IDRC Operations/Safety and LAR BSL-3 Emergency Response Packet
TAKE THIS PACKET WITH YOU!

- Emergency Contact Information --Directions to Emergency Room
- Workers' Compensation Information --Incident Report Form
- Directions to Authorized Treating Physicians --Infectious Agent Fact Sheets:

| Arenaviruses (Junin, Tacaribe, and Pirital) | Highly Pathogenic Avian Influenza | Rabies Virus |
| Bacillus anthracis | Human Immunodeficiency Virus | Rickettsia prowazekii (to be acquired) |
| Blue tongue Virus (exotic) | Illheus Virus | Rickettsia rickettsia (to be acquired) |
| Brucella Species (abortus, suis, melitensis to be acquired) | Japanese Encephalitis Virus | Rift Valley Fever Virus |
| Burkholderia mallei | LaCrosse Virus | Semliki Forest Virus |
| Burkholderia pseudomallei | Lassa Virus Vaccine Clone (ML-29, no virulence determinants) | |
| Bussuquara Virus | Low Path Avian Influenza virus | Severe Fever with Thrombocytopenia Syndrome Virus |
| Chikungunya Virus | Middle East Respiratory Virus Syndrome Virus (MERS -CoV) | Sindbis Virus |
| Clostridium botulinum (and Toxin) | Mycobacterium abscessus (MDR) | St. Louis Encephalitis Virus |
| Coccidiodes immitis | Mycobacterium avium (BSL2) | Staphylococcus aureus (BSL2) |
| Coxiella burnetii | Mycobacterium bovis | Venezuelan Equine Encephalitis Virus |
| Dengue Viruses (1-4) | Mycobacterium chelonae (BSL2) | West Nile Virus |
| E. coli (BSL2) | Mycobacterium massilense (BSL2) | Western Equine Encephalitis Virus |
| E. coli encoding Clostridium botulinum toxin A | Mycobacterium spp., nontuberculous | Yellow Fever Virus |
| Eastern Equine Encephalitis Virus | Mycobacterium tuberculosis (MDR Included) | Yersinia pestis |
| Francisella tularensis | Neurtoxin A (BSL2 as well) (to be acquired) | Zika Virus |
| Francisella tularensis LVS (BSL2) | O’Nyong-Nyong Virus | |
| Hantavirus (Maporal virus, El Moro Canyon, Sin Nombre, Andes, Hantaan, Seoul virus) | Powassan Virus | |

Updated 12/2014
The most up to date version of this document can be found in the Biosafety or Occupational Health Websites under the “Illness Procedure and “Emergency Response Packet” Bar: http://www.ehs.colostate.edu/WOHSP/BSL3Packets.aspx
# Emergency Phone Numbers

<table>
<thead>
<tr>
<th>BIOSAFETY EMERGENCY NUMBER</th>
<th>491-0270</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDRC On-Call</td>
<td>491-IDRC (491-4372)</td>
</tr>
<tr>
<td>Fort Collins Emergency Room</td>
<td>495-7000</td>
</tr>
<tr>
<td>Occupational Health Coordinator</td>
<td>491-3102, 420-8172</td>
</tr>
</tbody>
</table>
Workers’ Compensation Procedure

Updated 12/2014

NOTE: Workers Compensation Statutes change frequently, and every effort has been made to update this document accordingly. However, Risk Management is the source for the most current Workers’ Compensation procedures: http://www.ehs.colostate.edu/WWorkComp/Home.aspx

• First Report of Injury must be INITIATED as soon as possible
  – Online link: required forms: https://wsnet.colostate.edu/cwis86/EHslogin/default.aspx?From=WorkComp

• Medical attention must be sought by a CSU Authorized Treating Physician
  – For a complete list of CSU Authorized Treating Physicians: http://www.ehs.colostate.edu/WWorkComp/HealthContPrint.aspx

• All claims are subject to review and may not be covered under Workers Compensation unless found compensable under current Worker’s Compensation Statutes.
  – **GO TO A CSU AUTHORIZED TREATING PHYSICIAN WHENEVER POSSIBLE** as initial visit costs will be covered through Workers Compensation even if it is determined that your illness is not work related. If you must go to the ER or an Urgent Care provider for the specific reasons listed above, you and/or your insurance carrier will be responsible for all health care costs for illnesses/injuries that are NOT related to your employment.
  – **However**, in order to assure that medical attention is sought appropriately for potentially work related illnesses, CSU may cover certain out of pocket costs for ER or Urgent Care services that are NOT covered under Colorado Workers’ Compensation Statutes (provided that the requirements of this procedure have been properly followed). In general, such coverage will not exceed $2,000.

• CSU Workers’ Compensation Website: http://www.ehs.colostate.edu/WWorkComp/Home.aspx
When to go to a CSU Authorized Treating Physician

- During regular business hours
  - When you **have a fever**, and you have been in the **BSL-3 barrier in the last 5 days**
  - When you have a **KNOWN exposure** to or an injury **IN Volving TUBERCULOSIS**
  - When you have a minor injury

- When told by the ER, Urgent Care, or Workers’ Compensation to follow up after an Emergency Room or Urgent Care visit

- Due to limitations in Workers’ Compensation coverage for ER or Urgent Care visits, see a CSU Designated Care Provider whenever possible.
  - For details see Workers’ Compensation Procedure in this packet, or “BSL3 Illness Procedures” online at [http://www.ehs.colostate.edu/WBiosafety/Home.aspx](http://www.ehs.colostate.edu/WBiosafety/Home.aspx) under the bar labeled “BSL3 Illness Procedures, Info, and Emergency Response Packets”.
CSU AUTHORIZED TREATING PHYSICIANS

For NON-EMERGENCY incidents

If you go to the Emergency Room, follow-up with one of these providers

A complete list of designated providers can be found at: http://www.ehs.colostate.edu/WWorkComp/HealthContPrint.aspx
University of Colorado Health Occupational Health Services
4674 Snow Mesa Drive, Suite 200
Fort Collins, CO
(970) 495-8450
Mon-Fri, 7:00am - 6:00pm
**Workwell Fort Collins**  
1600 Specht Point Road, Suite 115  
Fort Collins, CO  
(970) 672-5100  
Mon-Fri, 8:00am - 5:00pm

**Workwell Loveland**  
1608 Topaz Drive  
Loveland, CO  
(970) 593-0125  
Mon-Fri, 8:00am - 5:00pm

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**FROM FOOTHILLS CAMPUS to Workwell, Fort Collins**  
- Turn Right on Overland Trail.  
- Turn Left on W. Prospect Road.  
- Turn Right at Specht Point Drive.  
- Workwell is located on the first floor.  
Approximate drive time is 15 minutes.

**FROM MAIN AND SOUTH CAMPUSSES to Workwell, Fort Collins**  
- Head East on Prospect Road.  
- Turn Right at Specht Point Drive.  
- Workwell is located on the first floor.  
Approximate drive time is 15 minutes.
When to go to the Emergency Room

• When you have a KNOWN EXPOSURE to a BSL-3 infectious agent (other than Tuberculosis)

• When you have a major injury

• **WHEN A CSU AUTHORIZED TREATING PROVIDER IS CLOSED** and you have a fever within 5 days of being in the BSL-3 barrier and/or have symptoms associated with disease due to pathogens worked with.
  
  – IF YOU GO TO THE EMERGENCY ROOM OR URGENT CARE AND ARE DIRECTED TO DO SO, YOU MUST FOLLOW UP WITH ONE OF THE CSU AUTHORIZED TREATING PHYSICIAN THE NEXT BUSINESS DAY.

• Complete list: [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)

• If you go to the Emergency Room or Urgent Care, it is your responsibility to follow up by providing them with your Workers’ Compensation claim number and billing information:
  
  P.O. Box 4998
  Greenwood Village, CO 80155
  Phone: (303) 804-2000
  Fax: (303) 804-2005
  Toll-Free: (888) 428-4671
Emergency Room Directions

Please do not drive yourself. Have someone take you. Contact Biosafety if you need a ride. 491-0270
Poudre Valley Hospital
Emergency Dept (Colorado Health Medical Group)
1024 South Lemay Ave
Fort Collins, CO
(970) 495-7000
24 hours, 7 days per week

**FROM FOOTHILLS CAMPUS**
- Turn Left on Overland Trail
- Turn Right on W. Mulberry Street
- Turn Right on Riverside Avenue
- Turn Right at S. Lemay Avenue
- Hospital is on the East side of the road.

Approximate drive time is 15 minutes.

**FROM MAIN AND SOUTH CAMPUSES**
- Head East on Prospect or Drake
- Turn Left at Lemay Avenue
- Hospital is on the East side of the road.

Approximate drive time is 10 minutes.
# Poudre Valley Hospital Harmony

## URGENT CARE

Go to an Urgent Care closest to you

<table>
<thead>
<tr>
<th>FROM FOOTHILLS CAMPUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Turn Left on Overland Trail</td>
</tr>
<tr>
<td>• Turn Right on Mulberry Ave</td>
</tr>
<tr>
<td>• Turn Right on Riverside Ave</td>
</tr>
<tr>
<td>• Turn Left on E. Prospect Rd</td>
</tr>
<tr>
<td>• Turn Right on Timberline Rd</td>
</tr>
<tr>
<td>• Turn Left on E. Harmony Rd</td>
</tr>
<tr>
<td>• Facility is on the South side of Harmony Road</td>
</tr>
<tr>
<td>• Follow signs to Urgent Care</td>
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</tbody>
</table>

Approximate drive time is 21 minutes

<table>
<thead>
<tr>
<th>FROM MAIN AND SOUTH CAMPUSSES</th>
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</thead>
<tbody>
<tr>
<td>• Head East on Prospect Rd</td>
</tr>
<tr>
<td>• Turn Right on Timberline Rd</td>
</tr>
<tr>
<td>• Turn Left on E. Harmony Rd</td>
</tr>
<tr>
<td>• Facility is on the South side of Harmony Road</td>
</tr>
<tr>
<td>• Follow signs to Urgent Care</td>
</tr>
</tbody>
</table>

Approximate drive time is 20 minutes

PVHs Harmony Urgent Care
2127 E. Harmony Road
Daily, 8 a.m. to 8 p.m.
(970) 297-6250
# Biosafety Incident Report Form

**THIS IS NOT A WORKERS' COMPENSATION INCIDENT REPORT FORM**

If this is an injury, have you filled out a workers' compensation form?  □ Yes  □ No

