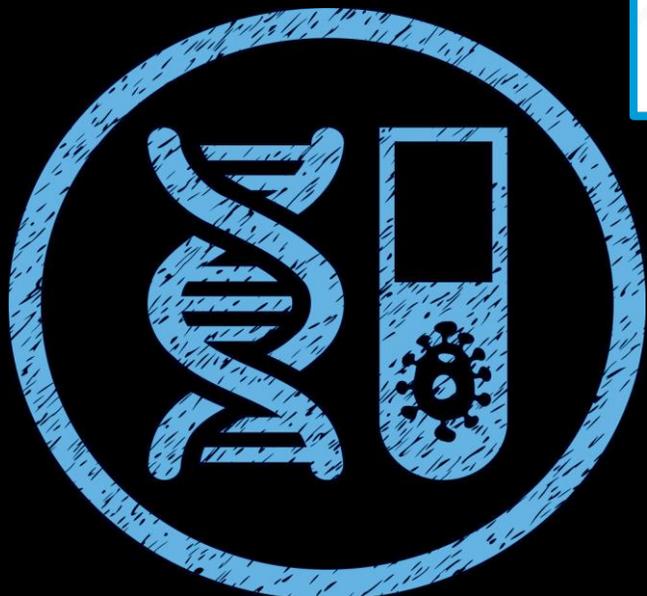




# K.C. COLLEGE



DEPARTMENT OF  
**MICROBIOLOGY**



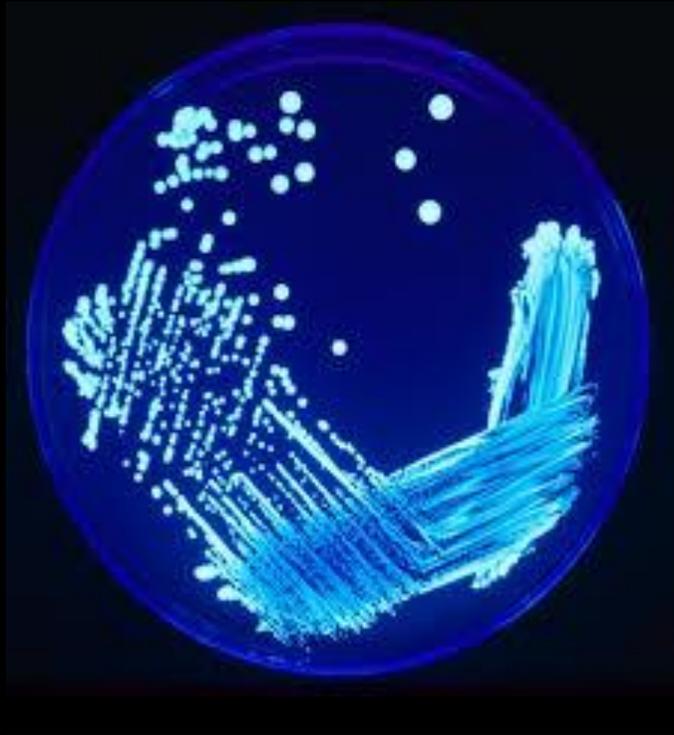
## THE **MICRO BIOLOGY**

NEWSLETTER



## **MICRO IN MACRO WORLD**

BY SHP BATCH-16



Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world.

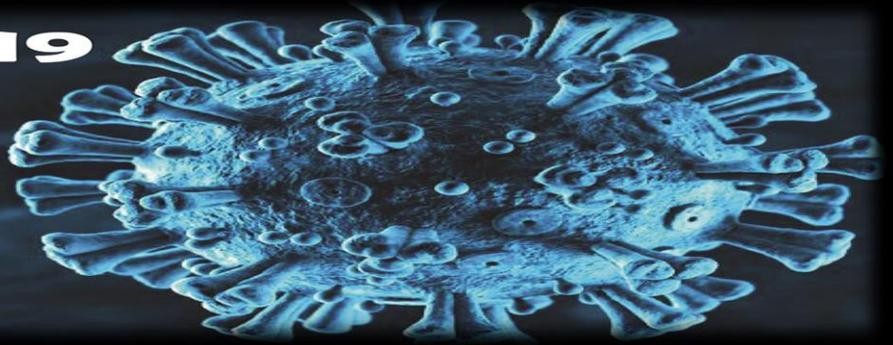
- Louis Pasteur

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- FROM STUDENTS WITH LOVE: NEW BACTERIA NAMED AFTER AN INDIAN MICROBIOLOGIST...
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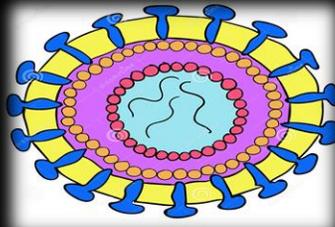
# COVID-19



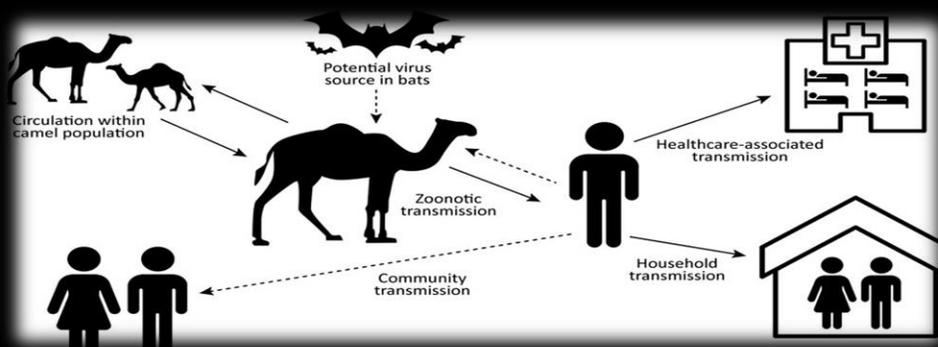
## What you need to know...

Coronaviruses are a family of viruses that cause illness such as respiratory diseases or gastrointestinal diseases. Respiratory diseases can range from the common cold to more severe diseases eg : Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). Corona represents crown-like spikes on the outer surface of the virus, thus it was named as Coronavirus. Coronaviruses are minute in size(65-125 nm in diameter) and contain a single strand RNA as the nucleic material, size ranging from 26 to 32kbs in length. There are four subgroups in the family of coronaviruses are Alpha( $\alpha$ ),Beta( $\beta$ ),Gamma( $\gamma$ ) and Delta( $\delta$ ) coronavirus.

The coronavirus disease 19 is highly transmittable and pathogenic viral infection caused by Severe Acute Respiratory Syndrome coronavirus 2(SARS-CoV-2),which emerged in Wuhan, China and spread around the world.



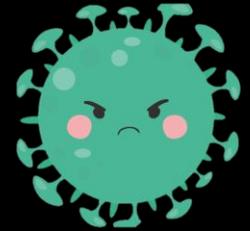
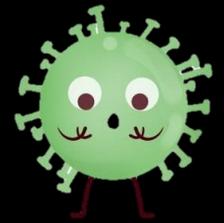
The virus that causes COVID-19 infects people of all ages. However, evidence to date suggests that older people over 60 to 70 years of age and children over 1 month to 10 years of age. Symptoms of coronavirus are respiratory symptoms, fever, cough, shortness of breath, breathing difficulties, fatigue, sore throat. A minority group of people may present with more severe symptoms and need to be hospitalised, most often with pneumonia. Transmission of COVID-19 is still dicy but current information is indicating that human to human transmission through respiratory droplets and direct or indirect contact with infected secretions. The incubation period of COVID-19 is currently understood to be between 2 to 14 days. There is no specific treatment for the disease caused by the Novel coronavirus. However, the patient can recover due to strong immunity.



The novel coronavirus originated from the Hunan seafood market at Wuhan, China where bats, snakes, Raccoon dogs, palm civets, and other animals are sold, it is suspected that the consumption of these contaminated meat products lead to the spread of the deadly virus...and the international travel of the infected people from this place lead to the world wide spread which became a pandemic in itself.

- Drinking alcohol does not protect you against COVID-19 and can be dangerous.
- Thermal scanners CANNOT detect COVID-19
- Adding pepper to your soup or other meals DOES NOT prevent or cure COVID-19
- Spraying or introducing bleach or another disinfectant into your body WILL NOT protect you against COVID-19 and can be dangerous.
- Exposing yourself to higher temperature DOES NOT prevent COVID-19

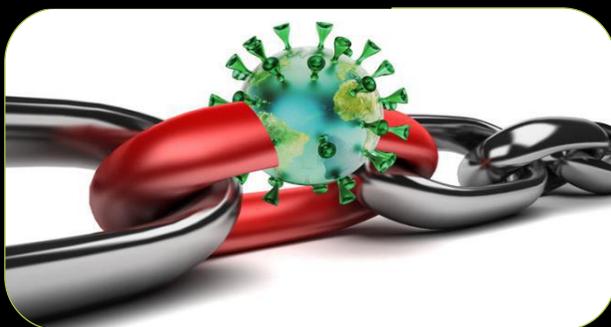
# MEDICAL MICROBIOLOGY



## Preventive but yet not curative !

What is corona virus? Why is it easily spreading? How it attacks human body? Why our immune cells are not able to recognize and kill this virus? Many more questions arise when we talk about this disease. Let's first look after the concept that how it attacks human body and its life cycle. A virus infects your body by entering healthy cells. There, the invader makes copies of itself and multiplies throughout your body. The new coronavirus latches its spiky surface proteins to receptors on healthy cells, especially those in your lungs. Specifically, the viral proteins bust into cells through ACE2 receptors. Once inside, the corona virus hijacks healthy cells and takes command. Eventually, it kills some of the healthy cells.

