

Chapter 24

Environmental Sustainability and Biotechnology



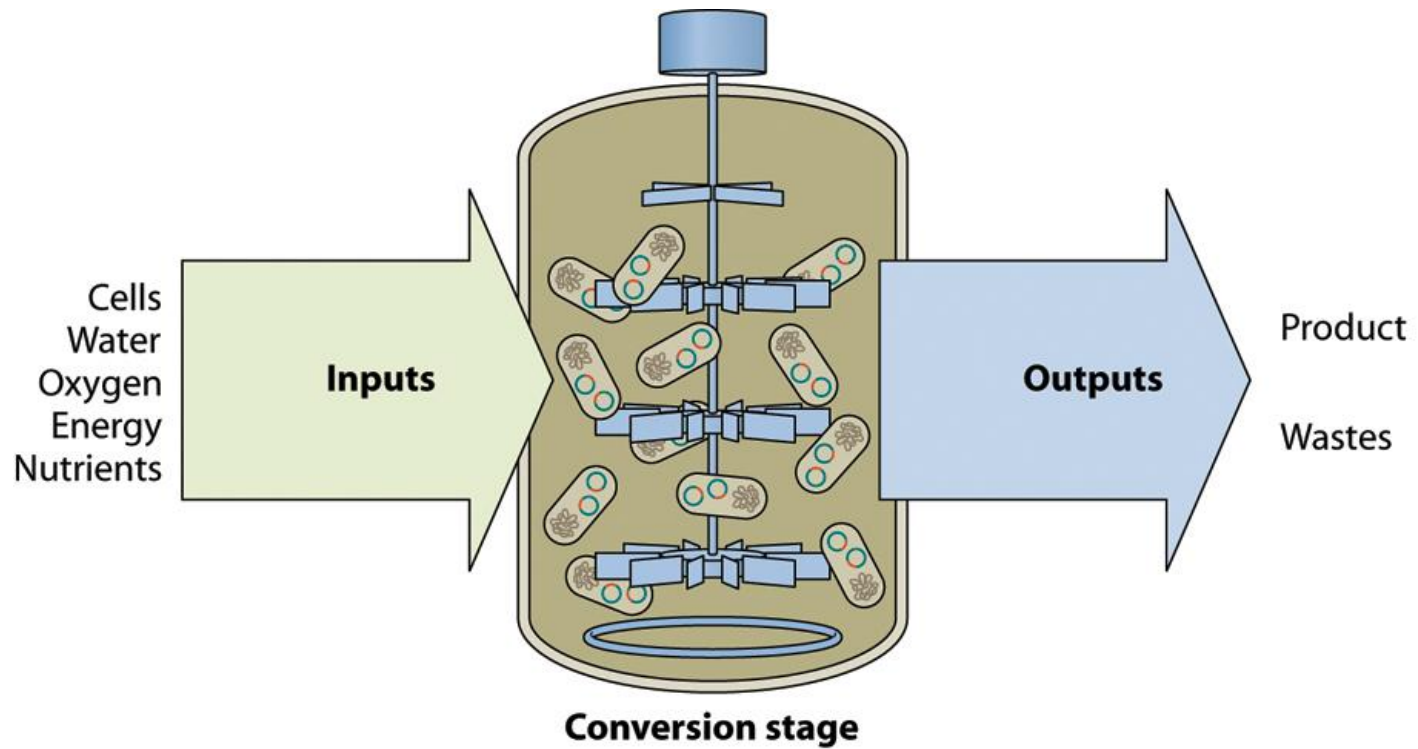
Large-Scale Biomanufacturing

- Microbial fermentation
 - Using microbes to manufacture a commercial product
 - Bioreactor (fermentor)
 - Supply of nutrients
 - Optimum environmental conditions
 - Temperature
 - Oxygen
 - pH
 - » add buffers to control pH
 - » pH controller

