

APPENDIX A. Classification of Biological Agents by Risk Group (RG)

Risk Group (RG)	Description of Biohazard Agent
1	Agents that are not associated with disease in healthy adult humans
2	Agents that are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are <i>often</i> available
3	Agents that are associated with serious or lethal human disease for which preventive or therapeutic interventions <i>may be</i> available (high individual risk but low community risk)
4	Agents that are likely to cause serious or lethal human disease for which preventive or therapeutic interventions are <i>not usually</i> available (high individual risk and high community risk)

APPENDIX B. Risk Group (RG) Agents

If your project involves the use of bacteria, fungi, virus, animal etiologic virus not listed below, please contact the Biosafety Officer at 323-563-5913 or write to Biosafety-IBC@cdrewu.edu before you start the research.

Any research project involving the use of biological agents in the RG3 or RG4 below cannot be conducted at CDU.

(All Appendix citations in this section are from NIH Guidelines for Recombinant DNA at http://oba.od.nih.gov/oba/rac/Guidelines/NIH_Guidelines_prnnew.pdf)

RISK GROUP 1 (RG1) Agents	
Agents that are not associated with disease in healthy adult humans. Some examples are,	
Asporogenic <i>Bacillus subtilis</i> or <i>Bacillus licheniformis</i>	(see Appendix C-IV-A, <i>Bacillus subtilis</i> or <i>Bacillus licheniformis</i> Host-Vector Systems, Exceptions)
Adeno- associated virus (AAV) types 1 through 4	
Recombinant AAV constructs, in which the transgene does not encode either a potentially tumorigenic gene product or a toxin molecule and are produced in the absence of a helper virus.	
A strain of <i>Escherichia coli</i> is an RG1 agent if it <ul style="list-style-type: none"> • does not possess a complete lipopolysaccharide (<i>i.e.</i>, lacks the O antigen); and • does not carry any active virulence factor (<i>e.g.</i>, toxins) or colonization factors and does not carry any genes encoding these factors. 	(see Appendix C-II-A, <i>Escherichia coli</i> K-12 Host Vector Systems, Exceptions)
<i>Those agents not listed in Risk Groups (RGs) 2, 3 and 4 are not automatically or implicitly classified in RG1</i>	A risk assessment must be conducted based on the known and potential properties of the agents and their relationship to agents that are listed.

RISK GROUP 2 (RG2) Agents (includes Chlamydia)	
<i>RG2 agents are associated with human disease which is rarely serious and for which preventive or therapeutic interventions are often available.</i>	
Microorganisms	
<i>Acinetobacter baumannii</i> (formerly <i>Acinetobacter calcoaceticus</i>)	
<i>Actinobacillus</i>	
<i>Actinomyces pyogenes</i> (formerly <i>Corynebacterium pyogenes</i>)	
<i>Aeromonas hydrophila</i>	
<i>Amycolata autotrophica</i>	
<i>Archanobacterium haemolyticum</i> (formerly <i>Corynebacterium haemolyticum</i>)	

