

Causes, Types, Symptoms, Diagnosis and Prevention of Tuberculosis

Tuberculosis, or TB (formerly called consumption), has plagued humankind since ancient times, as indicated by skeletal damage in 3,000-year-old Egyptian mummies and earlier human remains. It remains a massive global health problem today.

Many new cases occurred among AIDS patients; others appeared to represent reactivations of old infections triggered by immunodeficiency, crowding, stress, and use of antiinflammatory drugs. In 1993 the number of new cases reported per month rose from 778 in January to 5,130 in December. The increase continues, and people are afraid that tuberculosis may return and grow into an even bigger and more frightening plague than AIDS.

Tuberculosis is an **airborne disease** to which anyone could be exposed, whereas behaviour modification can lessen much of one's chances of exposure to the HIV virus.

Causative Agents

i)The causative agents of tuberculosis are members of the genus *Mycobacterium*, with *M. tuberculosis* causing the vast majority of cases.

Mycobacterium tuberculosis was discovered by Robert Koch in 1882, when the disease was called the "**White Plague**" of Europe. Certain other agents, referred to as atypical mycobacteria, also cause tuberculosis, especially **Mycobacterium Avium Complex** (MAC) in AIDS patients.

ii)These infections are often acquired by ingestion and are spread throughout all organs of the body by the bloodstream. The symptoms are therefore not primarily respiratory.

iii)All mycobacteria are straight or slightly curved rods that stain acid-fast. Certain properties of mycobacteria are closely associated with their role in tuberculosis. Waxes and long-chain mycolic acids in mycobacterial cell walls make mycobacteria difficult to Gram stain, contribute to environmental survival of these organisms, and protect them from some host defenses.

iv)Being obligate aerobes sensitive to slight decreases in oxygen concentration, mycobacteria grow best in the apical, or upper portions of the lungs, which are the most highly oxygenated.

v)Pathogenic mycobacteria have an exceedingly long generation time (12 to 18 hours, compared with 20 to 30 minutes for most bacteria), which accounts for the long time (up to 8 weeks) it takes to produce a visible colony on laboratory media.

vi)Mycobacteria are highly resistant to drying and can remain viable for 6 to 8 months in dried sputum, a property that contributes to public health problems. They are, however, quite sensitive to direct sunlight.

The Disease:

i)Tuberculosis is acquired by the inhalation of **droplet nuclei** of respiratory secretions or particles of dry sputum containing tubercle bacilli. Young children and elderly people are particularly at risk, so screening school, day-care, and nursing home workers for tuberculosis is important.

ii)After organisms are inhaled, they multiply very slowly inside white blood cells that have phagocytized them. They elicit a host response that includes neutrophil infiltration and fluid accumulation within the alveoli of the lungs.

iii)The organisms eventually rupture and destroy the neutrophils. Later, macrophages and lymphocytes move into the area. Alveolar macrophages also phagocytize the living tubercle bacilli, which are again able to multiply within and destroy their new hosts. Rupture of the dead phagocytes releases infective organisms. No toxins are produced.

iv)As additional cells are infected, an acute inflammatory response occurs. A large quantity of fluid is released, especially in lung tissue, where it produces pneumonia-like symptoms. Lesions sometimes heal, but more often they produce massive tissue necrosis or solidify to become chronic granulomas, or tubercles (Figure below).