<table>
<thead>
<tr>
<th>Personal Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>CSU ID:</td>
</tr>
<tr>
<td>First Name:</td>
<td>Last Name:</td>
</tr>
<tr>
<td>Email:</td>
<td>Phone Number:</td>
</tr>
<tr>
<td>Alt. Phone Number:</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Contact Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Phone #:</td>
</tr>
<tr>
<td>Name:</td>
<td>Alt. Phone #:</td>
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<tr>
<td></td>
<td>Phone #:</td>
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<tr>
<td></td>
<td>Alt. Phone #:</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Incident Information</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Pathogen working with:</td>
<td></td>
</tr>
<tr>
<td>Does the pathogen contain recombinant DNA or synthetic nucleic acid molecules?  □ Yes  □ No</td>
<td></td>
</tr>
<tr>
<td>Location (building, room):</td>
<td>Time of Incident:</td>
</tr>
<tr>
<td>Incident Type (exposure, physical injury, etc.):</td>
<td></td>
</tr>
<tr>
<td>Incident Description (Provide as much detail as possible and list external events that may have contributed to the incident):</td>
<td></td>
</tr>
<tr>
<td>Method and Location of Injury (check all that apply):</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Needlestick</td>
<td></td>
</tr>
<tr>
<td>Blood or body fluids</td>
<td></td>
</tr>
<tr>
<td>Spill</td>
<td></td>
</tr>
<tr>
<td>Aerosol</td>
<td></td>
</tr>
<tr>
<td>Animal Bite/Scratch</td>
<td></td>
</tr>
<tr>
<td>Necropsy</td>
<td></td>
</tr>
<tr>
<td>Broken glass</td>
<td></td>
</tr>
<tr>
<td>Sharps Container</td>
<td></td>
</tr>
<tr>
<td>Other (describe)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action(s) taken to control incident (e.g., hand washing, spill clean-up, etc.):</th>
</tr>
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<table>
<thead>
<tr>
<th>Personal Protective Equipment (PPE) Worn at time of injury:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrubs</td>
</tr>
<tr>
<td>Surgical gown</td>
</tr>
<tr>
<td>N95 respirator mask</td>
</tr>
<tr>
<td>Gloves</td>
</tr>
<tr>
<td>Hair Cover</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Was there a PPE failure?</th>
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<tbody>
<tr>
<td>If yes, explain:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tyvek</th>
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<tbody>
<tr>
<td>PAPR</td>
</tr>
<tr>
<td>Face Shield</td>
</tr>
<tr>
<td>Goggles</td>
</tr>
<tr>
<td>Shoes</td>
</tr>
</tbody>
</table>
**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**

**Arenaviruses -Junin, Tacaribe, Pirital**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**

- Junin virus Candid #1 Vaccine strain:
  - BSL-3 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures. PAPR is required while working with infectious or potentially infections materials and animals.
- Pirital virus:
  - BSL-3 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures. PAPR is required while working with infectious or potentially infections materials and animals.
- Tacaribe virus:
  - BSL-3 practices, containment equipment and facilities are recommended for infectious or potentially animals. PAPR is required while working with infectious or potentially infections materials and animals.
  - BSL-2 practices, containment equipment and facilities are recommended for infectious or potentially infected materials or cultures.

Containment

- The authorized Junin virus strain for work at CSU is the attenuated Junin virus Candid #1 vaccine strain.

**HAZARD IDENTIFICATION**

**Disease:**

- Junin virus: Argentine hemorrhagic fever
- Pirital and Tacaribe viruses have not been associated with human disease; however, precautionary measures are warranted.

**Transmission:** Human infection is incidental but occurs by aerosol inhalation (e.g. culture; or blood, tissues, feces, or urine of infected animals) or through percutaneous inoculation (needlesticks, contact of skin wounds with contaminated materials).

**Communicability:** Person-to-person spread is rare; however, Junin virus has been associated with nosocomial outbreaks.

**Incubation:** 5-21 days

**Infectious dose:** Unknown

**VIABILITY/INACTIVATION**

**Inactivation:**

- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% Ethanol, 2% glutaraldehyde
MEDICAL

Signs and symptoms:
- There are three phases of illness associated with Argentine hemorrhagic fever
  - **Prodromal phase** - Lasting for 1 week after symptom onset
    - Flu-like symptoms (fever, chills, malaise, headache)
    - Muscle pain, particularly in lower back
    - Nausea and vomiting
    - Dizziness
  - **Neurological-hemorrhagic Phase** - Occurring between 8-12 days after symptom onset
    - Vomiting blood
    - Tar colored stools
    - Nose bleeds
    - Blood in urine and uterine bleeding
    - Blood in lungs
    - Mental confusion
    - Tremors
    - Delirium
    - Convulsions
    - Complications of superimposed bacterial infections such as septicemia and pneumonia
  - **Convalescence Phase** – Lasting 1-3 months
    - Weakness
    - Memory loss
    - Irritability

Pre-exposure prophylaxis:
None

Diagnosis:
- WBC count of less than 2,500/mm³ and a platelet count of less than 100,000/mm³
- Virus isolation (from blood and mucosal secretions)
- RT-PCR
- Immunoassays

Post-exposure prophylaxis:
- Administration of convalescent serum or antiviral therapy (ribavirin)

Treatment of clinical cases:
- While administration of convalescent serum is highly effective, ribavirin is effective if delivered early in onset of symptoms
- Supportive care including pain management
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form: http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   • Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
• CDC Transmission Information: http://wwwn.cdc.gov/eid/article/17/12/11-0393_article.htm#r3
• CDC Web Page: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/arena.htm
• Iowa State University Technical Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/viral_hemorrhagic_fever_arenavirus.pdf

CONTENT REVIEW
This document has been reviewed by:
• CSU subject matter expert: Dr. Tony Schountz
Avian Influenza Virus (Highly Pathogenic, H5N1)

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment
- BSL-3 and ABSL-3 Level practices, containment equipment and facilities are required for work involving virus isolation and laboratory manipulation of virus.
- BSL2 practices and containment equipment are recommended for activities with clinical or diagnostic specimens

Special considerations:
- Select Agent
- Health care personnel PPE should include eye protection, laboratory coat or gown, gloves, and particulate N95 masks or equivalent.

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, and a number of commercially available disinfectants.

Stability:
- Infectious for 4-30 days in water, depending on temperature. Variable survival in feces.

HAZARD IDENTIFICATION

Disease: Influenza

Transmission: shed in feces, nasal secretions and saliva, fomites and flies are mechanical vectors.

Communicability: person to person spread is rare, and most likely due to close contact with severely ill patient.

Incubation: 1 to 4 days, virus shed for 3-5 days after initial signs

Infectious dose: unknown

MEDICAL

Signs and symptoms:
- Fever
- Chills
- Loss of appetite, weight loss
- Headache
- Myalgia (muscle pain)
- Weakness
- Sneezing
• Rhinitis
• Sore throat
• Non productive cough
• Diarrhea
• Abdominal pain
• Photophobia (light sensitivity)
• Nausea
• Vomiting
• Ear infection
• Pneumonia

**Disclaimer**
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Pre-exposure prophylaxis:
None (seasonal flu vaccination not protective)

Diagnosis:
• Viral isolation, detection of antigens or nucleic acids, virus isolated in cell lines or chicken embryos then identified by hemagglutination inhibition tests and nucleic acid sequencing. Antigens can be detected in respiratory secretions by immunofluorescence or ELISA. Commercial rapid diagnostic tests are available as well as RT-PCR tests.
  o Serum taken:
    ▪ Day of exposure and upon recovery
• Guidance for laboratory testing of persons with suspected infections can be found at: http://www.cdc.gov/flu/avianflu/guidance-labtesting.htm

Treatment:
Post-exposure prophylaxis:
• Oseltamivir once daily for 7 days post potential exposure

Treatment of clinical cases:
• Amatadine
• Rimantadine
• Zanamivir
• Oseltamivir
• Guidance for Follow-up

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/ Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form: http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
Workers’ Compensation (within 4 days or as soon as possible):
http://www.ehs.colostate.edu/WWorkComp/Home.aspx

4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form
http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form
http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES

- CDC Infection Control: http://www.cdc.gov/flu/professionals/infectioncontrol/index.htm
- CDC Web Page: http://www.cdc.gov/flu/avianflu/
- Iowa State University Technical Data Sheet, Influenza: http://www.cfsph.iastate.edu/Factsheets/pdfs/influenza.pdf
- Iowa State University Technical Data Sheet, Highly Pathogenic Avian Influenza: http://www.cfsph.iastate.edu/Factsheets/pdfs/highly_pathogenic_avian_influenza.pdf

CONTENT REVIEW
This document has been reviewed by:
- CSU subject matter expert: Dr. Richard Bowen
**Discretion**

This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention.

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**Bacillus anthracis**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINEr AND SPECIAL PRECAUTIONS**

**Containment**

- BSL-3 and ABSL-3 Level practices, containment equipment and facilities are required for work involving propagation of the organism, any activity with potential for aerosol production and infection of animals.
- BSL2 practices and containment equipment are recommended for activities using clinical materials and diagnostic cultures

**Special Considerations:**

- Select Agent, Tier 1

**HAZARD IDENTIFICATION**

**Disease:** Anthrax, woolsorters’ disease

**Transmission:** Skin contact with infected animal tissue, biting flies, contaminated hair, wool, hides or other hide products, inhalation of spores, ingestion of undercooked meat.

**Communicability:** Person to person transmission is extremely rare, occurring with contact of exudates from cutaneous forms of anthrax.

**Incubation:** within 7 days

**Infectious Dose:** 8,000 to 50,000 organisms by inhalation

**VIABILITY/INACTIVATION**

**Stability:** Spores remain viable in soil, skins/hides, milk, dried surfaces for years; spores survive in pond water for 2 years

**Inactivation:**

- Incineration and autoclave sensitive
- Spores are resistant to many disinfectants. Susceptible 10-12% bleach at pH close but not exceeding 7 (Add 1 part bleach, to 8 parts water, mix, and add one part white vinegar); 25.8% Hydrogen peroxide, 24 C, 15 minutes; 2% glutaraldehyde formaldehyde and 5% formalin (overnight soak). 10% NaOH or 0.5% bleach can be used for animal stockyards, pens and related farm equipment.

