypopigmentation.

Albinism (from Latin albus, "white") is a form of hypopigmentary congenital disorder also called achromia, achromasia, or achromatosis, characterized by a partial or total lack of melanin pigment in the eyes, skin and hair (or on rare occasion only eyes). This developmental anomaly is generally transmitted in an autosomal recessive fashion. There are two main categories of albinism in humans:

(a) In Oculocutaneous Albinism (OCA), there is reduction of pigment in the skin, hair and eyes. Pigmentation in people with oculocutaneous albinism ranges from total lack of pigment to – on rare occasions – close to normal levels. In this type of albinism, the reduction in melanin pigment in the skin results in an increased sensitivity to UV radiation and a predisposition to skin cancer.

(b) In Ocular Albinism (OA), only the eyes lack pigment but skin and hair colours are normal; this is rarer than OCA. In most cases ocular albinism is X-linked occurring almost exclusively in males. A less common type of ocular albinism shows autosomal recessive mode of inheritance viz. autosomal recessive ocular albinism" (AROA) that refers to milder variants of oculocutaneous albinism. In both these forms of albinism, the reduction of melanin pigment in the peripheral retina results in a stereoscopic set of developmental defects in neuronal migration in the visual pathways, thus leading to foveal hypoplasia, abnormal routing of the nerve fibers from the eye to brain with consequent low vision, photophobia, iris transillumination (due to lack of or decreased amount of melanin in the iris light passes through it to illuminate the anterior segment of the eye), nystagmus (rapid, oscillatory usually involuntary movements of the eyes, independent of normal eye movements, caused due to a disturbance in the sensory motor apparatus controlling normal binocular position), strabismus (also known as squint or crooked. eye, is a generic term applied to the conditions where the visual axes of the two eyes do not meet at the point or object of regard) etc. An OCA affected person is considered legally blind if he/ she has a visual acuity of 20/200 (6/60) or less in the better eye with best correction possible. This means that a legally blind individual would have to stand 20 feet (6.1m) from an object to see it – with vision correction – with the same degree of clarity as a normally sighted person could from 200 feet (61 m).

Mutations in genes that regulate the multistep process of melanin synthesis and distribution of melanin are the basis of this disease; e.g. tyrosinase (TYR), OCA2 gene, tyrosinase

related protein 1 (TYRP1), Solute carrier family 45, member 2 (SLC45A2 or MATP), ocular albinism 1 (OA1 or GPR143) etc. Till date at 21 different genes have been identified that on mutation can cause different forms of albinism in humans, among those genes four have been associated with "classical" OCA (Tyrosinase, OCA2, TYRP1 and SLC45A2) and another 17 genes with syndromic forms of OCA. If the disease prevalence in different populations of the world is considered, TYR, OCA2, TYRP1 and SLC45A2 are considered to be the most important associated genes and their defects lead to the classical OCA viz. OCA type 1 (OCA1), OCA type 2 (OCA2), OCA type 3 (OCA3) and OCA type 4 (OCA4), respectively.

So, Saheb is purely our 'Bengali Saheb' with misbehaved gene which gifted him poor vision and made him prone to skin cancer.

And I can remember, during my whole Ph.D. tenure, I had interacted with a bunch of 'Sahebs'...

Stimulatory as Well As Inhibitory Effect of Sesbania Grandiflora Flower Extract on Intestinal Bacteria

Dr. Ratna China, Lecturer in Microbiology.

Sesbania grandiflora, commonly known as the vegetable hummingbird, is a small leguminous tree. The Sesbania grandiflora or the humming bird tree bears a big white flower that is heartily used in Bengali cuisine. The tree's leaves, fruits and flowers can all be consumed – eaten alone as vegetables and added to curries or salads. It is also Known as Bok phool in West Bengal and the flower is commonly consumed by dipping in batter and frying. The flowers and leaves are enriched with vitamins and minerals and reported having anti-inflammatory, analgesic, and antipyretic effects. It is a flowery vegetable that can cure illness and diseases with wide health benefits. Polyphenol content of this flower has antimicrobial activity. The major contributors of phenolic substances in *Sesbania grandiflora* are simple phenolics acids. Traditionally the plant has been used for the treatment of headache, in fever, as a tonic, in catarrh, as an astringent etc.

Generally, bark is used as astringent and has been used in the treatment of small pox, ulcers in mouth and alimentary canal, infantile disorders of stomach, scabies etc. The juice of leaves of the *Sesbania grandiflora* have been reported to have anxiolytic and anticonvulsant, anthelmintic demulcent, expectorant, antipyretic and in treatment of bronchitis, cough, vomiting, wounds ulcers, diarrhea, dysentery etc.

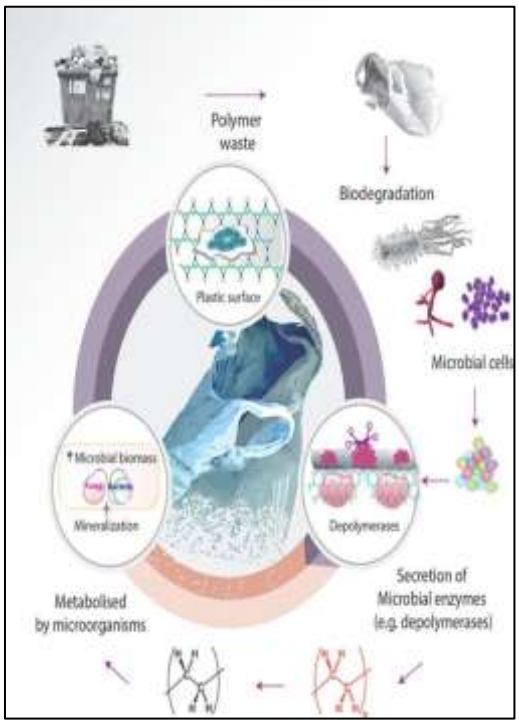
Some species of *Sesbania* are used frequently and widely in traditional medicine to treat gastrointestinal infections, cardiovascular diseases and have antibacterial and anti-viral activities. *S. grandiflora* flower water extract have been studied for antimicrobial effect against *Escherichia coli, Bacillus cereus and Staphylococcus aureus*.

But its effect on different antibiotic resistant enteric bacterial strains is still lacking. *S. grandiflora* flowers have ethnic use in prevention of diarrhea. In situ antimicrobial studies were conducted with food borne pathogen to evaluate the efficacy of *S. grandiflora* polyphenol extract in a modified food model during typical storage conditions of the test food. In vitro and in situ studies of polyphenol extract of *S. grandiflora* flower showed antagonistic effect on intestinal as well as food-borne pathogenic bacteria and simultaneously growth promoting effect on the typical intestinal probiotic bacterium, namely *Lactobacillus acidophilus*.

Antimicrobial screening of traditional medicinal plants has been the source of innumerable therapeutic agents. Few gram-negative enteric pathogens are susceptible to polyphenol extract of *S. grandiflora* flower and it is also effective against a gram-positive food borne bacteria Staphylococcus aureus. Human pathogens such as *Staphylococcus aureus* which are ubiquitous in food showed sensitivity to polyphenol extract of *S. grandiflora* in food matrices. The *Sesbania grandiflora* flower extracts have great potential as antimicrobial components against microorganisms and they can be used in the treatment of infectious diseases caused by resistant microorganisms. The in vitro growth stimulatory effect on probiotic bacteria and growth inhibitory effect on pathogenic bacteria might indicate the in vivo interaction of the polyphenolic extract and those pathogenic as well as probiotic organisms.

Plastic Eating Microbes: A Potential Solution to Environmental Cleaning

Smt. Subhasree Roy, Lecturer in Microbiology.



Plastic is widely used in every sector due to its stability, durability, and low cost. The widespread use of plastic results in the compilation of plastic waste in the environment. The buildup of such a vast volume of plastic garbage has emerged as the primary cause of environmental pollution, including air, land, and water pollution. Plastics contain various harmful chemicals and toxic substances that can leak and adversely affect humans and other organisms. Managing this much plastic waste is a very challenging task; therefore, an appropriate technique is needed to address this problem. Various methods are used, such as chemical, physical, and biological, to degrade plastic waste. Bacterial degradation is known to be the most effective technique for the biodegradation approach to overcome this issue. Biodegradation has played a crucial role in removing these polluting wastes more efficiently and eco-friendly.

The process of biodegradation involves a variety of bacteria & fungi, such as Acinetobacter baumannii, Bacillus cereus, Pseudomonas aeruginosa, Pseudomonas fluorescens, Rhodococcus ruber, Proteus vulgaris, Staphylococcus aureus, Aspergillus niger, Streptococcus lactis, Aspergillus glaucus, Aspergillus flavus, Penicillium, Micrococcus luteus and so on. Biodegradation of plastic takes place through various biochemical pathways, including biodeterioration, biofragmentation, assimilation, and mineralization. During biodegradation, bacteria produce enzymes like esterase, cutinase, laccase, lipase, and others that break down and transform plastic polymers into microbial biomass and gases. In plastic biodegradation, the environment is extremely important. Polymers break down as a result of environmental conditions such as light, heat, moisture, pH, and microbial action. These characteristics enhance the surface area of the polymer for microbial action, raising the biodegradation rate.

