# Principles of Disease and Epidemiology

## Chapter 14

Biology 1009

Microbiology

Johnson-Summer 2003

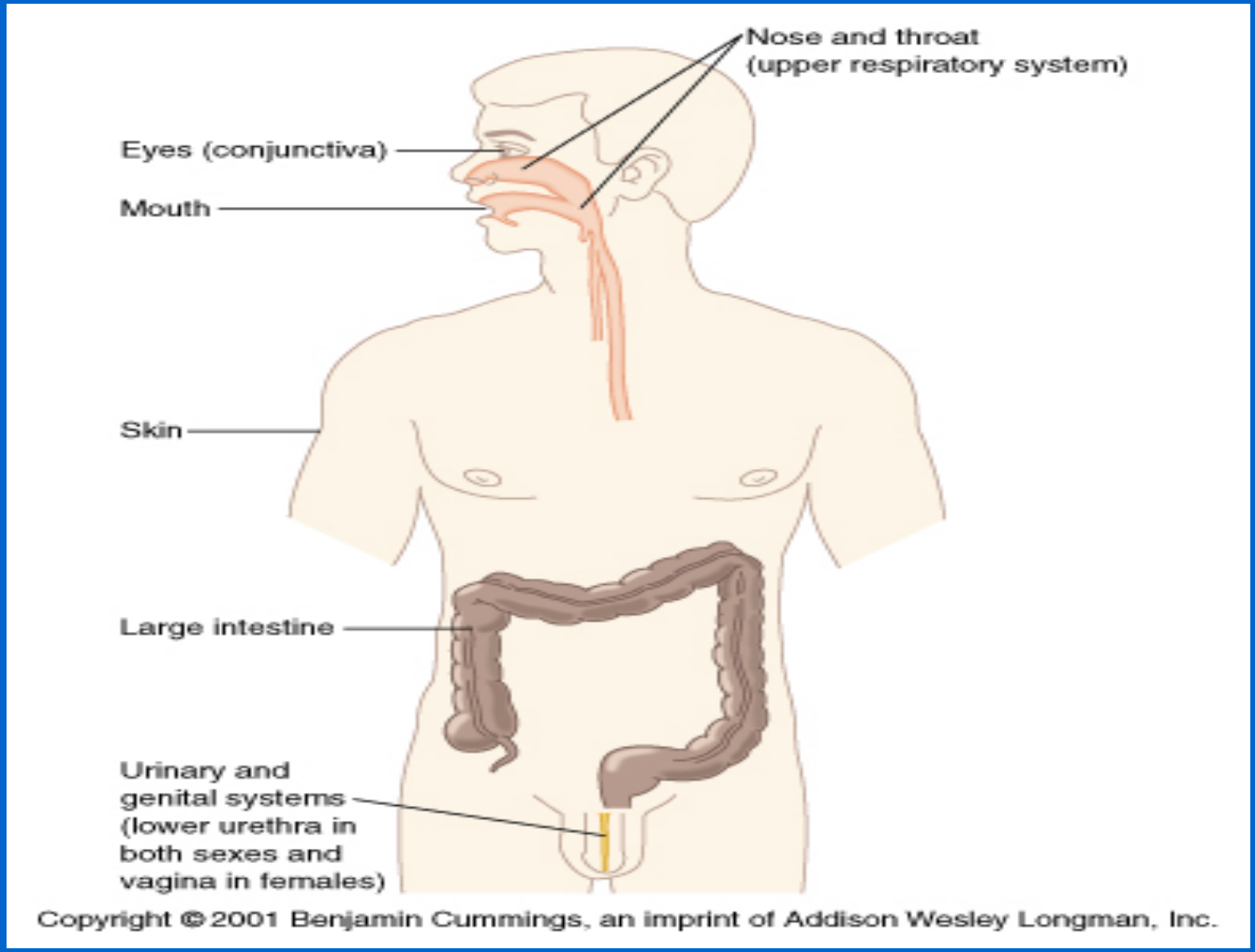
# Introduction
# Pathology, Infection and Disease

- Terms:
  - Pathogen: disease causing organism
  - Pathology: scientific study of disease
  - Etiology: causative agent of a disease
  - Infection: invasion or colonization of the body by a pathogenic organism
  - Disease: abnormal state in which all or part of the body is not functioning properly
  - Host: organism that shelters and supports the growth of pathogenic organisms

# Normal Flora

- In the womb, animals, including humans, are germ free
- Microbes begin colonization on and in the body soon after birth
- Normal flora:  microbes that are on or in a host, but do not cause disease
  - Transient:
  - Resident:

