

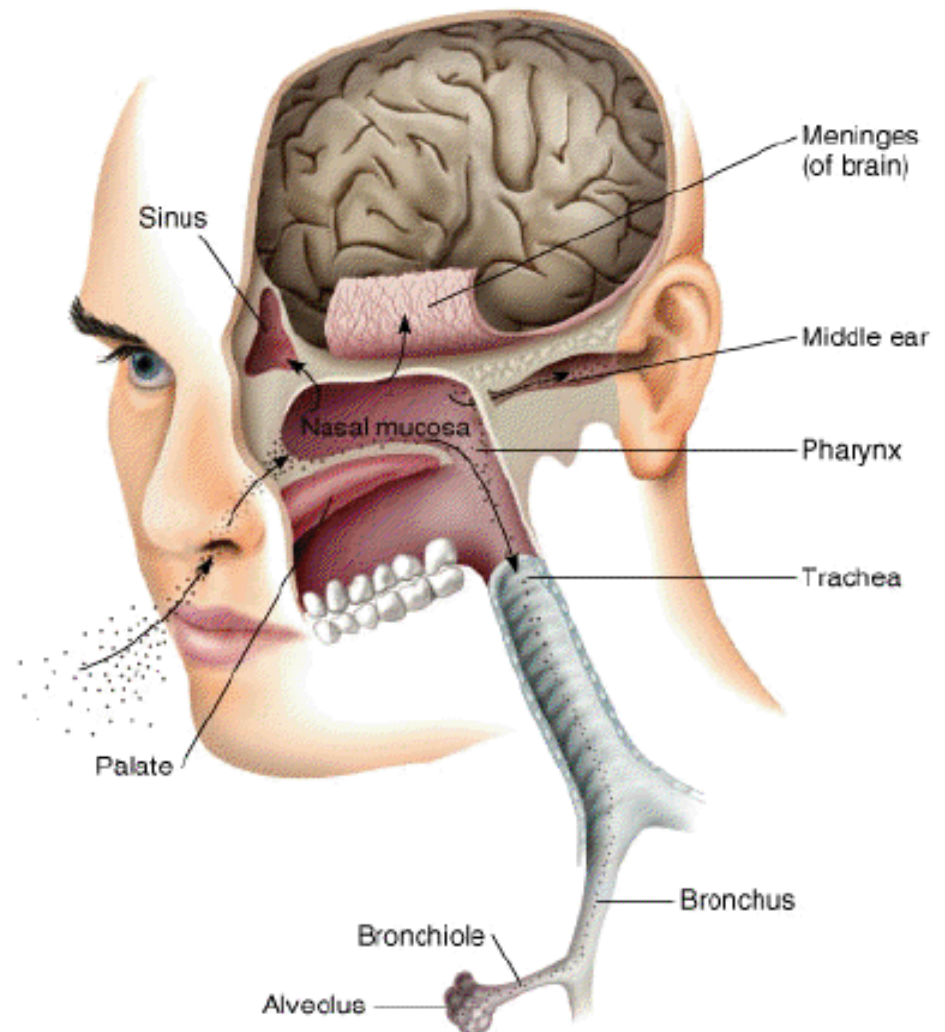
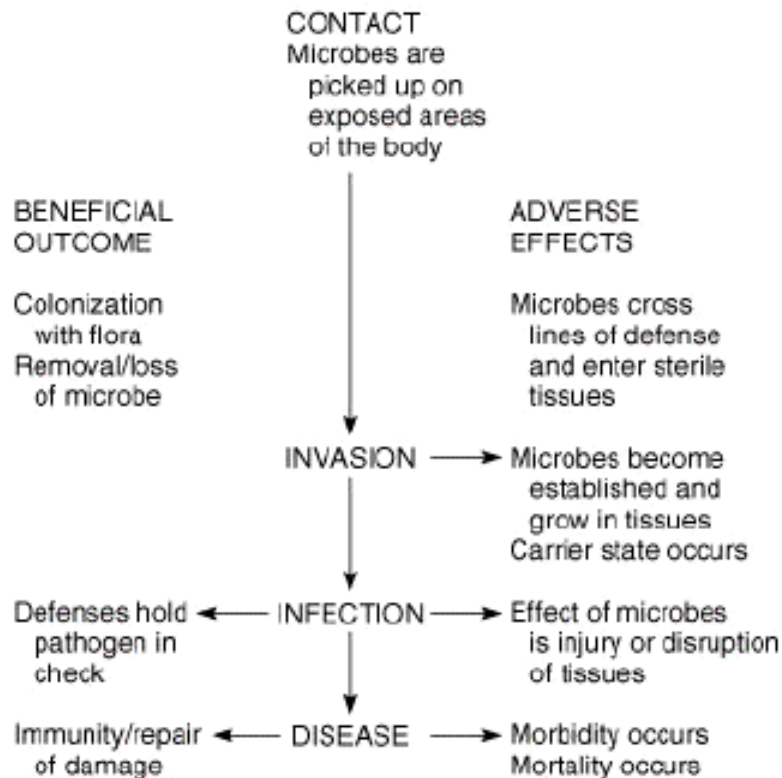
Principles of Infectious Disease

Terminology

- **Pathology**: study of disease
- **Etiology**: cause of disease
- **Pathogenesis**: disease process
- **Infection**: colonization by microbe
- **Disease**: illness

Microbe-Host Interactions

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Normal Microbiota/Flora

- Compete for living space and nutrients with pathogens
- **Mutualism**: they get space and food, we get vitamins and protection from pathogens
- **Biofilms** of microbes cooperate in attachment

TABLE 13.1 Sites That Harbor a Normal Flora

- Skin and its contiguous mucous membranes
- Upper respiratory tract
- Gastrointestinal tract (various parts)
- Outer opening of urethra
- External genitalia
- Vagina
- External ear canal
- External eye (lids, conjunctiva)

TABLE 13.2 Sterile (Microbe-Free) Anatomical Sites and Fluids

All Internal Tissues and Organs

Heart and circulatory system

Liver

Kidneys and bladder

Lungs

Brain and spinal cord

Muscles

Bones

Ovaries/testes

Glands (pancreas, salivary, thyroid)