Your lower airways have more ACE2 receptors than the rest of your respiratory tract. So COVID-19 is more likely to go deeper than viruses like the common cold. Your lungs might become inflamed, making it tough for you to breathe. This can lead to pneumonia, an infection of the tiny air sacs (called alveoli) inside your lungs where your blood exchanges oxygen and carbon dioxide.



## PANDEMIC



Being in quarantine is much more needed in order to decrease the number of patients and to destroy the chain system of the virus.

### MYTHS AND FACTS ABOUT CORONA VIRUS

#### coronavirus(CoVID-19)

##### Myths

The coronavirus is the most dangerous virus to exist.

I will die if I become infected with the coronavirus.

Wearing a face mask if I am not sick will protect me from getting coronavirus.

If the spread continues, there is nothing else we can do to stop it.

##### Facts

The common flu kills 60 times more people annually than coronavirus.

Only 2% of cases have reported deaths and in the majority of these cases, death was caused by a weakened immune system.

The coronavirus can still enter the body through touching your face (eyes, mouth, nose) so wearing a mask is not effective if you are not sick.

Proper and frequent handwashing works best to prevent the spread.

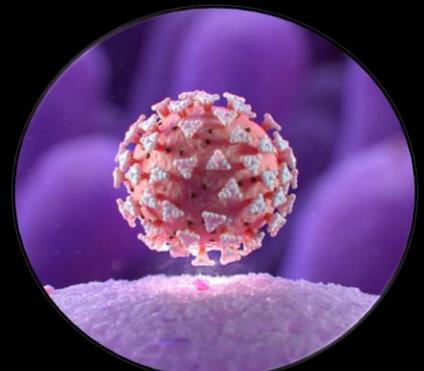
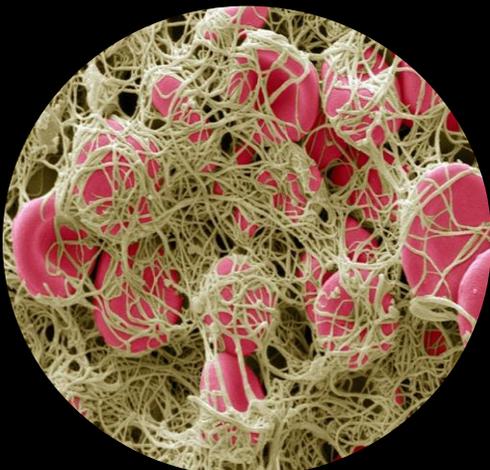
# CORONAVIRUS BLOOD CLOT MYSTERIES INTENSIFY

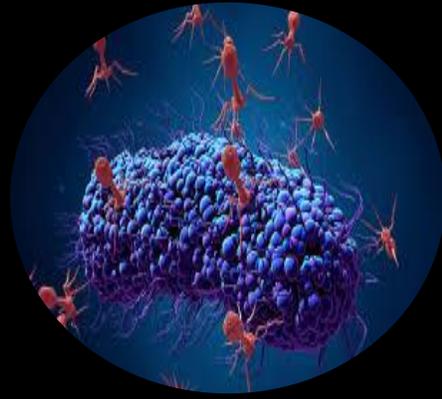
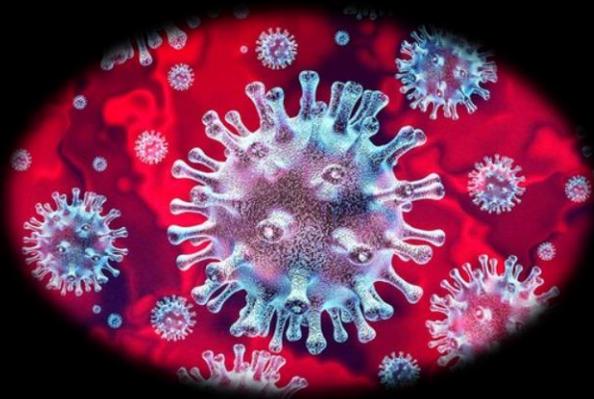
*Purple rashes, swollen legs, clogged catheters and sudden death — blood clots, large and small, are a frequent complication of COVID-19, and researchers are just beginning to untangle why. “This is like a storm of blood clots”*

Anyone with a severe illness is at risk of developing clots, but hospitalized patients with COVID-19 seem to be more susceptible. Some researchers view clotting as a key feature of COVID-19. But it's not just their presence that has scientists puzzled: it's how they show up. “This is not what you'd expect to see in someone who just has a severe infection,” he says. “This is really very new.” This might help to explain why some people have critically low blood-oxygen readings, and why mechanical ventilation often doesn't help. It's a “double hit”. Why this clotting occurs is still a mystery. One possibility is that SARS-CoV-2 is directly attacking the endothelial cells that line the blood vessels. Endothelial cells harbour the same ACE2 receptor that the virus uses to enter lung cells.

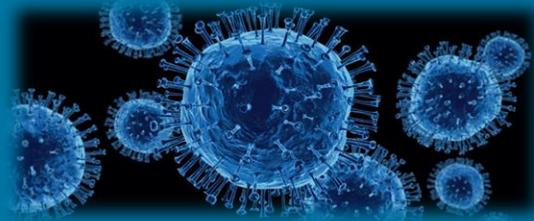
Even as researchers begin to unravel how clotting occurs in people with COVID-19, they're sprinting to test new therapies aimed at preventing and busting clots.

Blood-thinning medications are standard of care for patients in the intensive-care unit, and those with COVID-19 are no exception. But dosing is a matter of hot debate. At Columbia University in New York City, researchers are launching a clinical trial to compare the standard clot-preventing doses of blood thinners with a higher dose in people who are critically ill with COVID-19. Lee worries about the amount of ‘reactionary medicine’ happening. “People are changing their therapeutic approach in reaction to their local and personal experience,” she says. She understands the impetus, “but we have to remember the main thing is first do no harm”.



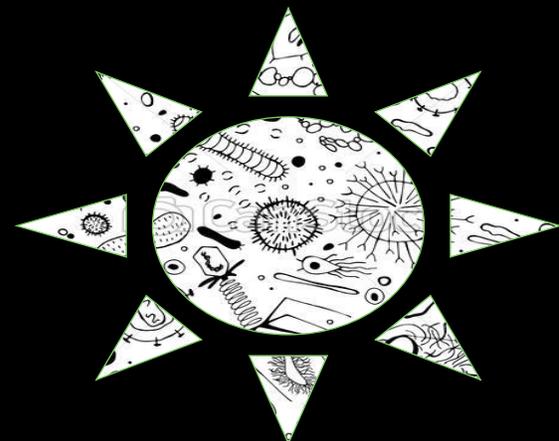


Mouthwash may reduce the spread of new corona virus. The recent scientific review speculates that mouthwash could inhibit the spread of SARS CoV-2.



## The reproductive number of COVID-19 is higher compared to SARS coronavirus.

*Here we review the basic reproduction number ( $R_0$ ) of the COVID-19 virus.  $R_0$  is an indication of the transmissibility of a virus, representing the average number of new infections generated by an infectious person in a totally naïve population. For  $R_0 > 1$ , the number infected is likely to increase, and for  $R_0 < 1$ , transmission is likely to die out. The basic reproduction number is a central concept in infectious disease epidemiology, indicating the risk of an infectious agent with respect to epidemic spread. It is important to further assess the reason for the higher  $R_0$  values estimated by some the mathematical studies.  $R_0$  estimates for SARS have been reported to range between 2 and 5, which is within the range of the mean  $R_0$  for COVID-19 found in this review. Due to similarities of both pathogen and region of exposure, this is expected. On the other hand, despite the heightened public awareness and impressively strong interventional response, the COVID-19 is already more widespread than SARS, indicating it may be more transmissible.*



<https://www.nature.com/articles/d43986-naa-n1403-8>, Medical News Today, <https://www.webmd.com/lung/coronavirus-covid-19-affects-body#1>

References: <https://www.webmd.com/lung/coronavirus-covid-19-affects-body#1>, journal of travel medicine, medical news today, <https://www.nature.com/article>

# BAT 'IMMUNITY' COULD HELP PROTECT PEOPLE

*For the first time, researchers have un-covered a unique ability in bats which allows them to carry but remain unaffected by lethal diseases.*

*Unlike humans, bats keep their immune system switched on 24/7 and scientists believe this could hold the key to protecting people from deadly diseases like Ebola.*

*Bats are a natural host for more than 100 viruses, some of which are lethal to people, including Middle Eastern Respiratory syndrome (MERS), Ebola and Hendra virus, however , interestingly bats do not get sick or show signs of diseases from these viruses.*



*Published in the Proceedings of the National Academy of Sciences (PNAS), this new research examines the genes and immune system of the Australian black flying fox, with surprising results.*

*Whenever our body encounters a foreign organisms, like bacteria or viruses, a complicated set of immune responses are set in motion, one of which is the defense mechanism known as innate immunity.*

*We focused on the innate immunity of bats, in particular the role of interferons—which are integral for innate immune responses in mammals—to understand what’s special about how bats respond to invading viruses.*

*Interestingly we have shown that bats only have three interferons which is only a fraction – about a quarter—of the number of interferons we find people.*

*The research showed that bats express a heightened innate immune response even when they were not infected with any detectable virus.*

