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Office of
Laboratory
Security



MATERIAL SAFETY DATA SHEET - INFECTIOUS SUBSTANCES

SECTION I - INFECTIOUS AGENT

NAME: *Mycobacterium tuberculosis, Mycobacterium bovis*

SYNONYM OR CROSS REFERENCE: TB

CHARACTERISTICS: Gram positive rods, non-spore forming, non-motile, slightly curved, forming strands and cords, acid-fast staining, aerobic, slow-growing,

SECTION II - HEALTH HAZARD

PATHOGENICITY: Initial infection usually unnoticed, tuberculin sensitivity appears in a few weeks and lesions commonly heal; may progress to pulmonary tuberculosis (fatigue, fever, cough, chest pain, hemoptysis fibrosis, cavitation) or extrapulmonary involvement (miliary, meningeal) by lymphohematogenous dissemination; serious outcome of initial infection more frequent in infants and children; infection with bovine bacillus rare; drug resistant strains can cause irreversible damage in the lungs

EPIDEMIOLOGY: Worldwide (important cause of disability and death in many parts of the world despite downward mortality and morbidity rates); higher in males, among poor and in cities; in low incidence areas, most tuberculosis is endogenous (reactivation of initial latent foci); long exposures of some contacts leads to high risk of infection (25-50%); epidemics in enclosed areas; *M. bovis* infection encountered where disease in cattle has not been controlled and raw milk is still used; 11.8% of the isolates are drug resistant, 1.2% being multi-drug resistant

HOST RANGE: Primarily humans, cattle, primates, other animals (rodents)

INFECTIOUS DOSE: 10 bacilli by inhalation

MODE OF TRANSMISSION: Portal entry is the lung; pathogen is carried as airborne particles (droplet nuclei); exposure to airborne bacilli from sputum of infected persons; direct invasion of mucous membranes or breaks in skin; bovine tuberculosis from exposure to infected cattle (airborne, ingestion of raw milk or dairy products); medical personnel at risk while performing autopsies, intubation, bronchoscopies or by dermal inoculation

INCUBATION PERIOD: From infection to primary lesion or significant tuberculin reaction - 4 to 12 weeks; risk of progressive pulmonary or extrapulmonary tuberculosis is greatest within 1 to 2 years after infection; may persist for lifetime as latent infection

COMMUNICABILITY: Communicable as long as bacilli are discharged in sputum (may be years if untreated); extrapulmonary TB (except laryngeal tuberculosis) generally not communicable

SECTION III - DISSEMINATION

RESERVOIR: Primarily humans; in some areas, diseased cattle, badgers, swine and other mammals are infected (*M. bovis*)

ZOONOSIS: Yes - inhalation of infected droplets; direct contact with infected animals or tissues of infected animals

VECTORS: None

SECTION IV - VIABILITY

DRUG SUSCEPTIBILITY: Sensitive to combination of antimicrobial drugs - isoniazid, rifampin, streptomycin, ethambutol, pyrazinamide

DRUG RESISTANCE: Isoniazid (INH) and rifampin; multi-drug resistant isolates are resistant to first and second-line antibiotics

SUSCEPTIBILITY TO DISINFECTANTS: Greater resistant to disinfectants and require longer 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

SECTION V - MEDICAL

SURVEILLANCE: Skin testing with PPD (purified protein derivative) of previously skin-tested-negative personnel; chest X-ray

FIRST AID/TREATMENT: Combination antibiotic therapy

IMMUNIZATION: Licensed attenuated live vaccine (BCG) available, but not routinely carried out

PROPHYLAXIS: Preventative treatment with INH (risk of hepatitis for those over 35 years old)

SECTION VI - LABORATORY HAZARDS

LABORATORY-ACQUIRED INFECTIONS: Incidence of tuberculosis in laboratory workers working with *M. tuberculosis* is three times higher than those not working with agent; fourth most commonly reported laboratory infection; 176 reported cases with 4 deaths

SOURCES/SPECIMENS: Sputum, gastric lavage fluids, cerebrospinal fluid, urine, lesions from a variety of tissues

PRIMARY HAZARDS: Inhalation of infectious aerosols; accidental parenteral inoculation, direct contact of mucous membranes, ingestion; naturally or experimentally infected non-human primates are a known cause of human infection; litter of infected animals (e.g. mice and hamsters) serve as source of infectious aerosols;

SPECIAL HAZARDS: Bacilli may survive in heat-fixed smears and may be aerosolized in the preparation of frozen sections and during manipulation of cultures; high rate of isolation of acid fast organisms from clinical specimens (>10%), sputum and other specimens, from suspected or known cases

SECTION VII - RECOMMENDED PRECAUTIONS

CONTAINMENT REQUIREMENTS: Biosafety level 2 practices, containment

equipment and facilities for primary culture of sputum and preparing smears; biosafety level 3 practices, containment equipment and facilities for the propagation and manipulation of cultures of *M. tuberculosis* or *M. bovis* and for animal studies utilizing non-human primates

PROTECTIVE CLOTHING: Laboratory coat and gloves when manipulating specimens; gloves and gown with tight wrists and ties in back when manipulating cultures

OTHER PRECAUTIONS: Appropriate practices and precautions to minimize the production of infectious aerosols

SECTION VIII - HANDLING INFORMATION

SPILLS: Allow aerosols to settle; wearing protective clothing, gently cover spill with paper towels and apply 5% phenol, starting at perimeter and working towards the centre; allow sufficient contact time (30 min) before clean up

DISPOSAL: Decontaminate before disposal; steam sterilization, incineration

STORAGE: In sealed containers that are appropriately labelled

SECTION IX - MISCELLANEOUS INFORMATION

Date prepared: March, 2001

Prepared by: Office of Laboratory Security, PHAC

Although the information, opinions and recommendations contained in this Material Safety Data Sheet are compiled from sources believed to be reliable, we accept no responsibility for the accuracy, sufficiency, or reliability or for any loss or injury resulting from the use of the information. Newly discovered hazards are frequent and this information may not be completely up to date.

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Last Updated: 2001-05-15



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