

Gradations of Risk: A Comparison of the Biosafety Levels Frequently Utilized for Common Biohazard Experiments

BSL1	Non-infectious materials (benign research materials that include non-infectious strains of bacteria and yeast used for cloning experiments, non-conjugative strains of <i>E. coli</i> , <i>Sacchomyces cerevisiae</i>)
BSL1	Well characterized cells and tissues from sources other than human or non-human primates (includes cell lines from rodents, dogs, and rabbits)
BSL1	Extracted DNA or RNA not associated with pathogenicity, toxicity or infectivity (note: +ssRNA from human pathogens should be treated as infectious, and must be handled with caution)
BSL1	Research animals, such as transgenic rodents, that have been bred specifically for research purposes and have been documented to be free of zoonoses
BSL1	Recombinant DNA materials based on Risk Group 2 Pathogens that have less than 50 percent of the pathogen's genome and designed to be replication defective (lowering of the containment level in these cases from the starting point of the parent pathogen requires confirmation that the host range of the vector has not been expanded and the inserted genomic material won't present a risk to those handling the material)
BSL1/BSL2 Bridge	Allergens, toxins of biological origin with an LD50 > 100 ug/kg body weight; Opportunistic human pathogens that infect only immunosuppressed hosts; Strict animal pathogens that pose risk to other animals who may be housed in the same room, suite, or facility (in other words, Mouse Hepatitis Virus)

BSL2	Well characterized continuous human and non-human primate cell lines
BSL2	Defective rDNA pathogen vectors that have been designed and verified to be replication defective
BSL2	Toxins of biological origin with an LD50 < 100 ug/kg body weight
BSL2	Cells that have been transformed with human oncogenic viruses or those that containing oncogenic materials
BSL2	Primary cells, tissues, and body fluids from humans and non-human primates (potentially infectious materials that may contain Bloodborne and other pathogens)
BSL2	Known Risk Group 2 classed human pathogens with route of exposure of ingestion, through the skin, or via the mucous membranes (and samples or specimens from patients infected with these agents)
BSL2	Known Risk Group 2 classed human pathogens with an aerosol route of exposure

<p>BSL2/BSL3 Bridge</p>	<p>Risk Group 2 human pathogens linked to an airborne Laboratory Associated Infection (considered unnatural route of transmission when compared infections outside of the laboratory); Aerosolized Rabies virus cases, Communicable Risk Group 2 human pathogens that may pose elevated risk to those outside the laboratory (Poliovirus, Vaccinia virus); Defective or attenuated Risk Group 3 human pathogens (requires verification of lack of pathogenicity and absence of high risk potential contaminants, in other words, wild type pathogen also in the laboratory)</p>
<p>BSL3</p>	<p>Non-airborne Risk Group 3 human pathogens</p>
<p>BSL3</p>	<p>Risk Group 3 human pathogens with a known airborne route of exposure or associated with an aerosol associated Laboratory Associated Infection</p>
<p>BSL3</p>	<p>Unknown or poorly characterized specimens or materials from patients with high risk communicable diseases</p>
<p>BSL3/BSL4 Bridge</p>	<p>Attenuated or defective Risk Group 4 human pathogens (requires verification of attenuation); Risk Group 3 human pathogens in an animal model that elevates the risk (Venezuelan Equine Encephalitis virus in horses); Risk Group 3 human pathogens that are resistant to prophylaxis (XDR Mycobacterium tuberculosis); Risk Group 4 human pathogens that have a known effective immunization (in other words, Junin virus)</p>
<p>BSL4</p>	<p>Risk Group 4 human pathogens</p>

BSL3	Specimens from patients infected with Risk Group 4 human pathogens
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