



The Growth, Survival and Death of Microorganisms

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Survival of Microorganisms in The Neutral Environment



- Population of microorganisms is constant in the biosphere
 - Completion for nutrients
 - Maintained of living cells
 - Avoiding nutritional deprivation
- Natural microbial nature may not be observable under laboratory conditions
 - Isolated cell lines
 - Optimal growth conditions
 - Competition in natural environment
- Natural niche will be filled immediately by competitors
 - Public health procedures
 - Niche occupation by successful nonpathogenic competitors

The Meaning of Growth



Growth is the orderly increase in the sum of all components of an organisms

- In unicellular organisms growth means increase in number of individuals making up a population or culture

Measurement of Microbial Concentrations

- Cell Concentration
 - Viable cell count
 - Measure of cell concentration
 - Turbidity of the culture
- Biomass Density
 - Determination by dry weight of microbial culture
 - Determination of important cellular content such as a particular protein

Exponential Growth



- Growth of cells is limited by the number of nutrients
- Rate of growth is measured in grams of biomass produced per hour
- The growth rate constant k

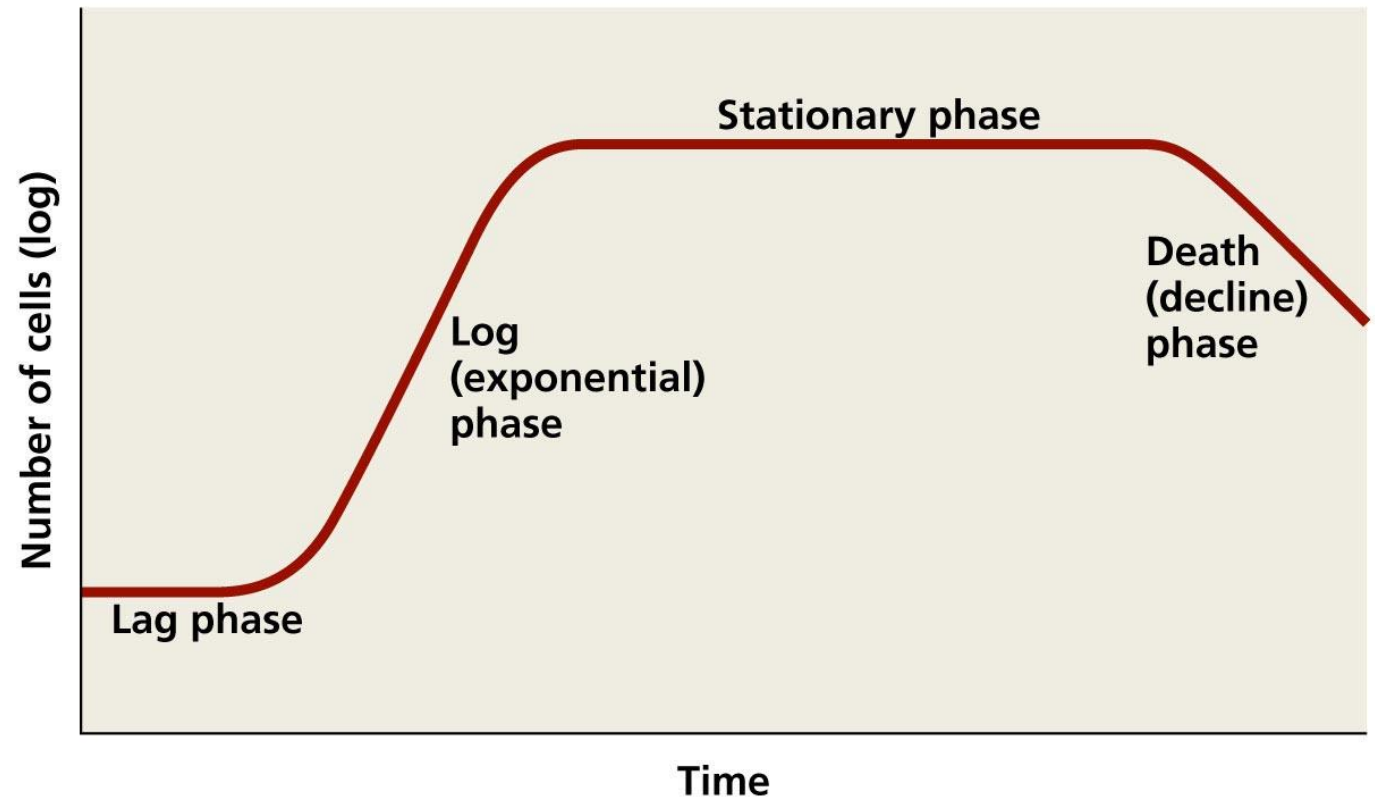
$$\frac{dB}{dt} = kB$$

$$k = \frac{dB}{dt}$$

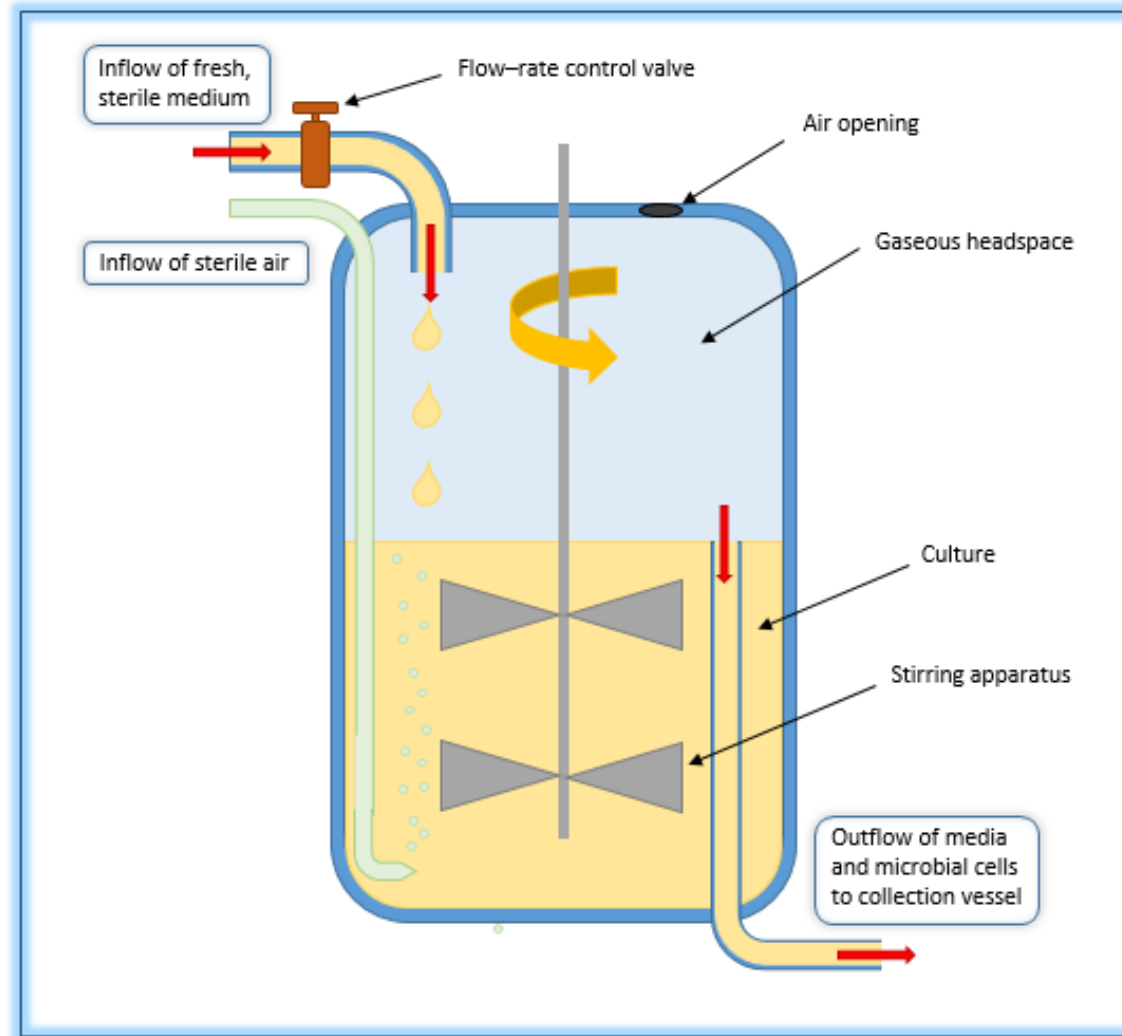
The Growth Curve



- Lag Phase
- The Exponential Phase
- The Maximum Stationary Phase
- The Phase of Decline (Death Phase)