Sinuses

Middle and inner ear

Internal eye

Fluids Within an Organ or Tissue

Blood

Urine in kidneys, ureters, bladder

Cerebrospinal fluid

Saliva prior to entering the oral cavity

Semen prior to entering the urethra

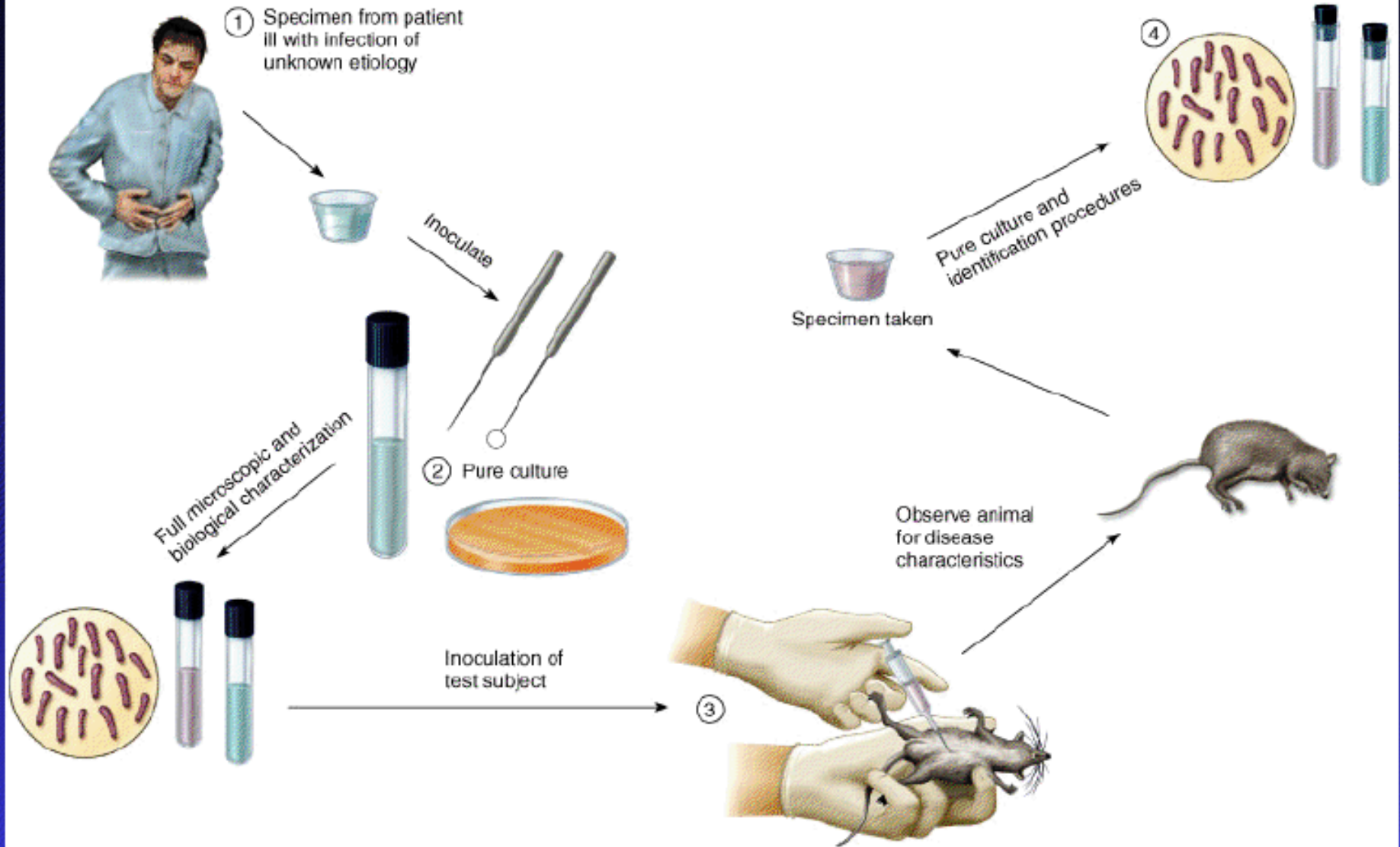
Amniotic fluid surrounding the embryo and fetus

Opportunistic Pathogens

- Organisms that cause disease when they enter different environment
 - *Staphylococcus aureus* enters break in skin
 - *Escherichia coli* enters peritoneal cavity from burst appendix
 - *Clostridium difficile* colonizes intestines when normal flora have been killed by antibiotics

Disease Etiology: Koch's Postulates

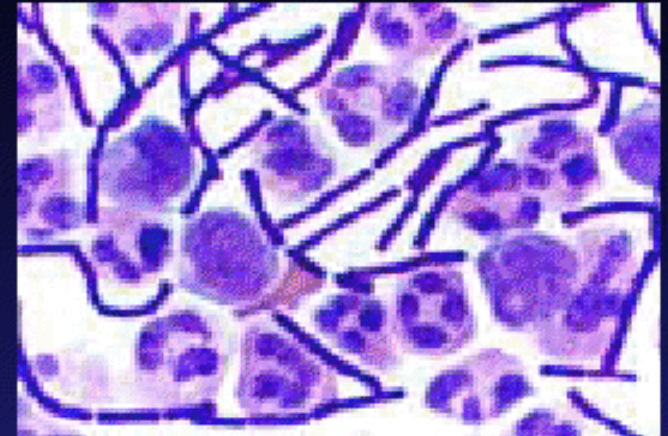
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Exceptions to Koch's Postulates

- Some bacteria and viruses cannot be cultivated in pure culture
- Some pathologies are caused by several organisms: nephritis, pneumonia, meningitis, peritonitis
 - “-itis” = inflammation
- Some organisms cause several diseases (*Staphylococcus aureus*)
- Ethical considerations

