



Federal Select Agent Program (FSAP)

Overview Biosafety Risk Assessment for Agriculture

2018 FSAP RO/ARO Workshop
August 2018

USDA and OVERLAP SATs

USDA SELECT AGENTS AND TOXINS

African horse sickness virus
African swine fever virus
Avian influenza virus³ Highly pathogenic
Classical swine fever virus
Foot-and-mouth disease virus*
Goat pox virus
Lumpy skin disease virus
*Mycoplasma capricolum*³
*Mycoplasma mycoides*³
Newcastle disease virus^{2,3} virulent
Peste des petits ruminants virus
Rinderpest virus*
Sheep pox virus
Swine vesicular disease virus

*Denotes Tier 1 Agent

<https://www.selectagents.gov/SelectAgentsandToxinsList.html>

USDA PLANT PROTECTION AND QUARANTINE (PPQ) SELECT AGENTS AND TOXINS

Peronosclerospora philippinensis
(*Peronosclerospora sacchari*)
Phoma glycinicola (formerly *Pyrenochaeta glycines*)
Ralstonia solanacearum
Rathayibacter toxicus
Sclerophthora rayssiae
Synchytrium endobioticum
Xanthomonas oryzae

OVERLAP SELECT AGENTS AND TOXINS

*Bacillus anthracis**
Bacillus anthracis Pasteur strain
Brucella abortus
Brucella melitensis
Brucella suis
*Burkholderia mallei**
*Burkholderia pseudomallei**
Hendra virus
Nipah virus
Rift Valley fever virus
Venezuelan equine encephalitis virus³

Risk Assessment

Process to identify:

1. Hazardous characteristics of an infectious or potentially infectious agent or material
2. Activities that can result in a person's exposure
3. Likelihood of a laboratory-acquired infection (LAI)
4. Probable consequences





Public Health

Risk Assessment



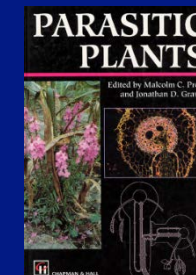
Agriculture

Risk Assessment



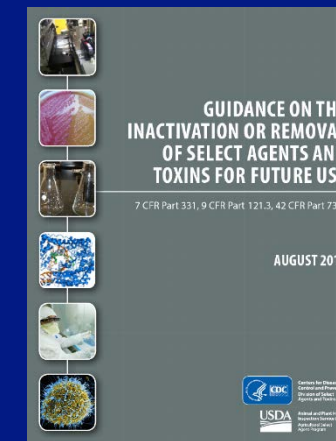
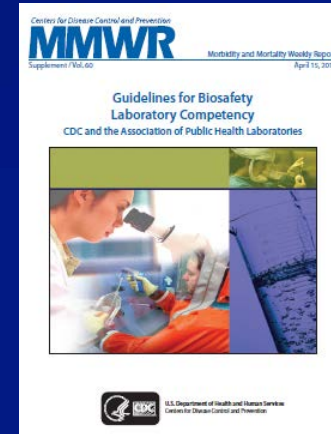
Risk Assessment for Ag

- Susceptibility of multiple animal or crop species
- Geographic location
- Seasonal
- Endemic or Foreign Animal Disease
 - Economic impact (domestic)
 - Effects on international trade
 - Disease status between countries and regions within countries
 - Active control or eradication programs for the disease



Risk Assessment for Ag

- Activities
 - in-vitro vs. in-vivo, research vs. diagnostic vs. field work
- Decontamination and Waste Management
- Inactivation for further use
- Personnel Competencies (KSAs)
- Pest Control
- Incident Response (e.g., spill)