**MEDICAL**

**Signs and Symptoms:**

- Cutaneous: Skin lesions becoming papular (bump with no visible fluid), then vesiculated (fluid filled), and depressed, black scab (eschar)
- Inhalation: Respiratory distress, fever and shock with death shortly after
- Intestinal: Abdominal distress followed by fever, septicemia and death (rare)
Pre-exposure Prophylaxis:
- Vaccine available, however, is only indicated when exposure risk is high: 5 shots intermuscular given at day 0, week 4, months 6, 12 and 18 months

Medical Surveillance:
- Before working with or around this agent, individuals must enroll in CSU's medical surveillance program through the CSU Occupational Health Program.

Diagnosis:
- Serum will be tested for antibody at day 0 and day 7-14 (or 14-35 days after symptoms occur)
- Dependent on type of specimen, mostly direct culture and PCR.

Treatment:
- **Post-exposure prophylaxis:** 3 doses of vaccine plus 60 days of antibiotics. Vaccine dose given as 0.5 ml subcutaneously at 0, 2, and 4 weeks after exposure. Duration of antibiotic treatment should be at least 30 days after administration of third dose of vaccine: ciprofloxacin, 500 mg orally every 12 hours; or doxycycline, 100 mg orally every 12 hours.
- **Treatment of Symptomatic Cases:** Treatment of inhalational anthrax should include ciprofloxacin (400 mg IV every 12 hours), or doxycycline (200 mg IV loading dose, followed by 100 mg IV every 12 hours for adults), in addition to additional drugs

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student Not Paid by CSU**
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

**Volunteers and Visitors**
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
REFERENCES

- Disinfection, EPA: http://www.epa.gov/pesticides/factsheets/chemicals/bleachfactsheet.htm
- Iowa State University Technical Data Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/anthrax.pdf

CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter expert: Dr. Richard Bowen
- Licensed Physicians: Occupational Health Services (principal: Dr. Tracy Stefanon)
Botulinum toxin, Botulinum Toxin Producing Clostridium spp.

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-3 Level practices, containment equipment and facilities are required for work involving large volumes of toxin producing bacterial (>10L) and/or activities with a high potential for aerosol production, and use of sharps should be limited.
- BSL2 level practices, containment equipment, and facilities are recommended for work involving infectious or potentially infectious clinical specimens, animals, or cultures <10L as well as for the purified toxin. Additional layers of PPE protection are required for handling of concentrated toxin (e.g., face shields, masks, and other additional PPE). Movement and activities in rooms should be minimized in rooms having concentrated toxin.

Special Considerations:
- Select Agent, Tier 1

HAZARD IDENTIFICATION

Disease: Botulism

Transmission: Ingestion, inhalation, contamination of wounds, needlesticks

Incubation: ingestion: 2 hrs to 8 days; inhalation: 72 hours; wound: 7 days

Infectious dose: Spores are not normally toxic for healthy adults. Botulinum toxin is the most potent toxin known. Injected toxic dose (serotype A) is 0.001 ug/kg body weight, and lethal inhalation dose of 0.07 ug/kg body weight.

VIABILITY/INACTIVATION

Stability:
- Toxin is detoxified in air within 12 hours, and following 1-3 hours exposure to sunlight. Spores are resistant to drying and heat, and can be found in soil and water.

Inactivation:
- Physical: Autoclave sensitive (minimum of 20 minutes at 121 C).
- Chemical: Vegetative state is susceptible to 70% ethanol, 10% bleach (20 minutes). Spores may be resistant to disinfectants. Toxins are inactivated by 20 minutes of exposure to 3 mg/L free available chlorine or 0.1 M sodium hydroxide. Alternatively, Sodium hypochlorite in concentrations of 0.5% or greater (equivalent to a 1:10 dilution of household bleach) may be used to bathe all surfaces exposed to botulinum toxin for a period of 20 minutes. Autoclaving at 121 C for 30 minutes or greater will also render the toxin inactive.
MEDICAL

Signs and Symptoms:
- Nausea, Vomiting
- Drooping eyelids
- Diarrhea (early)
- Constipation (late)
- Fatigue
- Weakness and dizziness
- Blurred or double vision
- Dry mouth
- Difficulty speaking and swallowing
- Descending paralysis of the arms, legs, trunk and breathing muscles (starts in the arms and moves down)

Diagnosis:
ELISA to detect botulinum toxin

Medical Surveillance:
- Before working with or around this agent, individuals must enroll in CSU’s medical surveillance program through the CSU Occupational Health Program

Pre-exposure Prophylaxis:
The botulism toxoid vaccine is no longer available due to declining immunogenicity, decreased potency, and adverse reactions.

Treatment
- Post Exposure Prophylaxis:
  - Contact State Health Department IMMEDIATELY
  - 24 hour CDC Emergency Operations Center: 770-488-7100
  - Heptavalent Botulinum Antitoxin (HBAT) to be administered but must be acquired by State Health Department from CDC.
  - In 2013, the FDA approved Botulism Antitoxin Heptavalent (A, B, C, D, E, F, G)-(Equine) to treat patients showing signs of botulism following documented or suspected exposure to botulinum neurotoxin. The product is derived from horse plasma and contains a mixture of antibody fragments that neutralize all of the seven botulinum nerve toxin serotypes known to cause botulism.
- Treatment of clinical cases:
  - Supportive care: Antibiotics are recommended for wound botulism after antitoxin is administered.
    - Penicillin G – 3 million units IV every 4 hours in adults
    - Alternatively, 500 mg IV metrodiazole every 8 hours

WHAT TO DO IF AN EXPOSURE OCCURS
IF CLINICAL SIGNS OR SYMPTOMS ARE PRESENT, PROCEED DIRECTLY TO EMERGENCY ROOM

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Biosafety Incident report form:

Page 2 of 3
Colorado State University  Environmental Health Services Biosafety Office  (970) 491-0270
Updated 2013

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**
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4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form

http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form

http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
- CDC Treatment Outline for Physicians: http://www.bt.cdc.gov/agent/botulism/clinicians/treatment.asp
- CDC Vaccine Information: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6042a3.htm?s_cid=mm6042a3_w
- Iowa State University Technical Data Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/botulism.pdf

CONTENT REVIEW
- CSU subject matter expert: Dr. Dennis Pierro
- Licensed Physicians: Occupational Health Services (principal: Dr. Tracy Stefanon)
**Brucella spp. (B. abortus, B. melitensis, B. suis, B. canis)**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment:**
- BSL-3 level practices, containment equipment, and facilities for manipulations of cultures and experimental studies using animals.
- BSL-2 level practices, containment equipment and facilities for manipulations of clinical specimens.

**Special Considerations:**
- Select Agent

**HAZARD IDENTIFICATION**

**Disease:** Brucellosis, Undulant fever

**Transmission:** ingestion, direct contact of mucous membranes and broken skin with infected material, inhalation, contact with vaccine strain for cattle RB51 (accidental injection)

**Communicability:** Person to person spread is extremely rare, occurring through sexual contact or ingestion of infected breastmilk.

**Incubation:** variable, 5-60 days, stable in the environment

**Infectious Dose:** 10 to 100 by inhalation

**VIABILITY/INACTIVATION**

**Stability:** Survives for up to 28 days at room temperature on glass and aluminum and without UV light and 7 days on concrete. Survives in carcasses and organs for up to 135 days, and blood stored at 4 C for 180 days

**Inactivation:**
- Autoclave sensitive
- 1%-2.5% bleach (500 -1,250 ppm available sodium hypochlorite), 70% ethanol, susceptible to most commonly available disinfectants

**MEDICAL**

**Signs and Symptoms:**
Note that there have been very few documented human cases of infection with B. canis

**Systemic disease:**
- Intermittent fever
- Headache
- Weakness
- Profuse sweating

**Infectious agents:**
- Chills
- Arthralgia (joint pain)
- Localized suppurative (discharge or pus) infections
**Diagnosis:**
Serological testing microagglutination testing at day 0 and at week 2, 4, 6 and 24

**Pre-exposure Prophylaxis:**
None

**Treatment:**

- **Post-exposure Prophylaxis and Treatment of Symptomatic Cases:**
  - Antibiotic therapy, doxycycline (100mg) and rifampin (600mg) in combination for 21 days
  - Exposure to the RB51 (vaccine) strain does not require rifampin
  - For individuals with problems with doxycycline, trimethoprim-sulfamethoxazole can be used

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**

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**Volunteers and Visitors**

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2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

**REFERENCES**

- CDC Clinician Guide: [http://www.cdc.gov/brucellosis/clinicians/index.html](http://www.cdc.gov/brucellosis/clinicians/index.html)
- CDC Information on Transmission: [http://www.cdc.gov/brucellosis/transmission/index.html](http://www.cdc.gov/brucellosis/transmission/index.html)
• Iowa State University Technical Data Sheet:  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis.pdf
• Iowa State University Technical Data Sheet, Brucella abortus:  
  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_abortus.pdf
• Iowa State University Technical Data Sheet, Brucella canis:  
  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_canis.pdf
• Iowa State University Technical Data Sheet, Brucella melitensis:  
  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_melitensis.pdf
• Iowa State University Technical Data Sheet, Brucella ovis:  
  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_ovis.pdf
• Iowa State University Technical Data Sheet, Brucella suis:  
  http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis_suis.pdf
• USAMRIID Manual for Occupational Exposures:  

CONTENT REVIEW

This document has been reviewed by:

• CSU subject matter expert: Dr. Richard Bowen
**Burkholderia mallei**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment:** BSL-3 level practices, containment equipment, and facilities are required for work involving infectious body fluids, tissues, animals and cultures.

**Special considerations:**
- Select Agent, Tier 1
- Health Risk Factors: People with diabetes or renal disease are at greater risk for infection.

**HAZARD IDENTIFICATION**

**Disease:** Glanders

**Transmission:** inhalation, contact with mucous membranes, through broken skin, ingestion.

**Communicability:** Person-to-person transmission could occur

**Incubation:** 10-14 days following aerosol exposure; 1 – 5 days following percutaneous exposure.

**Infectious dose:** unknown

**VIABILITY/INACTIVATION**

**Stability:** Inactivated by heat and sunlight, but can survive in wet or humid places for at least two weeks and can survive in water at room temperature for a month.

