

WHO Bio risk Management Advanced Trainer Programme

Mycobacterium Tuberculosis

Agent Criteria

Infectious Dose: 10 bacilli by inhalation for humans and animals

Stability: M. tuberculosis is fairly stable in the environment

Susceptibility to disinfectants: Greater resistance to disinfectants and require long contact Times for most disinfectants to be effective; 5% phenol, 1% sodium hypochlorite (only if Low organic matter and longer contact times), iodine solutions (high concentration of available iodine required), glutaraldehyde and formaldehyde (longer contact time) are effective

Physical inactivation: Sensitive to moist heat (121° C for at least 15 min), light

Survival outside host: Guinea pig carcasses - 49 days; carpet - up to 70 days; dust - 90 to 120 days; cockroaches - 40 days; manure 45 days; paper book - 105 days; sputum (cool, dark location) - 6 to 8 months; clothing - 45 days

Incubation Period: 4-12 weeks from infection to primary lesion or significant titan blue Antigen skin reaction. The risk of progressive pulmonary or extra pulmonary tb is greatest Within 1 to 2 years after infection. It may persist for a lifetime as a latent infection.

Mortality Rate: 50-70% of untreated patients with active pulmonary tb, within 2 years. Rates are higher for those with concurrent HIV infection.

Morbidity:

Duration of Illness: as an active disease, 6 months to 2 years. Survival ranges from 1.5 months in immune compromised HIV patients to 14.3 months in normal patients with drug susceptible TB.

Severity of Illness: High.

Duration of Infection: Possibly lifetime.

Long term effects after infection: Active disease can be triggered at any time after the establishment of a latent infection, though the probability of developing active disease is higher 1-2 years after infection, in immune compromised patients, small children, young adults, and the very old.

The morbidity rate in bovines is around 40%. Agent known to infect other species but is most prevalent in bovines.

Allergen (yes/no): No

Carcinogenic/mutagenic (yes/no): No

Abort genic (yes/no): No

Toxin Production (yes/no): No

Immune Suppression (yes/no): No

Ability to Mutate in Host or Environment (yes/no): Yes

Infection Mitigation Measures:

For human pathogens

Immunization: Yes

Prophylaxis: No (standard TB prophylaxis of isoniazid is ineffective for MDR-TB)

Post Infection Treatment: First line TB drugs isoniazid and rifampin are ineffective for MDR-TB. A variety of second-line drugs are available to treat MDR-TB, usually done so In combination with each other, though they are less effective than the first line Options. One common combination for suspected MDR-TB patients includes

Streptomycin, Isoniazid, Rifampin, Ethambutol, pyrazinamide, MXF & Cycloserine (Isoniazid and Rifampin are maintained due to their effectiveness against regular TB).

Existence of Diagnostic tests: Yes. Traditional skin test or TST, and newer interferon release assays (IGRA)

Routes of Infection in Humans:

Inhalation: Yes

Ingestion: Possible

Percutaneous: No

Contact: No

Vector-Borne: No

Sexual Transmission: No

Vertical Transmission: No

Routes of Infection in Bovine:

Inhalation: Yes

Ingestion: Possible

Percutaneous: No

Contact: No

Vector-Borne: No

Sexual Transmission: No

Vertical Transmission: No

Communicability:

Human to Human: Yes, though less likely for MDR-TB compared to normal TB

Human to Animal: No Evidence

Animal to Animal: No Evidence

Animal to Human: No Evidence

Multiple Species: Yes.

Geographical distribution: Worldwide. One third of the world's population is infected with TB. MDR-TB is much less prevalent. However, cases of MDR-TB are rising. It is highly endemic in the population surrounding the laboratory.

Perception of malicious use: LOW

Culture: Sputum from patients suspected of having TB can be cultured for evidence of TB in several different media, the most common of which is Lowenstein-Jensen medium. While not particularly difficult to culture, TB has an unusually slow growth rate, and it takes 6-8 weeks to grow enough bacteria for diagnosis and drug susceptibility testing.

Equipment: Bench, culture plates, liquid cultures, wire loops, burners, glass flasks, glass tubes, vortexes

Laboratory environment: Open window ventilation, lab coats, no vaccination available, humid environment, surgical masks, gloves worn occasionally, lab waste is hauled away for offsite treatment, open campus with no locks on doors, cultures not secured or inventoried, no personnel verification program.