<https://www.cdc.gov/mmwr/preview/mmwrhtml/su6002a1.htm>

https://www.avma.org/News/Journals/Collections/Documents/javma_233_3_415.pdf

Risk Assessment for Ag

- Animal Handling & Occupational Health
 - Large vs. small
 - livestock, wildlife, aquatic species, arthropods, nematodes
 - Zoonotic Disease
 - Availability of data
 - Medical surveillance, effective post-exposure prophylaxis and treatment
 - Respiratory protection program, pre-exposure vaccines availability
- Relevant regulatory requirements
 - FSAP, CDC, USDA, NIH

https://www.selectagents.gov/resources/AIV_Guidelines_180220.pdf

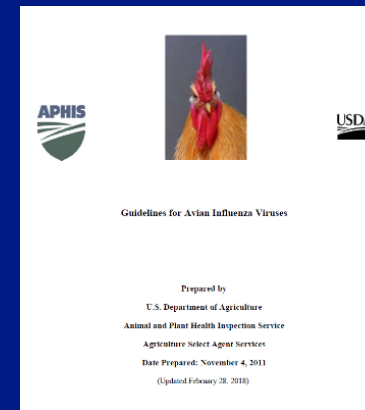
https://osp.od.nih.gov/wp-content/uploads/2013/06/NIH_Guidelines.pdf

GUIDELINES FOR AVIAN INFLUENZA VIRUSES

The Agricultural Select Agent Program has prepared Guidelines for Avian Influenza Viruses (AIV) to assist individuals and entities develop policies and implement procedures for working safely with (AIV) in the laboratory. The guidelines provide a basic understanding of AIV as well as a baseline to meet the requirements of title 9, Code of Federal Regulations Parts 121 (Possession, Use, and Transfer of Select Agents and Toxins) and 122 (Organisms and Vectors).

[Guidelines for Avian Influenza Viruses](#)

[OIE Terrestrial Manual 2015: Avian Influenza](#)

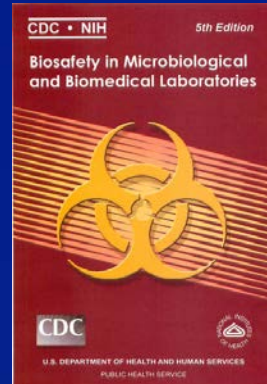


National Institutes of Health • Office of Biotechnology Activities

Frequently Asked Questions:

Biological Safety Guidance for Research with Risk Group 3 Influenza Viruses:
Human H2N2, 1918 H1N1, and HPAI
H5N1 (wild type and mammalian-transmissible by respiratory droplets)

Risk Assessment for Ag



Appendix D—Agriculture Pathogen Biosafety

The contents of this Appendix were provided by USDA. All questions regarding its contents should be forwarded to the USDA.

Contents

- I. Introduction
- II. BSL-3-Ag
- III. BSL-3, Enhanced
- IV. Pathogens of Veterinary Significance
- V. Summaries of Selected Agriculture Agents
- VI. Additional information

I. Introduction

Risk assessment and management guidelines for agriculture differ from human public health standards. Risk management for agriculture research is based on the potential economic impact of animal and plant morbidity, and mortality, and the trade implications of disease. Agricultural guidelines take this difference into account. Worker protection is important but great emphasis is placed on reducing the risk of agent escape into the environment. This Appendix describes the facility parameters and work practices of what has come to be known as BSL-3-Ag. BSL-3-Ag is unique to agriculture because of the necessity to protect the environment from an economic, high risk

IV. Pathogens of Veterinary Significance

African horse sickness virus ^{a, b}	Louping ill virus ^a
African swine fever virus ^{a, b, c}	Lumpy skin disease virus ^{a, b, c}
Akabane virus ^b	Malignant catarrhal fever virus (exotic strains or alcelaphine herpesvirus type 1) ^b
Avian influenza virus (highly pathogenic) ^{a, b, c}	Menangle virus ^b
<i>Bacillus anthracis</i> ^{a, b}	<i>Mycobacterium bovis</i>
<i>Besnoitia besnoiti</i>	<i>Mycoplasma agalactiae</i>
Bluetongue virus (exotic) ^{a, b}	<i>Mycoplasma mycoides subsp. mycoides</i> (small colony type) ^{a, b, c}

*Not all inclusive

V. Summaries of Selected Agriculture Agents

African Swine Fever Virus (ASFV)