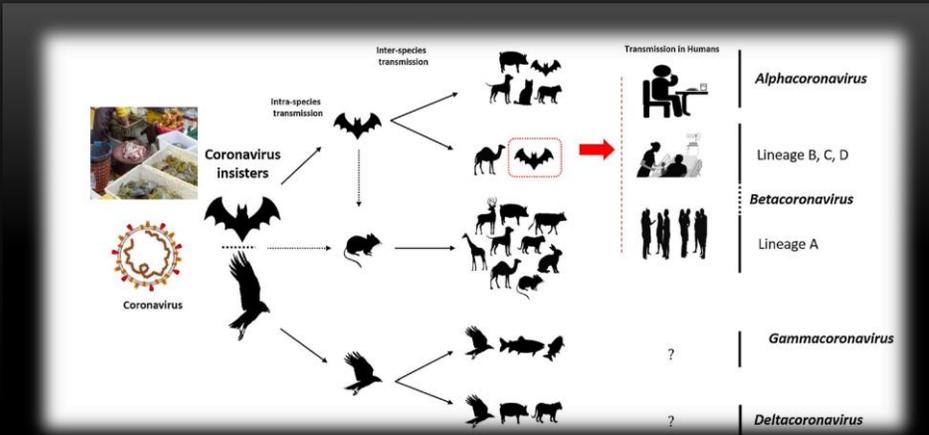
*The bats interferon-alpha is constantly switched on acting as a 24/7 front line defence against diseases. “If we can redirect other species immune responses to behave in a similar manner to that of bats, then the high death rate associated with diseases, such as Ebola, could be a thing of the past.” Dr. Baker said.*

## ADVICE FROM A BAT

*Trust in your sense, don't be afraid of dark spend time just hanging around friends get a grip enjoy a night life sometimes you've just gotta wing it guano happens!*

# THE SPECIES LINK.....

The Novel coronavirus is one of the evolved entity from the long history of the virus family, the pattern of evolution of the virus is not yet discovered by the scientists and hence preparation of the vaccine for the particular deadly virus has become so difficult for the researchers. Coronaviruses have a long history of causing simple respiratory distresses, cough and cold but the mutant form is on its way for a rampage and sadly a pandemic causing the whole world to shutdown. According to the phylogenetic tree of the Coronaviruses there are four subgroups Alpha, Beta, Gamma and Delta Coronaviruses respectively.



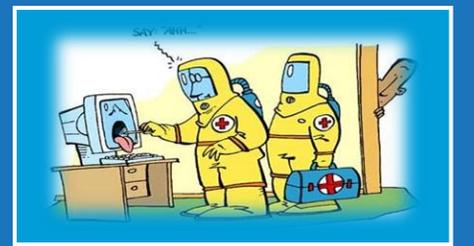
The key reservoirs responsible for the transmission of these viruses are generally not known to the common people but the researchers have particularly mapped the suspected transmission of the viruses by generating a link between the interspecies of animals and birds which is evident in the above mentioned fig. Among these only Alpha-coronaviruses and Beta-coronaviruses have the ability to infect Humans.

The consumption of the infected animals as a source of food by the Humans has led to the Animal to Human transmission of the virus and due to close contact with the infected individual, the virus is further transmitted to healthy individuals creating a havoc .Hence prevention of the Covid-19 disease can only be done by Cutting the close contact among people and staying indoors as long as possible to break the chain of the Novel Coronavirus. Eventually some day the scientists will come up with a befitting reply in form of a vaccine and make the mother Earth a better and safe place to live in until then HOPE FOR THE BEST!!!!

**CAUTION : ENTRANCE WITHOUT THE PPE KIT COULD COST YOUR LIFE**



The PPE or the *Personal Protective Equipment* is the need of the hour, it is still protecting thousands of the frontline Health Care Workers which work around the clock in order to protect the country from the deadly virus...the PPE kit is one of the strongest equipment which is designed for the protection of the Saviour's still the safety of the **DOCTORS** is questionable???????



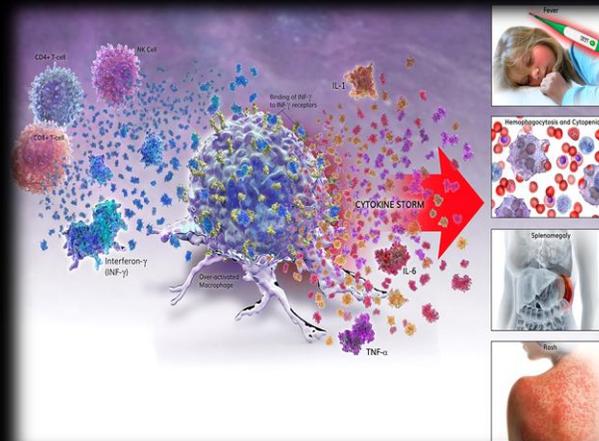
# Possibility of cure

## THE FDA-APPROVED GOLD DRUG AURANOFIN INHIBITS NOVEL CORONA VIRUS (SARS COV-2) REPLICATION AND ATTENUATES INFLAMMATION IN HUMAN CELLS

SOURCE- [HTTPS://DOI.ORG/10.1016/J.VIROL.2020.05.002](https://doi.org/10.1016/j.virol.2020.05.002)

SARS-COV-2 has recently emerged as a new public health threat. Here in, we report that the FDA-approved drug, gold derived auranofin, inhibits SARS-COV-2 replication in human cells at low micro molar concentration. Gold-based compounds have shown promising activity against a wide range of clinical conditions and microorganism infections. Auranofin, a gold-containing triethyl phosphine, is an FDA-approved drug for the treatment of rheumatoid arthritis since 1985. Treatment of cells with auranofin resulted in a 95% reduction in the viral RNA at 48 hrs after infection.

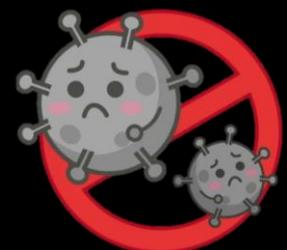
Auranofin treatment dramatically reduced the expression of SARS-COV-2-induced cytokines in human cells. Data indicates that auranofin could be a useful drug to limit SARS-CoV-2 infection and associated lung injury due to its antiviral, anti-inflammatory and anti-reactive oxygen species (ROS) properties. Further animal studies are warranted to evaluate the safety and efficacy of auranofin for the management of SARS-COV-2 associated disease.



SARS-COV-2 infection causes acute inflammation and neutrophilia that leads to a cytokine storm with over expression of IL-6, TNF-alpha, monocyte chemoattractant protein (MCP-1) and reactive oxygen species (ROS). The severe COVID-19 illness represents a devastating inflammatory lung disorder due to cytokines storm that is associated with multiple organ dysfunction leading to high mortality. Taken together, these studies suggest that auranofin could mitigate SARS-COV-2 infection and associated lung damage due to its anti-viral, anti-inflammatory and anti-ROS properties.

### RANDOM FUN FACT:

Whipping their tails, *E. coli* can travel 25 times their own length in 1 second, equivalent to a horse running 135 miles per hour.



# ASYMPTOMATIC SARS-CoV-2: CULPRIT FOR COMMUNITY TRANSMISSION.....

To begin with, what does being symptomatic mean? Acquiring any infections leads to trigger immunological response in our body, which primarily is nothing else but increase in body temperature and in case of SARS-CoV-2, symptoms appear to be similar to a normal flu infection, but on contrary to a normal flu infection person infected by Corona virus could show up symptoms between 7 to 14 days after being infected, which tends to the risk firstly of the person's health as there would be delay in getting treated and secondly spread of the disease. But if you notice atleast the signs and symptoms would help to detect the infected person as well as to quarantine his or her close contacts. What if the infected person doesn't show up any symptoms? Yes, this could happen which drives our attention to the term 'Asymptomatic'. The main responsible thing for being asymptomatic is the person's immune response; healthy and young individuals have boosted immunity (their body is capable of fighting back an infection) but this asymptomatic individuals act as silent carriers for the individual which have low immunity, infants and senior citizens. Thus, the transmission through asymptomatic carriers is a challenge to containment; as in any diagnosis of any disease is primarily based on the clinical symptoms that the individual reports. For any infectious disease, there are three ways to control the epidemic of the infectious disease- that is, to control the source of infection, to cut off the transmission routes, and to protect the susceptible population. The phenomenon of been asymptomatic in case of SARS-CoV-2 has blocked the ways to control the epidemic of this infection which ultimately resulted it to turn out as a 'Pandemic'.

India say's  
**ThankYou**  
 #CORONAWARRIORS

Nanhi Si Hasi Bholi Si Khushi  
 Phoolon Si Wo Baahein Bhool Gaye  
 Jab Desh Ne Di Aawaz Humein  
 Hum Ghar Ki Raahein Bhool Gaye

Majboor Huyi Jab Dil Ki Dua  
 To Humne Dawaa Se Kaam Liya  
 Wo nabz Nahin Phir Thamne Di  
 Jis Nabz Ko Humne Thaaam Liya

Hum Soye Nahi Kayi Raaton Se  
 Aye Jaane Watan Sau Chaand Bujhe  
 Humein Neend Usi Din Aayegi  
 Jab Dekhenge Aabaad Tujhe

Bear Hai Jo Kis Dharm Ka Hai  
 Humse Na Kabhi Ye Bhed Hua  
 Sarhad Pe Jo Wardi Khakhi Thi  
 Ab Uska Rang Safed Hua

Teri Mitti Mein Mil Jaawan  
 Gul Banke Main Khil Jaawan  
 Itni Si Hai Dil Ki Aarzu

Teri Mitti Mein Mil Jaawan  
 Gul Banke Main Khil Jaawan  
 Itni Si Hai Dil Ki Aarzu

Teri Nadiyon Mein Bah Jaawan  
 Tere Kheton Mein Lahrawan  
 Itni Si Hai Dil Ki Aarzu

Teri Nadiyon Mein Bah Jaawan  
 Tere Kheto Mein Lahrawan  
 Itni Si Hai Dil Ki Aarzu

## CORONA HEROES



# Microbial Biofuels: Current Production and Future Prospects



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## ETHANOL

Microbial biofuel production is already in use, principally in the form of sugar fermentation by yeast to produce ethanol. Although many microbes have been used in ethanol production, the yeast species *Saccharomyces cerevisiae* is primarily used in industry, using starch and sugars from plants as the starting material for the process. Ethanol fermentation by *S. cerevisiae* is primarily done via the standard glycolysis pathway. In the case of corn and other starch-containing plants, the simple sugars necessary are formed via the hydrolysis of starch to yield monosaccharide subunits, whereas the sugars in sugarcane are hydrolyzed only once and then go straight into the pathway. In the process, a single molecule of glucose is oxidized to two molecules of pyruvate.

