Exposure Response Plan for the Laboratory Handling of *Mycobacterium tuberculosis*

**Background Information**

*Mycobacterium tuberculosis* is a Risk Group 3 bacterium that causes the disease known as tuberculosis (TB) in some individuals. The infectious dose for humans is unknown, but has been estimated to be less than 10 bacilli via inhalation. TB is a serious illness, but most immunocompetent people (90-95%) control the infection and do not develop the disease. However, TB can cause permanent disability or death in immunocompetent individuals despite adequate therapy. Infection with drug resistant TB poses an even greater risk of permanent disability or death.

Tubercle bacteria are transmitted through the air by droplet nuclei and inhaled by a susceptible host. Droplets containing the bacteria are propelled from the source by coughing or speaking and stay in the air until dispersed, diluted, dried, or inhaled by a host. Therefore, low ventilation rates or recirculation of air can greatly increase and enhance transmission of the agent.

**Exposure Incident:** Laboratory acquired infections (LAIs) can be acquired through percutaneous exposure, mucus membrane exposure, animal bite, needle stick, broken glass, or inhalation of aerosols. The incidence of tuberculosis in laboratory personnel working with *M. tuberculosis* has been reported to be three times higher than that of those not working with the agent. The PRIMARY route of TB exposure is through inhalation.

**Reporting Exposure Incidents:** Report all exposures to the Principal Investigator/lab supervisor and seek immediate medical evaluation. If help is needed with injuries or clean up contact the following depending upon your location:

- Tufts University (Boston) x6-6911 (from outside lines 617-636-6911)
- Tufts University (Medford) x6-6911 (from outside lines 617-627-6911)
- Tufts University (Grafton) x6-6911 (from outside lines 508-839-5303)
- Tufts Medical Center x6-5100 (from outside lines 617-636-5100)

Whenever there is an accident or incident involving *M. tuberculosis*, the Biosafety Officer must be notified.

**Pre-exposure Health Screening:**

All persons will be educated of the risks of working with *M. tuberculosis* and symptoms of exposure by the Tufts Medical Center Employee Clinic (Boston), or the Mount Auburn
Occupational Health services (Medford), or TCSVM Occupational Medical Clinic (Grafton).

Prior to receiving medical clearance to work with *M. tuberculosis*, the individual may have a Purified Protein Derivative (PPD) skin test, IGRA (Interferon-gamma Response Assay) for PPD positive individuals; a respirator fit test, and/or a chest radiograph at the discretion of the medical provider.

Workers will be **required** to participate in a screening program designed to detect occult exposure to TB before symptoms develop. This is called latent TB infection (LTBI). Thus workers will be subject to periodic PPD testing, IGRA testing, and/or symptom review by a health care provider on a regular basis.

Development of LTBI, either in the event of known or unknown exposure, is discussed below.

**Before an Exposure Incident Occurs:**

Licensed attenuated live vaccine (BCG, bacillus Calmette-Guérin) is available, but does not always protect people from TB disease. This vaccine is not widely used in the United States, but it is often given to infants and small children in other countries where TB is common. The BCG vaccine should be considered only for very select persons who meet specific criteria and in consultation with a physician trained in infectious diseases. ([http://www.cdc.gov/tb/topic/vaccines/default.htm](http://www.cdc.gov/tb/topic/vaccines/default.htm))

**After an Exposure Incident Occurs: Immediate Action by Route of Exposure**

- **Needle stick, Animal Bite or Laceration:** Wash the area with soap and running water for at least 15 min. Do not apply bleach, alcohol or other disinfectant to the skin.

- **Mucous membranes (eye, nose, mouth):** If contaminated material is splashed or sprayed into the face contaminating the eyes, nose or mouth: flush the eyes for 15 minutes, rinse mouth out with clean water and be sure not to swallow, and wash down face being sure that the nasal cavities have been rinsed as much as possible.

