BIOENGINEERED SOLUTION FOR PLASTICS POLLUTION

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Introduction :

- Brief overview of plastic pollution as a global issue.
- Statistics: Over 400 million tons plastic waste produced annually.
- Need for innovative solutions beyond traditional recycling.

What is Bioengineering?

- Definition: The use of biological processes and organisms to solve environmental problems.
- Role in plastic pollution: Developing plastic-degrading enzymes, microbes, and sustainable materials.

Problem Statement:

- Plastic waste takes hundreds of years to decompose.
- Inefficient recycling processes lead to increasing landfill waste.
- Environmental hazards: marine pollution, microplastic contamination.

Plastic-Degrading Enzymes:

- **PETase & MHETase:**

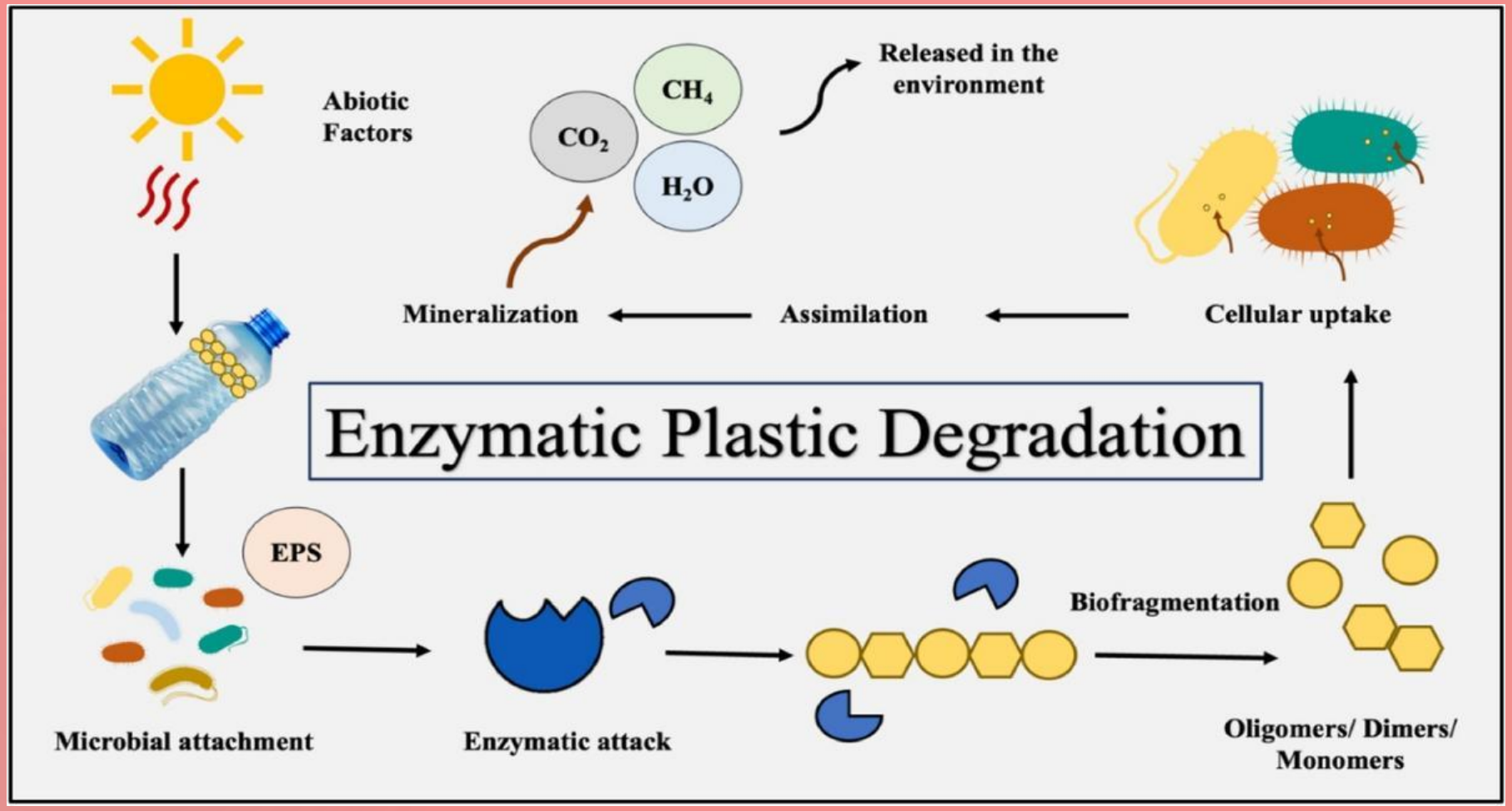
  Enzymes that break down PET plastics into monomers for easier recycling.

- **Benefits:**

  Faster degradation

  Improved recycling efficiency.

  This reduces the amount of plastic waste


Abiotic Factors
CH_4
CO_2
H_2O
Released in the environment
Mineralization
Assimilation
Cellular uptake
Enzymatic Plastic Degradation
EPS
Microbial attachment
Enzymatic attack
Biofragmentation
Oligomers/ Dimers/ Monomers

Genetically Engineered Solutions:

- Synthetic Biology for Biodegradation
- CRISPR-modified microbes for faster plastic degradation
- Microbial Consortia
- Combining multiple organisms for enhanced breakdown

Case Studies & Real-World Applications:

- Carbios (France) - Enzyme-based plastic recycling
- Danimer Scientific (USA) Biodegradable PHA plastics
- Kyoto Institute of Technology (Japan) – Microplastic - consuming bacteria

Advantages of Bioengineered Solutions:

- Eco-Friendly
- Sustainable
- Scalable
- Cost-Effective
- Improve human health
- Job creation

Benefits and Challenges

Benefits:

- Faster plastic degradation.
- Reduce carbon foot
- Potential for Industrial waste management
- Reduced landfill waste.
- Improved recycling efficiency.

Challenges:

- Scalability and production costs.
- Safety and environmental concerns regarding modified organisms.
- Bioplastics limitation
- Economic viability

Conclusion:

- The role of bioengineering in a sustainable future
- Call for further research and investment
- “In conclusion, bioengineered solutions present a revolutionary and sustainable approach to addressing plastic pollution. With further research, these technologies could “.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