Anaerobic conditions are required so that molecular oxygen is not available for use as an electron acceptor, and instead pyruvate must be used as the terminal electron acceptor. This fermentative process involves the decarboxylation of pyruvate to form carbon dioxide and acetaldehyde, and the subsequent reduction of acetaldehyde to produce ethanol. The use of fermented bio-ethanols as a fuel source offers some advantages over standard fossil fuels. Both corn ethanol and sugarcane ethanol require an input of fossil fuel energy in order to produce them because of the energy requirements of farming, processing, and transportation. Ethanol fermentation by yeast also helps to address the problem of greenhouse gas emissions

## USES OF ETHANOL

Ethanol is used extensively as a solvent in the manufacture of varnishes and perfumes, as a preservative for biological specimens, in the preparation of essences and flavorings, in many medicines and drugs, as a disinfectant and in tinctures and as a fuel and gasoline additive. Ethanol was commonly used as fuel in early bipropellant rocket (liquid propelled) vehicles, in conjunction with an oxidizer such as liquid oxygen. Ethanol is used in medical wipes and most commonly in antibacterial hand sanitizer gels as an antiseptic for its bactericidal and anti-fungal effects. Ethanol kills microorganisms by dissolving their membrane lipid bilayer and denaturing their proteins, and is effective against most bacteria and fungi and viruses. However, it is ineffective against bacterial spores

# LIGNOCELLULOSE

The production of bioethanol typically only utilizes the starchy or sugary components of the agricultural crop, wasting much of the energy locked away in the plant's biomass. The unused parts of the plants, like stalks, leaves, and wood, are composed of lignocellulosic materials, and are much more difficult for microbes to break down. If these materials could be exploited, they would represent a massive new energy resource for biofuel production. Lignocellulose is made up of different combinations of cellulose, hemicelluloses, and lignin, which together make up a plant's cell walls and provide structural support for the organism. Despite the potential gains of using lignocellulose for feedstock, the challenges of degrading lignin and cellulose require creative solutions which often involve expensive pretreatment procedures. For instance, digesting the lignin in the plant material is inefficient enough that consuming it is impractical, so it must be separated from the carbohydrates. But even after separation from lignin, the remaining cellulose and hemicellulose is still resistant to digestion with hydrolysis enzymes, and must undergo further processing prior to any enzymatic digestion.



Unfortunately, all of these pretreatment steps make utilizing lignocellulose extremely expensive. However, a possible solution to this problem is to consolidate the enzymatic hydrolysis step with microbial processing, by engineering microorganisms capable of exporting the enzymes necessary to break down cellulose and hemicellulose. Scientists used combinations of specially designed plasmids containing the relevant metabolic enzymes from different microbes, placed under the control of ordinary *E. coli* promoters. They were successful, and obtained strains which expressed and exported cellulose- and hemicellulose-digesting enzymes, which could both break down these plant biomass components and then use them to produce three different useful biofuels: pinene, butanol, and fatty acid ethyl esters. The plant material only needed to be pretreated with an ionic liquid, thereby making this a potentially useful and economical alternative.



## FUN FACT:

**Yeast evolved to lure fruit flies not to make delicious beer. Yeast evolved the ability to ferment products to produce Esters and alcohol for their fruity smell. This smell attracted fruit flies which allowed the yeast to travel to other regions.**

# FATTY ACIDS AND GLYCEROL

Microbes are incredibly diverse with respect to their ability to utilize different substrates, and this diversity provides the opportunity to use different compounds for making biofuels besides the standard carbohydrates. In particular, fatty acids provide one appealing alternative to sugars. Because they are so much more reduced than simple carbohydrates, fatty acids contain much more carbon and energy with which to produce greater biofuel yields. Furthermore, because fatty acids are broken down directly into acetyl-CoA and do not have to go through the intermediate of pyruvate, they never have to be carboxylated, and thus unlike glycolysis, every carbon molecule from the substrate could theoretically be incorporated into the product.

Glycerol could also be a useful feedstock, as it is readily produced as a byproduct of many industrial processes, and could be harvested from microbes like those of the algae genus *Dunaliella*, which produce it in abundance. The low cost and availability would be an important asset: its economic viability would place it in stark contrast to agricultural feedstocks like corn, the use of which in biofuel production has unfortunately driven up food prices. Furthermore, glycerol is highly reduced, and thus would provide more energy and carbon to produce biofuel with.

## EVERYDAY COMPOUNDS: GLYCEROL

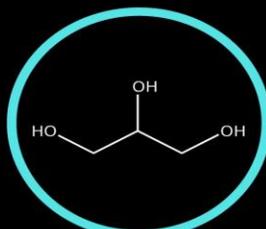
ALSO KNOWN AS GLYCERIN, GLYCEROL IS PRODUCED AS A BY-PRODUCT OF SOAP-MAKING, & CAN ALSO BE PRODUCED SYNTHETICALLY

### IN THE FOOD INDUSTRY

There are a number of different uses for glycerol in the food industry. It can be used as a sweetener in drinks, as an important moistening agent for baked goods, and is also added to confectionary to prevent sugar crystallisation. Additionally, it is often used as a solvent for food colourings, and higher levels can have a preservative effect.

### IN ANTI-FREEZE

Glycerol was historically used as an anti-freeze, since it can form strong hydrogen bonds with water, lowering the freezing point. It was succeeded by ethylene glycol (shown below), but as this is toxic to humans, glycerol is being reconsidered as a non-toxic alternative.



**GLYCEROL**  
*Propane-1,2,3-triol*  
Colourless, odourless,  
viscous liquid  
 $C_3H_8O_3$

### IN PERSONAL CARE PRODUCTS

Glycerol is used as a method of improving smoothness in toothpaste, skin care products, shaving cream, soaps, and hair-care products. It serves as an emollient and lubricant in these products. It is also found in pharmaceuticals, where it is commonly used as a humectant to stop creams drying out, and as a tablet-holding agent.

### AS A PRECURSOR TO EXPLOSIVES

Glycerol can be reacted with a mixture of sulfuric acid & nitric acid to produce nitroglycerin, an explosive liquid commonly used in dynamite and other propellants. This compound is also used as a medication for ischemic heart disease.



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### RANDOM FUN FACT :

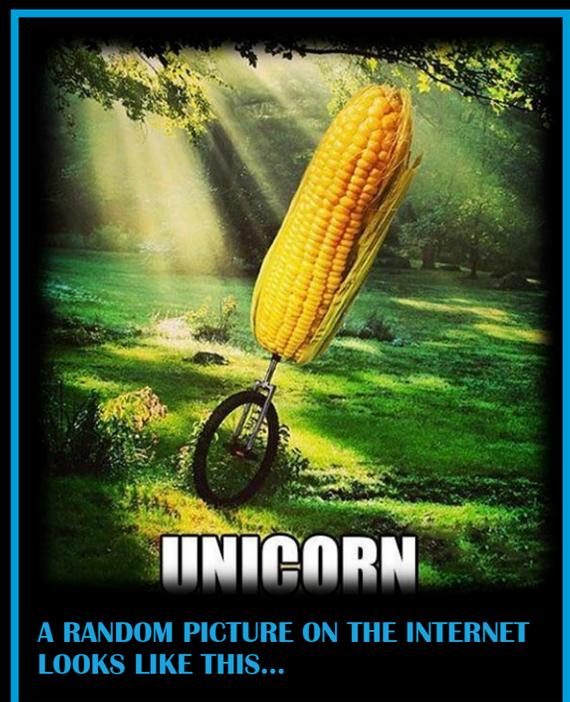
**Earth's Clouds Alive With Bacteria.** Clouds usually don't form by themselves they need a surface to collect water vapours. This base is provided by mountains or high-density air. Bacteria along with dust particles and water vapours get trapped in the clouds and form a colony.

# IMPROVING MICROBIAL BIOFUEL PRODUCTION: RECENT DEVELOPMENTS

## USING EFFLUX PUMPS TO IMPROVE BIOFUEL PRODUCTION:

A common problem of biofuel production is that the biofuel itself is frequently toxic to the cell. This is the case with ethanol, the most common biofuel, and others. Furthermore, the accumulation of the biofuel within the organism itself often downregulates the pathway that produces it, decreasing production efficiency. The research group of Dunlop *et al.* sought to address this problem by engineering *E. coli*, introducing many different efflux pumps from different species of microbes to investigate whether or not the pumps would improve the organism's ability to survive biofuel stress, and determine whether it would improve biofuel production. In order to accomplish this the researchers constructed a database containing members of the hydrophobe/amphiphile efflux (HAE1) family of bacterial protein pumps, which contains all efflux pumps known to confer solvent resistance in gram negative bacteria.

The team then conducted a bioinformatic analysis, searching for the proteins with similar sequences of their substrate-binding regions to the substrate-binding region of TtgB, a well-studied efflux pump known to be able to export solvents out of the cytoplasm. They cloned the operon of all identified efflux pumps into plasmid vectors, and transformed *E. coli* with one of each of these plasmids. The authors conducted a competition assay in order to identify useful efflux pumps. They did so by growing all *E. coli* strains together in a single culture, which also contained a significant amount of some biofuel, presuming that *E. coli* expressing efflux pumps that conferred resistance to that biofuel would come to dominate the population. After maintaining and diluting that culture for four days, they quantified the relative concentrations of the plasmids in each culture, and found that certain efflux pumps can confer resistance to biofuels, the pump also improves the efficiency of biofuel production in a limonene production strain.



