

Summary of Recommended Biosafety Levels for Infectious Agents

BSL	Agents	Practices	Safety Equipment (Primary Barriers)	Facilities (Secondary Barriers)
1	Not known to consistently cause disease in healthy adults	Standard Microbiological Practices	<ul style="list-style-type: none"> No primary barriers required PPE: laboratory coats and gloves; eye, face protection, as needed 	Open bench and sink required
2	Associated with human disease Routes of transmission include: Percutaneous injury, ingestion, mucous membrane exposure	BSL-1 practice plus: <ul style="list-style-type: none"> Limited access Biohazard warning signs "Sharps" precautions Biosafety manual defining any needed waste decontamination or medical surveillance policies 	Primary barriers: <ul style="list-style-type: none"> Class I or II BSCs or other physical containment devices used for all manipulations of agents that cause splashes or aerosols of infectious materials PPEs: laboratory coats; gloves; face protection as needed 	BSL-1 plus: <ul style="list-style-type: none"> Autoclave available
3	Indigenous or exotic agents that may cause serious or potentially lethal disease through aerosol transmission	BSL-2 practice plus: <ul style="list-style-type: none"> Controlled access Decontamination of all waste Decontamination of lab clothing before laundering Baseline serum 	Primary barriers: <ul style="list-style-type: none"> Class I or II BSCs or other physical containment devices used for all open manipulations of agents PPEs: Protective lab clothing; gloves; respiratory protection as needed 	BSL-2 plus: <ul style="list-style-type: none"> Physical separation from access corridors Self-closing, double-door access Exhausted air not recirculated Negative airflow into laboratory Entry through anteroom or airlock Hand washing sink near laboratory exit
4	Dangerous/exotic agents which pose high risk of aerosol transmitted life-threatening disease that are frequently fatal, for which there are no vaccines or treatments Agents with a close or identical antigenic relationship to an agent requiring BSL-4 until data are available to redesignate the level	BSL-3 practices plus: <ul style="list-style-type: none"> Clothing change before entering Shower on exit All material decontaminated on exit from facility 	Primary barriers: <ul style="list-style-type: none"> All procedures conducted in Class III BSCs or Class I or II BSCs in combination with full-body, air-supplied, positive pressure personnel suit 	BSL-3 plus: <ul style="list-style-type: none"> Separate building or isolated zone Dedicated supply and exhaust, vacuum, and decontamination systems Other requirements outlined in the text of BMBL 5th Edition

Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition

Summary of Recommended Animal Biosafety Levels for Activities in which Experimentally or Naturally Infected Vertebrate Animals are Used

BSL	Agents	Practices	Safety Equipment (Primary Barriers)	Facilities (Secondary Barriers)
1	Not known to consistently cause disease in healthy human adults	Standard animal care and management practices, including appropriate medical surveillance programs	As required for normal care of each species	<ul style="list-style-type: none"> • Standard animal facility: • No recirculation of exhaust air • Directional air flow recommended • Hand washing sink
2	Associated with human disease Routes of transmission include percutaneous exposure, ingestion, and mucous membrane exposure	ABSL-1 practices plus: <ul style="list-style-type: none"> • Limited access • Biohazard warning signs • “Sharps” precautions • Biosafety manual • Decontamination of all infectious wastes and of animal cages prior to 	ABSL-1 equipment plus primary barriers: <ul style="list-style-type: none"> • Containment equipment appropriate for animal species • PPES: laboratory coats, gloves, face and respiratory protection as needed. 	ABSL-1 facility plus: <ul style="list-style-type: none"> • Autoclave available • Hand washing sink available in the animal room. • Mechanical cage washer used
3	Indigenous or exotic agents that may cause serious or potentially lethal disease through the inhalation route of exposure	ABSL-2 practices plus: <ul style="list-style-type: none"> • Controlled access • Decontamination of clothing before laundering • Cages decontaminated before bedding removed • Disinfectant foot bath as needed 	ABSL-2 equipment plus: <ul style="list-style-type: none"> • Containment equipment for housing animals and cage dumping activities • Class I or II BSCs available for manipulative procedures (inoculation, necropsy) that may create infectious aerosols. • PPEs: appropriate respiratory protection 	ABSL-2 facility plus: <ul style="list-style-type: none"> • Physical separation from access corridors • Self-closing, double-door access • Sealed penetrations • Sealed windows • Autoclave available in facility • Entry through ante-room or airlock • Negative airflow into animal and procedure rooms • Hand washing sink near exit
4	Dangerous/exotic agents that pose high risk of aerosol transmitted laboratory infections that are frequently fatal, for which there no vaccines or treatments Agents with a close or identical antigenic relationship to an agent requiring BSL-4 until data are available to redesignate the level	ABSL-3 practices plus: <ul style="list-style-type: none"> • Entrance through change room where personal clothing is removed and laboratory clothing is put on; shower on exiting • All wastes are decontaminated before removal from the facility 	ABSL-3 equipment plus: <ul style="list-style-type: none"> • Maximum containment equipment (i.e., Class III BSC or partial containment equipment in combination with full body, air-supplied positive-pressure personnel suit) used for all procedures and activities 	ABSL-3 facility plus: <ul style="list-style-type: none"> • Separate building or isolated zone • Dedicated supply and exhaust, vacuum and decontamination systems • Other requirements outlined in the text of BMBL 5th Edition

Risk Group Classification	NIG Guidelines for Research involving Recombinant DNA Molecules	World Health Organization Laboratory Biosafety Manual 3 rd Edition 2004
Risk Group 1	Agents not associated with disease in healthy adult humans	(No or low individual and community risk) A microorganism unlikely to cause human or animal disease.
Risk Group 2	Agents associated with human disease that is rarely serious and for which preventive or therapeutic interventions are <i>often</i> available.	(Moderate individual risk; low community risk) A pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventive measures are available and the risk of spread of infection is limited.
Risk group 3	Agents associated with serious or lethal human disease for which preventive or therapeutic interventions may be available (high individual risk but low community risk).	(High individual risk; low community risk) A pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available.
Risk Group 4	Agents likely to cause serious or lethal human disease for which preventive or therapeutic interventions are not usually available (high individual risk and high community risk).	(High individual and community risk) A pathogen that usually causes serious human or animal disease and can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.

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