ASF is a tick-borne and contagious, febrile, systemic viral disease of swine.^{1,2,3} The ASF virus (ASFV) is a large (about 200 nm) lipoprotein-enveloped, icosahedral, double-stranded DNA virus in the family *Asfarviridae*, genus *Asfivirus*. This virus is quite stable and will survive over a wide range of pH. The virus will survive for 15 weeks in putrefied blood, three hours at 50°C, 70 days in blood on wooden boards, 11 days in feces held at room temperature, 18 months in pig blood held at 4°C, 150 days in boned meat held at 39°F, and 140 days in salted dried hams. Initially, domestic and wild pigs (Africa: warthog, bush pig, and giant forest hog; Europe: feral pig) were thought to be the only hosts of ASFV. Subsequently, researchers showed that ASFV replicates in *Ornithodoros* ticks and that there is transstadial, transovarial, and sexual transmission. ASF in wild pigs in Africa is now believed to cycle between soft ticks living in warthog burrows and newborn warthogs. *Ornithodoros* ticks collected from Haiti, the Dominican Republic, and southern California have been shown to be capable vectors of ASFV, but in contrast to the African ticks, many of the ticks from California died after being infected with ASFV. Because ASFV-infected ticks can infect pigs, ASFV is the only DNA virus that can qualify as an arbovirus.

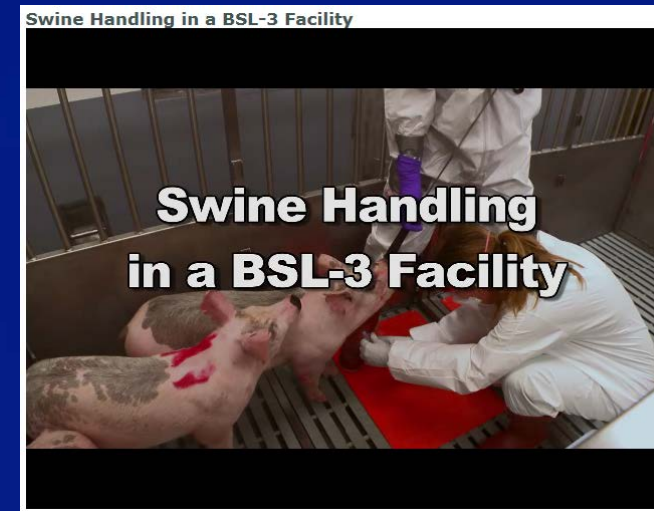
Animal Diseases associated with Potential Bioterrorist Agents

Animal Disease From Potential Bioterrorist Agents



CDC Category	Disease or Agent	Severity of disease in potentially affected species									Incubation Period	Prominent Clinical Signs
		Cattle	Sheep	Goats	Pigs	Horses	Dog	Cat	Birds	Other		
		Mild Moderate Severe										
A	Anthrax <i>Bacillus anthracis</i>									wild herbivores and carnivores, guinea pig	3-7 days	Sudden death from septicemia with lack of rigor mortis; blood fails to clot; excitement followed by depression or stupor; blood from mouth, nose, anus; edema, especially neck, throat and shoulders
A	Botulism <i>Clostridium botulinum</i> toxin									foxes, mink	24-72 hours	Muscle paralysis - progressive symmetrical to flaccid; disturbed vision; unable to swallow or chew; death from respiratory or cardiac paralysis
A	Plague <i>Yersinia pestis</i>									rodents, rock and ground squirrel, prairie dog	Variable, several days	High fever; extremely swollen lymph nodes ("buboes"); severe pneumonia; septicemia
A	Tularemia <i>Francisella tularensis</i>									rabbits, rodents, aquatic animals	1-10 days	Sudden high fever with lethargy and anorexia; stiffness; reduced mobility; tachycardia; tachypnea; prostration and death; miliary white necrotic foci of liver, spleen or lymph node
A	Viral Hemorrhagic Fevers <i>Ebola; Marburg; Lassa; Machupo</i>									non-human primates	2-16	Fever; petechiae; bleeding from orifices and internal organs; skin rash; splenomegaly
B	Brucellosis <i>Brucella melitensis</i>									wild ruminants	Variable	Abortions, stillborn or weak newborns; retained placentas; placentitis; orchitis; epididymitis; arthritis; lameness; Goats: May also have mastitis
B	Brucellosis <i>Brucella abortus, B. ovis, B. suis, B. canis</i>									wild ruminants, buffalo, bison, elk	Variable	Abortions, stillborn or weak newborns; placentitis; orchitis; epididymitis; arthritis; lameness; Horses: suppurative bursitis ("fistulous withers")
B	Glanders <i>Burkholderia mallei</i>									donkeys, mules, guinea pigs, hamsters	2 weeks	Ulcerated nodules on skin, upper respiratory tract, lungs; septicemia; high fever; thick mucopurulent nasal discharge; respiratory signs
B	Melioidosis <i>Burkholderia pseudomallei</i>									rodents, rabbits, kangaroos, other zoo animals, fish	Variable; Latency	Signs vary with site of lesion; suppurative or caseous lesions in lymph nodes, lungs, and viscera; pneumonia; possibly nasal discharge, arthritis or lameness; Horses: neurological; colic; Goats: mastitis

