

## 7. Biological Agents and Biohazard Classification

### Classification of Microorganisms on the Basis of Risk

Risk group classifications are most often used in the academic health center research environment as a way to categorize infectious agents based on their relative risk. [The NIH Guidelines](#) also use risk groups as an aid in risk assessment.

#### 7.1 Risk Group 1

This group includes all bacterial, fungal, parasitic, and viral agents generally not associated with disease in healthy adult humans and not listed in the higher risk groups. Included in this group are:

*Parainfluenza virus* type 3, SF4 strain  
*Influenza virus* strains A/PR8/34 and A/WS/33  
*Newcastle Disease virus* strains licensed for vaccine use in the United States  
*Adeno-Associated virus* serotypes 1-4 (*when free of adenoviruses and Herpes simplex virus types 1 & 2*)  
*Escherichia coli* K12 and similar strains

as well as the following Low-Risk Oncogenic Viruses:

Adenovirus 7-Simian virus 40 (Ad7-SV40)  
Avian leukosis virus  
Bovine leukemia virus  
Bovine papilloma virus  
Chick-embryo-lethal orphan (CELO) virus or fowl adenovirus-1  
Dog sarcoma virus  
Guinea pig herpes virus  
Lucke (Frog) virus  
Hamster leukemia virus  
Marek's disease virus  
Mason-Pfizer monkey virus  
Mouse mammary tumor virus  
Murine leukemia virus  
Murine sarcoma virus  
Polyoma virus  
Rat leukemia virus  
Rous sarcoma virus  
Shope fibroma virus  
Shope papilloma virus  
Simian virus 40 (SV-40)

#### 7.2 Risk Group 2

This group includes agents of moderate potential hazard to personnel and the environment and may be associated with human disease. Included in this group are:

##### 7.2.1 Bacterial Agents (including Chlamydia and Rickettsia)

*Acinetobacter calcoaceticus*  
*Actinobacillus* - all species  
*Actinomyces* species  
*Aeromonas hydrophila*  
*Amycolata autotrophica*

*Arizona hinshawii* - all serotypes (*Salmonella enterica* - subspecies *arizonae*)  
*Bacillus anthracis*  
*Bordetella* - all species  
*Borrelia recurrentis*, *B. vincenti*, *B. burgdorferi*  
*Campylobacter fetus*, *C. coli*, *C. jejuni*  
*Chlamydia psittaci*, *C. trachomatis*, *C. pneumoniae*  
*Clostridium botulinum*, *Cl. chauvoei*, *Cl. haemolyticus*, *Cl. histolyticum*, *Cl. novyi*,  
*Cl. septicum*, *Cl. tetani*  
*Corynebacterium diphtheriae*, *C. equi*, *C. haemolyticum*, *C. pseudotuberculosis*,  
*Cl. renale*  
*Dermatophilus congolensis*  
*Edwardsiella tarda*  
*Erysipelothrix insidiosa*  
*Escherichia coli* - all enteropathogenic, enterotoxigenic, enteroinvasive, strains  
bearing K1 antigen including 0157:H7  
*Fusobacterium necrophorum*  
*Haemophilus ducreyi*, *H. influenzae*  
*Helicobacter pylori*  
*Klebsiella* - all species including *K. oxytoca*  
*Legionella pneumophila*  
*Leptospira interrogans* - all serotypes  
*Listeria* - all species  
*Moraxella* - all species  
*Mycobacterium* - all species (including *M. bovis* BCG vaccine strain) **except**  
those listed in Risk Group 3  
*Mycoplasma* - all species **except** *Mycoplasma mycoides* and *Mycoplasma*  
*agalactiae* which are restricted animal pathogens in Risk Group 5  
*Neisseria gonorrhoeae*, *N. meningitidis*  
*Nocardia asteroides*, *N. brasiliensis*, *N. otitidiscaviarum*, *N. transvalensis*  
*Pasteurella* - all species **except** *Pasteurella multocida* type B and other virulent  
strains in Risk Group 3  
*Rhodococcus equi*  
*Rochalimaea quintana*, *R. vinsonii* - (*Bartonella*)  
*Salmonella* - all species and serotypes  
*Shigella* - all species and serotypes  
*Sphaerophorus necrophorus*  
*Staphylococcus aureus*  
*Streptobacillus moniliformis*  
*Streptococcus pneumoniae*, *S. pyogenes*, and *viridans streptococcus*  
*Treponema pallidum*, *T. pertenue*, *T. carateum*  
*Vibrio cholerae*, *V. parahemolyticus*, *V. vulnificus*  
*Vole rickettsia*  
*Yersenia enterocolitica*