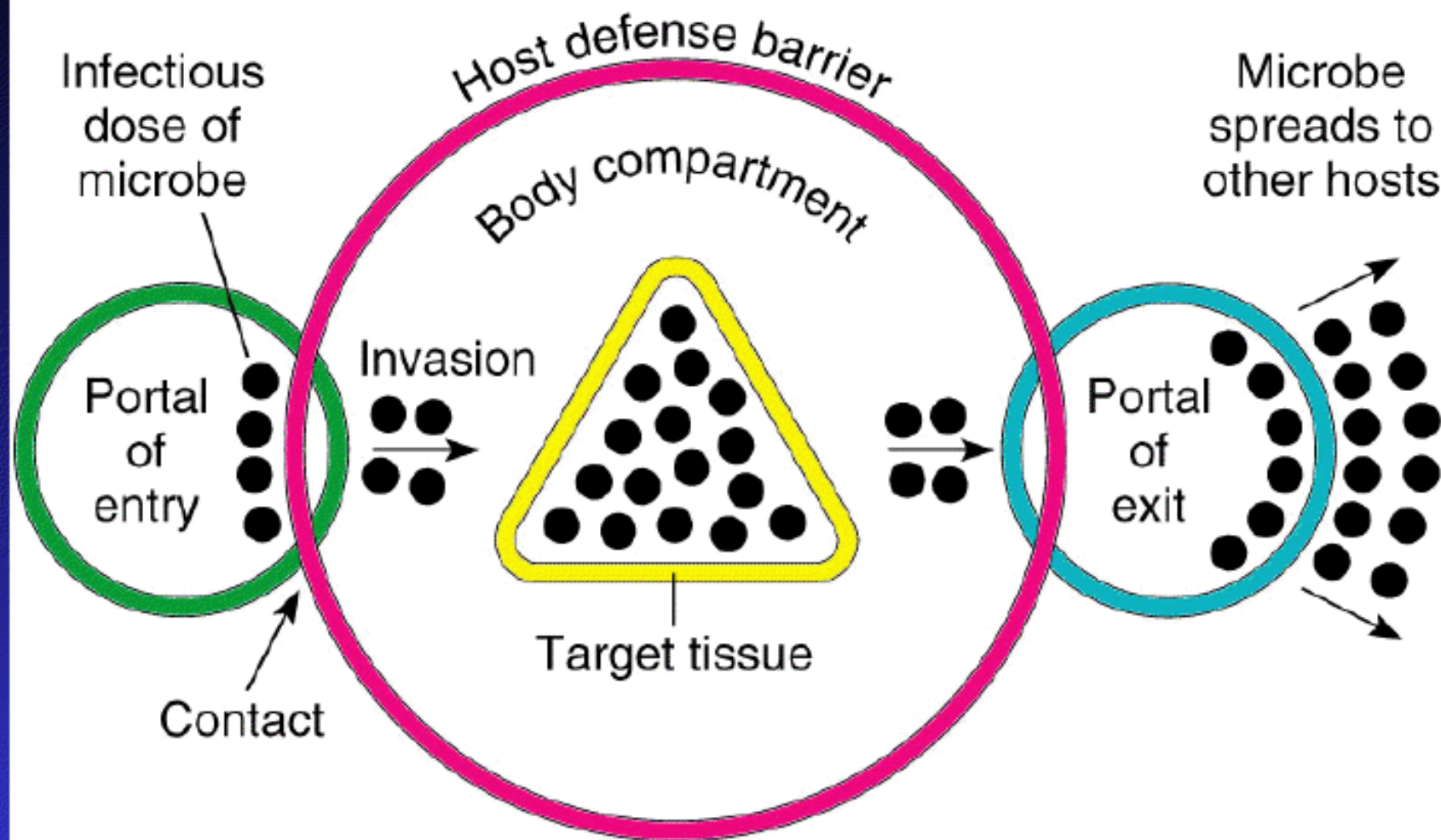
Microbe of the Day



- *Bacillus anthracis*
- Gram positive rod
- Survives in soil as spores
- Infects hoofed animals
- First bacterium proven to cause specific disease

Infection

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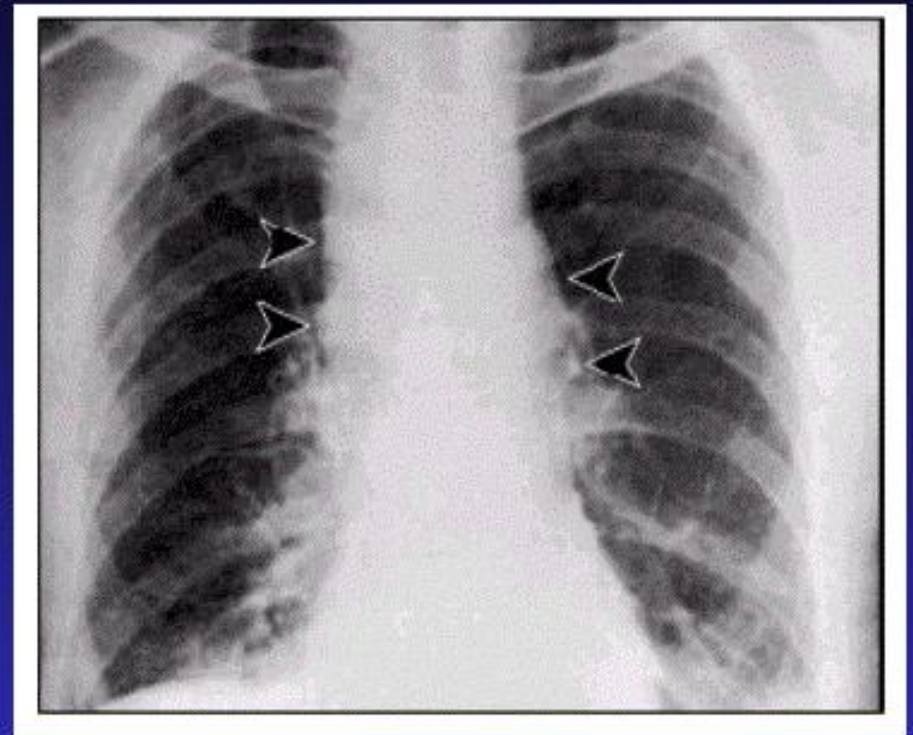
Anthrax in Herbivores

- May be listless or without appetite
- After death, bleeding from body cavities
- In US, incidence higher along old cattle drive routes



