

# Pathogenic Bacteriology

**Introduction**

# What the class will cover:

- Clinically significant bacteria
  - Morphological characteristics
  - Biochemical characteristics
  - Signs and symptoms they cause in the host they are infecting
  - Virulence factors
  - Pathophysiology of infection

# Clinically significant bacteria

- Propensity to cause disease, i.e., how likely are they to cause disease
  - Opportunistic pathogens – only cause disease in immunocompromised hosts
    - AIDS patients
    - Transplant patients on immunosuppressive drugs
    - Cancer patients undergoing chemotherapy
    - Patients who are already ill
    - Opportunistic pathogens are often organisms that are typically normal flora.
      - *Staphylococcus epidermidis* and intravenous catheters
      - Given the right circumstances any organism can be invasive and lethal

# Clinically significant bacteria

- Frank pathogens are always associated with disease
  - *Neisseria gonorrhoeae*
  - *Shigella species*
- Facultative pathogens fall between the two extremes (opportunistic and frank) and the majority of organisms that cause disease fall into this group
  - *Staphylococcus aureus*
  - *E. coli*

# Clinically significant bacteria

- Various factors involved in the host-parasite interaction determine whether an organism will cause disease in the host:
  - Virulence factors of the bacteria including:
    - Capsules
    - Pili
    - IgA protease production
    - Iron capturing ability
    - Production of coagulase
    - Production of toxins
    - Ability to survive inside phagocytic cells

# Clinically significant bacteria

- Degree of resistance of the host
  - Age
  - Gender
  - Physical health
  - Mental health
  - Antibiotic therapy that disrupts the normal balance between the host and normal flora
- From the organisms point of view, the most successful pathogen is NOT the one that inflicts the most extensive damage on the host, but rather the one that can establish a **balanced pathogenicity** with the host. Parasites that kill the host will eventually lead to their own extinction.

# Clinically significant bacteria

- Severe human infections - often from zoonotic organisms
  - No balanced pathogenicity
  - Humans irrelevant for organism's survival - Humans simply serve as accidental hosts.
    - Bubonic plague
    - Anthrax
    - Leptospirosis
- Based on your knowledge of normal flora and the propensity of organisms to cause disease, you may be asked to determine the likelihood that a clinical isolate is causing disease. Things to consider are:
  - Site from which the organism was isolated (*E. coli* in G.I. tract versus the urinary tract)
  - Relative numbers of organism isolated
  - Age of patient

# What the class will cover:

- **Media**
  - Content
  - Usage
  - Appropriate positive and negative controls
  - What information can be gained by using the media
  - How to read results on the media

# What the class will cover:

- What is the difference between pathogenicity and virulence?
  - Pathogenicity is the potential to cause disease and is applied to groups or species of organisms
  - Virulence is the degree of pathogenicity within a group or species and is measurable by the  $LD_{50}$  or the  $ID_{50}$ .

# LD<sub>50</sub>

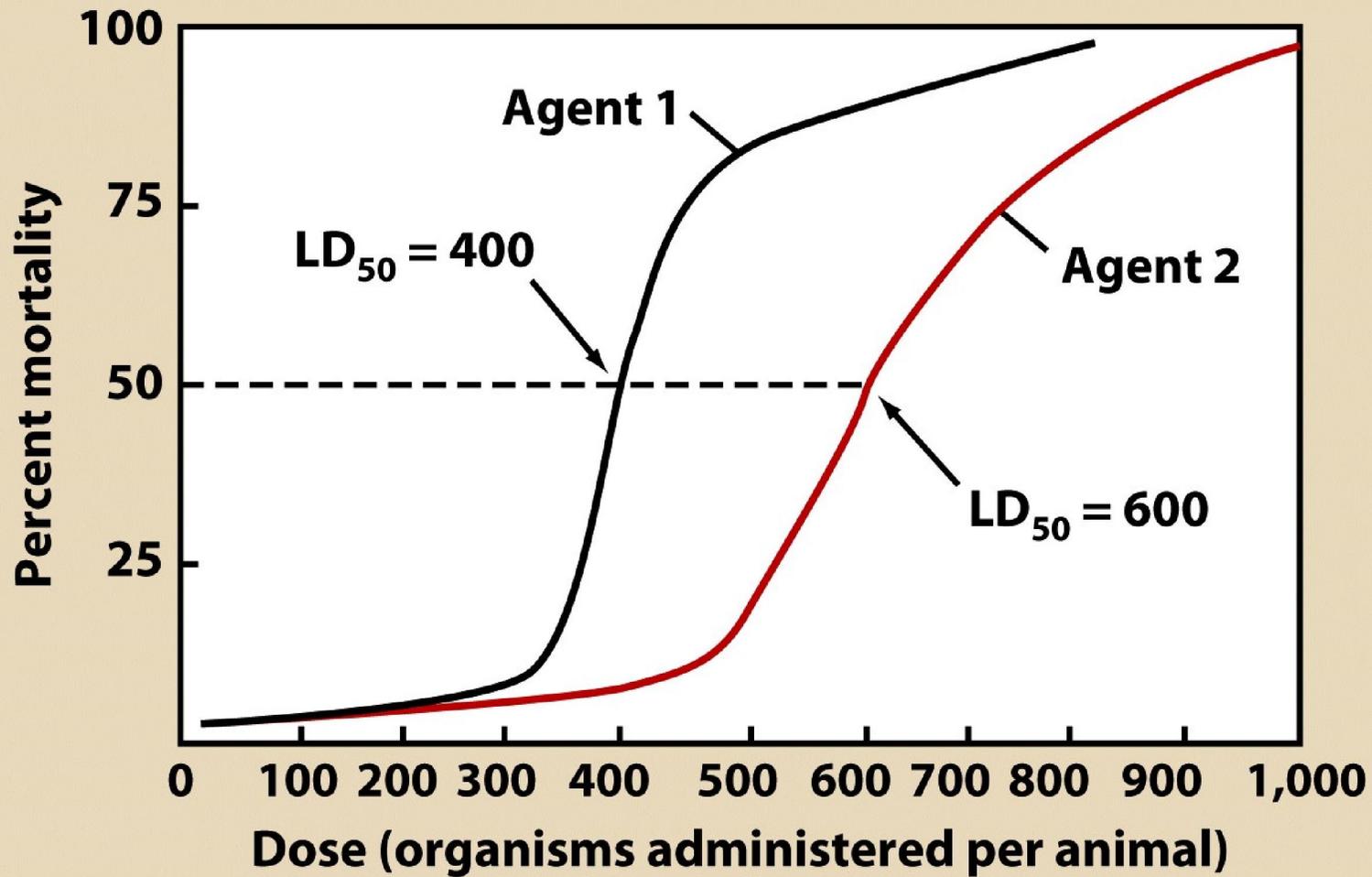


Figure 25.5 Microbiology: An Evolving Science  
© 2009 W. W. Norton & Company, Inc.