**Inactivation methods:**
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% Ethanol, 2% glutaraldehyde, Iodines, Phenolics and Formaldehyde

**MEDICAL**

**Signs and symptoms:**

- **Vary pending route of infection:**
  - Acute localized infection (Infection by inoculation of abraded or lacerated skin, percutaneous, mucosal)
    - Nodules, abscesses and ulcers at site of inoculation
    - Fever, sweats, malaise, swelling of regional lymph nodes
  - Acute Septicemia (Infection by inhalation or localized infection)
    - Fever
    - Chills
    - Malaise (discomfort)
    - Myalgia (muscle pain)
    - Severe headache
Disorientation
- Chest pain
- Rash
- Lymphadenopathy (swollen lymph nodes)
- Cellulitis (skin infection)
- Cyanosis (blue or purple skin color)
- Jaundice (yellowing of the skin)
- Photophobia (light sensitivity)
- Diarrhea
- Necrotizing (dead or black) lesions
- Tachycardia (fast heart beat)
- Hepatomegaly or splenomegaly (enlarged liver or spleen)
- Multi-organ failure
- Death within 24 to 48 hours of onset of symptoms

- **Acute pulmonary infection (infection by inhalation)**
  - Pulmonary abscesses
  - Pleural effusion (build-up of fluid between layers of tissue)
  - Pneumonia
  - Fever
  - Sweats
  - Coughing
  - Chest pain
  - Dyspnea (shortness of breath)

- **Chronic suppurative (pus) disease (Infection by inoculation of abraded or lacerated skin, percutaneous, mucosal)**
  - Multiple abscesses, nodules and ulcers
  - Organ involvement
  - Weight loss
  - Lymphadenopathy (swollen lymph nodes)
  - Chronic form of the disease can last up to 25 years

**Pre-exposure prophylaxis:**
- NONE

**Medical Surveillance:**
- Before working with or around this agent, individuals must enroll in CSU’s medical surveillance program through the CSU Occupational Health Program.

**Diagnosis:**
- Self-report febrile illness with or without cough for 21 days post exposure
- Culture of sputum or cutaneous lesions. Isolation from blood, sputum, urine, or skin lesions.
- Serum taken day of exposure, 1, 2, 4, and 6 weeks’ post exposure.
  - 4 fold increase in titer is indicative of infection
  - Detection of antibodies in blood does not distinguish between *B. mallei* and *B. pseudomallei*,
Treatment

- Note, for any prolonged use of TMP-SMX, of coadministration of folinic acid may be considered to prevent or reduce the antifolate activity of TMP-SMX without affecting its antimicrobial action.

- Post exposure prophylaxis (duration 3 weeks):
  - Despite slight differences in antimicrobial drug susceptibilities, drug regimens that are effective in human melioidosis (which have been better evaluated than those for glanders) would also be expected to be effective in glanders. Recommendations for the management of exposure to *B. mallei* are the same as those for *B. pseudomallei* with one important exception. Although serum should be taken and stored, no validated serologic test for human glanders currently exists.

  - Antimicrobial susceptibility of the strain of involved in the exposure event should be known, and if not tested as soon as possible. PEP should be cross referenced with this information to ensure efficacy. Resistance may be developed to tetracyclines.

  - Trimethoprim-sulfamethoxazole (TMP-SMX) orally: 160 mg/800mg tablets: 2 tablets every 12 h for adult ≥60kg
    OR
    80 mg/400 mg tablets: 3 tablets every 12 h for adult 40-60 kg
    OR
    160 mg/800 mg tablets: 1 tablet every 12 h or 80 mg/400 mg tablets: 2 tablets every 12 h for adult <40 kg,
    OR
  - Amoxicillin-clavulanic acid (co-amoxiclav) orally: 500 mg/125 mg tablets: 3 tablets every 8 h for adult ≥ 60 kg*
    OR
    500 mg/125 mg tablets: 2 tablets every 8 h for adult <60 kg*
    *Weight-based dosage based on 20 mg/5 mg/kg/dose.

- Treatment of Glanders:
  - Initial parenteral therapy
    - Ceftazidime 50 mg/kg/dose (up to 2 g) intravenous every 8 h or 6 g per day by continuous infusion after a 2 g bolus,
    OR
    - Meropenem 25 mg/kg/dose (up to 1 g) intravenous every 8 h (for intensive care unit, neuro-melioidosis or persistent bacteremia)
    - Duration of therapy a minimum of 10–14 d, however, four or more weeks of parenteral therapy may be necessary in cases of more severe disease such as septic shock, deep seated or organ abscesses, extensive lung disease, osteomyelitis or septic arthritis or neurological melioidosis.
    - Consider the addition of trimethoprim-sulfamethoxazole (TMP-SMX) for patients with severe infection involving the brain, prostate, or other privileged site (same dosing as described in Eradication Therapy, below). Can be administered by IV infusion over 30-60 min every 12 h, or nasogastric, or oral, as appropriate. If TMP-SMX is included, it should be used for the entire duration of the intensive phase.
    - A switch to meropenem is indicated if patient condition worsens on ceftazidime, e.g., organ failure, development of a new focus of infection during treatment, or if repeat blood cultures remain positive. Depending on the severity of infection, the dose for patients ≥3 months and older can be ≤40 mg/kg/dose; not to exceed 2 g/dose.
Oral eradication therapy

- Trimethoprim-sulfamethoxazole (TMP-SMX) orally: 160 mg/800 mg tablets: 2 tablets every 12 h for adult ≥60 kg
  
  **OR**
  
  80 mg/400 mg tablets: 3 tablets every 12 h for adult 40–60 kg
  
  **OR**
  
  160 mg/800 mg tablets: 1 tablet every 12 h or 80 mg/400 mg tablets: 2 tablets every 12 h for adult <40 kg
  
  **OR**
  
  - Amoxicillin-clavulanic acid (co-amoxiclav) orally: 500 mg/125 mg tablets: 3 tablets every 8 h for adult ≥60 kg*
    
    **OR**
    
    500 mg/125 mg tablets: 2 tablets very 8 h for adult <60 kg*
  
  *Weight-based dosage based on 20 mg/5 mg/kg/dose

- Duration at is a minimum of 3 months
- If the organism is susceptible and the patient does not have a documented allergy to it, oral TMP-SMX is the agent of first choice. If the organism is resistant to TMP-SMX or the patient is intolerant, the second-line choice is co-amoxiclav.

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed.
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU

1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Student goes to CSU Health Network (Formerly Hartshorn Health Services)
Volunteers and Visitors

1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form

http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES

- CDC, Actions Required before working with B. pseudomallei: http://wwwnc.cdc.gov/eid/article/14/7/07-1501_article.html#actionrequiredbeforeworkingwithbpseudomallei
- Iowa State University Fact Sheet, B. mallei: http://www.cfsph.iastate.edu/Factsheets/pdfs/glanders.pdf
- Iowa State University Fact Sheet, B. pseudomallei: http://www.cfsph.iastate.edu/Factsheets/pdfs/melioidosis.pdf

CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter expert: Dr. Herbert Schweizer
- Licensed Physicians: Colorado Health Medical Group, Occupational Health (principal: Dr. Tracy Stefanon)
Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment: BSL-3 level practices, containment equipment, and facilities are required for work involving infectious body fluids, tissues, animals and cultures.

Special considerations:
- Select Agent , Tier 1
- Health Risk Factors: Persons with diabetes, chronic kidney failure, cystic fibrosis, chronic lung disease, immunosuppression, or alcoholics are at increased risk for infection with this organism.

HAZARD IDENTIFICATION

Disease: Melioidosis

Transmission: Inhalation, ingestion, percutaneous inoculation (wounds or abrasions), not spread by casual contact.

Communicability: Extremely rare person-to-person spread

Incubation: Varies from 1 day to years; generally 1-21 days, and acute localized infection could be 1-5 days post inoculation.

Infectious dose: Unknown

VIABILITY/INACTIVATION

Stability: Can survive for years in soil and water and is very resistant to drying.

Inactivation methods:
- Autoclave sensitive
- 1% Sodium hypochlorite, 70% Ethanol, 2% glutaraldehyde, Iodines, Phenolics and Formaldehyde

MEDICAL

Signs and symptoms:
Most individuals exposed to B. pseudomallei do not develop symptoms. Those who do develop symptoms usually have predisposing medical conditions (See Special Considerations). Symptoms of melioidosis may be exhibited many years after exposure, commonly in association with an alteration in immune status or other compromising conditions such as diabetes. Manifestations of disease are extremely broad ranging and form a spectrum from rapidly life-threatening sepsis to chronic low-grade infection. A common clinical picture of acute melioidosis is that of sepsis associated with bacterial dissemination to distant sites, frequently causing concomitant pneumonia and liver and splenic abscesses. Infection may also occur in bone, joints, skin, soft tissue, or the prostate. Specific disease manifestations include:
- Early:
  - Enlarged lymph nodes in jaws/neck (looks like mumps)
  - Skin infections
- Acute Pulmonary disease (most common form, from inhalation or secondary from septicemia)
  - Fever above 102 F
  - Pneumonia
Coughing
Chest pain
Headache
May present similar to tuberculosis with fever, weight loss, and lung lesions.

- **Acute Localized** (infection through skin and mucous membrane exposures)
  - Ulcers, abscessus, or cellulitis at site of inoculation
  - Fever and malaise
  - Could progress to acute septicemic form

- **Acute Septicemia** (infection through inhalation or as consequence of localized infection)
  - Fever
  - Severe muscle tenderness
  - Severe headache
  - Diarrhea
  - Disorientation

- **Chronic Suppurative Infection** (infection through skin and mucous membrane exposures)
  - Pneumonia
  - Abcessus located primarily on extremities
  - Patients may not have a fever
  - May present similar to tuberculosis with fever, weight loss, and lung lesions

**Pre-exposure prophylaxis:**

NONE

**Medical Surveillance:**

- Before working with or around this agent, individuals must enroll in CSU's medical surveillance program through the Occupational Health Program.