# Common Locations of Normal Flora



# Relationships between Normal Flora and the Host

- Microbial antagonism: belief that normal flora benefit a host by preventing overgrowth of more harmful microbes
  - Example: vagina
- Symbiosis: close relationship between two different organisms

# Symbiotic Relationship Types

- Commensalism:  One organism benefits, the other is unaffected (harmless)
- Mutualism:  Both organisms benefit (helpful)
- Parasitism:  One organism benefits and the other is harmed (harmful)
- Opportunism:  Organism don’t cause disease unless appropriate condition exists (potentially harmful)

# Etiology of Infectious Disease

- Koch's Postulates: established criteria illustrating how specific microbes cause certain disease
- 1) same pathogen present in every case of the disease
- 2) pathogen must be grown in pure culture
- 3) pathogen isolated from pure culture must cause disease in healthy host
- 4) pathogen must be re-isolated from inoculated lab animal

# Exceptions to Koch's Postulates

- Some bacteria and viruses can't be grown on artificial media
- Some diseases caused by several microbes
- Some pathogens cause many different diseases
- Some pathogens only cause disease in humans

# Classifying Infectious Diseases

- Communicable Diseases: transmitted directly or indirectly from 1 host to another
- Contagious Diseases: easily spread from 1 person to another
- Noncommunicable Diseases: not spread from 1 host to another

# Classification of Disease

- Based on frequency of occurrence:
  - sporadic
  - endemic
  - epidemic
  - pandemic

# Severity of Disease

- Four categories:
  - acute-develops quickly/lasts short time
  - chronic-develops slowly/lasts long time
  - subacute-inbetween acute and chronic
  - latent-causative agent remains inactive for a period of time and then becomes active to produce symptoms