## HOW IRON BINDING DRIVES THE IMMUNE SYSTEM TO DEAL WITH RESPIRATORY INFECTIONS.

Although COVID-19 commands the headlines today, tuberculosis(TB) remains the biggest infection killer in the world and multi drug resistant TB, which does not respond to regular antibiotics, continues to be a major threat to global health.

Iron is crucial for daily human function but is also an essential element for the survival of viruses and bacteria. For some time, scientists have known that depriving infections of iron can limit bacterial burden and help improve patient outcome.

### THE RESEARCH TEAM, LED BY PROFESSOR JOSEPH KEANE, HAS SHOWN FOR THE FIRST TIME HOW DFX SUPPORTS LUNG IMMUNITY

By driving the activation of a key metabolic pathway called “glycolysis”. The process of glycolysis helps immune cells make energy to fight infection which in turn drives several signals that improve the macrophages’ (white blood cells) ability to address TB infection.

By helping immune cells turn on glycolysis, DFX has the potential to aid in developing more lung targeted treatment of pulmonary infection, which is the ultimate goal of this research group; by boosting the patient’s immune response using the iron binding agent, DFX.

DFX helps infected immune cells to readily switch on metabolism which could help immune cells fight the infection.

Indeed, a clinical trial is underway using DFX to treat COVID-19, yet it is unclear how DFX might help the human lung fight infection; this research has the potential to greater understand this. In related experiments, the Trinity investigators demonstrate that DFX strategy in fighting other infectious diseases and supports the clinical trail underway of DFX for COVID disease.

#### RANDOM FUN FACT:

The largest bacteria found so far can actually be seen without the use of a microscope. *Thiomargarita namibiensis* which means “sulfur pearl of Namibia” is a single celled giant bacteria that lives in the ocean.



© Can Stock Photo

# FROM STUDENTS WITH LOVE: NEW BACTERIA NAMED AFTER AN INDIAN MICROBIOLOGIST

Researchers from North Bengal University, Siliguri, Bose Institute, Kolkata, and Kalyani University, have identified a new genus of bacteria which can degrade a potent neurotoxin that has been responsible for several food-poisoning outbreaks. The researchers have named the new isolate *Pradoshia eiseniae*, as a tribute to their mentor, the late Indian microbiologist Pradosh Roy.

Capable of crossing the blood brain barrier, 3-NPA irreversibly inhibits mitochondrial respiration causing involuntary muscle contraction.

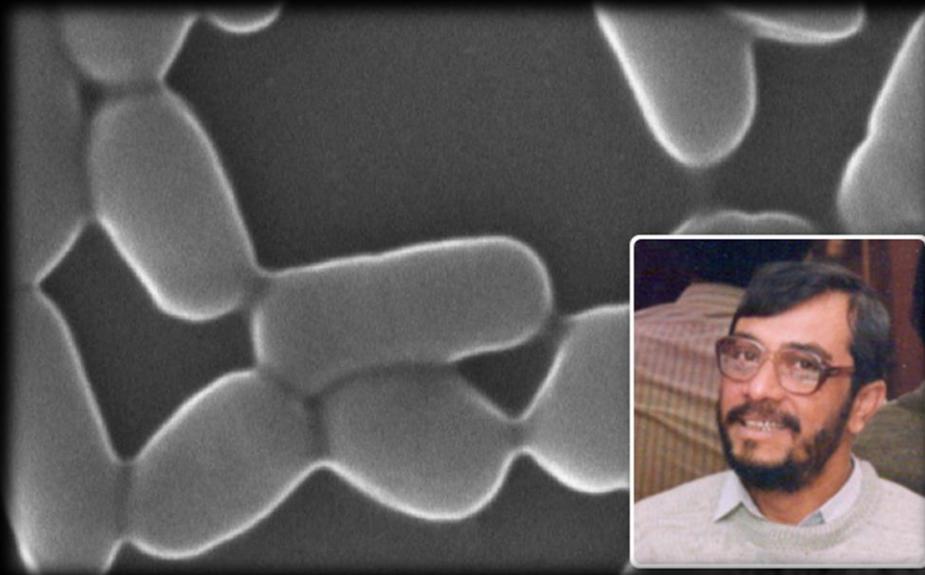
There are several reports of food poisoning outbreaks caused by this neurotoxin.

The researchers cultured the gut content of redworm *Eisenia fetida* on laboratory media containing 3-NPA. From this, they were able to isolate 3-NPA consuming bacteria, even capable of surviving solely on a diet of this neurotoxin.

Analysis of the isolate confirmed characteristics typical of spore forming members of the *Bacillaceae* family.

## NEW ETHANE MUNCHING MICROBES DISCOVERED AT HOT VENTS

Researchers from the Max Planck Institute for Marine Microbiology and the MARUM -- Center for Marine Environmental Sciences, Bremen have discovered a microbe that feeds on ethane at deep-sea hot vents. They also succeeded in cultivating this microbe in the laboratory. What is particularly remarkable is that the mechanism by which it breaks down ethane is reversible. In the future, this could allow to use these microbes to produce ethane as an energy source.



### RANDOM FUN FACT:

**In 1918 more people died from the influenza virus (approximately 30 million) than died in the First World War (10 million).**

# MAGNETO-AEROTACTIC BACTERIA DELIVER DRUG-CONTAINING NANOLIPOSOMES TO TUMOUR HYPOXIC REGIONS

*Magnetococcus marinus* strain MC-14, can be used to transport drug-loaded nanoliposomes into hypoxic regions of the tumor.

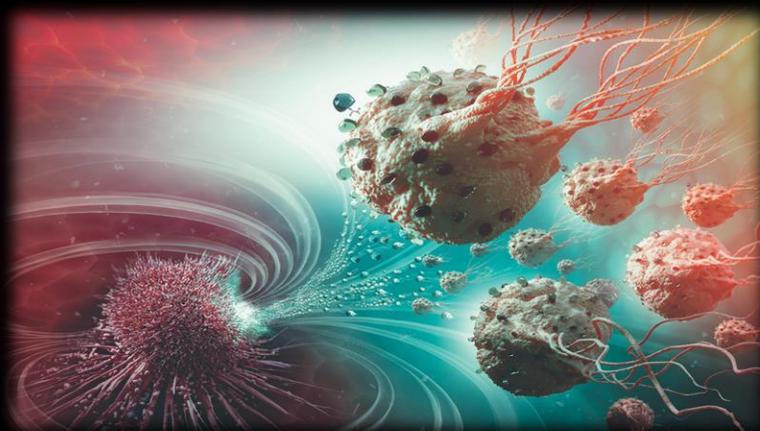
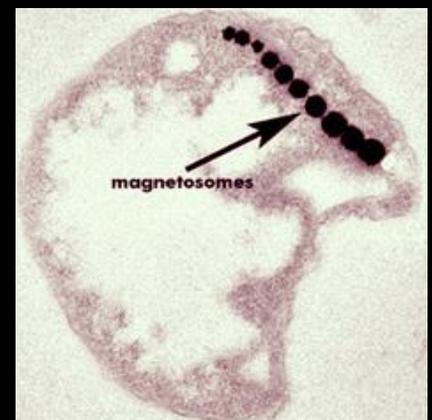
Oxygen depleted hypoxic regions in the tumor are generally resistant to therapies. Although nanocarriers have been used to deliver drugs, the targeting ratios have been extremely low. Here, we show that the magneto-aerotactic migration behavior of magneto tactic bacteria, *Magnetococcus marinus* strain MC-14, can be used to transport drug-loaded nanoliposomes into hypoxic regions of the tumor. In their natural environment, MC-1 cells, each containing a chain of magnetic iron oxide nanocrystals, tend to swim along local magnetic field lines and towards low oxygen concentrations<sup>6</sup> based on a two-state aerotactic sensing system,

along local magnetic field lines and towards low oxygen concentrations<sup>6</sup> based on a two-state aerotactic sensing system

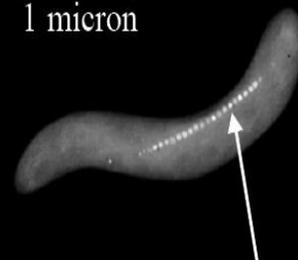
We show that when MC-14 cells bearing covalently bound drug-containing nanoliposomes were injected near the tumor in SCID Beige mice and magnetically guided, up to 55% of MC-14 cells penetrated hypoxic regions of HCT11 colorectal xenografts. Approximately 70 drug-loaded nanoliposomes were attached to each MC-14 cell.



*Harnessing swarms of microorganisms exhibiting magneto-aerotactic behavior can significantly improve the therapeutic index of various nanocarriers in tumor hypoxic regions*



1 micron



Why, there be magnets in that bacterium!

# THE BLIND SPOT OF THE WOUND HEALING MACHINERY !!!!

DID YOU KNOW!!!!

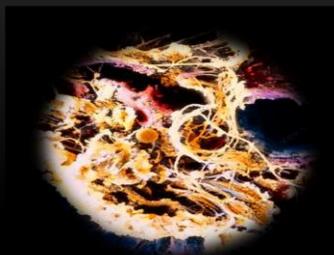
Most of the tissues of our body have an extraordinary ability to heal themselves upon injury. At times something goes haywire and many connective tissues are formed causing "Fibrosis". Which can result in organ damage or might affect the efficiency of the organ.

A study published by researchers of the Osaka University shows how the protein Rbm7 induces cell death after tissue injury to then result in the recruitment of a specific type of immune cell which initiates the process of fibrosis.

The Human immune response is hardwired to be quite same in all cases. The scientists are predicting that the presence of the gene which codes for specific Rbm7 protein is the responsible factor which may induce formation of fibrotic tissue

This leads to organ fibrosis, in very few cases that are witnessed as the blind spot or as a factor responsible for the mishap.

