Plastic Degrading Bacteria carries AMR Genes

***Prelims**: Current events of national and international importance*

Why in News?

Recently, IISER Kolkata has raised the troubling possibility that microbes capable of breaking down plastics are also reservoirs of antibiotic resistance gene.

- ***Location of research -** Sundarbans Forest*
- **Research overview** – IISER Kolkata reveals a troubling connection i.e., microbes that digest plastic may also host antibiotic resistance genes, creating potential hotspots for gene transfer.
- Metagenomic sequencing is the method used by researchers read the genetic material of the entire microbial community
- **Severity of plastic pollution** – Plastic is universal in applications like packaging and medical supplies, yet it doesn't decompose.
- The disintegrated microplastics and nano plastics endure for decades.
- These particles *accumulate in waterways and attract* harmful pollutants such as *heavy metals and antibiotics*.
- **Plastic biodegradation** – Certain microbes have evolved enzymes to break down plastics, demonstrated by PETase from ***Ideonella sakaiensis*,** capable of degrading PET.

***Polyethylene terephthalate (PET)** is a strong, stiff synthetic fibre and resin and a member of the polyester family of polymers.*

- **The link to antibiotic resistance** – Sticky microplastic surfaces foster bacteria that contain *antibiotic resistance genes (ARGs),* raising grave concerns about the rise of ***antimicrobial resistance (AMR).***
- Microbes with PDEs frequently also carry genes for antibiotic and metal resistance, particularly for zinc and aminoglycosides.
- It revealing a concerning relationship between pollution and microbial adaptation.
- **Significant findings on enzyme diversity** – The study identified 838 ***plastic degrading enzyme (PDE) genes*** targeting 17 plastic polymers, with 73% linked to synthetic plastics.
- Most hits (73%) targeted synthetic plastics such as *polyethylene glycol (PEG)*, polylactic acid, PET, and nylon, while the rest targeted natural polymers like polyhydroxyalkanoates
- **The abundance of PEG** – Plenty degrading enzymes indicates industrial and biomedical contamination.

- **Impact of seasonal variations** – *PDE abundance increased* during monsoon season *due to nutrient influx from inland rivers*.

  *The **Sundarbans** faces inundation by around three billion microplastic particles daily from rivers flowing into the Bay of Bengal.*

- **Implications** – Climate change can potentially accelerate the transfer of ARGs among bacteria, which may ultimately end up in humans.

Reference

The Hindu| Plastic Degrading Bacteria carries AMR Genes