

Use of BSL2 Pathogens Erickson/Wilson Laboratories

Before using BSL2 pathogens in the laboratory you must read the following and then acknowledge that you understand the risks of working with these organisms, the safety measures to protect you from accidental exposure and the appropriate procedures in case of accidental exposure.

Escherichia coli

Strains of *Escherichia coli* isolated from agricultural environments or from cases of human disease are used in the lab. These strains live asymptotically in the digestive tracts of animals and cause disease when they colonize other tissues. It is likely that they are not able to cause disease through the oral/gastrointestinal route. Many of these are likely commensal (harmless) *E. coli* that normally live in our intestines. They do not produce the virulence factors necessary to cause gastrointestinal disease. It is reasonable to suspect that ingesting even a very large dose (> 10 billion organisms) would be unlikely to cause disease in a laboratory worker.

A smaller number of the *E. coli* strains may be able to cause extraintestinal diseases such as urinary tract and bloodstream infections. These strains are also not known to cause disease through the gastrointestinal route in healthy persons. They usually must gain entrance to the urinary tract or bloodstream through disruptions of the gastrointestinal barrier or by colonizing the urethra from the GI tract. If ingested, these strains may colonize the GI tract of a laboratory worker without causing disease. These strains could cause disease if accidentally injected via a needle or through contact with an open wound. The infectious dose required through this route would likely be between 10,000 and 1,000,000 organisms, but these strains have not been characterized for virulence in any animal model of infection. **Because we cannot know in advance which *E. coli* strains are “pathogens” and which are not, all uncharacterized strains must be considered potentially pathogenic and handled using BSL2 precautions.**

If infection were to occur via the bloodstream, the time required for disease to manifest would likely be 12-72 hours. If a worker were to be knowingly exposed via this route, they should thoroughly clean the wound, apply disinfectant such as hydrogen peroxide or rubbing alcohol, report the incident to their supervisor and/or safety officer and seek medical attention, which would likely include prophylactic antibiotic therapy. The vast majority of *E. coli* strains are treatable with commonly prescribed antibiotics. The worker should watch for signs of infection including fever, pain and swelling at the site of injection and seek immediate medical attention should they occur.

Staphylococcus aureus

Staphylococcus aureus derived from agricultural settings and from human disease are used in the laboratory. Thus they are predicted to have a wide range of virulence, based on their variable carriage of toxins and colonization factors known to contribute to human disease. *S. aureus* can cause a wide range of diseases, including pneumonia, bloodstream infections, boils, soft-tissue infections, and toxic shock syndrome. Some strains of community-acquired methicillin-resistant *S. aureus* (MRSA) that produce high toxin levels may also be used. The infectious dose required for initiating disease is expected to vary widely depending on the route of infection and the individual strain. *S. aureus* bacteria would be unlikely to cause disease if ingested. If injected accidentally via a needle or through an open wound, the dose required to initiate disease would

fall between 1,000 and 10,000,000 organisms. If a worker were to inhale the bacteria through aspiration or aerosols, the infectious dose would likely be between 10,000 and 10,000,000 organisms.

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Yersinia pseudotuberculosis

Yersinia pseudotuberculosis causes intestinal disease in humans. These are relatively mild infections that are frequently asymptomatic. If accidentally ingested, in the vast majority of cases, the bacteria would colonize the local (intestinal) lymph nodes. Symptoms of disease include low-grade fever, pain, and diarrhea. In rare cases the bacteria may spread from the GI tract through the blood stream and/or colonize other organs including the liver and spleen. This would result in severe disease with high fever and signs of sepsis (low blood pressure, chills, fatigue, rapid breathing). In order to cause disease, a laboratory worker would need to ingest large numbers (>10 billion organisms). It would take between 3 and 10 days for symptoms to occur following infection by the oral route.

If *Y. pseudotuberculosis* were accidentally injected via a needle or through contact with an open wound, the infectious dose would be much smaller (~10,000 organisms) and would likely cause symptoms of sepsis rather than gastrointestinal disease. The onset of disease could occur in less than 24 hours but may take as long as one week. If a worker were to be knowingly exposed via the bloodstream route, they should thoroughly clean the wound, apply disinfectant such as hydrogen peroxide or rubbing alcohol, report the incident to their supervisor and/or safety officer and seek medical attention. If bacteria are ingested, the worker should report the incident as described above and seek medical attention. This may include prophylactic antibiotic therapy. The strains in use are treatable with commonly prescribed antibiotics.

By signing this form, I acknowledge these risks associated with using the bacteria listed above and certify that I will follow established protocols for BSL2 organisms, such as wearing gloves and practicing safe laboratory techniques as outlined in lab training. If exposure to these organisms occurs, I will immediately notify my supervisor and seek appropriate medical help.

Name Printed: _____

Signature: _____ Date: _____