Plastic pollution in the marine environment is the cause of several hazardous and ecologically damaging effects. Plastic debris poses a direct threat to wildlife, with many and varied species documented as being negatively impacted by plastic items. Juvenile animals in particular often become entangled in plastic debris, which can result in serious injury as the animal grows, not to mention restriction of movement, preventing animals from properly feeding and, in the case of mammals, breathing. A wide variety of species have been reported to be negatively impacted by plastic debris: marine birds, sea turtles, fur seals, sharks and filter feeders are just some of those documented. Marine birds are particularly susceptible to ingestion of plastic objects that they mistake for food. Plastic ingested by these animals persists in the digestive system and can lead to decreased feeding stimuli, gastrointestinal blockage, decreased secretion of gastric enzymes and decreased levels of steroid hormones, leading to reproduction problems. Toxic chemicals, such as polychlorinated biphenyls (PCBs), nonylphenol (NP), organic pe (PAHs), polybrominated diphenyl ethers (PBDES) and bisphenol A (BPA) have been consistently found throughout oceanic plastic debris. pesticides, such as dichlorodiphenyltrichloroethane (DDT), polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ethers (PBDES) and bisphenol A (BPA) have been consistently found throughout oceanic plastic debris.

The presence of these compounds further increases the risks associated with ingestion of plastic debris by wildlife, and additionally, many of these compounds can undergo significant biomagnification and may potentially pose a direct risk to human health. These toxic agents have been linked to and are associated with many health problems, including developmental impairment (neurological impairment, growth abnormalities and hormonal imbalances), cancer, endocrine disruption, neurobehavioral changes, arthritis, breast cancer, diabetes and DNA hypomethylation etc. Awareness must be created about plastic pollution and its adverse effects on living organisms. Mass level through monthly campaigns and eminence of PE (polythene) pollution should be updated area wise to create awareness among the public. People should be encouraged to use eco-friendly products. Methods for Proper disposal of plastics must disseminate among people using all available media platforms. Selection of appropriate microbial strains, adapting suitable in-situ and ex-situ remediation techniques, continuous monitoring of remediation site, and proper maintenance such as providing proper aeration, nutrients necessary for microbial growth and physicochemical conditions are highly required. Genetic, molecular analysis for identifying genes responsible for producing plastic degrading enzymes and recombinant DNA technology can improve and accelerate remediation of plastic waste and its disposal. The awareness should be highly created at the school level by guiding the students to properly separate the biodegradable and non-biodegradable plastic waste before its disposal.

Biological Warfare

SHEWANTIKA DAS,
SEMESTER 6

Biological warfare, also referred to as germ warfare, is the use of biological toxins or infectious agents such as bacteria, viruses, insects and fungi for the purpose of killing, harming or incapacitating humans, animals or plants as an act of war. Biological weaponry is a living organism or a reproducing entity. (i.e. viruses, which are not universally considered "alive"). Entomological (insect) warfare is a subtype of biological warfare.

Direct use of infectious agents and poisons against enemy personnel is an age-old practice of war. In fact, in many conflicts, diseases have been responsible for more deaths than all the combat weapons used in combination, even when they were not consciously used as weapons. Biological weapons are commonly referred to as weapons of mass destruction, however those lethal biological weapons may cause mass deaths, but they are not capable of mass destruction of infrastructure, buildings, or equipment.

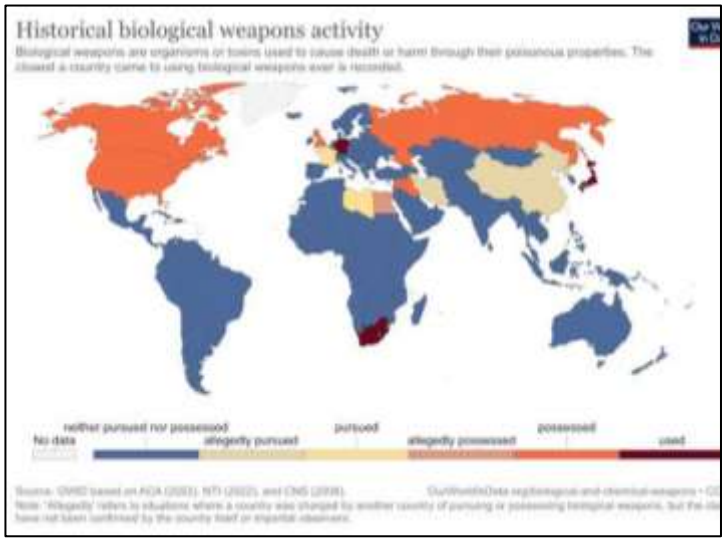
Biological warfare agents differ greatly in the type of organism or toxin used in a weapons system, lethality, length of incubation, infectiousness, stability, and ability to be treated with current vaccines and medicines. There are five categories of biological agents that can be weaponized and used in warfare or terrorism:

- Bacteria— single-cell organisms that cause diseases such as anthrax, brucellosis, tularemia, and plague.
- Rickettsiae— microorganisms that resemble bacteria but differ in that they are intracellular parasites that reproduce inside cells. Typhus and Q fever are examples of diseases caused by rickettsia organisms.
- Viruses—intracellular parasites, about 1/100 the size of bacteria, that can be weaponized to cause diseases such as Venezuelan equine encephalitis.
- Fungi— used against crops to cause such diseases as rice blast, cereal rust, wheat smut, and potato blight.
- Toxins— poisons that can be weaponized after extraction from snakes, insects, spiders, marine organisms, plants, bacteria, fungi, and animals. An example of a toxin is ricin, which is derived from the seed of the castor bean.

- **History -**

Rudimentary forms of biological warfare have been practiced since antiquity.

- The earliest documented incident of the intention to use biological weapons is recorded in Hittite texts of 1500–1200 BCE, in which victims of tularemia were driven into enemy lands, causing an epidemic.
- The Assyrians poisoned enemy wells with the fungus Ergot.
- Mongol warriors used plague infected corpse which were thrown over the walls of the besieged Crimean city of Kaffa. Which might had been the reason for the spread of the Black Death in Europe.
- Biological sabotage in the form of anthrax and glanders was undertaken on behalf of the Imperial German government during World War I
- At the beginning of World War II, the United Kingdom Department of Supply established a biological warfare program in Porton Down under the leadership of microbiologist Paul Fildes. The research was promoted soon tularemia, anthrax, brucellosis and botulism toxins were actually weaponized.
- Unit 731 in Manchuria, China. Dr. Ishii Shiro did Human experiments. Ishii and his men would perform experiments on live humans, infecting living subjects with plague rats, forced pregnancies, vivisections (often conducted without anesthesia), and inducing frostbite and trying to cure it.
- Japan Used typhoid warheads against Russians in 1939. Contaminated wells with typhoid in Harbin, China (1939-40), Caused cholera outbreak in Changchun (1940). Used plague infested rats in Nanking (1941). Operation Sei-Go (Scorched Earth)
- In Britain, the 1950s saw the weaponization of plague, brucellosis, tularemia and later equine encephalomyelitis and vaccinia viruses.
- In 2001, powdered anthrax spores were deliberately put into letters that were mailed through the U.S. postal system. Twenty-two people, including 12 mail handlers, got anthrax, and five of these 22 people died.

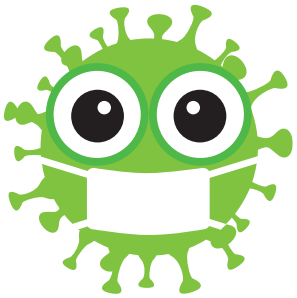


- **International Law -**

Offensive biological warfare is prohibited under customary international humanitarian law and several international treaties. In particular, the 1972 Biological Weapons Convention (BWC) bans the development, production, acquisition, transfer, stockpiling and use of biological weapons. Therefore, the use of biological agents in armed conflict is a war crime. In contrast, defensive biological research for prophylactic, protective or other peaceful purposes is not prohibited by the BWC.

- India signed the BWC with some reservations on January 15, 1973 and ratified the treaty a year and a half later on July 15, 1974.

Role of Viral Envelope Proteins in Host Cell Entry

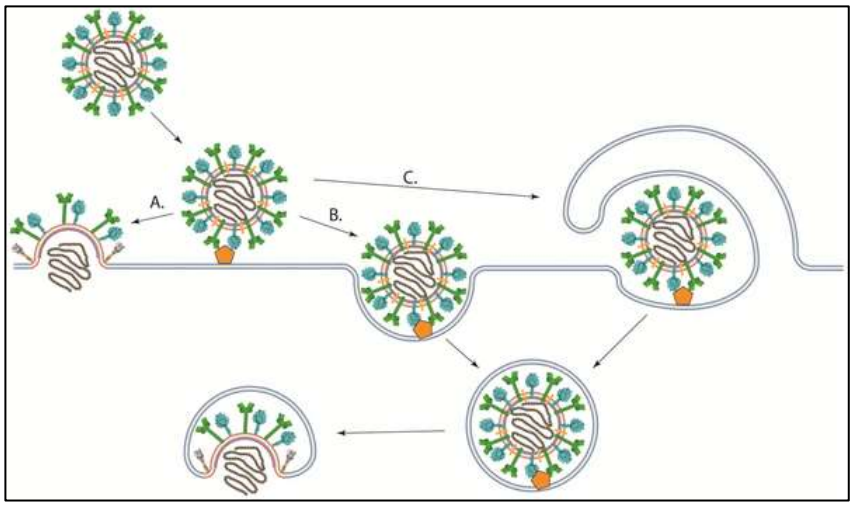


SOUMYA MAZUMDAR
SEMESTER 6

Viruses are obligate intracellular parasites that must infect a host cell to replicate. The membrane of the host cell serves as the basis for the lipid bilayer that forms the viral envelope, which shields the viral genome. A key component of interactions between viruses and hosts is the envelope protein, a membrane protein incorporated into the viral envelope. Many viral envelopes contain the glycoprotein known as the envelope protein. Both the virus's attachment to the host cell and its entry into the cell are controlled by it.

