

## \* Bioplastic bacteria

- Bacterium called

↳ *ZoBellella denitrificans* ZD1

↳ reported aid in production of bioplastics

- They feed on sludge, wastewater and produce polyhydroxybutyrate.

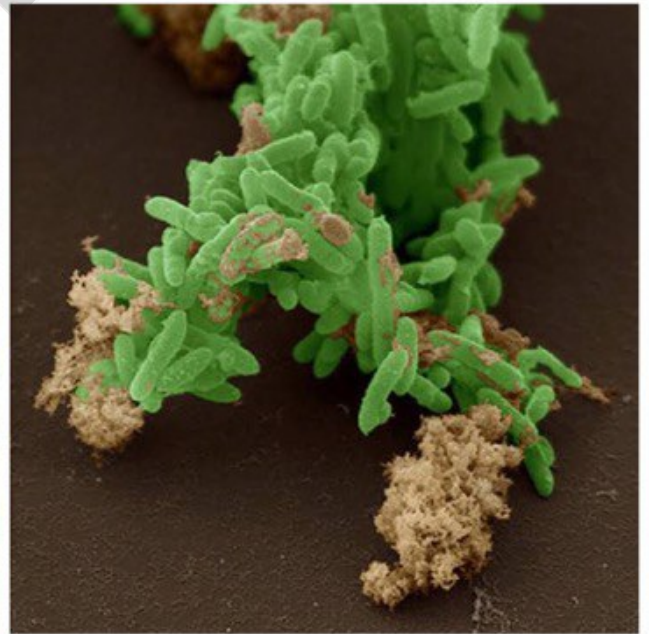
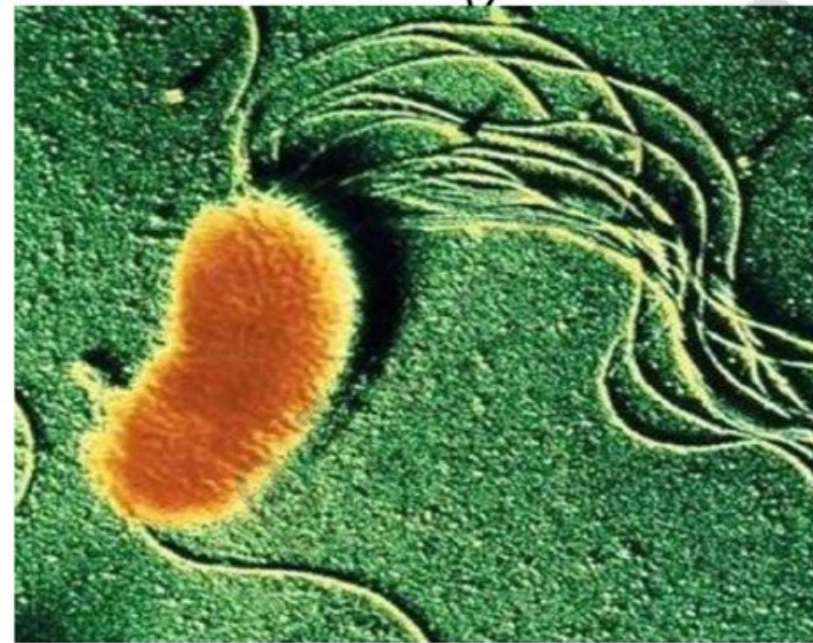
- Advantage

↳ can help to reduce the burden on landfills.

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## \* Bacterial haute couture (Geobacter)

- Cobalt → used in batteries
  - ↓ → toxic to living things
- The metal seeps into cells of most bacteria and kills them.
- But one soil bacteria called Geobacter
  - ↳ can extract Co from rust and coat themselves with it
  - ↳ this ability can be used in microbial extraction of Cobalt from batteries and recycle it



- Other applications of Geobacter -
  - (1) Biodegradation and bioremediation

↳ Geobacter has ability to consume oil based pollutants & radioactive materials with  $\text{CO}_2$  as waste product

↳ thus used in clean up of underground petroleum spills

↳ for precipitation of Uranium out of groundwater

## (2) Biofilm conductivity

↳ some species of Geobacter capable of creating thick networks of biofilms on microbial fuel cell anodes

↳ thus can be used as microbial nano-wires for more efficient electricity generation

## (3) Neuromorphic memristor

↳ i.e. can conduct low voltage similar to that of a neurons in human brain



## \* A tiny plant that can 'digest' low density plastic sheets

- Low-density polyethylene is highly resistant to degradation.

- Researchers in Chennai have isolated an alga that breaks down low density polyethylene.

.The alga identified is microalga *Uronema africanum* Borge.

.This is a species of microalgae that is commonly found in Africa, Asia and Europe.

.The alga used for the study has been harvested from a lake in Chennai.

.It produces enzymes, hormones, toxins such as cyanotoxins and some polysaccharides.

.It then slowly degrades polyethylene into monomers which will not have harmful effect in the atmosphere.