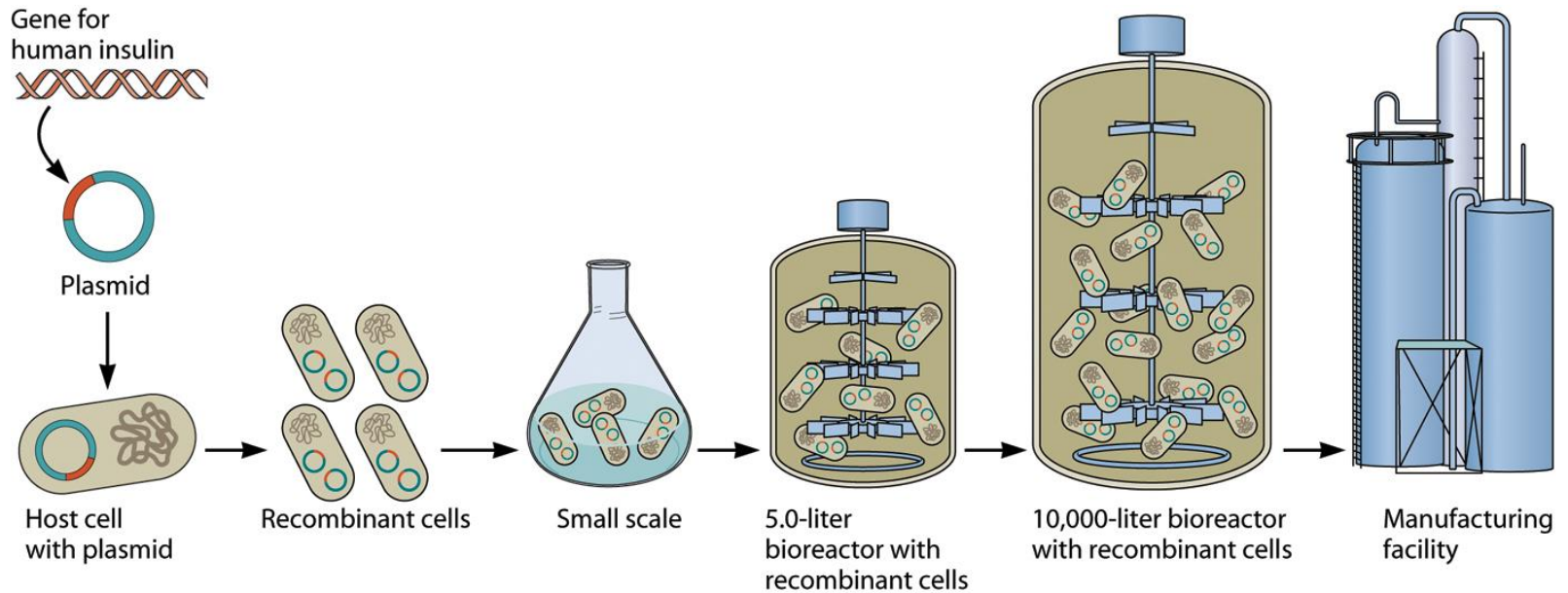
Bioprocess Technologies

- **Bioprocess**
 - Use biocatalysts: living organism or enzymes
- **Advantages of bioprocess**
 - **Sustainability**
 - Reproduction of cells
 - **Mild conditions**
 - Water soluble, low temperature, normal atmospheric pressure, neutral pH
 - **Specificity**
 - Highly selective for substrates and products
 - **Can be continually improved**
 - Genetic modification for optimization of the process

Large-Scale Biomanufacturing



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Using Biodegradation Pathway

- Biomass as energy source

- Biofuel

- Storage of bio energy in other organic molecules
 - Bioethanol, biogas, biodiesel
 - Source of biomaterial
 - Sugarcane, corn starch
 - Environment vs. cost



- Biofeedstocks

- Feed stock chemicals

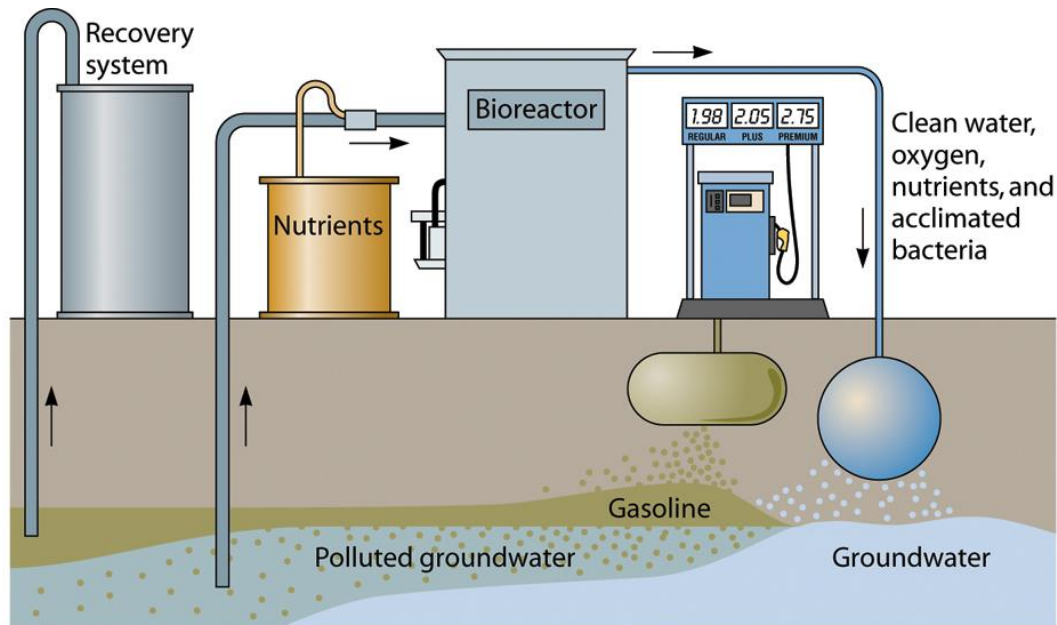
- Building blocks for various consumer products (plastics, polyethylene etc.)
 - Glucose as a starting material for producing building blocks

- The source of biomass

- Natural vegetation
 - Growing agricultural crops and trees
 - Biological waste products : e.g. cellulose

Bioremediation

- Bioremediation
 - Use microbes to remove pollutants
 - (oil, toxic waste sites)



Bioremediation of a gasoline spill