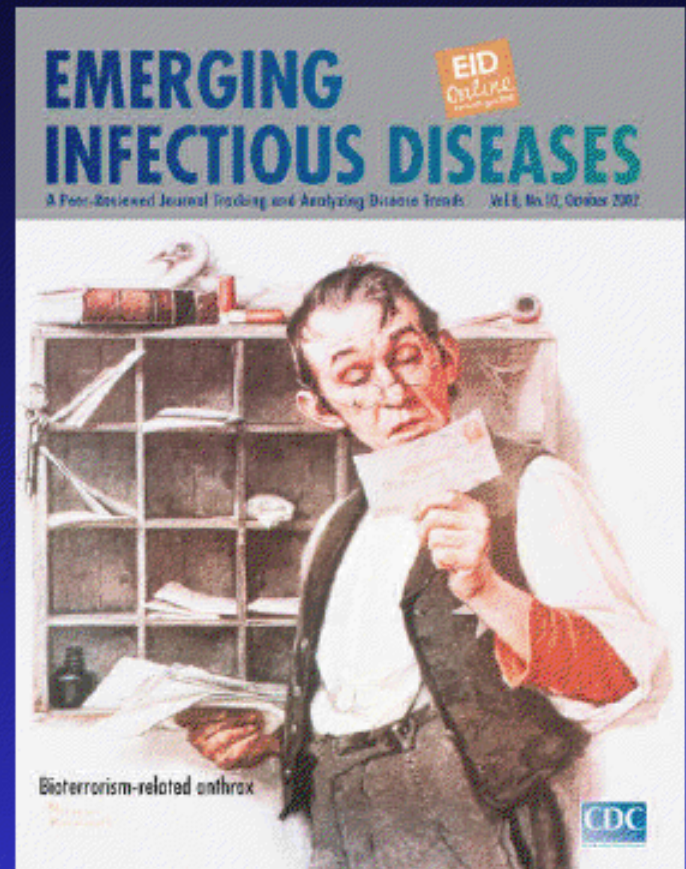
Human Anthrax Infections

- Cutaneous
- Respiratory
- Gastrointestinal



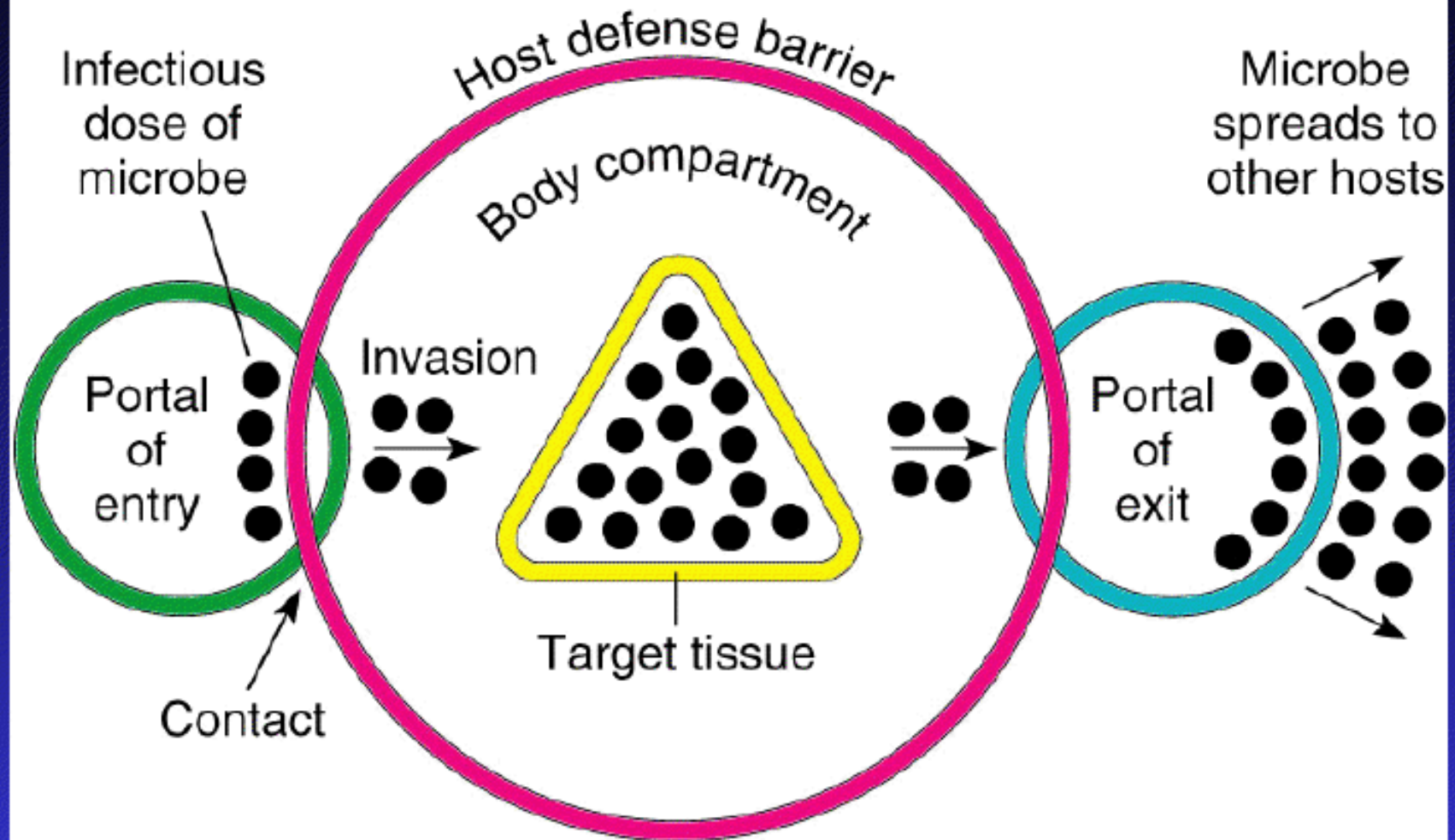
Anthrax Disease

- Not spread person-to-person (not **contagious**)
- Most common in countries without veterinary public health programs
- NOW – germ warfare threat



Infection

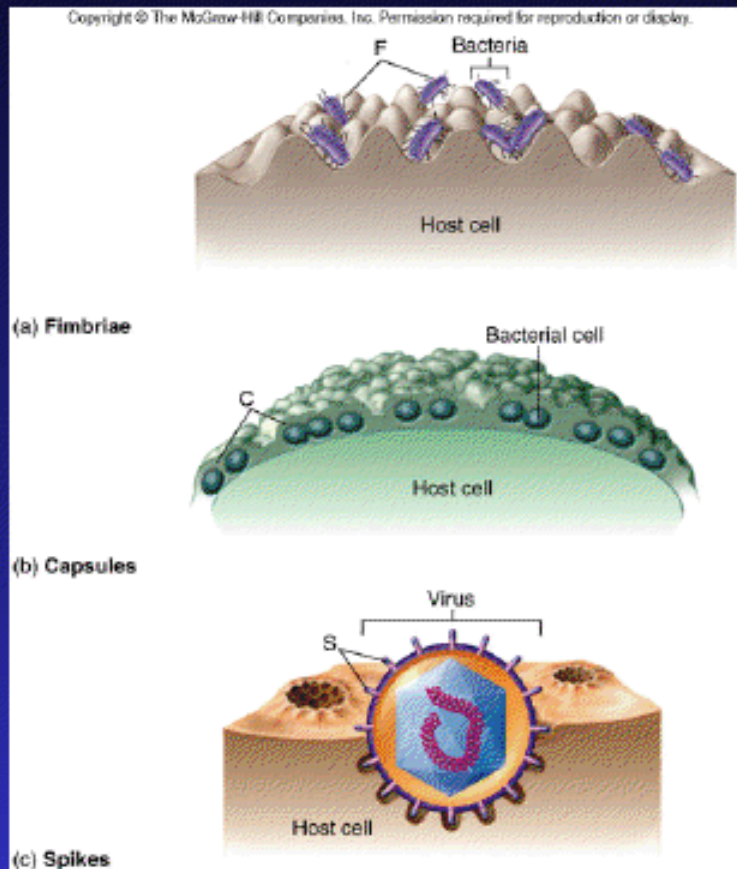
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Portals of Entry

- Skin
- Gastrointestinal Tract
- Respiratory
- Urogenital
- Via Placenta
- **Parenteral** (injection, bite)