**Diagnosis:**

- Self-report febrile illness with or without cough for 21 days post exposure – if symptoms occur, culture sputum samples on Ashdown medium or *Burkholderia cepacia* agar if Ashdown is unavailable. Gram negative, motile, bipolar staining, wrinkled colonies.
- Detection of antibodies in blood, 4 fold increase in titer is indicative of infection
  - Serum taken:
    - Day of exposure, 1, 2, 4, and 6 weeks post exposure

**Treatment**

- Note, for any prolonged use of TMP-SMX, of coadministration of folinic acid may be considered to prevent or reduce the antifolate activity of TMP-SMX without affecting its antimicrobial action.
- **Post exposure prophylaxis (duration 3 weeks):**
  Antimicrobial susceptibility of the strain of involved in the exposure event should be known, and if not tested as soon as possible. PEP should be cross referenced with this information to ensure efficacy. If patient seroconverts, but is asymptomatic, continue PEP for 12 weeks, with periodic checks.
  - Trimethoprim-sulfamethoxazole (TMP-SMX) orally: 160 mg/800 mg tablets: 2 tablets every 12 h for adult ≥60kg
  - OR
  - 80 mg/400 mg tablets: 3 tablets every 12 h for adult 40-60 kg
OR
160 mg/800 mg tablets: 1 tablet every 12 h or 80 mg/400 mg tablets: 2 tablets every 12 h for adult <40 kg,
  OR
  o Amoxicillin-clavulanic acid (co-amoxiclav) orally: 500 mg/125 mg tablets: 3 tablets every 8 h for adult ≥ 60 kg*
  OR
  500 mg/125 mg tablets: 2 tablets every 8 h for adult <60 kg*

*Weight-based dosage based on 20 mg/5 mg/kg/dose.

Treatment of melioidosis:
  o Initial parenteral therapy
    Ceftazidime 50 mg/kg/dose (up to 2 g) intravenous every 8 h or 6 g per day by continuous infusion after a 2 g bolus
    OR
    ▪ Meropenem 25 mg/kg/dose (up to 1 g) intravenous every 8 h (for intensive care unit, neuro-melioidosis or persistent bacteremia)
    ▪ Duration of therapy a minimum of 10–14 d, however, four or more weeks of parenteral therapy may be necessary in cases of more severe disease such as septic shock, deep seated or organ abscesses, extensive lung disease, osteomyelitis or septic arthritis or neurological melioidosis.
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      OR
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*Weight-based dosage based on 20 mg/5 mg/kg/dose.
• Duration at is a minimum of 3 months
• If the organism is susceptible and the patient does not have a documented allergy to it, oral TMP-SMX is the agent of first choice. If the organism is resistant to TMP-SMX or the patient is intolerant, the second-line choice is co-amoxiclav.

WHAT TO DO IF AN EXPOSURE OCCURS

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2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Student goes to CSU Health Network (Formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

Volunteers and Visitors
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2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician
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REFERENCES
• CDC General Information Melioidosis: http://www.cdc.gov/melioidosis/
- Peacock SJ, Schweizer HP, Dance DAB, Smith TL, Gee JE, Wuthiekanun V, et al. Management of Accidental Laboratory Exposure to *Burkholderia pseudomallei* and *B. mallei*. Emerging Infectious Disease. 2008:14 (7) ([http://cmr.asm.org/content/18/2/383.long](http://cmr.asm.org/content/18/2/383.long)).

**CONTENT REVIEW**

This document has been reviewed by:
- CSU subject matter expert: Dr. Herbert Schweizer
- Licensed Physicians: Colorado Health Medical Group, Occupational Health (principal: Dr. Tracy Stefanon)
**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**

**Bussuquara Virus**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment:**
- **Containment: BSL-2** level practices, containment equipment, and facilities are recommended for infectious or potentially infected materials, animals, or cultures
- **BSL-3** level practices, containment equipment and facilities are recommended for work with infectious or potentially infected arthropods.

**Special considerations:**
- Mosquito-borne virus

**HAZARD IDENTIFICATION**

**Disease:** Bussuquara fever

**Transmission:** Mosquito bite

**Incubation:** unknown

**Infectious dose:** unknown

**VIABILITY/INACTIVATION**

**Inactivation:**
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, organic solvents, detergents

**MEDICAL**

**Signs and symptoms:**
- A single clinical self-limiting human infection has been reported, with symptoms including:
  - Fever
  - Anorexia
  - Joint pain
  - Chills
  - Profuse sweating
  - Restlessness

**Pre-exposure prophylaxis:**
None

**Diagnosis:**
Serum testing at day of exposure and day 14 to check for 4-fold rise in antibody titer
**Post-exposure prophylaxis:**
- Treatment is supportive and symptomatic

**Treatment of clinical cases:**
- Treatment of symptoms

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Biosafety Incident report form:
     [http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf](http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf)
   - Workers’ Compensation (within 4 days or as soon as possible):
     [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

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**REFERENCES**

**CONTENT REVIEW**
This document has been reviewed by:
- CSU subject matter expert: Dr. Carol Blair

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**Chikungunya Virus**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-3 level practices, containment equipment and facilities are required for infectious or potentially infected materials, animals, cultures, or insects

**Special considerations:**
- Mosquito-borne virus
- Transmission to fetus rare, may cause abortion in first trimester

**HAZARD IDENTIFICATION**

**Disease:** Chikungunya fever

**Transmission:** Mosquito bite, aerosol transmission in laboratory

**Communicability:** Limited evidence for vertical transmission (mother to infant in womb)

**Incubation:** 2-12 days

**Infectious dose:** unknown

**VIABILITY/INACTIVATION**

**Inactivation:**
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, organic solvents, detergents

**MEDICAL**

**Signs and symptoms:**
- Self-limiting fever
- Arthralgia (joint pain)
- Arthritis in knee, joints and ankle
- Rash
- Nausea and vomiting
- Eruption of mucous surfaces

**Pre-exposure prophylaxis:**

None
Diagnosis:
- Serology – testing serum to detect virus-specific IgM and IgG
- Serum taken:
  Day of exposure and 10-14 days later to detect 4-fold rise in titer

Treatment
Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Biosafety Incident report form:  
     http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   - Workers’ Compensation (within 4 days or as soon as possible):
     http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

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Volunteers and Visitors
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   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
- CDC Web Page: http://www.cdc.gov/chikungunya/
- WHO Fact Sheet: http://www.who.int/mediacentre/factsheets/fs327/en/
WHO Guidelines on Clinical Management:
http://www.wpro.who.int/mvp/topics/ntd/Clinical_Mgmt_Chikungunya_WHO_SEARO.pdf

CONTENT REVIEW
This document has been reviewed by:
- CSU subject matter expert: Dr. Carol Blair
Coccidiodes immitis

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment: BSL-3 Level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures.

HAZARD IDENTIFICATION

Disease: Valley Fever

Transmission: inhalation of fungal spores, and secondary transmission by fomites.

Incubation: 1-3 weeks

Infectious dose: unknown

VIABILITY/INACTIVATION

Stability: Can survive on surfaces for a long period of time, can grow in soil.

Inactivation:
• Autoclave sensitive, 30 minutes at 120º C
• Iodine, 5% bleach, phenol, quaternary ammonia

MEDICAL

Signs and symptoms:
• 60% of cases are asymptomatic
• Symptomatic:
  o Fever
  o Cough
  o Headache
  o Rash
  o Muscle aches
  o Full recovery requires weeks to months of anti-fungal therapy
• Chronic Pulmonary infection
• Widespread disseminated infection
  o Skin lesions, central nervous system infection (meningitis), bone and joint infection

Pre-exposure prophylaxis:

None

Diagnosis:

Testing serum at day 0 and day 14 to check for antibody using complement fixation test.
Treatment:
- Post-exposure prophylaxis:
  o Monitor for symptoms
- Treatment of clinical cases:
  o Fluconazole or another antifungal

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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Volunteers and Visitors
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   [http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf](http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf)

REFERENCES
- Iowa State University Technical Data Sheet: [http://www.cfsph.iastate.edu/Factsheets/pdfs/coccidioidomycosis.pdf](http://www.cfsph.iastate.edu/Factsheets/pdfs/coccidioidomycosis.pdf)

CONTENT REVIEW
- This document has been reviewed by CSU subject matter expert, Dr. Richard Bowen.
**Coxiella burnetii**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-3 level practices, containment equipment, and facilities are required for work involving infectious body fluids, tissues, animals and cultures.

**Special considerations:**
- Select Agent
- Health care personnel PPE should include masks and eye protection when generation of aerosols or splatters of body fluids are anticipated.
- Health Risk factors: Persons with valvular heart disease, prosthetic heart valves, liver disease, altered immune systems and pregnant individuals are at increased risk for developing Q fever or complications.

**HAZARD IDENTIFICATION**

**Disease:** Q fever

**Transmission:** inhalation of infective animal body fluids (urine, milk, blood, and birthing fluids); arthropods (ticks). Person to person transmission is rare. While there is not a risk of secondary contamination or reaerosolization of the organisms from patients exposed to aerosolized *C. burnetii*, contaminated clothing may be a source of infection.

**Communicability:** While rare, person to person transmission has been reported in hospital workers as well as contact families.

**Incubation:** 10-40 days; varies

**Infectious dose:** 10-50 cfu by inhalation and percutaneous

**VIABILITY/INACTIVATION**

**Stability:** Spore-like form is resistant to heat, drying and sunlight and fomites contaminated by blood, urine, feces, and birth fluids can remain infectious for long periods.

**Inactivation:**
- Autoclave sensitive
- 1% Sodium hypochlorite, 5% Peroxide, 70% Ethanol (30 minutes), 2% glutaraldehyde, formaldehyde
- Zoonotic
- Can cause abortion and premature labor
- People with recent heart surgery should avoid contact with agent
**Medical**

**Signs and symptoms:**
Commonly presents as self-limited febrile illness of 2-14 days of duration. Can also cause chronic infections such as endocarditis or granulomatous hepatitis.

- High Fever
- Flu-like symptoms
- Abdominal pain
- Severe sweats
- Weakness
- Severe headache
- Pneumonitis (no cough or chest pain)
- Hepatitis
- Osteomyelitis
- Arthritis
- Endocarditis
- Neurological signs - confusion

**Pre-exposure prophylaxis:**
Vaccine (Q-Vax) may be available but requires sensitivity testing and travel to Australia.

**Diagnosis:**
- Serological tests include: immunofluorescence, microagglutination, complement fixation and ELISA
- PCR can detect organism in blood, cerebrospinal fluid, tissues and milk.
- Serum taken: Day of exposure, and 14 - 21 days post infection to detect 4-fold rise in titer

**Treatment**
- **Post exposure prophylaxis:**
  - Doxycycline, 100 mg, orally, every 12 hours, or tetracycline, 500 mg, orally every 6 hours following moderate to high risk exposure.
- **Symptomatic Treatment:** Should be started within first 3 days:
  - 100 mg Doxycycline, orally, twice daily for 15-21 days
  - Chronic stage – Doxycycline and quinolones for 4 years, or Doxycycline and hydroxychloroquine for 1 ½ to 3 years.

