Chapter 24

Environmental Sustainability and Biotechnology

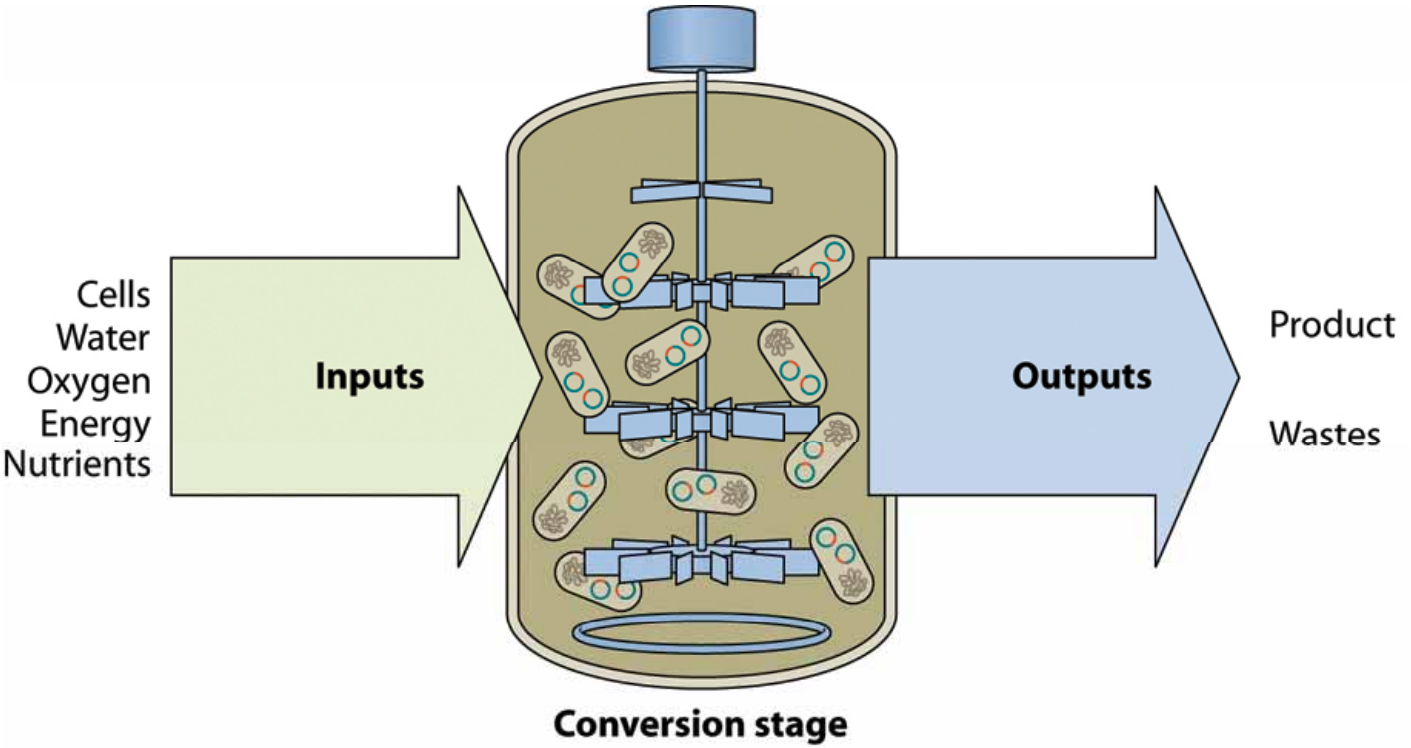
Bioprocess Technologies

- 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

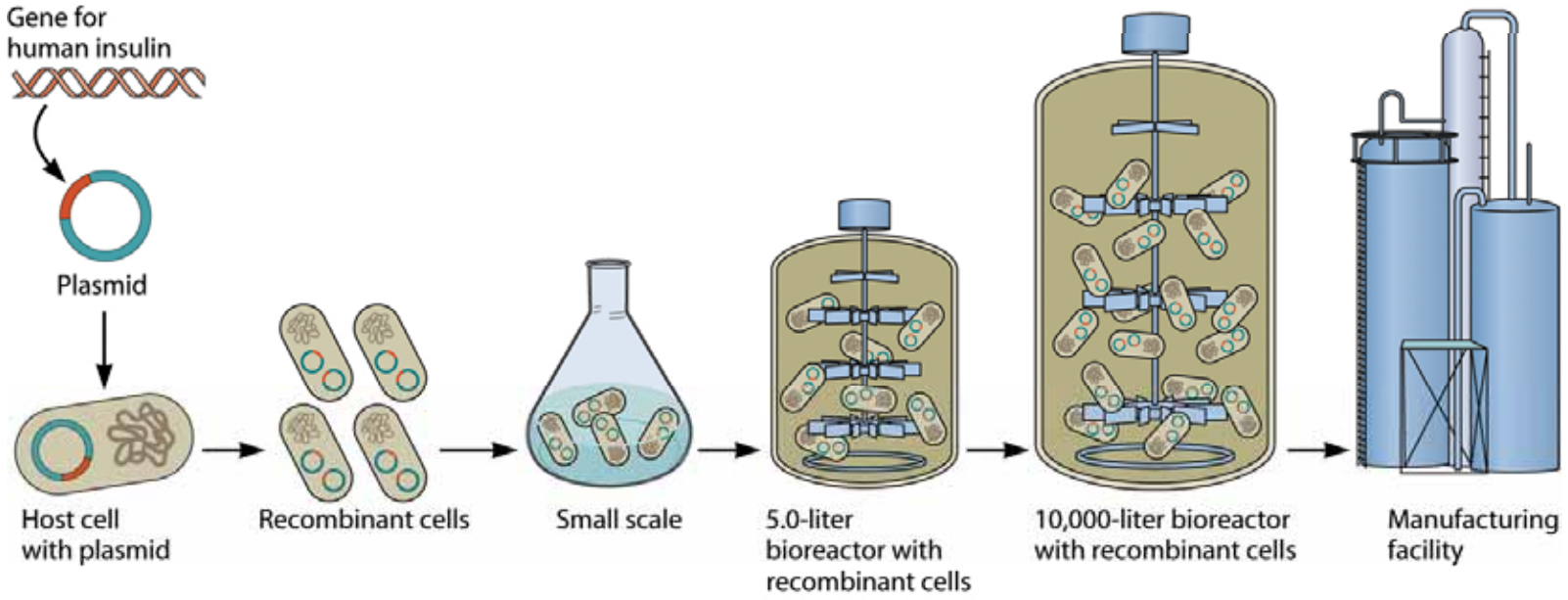
Large-Scale Biomanufacturing

