Tuberculosis

Tuberculosis (*Mycobacterium tuberculosis)*
is an ancient disease

→ skeletons and mummies from 4500 BC show signs of the disease

also called consumption

has been called the worlds most neglected epidemic

→kills more people worldwide than any other infectious disease

yet relatively little money is spent combating it

about 1/3rd of the world's population is infected, with 8-10 million new cases each year

about 2 million people die each year from the disease

no longer a major disease in US,
in early 1900 was relatively common (20/1000 Americans had it)
today ~30,000 cases/yr reported in US

disease is very difficult to contract
→ usually requires months of continuous exposure & close contact

one of most easily combated diseases if caught early

very difficult to get rid of in advanced cases

slow growing pathogen – respiratory disease

infection in lungs causes formation of 'tubercles'

90% of infected people remain infected for life but never develop symptoms of the disease = **asymptomatic** (subclinical)

good example of a balanced host/parasite relationship
→ hosts are usually not aware of pathogen and it is usually eliminated by the immune system

if body's defenses fail → disease results

most commonly acquired by inhaling

has long incubation period

WBC's in lungs engulf bacteria and destroy most of them

but sometimes bacteria survive inside WBC's and are protected from destruction

the infection causes formation of tubercles in lungs as bacteria multiply inside

of body's defenses are overwhelmed may produce

symptoms:
- weight loss
- coughing bloody cough
- fatigue
- weakness
- anorexia
- low grade fever

may become a chronic infection

may invade blood or lymphatic system and spread to liver, brain and bone

humans are primary reservoir
but may survive in cattle

spread by bacteria in sputum

major concerns today:

1. two new strains have appeared:
   - →a fast growing form
     - grows 1000x's faster
     - much more easily spread → don't need extended contact (just standing in line with infected can get it)
   - →a completely antibiotic resistant form
     - first appeared in 2006, now confirmed in 27 countries (2007)
2. increased poverty and urbanization

→ rates in cities higher than in rural areas

is a disease of the urban poor, homeless, AIDS victims

3. increase in HIV patients

more susceptible to infection

Syphilis

(*Treponema pallidum*)

humans are only natural hosts

STD→ survives only a few minutes to hours in body secretions; up to 36 hrs in stored blood

first recognized in 1500's:

thought it may have been a disease picked up by Native Americans and spread to Europeans,

new evidence doubts this, it was in Europe before contact with Americas

very common in US until 40's and discovery of penicillin

on increase again today

esp among prostitutes and drug users

disease is slow and progressive
with long periods of latency

easily treated in early stages,
difficult to treat in advanced stages

progresses through three major stages:

1st – (9-90d after infection)
after sexual contact, the bacteria enters
through breaks in skin

produce open sores in genital area (cancres)

they persist for several weeks, then heal

2nd – (3 wks – 6 mo after 1st stage heals)
several months later the bacteria
have spread throughout the body,

secondary lesions on skin surface:
trunk, arms, legs, genitalia, palms, soles

highly infectious

fever, headaches, sore throat, rash, etc.

symptoms disappear in a few weeks

3rd – (3-30 yrs after primary infection)
latent period lasts up to 20 years,
about 30% of patients untreated will show
severe pathology

noncommunicable unless secondary lesions
appear again

soft lesions in skin, bone, blood vessels,
liver, CNS

wide range of symptoms depending on tissue
showing lesions
rupture of blood vessels
heart damage
blindness
derangement
convulsions
brain damage
death.

can be spread from mom to unborn child

may cause miscarriage, birth with lesions or no symptoms till later: blindness, deafness, retardation

Identification and Culture

spirochaete bacterium, flagella

G- cell wall, doesn't stain well

strict parasite – cannot grow on artificial media

later stages require serological testing to ID

Anthrax

(*Bacillus anthracis*)

common soil organism
→ grows slowly in soil

produces spores that can persist for years
up to 60 years

is a **zoonosis** – animal disease that people can catch

a fatal disease of livestock; eg. sheep, cattle, goats,
horses

people catch it from animals, not usually from other
people

soil is a reservoir → spores can persist

in humans is mainly and occupational disease:
farmers, vets, textile and fur workers, etc

ID is very low: 1-3 spores

enters through cuts and abrasions on skin or spores can be inhaled

cutaneous anthrax is relatively easily treated and removed

pulmonary anthrax is the most dangerous form
→ systemic toxemia
→ can be fatal within hours

need pretty high exposure to spores to actually get the disease

in US only a few cases a year

Symptoms

1. if spores enter skin through abrasions or cuts:

begins as a skin infection of pustules

develops into a necrotic ulcer

bacilli release toxins that cause local swelling

if untreated may spread through lymphatic system to blood to cause septicemia

if so will cause shock and death within a few days

5-50% mortality if untreated

2. if enter through lungs may produce flu like symptoms

gets into blood much more quickly

much higher mortality rate

Isolation and culture

large rod shaped bacterium

mostly saprobic in soil

aerobic, catalase pos

easily grown in culture, nonfastidious

genus is common source of antibiotics

beta hemolytic

produces endospores

Biowarfare Agent

preferred biowarfare agent since it lasts long and can be relatively easily dispersed

50% of people who inhale 8000-10,000 spores will die

most research as biowarfare agent centers around making the spores lighter and more easily spread in air

Gonorrhea

Neisseria gonorrhoeae

highly infectious **sexually transmitted disease**

STD's are a growing public health problem in US
→require direct intimate contact to transmit
→don't survive outside of host very long

disease named by Galen: gonos = seed; rhoia = flow

known from ancient times
→ described in 3500 bc Egyptian papyrus

→ 3rd century BC, Hippocrates described its mode of transmission:
"excesses of the pleasure of venus"
ie. "**venereal disease**"

strictly human pathogen

several hundred thousand (600,000) cases reported in US each year

>60% cases are 15 – 24 yrs old

→ but millions may be infected and not know it
=**subclinical infections** (asymptomatic)

requires direct body contact
→does not survive more than 1-2 hours outside body

Infectious Dose: ~100-1000 bacteria

in males

usually infects urethra = acute urethritis
→causing yellowish discharge

if untreated may lead to arthritis, endocarditis or meningitis

but many are asymptomatic

in females

urinary and reproductive systems may both get infected

often mild or asymptomatic in early stages
→ most common cause of spread of the disease

produces bloody vaginal discharge in ~1/2 cases

if untreated, may ascend to cause pelvic inflammatory disease

scar tissue produced may cause sterility

children

infants born to infected moms may become infected

→results in blindness

silver nitrate, or now antibiotics applied to child's eyes immediately after birth