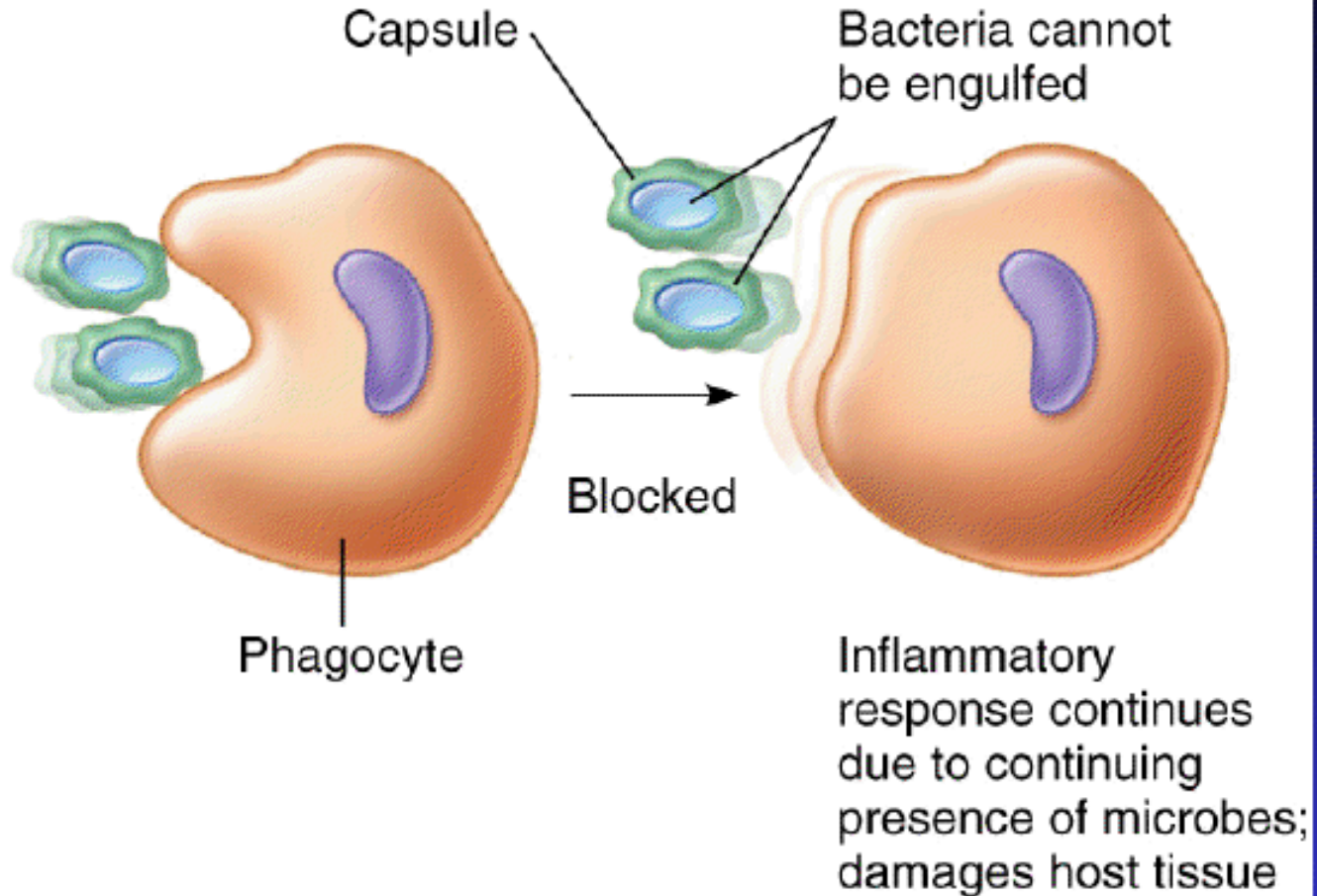
Attachment



- Fimbriae
- Glycocalyx
- Hooks
- Suction discs
- Viral spike

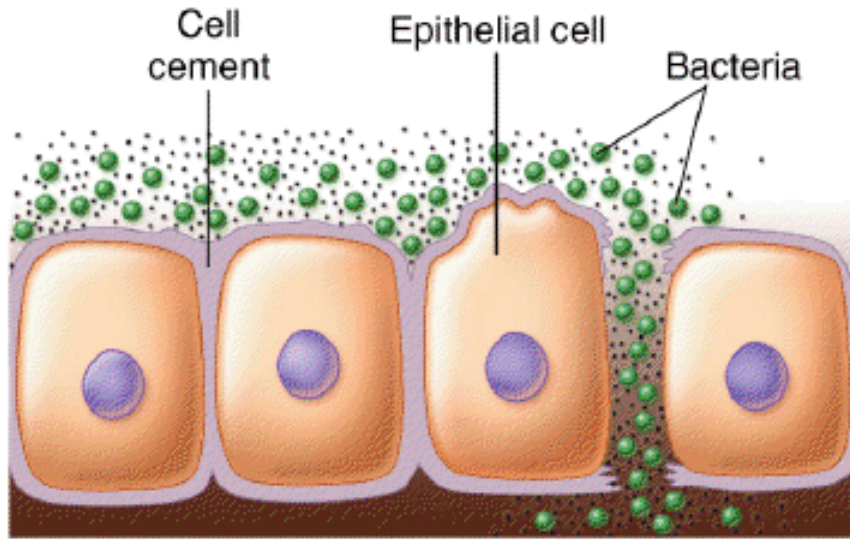
Surviving Host Defenses

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(c) Induction of host response

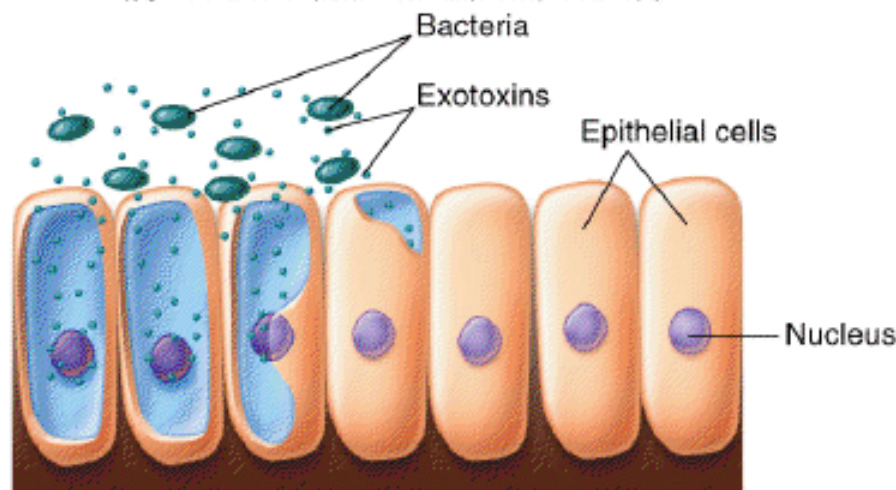
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(a) Exoenzymes

Additional Virulence Factors

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(b) Toxins

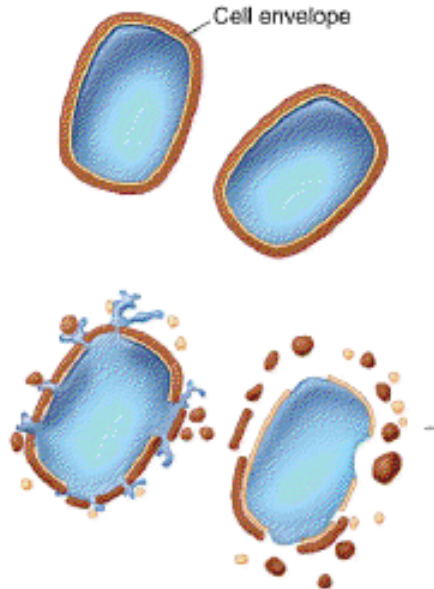
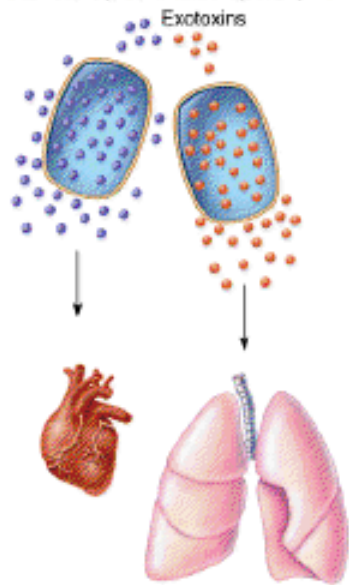


