

What is Biohazardous Waste?

Solid waste contaminated with infectious agents known to cause human illness and not contaminated with radioactive materials or hazardous chemicals.

In a research laboratory, this would include solid waste generated from any work with human or non-human primate blood, tissue, or cells and microbiological agents that may cause human illness. This also includes animal carcasses infected with infectious agents known to cause human illness. The National Institute of Health has created a list of microbiological agents that is categorized into 4 major risk groups.

Agents that fall within Risk Groups 2,3 and 4 are considered biohazardous and should be treated as such. Agents that fall within Risk Group 1 are considered as biowaste and do not fall under the biohazardous waste requirements although certain precautions still need to be followed.

Classification of Biohazardous Agents by Risk Group (RG) (taken from *NIH Guidelines for Research Involving Recombinant DNA Molecules*, May 1999)

Risk Groups

Risk Group 1 (RG1)	Agents that are not associated with disease in healthy adult humans.
Risk Group 2 (RG2)	Agents that are associated with human disease which is rarely serious and for which preventative or therapeutic interventions are often available.
Risk Group 3 (RG3)	Agents that are associated with serious or lethal human disease for which preventive or therapeutic interventions may be available (high individual risk but low community risk).
Risk Group 4 (RG 4)	Agents that are 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)

Risk Group 1 Agents

Examples of RG1 Agents include:

<i>Bacillus subtilis</i> (asporogenic)	<i>Escherichia coli</i> K-12	Recombinant AAV
<i>Bacillus licheniformis</i>	Adeno-associated virus (AAV) types 1 through 4	
Note: Agents not listed on Risk Groups 2, 3, and 4 are not automatically or implicitly classified in Risk Group 1. 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 Agents

Bacterial Agents including Chlamydia		
Acinetobacter baumannii	Actinobacillus	Actinomyces pyogenes
Aeromonas hydrophila	Amycolata autotrophica	Archanobacterium haemolyticum
Arizona hinshawii – all serotypes	Bacillus anthracis	Bartonella henselae, B. quintana, B. vinsonii
Bordetella including B. pertussis	Borrelia recurrentis, B burgdorferi	Burkholderia (except those listed in RG3)
Campylobacter coli, C. fetus, C. jejuni	Chlamydia psittaci, C. trachomatis, C. pneumoniae	Clostridium botulinum, Cl. Chauvoei, Cl. Haemolyticum, Cl. Histolyticum, Cl. Novyi, Cl. septicum, Cl. tetani
Corynebacterium diphtheriae, C. pseudotuberculosis, C. renale	Dermatophilus congolensis	Edwardsiella tarda
Erysipelothrix rhusiopathiae	Escherichia coli – all enteropathogenic, enterotoxigenic, enteroinvasive and strains bearing K1 antigen, including E. coli O157:H7	Haemophilus ducreyi, H. influenzae
Helicobacter pylori	Klebsiella – all species except K. oxytoca (RG1)	Legionella including L. pneumophila
Letospria interrogans – all serotypes	Listeria	Moraxella
Mycobacterium (except those listed in RG3) including M. avium complex, M. asiaticum, M. bovis BCG vaccine strain, M. chelonae, M. fortuitum, M. kansasii, M. leprae, M. malmoense, M. marinum, M. paratuberculosis, M. scrofulaceum, M. simiae, M. szulgai, M. ulcerans, M. xenopi	Mycoplasma, except M. mycoides and M. agalactiae which are restricted animal pathogens.	Neisseria gonorrhoeae, N. meningitidis
Nocardia asteroides, N. brasiliensis, N. otitidiscaviarum, N. transvalensis	Rhodococcus equi	Salmonella including S. arizonae, S. choleraesuis, S. enteritidis, S. gallinarum-pullorum, S. meleagridis, S. paratyphi, A, B C, S. typhi, S. typhimurium
Shigella including S. boydii, S. dysenteriae, type 1, S. flexneri, S. sonnei	Sphaerophorus necrophorus	Staphylococcus aureus
Streptobacillus moniliformis	Streptococcus including S. pneumoniae, S. pyogenes	Treponema pallidum, T. carateum
Vibrio cholerae, V. parahemolyticus, V. vulnificus	Yersinia enterocolitica	
Fungal Agents		
Blastomyces dermatitidis	Cladosporium bantianum, C (Xylohypha) trichoides	Cryptococcus neoformans
Dactylaria galopava (Ochroconis gallopavum)	Epidermophyton	Exophiala (Wangiella) dermatitidis
Fonsecaea pedrosoi	Microsporium	Paracoccidioides brasiliensis
Penicillium marneffeii	Sporothrix schenckii	Trichophyton
Parasitic Agents		
Ancylostoma human hookworms including A. duodenale, A. ceylanicum	Ascaris including Ascaris lumbricoides suum	Babesia including B. divergens, B. microti
Brugia filaria worms including B. malayi, B. timori	Coccidia	Cryptosporidium including C. parvum
Cysticercus cellulosae (hydatid cyst, larva of T. solium)	Echinococcus including E. granulosus, E. multilocularis, E. vogeli	Entamoeba histolytica
Enterobius	Fasciola including F. gigantica, F. hepatica	Giardia including G. lamblia
Heterophyes	Hymenolepis including H. diminuta, H. nana	Isospora