<i>Arizona hinshawii</i>	All serotypes
<i>Bacillus anthracis</i>	
<i>Bartonellahenselae, B. quintana, B. vinsonii</i>	
<i>Bordetella</i> including <i>B. pertussis</i>	
<i>Borrelia recurrentis, B. burgdorferi</i>	
<i>Burkholderia</i> (formerly <i>Pseudomonas</i> species)	Except those listed in Appendix B-III-A (RG3)
<i>Campylobacter coli, C. fetus, C. jejuni</i>	
<i>Chlamydia psittaci, C. trachomatis, C. pneumoniae</i>	
<i>Clostridium botulinum, C. chauvoei, C. haemolyticum, C. histolyticum, C. novyi, C. septicum, C. tetani</i>	
<i>Coxiellaburnetii</i> - specifically the Phase II, Nine Mile strain, plaque purified, clone 4	
<i>Corynebacterium diphtheriae, C. pseudotuberculosis, C. renale</i>	
<i>Dermatophilus congolensis</i>	
<i>Edwardsiella tarda</i>	
<i>Erysipelothrix rhusiopathiae</i>	
<i>Escherichia coli</i> - all enteropathogenic, enterotoxigenic, enteroinvasive and strains bearing K1 antigen, including <i>E. coli</i> O157:H7	
* <i>Francisella tularensis</i> – specifically <i>F. tularensis</i> subspecies <i>novocida</i> [aka <i>F. novocida</i>], strain Utah 112; <i>F. tularensis</i> subspecies <i>holartica</i> LVS; <i>F. tularensis</i> biovar <i>tularensis</i> strain ATCC 6223 (aka strain B38)	*For research involving high concentrations, BSL3 practices should be considered (See Appendix G-II-C-2. Special Practices (BSL3)).
<i>Haemophilus ducreyi, H. influenzae</i>	
<i>Helicobacter pylori</i>	
<i>Klebsiella</i> - all species except <i>K. oxytoca</i> (RG1)	
<i>Legionella</i> including <i>L. pneumophila</i>	
<i>Leptospira interrogans</i> - all serotypes	
<i>Listeria</i>	
<i>Moraxella</i>	
<i>Mycobacterium</i> (except those listed in Appendix B-III-A (RG3)) including <i>M. avium</i> complex, <i>M. asiaticum</i> , <i>M. bovis</i> BCG vaccine strain, <i>M. chelonae</i> , <i>M. fortuitum</i> , <i>M. kansasii</i> , <i>M. leprae</i> , <i>M. malmoense</i> , <i>M. marinum</i> , <i>M. paratuberculosis</i> , <i>M. scrofulaceum</i> , <i>M. simiae</i> , <i>M. szulgai</i> , <i>M. ulcerans</i> , <i>M. xenopi</i>	Except those listed in Appendix B-III-A (RG3)
<i>Mycoplasma</i>	Except <i>M. mycoides</i> and <i>M. agalactiae</i> which are restricted animal pathogens
<i>Neisseria gonorrhoeae, N. meningitidis</i>	
<i>Nocardia asteroides, N. brasiliensis, N. otitidis cavium, N. transvalensis</i>	
<i>Rhodococcus equi</i>	
<i>Salmonella</i> including <i>S. arizonae, S. choleraesuis, S. enteritidis, S. gallinarum-pullorum, S. meleagridis, S. paratyphi, A, B, C, S. typhi, S. typhimurium</i>	
<i>Shigella</i> including <i>S. boydii, S. dysenteriae, type 1, S. flexneri, S. sonnei</i>	

<i>Sphaerophorusnecrophorus</i>	
<i>Staphylococcus aureus</i>	
<i>Streptobacillusmoniliformis</i>	
<i>Streptococcus</i> including <i>S. pneumoniae</i> , <i>S. pyogenes</i>	
<i>Treponemapallidum</i> , <i>T. carateum</i>	
<i>Vibrio cholerae</i> , <i>V. parahemolyticus</i> , <i>V. vulnificus</i>	
<i>Yersinia enterocolitica</i>	
<i>Yersinia pestis</i> specifically <i>pgm(-)</i> strains (lacking the 102 kb pigmentation locus) and <i>lcr(-)</i> strains (lacking the LCR plasmid).	
Fungi	
<i>Blastomycesdermatitidis</i>	
<i>Cladosporiumbantianum</i> , <i>C. (Xylohypha) trichoides</i>	
<i>Cryptococcus neoformans</i>	
<i>Dactylariaagalopava (Ochroconisgallopavum)</i>	
<i>Epidermophyton</i>	
<i>Exophiala (Wangiella) dermatitidis</i>	
<i>Fonsecaeaapetrosi</i>	
<i>Microsporium</i>	
<i>Paracoccidioidesbraziliensis</i>	
<i>Penicilliummarneffeii</i>	
<i>Sporothrixschenckii</i>	
<i>Trichophyton</i>	
Parasitic Agents	
<i>Ancylostomahuman</i> hookworms including <i>A. duodenale</i> , <i>A. ceylanicum</i>	
<i>Ascaris</i> including <i>Ascarislumbricoidessuum</i>	
<i>Babesia</i> including <i>B. divergens</i> , <i>B. microti</i>	
<i>Brugia</i> filaria worms including <i>B. malayi</i> , <i>B. timori</i>	
<i>Coccidia</i>	
<i>Cryptosporidium</i> including <i>C. parvum</i>	
<i>Cysticercuscellulosae</i> (hydatid cyst, larva of <i>T. solium</i>)	
<i>Echinococcus</i> including <i>E. granulosus</i> , <i>E. multilocularis</i> , <i>E. vogeli</i>	
<i>Entamoebahistolytica</i>	
<i>Enterobius</i>	
<i>Fasciola</i> including <i>F. gigantica</i> , <i>F. hepatica</i>	
<i>Giardia</i> including <i>G. lamblia</i>	
<i>Heterophyes</i>	
<i>Hymenolepis</i> including <i>H. diminuta</i> , <i>H. nana</i>	
<i>Isospora</i>	
<i>Leishmania</i> including <i>L. braziliensis</i> , <i>L. donovani</i> , <i>L. ethiopia</i> , <i>L. major</i> , <i>L. mexicana</i> , <i>L. peruviana</i> , <i>L. tropica</i>	
<i>Loa loa</i> filaria worms	
<i>Microsporidium</i>	
<i>Naegleriafowleri</i>	