## \* Guidelines for non-transgenic gene editing techniques pending since Jan 2020

### - Genome Editing

- It allows genetic material to be added, removed, or altered at particular locations in the genome.

### - Techs for Genome Editing

- CRISPR-associated protein 9 (Cas9)
- Transcription activator-like effector nucleases (TALENs)
- Zinc-finger nucleases (ZFNs)
- Homing endonucleases or meganucleases

### - CRISPR

- Adapted from a naturally occurring genome editing system in bacteria.
- The bacteria capture snippets of DNA from invading viruses and use them to create DNA segments known as CRISPR arrays.



- The CRISPR arrays allow the bacteria to "remember" the viruses.
- If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA.
- The bacteria then use Cas9 to cut the virus DNA apart, which disables the virus.
- This method is faster, cheaper, more accurate, and more efficient than other existing genome editing methods.

## - Non-Transgenic Gene Editing

- Older GM technology involves the introduction of foreign DNA
- While the new proposal involves the use of gene editing tools to directly tweak the plant's own genes instead.
- It does not involve inserting any foreign DNA.

## - Use in India

- Indian Agricultural Research Institute (IARI) is in the process of developing resilient and high-yield rice varieties using such gene editing techniques.
- But proposal has been pending with the (GEAC) for almost two years.
- While such tech don't need any approval in US, EU, Canada, Aus, Japan.

## - Why need such technique?

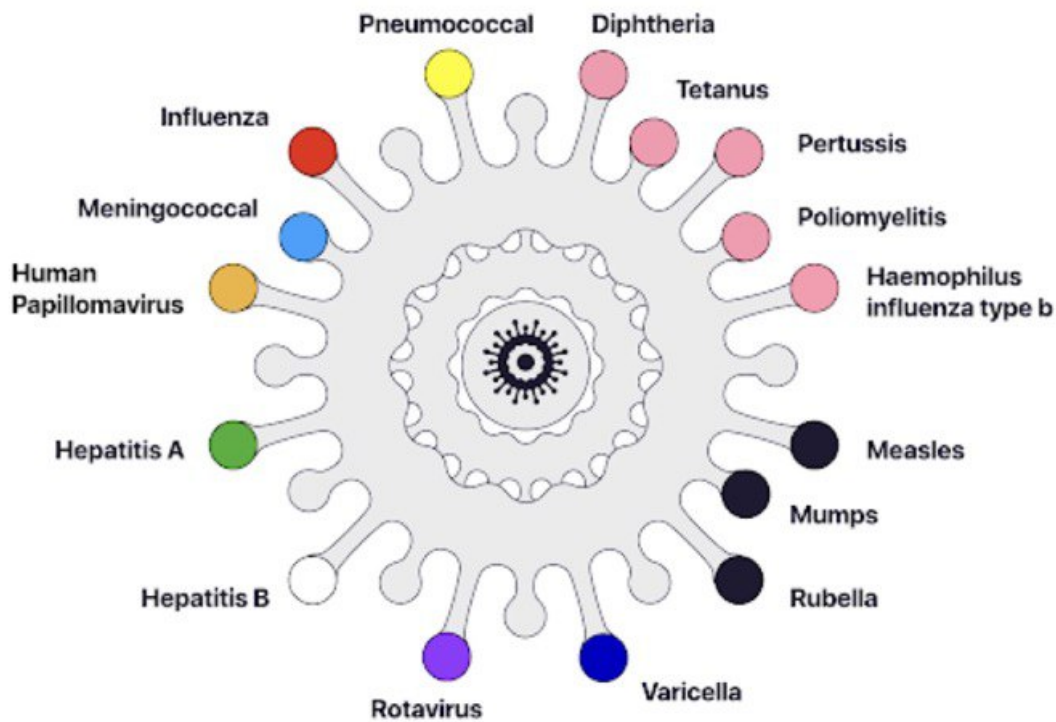
- Similar to natural mutation: In this case, this protein is changed a little bit, just as nature does through mutation.
- Faster and cheaper: It is much faster and far more precise than natural mutation or conventional breeding methods.
- Safe for consumption:
- It is potentially a new Green Revolution.

## Vaccine-Preventable Diseases (VPDs)

Vaccine-preventable diseases (VPDs) are bacterial and viral infections that can be avoided using vaccinations.

- VPDs can be transmitted by a variety of means, including the air, respiratory droplets, and body contact.

### Vaccine-Preventable Diseases





- **Mission Indradhanush** provides vaccination against 12 Vaccine-Preventable Diseases (VPD).
- The VPDs covered under Mission Indradhanush are
  - Diphtheria
  - Whooping Cough
  - Tetanus, Polio
  - TB
  - Hepatitis B
  - Meningitis
  - Pneumonia
  - Haemophilus Influenzae Type B infections
  - Japanese Encephalitis (JE)
  - Rotavirus Vaccine
  - Pneumococcal Conjugate Vaccine (PCV)
  - Measles-Rubella (MR).