# Exposure Response Plan for Laboratory Handling of Streptococcus pneumoniae

## Background Information

S. pneumoniae is of the Streptococcaceae family. The gram-positive, oval/lancet-shaped cocci are often arranged in pairs, known as diplococcus, or can be present in short chains. There are around 90 serotypes and its surface capsule, which is the distinguishing trait of the pneumococcus and is the major virulent factor, holds a complex mosaic of monosaccharides, oligosaccharides, and other polymer components that are of high-molecular weight. Most S. pneumoniae serotypes can cause disease, but only a minority of serotypes produce the majority of pneumococcal infections.

### Host Range

Humans, mice, rats, guinea pigs, and mammals that live in close contact with humans.

### Modes of Transmission

Infectious cells can be disseminated via microaersol droplets created by coughing or sneezing, or person-person oral contact. Transmission is common, but infection is infrequent as healthy individuals carry S. pneumoniae in the nasopharyngeal region without any presence of infection. Pneumococcus bacteria can cause infections in many parts of the body including: lungs, ears, sinuses, brain, and spinal tissue.

### Laboratory Hazards

Inhalation of aerosols, parenteral inoculation; direct person-to-person contact via respiratory or microaersol droplets.

### Signs and Symptoms

Symptoms of pneumococcal infection depend on the part of the body affected. Symptoms can include fever, cough, shortness of breath, chest pain, stiff neck, confusion, increased sensitivity to light, joint pain, chills, ear pain, sleeplessness, and irritability. In severe cases, pneumococcal disease can cause hearing loss, brain damage, sepsis, and death.

### Incubation Period

Varies; generally 1-3 days upon breaching primary immune barriers.

### Medical Precautions/Treatments

**Prophylaxis**

Antibiotic prophylaxis is available. Penicillin for some vulnerable groups.

**Vaccines**

The pneumococcal conjugate vaccine (PCV13) and pneumococcal polysaccharide vaccine (PPSV23) are effective vaccines to prevent infections.

**Treatment**
Administer appropriate drug treatment. Inflammation caused by pneumococcal lysis makes the treatment of pneumococcal diseases less effective with antibiotics alone, and even a highly effective bactericidal such as β-lactam may enhance the harmful effects of the disease in some cases.

**Surveillance**
Monitor for symptoms. Gram-negative stains or bacteriology studies of direct smears can be used to detect symptomatic or asymptomatic infections. ELISA, PCR fingerprinting analysis, and radiography techniques are also useful for diagnosis.

## Personal Protective Equipment (PPE)

Lab coat, gloves, closed-toed shoes, eye protection are required. Wash hands with soap and water after removing gloves.

## Containment

**BSL-2/ABSL-2**
Risk Group 2 classification is applied. VC. BSL-2 practices, containment equipment, and facilities are recommended for activities with cultures or potentially infectious clinical materials. ABSL-2 practices, containment equipment, and facilities are recommended for activities with naturally or experimentally infected animals.

## Immediate Response Following Exposure

**Mucous membrane**
Eyes, mouth, nose, exposure: Flush eyes for 10-15 minutes with clean water, rinse mouth thoroughly without swallowing.

For any area not protected by skin, wash with soap and water for 15 minutes (open wounds, sores, etc.)

## Reporting Exposure Incidents

Any exposure incident—such as contact of *S. pneumoniae* with eyes, nose, mouth, broken skin, or inhalation of aerosols—must be **immediately reported** to:

- **Your PI or laboratory supervisor**
- **UCR Biosafety Officer (BSO)** and **EHSRM at (951) 827-5528.**
- **Occupational Health** **ehsocchealth@ucr.edu**
- **You may contact the UCI Medical Center Infectious Disease Fellow on call at 714-456-6011 for immediate counseling and guidance. UCR maintains an agreement with the UCI Center for Occupational and Environmental Health (COEH) Clinic, which serves as**

**our Occupational Health provider and reviews UCR's Animal Occupational Health Program.**

Undergraduate Student Employees report your injury to your supervisor (or go to Employee Injuries).

For life-threatening injuries, call 911 immediately.

For all other injury types, seek Medical Treatment at UCR's preferred Occupational Clinics. Visit the Medical Treatment Facilities webpage to learn more about where to seek medical treatment.

## Stability

### Disinfection

Susceptible to 10% bleach, 0.5% glutaraldehyde, 70% ethanol.

### Inactivation

Cells can be inactivated by heat suspension in a water bath at 56 degrees Celsius for 30 minutes.

### Survival Outside Host

Can survive in dental plaque and sputum for up to 7 days, in dust for up to 20 days, on glass for 1 - 11 days, up to 180 days in frozen fish, and on mouse carcasses for up to 180 to 270 days.

## References

Centers for Disease Control and Prevention (CDC). Pneumococcal Disease

Public Health Agency of Canada (2011) Pathogen Safety Data Sheets: Infectious Substances – Streptococcus pneumoniae

**University of California, Riverside**
**INFECTIOUS AGENT CARD**

**My job requires me to work with the agent Streptococcus pneumoniae, and animals injected with S. pneumoniae**

If the person with this card exhibits any of the symptoms listed on the back, immediately contact the UCI Medical Center Infectious Disease Fellow on call at (714) 456-6011. For immediate medical counseling on what to do right away, proceed to the nearest Emergency Department and present this card. For more information or to report an incident call: UC Riverside, Occupational Health, at (951) 827-5528.

**Streptococcus pneumoniae** is transmitted via microaerosol droplets, person-person oral contact.

INCUBATION PERIOD: 1-3 days

SYMPTOMS: Fever, cough, shortness of breath, chest pain, stiff neck, confusion, increased sensitivity to light, joint pain, chills, ear pain, malaise, rapid heartbeat.

TREATMENT: Antibiotics.

## Acknowledgement of Working with *Streptococcus pneumoniae*

By signing below, I confirm that I have reviewed and understood the requirements for working with Streptococcus pneumoniae. I agree to comply with all outlined responsibilities, including:

- Following safe laboratory practices and use of appropriate PPE
- Applying proper first aid and decontamination procedures in the event of an exposure
- Promptly reporting any exposures, incidents, or safety concerns to my supervisor, Biosafety Officer, and Occupational Health

| Name (Print) | Identification* | Signature | Date | Supervisor / Principal Investigator |
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*Identification: Provide your UCR Student ID, Employee ID, UCR NetID, UCR Email, or Date of Birth.