

Disease of the Day

Tuberculosis

Causative agent

- ✓ *Mycobacterium tuberculosis*
- ✓ *Mycobacterium bovis*
- ✓ *Mycobacterium avium*

- ✓ Acid fast bacillus bacterium
- ✓ Obligate aerobe
- ✓ Slow grower
 - Generation time = 12 hours

Mycobacterium diseases

SPECIES	DISEASE
<i>M. tuberculosis</i>	Tuberculosis
<i>M. avium</i>	Tuberculosislike disease in humans, transmitted from birds and swine
<i>M. bovis</i>	Tuberculosis, transmitted from cattle; could be transmitted from subhuman primates
<i>M. fortuitum</i> complex	Wound infections
<i>M. kansasii</i>	Tuberculosislike disease
<i>M. leprae</i>	Hansen's disease (leprosy)
<i>M. marinum</i>	Cutaneous lesions in humans, tuberculosis in fish
<i>M. ulcerans</i>	Ulcerative lesions

Acid fast and staining

- ✓ Lipid layer - mycolic acid
 - Prevents drying
 - Prevents staining with most dyes
- Carbofuchsin - red (positive)
- Methylene blue - blue (negative)

Acid fast staining

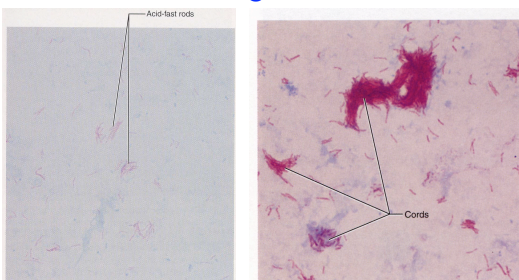


FIGURE 3.23 An acid-fast stain of *Mycobacterium tuberculosis*, an acid-fast rod. Acid-fast rods appear red (3600 \times).

FIGURE 2.17 Cording in *Mycobacterium tuberculosis*. Due to the high wax content of the cell wall, these rods tend to adhere to each other after cell division to form cords (3600 \times).

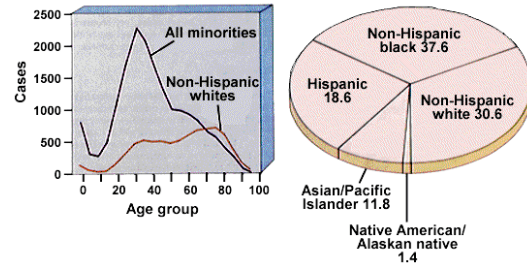
Transmission

- ✓ Aerosol droplets
 - 10 or fewer cells cause disease
 - Coughing
 - Ventilation
 - Crowding
 - Families
 - Schools
 - Hospitals
 - Elderly homes

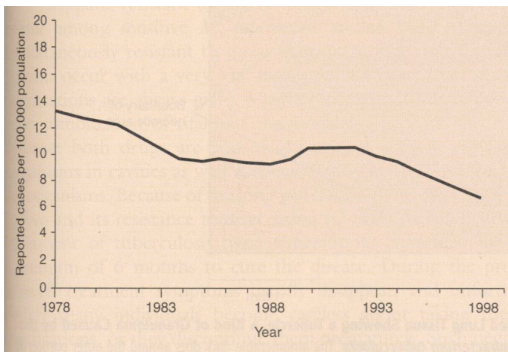
Signs/symptoms

- ✓ Slight fever
- ✓ Chronic cough
- ✓ Sweating at night
- ✓ Weight loss
- ✓ Blood streaked sputum

US incidence of TB



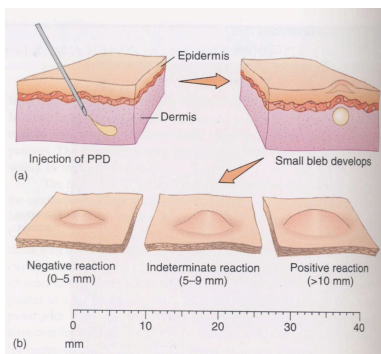
Incidence of tuberculosis



Tuberculin or Mantoux test

- ✓ Inject under the skin the purified protein
 - PPD - purified protein derivative
- ✓ If infected
 - Redness and firmness develops
 - 48-72 hr
- ✓ T-cell delayed hypersensitivity response
- ✓ Positive test - infected or exposed to *Mycobacterium tuberculosis*

PPD skin test



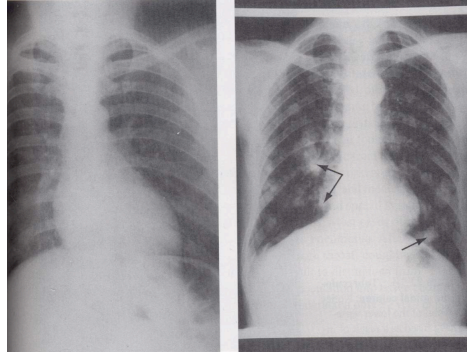
Positive skin test



Diagnosis

- ✓ Sputum culture
 - Slow - 8 weeks
- ✓ Genetic probes
 - Fast
- ✓ Chest x-rays
- ✓ Skin test

X-rays



Treatment

- ✓ Isoniazid & rifampin
 - Six months or more
- ✓ Other drugs...

- ✓ GCG vaccine
 - Discouraged in US
 - Living attenuated bacteria

Growth of *M. tuberculosis*