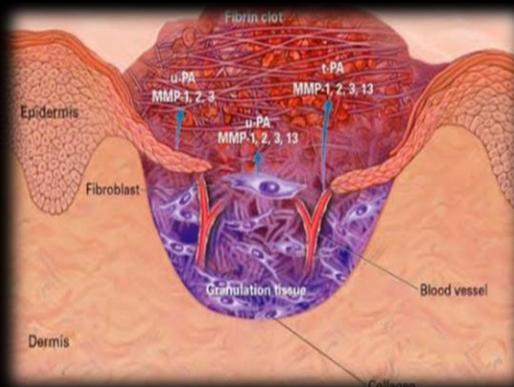
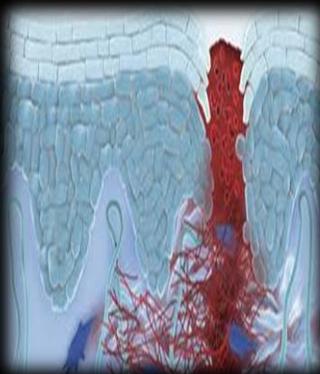
A study in mice showed that the tissue bound to show fibrosis in definitive organ failed to do so in absence of Rbm7 protein. This study could help us in prevention of fibrosis of multiple wounds which can help us curb the patient's sufferings. The actual trial Results on humans are not yet discovered.....



## ALGAE IN THE OCEANS OFTEN STEAL GENES FROM BACTERIA



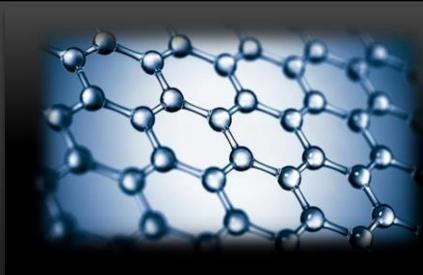
Algae in the deep sea oceans often steal the susceptible genes from bacteria to gain beneficial attributes such as the ability to tolerate the stressful environment or break down carbohydrates for food, according to an article in [Science Advances](#) shows for the first time that the gene acquisition had a significant impact on the evolution of the massive and ancient group of algae and protists (mostly one celled organisms including protozoa). The researchers suspect the gene stealing takes place by the process of **Horizontal gene transfer**.....



# GRAPHITE NANOPATELETS: THE REDEEMER OF THE ERA!!!

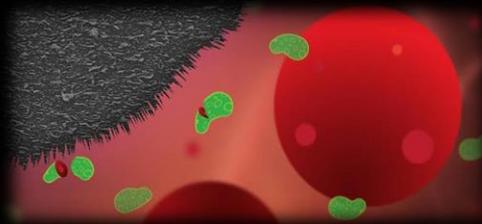
ABSOLUTE  
....STUNNERS

Graphite nanoplatelets are one of the most awaited phenomenon of the era. This following article was published in the journal "Small". According to the research the integration of graphite nanoplatelets in the development of plastic medical surfaces can prevent infections, killing upto 99.9 percent of bacteria which try to attach, this could be a breakthrough in "Medical fraternity" and a potential solution to the problems of millions of patients – being cheap and affordable it makes a big blinder for the Medical officials as well.



Every year millions of people are affected by infections contracted during the health care procedures. Many of these are bacterial infections which develop around medical devices and implants within the body such as catheters, hip and knee prostheses or dental implants and in worst cases the implants are removed due to sepsis.

The researchers allege that it is unique and it is different from other alternatives as in this case it is mixed with a versatile polymer and an inexpensive graphene derivative it also claims that there is negligible tissue damage during the destruction of the bacteria. The only vital factor in this is orientating and properly distributing the derivatives.



## 1. CIGARETTE SMOKE MAKES MRSA MORE DRUG RESISTANT!!!

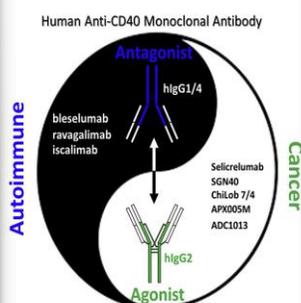
Cigarette smoke can make MRSA bacterial strains more resistant to antibiotics, basically it can make the *S.aureus* more invasive and persistent. Researchers believe that the stress cigarette smoke causes, sparks an emergency 'SOS' response which increases the rate of mutation of the DNA.



## 2. HIGH BLOOD PRESSURE DURING AND AFTER EXERCISE MAY BE MARKERS FOR DISEASES IN LATER LIFE...

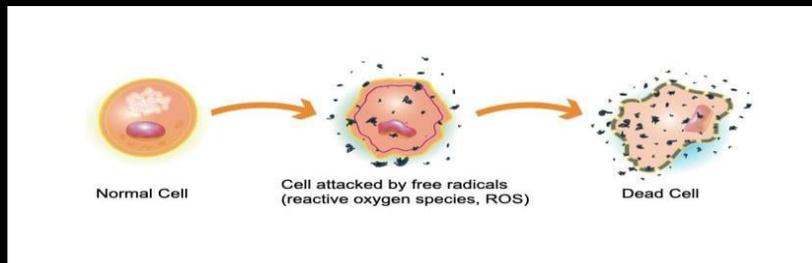
The way our blood pressure reacts to the exercises provides important information whether the individual is susceptible to cardiovascular diseases and hypertension later in life.

# THE "SWITCH" OF THE HOUR!!!



Scientists from the University of South Hampton have discovered a way to transform Antibody drugs previously developed to treat Autoimmunity into antibodies with powerful Anti – cancer activity through a simple molecular "switch". A molecule CD40 that is present on the cell surface of the immune cells controls both autoimmunity and cancer. It is thought to be overstimulated in the case of autoimmune diseases; increasing the chances of attack on own cells whereas understimulated in the case of cancer hampering the immune cells to fight the tumour. The role of this molecule can be switched by modifying the "Constant Domain Of The Antibody thereby controlling its production. These unique switches are successful in preclinical trials and planned to take forward to the Clinical trials.....

# EFFECT OF OXIDATIVE STRESS ON BACTERIA IN ENVIRONMENT

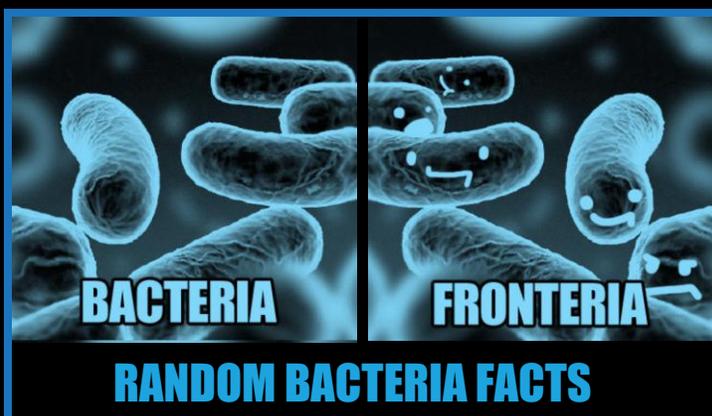


What is Oxidative stress? Oxidative stress is essentially an imbalance between the production of free radicals and the ability of the body to counteract or detoxify their harmful through neutralization by antioxidants. Oxidative stress in Bacteria is caused by reactive oxygen species. ROS (Reactive Oxygen Species) include peroxides, superoxide, hydroxyl radical, singlet oxygen and alpha oxygen. These ROS affect all macromolecules (DNA, lipids, protein). Bacteria have to build up mechanisms to protect themselves against oxidative stress, with enzymes such as catalase and superoxide dismutase, small proteins like thioredoxin and glutaredoxin, and macromolecules such as glutathione.

Oxidative damage can have a devastating effect on the structure and activity of proteins, and may even lead to cell death. The sulfur-containing amino acids cysteine and methionine are particularly susceptible to reactive oxygen species (ROS) and reactive chlorine species (RCS), which can damage proteins. The sulfur containing amino acids cysteine and methionine are particularly susceptible to damage caused by ROS. In bacteria there are reducing systems that enable the bacteria to repair oxidatively damaged cysteine and methionine residues in the cytoplasm and in the bacterial cell envelope. Thus ROS are useful in showing anti-microbial effects.