The envelope protein facilitates viral genome entrance into the cell and attachment of the virus to the host cell surface. The envelope protein goes through a conformational shift once the virus attaches to the cell surface, which encourages the fusion of the viral envelope with the cell membrane and the release of the viral DNA into the cell.

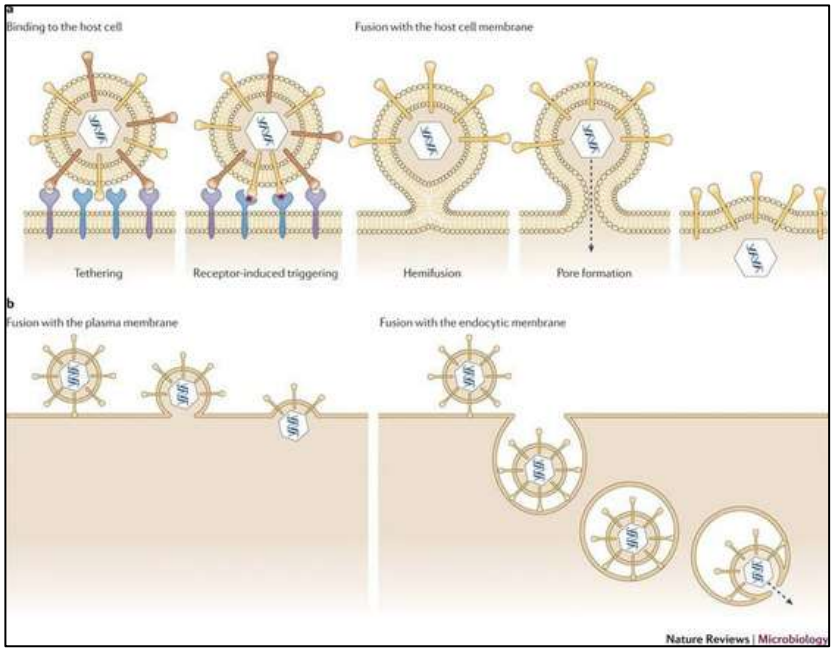
The protein is also necessary for the assembly and release of viruses from cells. Specialized viral proteins called fusogens promote the fusing of viral and cellular membranes. The structural changes that the viral fusogens go through during fusion produce the energy required to defeat the repulsive forces inhibiting the spontaneous fusion of the two membranes.



Schematic of different pathways of viral entry: (A) membrane fusion, (B) endocytosis, and (C) macropinocytosis

The glycosylation of the envelope protein in some viruses is crucial for the viability of the virus. The envelope glycoproteins play a key role in both viral entry and replication. The surface glycoproteins of an enveloped virus successfully interact with a cellular receptor to attach the virion to a particular host cell. According to structural biology studies, viral envelope glycoproteins have a variety of folds, which makes it simpler for viruses to attach to the appropriate host receptors. A key factor in the specificity of viral species is the envelope protein.

For instance, the human immunodeficiency virus (HIV) envelope protein interacts with the CD4 receptor on human cells, long while the envelope protein of simian immunodeficiency virus (SIV) binds to the CD4 receptor on monkey cells. As a result, HIV can infect only human cells and SIV can infect only monkey cells. The envelope protein is frequently the target of neutralizing antibodies. When a virus infects a person, the immune system frequently attacks the envelope protein. By preventing the virus from attaching to the host cell or by neutralizing the virus, neutralizing antibodies to the envelope protein can prevent infection.



The two steps of virus entry: binding to the host cell and fusion with the host cell membrane. The virus binds to cellular receptors (purple or blue) via envelope glycoproteins (brown or yellow) to tether the virus to the host cell membrane. Some receptor-binding events serve simply to tether the virus to the cell (brown glycoproteins and purple receptors), whereas others trigger conformational changes in the entry glycoproteins that mediate membrane fusion (yellow glycoproteins and blue receptors).

Following the fusion trigger, fusion of the viral and cellular membranes progresses through a hemifusion intermediate, in which the outer membrane leaflets mix. This is followed by full fusion, in which the inner membrane leaflets mix and a fusion pore is formed, resulting

in the release of the viral capsid into the host cell. b | Routes of entry. Herpes simplex viruses (HSVs) and Epstein–Barr virus (EBV) can enter cells by fusion at the plasma membrane or fusion with an endocytic membrane after endocytosis.

The shape and operation of the viral DNA can also be impacted by the envelope protein. For instance, the influenza virus's envelope protein interacts with the viral RNA and affects how the genome is packaged into virions. As the genome is transferred from one cell to another, this protein aids in preventing harm. This protein also facilitates the virus's attachment to cells and infection of those cells. The interaction between viruses and their hosts, as well as the virulence and species-specificity of the viruses, are largely determined by the envelope protein. The protein also plays a role in several critical processes, such as virus assembly and release, host cell environment regulation, and virus entrance into cells.

The Vaccine Conundrum

ARITRIKA MAJUMDAR
SEMESTER 6

On the eve of 16th January 2021, the Prime Minister of the country announced on live television that a mass vaccination drive against Covid-19 is going to be launched in India. Some people heaved a sigh of relief upon the arrival of the vaccine and yet in another part of the country someone wondered whether it would be safe to obtain the vaccine.

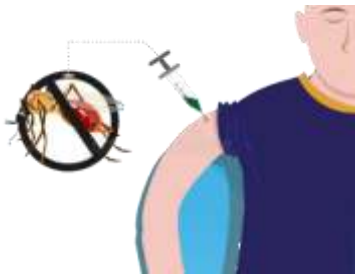
For an entire year, our countrymen have waited anxiously for the vaccine against Covid-19. "When is the vaccine going to come?" had become one of the most common dinner-table conversations in households. The influx of information about different vaccines being researched in different countries gave rise to another favourite term of the experts: Information Pandemic. Indeed, in the age of social media and digital media people can know everything and even offer their opinion in everything. However, when the vaccine was finally rolled out, in an ironic turn of events a large percentage of the population seemed hesitant to take the vaccine. When asked about their reasons for refusing the vaccine, the narratives took the form of **"we don`t know if this vaccine is going to work or not", "what if I get sick after being injected", "the scientists have rushed through the trials", and "this is an experimental vaccine. It's not safe" etc.**

Isolated incidents of people getting tested positive after taking the vaccine rose further suspicion and doubt in the minds of the general public. At one point of time, 3 vaccines in India namely, Sputnik V, Covaxin and Covishield were available to the public. With each vaccine coming with its own side effects, people were confused. Even the simple act of going to a clinic and getting injected, required intense discussion with family and friends who had taken any one of the vaccines. Along with this, unscientific misinformation spread by few individuals or groups added fuel to the fire. Such anti-vaxxing sentiments has the potential to set back the progress of public health in India. It also prevents other individuals to access the vaccines who might need it.

A study conducted by researchers and published in the 'Scientific Reports' journal of the Nature group reveals that 11% of Indians are hesitant or unwilling to get vaccinated. In an interview with Dr. Samiran Panda, distinguished and senior scientist at NICED, Kolkata, Dr. Panda reveals how this is not the first-time vaccine hesitancy has been recorded in India. "Vaccine hesitancy was encountered during MMR vaccination. Even with tetanus toxoid. This is not new in India. So, what the government did was design activities through social media, through television channels, through newspapers and through chat programs to address the issue of vaccine hesitancy among the masses."

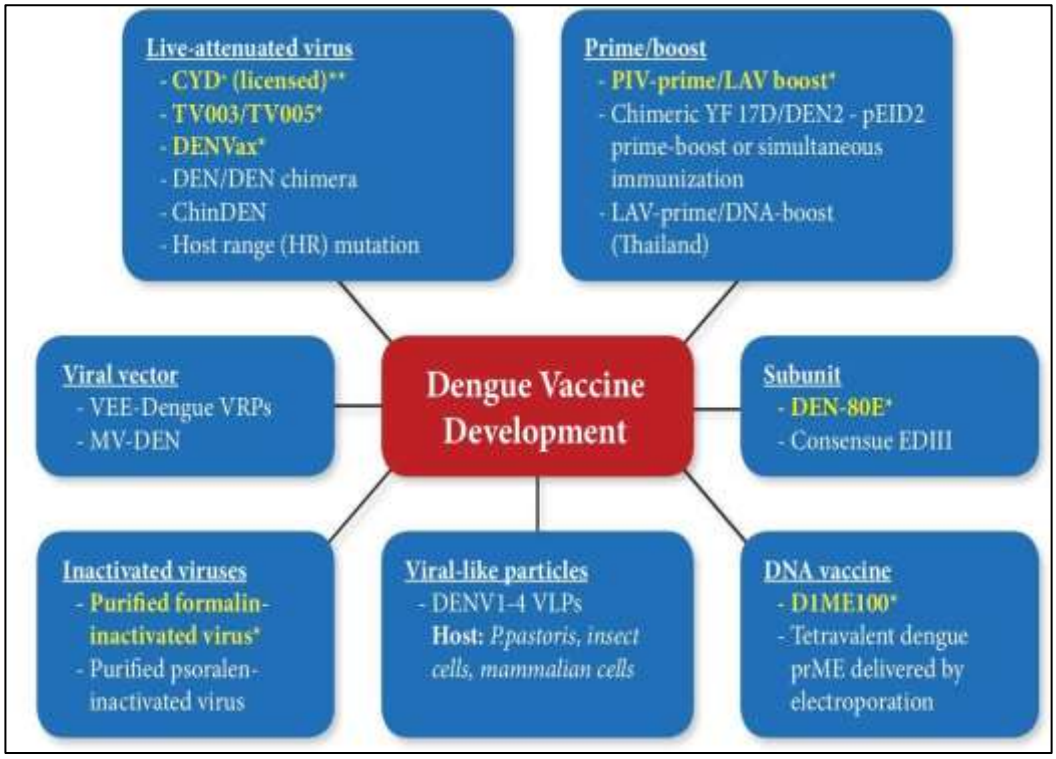
The Government of India set up its own portal where people can register themselves for free and take an appointment for getting vaccinated. The younger generation played a positive role by posting pictures of getting vaccinated with the caption 'hashtag, jabbed' Such positive influence on social media also had an impact by encouraging others to go get vaccinated. The Vaccination program in India took place in 3 phases. 30 million health workers who were dealing directly with Covid patients were the first recipients for the vaccine. As of 4th March 2023, India has administered over 2.2 billion doses overall, including first, second and precautionary (booster) doses. In spite of shortages of vaccine and hesitancy towards vaccination, India has managed to administer more than 2 billion Covid vaccination doses and thus becoming the second country to hit the milestone after China. In the coming days, the fight against newer viruses is going to continue and the countrymen can always cooperate with the scientists who are relentlessly working to win the war against such pandemics.

