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, meningeval) 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
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

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Prepared by: Office of Laboratory Security, PHAC

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Important Notices