- **Inhalation:** There is no action to reduce lung and upper respiratory system exposure. Report the exposure to the Supervisor/Principal Investigator, the Biosafety Officer, and seek medical attention.

- **Contact with intact skin and clothing:** Remove contaminated clothing using gloves and place objects in plastic bags and dispose of as biological or medical waste. Wash contaminated skin with soap and water for 15 minutes.

**After an exposure incident occurs: medical evaluation and follow-up:**

Following immediate post-exposure actions, the exposure incident must be reported to the Supervisor/Principal Investigator, and the Biosafety Officer. The exposed person
must contact the Tufts Medical Center Employee Clinic (Boston), the Mount Auburn Occupational Health services (Medford) or the TCSVM Occupational Medical Clinic (Grafton) and arrange for medical evaluation, diagnosis, and treatment if indicated.

Individuals should contact the Tufts Medical Center Employee Clinic (Boston), the Mount Auburn Occupational Health services (Medford) or the TCSVM Occupational Medical Clinic (Grafton) prior to receiving emergency medical care for TB symptoms. They will arrange and coordinate for treatment at a nearby Emergency Room for emergency medical care to ensure that treating physicians are fully informed of the individual’s occupational health condition.

**Signs and Symptoms of Disease:**

Symptoms of TB disease depend on where in the body the *M. tuberculosis* is growing. *M. tuberculosis* growth in the lungs leads to pulmonary TB. TB disease in the lungs may cause symptoms such as a severe cough that lasting 3 weeks or longer, pain in the chest, and/or coughing up blood or sputum (phlegm from deep inside the lungs.) Other symptoms of TB disease include: weakness or fatigue, weight loss, no appetite, chills, fever, shortness of breath, respiratory difficulty, pleurisy, and/or sweating at night. Symptoms of TB disease in other parts of the body depend on the area affected.

Immunocompetent and immunocompromised individuals can have the same signs and symptoms, although infection and disease are more severe with more rapid onset in immunocompromised individuals or individuals taking immunosuppressive drugs.

People with latent TB infection (LTBI) have *M. tuberculosis* in their bodies, but they are not sick because the bacteria are not active. People with LTBI do not have symptoms, and they cannot spread *M. tuberculosis* to others. However, if *M. tuberculosis* become active in the body and multiply, the person will go from having latent TB infection to being sick with TB disease. ([http://www.cdc.gov/tb/topic/treatment/default.htm](http://www.cdc.gov/tb/topic/treatment/default.htm))

**Post-exposure prophylaxis:**

After known exposures, the exposed person will be evaluated by a physician trained in infectious diseases. Depending on the nature of the exposure, post-exposure evaluation may include institution of prophylactic antimicrobial(s), and will include serial testing with either PPD or IGRA’s unless exposed person is already known to be PPD or IGRA positive. Conversion from negative to positive PPD, or negative to positive IGRA, after a known laboratory exposure incident will be considered as a laboratory-acquired infection. S/he will be offered prophylaxis for LTBI, and the risks/benefits of such prophylaxis will be discussed. The PI and BSO will be notified immediately, and LTBI will be considered laboratory-acquired.

If an employee converts his/her PPD or IGRA without known exposure to TB, s/he will be offered prophylaxis for LTBI, and the risks/benefits of such prophylaxis will be
discussed. The PI and BSO will be notified immediately, and LTBI will be considered laboratory-acquired unless other potential exposure history can be identified.

If an employee develops signs and symptoms associated with *M. tuberculosis* exposure in the absence of an exposure incident and appropriate travel history, the PI and Biosafety Officer shall be notified immediately. The infection will be considered laboratory-acquired unless other potential exposure history can be identified.

Massachusetts regulation classifies *M. tuberculosis* as a reportable disease and TB infections will be reported to the Local Board of Health and to the Massachusetts Department of Public Health by the attending physician or the clinical laboratory diagnosing or identifying the infection.