Development of Dengue Vaccine



ABHRAJIT MUKHERJEE
SEMESTER 4

Dengue virus (DENV) has become a global health threat with about half of world's population at risk of infection.DENV is self-limiting in first infection but usually becomes fatal as the antibody independent enhancement(ADE) effect increases in the second infection with a heterotypic virus. There is no efficient treatment available so it is essential to develop a vaccine in order to prevent it.



The development of a dengue vaccine has been an ongoing process for several decades. Dengue is a viral disease that is transmitted by mosquitoes and can cause severe flu-like symptoms, including high fever, severe headache, joint and muscle pain, and in some cases, haemorrhagic fever and shock, which can be fatal.

There are four different types of dengue virus, and infection with one type does not provide immunity against the other types. This makes vaccine development challenging because a

vaccine must provide protection against all four types of the virus. Several vaccine candidates have been developed over the years, including live-attenuated vaccines, inactivated vaccines, and subunit vaccines. The most promising vaccine to date is a live-attenuated vaccine developed by Sanofi Pasteur called **Dengvaxia**.

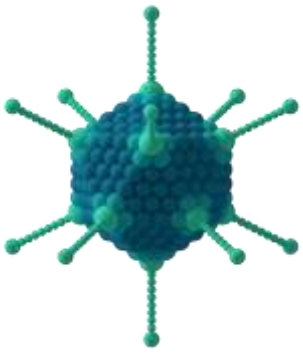
Dengvaxia was first approved in Mexico in 2015, and it has since been approved in several other countries. The vaccine is administered in three doses over a 12-month period and has been shown to be effective in preventing dengue in individuals aged 9-45 years. However, the vaccine's efficacy varies by serotype, and it is less effective against serotypes 1 and 2.

There have also been concerns about the safety of the vaccine, particularly in individuals who have not been previously infected with dengue. Studies have shown that in some cases, the vaccine can actually increase the risk of severe dengue in these individuals. Overall, the development of a safe and effective dengue vaccine remains a significant challenge, but progress has been made with the introduction of Dengvaxia. Ongoing research is focused on developing more effective vaccines and improving the safety profile of existing vaccines

Unlike other viral diseases, such as poliomyelitis, yellow fever, or mumps, dengue can occur in the presence of detectable levels of serum neutralizing antibodies. Higher levels of neutralizing antibodies correlate better with protection than low or undetectable levels of antibodies. The planned longer-term studies should help to determine whether a balanced neutralizing antibody response is maintained and identify correlates of protection. In a dengue-endemic region, exposure to DENV may boost vaccine-induced immune responses, which would not occur in individuals living in areas that are dengue free

In summary, dengue is a major and increasing public health burden causing high levels of morbidity and significant mortality in much of the world. Progress in dengue vaccine development over the last 50 years has been limited. Recently, a first-generation vaccine has been developed that induces significant but serotype-variable protection after multiple doses.

Adenovirus: Utilization for Advancement in Medical Science



CHHANDASHIK DASGUPTA
SEMESTER -2

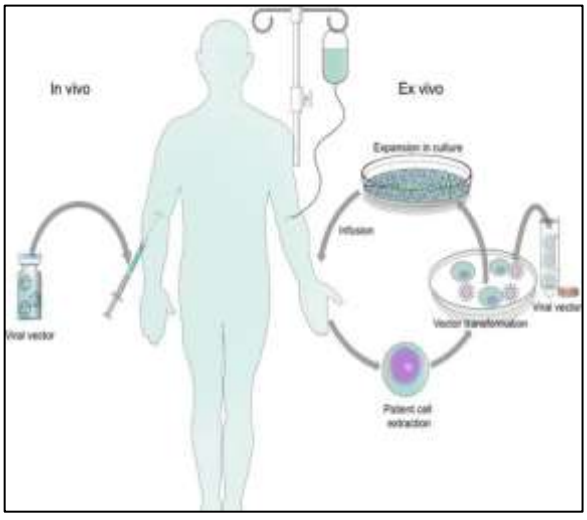
Adenoviruses are medium-sized (90–100 nm). The virions are composed of one linear piece of double-stranded DNA inside an icosahedral capsid. 240 hexon proteins make up the bulk of the capsid, while twelve penton bases cap the icosahedron's corners. Their name derives from their initial isolation from human adenoids in 1953

ROLE IN VARIOUS FIELDS:

- **GENE THERAPY:**

Adenovirus vectors are a popular viral vector for gene therapy due to their ability to affect both replicating and non-replicating cells, accommodate large transgenes, and code for proteins without integrating genetic material into the host cell genome. They have been found to be especially useful in treating monogenic disease (e.g. cystic fibrosis, X-linked SCID, alpha1-antitrypsin deficiency) and cancer. Ad vectors have many advantages, such as being well studied, able to be grown into high titer stable stocks, infect non-dividing and dividing cells of different types, and maintaining in cells as an episome. Most of these trials are for treatment of cancer, although some are for use of Ad vectors as vaccines.

Most Ad vectors are genetically modified versions of Ad5, and they are of two types: replication-defective (RD) and replication-competent (RC). The RD vectors have the essential E1A and E1B genes deleted and replaced by an expression cassette with a high activity promoter such as the cytomegalovirus immediate early (CMV) promoter.



These E1A-coded proteins are essential for Ad replication, and they alter expression of a multitude of cellular genes to facilitate Ad replication. Most

Ad vectors lack the E3 genes, which prevent infected cells from elimination by the immune system and are not essential for Ad replication in cell culture or in vivo. These E1A and E1B deleted vectors are usually constructed from plasmids or Ad DNA containing the genetically modified Ad genome, and they are grown up on complementing cell lines such as HEK293, PER.C6, or N52.E6 which retain and express the E1A and E1B genes.

Vectors deleted for E1A, E1B, and E3 can exhibit leaky expression of other Ad genes, which can be eliminated by a T cell response. However, many RD vectors also lack the E4 region, which encodes genes for double strand DNA repair and other essential functions. These E1A, E1B, E3, and E4 deleted vectors are much less leaky, and complementing cell lines for these vectors express E1A, E1B, and E4 proteins.

The "helper-dependent" (HDAd) vector is a type of RD Ad vector that has most of the genome deleted but retains the origins of DNA replication at each end of the genome as well as 500 base pairs at the left end of the genome that are required to package the genome into virions. HDAd vectors are constructed and propagated in the presence of a RC helper Ad which provides the required early and late proteins necessary for replication. Cell lines used to produce HDAd vectors conditionally express Cre recombinase which excises the loxP-flanked packaging signal from the helper Ad genome. The HDAd is separated from the helper by ultracentrifugation on cesium chloride density gradients and multiple rounds of purification are required. For large scale purposes, the HDAd and the helper Ad are separated by anion exchange and size exclusion chromatography.

- ## VACCINES:

Modified (recombinant) adenovirus vectors, including replication incompetent types, can deliver DNA coding for specific antigens.Adenovirus have been used to produce viral vector COVID-19 vaccines. "In four candidates

COVID-19 vaccines... Ad5... serves as the 'vector' to transport the surface protein gene of SARS-CoV-2". The goal is to genetically express the spike glycoprotein of severe acute respiratory syndrome coronavirus 2 (SARSCoV-2). A replication-deficient chimpanzee adenovirus vaccine vector (ChAdOx1) is used by the Oxford–AstraZeneca COVID-19 vaccine that has been approved for use.The Janssen COVID-19 vaccine uses modified recombinant adenovirus type-26 (Ad26).Recombinant adenovirus type-5 (Ad5) are being used by Ad5-nCoV,ImmunityBio and UQ-CSL V451. The GamCOVID-Vac (aka Sputnik-V) product is innovative because an Ad26 based vaccine is used on the first day and an Ad5 vaccine is used on day 21. Another one is ChAd-SARS-CoV-2-S; the vaccine reportedly prevented mice that were genetically modified to have human ACE2 (hACE2) receptors, presumably receptors that allow virus-entry into the cells, from being infected with SARSCoV-2.

Possible issues with using Adenovirus as vaccine vectors include: the human body develops immunity to the vector itself, making subsequent booster shots difficult or impossible. In some cases, people have pre-existing immunity to Adenoviruses, making vector delivery ineffective.