### 7.2.2 Fungal Agents

*Blastomyces dermatitidis*  
*Cladosporium bantianum*, *C. trichoides*  
*Cryptococcus neoformans*  
*Dactylaria galopava* (*Oochroconis galloparvum*)  
*Epidermophyton* - pathogenic species  
*Exophiala (Wangiella) dermatitidis*  
*Fonsecaea pedrosoi*  
*Microsporium* - pathogenic species  
*Paracoccidioides brasiliensis*  
*Penicillium marneffeii*

*Sporothrix schenckii*  
*Trichophyton* - pathogenic species

### 7.2.3 Parasitic Agents

*Ancylostoma* human hookworms including *A. duodenale*, *A. ceylanicum*  
*Ascaris lumbricoides suum* and other *Ascaris* species  
*Babesia divergens*, *B. microti*, and other *Babesia* species  
*Coccidia* species  
*Cryptosporidium parum* and other *Cryptosporidium* species  
*Cystisercus cellulosa*  
*Echinococcus granulosis*, *E. vogeli*, *E. multilocularis*  
*Entamoeba histolytica*  
*Enterobius* species  
*Fasciola gigantica*, *F. hepatica*, and other *Fasciola* species  
*Giardia lamblia* and other *Giardia* species  
*Heterophyes* species  
*Hymenolepis diminuta*, *H. nana*, and other *Hymenolepis* species  
*Isospora* species  
*Leishmania braziliensis*, *L. ethiopia*, *L. donovani*, *L. major*, *L. mexicana*, *L. peruviana*, *L. tropica*  
*Naegleria fowleri*  
*Necator americanus* and other *Necator* species  
*Plasmodium falciparum*, *P. malariae*, *P. vivax*, *P. cynomologi*, *P. ovale*, and simian species  
*Sarcocystis sui hominis* and other *Sarcocystis* species  
*Schistosoma haematobiun*, *S. japonicum*, *S. mansoni*, *S. intercalatum*, *S. mekongi*, and other *Schistosoma* species  
*Strongyloides stercoralis* and other *Strongyloides* species  
*Taenia solium*  
*Toxocara canis* and other *Toxocara* species  
*Toxoplasma gondii* and other *Toxoplasma* species.  
*Trichinella spiralis*  
*Trypanosoma brucei brucei*, *T. brucei gambiense*, *T. brucei rhodesiense*, *T. cruzi*, and other *Trypanosoma* species  
*Wuchereria bancrofti*

### 7.2.4 Viral Agents

Adenoviruses - human origin, all serotypes  
Bebaru virus  
Buffalopox virus  
Bunyamwera virus  
Cache Valley virus  
California Encephalitis virus  
Chikkungunya virus vaccine strain 131/25  
Coronaviruses  
Cowpox virus  
Coxsackie A and B viruses  
Creutzfeldt-Jakob Disease Agent  
Cytomegalovirus - both human and murine strains  
Dengue virus - all serotypes - no animal inoculations  
Echoviruses - all serotypes  
Encephalomyocarditis virus (EMC)  
Epstein-Barr virus  
Flanders virus

Hart Park virus  
 Hazara virus  
 Hepatitis viruses - types A,B,C,D,E, associated antigen material and any other  
     bloodborne hepatitis viruses  
 Herpes simplex virus - types 1 and 2  
 Influenza A and B viruses - all strains except those listed in Risk Group 1  
 Kunjin virus  
 Kuru virus  
 Langat virus  
 Lymphocytic Choriomeningitis virus - non-neurotropic strains: neurotropic strains  
     are in Risk Group 3  
 Measles (rubeola) virus  
 Mopeia virus  
 Mumps virus  
 O'nyong-nyong virus  
 Orf virus  
 Parainfluenza virus - all serotypes except those listed in Risk Group 1  
 Parvovirus - animal origin  
 Rabies virus - all laboratory strains; Rabies "street" virus is classified in Risk  
     Group 3  
 Reoviruses - all serotypes  
 Respiratory Syncytial virus  
 Rhinovirus - all serotypes  
 Rift Valley Fever virus vaccine strain MP-12 only  
 Ross River virus  
 Rubella virus  
 Simian viruses - all strains and serotypes except Herpes simiae virus (monkey B  
     virus) and Marburg virus which are listed in Risk Group 4  
 Sindbis virus  
 Tanapox virus  
 Tensaw virus  
 Turlock virus  
 Vaccinia virus  
 Venezuelan Equine Encephalitis virus (vaccine strain TC-83)  
 Vesicular stomatitis virus – laboratory adapted strains  
 Yabapox virus  
 Yellow fever virus (17D vaccine strain)

### **7.3 RISK GROUP 3**

This Risk Group includes indigenous or exotic agents with potential for aerosol transmission. The resulting human disease may have serious or lethal consequences. Agents in this Risk Group include:

#### **7.3.1 Bacterial Agents (including Rickettsia)**

*Bartonella* -all species  
*Brucella abortus*, *B. suis*, *B. melitensis*, *B. ovis*, *B. canis*, *B. neotomae*  
*Burkholderia (Pseudomonas) mallei*, *B. pseudomallei*  
*Coxiella burnetii*  
*Francisella tularensis*  
*Mycobacterium tuberculosis*, *M. bovis*, *M. avium*  
*Pasteurella multocida* type B - and other virulent strains  
*Rickettsia prowazekii*, *R. mooseri*, *R. akari*, *R. rickettsii*, *R. conorii*, *R. canada*,  
*R. siberica*, *R. tsutsugamushi*, *R. australis*  
*Yersinia pestis*

### 7.3.2 Fungal Agents

*Coccidioides immitis*  
*Histoplasma capsulatum*  
*Histoplasma capsulatum var duboisii*

### 7.3.3 Viral Agents

Dengue virus - all serotypes, when used for animal inoculation experiments  
Eastern Equine Encephalomyelitis virus  
Hantavirus - under some conditions may be considered for Risk Group 2  
Human immunodeficiency virus (HIV) types 1 and 2  
Human T cell lymphotropic virus (HTLV) types 1 and 2  
Lymphocytic Choriomeningitis - all neurotropic strains  
Monkeypox virus - used only in in vitro studies  
Rift Valley fever virus  
St. Louis Encephalitis virus  
Semliki Forest virus  
Simian immunodeficiency virus (SIV)  
Transmissible spongiform encephalopathies (TME) agents (Creutzfeldt-Jacob disease and kuru agents)  
Venezuelan Equine Encephalitis virus  
Vesicular stomatitis virus  
West Nile virus  
Western Equine Encephalomyelitis virus  
Yellow Fever virus - wild strains - when used in in vitro experiments

## 7.4 RISK GROUP 4

This Risk Group includes dangerous exotic agents that pose high risk of life-threatening disease, aerosol-transmitted laboratory infections or where the risk of infection is unknown. **No work with Risk Group 4 agents is permitted at UAB.** Risk Group 4 agents include the following:

### 7.4.1 Viral Agents

Ebola virus  
Equine morbillivirus  
Hemorrhagic Fever viruses - including Congo, Junin, Machupa, and other isolates as yet unidentified  
Herpes simiae virus (monkey B virus)  
Lassa virus  
Marburg virus  
Monkeypox virus - when used for animal inoculation experiments  
Tick-Borne Encephalitis virus - including Russian-Spring-Summer Encephalitis, Kyasanur Forest Disease, Omsk Hemorrhagic Fever, Central European Encephalitis, Hanzolova, Kumlinge, and Hypr  
Venezuelan Equine Encephalitis virus - when used for animal inoculation  
Yellow Fever virus - when used for animal inoculation

**Please Note: A U.S. Department of Agriculture (USDA) permit is required for the importation or interstate transport of any animal pathogen permitted in the United States.**

## 7.5 RESTRICTED AGENTS

### 7.5.1 Restricted microorganisms that **may not be studied in the United States include the following:**

***Variola (smallpox) virus***  
***Alastrim***  
***Whitepox***

**All activities including storage of the above three viruses are restricted to the single national facility (World Health Organization [WHO] Collaborating Center for Smallpox Research, Centers for Disease Control in Atlanta, Georgia).**

### 7.5.2 **Restricted Animal disease microorganisms which by United States Department of Agriculture policy cannot be imported into the United States:**

*African Horse Sickness virus*  
*African Swine Fever virus*  
*Akabane virus*  
*Besnoitia besnoitia*  
*Borna Disease virus*  
*Bovine Infectious Petechial Fever Agents*  
*Camelpox virus*  
*Ephemeral Fever virus*  
*Foot and Mouth Disease virus\**  
*Fowl Plague virus*  
*Goatpox virus*  
*Hog Cholera virus* - strains indigenous to the United States may be studied under appropriate conditions  
*Louping Ill virus*  
*Lumpy Skin Disease virus*  
*Nairobi Sheep Disease virus*  
*Newcastle Disease virus (Asiatic strains)*  
*Mycoplasma mycoides (Contagious Bovine Pleuropneumonia)*  
*Rickettsia ruminantium (Heart Water Fever)*  
*Rift Valley Fever virus*  
*Rinderpest virus*  
*Sheeppox virus*  
*Swine Vesicular Disease virus*  
*Teschen Disease virus*  
*Trypanosoma vivax (Nagana), T. evansi*  
*Theileria parva (East Coast Fever), T. annulata, T. lawrencei, T. bovis, T. hirci*  
*Vesicular Exanthema virus*  
*Wesselsbron Disease virus*  
*Zyonema farciminosum (psudofarcy)*

\* by United States law cannot be imported into the US.