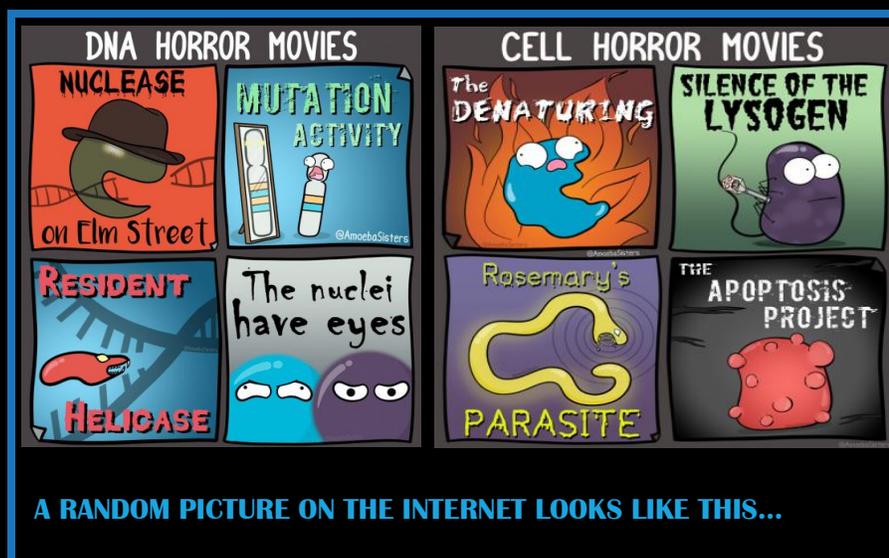
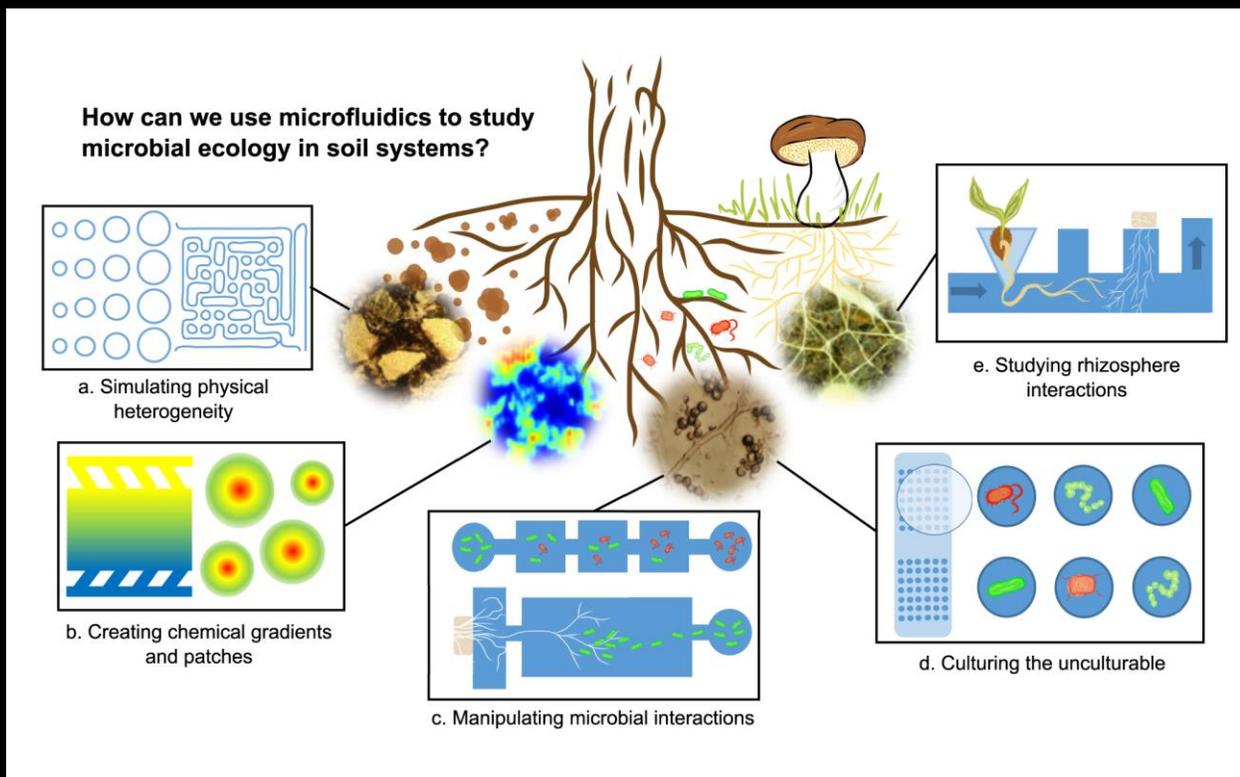
## DID YOU KNOW?

Handwashing sinks and their associated premise plumbing are an ideal environment for pathogen harboring biofilms to grow and spread throughout facilities due to the connected system of wastewater plumbing. A study was conducted to understand the distribution of pathogens and antibiotic resistant organisms (ARO) within and among handwashing sinks using culture dependent methods to quantify the organisms present. The study resulted, *Pseudomonas aeruginosa*, opportunistic pathogen capable of growth on a cefotaxime-containing medium (OPP-C), and carbapenem-resistant *Enterobacteriaceae* (CRE) these organisms were predominantly found.



# USE OF MICROFLUIDICS TO STUDY MICROBIAL ECOLOGY IN SOIL SYSTEM.

*"Soil is likely the most complex ecosystem on earth. Despite the global importance and extraordinary diversity of soils, they have been notoriously challenging to study. We show how pioneering microfluidic techniques provide new ways of studying soil microbial ecology by allowing simulation and manipulation of chemical conditions and physical structures at the microscale in soil model habitats."*



# FUN ZONE

---

## QUIZ

- The oldest eukaryotic organisms are considered to be
  - Archaea
  - Fungi
  - Animals
  - Diplomonads like giardia
- Mycoplasma, rickettsia, Chlamydia are
  - Forms of viruses
  - Small bacteria
  - Types of fungi
  - None of these
- Which one is not studied in microbiology?
  - Bacteria
  - Fungi
  - Animal behaviour
  - Algae
- The five kingdom system of classification was set up by
  - Robert Whittaker
  - Masaki Ogata
  - Robert Koch
  - None of these
- Most microbial structure and enzymes are composed of
  - Lipids
  - Proteins
  - Carbohydrates
  - All of the above
- The individual best remembered for bringing microbes to the world?
  - Robert Koch
  - Robert Hooke
  - Antony Van Leeuwenhoek
  - Masaki Ogata
- The size of viruses is usually measured in
  - Millimeter
  - Micrometer
  - Nanometer
  - Centimeter
- The cocci which forms a bunch and irregular pattern are
  - Staphylococci
  - Streptococci
  - Diplococci
  - Tetrads
- The structure responsible for motility of bacteria is
  - Sheath
  - Flagella
  - Capsules
  - None of these
- Passive immunization is done for
  - Diphtheria
  - Tuberculosis
  - Enteric fever
  - None of these

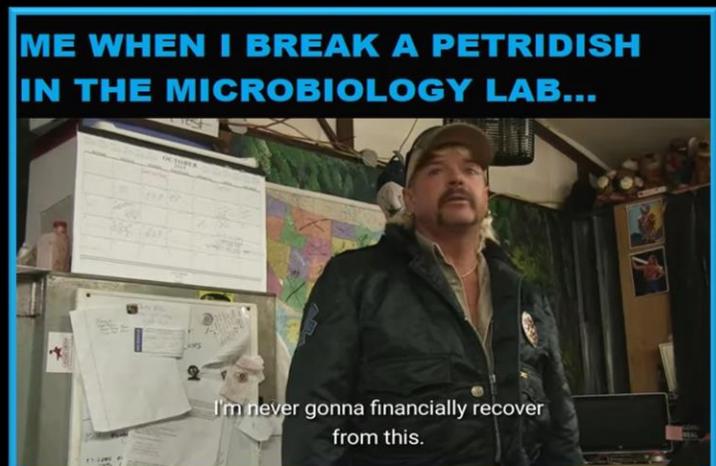
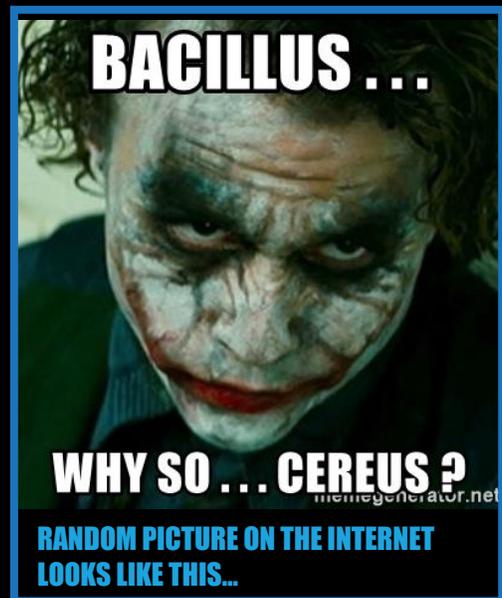
# ANSWERS:

1. A) Archaea
2. B) Small Bactria
3. C) Animal Behaviour
4. A) Robert Whittaker
5. B) Proteins
6. C) Antony Von Leeuwenhoek
7. C) Micrometer
8. A) Staphylococcus
9. B) Flagella
10. A) Diptheria

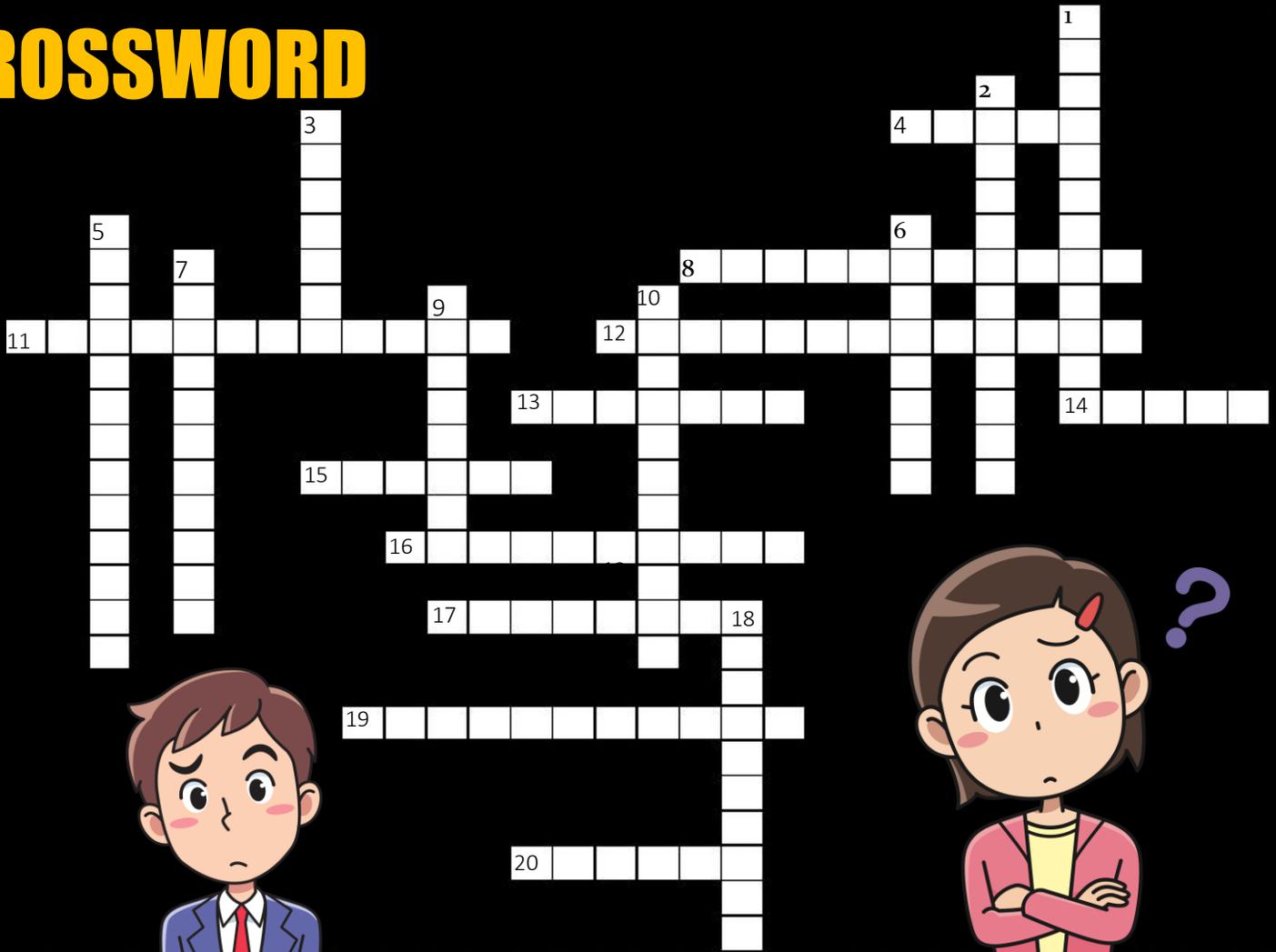
IMPORTANT QUESTION ( worth 500 points... seriously... its like a golden snitch of this quiz )