Animal Behavior & Handling



Animal Penning, Gating & Animal Welfare



Tenderfoot
flooring
(rubber, no
bedding)



Rubber
Mating
(no
bedding)



Ag Biosafety

- Agriculture animals are loosed-housed or in open caging (cannot be housed in primary containment isolators or equivalent means of primary containment devices) *



ABSL-2



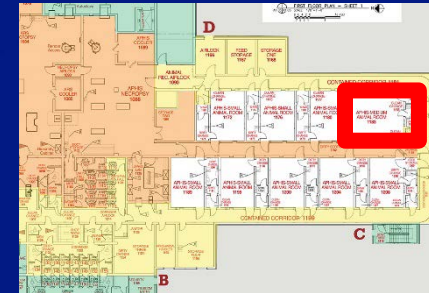
BSL-3Ag (11 agents)

✓ABSL-3E

Agents typically handled in BSL-3Ag but are being studied within primary containment devices



ABSL-3



Box within a box



ABSL-4

* Enhancements may be required by USDA APHIS, other relevant regulatory entity, or local policies and procedures.

BSL-3Ag Animal Diseases



African Swine Fever



Classical Swine Fever
(hog cholera)



HPAI



Rift Valley Fever



Contagious
caprine
pleuropneumonia



Contagious bovine
pleuropneumonia



FMD



Peste des Petites Ruminants

• Lumpy skin disease virus

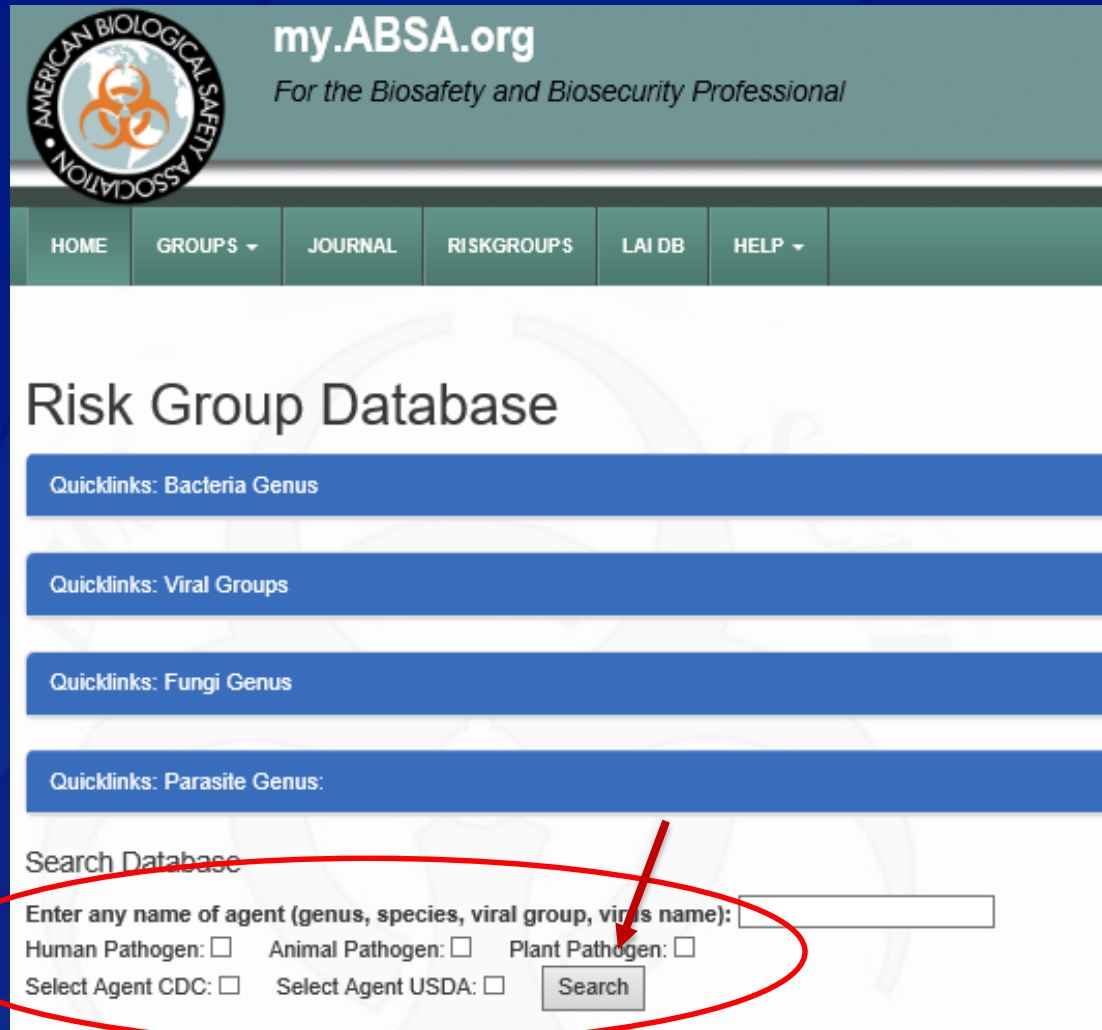
* Newcastle disease (velogenic)

* Rinderpest virus

Risk Assessment - Plant Health

- Origin-imported or domestic
- Pure culture or field-collected
- Lab, growth chamber, greenhouse usage
- Vector studies
 - Arthropods, nematodes
- Trophic types
 - Obligate or facultative parasite
- Tropical vs. Temperate
- Fungal spore dispersal
- Special cases
 - Some bacteria produce endospores
 - Nematodes have resistant cysts
 - Some rust fungi have five different spores in their life cycle
 - The presence of rust alternate hosts

Risk Group Classification



 my.ABSA.org
For the Biosafety and Biosecurity Professional

HOME GROUPS JOURNAL RISKGROUPS LAI DB HELP

Risk Group Database

Quicklinks: Bacteria Genus

Quicklinks: Viral Groups

Quicklinks: Fungi Genus

Quicklinks: Parasite Genus:

Search Database

Enter any name of agent (genus, species, viral group, virus name):

Human Pathogen: ☐ Animal Pathogen: ☐ Plant Pathogen: ☐

Select Agent CDC: ☐ Select Agent USDA: ☐

FREE App

ABSA International's
Risk Group
Database app
Now available for
Apple iOS and Android devices.

To download on your device search for
"Risk Group Database" in Apple's **iTunes**
App Store or in the **Google Play App** store.