- ## CANCER TREATMENT:

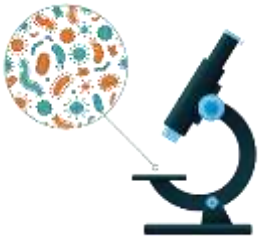
Cancer is a leading cause of death, and Adenoviruses (Ads) have become a promising therapeutic strategy for cancer treatment. Ads can be engineered to deliver transgenes that code for tumor suppressor gene (p53) and other proteins, as well as express tumor specific antigens, cytokines, and other immune-modulatory molecules.Ads have been used in cancer therapy to kill tumor cells. Gendicine and Advexin are replication-defective recombinant human p53 adenoviral vectors that have been shown to be effective against several types of cancer. Oncorine and ONYX-015 are oncolytic adenoviral vectors that have been shown to be effective against some types of cancer. Ads engineered to express immune-stimulatory cytokines and other immune-modulatory molecules such as TNF-, IL-2, BiTE, CD40L, 4-1BBL, GM-CSF, and IFN have shown promising outcome in treatment of cancer.

Ads can improve therapeutic efficacy of immune checkpoint inhibitors and adoptive cell therapy, and replication-deficient adenoviral vectors have been shown to induce strong antitumor immune response.

Adenoviral vectors can be used as a platform for anticancer vaccine development due to their ability to stimulate antitumor immune response. Replication-deficient adenoviral vectors are one of the viral vectors used as recombinant cancer vaccines as they because potent cell mediated and humoral immune responses against transgenes expressed by the adenoviral vectors.

Cytotoxic CD8+ T cells are a major component of anti-cancer immunity, as they recognize tumor antigen presented by MHC-I and when bound, trigger their cytotoxic activity. However, some tumor cells lower their MHC-I expression and avoid being detected by cytotoxic CD8+ T cells. Additionally, tumor cells use to escape cytotoxic CD8+ T cells by stopping expressing molecules essential for co-stimulation of cytotoxic CD8+ T cells such as CD 86 or CD80. To overcome the obstacles of using adenoviral vectors in gene therapy, innovative strategies must be developed.

Applications of Microbiology in Human Welfare

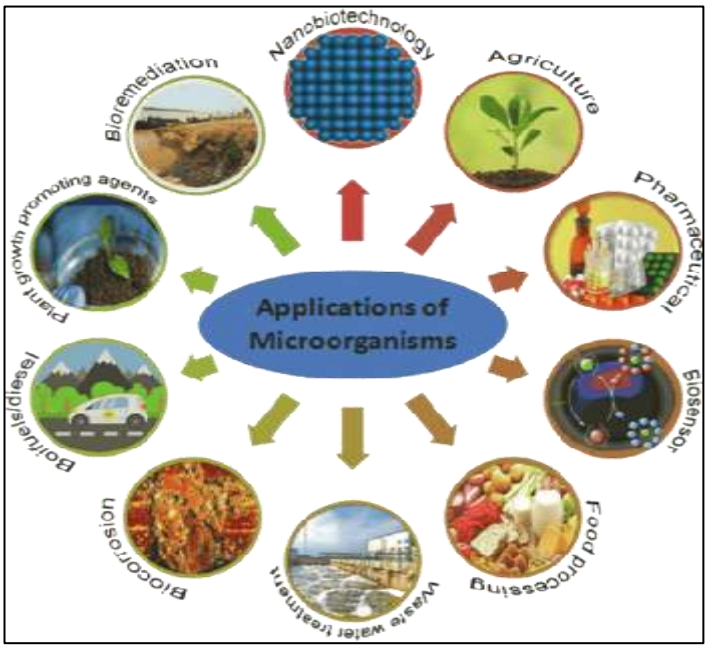


Aratrika Ghosh, Arinpam Ghosh
SEMESTER -2

Microbiology is a branch of biological science which deals with study of all living organism that are too small to be visible with naked eyes like bacteria, fungi, protozoa, virus etc. Microbiology helps in understanding microbes which causes disease, discovery of their treatment, development of various substances for industrial and human welfare. Microbiology is important in various field like food industry, health industry, agriculture industry, genetic engineering, biofuel industry for human welfare.

Fermented dairy products involves microbes like *Lactobacillus* sp., *Lactococcus* sp., *Streptococcus sp.*, *Penicillium sp*. For the preparation of yoghurt, curds, chesse etc. Microbes play an essential role for acid fermentation preparation of alcohol and vinegar in industrial basis, economical profit. Microbes increase the shelf life, taste, quality of the product.

Microbes also plays an important role in **Health Industry** by the preparation of vaccine, antibiotics, probiotics, etc. Vaccines are biological preparations which improves our body's immune system by phagocytosis of foreign particles. Ex-Rubella-R-VAC (vaccine). Antibiotics are chemical substances produced by certain living microorganisms which are detrimental to other microorganisms. Ex-Penicillin against lungs infection. Probiotics are beneficial live microbes like Lactic acid bacteria that Improves our gut flora and its health.



A large portion of **Agricultural Industry** is dominated by microorganisms contributing to the nitrogen cycle, production of biofertilizer, plant growth promoter etc. Microbes like Acetobacter sp., *Clostridium sp., Bacillus sp., Nitrococcus sp., Micrococcus sp.,* plays important role in the process of nitrogen cycle which involves the following steps: Nitrogen fixation, Ammonification, Nitrification, Denitrification for crop yield and agricultural manufacturing. Biofertilizers are substances which contain living microorganisms which increases soil nutrient for promoting crop yield.

Nowadays Microbiology deals with a special branch of Biology that's known as **Genetic Engineering**. Genetic engineering deals with the manipulating of genes under highly controllable laboratory conditions. This newly born technique has attracted the attention of microbiologists and is being applied in the food and drug industries, waste disposal, medicine, agriculture, oil pollution, and others.

Microbes are being used for biofuel production such as biodiesel, bio gas etc in **Biofuel Industry**. It is produced from living organism and their waste. Biodiesel is used as biofuel is defined as non-petroleum-based diesel fuel consisting of alkyl esters of long chain fatty acids. Biogas used as biofuel is a mixture of CH_4 and CO2 is produces from the methanogenic decomposition of organic waste under anaerobic condition. Its uses reduce air pollution in a good amount.

Apart from this microbe can be used in various fields like ***Ecology and Environmental microbiology, Exomicrobiology, Biochemistry and Physiology, Geochemical microbiology etc***.

Therefore, we can conclude that in comparison to other disciplines of science, the mission of microbiology is clearer, Microbiology is enough confident for its tremendous practical significance. There are lots of microorganisms of microbial world are yet to be discovered. Development of new isolation technique may lead to the discovery of new techniques. Our present knowledge of human pathogen relationship will establish in a new way if we find some extra informations about pathogens via their mode of growing cultures and reproduction process. Multiple drug resistance in present microbial pathogens have become a serious problem and can render a pathogen impervious to present day medical treatment. Microbiologists have to discover new drugs and find ways to slow or prevent the spread of drug resistance. Microorganisms are essential partners with higher organisms in symbiotic associationship. There is more knowledge of this associationship will lead to improve in the future, in the health of plants, livestock and human.

Lab, Life & Lessons

MARTINA CHAKRABORTY
SEMESTER -6

I remember reading somewhere, "Biology gives you a brain and life turns it into a mind." Little did I know back then, my UG Microbiology lab works would embody that quote. Whichever field we would choose after this, be it Masters or some other jobs, the life lessons learnt from the Lab will stay with us.

• Efforts Never Go Waste:

From colonies on the plates to DNA bands on the gel, we would stare at them in wonder as if we were children confronting natural phenomena. We were too curious to miss the preparatory phase of any practical, we reached early and stayed back even after college hours. "All these extra hours will eventually pay back", assured one of our seniors and they really do. Similarly, when we make honest efforts for something, we end up achieving even more than that. When putting blood, sweat, tears into something gives us satisfaction, working hard becomes a habit, destiny does not disappoint.

• Improvement Is Important:

Whether it be in microbiology lab or in life, even the silliest mistakes or a few seconds of carelessness can cost us millions. There were times when we were careless, and the consequences were inevitable. Initial days were very difficult, cotton plugs caught fire, killed poor microbes with hot spreader, P-20 micropipette got replaced with P-200 one and the list goes on. But with every passing day we improved. Now we check our pipettes twice before using, the lids of our petri plates bear the scars from hot spreader but the microbes survive! We go through the handouts before the work, make flowchart of the process, list out the materials. Yes, we still get yelled at for our mistakes, but we have improved a lot. Don't you think the daily improvement approach is applicable for the life out of lab as well?

• Patience & Perseverance:

Biology is no less than a mystery. There are times when you do not get the result and there is no explanation you can think of. Negative control in PCR shows bands and the whole process needs to get started from the scratch once again! I remember, we had to repeat an experiment almost thrice, we got frustrated but did not quit. One of our seniors in her MSc had to repeat a cloning experiment for almost 4 months to get the desired result. "When I finally got the result, the satisfaction was worth the sleepless nights", she said. What we learn from these exhausting, nerve wrecking practical works is, "Change your approach but never give up." When we do not give up, half of the battle is already won.

• Accept the Unexpected:

Unwanted results are still results! In this case you've two options, either ignore the deviation and manipulate the data in your lab notebook (which is not only unethical but also threatening; this practice is capable of killing lives) or be responsible for that and explain the result. Some break-through discoveries that changed the world for good, were actually happy accidents e.g., the discovery of Penicillin. Sir Alexander Fleming found mold growing on a Petri dish of Staphylococcus bacteria and preventing growth of bacteria around it. Technically, that was not the desired result, but it led to the introduction of antibiotics. There are chances that you also might stumble across an important discovery just like him, provided that you're openminded and willing to accept the result. Once we ace the art of accepting whatever challenge comes to us, overcoming it is just a matter of time.

How do we learn these from lab? It's simple. Carrying proper Lab attire, a notebook and a curious mind to the lab: this is all we have to do. The rest just follows.