Leishmania including L. braziliensis, L. donovani, L. ethiopia, L. major, L. mexicana, L. peruviana, L. tropica	Loa loa filaria worms	Microsporidium
Naegleria fowleri	Necator human hookworms including N. americanus	Onchocerca filaria worms including O. volvulus
Plasmodium including simian species, P. cynomologi, P. faciparum, P. malariae, P. ovale, P. vivax	Sarcocystis including S. sui hominis	Schistosoma including S. haematobium, S. intercalatum, S. japonicum, S. mansoni, S. mekongi
Strongyloides including S. stercoralis	Taenia solium	Toxocara including T. canis
Toxoplasma including T. gondii	Trichinella spiralis	Trypanosoma including T. brucei brucei, T. brucei gambiense, T. brucei rhodesiense, T. cruzi
Wuchereria bancrofti filaria worms		
Viruses		
Adenoviruses, human – all types		
Aphaviruses (Togaviruses) – Group A Viruses --Eastern equine encephalomyelitis virus --Venezuelan equine encephalomyelitis vaccine strain TC 83 --Western equine encephalomyelitis virus		
Arenaviruses --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 --Bunyamwera virus --Rift Valley fever virus vaccine strain MP-12 -- Other viruses as listed in the reference source (see Section V-C, Footnotes and Reverence of Sections I through IV)		
Caliciviruses		
Coronaviruses		
Flaviviruses (Togaviruses) – Group B Arboviruses --Dengue virus serotypes 1,2,3, and 4 -- Yellow fever virus vaccine strain 17D -- Other viruses as listed in the reference source(see Section V-C, Footnotes and References of Section I through IV)		
Hepatitis A, B, C, D, and E Viruses		
Herpesviruses – except Herpesvirus simiae (Monkey B virus) -- Cytomegalovirus -- Epstein Barr virus -- Herpes simples types 1 and 2 -- Herpes zoster -- Human herpes virus types 6 and 7		
Orthomyxoviruses -- Influenza viruses types A, B, and C -- Other tick-borne orthomyxoviruses as listed in the reference source (see Section V-C, Footnotes, and References of Section I through IV)		
Papovaviruses -All human papilloma viruses		
Paramyxoviruses -- Newcastle disease virus -- Measles virus -- Mumps virus -- Parainfluenza viruses types 1, 2, 3, and 4 -- Respiratory syncytial virus		
Parvoviruses -- Human parvovirus(b19)		