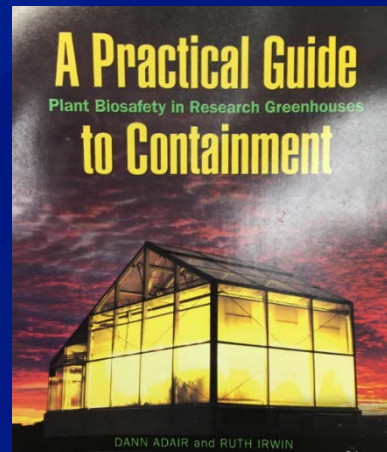
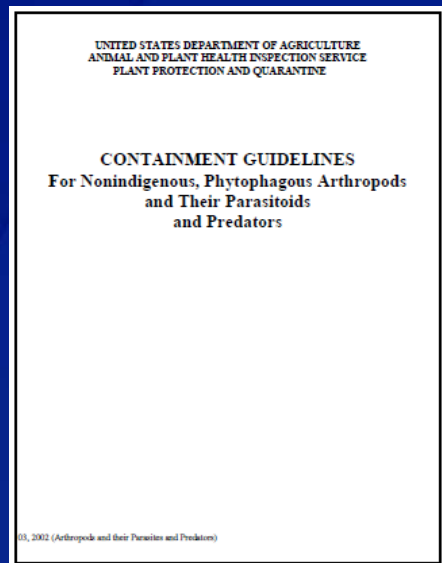
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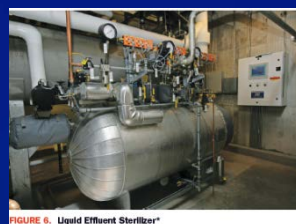


<https://my.absa.org/tiki-index.php?page=Riskgroups>

Biocontainment – Plant Health



Containment Facilities and Safeguards for Exotic Plant Pathogens and Pests” (Robert P. Kahn and S.B. Mathur eds., 1999



http://www.aphis.usda.gov/plant_health/permits/downloads/plant_fungal_pathogens_containment_guidelines.pdf

<http://www.isb.vt.edu/documents/Plant%20Contain.text.PDFX-1a.pdf>

Hazardous Characteristics of Select Agents and Toxins* (both animal and plant diseases)

SELECT AGENT OR TOXIN	ENDEMICITY INFORMATION	INFECTIOUS DOSE	LABORATORY SAFETY & CONTAINMENT RECOMMENDATIONS	TREATMENT (antidote or prophylaxis)	DISINFECTANTS
Classical swine fever virus	Endemic in much of Asia, Central and South America, and parts of Europe and Africa	10 TCID ₅₀	BSL-3 with enhancements. BSL-3-Ag & ABSL-3, both with enhancements with no contact w/ susceptible hosts for 5 days.	No treatment	Inactivated by cresol, sodium hydroxide (2%), formalin (1%), sodium carbonate (4% anhydrous or 10% crystalline, with 0.1% detergent), ionic and non-ionic detergents, strong iodophors (1%) in phosphoric acid.
<i>Rathayibacter toxicus</i>	Australia and South Africa	3-6 mg/kg/ body weight	BSL-2	No treatment	Alcohol

NOTE: instructional use only and does not qualify as an entity specific assessment

Procedural Risks (Examples)

Appendix II: Example Procedural Risks

		Mitigating Factors (A risk assessment for each experiment is necessary, as well as risk communications)					Notes
Procedural Risks*	PPE	BSC/ Primary Containment	Engineering Controls/ Secondary Containment	Biosafety SOP(s)/ Training	Occ. Health Plan	Gasket on Lid	
Propagation	X	X	X	X			Sterility testing and use of non-viable/exempt strains
Lack of Appropriate Immunizations					X		
Aerosol Producing	Vortexing	X	X	X			
	Centrifuging	X	X	X	X	X	Use safety cup (if available)
	Sonication	X	X	X	X		Use hearing protection
	Pipetting	X	X	X	X		
	Blending	X	X	X	X		
	Homogenizing	X	X	X	X		
	Shakers	X	X	X			
	Lyophilization	X	X	X		X	
	Flow Cytometry/ Culture Manipulation	X	X	X	X		
	Automated plating/ Plate washing	X	X	X	X		
Animal Work	Spills/Splashes/Sprays	X	X	X	X		Use spill kit
	Mouth pipetting and other ingestion forms	X			X		
	Cell Line/ Culture manipulation	X	X	X	X		
	Pressure column chromatography	X		X	X		Avoid using glass columns when possible
	Injection Procedures	X			X		
	Loosely Housed	X	X	X	X		
	Aerosol Exposure	X	X	X	X		
	Bedding changing and disposal procedures	X	X	X	X		
	Necropsy/ Harvesting tissues	X	X	X	X		
	Animal Bites	X	X	X	X		
	Use of Sharps	X			X		
	Inadequate Training				X		
	Inadequate Safety Equipment				X		
	Inadequate Facilities			X	X		
	Waste Handling and Inactivation Procedures	X		X	X		
	Decontamination	X			X		
	Selection and Use of PPE				X		
	Inadequate Signage/ Labeling				X		