Lab Insights

Lab Insights

Interview

Nothing is Too Taboo for Scientists to Research:

Dr. Samiran Panda is a tropical medicine specialist who is currently associated with ICMR-NICED. He is a clinician scientist of more than 20 years standing. Dr. Panda is a leader in the field of HIV prevention and care in South Asia with a substantial track record in clinical and epidemiological research, intervention design, evaluation and advocacy. He has worked as a short-term consultant of WHO in the delivery of anti-retroviral therapy for injection drug users (IDUs) and their partners in resource poor settings. During the last two decades he has played a key role in supporting the National AIDS Programs in India and assisting development partners in designing and implementing evidence-based interventions for HIV-prevention and care in South Asia.

Students of Department of Microbiology of DAC, Ms. Aritrika Majumdar and Ms. Martina Chakrabarty had an enriching conversation with Dr. Panda about his work and impetus with which he conducts his research.

Q. You are a leader in the field of HIV prevention and care. You have been associated with WHO for development and delivery of anti-retroviral therapy for injection drug users. What prompted you to work on this specific field of HIV?

A. I was a student at the School of Tropical Medicine, Calcutta. We had very good professors in Virology and during that course they used to talk about HIVAIDS. In those days we thought that in India it is not a big issue. Its more in Africa and US, but soon we were proven wrong when various countries started reporting the occurrence of AIDS. My friends and I were familiar with the new terms and virus and the new diseases coming up. We were shown slides where a haemophiliac person receiving blood transfusions was infected by HIV since in those days there was no screening or test for HIV. The disease was known but the virus was detected much later. We were taught how AIDS spread from the man to his wife through heterosexual transmission and from the mother to the children due to mother to child transmission. In those days AIDS was categorised as Gay Related Immunodeficiency Syndrome (GRID). Then I got this offer from the Indian Council of Medical Research (ICMR) to work in NICED. NICED in collaboration with the Manipur government investigated in 1988-89 the occurrence of HIV AIDS in injection drug users in the North East and it was realised that AIDS had taken the form of a rapid and explosive epidemic. Then the School of Tropical

Medicine wanted somebody who would go there because, for solving public health problems one has to be there at the site. So, I stayed there in the North Eastern states for 4 years and that is how the whole thing started.

Q. You have worked with sex workers and drug users the so called "tabooed" sects of society. How do find the motivation to work with them even after so much of discrimination and prejudice towards them? Have you faced any such major problem or dissent by any particular group or organisation while you were working with the sex workers or drug users?

A. If we think of injection drug users or female sex workers, they are more vulnerable to HIV/AIDS or other sexually transmitted diseases or blood borne infections. If we can understand the risks associated with such practices, they can also understand it. Despite understanding it, these key population groups are in a socio-cultural setting which pushes them to the fringe. During my college days while I was doing MBBS we always realised that the vulnerability of population groups or individuals are not necessarily due to individual behaviour which can be held responsible. The behaviour of an individual happens within a context and there is a reason behind it. Quite a few years ago, Dr. Mike Marcin said that "HIV AIDS leads to marginalisation, people say, but I think marginalisation causes HIV AIDS."

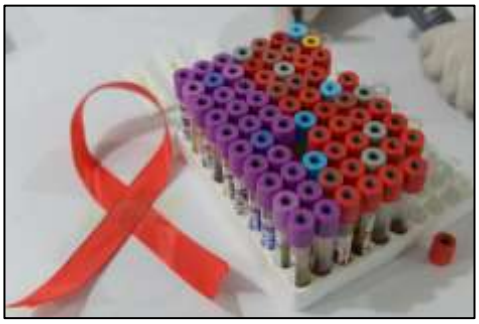
Our parents can afford to send us to schools and colleges but what happens to them whose parents are not able to send them to school. Due to their lack of an educational background they are not able to absorb the message that we trying to spread. The larger society fails to address this problem. Everyone needs a to make a living. In such a scenario, the means of livelihood can be sex work or drug peddling. So, there are many socio-cultural and economic factors that creates the vulnerability of an individual or key population groups towards AIDS and other STDs. There is no point in blaming them. Me and my friends had that understanding. Those days it was known that HIV does not spread just by sharing food from the same plate or by simple shaking of hands or by hugging, but even then, people behaved in a very stigmatising fashion. So, I decided that I have the opportunity to give back to society whatever I have learned. Practicing what you preach is very important. If I am saying in different awareness campaigns that HIV is not easily contracted than why not? All these convictions actually encouraged me to go to Manipur and I stayed there for years together. This whole stigma that the larger society attaches with the sex workers and injection drug users did not make sense to me. Their socio-cultural, economic and political context leads to marginalisation that causes the disease. So, what is the point of stigma and discrimination or being unnecessarily afraid? That does not serve as a solution.

Q. What is your personal opinion on the current scenario about people`s perception of HIV/AIDS? Compared to the 90`s how much has it changed?

A. You see when a disease is identified which is new and the virus is identified but there is no medicine then people remain afraid. They are scared of contracting the disease. But when the anti-retroviral medicine became a reality then this fear went down. One is the active involvement of key population group in intervention programs, working with them learning from them and understanding the context in which this is happening. This was one of the key ways in the early days when there was

no medicine. In addition to that , when the medicines got discovered, the anti-retroviral medicine and the combination therapy which consisted of the combination of 3 or 4 medicines to treat HIV, then people realised that HIV

is not a death sentence? It is a chronic manageable disease. We do not discriminate diabetic persons or people with hypertension. Those are also chronic manageable disease. You have to take your medicines every day. Similarly, AIDS is also a chronic manageable disease. So why unnecessarily discriminate? Right now, people have understood this. There is still stigma surrounding this, it is not totally removed but yes compared to earlier times the situation has improved.



Q. Sir, please share some of your work experiences in Manipur while you were working there with the infected population groups. Did you face any dissent from any individual or groups while you were working there on such a sensitive issue?

A. Doctors are again not different, they come from the society only. Not all doctors were free from fear or prejudice. I was in Manipur and I would be pay visit to the addiction treatment centres. The young people who underwent treatment there were my friends and they were even advisors in my research team. So, I always got them in my team and wanted to work with them. Here in West Bengal, in the rural setting I have female colleagues who are HIV positive. They have lost their husbands, some of their children are HIV infected but they came out openly with HIV and I work with them. So, we created a model where HIV positive people are working side by side with non-infected individuals. This model is called 'SPARSHA'. 'Sparsha' means touch. The full form of the SPARSHA is 'Society for Positive Atmosphere and Related Support to HIV AIDS.' We created this model and worked in rural and urban settings like Kolkata, Howrah and Paschim Medinipur. So that was how we tried to reduce stigma and discrimination.

Yes, initially people did not pay much attention and would think that this doctor mixes with the infected people. In Manipur they used to come in my quarters and we used to have food together. But the other doctors, I won`t say all of them but some did have some prejudice. There were doctors who were very passionate about their patients and did not have any prejudice or discriminatory attitude. Gradually through the work of my colleagues here in West Bengal and in other parts of Manipur and in other parts of India the change has happened. It's like a silent storm; a change which has happened due to active involvement of key population groups in the program execution and monitoring. The Government also started learning about all this much later. It was not an overnight achievement for the government.

Q. There has been an increase in the number of cases of Covid-19 infection. Is there any possibility that their will be a repeat of the full-blown pandemic in the near future?

A. We have gone through 3 distinct waves of Covid-19. During 2020 there was no

vaccine. The vaccines started rolling out on 16th January 2021. Now we have a population in India which has been exposed to infection. People have also received their first dose, second dose and the booster dose. So, vaccine induced immunity is there, infection induced immunity is also there. The population group has certain immunity built, not necessarily through natural infection but also vaccine induced. So that is why the term 'Hybrid immunity' is used. Even if immunity comes down, people are infected from one another, and remain asymptomatic. Not everybody following infection, is symptomatic. In fact, in Covid-19, 80% of the infected people were asymptomatic. So even if Covid-19 infection cases are increasing, it is not a great concern for India and at the moment I won`t project that it is going to be another big wave. But yes, those who are elderly should use masks and before going to mass gatherings we should take necessary precautions. People who are with co-morbidity might land up in advanced stage, so they also need to be careful. I won`t consider this as a preamble to a large wave of infection.

Q. The Covid 19 pandemic had changed our perspective of life and science and how those two are intertwined. More and more students are now willing to enter the science field and pursue research. As a senior and stalwart scientist, yourself what would be your message to all the young people out there wanting to pursue a career in science?

A. I would say for any young aspiring researchers or scientists in any stream or school of science should not be afraid of asking questions. Be it at home or be it at their educational institute. Sometimes it is believed that asking questions is a sign of disrespect which is not true. Most importantly, go out where the problem is. Sitting in your room, in your comfort zone might not help you to answer the question that you're itching for an answer to. Go out there in the community and understand the problem first. There is a saying that if you have just 1 hour to solve a problem it is a good use of time to think about the problem and the nature of the problem for 50 to 55 minutes. The answer will probably come out in 5 minutes if you have understood the problem well. It might sound a bit simplistic but it underlines the importance of understanding a problem well before jumping into an attempt to solve it. So, go out in the community, be with the people, come out of your comfort zone and don`t be afraid to ask questions. The answer mostly lies in the society or community where the problem lies. So, if need be, keep your books aside, step outside and be with the community to understand the context of the issue which you are trying to solve.