**WHAT TO DO IF AN EXPOSURE OCCURS**

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3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

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Volunteers and Visitors
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4. Individual fills out Biosafety Incident Report form 
http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES

- CDC Prophylaxis after Exposure: http://wwwnc.cdc.gov/eid/article/14/10/08-0576_article.htm
- Iowa State University Technical Data Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/q_fever.pdf

CONTENT REVIEW

This document has been reviewed by:
- CSU subject matter expert: Dr. Richard Bowen
Dengue Virus Types 1-4

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures
- BSL-3 level practices, containment equipment and facilities are required for work with infectious or potentially infected arthropods.

Special considerations:
- Mosquito-borne viruses

HAZARD IDENTIFICATION

Disease: Dengue fever, dengue hemorrhagic fever, dengue shock syndrome

Transmission: Mosquito bite

Incubation: 3-14 days, usually 4-7 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde organic solvents, detergents

MEDICAL

Signs and symptoms:
- Dengue fever
  - Fever
  - Severe headache
  - Severe pain behind the eyes
  - Joint pain
  - Muscle and bone pain
  - Rash
  - Mild bleeding from the nose or gums
  - Leukopenia
- Dengue hemorrhagic fever
  - Fever lasting 2-7 days
  - Sweatiness; cold and clammy extremities
- Ecchymosis (purple coloring of the skin from subcutaneous hematoma) and petechia (pinpoint size hemorrhages)
- Vomiting blood
- Severe abdominal pain
- Difficulty breathing
- Capillary leaking into peritoneum and pleural cavities
- Circulatory system failure
- Shock
- Plasma leakage
- Dengue shock syndrome

Pre-exposure prophylaxis:

NONE – no vaccine currently approved for use

Diagnosis:

- Serology – MAC-ELISA – detect IgM antibodies for all four serotypes, IgG ELISA – detect specific antibodies elicited by dengue infection, Plaque reduction neutralization test
- Serum taken:
  - Day of exposure and 12-14 days later to detect 4-fold rise in antibody titer, also 0 to 5 days after symptoms occur for MAC-ELISA,
- RT-PCR (FDA approved -CDC DENV-1-4 Real-Time RT-PCR Assay) for virus RNA detection and typing
- Virus isolation from serum during first 5 days after onset of symptoms

![Diagram showing virus isolation and antibody detection](www.CDC.gov)

Treatment

Post-exposure prophylaxis:
- Supportive care with daily monitoring

Treatment of clinical cases:
- Treatment of symptoms, hydration, replacement of plasma losses
WHAT TO DO IF AN EXPOSURE OCCURS

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3. Individual goes to their personal physician, or as otherwise directed by their physician

Volunteers and Visitors
5. Contact supervisor/PI
6. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
7. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
- CDC Case Definition: http://www.cdc.gov/dengue/clinicalLab/caseDef.html

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CONTENT REVIEW
This document has been reviewed by:

- CSU subject matter expert: Dr. Carol Blair

Encephalitis Viruses

Japanese Encephalitis Virus (JE)
Western Equine Encephalitis (WEE)
Venezuelan Equine Encephalitis (VEE)
Eastern Equine Encephalitis (EEE)

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment
- BSL-3 Level practices, containment equipment and facilities are required for work involving potentially infected materials, animals, cultures, or mosquitos.

Special considerations:
- North American strains of EEE virus and some epizootic subtypes (IAB and IC) of VEE virus are Select Agents
- Arthropod-borne disease
- Can cross placenta

HAZARD IDENTIFICATION

Disease: Encephalomyelitis

Transmission: infected mosquitoes, aerosol transmission of VEE and WEE viruses, natural person to person spread not reported, no human to mosquito transmission for WEE and EEE virus, but can happen in VEE virus up to 72 hours post-infection, VEE virus known to cross the placenta and this may also occur with the other viruses.

Incubation: 1-6 days (VEE) 5-15 days (JE, WEE and EEE)

Infectious dose: VEE – 1 pfu, JE, WEE and EEE – unknown

VIABILITY/INACTIVATION

Stability: Stable in blood, exudates, and freeze dried materials (VEE), can survive over winter in mosquito eggs (JEE)

Chemical Inactivation: Like most enveloped viruses, susceptible to 1% bleach (500 ppm available sodium hypochlorite), 2% glutaraldehyde, 3-8% Formaldehyde, quaternary compounds and phenolics. JEE and VEE are susceptible to 70% ethanol. EEE is inactivated after 60 minutes exposure to 50% ethanol.

Physical Inactivation: Sensitive to autoclave and drying
MEDICAL

Signs and symptoms:

EASTERN EQUINE ENCEPHALITIS

- Fever
- Chills
- Myalgia (muscle pain)
- Arthalgia (joint pain)
- Headache
- Irritability
- Neck stiffness
- Confusion
- Stupor
- Disorientation
- Tremors
- Seizures
- Paralysis
- Coma
- Abdominal pain
- Vomiting and diarrhea
- Symptoms subside in 1-2 weeks

JAPANESE ENCEPHALITIS

- Fever
- Headache
- Stupor
- Disorientation
- Coma
- Tremors/Seizures
- Paralysis
- Diarrhea
- Myalgia (muscle pain)

WESTERN EQUINE ENCEPHALITIS (similar signs as EASTERN EQUINE ENCEPHALITIS)

- Fever
- Chills
- Myalgia (muscle pain); back pain
- Malaise (discomfort)
- Headache
- Nausea, vomiting
- Diarrhea, abdominal pain
- Respiratory symptoms
- Symptoms subside in 1-2 weeks

VENezuelAN EQUINE ENCEPHALITIS

- Fever
- Chills
- Malaise (discomfort)
- Myalgia (muscle pain)
- Severe headache
- Encephalitis
- Coughing
- Sore throat
- Nausea, vomiting
- Diarrhea
- Symptoms subside in 4-6 days

Pre-exposure prophylaxis:

- JE: Vaccine readily available, although there are no data demonstrating vaccine efficacy post needle stick or aerosol exposure.
- EEV, VEE, and WEE- May be available under certain circumstances through USAMRIID

Diagnosis:

- In all cases, Serum is taken on day of exposure, and 10-14 days post infection to detect 4-fold rise in titer.
- EEE: Isolated in A549 and MRC-5 cell cultures. Antigens detected by immunofluorescence and ELISA. Nucleic acid detected by RT-PCR.
- WEE: Throat swabs can be cultured. Viral isolation in embryonated eggs (Vero cell plaque assay). Also, detection methods similar to EEE.
• VEE: Viral isolation from blood, CSF and throat swabs. During febrile stage, antigen capture ELISA can detect VEE in the blood. Also, detection methods similar to EEE and WEE.
• JE: Similar to EEE, WEE and VEE

Treatment (Post-Exposure Prophylaxis/Treatment):
• Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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REFERENCES
• CDC General Information: http://www.cdc.gov/ncidod/dvbid/jencephalitis/qa.htm
• Iowa State University Technical Fact Sheet, Eastern, Western, Venezuelan: http://www.cfsph.iastate.edu/Factsheets/pdfs/easter_wester_venezuelan_equine_encephalomyelitis.pdf
• Iowa State University Technical Fact Sheet, Japanese: http://www.cfsph.iastate.edu/Factsheets/pdfs/japanese_encephalitis.pdf

**CONTENT REVIEW**

This document has been reviewed by:

- CSU subject matter experts: Dr. Richard Bowen
**Francisella tularensis**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-3 Level practices, containment equipment and facilities are required for work involving viable cultures, infected experimental animals and for activities with a high potential for aerosol production.
- BSL2 practices and containment equipment are recommended for activities using inactivated clinical materials.

**Special Considerations:**
- Select Agent, Tier 1

**HAZARD IDENTIFICATION**

**Disease:** Tularemia

**Transmission:** arthropods (ticks, deer fly, mosquito), infected rabbits, hamsters and other rodents, inhalation, contact with infected animal tissue, blood and urine; contaminated food and water

**Communicability:** Person to person transmission has NOT been documented

**Incubation:** 1-14 days, clinical symptoms 3-5 days post infection

**Infectious dose:** VERY LOW 10-50 cfu by inhalation or percutaneous inoculation

**VIABILITY/INACTIVATION**

**Stability:** Can survive in carcasses and organs for up to 133 days, and in straw and animal bedding for 192 days. Survives in water for 90 days.

**Inactivation:**
- Autoclave sensitive
- 1% Sodium hypochlorite, 70% Ethanol, 2% glutaraldehyde, Formaldehyde
- Can withstand freezing for months to years

**MEDICAL**

**Signs and symptoms:**
There are six forms of tularemia in humans, depending on the inoculation site (lastate.edu):
- Tularemia can be fatal if not treated with the appropriate antibiotics.
- **Ulceroglandular (when infection occurs through the skin or mucous membranes)**
  - Initial flu-like symptoms: fever, chills, headache, body aches, malaise
  - Inflamed and ulcerated lesion at site of entry
  - Enlarged and painful regional lymph nodes
- **Glandular (When infection occurs through the skin or mucous membranes)**
- Identical to Ulceroglandular, but without the lesion
  - **Oculoglandular** (when infection occurs through the eyes)
    - Fever
    - Painful and purulent conjunctivitis
    - Swelling of lymph nodes in front of the ear
    - Sometimes nodules or ulcerations on the conjunctiva
- **Oropharyngeal** (infection through eating or drinking)
  - Fever, malaise
  - Exudative stomatitis (oozing inflammation of the mouth)
  - Sore throat with pustules and ulcers
  - Inflamed tonsils
  - Swelling of lymph nodes in the neck
  - Vomiting
  - Diarrhea
- **Pneumonic** (infection through inhalation)
  - Acute form of tularemia
  - Non-specific symptoms: fever, chills, malaise
  - Coughing, chest pain, dyspnea (difficulty breathing)
  - Sometimes nausea and vomiting
  - May follow other forms of tularemia that are left untreated, when the bacteria spread through the bloodstream to the lungs
  - Occasionally no overt signs of pneumonia
- **Typhoidal** (infection route may not be apparent)
  - Acute form of tularemia
  - Septicemia
  - Fever, chills, malaise
  - Usually lymph nodes NOT enlarged
  - Usually NO ulcers
  - Delirium, shock
  - Mortality rate: 30-60%

Pre-exposure prophylaxis:

**NONE** – no vaccine currently approved for use in the US (Currently under review by FDA, but not available)

Medical Surveillance:

- Before working with or around this agent, individuals must enroll in CSU’s medical surveillance program through the CSU Occupational Health Program.