- 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

Large-Scale Biomanufacturing



Large-Scale Biomanufacturing



Large-Scale Biomanufacturing

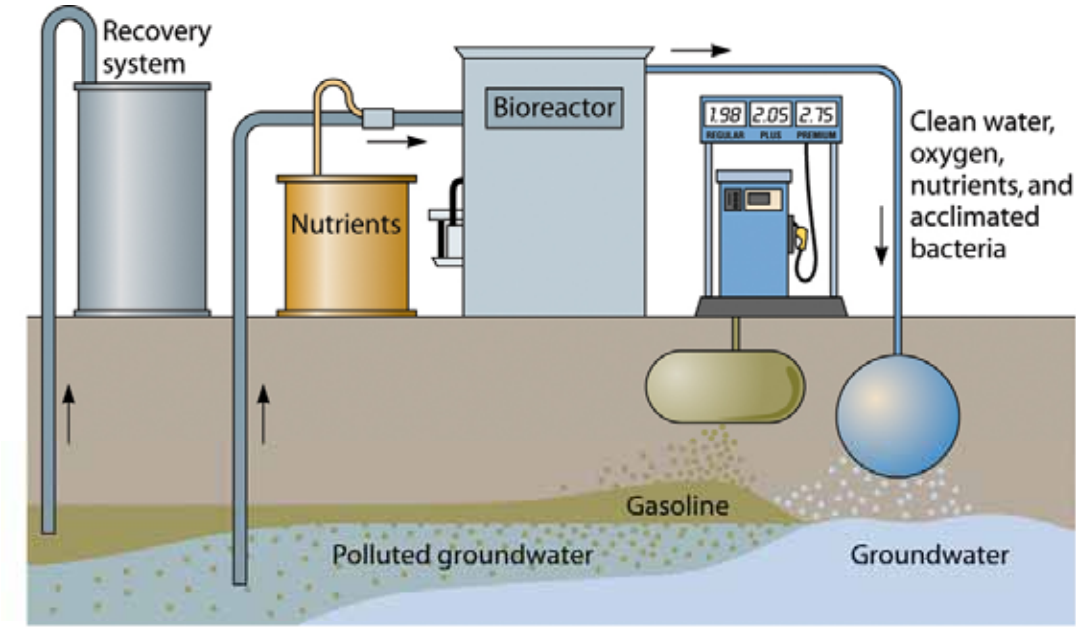
Using Biodegradation Pathway

- 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