QUARTERLY ISSUES

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BIOTECHNOLOGY

What is Biotechnology?

the exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.

LATEST NEWS

A new way of finding compounds that prevent ageing

Researchers have developed a new method for identifying compounds that prevent ageing. The method is based on a new way of determining age in cultured human cells. Using the method, the researchers found a group of substances that they predict to rejuvenate human cells, and that extend the lifespan and improve the health of the model organism C. elegans.

New imaging reveals previously unseen vulnerabilities of HIV

Imagine that HIV is a sealed tin can: if you opened it, what would you find inside? For the first time, scientists have visualized what the 'open can' of the human immunodeficiency virus looks like, revealing a previously unknown virus shape and a very detailed image of the vulnerabilities of the virus.

New electron microscopy technique limits membrane destruction

Researchers have created an electron microscopy technique termed 'cryoAPEX' that accurately tracks membrane proteins in a well-preserved cell.

New non-antibiotic strategy for the treatment of bacterial meningitis

With the increasing threat of antibiotic resistance, there is a growing need for new treatment strategies against life threatening bacterial infections. Researchers may have identified such an alternative treatment for bacterial meningitis, a serious infection that can lead to sepsis.

An Introduction

Biotechnology isa field of science which has left the world stunned with the amount of potential it possesses. It had been unexplored and untouched till 1978, however had been prevalent since the evolution of time. We have been unaware of this terminology until recently, however have been executing and performing actions that advertise this obscure field of research. The common people who have unknowingly let out the secrets of science and exposed it to the bare eyes. The production of alcohol by yeast or the procedure of home-made curd, all these instances demonstrate the wonders of biotechnology. Biotechnology is the efficient method of combining science and technology, to find the solutions that have proved to be irksome to the world.

A new year has just started, however, that does not deter the path that scientists lead. Young aspiring scientists like myself, are astonished to read about the new inventions and discoveries that have made human lives more enduring and consequently the life expectancy to increase greatly. The breakthroughs of 2018 include a massive step towards the treatment of HIV infection. HIV (Human Immunodeficiency Virus) is a virus that can weaken an individual's immune system tremendously and can lead to the life threatening disease, AIDS (Acquired Immune Deficiency Syndrome). There was no functional cure for the HIV infection until 2018, when a Japanese scientist found the cure by using the CRISPR technology to stop the replication of the virus in the host cell. CRISPR technology enables gene editing and this has proven to be highly beneficial to our world today. This ground-breaking discovery works on the simple principle of disrupting the genes that are responsible for HIV virus replication. This had been extremely easy hypothetically and theoretically earlier, but because of the ever-developing technology, it is now also possible in reality.

The strange yet powerful duo of science and technology brings us to the verge of demolishing our previously set notions of how the world works. It is inspiring and surprising to read about such talented people, who have set upon the mission to make this world a better and advanced place.

- Svarika Sonthalia (IB-1)

Beyond ATGC

All life forms on Earth use the same genetic alphabet of the bases A, T, C, and G—nitrogen-containing compounds that constitute the building blocks of DNA and spell out the instructions for making proteins.

Now, scientists have developed the first bacterium to use extra letters, or unnatural bases, to build proteins. The new research builds on the team's previous efforts to expand the natural genetic code. In 2014, the scientists engineered E. coli bacteria to incorporate an additional pair of bases—X and Y—into their DNA. The bacteria could store the unnatural bases and pass them onto daughter cells. But to be useful, these bases need to be transcribed into RNA molecules and then translated into proteins. So in the new study the researchers slipped the "alien" pair of bases into bacterial genes that also contained traditional bases. The microbes successfully "read" DNA containing the unnatural bases and transcribed it into RNA molecules. What's more, the bacteria could use these RNA molecules to produce a variant of green fluorescent protein that contains unnatural amino acids. The traditional four DNA bases code for 20 amino acids, but the addition of X and Y could produce up to 152 amino acids, which might become building blocks for new drugs and novel materials.

-Shuvayu Dasgupta (IB-1)

BIOSKIN

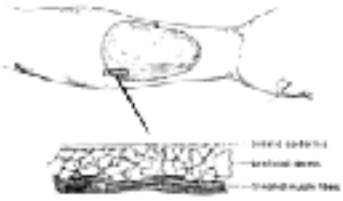
The largest organ of our body- our skin- protects our internal organs from infection, injury and any other form of harm. When it is critically damaged due to burns or diseases, the body cannot respond fast enough to replace what is lost. As a result, damage to this organ is a significant issue. Damage to the skin due to burns, infections and surgery has been a long-lived concern in the world of medicine and efforts to synthesize skin date back to 1500 BC... and we have come a long way since.

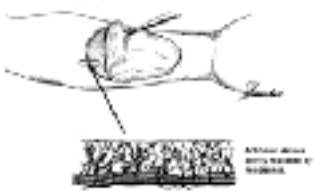
Artificial skin is a synthetic material that acts nearly as a skin flap, covering regions of the body that have been left unprotected. Scaffolds, "three- dimension porous solid biomaterials", as stated by the International Journal of Pharmacy and Biological Sciences, are designed with the following factors in mind:

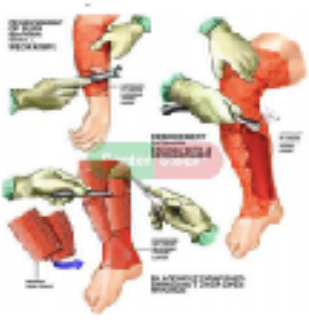
1. Must uphold cell adhesion and interaction
2. Must allow sufficient transport useful gases and nutrients and regulation of cells to keep them viable
3. Must Biodegrade at practical rates
4. Cause as little inflammation as possible
5. Must be porous
6. Must maintain the body's volume: surface area ratio

There are various types of artificial skin designed to aid specific damage. "Spray-on-skin"; permanent skin grafts; gelatine- containing skin; artificial electronic skin and CBEGs are a few of the most used forms. Among all types, collagen is most widely accepted as it can be easily fabricated into various shapes and sizes, it supports cellular attachment and does not cause untoward response.
Although this branch of biotechnology, more specifically material sciences, has come a long way, much research and development must take place before artificial skin is something that can be synthesized easily, and ethically.

-Anouska Saraf (IB-1)







An entire population of Mosquitoes can be hacked by CRISPR

New research suggests that a new genetic engineering technique – gene drive or CRISPR – can wipe the entire population of mosquitoes. However, this is only possible if we are willing to risk our ecosystem. On the other hand, we might eradicate disease like malaria and dengue reducing mortality rates.

A gene drive allows the researchers to manipulate an organism's genetic makeup which is then passed down the organism's offspring – like a genetic time bomb. For instance, researchers from Imperial College London wiped out a wiped out a caged population of Anopheles gambiae.

Very interestingly, a study published in the journal of 'Nature Biotechnology' shows that a group of researchers employed the new technique CRISPR to modify the gene responsible for determining sex in 150 male mosquitoes. "That alteration made the male gene dominant — the idea was, over time, that the population would stop producing females, driving them to collapse. The researchers added these genetically altered mosquitoes to a caged population of 450 unaltered male and female mosquitoes to reproduce with them. The hack worked: Subsequent generations of females exhibited male and female characteristics, couldn't bite, and couldn't lay eggs. By the eighth generation, there were no longer any females in the population at all." (Houser,2018)

Taking all the benefits of this new advance in biotechnology, we must not forget the potential side effects of this technique on the ecosystem. Unfortunately, we cannot figure it out without giving the technology a shot in the wild which might take another 10 years.

-Shrija Pathak(IB-1)

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