Diagnosis:

Serological tests include: tube agglutination, microagglutination, and ELISA

Serum taken: Day of exposure, and 14 days post infection to detect 4-fold rise in titer (cross reaction with Brucella, Proteus and Yersinia species.)
Isolation of baceteria from blood, sputum, pharyngeal or conjunctival exudates, ulcers, lymph nodes and gastric washings grown on blood-enriched media, including cysteine glucose blood agar, cysteine heart agar supplemented with 9% heated sheep red blood cells (CHAB), buffered charcoal yeast extract agar, modified Thayer Martin media. Sheep blood agar, chocolate agar, and Thayer-Martin may be used for initial isolation of bacteria, but CDC recommends CHAB media once presence of *F. tularensis* is confirmed.

**Treatment:**

- **Post Exposure Prophylaxis:**
  - Should be started within 24 hours and continued for at least 14 days
  - Streptomycin 1mg IM 2x/day
  - Gentamycin 5 mg/kg IM or IV 1x/day for 10 days
  - Doxycycline 100 mg 2x/day for 14 days
  - Ciprofloxacin 500 mg 2x/day for 10-14 days

- **Symptomatic Treatments:**
  - Streptomycin (7.5 to 10 mg/kg every 12 hours for 10 to 14 days, not to exceed 1 g IM twice daily)
  - Doxycycline (100 mg IV twice daily for 14 to 21 days)
  - Ciprofloxacin (400 mg IV twice daily for 14 to 21 days, switching to oral 750 mg every 12 hours after clinical improvement),

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student not paid by CSU**

1. Contact supervisor/PI
2. Student or supervisor contact Biosafety 491-0270 (491-0270) or Occupational Health (420-8172) to report, to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (Formerly Hartshorn Health Services)

**Volunteers and visitors**

1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to report, to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician
REFERENCES

- CDC General Information: http://www.cdc.gov/tularemia/index.html
- CDC Signs and Symptoms: http://www.cdc.gov/tularemia/signssymptoms/
- Iowa State University Technical Data Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/tularemia.pdf

CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter experts: Drs. Richard Slayden and Claudia Gentry-Weeks
- Licensed Physicians: Occupational Health Services (principal: Dr. Tracy Stefanon)
**Hantaviruses**

(Maporal, El Moro Canyon, Sin Nombre, Andes, Hantaan, Seoul viruses)

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment:**
- **Maporal, Hantaan and Seoul viruses**
  - BSL-3 practices, containment equipment and facilities are required for infectious or potentially infected materials, animals, cultures. PAPR is required while working with infectious or potentially infections materials and animals.
- **Sin Nombre and Andes viruses**
  - BSL-3 practices, containment equipment and facilities are required for infectious or potentially infected materials and cultures. PAPR is required while working with infectious or potentially infections materials and animals.
  - BSL-4 practices are required for infectious or potentially infected animals.
- **El Moro Canyon virus**
  - BSL-2 practices, containment equipment and facilities are required for infectious or potentially infected materials and cultures
  - BSL-3 practices, containment equipment and facilities are required for infectious or potentially infected animals.
  - PAPR is required while working with infectious or potentially infections materials and animals.

**HAZARD IDENTIFICATION**

**Diseases:** Hantavirus (cardio) pulmonary syndrome, hemorrhagic fever with renal syndrome

**Transmission:** Inhalation of aerosolized rodent urine or feces, contact of infectious materials with mucous membranes, broken skin and via bites of infected animals.

**Communicability:** Person to person transmission not documented in the United States. One outbreak of human to human transmission of Andes virus has been recorded, and was potentially due to close contact with infectious saliva or respiratory aerosols.

**Incubation:** 3-60 days; 1-2 weeks after exposure for hemorrhagic fever with renal syndrome; typically 1-5 weeks for hantavirus cardiopulmonary syndrome.

**Infectious dose:** unknown
VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol (30 minute contact time), 1-5% Clidox (chlorine dioxide), 1-5% Dettol (parachlorometaxylenol), 1-5% Halamid-d (sodium-p-toluene-sulfonchloramide), 1-5% peracetic acid, or Virkon (10 minute contact time), absolute methanol (10 minute contact time).

MEDICAL

Signs and symptoms:
- **El Moro Canyon and Maporal hantaviruses** have not been associated with human disease, but are highly infectious in rodent populations and genetically similar to Sin Nombre and Andes viruses.
- **Hemorrhagic fever with renal syndrome (Hantaan, Seoul viruses)**
  - Fever
  - Chills
  - Headache
  - Backache
  - Nausea
  - Vomiting
  - Abdominal pain
  - Conjunctivitis
  - Rash
  - Shock
  - Flushing of face
  - Inflamed, red eyes
  - Renal failure
  - Hypertension (high blood pressure)
- **Hantavirus cardiopulmonary syndrome (Sin Nombre, Andes viruses)**
  - Fever
  - Myalgia (muscle pain, particularly lower back)
  - Headache
  - Chills
  - Dizziness
  - Malaise (discomfort)
  - Lightheadedness
  - Nausea
  - Vomiting
  - Diarrhea
  - Arthralgia (joint pain)
  - Respiratory distress

Pre-exposure prophylaxis:
- **NONE** – no vaccine currently approved for use in US

Diagnosis:
- Serology – presence of IgM or increase in IgG hantavirus specific antibody in serum or cerebrospinal fluid; ELISA, immunoblotting, immunofluorescent antibody test, virus neutralization
- Hematology – Platelet count lower than 100,000/mm³ (thrombocytopenia)
- Serum taken:
  - Day of exposure, and 10-14 days post infection to detect 4-fold rise in titer
- RT-PCR

Treatment:
- **Post-exposure prophylaxis:**
  - Supportive care with careful monitoring
- **Treatment of clinical cases:**
  - Supportive care and management of hydration, electrolyte, oxygen and blood pressure levels
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU

1. Contact supervisor/PI
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3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors

1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES

- CDC Information on Hantavirus Pulmonary Syndrome (HPS): http://www.cdc.gov/hantavirus/hps/index.html
- CDC Hantavirus Information for Health Care Workers: http://www.cdc.gov/hantavirus/health-care-workers/
- Iowa State University Technical Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/hantavirus.pdf

CONTENT REVIEW

This document has been reviewed by:
- CSU subject matter expert: Dr. Tony Schountz

Page 3 of 3

Colorado State University Environmental Health Services Biosafety Office (970) 491-0270 Updated 2013

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention. Medical professionals should seek appropriate resources for diagnosis and treatment. **
Human Immunodeficiency Virus (HIV)

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL2 level practices, containment equipment, and facilities are recommended work involving clinical specimens and non-culture protocols.
- BSL3 level practices, containment equipment and facilities are recommended for work involving culture or infected or inoculated animals.

Special considerations:
- Transplacental transfer can occur

Training:
- Bloodborne pathogen training required annually, taken online

HAZARD IDENTIFICATION

Disease: HIV/AIDS

Transmission: person to person by direct exposure to body fluids

Incubation: 6 months to 7 years or longer

Infectious dose: unknown

VIABILITY/INACTIVATION

Stability
- Relatively stable in blood at room temperature. Potentially infectious in blood remaining in syringes for up to 4 weeks, dried blood at room temperature for up to 6 days

Inactivation methods:
- Autoclave sensitive, Sensitive to drying
- 1% bleach (500 ppm available sodium hypochlorite), 70% Ethanol, 2% glutaraldehyde, and formaldehyde

MEDICAL

Signs and symptoms:
- Early: non-specific symptoms, fever, flu-like symptoms
- Rapid weight loss
- Dry cough
- Recurring fever or profuse night sweats
- Swollen lymph nodes
- Diarrhea that lasts for more than a week
- White spots or unusual blemishes on the tongue, mouth or throat
- Pneumonia
- Red, brown, pink, purplish blotches on or under the skin, mouth, nose, eyelids
- Memory loss, depression, other neurological disorders

**Disclaimer**

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Pre-exposure prophylaxis: NONE

Testing:
- Baseline HIV test available upon hire at CSU designated Occupational Health Care provider
- Routine HIV tests available every 2 years

Post-exposure prophylaxis: (See tables below)
- Treatment varies with resistance to reverse transcriptase and protease inhibitors.
- Recommendations from CDC for a FOUR week regimen:

  **Basic Regimen:**
  Zidovudine (Retrovir, ZDV, AZT) + Lamivudine (Epivir, 3TC) available as Combivir
  - ZDV: 300mg twice daily or 200 mg three times daily, with food; total 600 mg daily
  - 3TC: 300mg once daily or 150mg twice daily
  - Combivir: One tablet twice daily
  Zidovudine (Retrovir, ZDV, AZT) + Emtricitabine (Emtriva, FTC)
  - ZDV: 300mg twice daily or 200 mg three times daily, with food; total 600 mg daily
  - FTC: 200mg once daily
  Tenofovir DF (Viread, TDF) + Lamivudine (Epivir, 3TC)
  - TDF: 300mg once daily
  - 3TC: 300mg once daily or 150mg twice daily
  Tenofovir DF (Viread, TDF) + Emtricitabine (Emtriva, FTC); available as Truvada
  - TDF: 300mg once daily
  - FTC: 200mg once daily
  - Truvada: one tablet daily

  **Alternate Basic Regimens:**
  Lamivudine (Epivir; 3TC) + Stavudine (Zerit; D4T)
  - 3TC: 300mg once daily or 150mg twice daily
  - D4T: 40mg twice daily
  Emtricitabine (Emtriva, FTC) + Stavudine (Zerit; D4T)
  - FTC: 200mg once daily
  - D4T: 40mg twice daily
  Lamivudine (Epivir; 3TC) + Didanosine (Videx; DDI)
  - 3TC: 300mg once daily or 150mg twice daily
  - DDI: chewable tablet, on empty stomach as either 200mg twice daily or 400 mg twice daily.
  Emtricitabine (Emtriva, FTC) + Didanosine (Videx; DDI)
  - FTC: 200mg once daily
  - DDI: chewable tablet, on empty stomach as either 200mg twice daily or 400 mg twice daily.
- From CDC's [Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HIV and Recommendations for Postexposure Prophylaxis](https://www.cdc.gov/hiv/library/guidelines/index.html)