*List is non-comprehensive.

Incident Response & Reporting

- **Releases (e.g., spills)**
 - Outside primary containment
 - Animal disease agent
 - Zoonotic, arthropod
 - Activation of a post-exposure medical surveillance/prophylaxis protocol
 - Plant disease agent
 - Arthropod-borne disease (vector)
 - Incident reporting protocol
 - Evacuation, clean up
 - Proper disinfectant, contact time, final disposal
 - Reporting to FSAP
 - Outside secondary containment
 - Impact to environment (e.g, livestock, natural resources, cash crops, plant nursery industry, other)
 - Reporting to FESAP, other Federal and State agencies

Waste Management

- Decontamination, Disinfection, and Sterilization

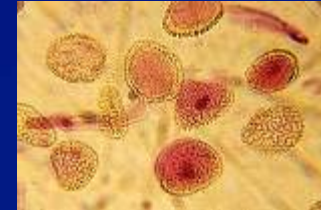


- Ever et. Al. (2013) Laboratory Decontamination of HHS-listed and HHS/USDA Overlap Select Agents and Toxins. Applied Biosafety. 18:2, pp. 59-72.
- Principles and Practices of Disinfection, Preservation and Sterilization, 4th Edition eds Fraiese, AP, Lambert, PA and Maillard J-Y, p 565.

Risk Assessment

In addition to Biological:

- Chemical
- Radiological
- Sharps
 - Contaminated (needles, syringes, scalpels)
- Physical
 - Animal handling (bites, scratches, allergens)



Breakout Exercise:

Assessment of Risks Associated
with
Incident Response
(e.g., spills)

Breakout session exercise

Entity ABC, a large agriculture animal health research and diagnostic campus somewhere in the Southwest, consists of multiple BSL-2/ABSL-2, BSL-3/ABSL-3, and BSL-3Ag laboratories, vivarium and associated support facilities. Several of the laboratory/animal facilities store and/or handle SATs and are registered with the FSAP. Describe the incident response and reporting procedure(s) you would have in place in the following situations:

1. On a Friday afternoon, an employee noticed a small air leak on top of the fermentor head plate at the start of a fermentor kill cycle. The fermentor contained *B. abortus* Strain 19 live vaccine (attenuated strain). The leak was observed as a small bubble from a pressure fitting.
2. One Thursday night, there was an operational failure in the effluent waste stream (EDS system that services the BSL-3Ag facility) that led to a possible release of untreated effluent into the “clean contained” portion in the building’s basement. The EDS system is located in a free-standing building. Animals in the BSL-3Ag facility had been inoculated with *Brucella abortus* a few months prior the incident, and two had aborted 2 weeks prior the incident. Staff encountered the spill the following morning.
3. Employee was processing a diagnostic sample taken from a zoo animal that died 2 days before. The zoo is located near a region where cases of velogenic *Newcastle disease virus* (vNDV) have been recently reported. The sample is suspected to contain vNDV based on necropsy results. In the process of loading the sample from the shipping to container to the BSC, the employee inadvertently dropped it causing a spill on the floor.

Discussion

www.selectagents.gov

CDC: Irsat@cdc.gov or 404-718-2000

APHIS: AgSAS@aphis.usda.gov or
301-851-3300 option 3 (voice only)