TABLE 13.7 Differential Characteristics of Bacterial Exotoxins and Endotoxin

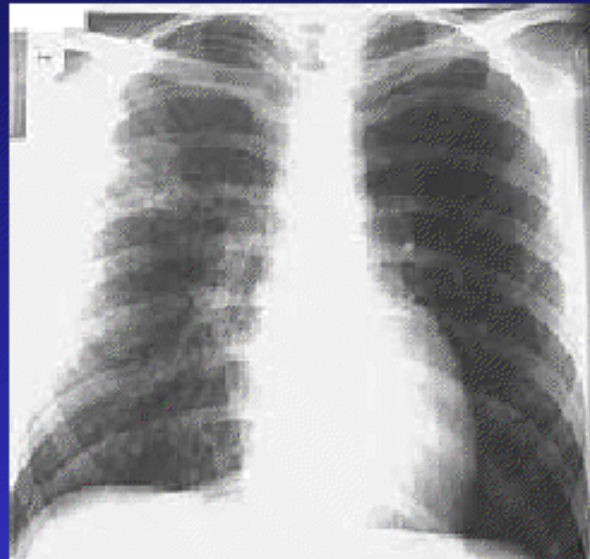
Characteristic	Exotoxins	Endotoxin
Toxicity	Toxic in minute amounts	Toxic in high doses
Effects on the Body	Specific to a cell type (blood, liver, nerve)	Systemic: fever, inflammation
Chemical Composition	Small proteins	Lipopolysaccharide of cell wall
Heat Denaturation at 60°C	Unstable	Stable
Toxoid Formation	Can be converted to toxoid*	Cannot be converted to toxoid
Immune Response	Stimulate antitoxins**	Does not stimulate antitoxins
Fever Stimulation	Usually not	Yes
Manner of Release	Secreted from live cell	Released by cell during lysis
Typical Sources	A few gram-positive and gram-negative	All gram-negative bacteria

*A toxoid is an inactivated toxin used in vaccines.

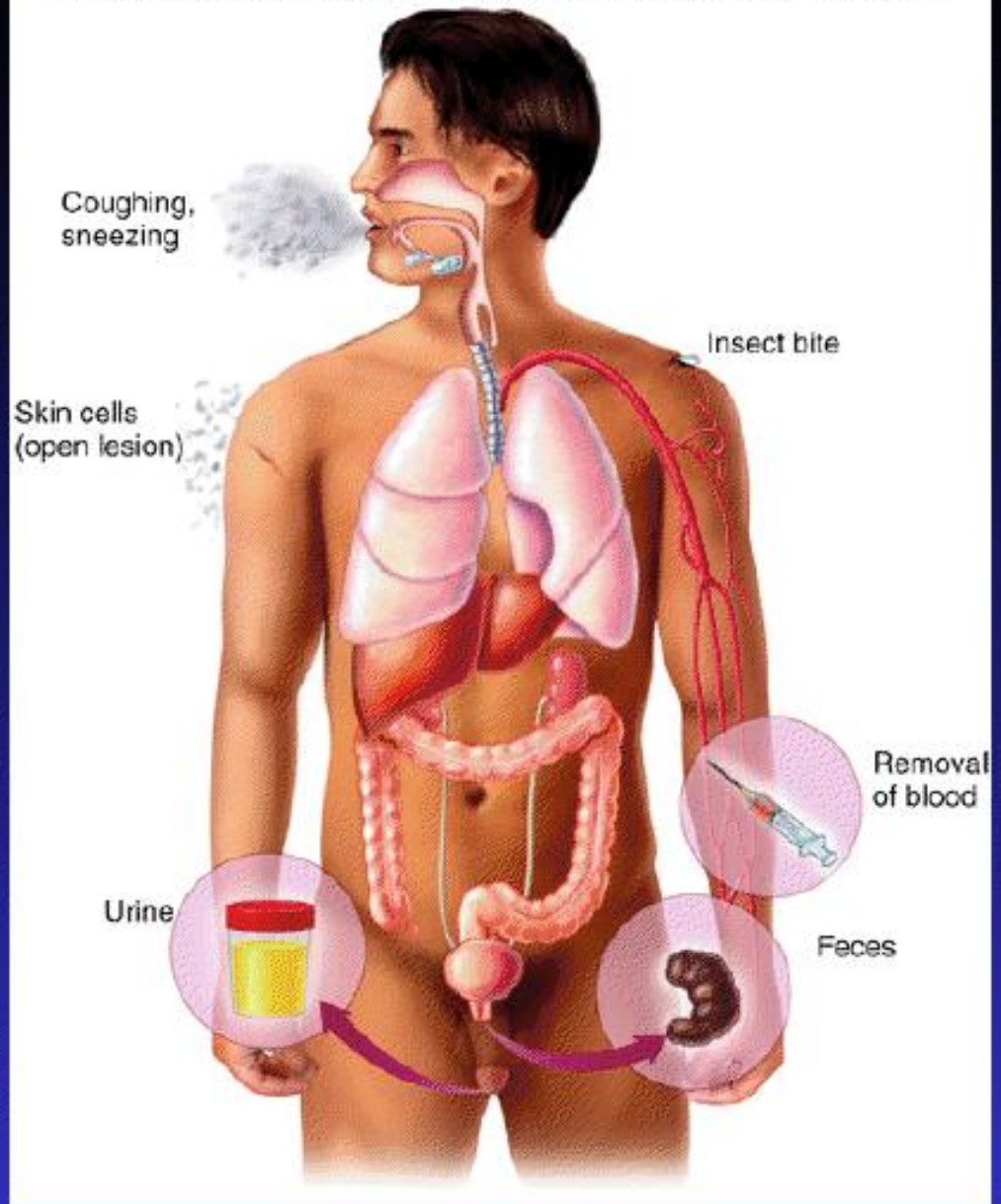
**An antitoxin is an antibody that reacts specifically with a toxin.