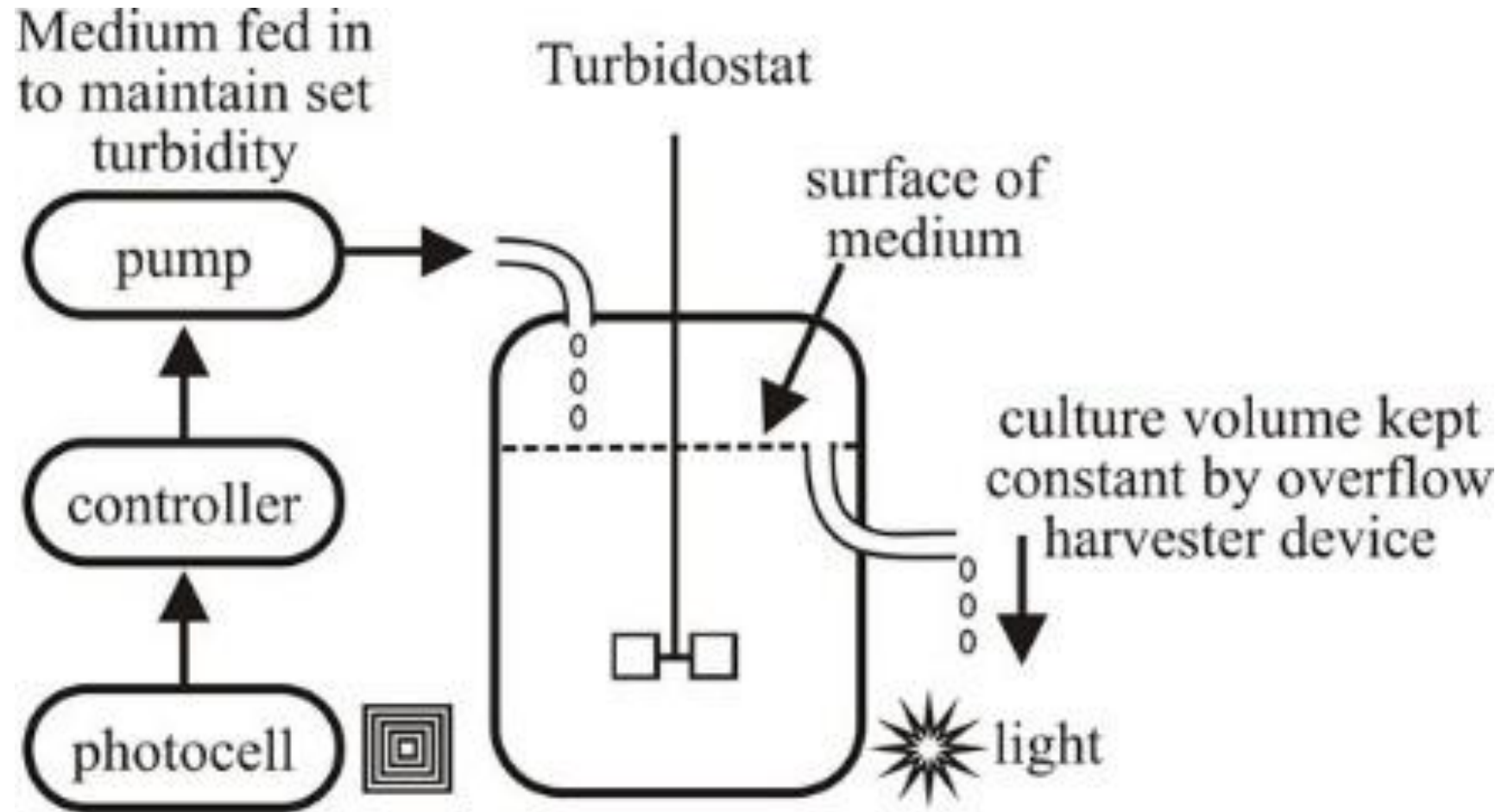


Maintenance of Cells in the Exponential Phase



Chemostat

Maintenance of Cells in the Exponential Phase



Turbidostat

Growth Parameters



- Total growth
- Exponential growth rates

Definition and Measurement of Death



- The meaning of Death
- The measurement of Death
- Sterilization
- Effect of drug concentration

Antimicrobial Agents



- Bacteriostatic
- Bactericidal
- Sterile
- Disinfectant
- Septic
- Aseptic

Modes of Action

- Damage to DNA
- Protein Denaturation
- Disruption of Cell Membrane
- Removal of free Sulfhydryl Group
- Chemical Antagonism

Reversal of Antibacterial Action

- Removal of Agent
- Reversal of Substrate
- Inactivation of Agent
- Protection Against Lysis

Resistance to Antibacterial Agents

• Physical Agents

- Heat
- Radiation

• Chemical Agents

- Alcohols
- Phenols
- Heavy Metal Ions
- Oxidizing Agents
- Alkylating Agents

• Detergents

- Anionic Detergents
- Cationic Detergents

• Chemotherapeutic Agents



THE END