<i>Necator</i> human hookworms including <i>N. americanus</i>	
<i>Onchocerca</i> filaria worms including, <i>O. volvulus</i>	
<i>Plasmodium</i> including simian species, <i>P. cynomologi</i> , <i>P. falciparum</i> , <i>P. malariae</i> , <i>P. ovale</i> , <i>P. vivax</i>	
<i>Sarcocystis</i> including <i>S. sui hominis</i>	
<i>Schistosoma</i> including <i>S. haematobium</i> , <i>S. intercalatum</i> , <i>S. japonicum</i> , <i>S. mansoni</i> , <i>S. mekongi</i>	
<i>Strongyloides</i> including <i>S. stercoralis</i>	
<i>Taenia</i> solium	
<i>Toxocara</i> including <i>T. canis</i>	
<i>Toxoplasma</i> including <i>T. gondii</i>	
<i>Trichinella</i> spiralis	
<i>Trypanosoma</i> including <i>T. brucei brucei</i> , <i>T. brucei gambiense</i> , <i>T. brucei rhodesiense</i> , <i>T. cruzi</i>	
<i>Wuchereria bancrofti</i> filaria worms	
Viruses	
Adenoviruses, human - all types	
Alphaviruses (Togaviruses) - Group A Arboviruses	<ul style="list-style-type: none"> • Chikungunya vaccine strain 181/25; • Eastern equine encephalomyelitis virus; • Venezuelan equine encephalomyelitis vaccine strains TC-83 and V3526; • Western equine encephalomyelitis virus
Arenaviruses	<ul style="list-style-type: none"> • Junin virus candid #1 vaccine strain; • Lymphocytic choriomeningitis virus (non-neurotropic strains); • Tacaribe virus complex; • Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
Bunyaviruses	<ul style="list-style-type: none"> • Bunyamwera virus; • Rift Valley fever virus vaccine strain MP-12; • Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
Caliciviruses	
Coronaviruses	
Flaviviruses - Group B Arboviruses	<ul style="list-style-type: none"> • Dengue virus serotypes 1, 2, 3, and 4; • Japanese encephalitis virus strain SA 14-14-2; • Yellow fever virus vaccine strain 17D; • Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
Hepatitis A, B, C, D, and E viruses	
Herpesviruses - except Herpesvirussimiae (Monkey B virus) (see Appendix B-IV-D, Risk Group 4 (RG4) – Viral Agents)	<ul style="list-style-type: none"> • Cytomegalovirus; • Epstein Barr virus; • <i>Herpes simplex</i> types 1 and 2;