Q) What hair dyes do microbiologists use?

ANS.



# CROSSWORD



## Across

4. Is a liquid and no living thing can live without it.
8. harmless dose of a disease-causing microbe that build up the immunity of body.
11. nutrient medium used for the cultivation of microbes supporting growth of a wide range of non-fastidious organisms.
12. Reproduction in which bacteria split into two identical individual organisms.
13. free from bacteria or other living microorganisms
14. microorganisms used in the brewing and baking industry
15. A fungal disease which damages plants which caused the Great Irish Famine
16. A chemical which kills bacteria and fungi but not viruses
17. An organism that lives in or on another living thing and takes its nourishment from that organism
19. Organisms which feed on the dead remains of living things
20. Ability of being protected against particular disease.

## Down

1. The scientific study of microorganisms
2. A contagious fungal infection that affects the skin on the feet.
3. A slightly sour, thick liquid made from milk with bacteria added to it
5. biology that uses living processes, organisms or systems to manufacture products or technology intended to improve the quality of human life
6. proteins that are produced by the white blood cells in response to an antigen
7. an organism that consists of a single cell
9. a bacterium, virus, or other microorganism that can cause disease.
10. A term used to describe things which can only be seen by a microscope
18. Microbes are omnipresent and found \_\_\_\_\_.

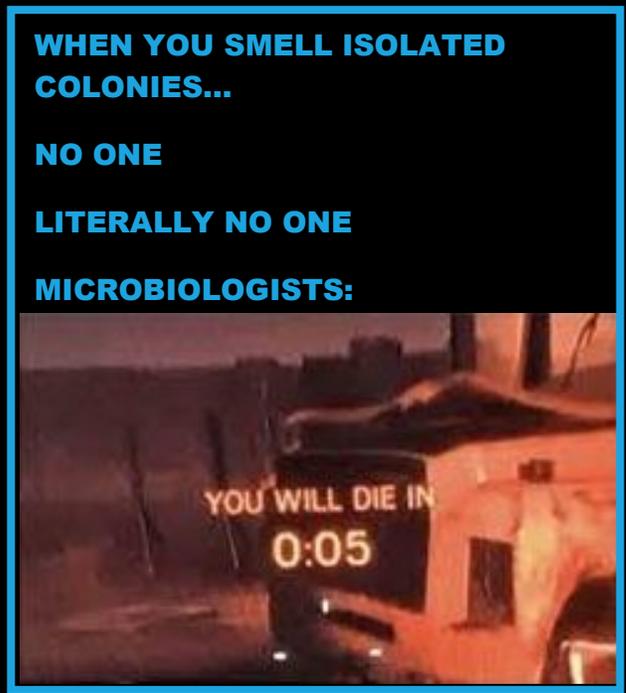
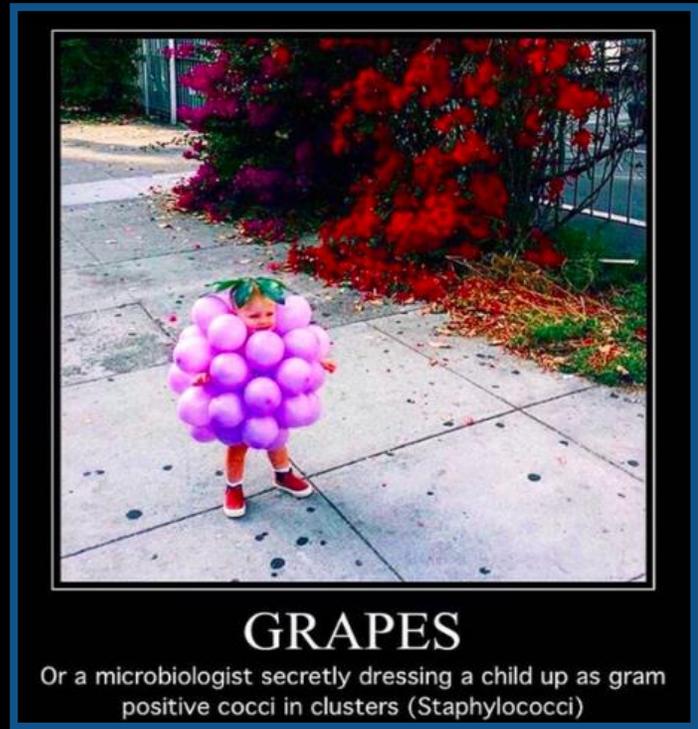
# ANSWERS

## ACROSS

- 4) Water
- 8) Vaccination
- 11) Nutrient Agar
- 12) Binary Fission
- 13) Sterile
- 14 Yeast
- 15) Blight
- 16) Antibiotics
- 17) Parasites
- 19) Decomposers
- 20) Immune

## DOWN

- 1) Microbiology
- 2) Athletes Foot
- 3) yogurt
- 5) Biotechnology
- 6) Antibody
- 7) Unicellular
- 9) Pathogen
- 10) Microscopic
- 18) Penicillin



# HIGHLIGHTS

## OF THE DEPARTMENT

- ❖ MICROFIESTA 4.0 – Amazing Event of the department where the Second year students compete in groups against each other.
- ❖ WORKSHOP ON IMMUNOLOGICAL AND MOLECULAR DIAGNOSTICS
- ❖ NATIONAL SEMINAR ON RECENT ADVANCES IN DIAGNOSTICS
- ❖ MRS. RAJITHA SATISH WAS AWARDED THE “NAVMANI” AWARD FOR EXEMPLARY WORK
- ❖ THE T.Y.Bsc AND S.Y.Bsc STUDENTS WERE ACCOMPANIED BY THE TEACHERS ON A FIELD TRIP TO SANJAY GANDHI NATIONAL PARK...
- ❖ AN INDUSTRIAL VISIT TO KATRAJ DAIRY, PUNE WAS CONDUCTED FOR THE T.Y.Bsc AND S.Y.Bsc STUDENTS
- ❖ MS. PARITA CHORGHE WAS AWARDED THE “BEST NSS VOLUNTEER” FOR THE ACADEMIC YEAR 19-20.
- ❖ THE LOCKDOWN



MICROFIESTA 4.0



VISIT TO SANJAY GANDHI NATIONAL PARK



INDUSTRIAL VISIT TO PUNE

DURING THE LOCKDOWN PERIOD THE FACULTIES SUPPORTED THE STUDENTS TO BE MENTALLY STRONG AND KEPT THEM ENGROSSED IN ACTIVITIES BY ARRANGING AND CONDUCTING VARIOUS SEMINARS...

1. UNDERSTANDING THE FOOD PSYCHOLOGY.
2. UNDERSTANDING COVID-19; A MICROBIOLOGICAL PERSPECTIVE.
3. AN INTERACTION WITH THE ALUMNI “BEEN THERE, DONE THAT”.
4. CHROMATOGRAPHY AND ITS APPLICATIONS.



## ❖ THE GEMS OF THE DEPARTMENT (FACULTY MEMBERS)

- DR. SEJAL RATHOD
- DR. PRATIBHA SHAH
- MRS. RAJITHA SATISH
- MS. AMINA DHOLKAWALA
- MS. PRIYANKA YADAV
- MS. RASHMI PATIL



## ❖ THE SQUAD

- ANURAG G.
- GANESH CHINTAKINDI
- CHIRAG CHINTA
- NAMRATA AGROL
- KIRAN MISHRA
- SANSKRUTI RANE
- SHALINI SINGH
- JAYA TIWARI

### The Microbe

The Microbe is so very small  
You cannot make him out at all,  
But many sanguine people hope  
To see him through a microscope.  
His jointed tongue that lies beneath  
A hundred curious rows of teeth;  
His seven tufted tails with lots  
Of lovely pink and purple spots,

On each of which a pattern stands,  
Composed of forty separate bands;  
His eyebrows of a tender green;  
All these have never yet been seen--  
But Scientists, who ought to know,  
Assure us that they must be so....  
Oh! let us never, never doubt  
What nobody is sure about!

*Hilaire Belloc*

**THANK YOU !!!!!!!  
HOPE YOU ENJOYED THE JOURNEY...**