<p>Picornaviruses</p> <ul style="list-style-type: none"> -- Coxsackie viruses types A and B -- Echoviruses – all types -- Polioviruses – all types, wild and attenuated -- Rhinoviruses – all types
<p>Poxviruses</p> <ul style="list-style-type: none"> – all types except Monkeypox virus (see Appendix B-III-D, Risk Group 3 – Viruses and Prions) <p>restricted poxviruses including Alastrim, Smallpox, and Whitepox (see Section V-L, Footnotes and References of Sections I through IV)</p>
<p>Reoviruses</p> <ul style="list-style-type: none"> – all types including Coltivirus, human Rotavirus, and Orbivirus (Colorado tick fever virus)
<p>Rhabdoviruses</p> <ul style="list-style-type: none"> -- Rabies virus – all strains -- Vesicular stomatitis virus – laboratory adapted strains including VSV-Indiana, San Juan, and Glasgow
<p>Togaviruses (see Alphaviruses and Flaviviruses)</p> <ul style="list-style-type: none"> - Rubivirus (rubella)

Risk Group 3 (RG3) Agents

Bacterial Agents including Rickettsia		
Bartonella	Brucella including B. abortus, B. canis, B. suis	Burkholderia (Pseudomonas) mallei, B. pseudomallei
Coxiella burnetii	Francisella tularensis	Mycobacterium bovis (except BCG strain, see Appendix B-II-A, Risk Group 2 – Bacterial Agents Including Chlamydia), M. tuberculosis
Pasteurella multocida type B – "buffalo" and other virulent strains	Rickettsia akari, R. australis, R. canada, R. conorii, R. prowazekii, R. rickettsii, R. siberica, R. tsutsugamushi, R. typhi (R. mooseri)	Yersinia pestis
Fungal Agents		
Coccidioides immitis (sporulating cultures; contaminated soil)	Histoplasma capsulatum, H. capsulatum var. duboisii	
Parasitic Agents		
None		
Viruses and Prions		
<p>Aphaviruses (Togaviruses) – Group A Arboviruses</p> <ul style="list-style-type: none"> -- Semliki Forest virus -- St. Louis encephalitis virus -- Venezuelan equine encephalomyelitis virus (except the vaccine strain TC-83, see Appendix B-II-D (RG2)) -- Other viruses are listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV) 		
<p>Arenaviruses</p> <ul style="list-style-type: none"> -- Flexal -- Lymphocytic choriomeningitis virus (LCM) (neurotropic strains) 		
<p>Flaviviruses (Togaviruses) – Group B Arboviruses</p> <ul style="list-style-type: none"> -- Japanese encephalitis virus -- Yellow fever virus -- Other viruses as listed in the reference source (see Section V-C, Footnotes and References of Sections I through IV) 		
<p>Poxviruses</p> <ul style="list-style-type: none"> -- Monkeypox virus 		
<p>Prions</p> <ul style="list-style-type: none"> -- Transmissible spongiform encephalopathies (TME) agents (Creutzfeldt-Jacob disease and kuru agents) (see Section V-C, Footnotes and References of Sections I through IV, for containment instruction) 		
<p>Retroviruses</p> <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) 		
<p>Rhabdoviruses</p> <ul style="list-style-type: none"> -- Vesicular stomatitis virus 		

Risk Group 4 (RG4) Agents

Bacterial Agents		
None		
Fungal Agents		
None		
Parasitic Agents		
None		
Viral Agents		
Arenaviruses --Guanarito virus --Lassa Virus	Junin virus	Machupo virus
Sabia	Bunyaviruses (Nairovirus) --Crimean-Congo hemorrhagic fever virus	Filoviruses --Ebola virus --Marburg virus
Flaviruses (Togaviruses) – Group B Arboviruses --Tick-borne encephalitis virus complex including Absetterov, Central European encephalitis, Hanzalova, Hypr, Kumlinge, Kyasanur Forest disease, Omsk hemorrhagic fever, and Russian spring-summer encephalitis viruses	Herpesviruses (alpha) --Herpesvirus simiae (Herpes B or Monkey B virus)	Paramyxoviruses --Equine morbillivirus