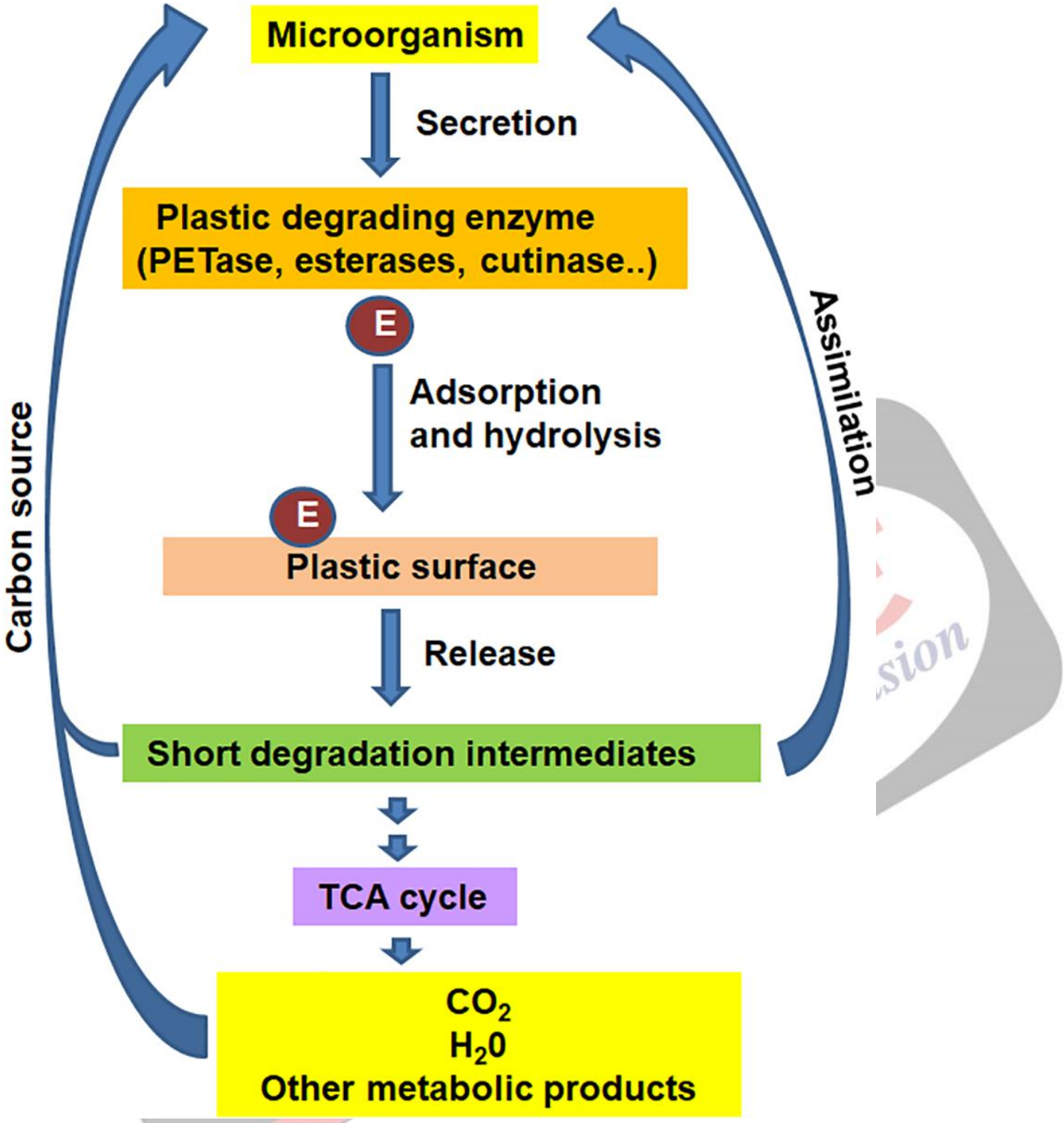
Plastic-Degrading Microbes

Source: TH

A study in the **Sundarban forest** found a troubling link between **plastic-degrading microbes** and **antibiotic resistance genes (ARGs)**, highlighting a new aspect of pollution that could worsen the **antimicrobial resistance (AMR)** crisis.

- The Sundarbans **world's largest mangrove forest** receives around **3 billion microplastic particles every day** through the rivers that feed into the **Bay of Bengal.**
  - It promotes microbes with **plastic-degrading enzymes(PDEs)** that often carry antibiotic and metal resistance genes.
- Non-biodegradable plastics like **polyethylene terephthalate (PET)**, persist in the environment, accumulating in water bodies and adsorbing pollutants, including heavy metals and antibiotics.
  - These microplastics foster bacteria with resistance genes, raising concerns about the spread of AMR.



Microplastics

- **Microplastics** are plastic fragments **<5 mm** (nanoplastics <100 nm) formed from the breakdown of larger plastics via **UV radiation, wind, and ocean currents**.
- Microplastics persist in ecosystems, harm m**arine life and food chain**s, and enter humans through **ingestion, inhalation, or skin contact**, affecting **cells, immunity, hormones**, and the **cardiovascular system.**
- Addressed globally by the **UNEP Plastics Treaty** and in India through the **Single-Use Plastics Ban** and **Plastic Waste Management Rules (2016 & 2024)**.

THE 7 TYPES OF PLASTICS

THEIR TOXICITY AND WHAT THEY ARE MOST COMMONLY USED FOR

TOXICITY CODE: ⚠ LOW ☠ HIGH

Polymer Name	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	All other plastics, including acrylic, fiberglass, nylon, polycarbonate, and polylactic acid (a bioplastic)
Resin Identification Code	1	2	3	4	5	6	7
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle
Percentage Recycled Annually	36%	30-35%	<1%	6%	3%	34%	Low
How Long to Decompose Under Perfect Conditions	5-10 Years	100 Years	Never	500-1,000 Years	20-30 Years	50 Years	Majority of these plastics: never Polylactic acid: 6 months
Maximum Temperature	70°C (158°F)	120°C (248°F)	70°C (158°F)	80°C (176°F)	135°C (275°F)	90°C (194°F)	Polycarbonate: 135°C (275°F) Polyactic acid: 150°C (302°F)
Brittleness Temperature	-40°C (-40°F)	-100°C (-148°F)	-30°C (-22°F)	-100°C (-148 °F)	0°C (32°F)	-20°C (-4°F)	Polycarbonate: -135°C (-211°F) Polylactic acid: 60°C (140°F)
Toxicity Level	☠	⚠	☠	⚠	⚠	☠	☠
Most Commonly Leached Toxin(s)	Antimony Oxide, Bromine, Diaszomethane, Lead Oxide, Nickel Ethylene Oxide, and Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, and Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, and Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, And Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, and Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alcohol, Antimony Oxide, and Tert-butyl Hydroperoxide, Bensoquinone	BPA, BPS, as well as all other toxins mentioned

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