

**OCCUPATIONAL HEALTH AND SAFETY PLAN**  
**Working with *Rickettsia rickettsii* in BSL-3 Laboratories**  
**University of Minnesota, Office of Occupational Health and Safety**

**Background Information**

*Rickettsia rickettsii* is a gram-negative obligate intracellular bacterium that causes Rocky Mountain spotted fever. The germ is transmitted naturally by the bite of an infected tick. Accidental transmission may occur in laboratory settings via needle sticks or inhalation. The incubation period following natural transmission is usually 5 to 10 days. Initial symptoms are non-specific and may include fever, nausea, vomiting, severe headache, muscle pain, and loss of appetite. Later symptoms may include rash, abdominal pain, joint pain, and diarrhea. The rash may appear 2 to 5 days after the onset of fever and most often begins with small, flat, pink, non-itchy spots on wrists, forearms, and ankles; about half the time the rash may evolve to petechiae (red or purple spots) and may involve the entire body. Severe manifestations of Rocky Mountain spotted fever will result in hospitalization. The organism infects the cells lining blood vessels throughout the body; more severe forms can involve the respiratory, central nervous, gastrointestinal, or renal systems. Severe infections can result in long-term effects including partial paralysis of the lower extremities, gangrene, hearing loss, loss of bowel or bladder control, movement disorders, and language disorders. Rocky Mountain spotted fever can be fatal in 20-30% of untreated cases. The infectious dose is estimated to be less than 10 organisms.<sup>1,2,3</sup>

There are currently no licensed vaccines available for rickettsial diseases. Rapid treatment is very important and should not be delayed while waiting for laboratory test results. Complete recovery is likely if treatment is received in the first week of illness. Antibiotics should be given as soon as possible following known or suspected exposure or symptoms, and taken for at least one week. Tetracycline antibiotics are very effective and relatively non-toxic. Doxycycline is the preferred antibiotic (for adults: 100 mg administered twice daily orally or intravenously for 5-7 days; continued at least 3 days after fever subsides).<sup>4</sup>

**Occupational Health Requirements for ALL Work in BSL-3 Laboratories**

The following summarizes the general requirements for all BSL-3 work. **Refer to the BSL-3 Laboratory Operations Manual as well as the facility's manual and laboratory safety plan for more details on occupational health and safety policies and procedures.** Prior to starting research, a Principal Investigator (PI) is responsible for completing risk assessments for biological, chemical, and physical hazards, as well as for project-specific protocols, in consultation with the Laboratory and BSL-3 Facilities Managers. Decisions about methods for ensuring employee health and safety should be made in consultation with the Office of Occupational Health and Safety (OHS). OHS must approve all decisions about personal protective equipment, medical evaluation, treatment, and medical surveillance.

**Training:** Prior to beginning work in a BSL-3 facility, research personnel must receive training about the potential health effects of exposure to all biological and chemical hazards associated with their research work in the facility, necessary precautions to avoid exposures, initial medical evaluation requirements, vaccine requirements, importance of monitoring and reporting exposures and symptoms, and post-exposure medical evaluation and treatments, as appropriate to their research project and activities.

**Preliminary Medical Evaluation:** Prior to beginning research, the BSL-3 Facilities Manager, Laboratory Manager, and Supervisor (PI or Facilities Management Team Leader) must complete a BSL-3 Medical Evaluation Authorization Form for each individual requiring access to a BSL-3 facility. Each employee and visitor must enroll in the Office of

<sup>1</sup> Centers for Disease Control and Prevention, Rocky Mountain Spotted Fever Signs and Symptoms, <http://www.cdc.gov/ncidod/dvrd/rmsf/signs.htm>

<sup>2</sup> Public Health Agency of Canada, Material Safety Data Sheet, <http://www.phac-aspc.gc.ca/msds-ftss/msds129e-eng.php>

<sup>3</sup> Centers for Disease Control and Prevention, Traveler's Health Yellow Book, Chapter 5, <http://wwwnc.cdc.gov/travel/yellowbook/2010/chapter-5/rickettsial-and-related-infections.aspx>

<sup>4</sup> MMWR, 55(RR04):1-27, March 31, 2006: Diagnosis and Management of Tickborne Rickettsial Diseases: Rocky Mountain Spotted Fever, Ehrlichiosis, and Anaplasmosis – United States, <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5504a1.htm>

Occupational Health and Safety (OHS) medical surveillance program and complete a BSL-3 Medical Questionnaire. Any employee who uses a respirator will be required to complete a Respirator Medical Evaluation Form and be medically cleared to wear a respirator. Some individuals may need to complete a medical evaluation conducted by an occupational health physician at the occupational health clinic designated by OHS ([www.ohs.umn.edu](http://www.ohs.umn.edu)). The occupational health physician will issue a Work Ability Report indicating medical and respirator clearance for work and respirator use; a copy of this report will be sent to the employee, the employee's supervisor, the Office of Occupational Health and Safety, and the BSL-3 Facilities Manager. Some individuals may be placed on work restrictions or require additional evaluation. Each employee will receive a card that identifies his/her work with specific organisms; this card should be presented to a health care provider if the employee is seeking medical attention for symptoms related to a possible exposure.