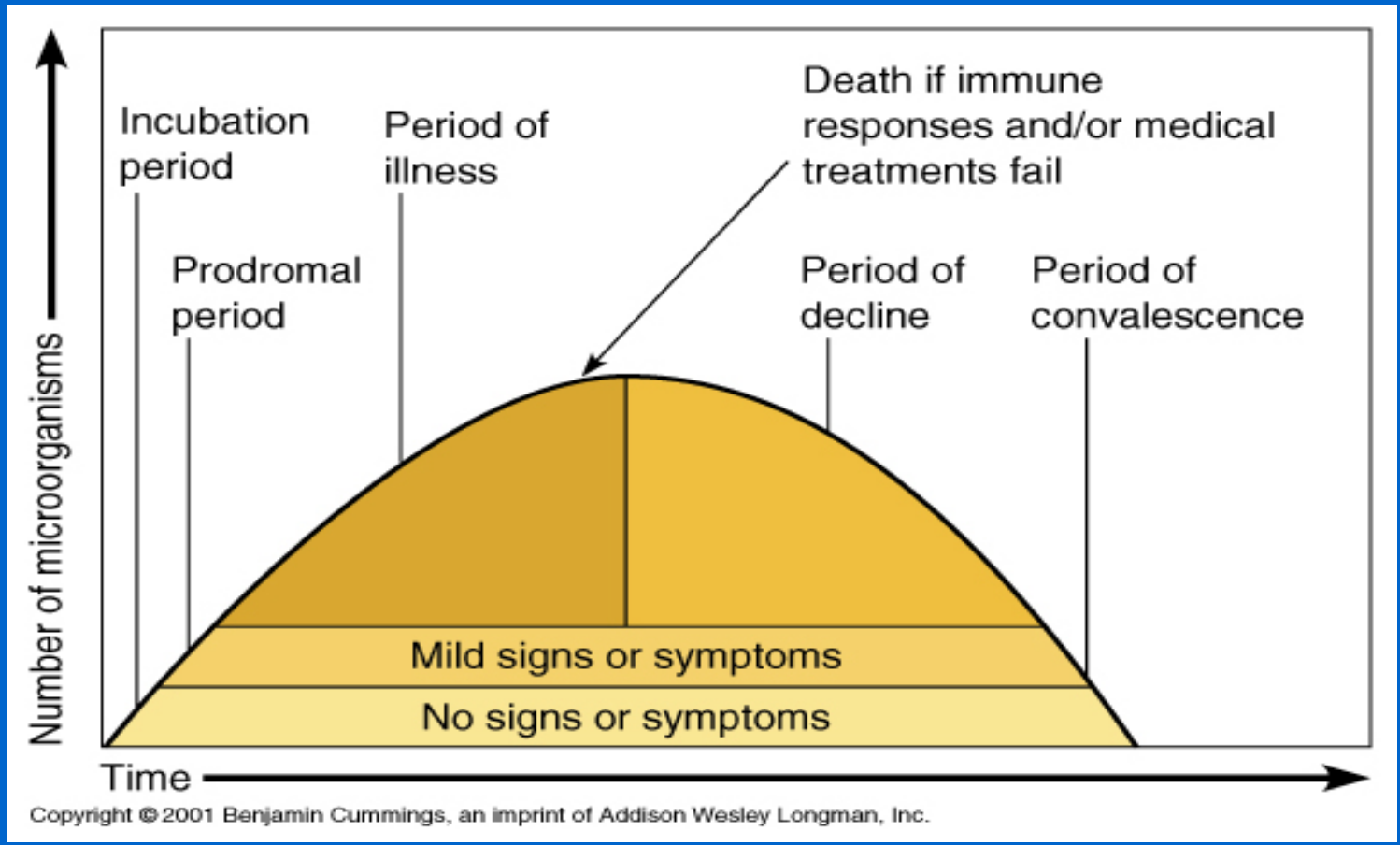
# Extent of Host Involvement

- Primary Infection:  acute infection caused by initial illness
- Secondary Infection:  caused by opportunistic microbe after host immune system weakened by primary infection
- Subclinical Infection:  does not cause noticable disease

# Stages of Disease Development

- Stage 1: Incubation Period
- Stage 2: Prodromal Period
- Stage 3: Illness
- Stage 4: Period of Decline
- Stage 5: Period of Convalescence

# Stages of Disease



# Reservoirs of Infection

- Continual source of infection
- Three types:
  - Human
  - Animal
  - Nonliving

# Transmission of Disease

- Three Main Routes:
  - Contact
    - direct
    - indirect
    - droplet
  - Vehicle
  - Vectors

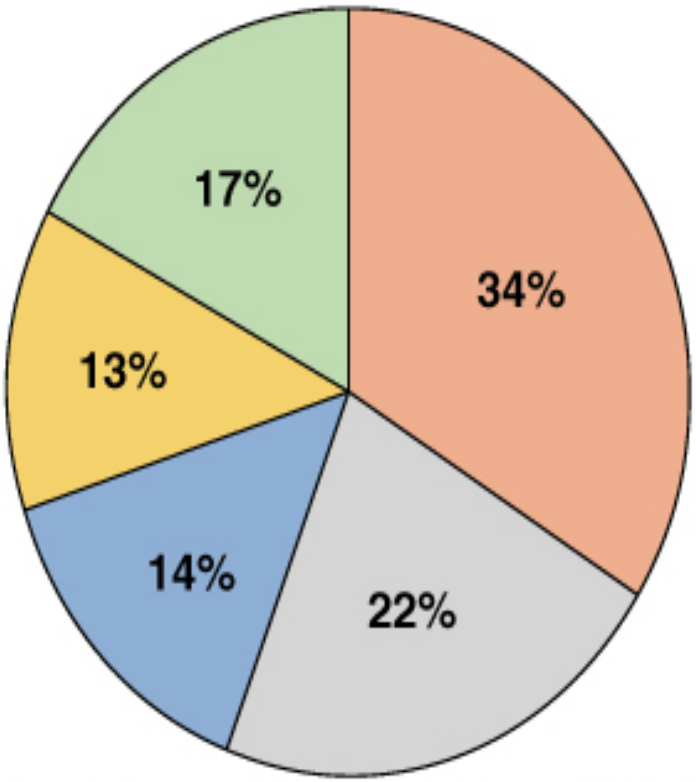
# Portals of Exit

- Routes that microbes use to exit host
- Three common methods:
  - Respiratory tract:  via cough/sneeze
  - GI tract:  via feces
  - Urogenital:  via vaginal/penile secretions
  - Skin:  via open wounds
  - Blood:  open wounds, surgery, syringes

# Nosocomial Infections

- Infection acquired during the course of stay in a hospital, nursing home, or other health care facility
  - today:  5-15% of patients acquire one
  - Gram negative opportunistic drug resistant bacteria often involved
  - introduced to body via surgery or catheter or direct contact with other patients or staff
  - compromised hosts most susceptible

# Relative Frequency of Nosocomial Infections




- Urinary tract infections
- Surgical site infections
- Lower respiratory infections
- Bacteremia
- Other, including skin infections

# Predisposing Factors of Disease

- Makes the body more susceptible to disease or alters the course of the disease
  - Examples:
    - gender
    - age
    - fatigue
    - climate
    - poor nutrition

# Emerging Infectious Diseases

- New diseases and diseases with increasing incidences
- Caused by viruses, bacteria, fungi, and protozoa
- May result from the following:
  - use of antibiotics and pesticides
  - climatic changes
  - travel
  - lack of vaccinations
  - improved case reporting