	<ul style="list-style-type: none"> • <i>Herpes zoster</i> • Human herpesvirus types 6 and 7
Orthomyxoviruses	<ul style="list-style-type: none"> • Influenza viruses types A, B, and C (except those listed in Appendix B-III-D, Risk Group 3 (RG3) - Viruses and Prions); • Tick-borne orthomyxoviruses
Papilloma viruses	All human papilloma viruses
Paramyxoviruses	<ul style="list-style-type: none"> • Newcastle disease virus; • Measles virus; • Mumps virus; • Parainfluenza viruses types 1, 2, 3, and 4; • Respiratory syncytial virus
Parvoviruses	Human parvovirus (B19)
Picornaviruses	<ul style="list-style-type: none"> • Coxsackie viruses types A and B; • Echoviruses - all types; • Polioviruses - all types, wild and attenuated; • Rhinoviruses - all types
Poxviruses	all types except Monkeypox virus (see Appendix B-III-D, Risk Group 3 (RG3) - Viruses and Prions) and restricted poxviruses including Alastrim, Smallpox, and Whitepox (see Section V-L, Footnotes and References of Sections I through IV)
Reoviruses	all types including Coltivirus, human Rotavirus, and Orbivirus (Colorado tick fever virus)
Rhabdoviruses	<ul style="list-style-type: none"> • Rabies virus - all strains; • Vesicular stomatitis virus non exotic strains: VSV-Indiana 1 serotype strains (e.g. Glasgow, Mudd-Summers, Orsay, San Juan) and VSV-New Jersey serotype strains (e.g. Ogden, Hazelhurst)
Rubivirus (Togaviruses)	Rubella virus
<p>Animal Viral Etiologic Agents in Common Use</p> <ul style="list-style-type: none"> • <i>The following list of animal etiologic agents is appended to the list of human etiologic agents. None of these agents is associated with disease in healthy adult humans; they are commonly used in laboratory experimental work. A containment level appropriate for RG1 human agents is recommended for their use.</i> • <i>For agents that are infectious to human cells, e.g., amphotropic and xenotropic strains of murine leukemia virus, a containment level appropriate for RG2 human agents is recommended.</i> 	
Baculoviruses	
Herpesviruses	<ul style="list-style-type: none"> • Herpesvirus ateles; • Herpesvirus saimiri; • Marek's disease virus; • Murine cytomegalovirus
Papilloma viruses	<ul style="list-style-type: none"> • Bovine papilloma virus; • Shope papilloma virus
Polyoma viruses	<ul style="list-style-type: none"> • Polyoma virus; • Simian virus 40 (SV40)

Retroviruses	<ul style="list-style-type: none"> • Avian leukosis virus; • Avian sarcoma virus; • Bovine leukemia virus; • Feline leukemia virus; • Feline sarcoma virus; • Gibbon leukemia virus; • Mason-Pfizer monkey virus; • Mouse mammary tumor virus; • Murine leukemia virus; • Murine sarcoma virus; • Rat leukemia virus
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Murine Retroviral Vectors

- *Murine retroviral vectors to be used for human transfer experiments (less than 10 liters) that contain less than 50% of their respective parental viral genome and that have been demonstrated to be free of detectable replication competent retrovirus can be maintained, handled, and administered, under BSL1 containment.*

Any research project involving the use of biological agents in the RG3 or RG4 below cannot be conducted at CDU.

RISK GROUP 3 (RG3) Agents

RG3 agents are associated with serious or lethal human disease for which preventive or therapeutic interventions may be available.

Bacterial Agents Including Rickettsia

<i>Bartonella</i>	
<i>Brucella</i> , including <i>B. abortus</i> , <i>B. canis</i> , <i>B. suis</i>	
<i>Burkholderia (Pseudomonas) mallei</i> , <i>B. pseudomallei</i>	
<i>Coxiella burnetii</i>	Except the Phase II, Nine Mile strain listed in Appendix B-II-A, Risk Group 2 (RG2) – Bacterial Agents Including Chlamydia
<i>Francisella tularensis</i>	Except those strains listed in Appendix B-II-A, Risk Group 2 (RG2) – Bacterial Agents Including Chlamydia
<i>Mycobacterium bovis</i>	Except BCG strain, see Appendix B-II-A, Risk Group 2 (RG2) – Bacterial Agents Including Chlamydia), <i>M. tuberculosis</i>
<i>Pasteurella multocida</i> type B – “buffalo” and other virulent strains	
<i>Rickettsia akari</i> , <i>R. australis</i> , <i>R. Canada</i> , <i>R. conorii</i> , <i>R. prowazekii</i> , <i>R. rickettsii</i> , <i>R. siberica</i> , <i>R. tsutsugamushi</i> , <i>R. typhi (R. mooseri)</i>	
<i>Yersinia pestis</i>	Except those strains listed in Appendix B-II-A, Risk Group 2 (RG2) – Bacterial Agents Including Chlamydia)