A tetanus vaccine is recommended for all personnel. Depending on the research activities, employees will require additional immunizations and, in some cases, periodic follow-up blood titers to measure antibody production. Employees choosing not to receive recommended vaccines or follow-up titers must sign a declination form. **Declination may prevent work with a BSL-3 agent or result in work restrictions from the occupational health physician. In many instances University policy does NOT permit an individual who declines immunization to work in some specified environments.**

**Ongoing Medical Evaluations:** BSL-3 employees must complete a medical re-evaluation at least every two years. More frequent evaluation may be necessary, depending on the organism, change in the health of the employee, or at the discretion of the evaluating physician. Updated medical evaluations may be required if there are changes in research processes identified by an updated risk assessment. Any medical condition that increases risk following exposure (e.g., immunosuppression, chemotherapy, pregnancy, significant injury) must be reported to the Office of Occupational Health and Safety to ensure appropriate evaluation.

#### **Specific Occupational Health Requirements for Work with *Rickettsia rickettsii***

The following are specifically required before an employee will be cleared to work with *R. rickettsii* and apply to all employees whose job duties may involve their presence in the laboratory when the organism is being used in research activities. These requirements do not apply to individuals who may encounter the organism only during a medical or other emergency or to individuals whose job duties involve their presence when research activities are not being conducted. An occupational health physician will make the final determination about the application of these requirements for each individual. Changes in these requirements may be made only for compelling medical reasons and in consultation with the OHS Director.

**Preventing Exposures:** In addition to the required facility-specific personal protective equipment, a Powered Air Purifying Respirator (PAPR) with a full facepiece or hood and equipped with N95 or N100 filters must be worn during all tasks that involve handling material that contains or may contain *R. rickettsii*. The same requirements for personal protective equipment pertain to all personnel present in the room during these activities. It is strongly recommended that any procedures that may produce aerosols be performed in a biological safety cabinet, when possible. Tasks must be performed in a manner that prevents or minimizes the generation of aerosols. Anyone responding to a medical or other emergency must wear personal protective equipment that prevents respiratory system exposure.

**Preliminary Medical Evaluation and Vaccinations:** No licensed vaccines are currently available for *R. rickettsii*. It is required that, prior to beginning work with this organism, employees be cleared to receive prophylactic antibiotics (doxycycline) should an exposure occur.

**Post-Exposure Reporting and Medical Treatment:** Any known or suspected exposure to *R. rickettsii* must be treated as a medical emergency and employees must seek immediate medical care through HealthPartners or Fairview University Medical Center. The employee should show his/her BSL-3 card, the agent hazard information sheet, and this Occupational Health and Safety Plan (if available) to the medical provider. Because the initial symptoms of Rocky Mountain spotted fever are non-specific, exposed workers who have unexplained illness should be certain they undergo comprehensive evaluation. Treatment should not be delayed pending laboratory confirmation of illness. Blood should be obtained for a complete blood count, including platelets as well as liver function tests. Clinical laboratory testing for evidence of exposure to *R. Rickettsii* can include PCR (*R. rickettsii* DNA) immunohistochemistry (*R. rickettsii* antigen), culture, or

serology (indirect immunofluorescence for anti-*Rickettsial* antibodies on an acute serum specimen, with a follow-up blood sample obtained 4 weeks later). Exposed employees should begin the adult treatment regimen with doxycycline 100 mg twice per day for 10 days. Chloramphenicol is an alternative drug if required (e.g., during pregnancy). Penicillin, cephalosporins, erythromycin, aminoglycoside, trimethoprim, and sulfamethoxazole are **not** effective against *R. rickettsii*.

Prescription of prophylactic antibiotics will depend on the nature of exposure and the presence of symptoms. If personal protective equipment was worn throughout exposure antibiotics may not be necessary, depending on the level and nature of exposure. After medical care is received, all exposures and treatment must be reported to OHS and the IBC and a First Report of Injury form must be completed and delivered to the University's Risk Management Office.

**Symptom Monitoring and Reporting:** Employees should self-monitor for symptoms, including fever, nausea, vomiting, severe headache, muscle pain, loss of appetite, rash, abdominal and joint pain and diarrhea. Employees who develop these signs or symptoms should seek immediately medical care and show their BSL-3 card to the medical provider. All treatment received for symptoms consistent with exposure must be reported to OHS and a First Report of Injury form must be completed and delivered to the University's Risk Management Office (an electronic form is available online at <https://webapps-prd.oit.umn.edu/froi/index.html>). ALL symptoms consistent with possible exposure should be reported to a supervisor and/or OHS.

### Describing an Occupational Health Plan in a Project-Specific Standard Operating Procedure

Principal Investigators must include the following information in the Occupational Health Plan Appendix as part of their Project-Specific Standard Operating Procedure(s) for a BSL-3 workplan:

1. Identify the type of respiratory protection that will be worn by all personnel.
2. List by name and job title all personnel who will receive:
  - a. Health and safety training
  - b. Medical evaluation
  - c. Respirator clearance
3. Identify who has responsibility for conducting health and safety training and describe how training records will be maintained.
4. Identify who has responsibility for reporting exposures (suspected or real).