

AR Gene Transfer by Nanoplastics

Why in News?

Recent study shows how discarded PET bottles can exacerbate the global menace of antibiotic resistance.

- **AR Gene transfer** - Antibiotic resistance gene transfer across the species.

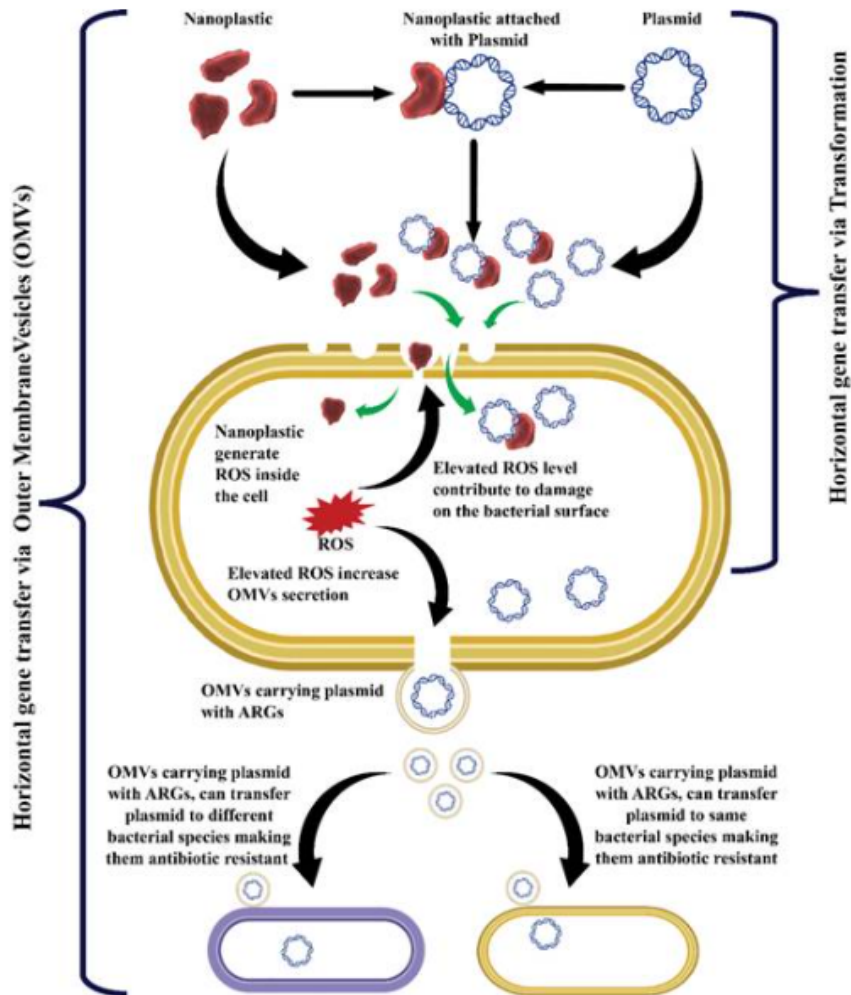
Antibiotic Resistance (AR) also known as Antimicrobial Resistance (AMR) occurs when bacteria develop defenses against the antibiotics designed to kill them.

Nanoplastics are a type of microplastic, ranging from 1 nanometre ($10^{-9}m$) to 1 μm ($10^{-6}m$).

- **Nanoplastics in AR gene transfer** - Polyethylene Terephthalate Bottle-Derived Nano-plastics (**PBNPs**) facilitate the cross-species gene transfer **from *E-coli* to *Lactobacillus acidophilus***.
- It is done through a process called *horizontal gene transfer (HGT)*.

E. coli and *Lactobacillus acidophilus* are a significant bacteria found in human gut microbiota. Protecting beneficial gut bacteria is crucial for immune support, digestion, and disease prevention.

- **2 novel Mechanism** - PBNPs facilitate AR gene transfer by
 - Direct transformation pathway
 - OMV-induced transfer pathway
- **Direct transformation pathway** - PBNPs act as *physical carriers, transporting AR plasmids* across bacterial membranes and promoting direct gene transfer between bacteria.
- **OMV-induced transfer pathway** - PBNPs *induce oxidative stress and damage to bacterial surfaces*, which activates the stress response genes and triggers an increase in OMV secretion.
- The OMV loaded with genes AR, becomes a potent vector for gene transfer across bacterial species.



- **Health impacts** - *Lactobacillus acidophilus* could act as reservoirs for AR genes, potentially transferring them to pathogenic bacteria during the course of infections.

Reference

[The Hindu Business Line| Nano-plastics Contribution to AMR](#)

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