Students with Dr. Panda

Petri-Art

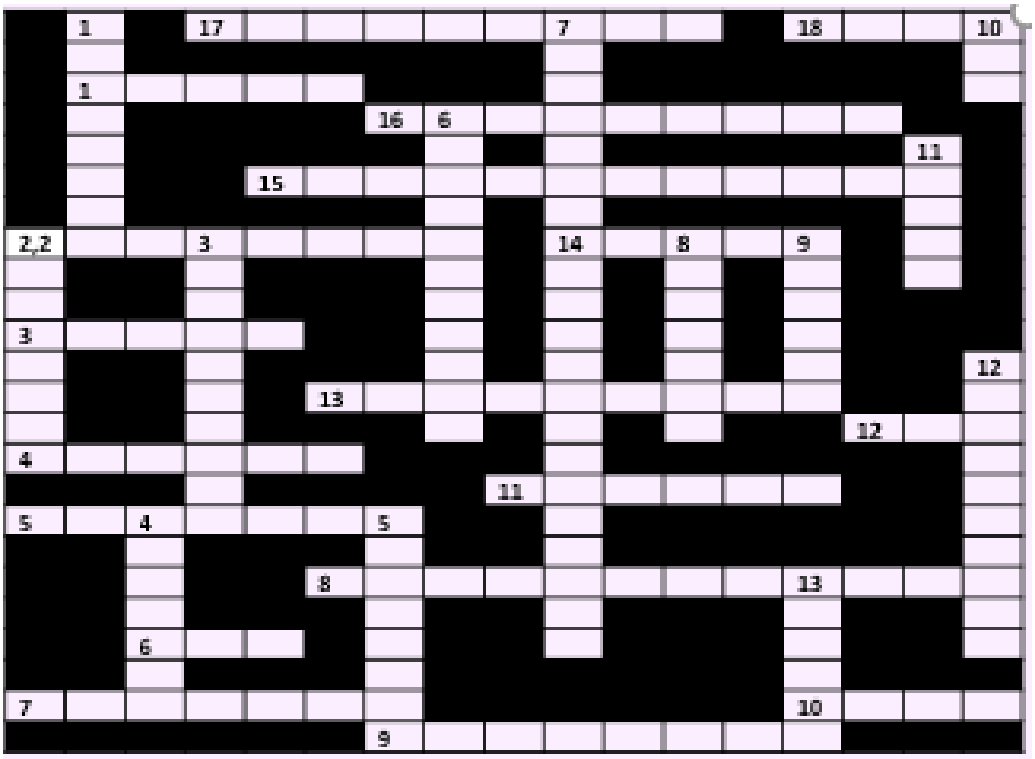
Joyita Chowdhury
Semester 6

Anwesha Pal
Semester 6

Himadri Shekhar Paul
Semester 6

Nilanjana Ganguly
Semester 6

Cross – Word



Across	***Down***
1. Spherical shaped bacteria 2. Organism which requires a host to live 3. Something spiral in form 4. A filamentous N_2 fixing bacteria 5. Formulation that stimulates body's immune response against disease 6. Most abundant genetic molecule present in every living 7. Discontinuous strands of DNA 8. Study of microorganisms 9. Most abundant structural proteins found in animals. 10. Coding portion of the gene 11. Carrier for a part of DNA fragment.	1. Most abundant single celled organism. 2. Agent responsible for causing a disease. 3. Drug that mostly kill pathogenic microorganism. 4. Asexual non-motile spore of fungi. 5. Outbreak of an infectious disease at the same time and community. 6. Organism that contains only a single cell. 7. Father of microbiology. 8. Causative agent of Measles. 9. A mixture of saliva and mucus coughed up from respiratory tract

12. Glucose degradation pathway. 13. Locomotive organ found in some bacteria. 14. Non-cellular proteinaceous disease-causing entity 15. A reproductive particle produced by Basidiomycete fungi. 16. Organism that can produce their own food using light, water and other chemical compound. 17. A laboratory instrument used in sterilizing microbiological media and goods. 18. Unit heredity passed from parents to child	10. Alternative for glycolysis 11. Eukaryotic single cell microorganisms 12. Organism that lives on dead/decaying organic matter. Symbiotic association between an alga and a fungus

Creative Strokes

Himadri Shekhar Paul
Semester 6

Ananya Das
Semester 6

Creative Strokes

Srabasti Barai
Semester 6

Joyita Chowdhury
Semester 6

Creative Strokes

Ritish Halder
Semester 2

Somali Chowdhury
Semester 2

Micro- Quiz

How well do you know Microbiology?
Answers on page 65

1. *Who proved that microorganisms cause disease?*

2. *Nitrogen bases are building blocks of:*

3. Proteins are formed by amino acids connected by:

4. *Which ATP synthesizing process requires proton gradient across inner mitochondrial membrane?*

5. *Which microscope uses an ultraviolet source of light ?*

6*. Molecules that are the primary building blocks of the plasma membrane in cells , are*

7. *Edward Jenner is credited for what?*

8. *Which theory states that "Life arises from non-living matter" ?*

9. _____ *are multi-cellular, eukaryotic organisms that derive nutrition from heterotrophic mode of nutrition*

10*. You want to know if a bacteria has a capsule, what do you use to identify it?*

11. *A cell is placed in a solution and the cell lyses. The solution is :*

12*. What type of microscopy uses fluorochromes and laser light to produce a 3D image ?*

13*. The popular anti-septic mouthwash Listerine is named after which famous British surgeon and medical scientist?*

14. *Which scientist developed a high-resolution microscope that enabled him to discover and record many microorganisms ?*

15*. Amino acids exist in which form in biological systems?*

16*. Name two primary lymph organs in human body*

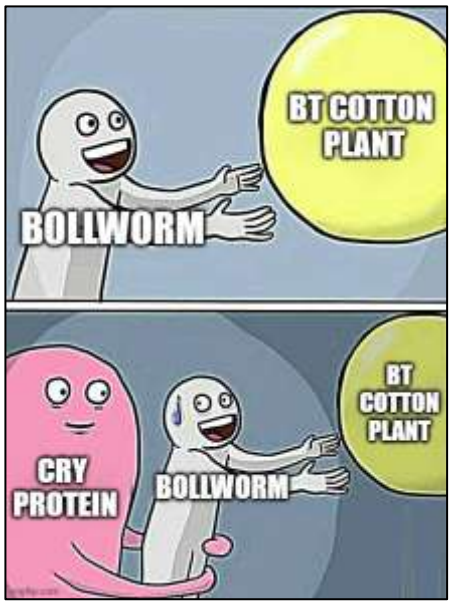
17. *Which vector is used in the synthesis of Covishield vaccine?*

18. *Which Indian born scientist is credited for making a genetically engineered new species of Pseudomonas bacteria that is used in bioremediation?*

Micro-Laugh

Arya Sarkar
Semester 6

Srabasti Barai
Semester 6

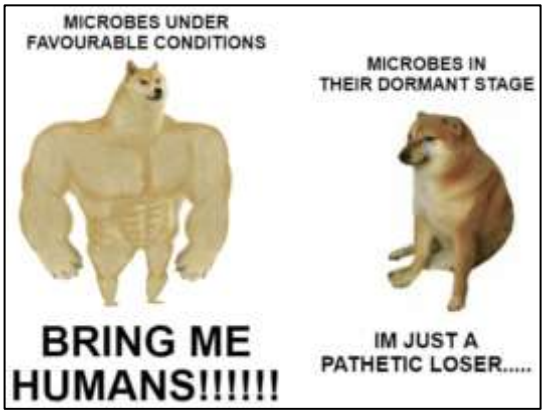


Anwesha Pal
Semester 6

Sreyosee Chabri
Semester 6

Micro-Laugh

Joyita Chowdhury
Semester 6



Malay Shubhra Singha
Semester 2

Shrestha Rooj
Semester 4

Surati Das
Semester 2

Through the Lens

Himadri
Shekhar Paul
Semester 6

Shreya Dutta
Semester 6

Through the Lens

Surati Das
Semester 2

Shreya Jana
Semester 6

Through the Lens

Debshakhi Chakraborty
Semester 6

Soumya Mazumdar
Semester 6

Through the Lens

Madhumita Halder
Semester 6

Ananya Das
Semester 6

Departmental Activities

Observation of Leprosy Day (31st January, 2022)

A webinar in collaboration with Microbiologists Society of India, WB unit and Premananda Memorial Leprosy Hospital

Celebration of International Mother Language Day

(21st Feb, 2022)

Observation of National Vaccination Day

(16th March, 2022)

Handmade poster competition

Observance of World Health Day (7th April, 2022)

Free Health Camp

in collaboration with Microbiologists Society of India, WB unit and Premananda Memorial Leprosy Hospital

Student-Teacher Interaction

Bidding farewell to Batch 2019-22 (8th August, 2022)

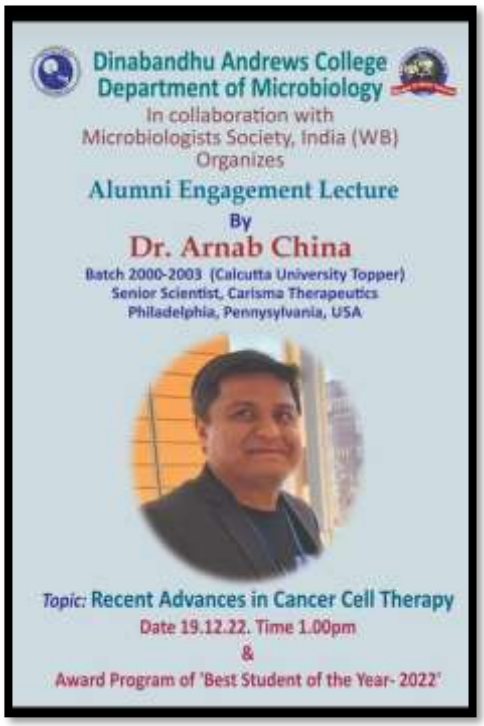
Teachers' Day celebration (12th September, 2022)