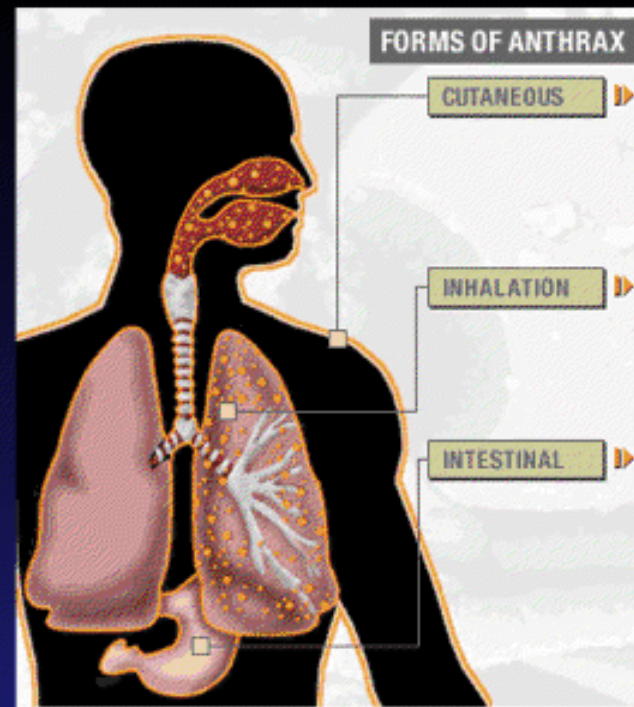
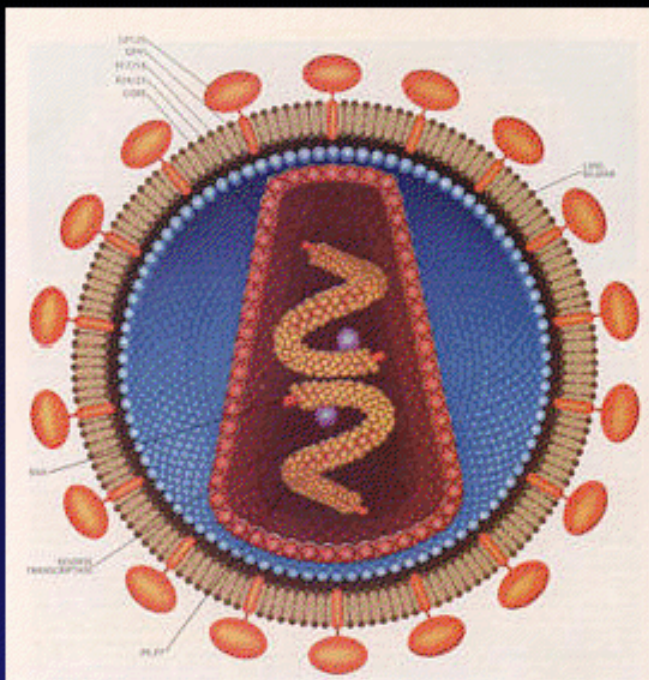
More Terminology

- **Signs:** measurable changes
- **Symptoms:** patient complaint

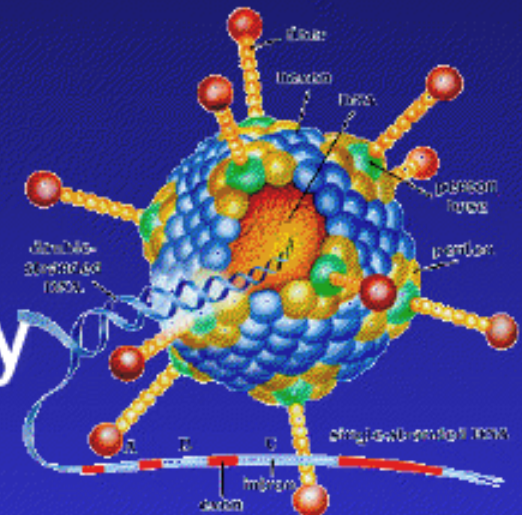


Portals of Exit

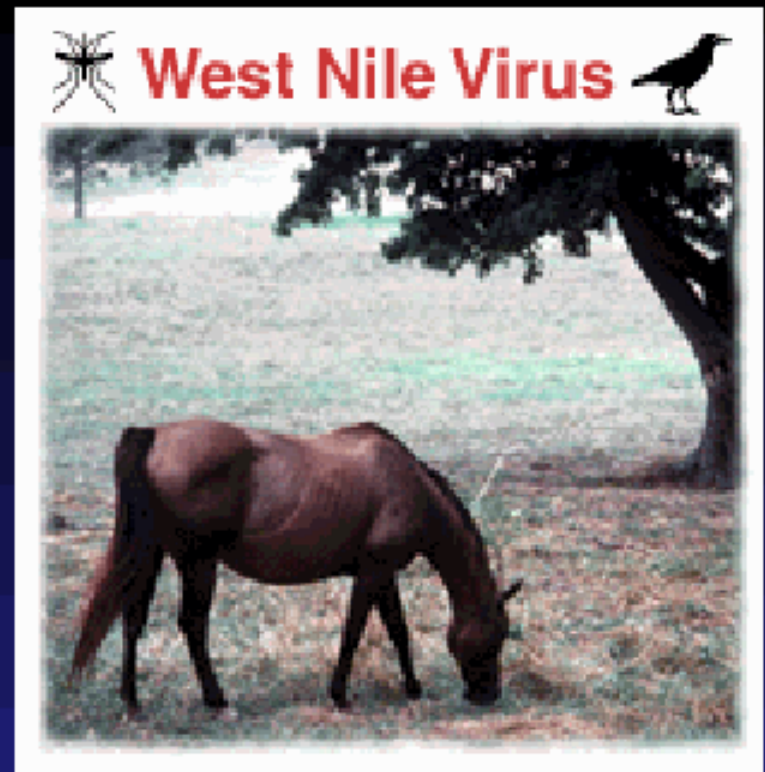
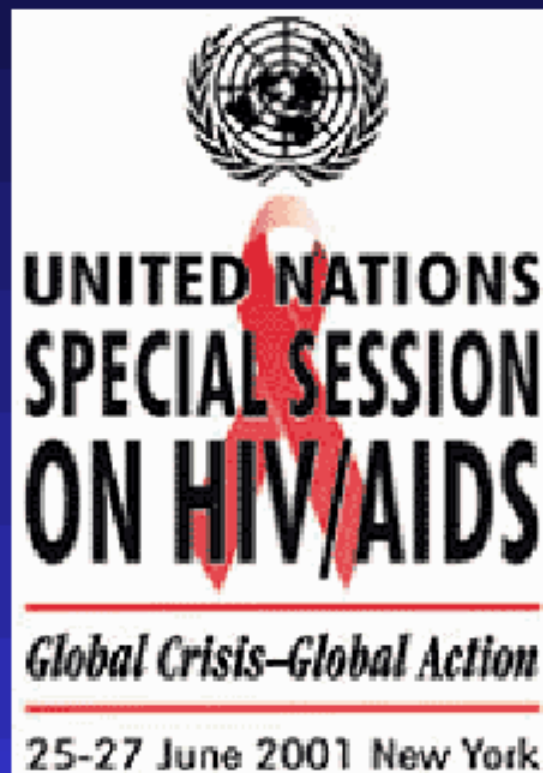




- **Communicable disease:** transmitted from one host to another
- **Contagious disease:** easily transmitted