Fungal Agents	
<i>Coccidioides immitis</i>	Sporulating cultures; contaminated soil
<i>Histoplasma capsulatum</i> , <i>H. capsulatum</i> var. <i>duboisii</i>	
Parasitic Agents	
None	
Viruses and Prions	
Alphaviruses (Togaviruses) – Group A Arboviruses	<ul style="list-style-type: none"> Chikungunya virus (except the vaccine strain 181/25 listed in Appendix B-II-D Risk Group 2 (RG2) – viruses Semliki Forest virus St. Louis encephalitis virus Venezuelan equine encephalomyelitis virus (except the vaccine strains TC-83 and V3526, see Appendix B-II-D (RG2) – Viruses Other viruses as listed in the reference source (see Section V-V, Footnotes and references of Sections I through IV)
Arenaviruses	<ul style="list-style-type: none"> Flexal Lymphocytic choriomeningitis virus (LCM) (neurotropic strains)
Bunyaviruses	<ul style="list-style-type: none"> Hantaviruses including Hantaan virus Rift Valley fever virus
Coronaviruses	<ul style="list-style-type: none"> SARS-associated coronavirus (SARS-CoV)
Flaviviruses – Group B Arboviruses	<ul style="list-style-type: none"> Japanese encephalitis virus (except those strains listed in Appendix B-II-D Risk Group 2 (RG2) – Viruses West Nile virus (WNV) Yellow fever virus Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV)
Orthomyxoviruses	<ul style="list-style-type: none"> Influenza viruses 1918-1919 H1N1 (1918 H1N1), human H2N2 (1957-1968), and highly pathogenic avian influenza H5N1 strains within the Goose Guangdong/96-like H5 lineage (HPAI H5N1)
Poxviruses	<ul style="list-style-type: none"> Monkeypox virus
Prions	<ul style="list-style-type: none"> Transmissible spongiform encephalopathies (TSE) agents (Creutzfeldt-Jacob disease and kuru agents) (see Section V-C, Footnotes and References of Sections I through IV, for containment instruction)
Retroviruses	<ul style="list-style-type: none"> Human immunodeficiency virus (HIV) types 1 and 2 Human T cell lymphotropic virus (HTLV) types 1 and 2 Simian immunodeficiency virus (SIV)
Rhabdoviruses	<ul style="list-style-type: none"> Vesicular stomatitis virus (except those strains listed in Appendix B-II-D Risk Group 2 (RG2) - Viruses

RISK GROUP 4 (RG4) Agents

RG4 agents are likely to cause serious or lethal human disease for which preventive or therapeutic

<i>interventions are not usually available.</i>	
Bacterial Agents	
None	
Fungal Agents	
None	
Parasitic Agents	
None	
Viral Agents	
Arenaviruses	<ul style="list-style-type: none"> • Guaranito virus • Lassa virus
Junin virus	<ul style="list-style-type: none"> • Except the candid #1 vaccine strain listed in Appendix B-II-D Risk Group 2 (RG2) – Viruses • Machupo virus • Sabia
Bunyaviruses (Nairovirus)	<ul style="list-style-type: none"> • Crimean-Congo hemorrhagic fever virus
Filoviruses	<ul style="list-style-type: none"> • Ebola virus • Marburg virus
Flaviruses – Group B Arboviruses (Tick-borne encephalitis virus complex including)	<ul style="list-style-type: none"> • Absetterov • Central European encephalitis • Hanzalova • Hypr • Kumlinge • Kyasanur Forest disease • Omsk hemorrhagic fever • Russian spring-summer encephalitis viruses
Herpesviruses (alpha)	<ul style="list-style-type: none"> • Herpesvirus simiae (Herpes B or Monkey B virus)
Paramyxoviruses	<ul style="list-style-type: none"> • Equine morbillivirus
Hemorrhagic fever agents and viruses as yet undefined	