Student-Teacher Interaction

Welcoming new batch of 2022 (24th November, 2022)

Alumni Engagement Program (19th December, 2022)

Lecture by Dr. Arnab China, senior scientist of Carisma Therapeutics, USA



Celebration of International Microorganism Day

(16th September, 2022)

Fermented Food Festival

organised in collaboration with Dinabandhu Andrews College

Celebration of National Science Day
(28th February, 2023)

E-Poster and Meme competition
in collaboration with Microbiologists Society of India, WB Unit

Student Seminar on Medical Microbiology and Instrumentation

Educational Tour

Study Trip to NIBMG Kalyani (1st April, 2022)

Excursion to Ranchi (11th August–15th August, 2022)

Young Talents

Model Presentation Competition:

1st - Snigdha Bhattacharya, Anushrita Dutta, Ipsita Chakraborty, Swastika Acharya, Malay Shubhra, Singha Surati Das

Martina Chakraborty & Joyita Chowdhury, Third Position in Poster Competition at the Annual Meet of Microbiologists Society of India, West Bengal Unit

Young Talents

Drawing competition:
1st Swastika Acharya
2nd Somali Chowdhury
3rd Aratrika Ghosh

Martina Chakraborty, third position in a debate competition organised by Economic Department of DAC

Martina Chakraborty, awarded as "Best Parliamentarian" & "Best Leader of the Opposition" in District Level Youth Parliament Competition organized by Government of West Bengal Department of Parliamentary Affairs

Young Talents

Microbiology Football team
with Gopal sir

Man of the match:
Diptayan Halder

Srejeeb Chowdhury,
First in Table Tennis Tournament

Fair Play Winner

Young Talents

Food Fest:

1st : Kimchi
Sreyosee Chabri, Pronohotoshmi Bakshi, Himadri Shekhar Paul, Srabasti Barai, Agnihotra Mukherjee, Puja Kar

1st: Sima & pineapple lassi.
Haimanti Samadder, Debleena Mondol,.Sneha Mondol, Sharmistha Guha Ray

2nd: Idli
Martina Chakraborty, Madhurima Thakur, Subhomita Chakraborty, Joyita Chowdhury, Aritrika Majumdar, Shewantika Das

3rd: Kefir
Abhrajit Mukherjee, Meghna Sahu, Somak Tripathy, Sandipan Mondal Samyo Basu Majumdar

Young Talents

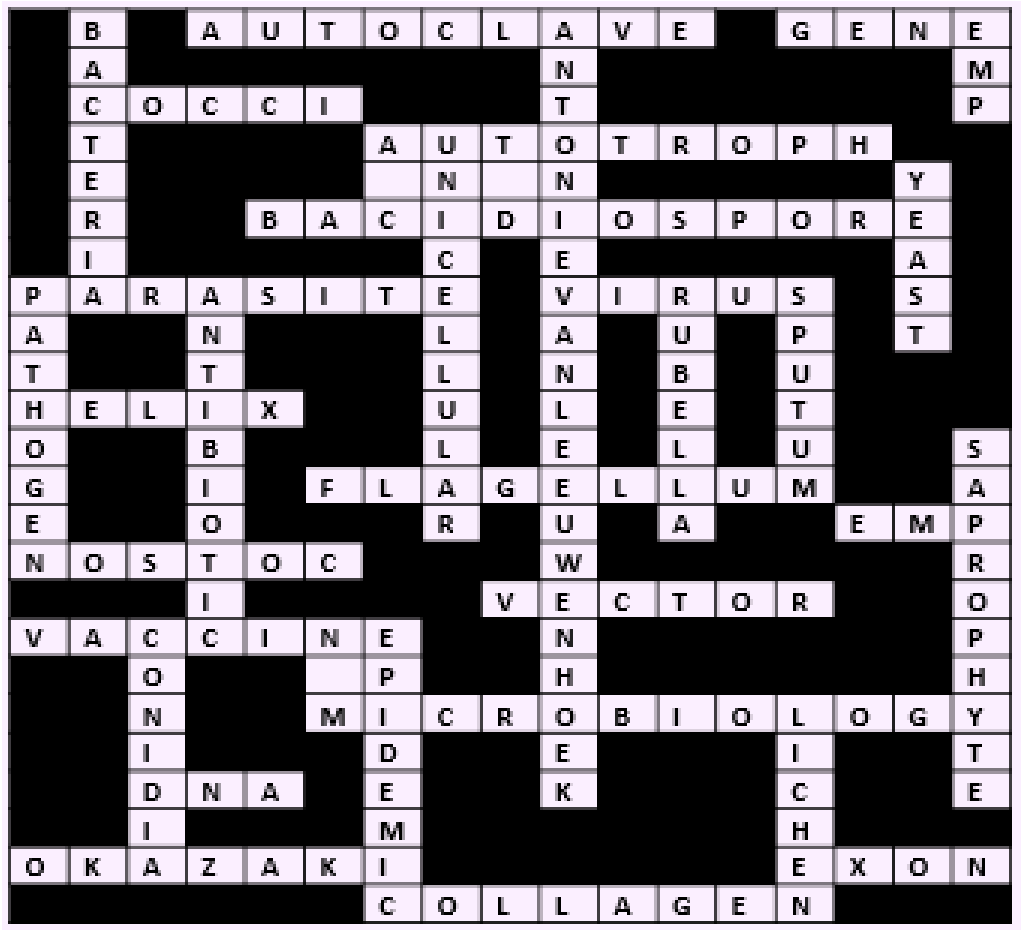
Poster Competition:

1st: Sohini Banerjee

2nd: Abhrajit Mukherjee, Sandipan Mondal, Samyo Basu Majumdar, Sanskriti Ghosh

3rd: Bidisha Dutta, Apeksha Giri, Dhiman Mondal, Rageshree Chowdhury

Crogg-Word Solution



Micro Quiz Answer

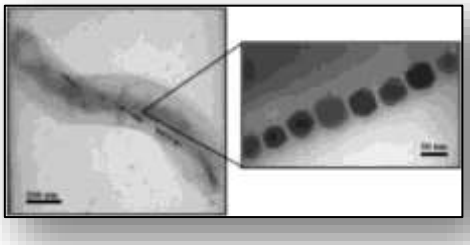
1. Robert Koch
2. Nucleotides
3. Peptide Bond
4. Oxidative Phosphorylation
5. Fluorescence Microscope
6. Lipids
7. Developing the process of vaccination
8. Theory of spontaneous generation
9. Fungi
10. A negative stain
11. Hypotonic
12. Confocal microscopy
13. Joseph Lister
14. Antonie van Leeuwenhoek
15. L-form
16. Bone marrow, thymus gland
17. Recombinant, replication deficient chimpanzee adenovirus vector
18. Dr. Ananda Mohan Chakrabarty

Did you know?

Earthy smell after raining, This special odor, also referred to as petrichor, actually comes from a bacteria called as *actinomycete* in soil.

Cordyceps is often referred to as the "zombie-ant fungus" because it really can hijack the brains and bodies of insects, turning them into real-life zombies.

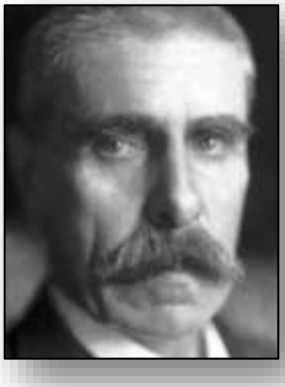
You are more likely to be struck by lightning than to be eaten by a shark. You are more likely to be infected by flesh-eating bacteria than you are to be struck by lightning.

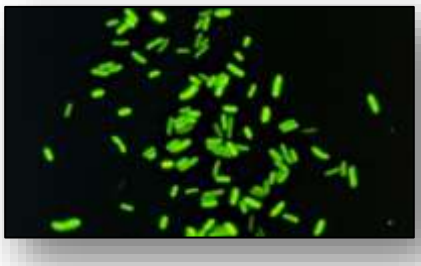


Magnetotactic bacteria biomineralize a unique organelle called the magnetosome. Magnetosomes consist of a nano-sized crystal of a magnetic iron mineral. Magnetosome chains causes the cell to behave like a miniature compass needle

Did you know?

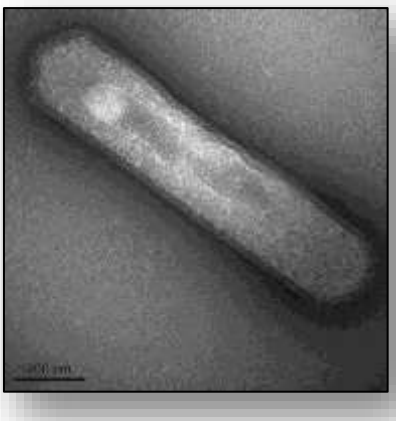
Before the discovery of Penicillin, doctors used to treat neurosyphilis by infecting the patients with Malaria. This treatment was discovered by Julius Wagner-Jauregg and is known as pyrotherapy. After the patients recovered from syphilis, they were treated with quinone.





In the American civil war, some soldiers noticed that their wounds were faintly glowing blue, and that the wounds which glowed healed quicker. Scientists have hypothesized it was likely a fluorescent bacteria which also produced antibiotics growing in their wounds

There would be no oxygen on Earth were it not for sunlight; the key component in photosynthesis. Now researchers have made the surprising discovery that oxygen is also produced without sunlight, possibly deep below the ocean surface. *Nitrosopumilus maritimus* turned out to be able to make oxygen in a dark environment. In the newly discovered pathway, *Nitrosopumilus maritimus* couples the oxygen production to the production of gaseous nitrogen.



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with the UG students of Batch 2023

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