- Acute disease
- Chronic disease
- Latent Disease

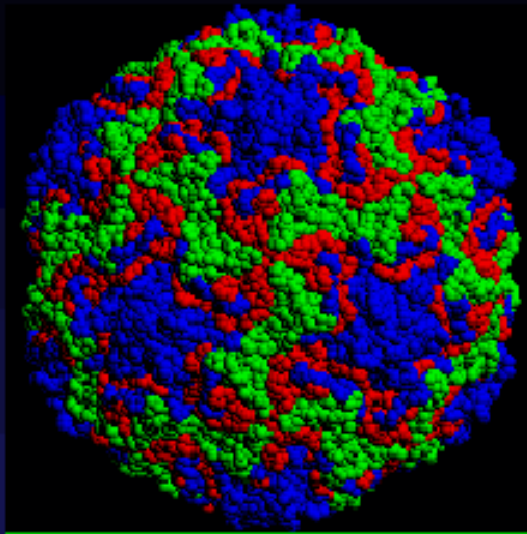


- **Secondary infections**
- **Bacteremia, septicemia, toxemia, viremia**



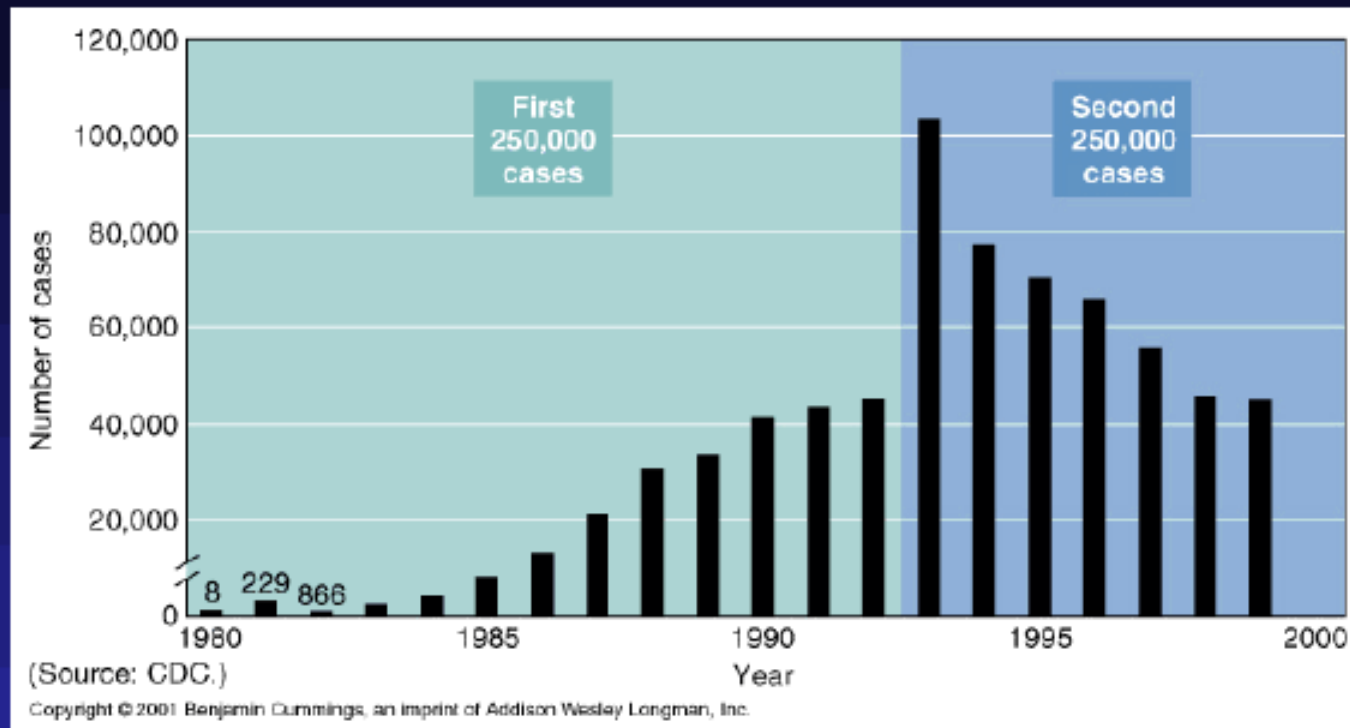


- **Sporadic**: occasional cases
- **Endemic**: constantly present
- **Epidemic**: outbreaks
- **Pandemic**: worldwide outbreaks



- **Incidence**: number of infected people during a particular time period (i.e. year)
- **Prevalence**: number of diseased people at any given time

Reported US AIDS Cases



- 1999: Incidence 45,000; prevalence 700,000

Spread of Disease

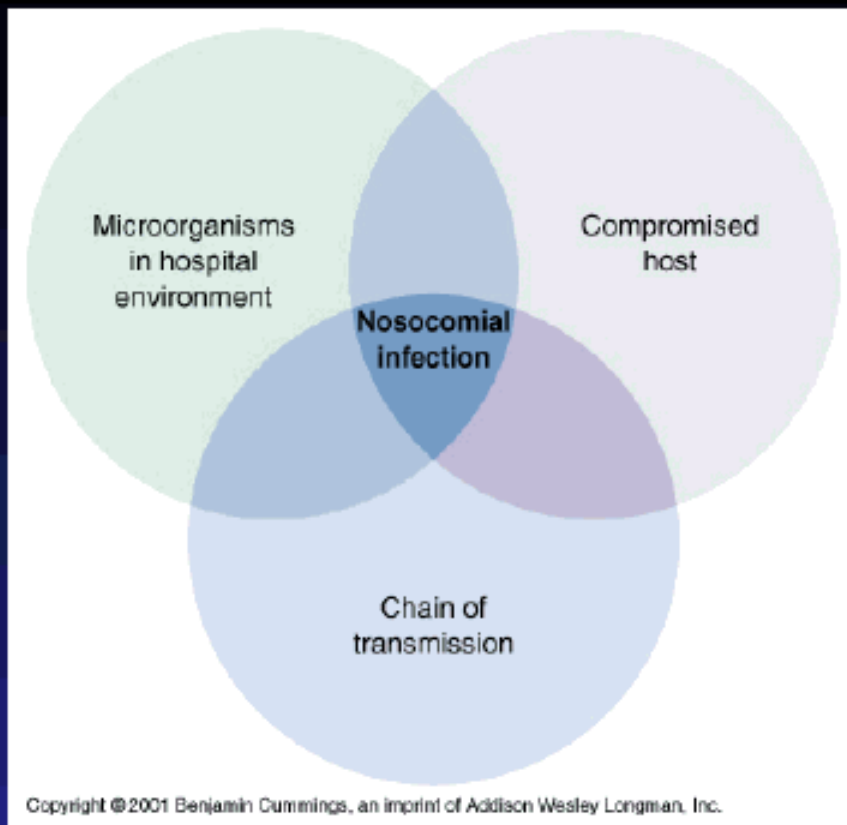
- **Reservoir**: source of organisms
 - Humans
 - Animals (**zoonoses**)
 - Environment



Spread of Disease

- contact
 - direct
 - indirect (**fomite**)
- droplet
- **vehicle**
- **vector**





Nosocomial Infections

- Hospital-acquired
- 5-15% of patients acquire infection

Control of Nosocomial Infection

- Handwashing
- Disinfection of surfaces
- Single-use materials
- Appropriate antibiotic use
- Surveillance :infection control officer