### TABLE 1. Recommended HIV postexposure prophylaxis (PEP) for percutaneous injuries

<table>
<thead>
<tr>
<th>Exposure type</th>
<th>HIV-positive, class 1*</th>
<th>HIV-positive, class 2*</th>
<th>Source of unknown HIV status†</th>
<th>Unknown source‡</th>
<th>HIV-negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less severe†</td>
<td>Recommend basic 2-drug PEP</td>
<td>Recommend expanded 3-drug PEP</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** for source with HIV risk factors††</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** in settings in which exposure to HIV-infected persons is likely</td>
<td>No PEP warranted</td>
</tr>
<tr>
<td>More severe‡‡</td>
<td>Recommend expanded 3-drug PEP</td>
<td>Recommend expanded 3-drug PEP</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** for source with HIV risk factors††</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** in settings in which exposure to HIV-infected persons is likely</td>
<td>No PEP warranted</td>
</tr>
</tbody>
</table>

* HIV-positive, class 1 — asymptomatic HIV infection or known low viral load (e.g., <1,500 ribonucleic acid copies/mL). HIV-positive, class 2 — symptomatic HIV infection, acquired immunodeficiency syndrome, acute seroconversion, or known high viral load. If drug resistance is a concern, obtain expert consultation. Initiation of PEP should not be delayed pending expert consultation, and, because expert consultation alone cannot substitute for face-to-face counseling, resources should be available to provide immediate evaluation and follow-up care for all exposures.
† For example, deceased source person with no samples available for HIV testing.
‡ For example, a needle from a sharps disposal container.
†† For example, solid needle or superficial injury.
** The recommendation “consider PEP” indicates that PEP is optional; a decision to initiate PEP should be based on a discussion between the exposed person and the treating clinician regarding the risks versus benefits of PEP.
††† If PEP is offered and administered and the source is later determined to be HIV-negative, PEP should be discontinued.
‡‡‡ For example, large-bore hollow needle, deep puncture, visible blood on device, or needle used in patient’s artery or vein.

### TABLE 2. Recommended HIV postexposure prophylaxis (PEP) for mucous membrane exposures and nonintact skin* exposures

<table>
<thead>
<tr>
<th>Exposure type</th>
<th>HIV-positive, class 1*</th>
<th>HIV-positive, class 2*</th>
<th>Source of unknown HIV status†</th>
<th>Unknown source‡</th>
<th>HIV-negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small volume**</td>
<td>Consider basic 2-drug PEP††</td>
<td>Recommend basic 2-drug PEP</td>
<td>Generally, no PEP warranted</td>
<td>Generally, no PEP warranted</td>
<td>No PEP warranted</td>
</tr>
<tr>
<td>Large volume††</td>
<td>Recommend basic 2-drug PEP</td>
<td>Recommend expanded 3-drug PEP</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** for source with HIV risk factors††</td>
<td>Generally, no PEP warranted; however, consider basic 2-drug PEP** in settings in which exposure to HIV-infected persons is likely</td>
<td>No PEP warranted</td>
</tr>
</tbody>
</table>

* For skin exposures, follow-up is indicated only if evidence exists of compromised skin integrity (e.g., dermatis, abrasion, or open wound).
† For example, deceased source person with no samples available for HIV testing.
‡ For example, splashed from inappropriately disposed blood.
†† For example, a few drops.
** The recommendation “consider PEP” indicates that PEP is optional; a decision to initiate PEP should be based on a discussion between the exposed person and the treating clinician regarding the risks versus benefits of PEP.
††† If PEP is offered and administered and the source is later determined to be HIV-negative, PEP should be discontinued.
‡‡‡ For example, a major blood splash.
WHAT TO DO IF AN EXPOSURE OCCURS

**Employees, Graduate Students, Work Study**

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers' Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student Not Paid by CSU**

1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

**Volunteers and Visitors**
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form

   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES

- CDC Information for Health Care Workers: http://www.cdc.gov/hantavirus/health-care-workers/
- MMWR Revised Recommendations for HIV Testing: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5514a1.htm

CONTENT REVIEW

This document has been reviewed by:
- CSU subject matter expert: Dr. Ramesh Akkina
- Licensed Physicians: Occupational Health Services (principal: Dr. Tracy Stefanon)
**Middle East Respiratory Syndrome Virus (MERS-CoV, Formerly Human Coronavirus Erasmus)**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**

- BSL-3 and ABSL-3 Level practices, containment equipment and facilities are required for work involving virus culture and isolation, laboratory manipulation of virus stocks, and all work involving animals. All work with exposed animals or manipulation of virus in vitro will require use of a PAPR for respiratory protection.

**Special considerations:**

- **Healthcare:** There is very limited information on transmission, severity and clinical impact of this newly emerged coronavirus. Until transmission is better understood, it is recommended that patients under investigation and probable and confirmed cases should be managed according to CDC’s infection control recommendations for the coronavirus that caused SARS per Appendix A of the 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings (http://www.cdc.gov/hicpac/2007ip/2007isolationprecautions.html) and CDC’s Appendix 1, Supplement I of Public Health Guidance for Community-Level Preparedness and Response to SARS (http://www.cdc.gov/sars/guidance/I-infection/app1.html) which include:
  - Prioritized placement into a single patient room, with preference for Airborne Infection Isolation Room
  - Droplet Precautions are recommended in addition to Standard Precautions, and Airborne Precautions should be used for aerosol generating procedures.
  - Appropriate use of PPE:
    - Laboratory coat or gown and gloves are recommended during procedures and patient-care that might result in contact of clothing/exposed skin with blood /body fluids, secretions.
    - In addition, eye protection, particulate N95 masks or equivalent during procedures and patient-care likely to generate splashes or sprays of blood, body fluids, or secretions.
  - Vigilant environmental disinfection is recommended per http://www.cdc.gov/hicpac/Disinfection_Sterilization/3_2contaminatedDevices.html

**VIABILITY/INACTIVATION**

**Inactivation:**

- Autoclave sensitive
- Studies with SARS indicates effective disinfection after 1-minute contact time with 10% household bleach (5,000 ppm available sodium hypochlorite), 70% ethyl alcohol, and povidone-iodine (1% iodine)

**Stability:**

- Not specifically known, however, the closely related SARS-CoV is infectious in solution for up to 9 days, and 24 hours to 6 days in the dried state, and is heat labile.

**HAZARD IDENTIFICATION**

**Transmission:** At least one strain has the potential for a broad host range, indicating potential for zoonotic and human-to-human transmission.
**Communicability:** Unclear. May have originated from bats, and zoonotic infection and human-to-human transmission is a possibility.

**Incubation:** Unknown. The incubation period for SARS is usually 2–7 days with approximately 95% of patients developing symptoms within 10 days.

**Infectious dose:** Unknown

**MEDICAL**

**Signs and symptoms:**
- Symptoms have not yet been comprehensively defined, and may be similar to SARS, including prodromal symptoms of fever, myalgias and headache for the first 3–7 days followed by respiratory symptoms including non-productive cough. Dyspnea may follow and may progress to respiratory failure.
- CDC requests that state and local health departments report patients under investigation for infection to CDC. Severity of symptoms may vary, ranging from flu-like symptoms to those for severe acute respiratory syndrome (SARS):
  - Criteria for investigation of infection can be found at [http://www.cdc.gov/coronavirus/ncv/case-def.html](http://www.cdc.gov/coronavirus/ncv/case-def.html) and include:
    - Acute respiratory infection, which may include fever and cough, AND
    - Suspicion of pulmonary parenchymal disease (e.g. pneumonia or acute respiratory distress), AND
    - Symptoms not already explained by any other infection or etiology, including all clinically indicated tests for community acquired pneumonia

**Pre-exposure prophylaxis:**
No

**Medical Surveillance and Occupational Health:**
- Before the initiation of work involving HuCov EMC, personnel shall be enrolled in the CSU Occupational Health Medical Surveillance Program; and be appropriately trained and proficient in specific laboratory and safety practices for the work being performed.
- Personnel working with HuCov EMC should immediately contact their supervisor in the event of exposure or development of respiratory symptoms
  - Exposures: The procedure outlined below should be followed for exposures
  - Symptoms: If symptoms consistent with the above description occur, then personnel should seek medical attention from a CSU Authorized Treating Physician, per the CSU Illness Procedure:

**Diagnosis:**
- To increase likelihood of detection, it is recommended that multiple specimens are collected from different sites.
- Lower respiratory tract and stool specimens should be considered as priority for collection and testing.
Treatment:

Post-exposure prophylaxis:
- Evaluation and active monitoring for respiratory symptoms as discussed above (in addition to sore throat, rhinorrhea, chills, myalgia, headache) within 10 days of exposure
- Activity restrictions should be discussed with the health department

Treatment of clinical cases:
- No specific treatment is recommended except for meticulous supportive care.

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
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3. After the Emergency Room visit, individual fills out the following forms:
   - Biosafety Incident report form:
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4. Employee follows up with CSU Authorized Treating Physician

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2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
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4. Individual fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
- CDC disinfection guide (SARS): http://www.cdc.gov/hicpac/Disinfection_Sterilization/3_2contaminatedDevices.html
- CDC infection control guidelines: http://www.cdc.gov/sars/guidance/l-infection/app1.html
- CDC Medical surveillance (SARS): http://www.cdc.gov/coronavirus/ncv/guidance/F-lab/app6.html

**CONTENT REVIEW**

This document has been reviewed by:

- CSU subject matter expert: Dr. Richard Bowen
- CSU Institutional Biosafety Committee Physician: Dr. Joseph Lopez
- Colorado Health Medical Group, Occupational Health (Dr. Tracey Stefanon)
Ilheus Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures.
- BSL-3 practices, containment equipment and facilities are recommended for arthropod work

Special considerations:
- Mosquito-borne virus

HAZARD IDENTIFICATION

Disease: Ilheus fever

Transmission: Mosquito

Incubation: 7-14 days (?)

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol, organic solvents, detergents

MEDICAL

Signs and symptoms:
- Often misdiagnosed as dengue, St. Louis encephalitis, yellow fever or influenza
- Febrile illness with arthralgia (joint pain), mild encephalitis

Pre-exposure prophylaxis:
None

Diagnosis:
- Testing serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer.

Treatment:

Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form: http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   • Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
• BMBL: http://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf
• Virology Online: http://virology-online.com/viruses/Arboviruses.htm
• Zoonoses: Infectious diseases transmitted from animals to humans by H. Krauss (Available at http://estore.asm.org/viewItemDetails.asp?ItemID=318)

CONTENT REVIEW
This document has been reviewed by:
• CSU subject matter expert: Dr. Carol Blair
H1N1 Pandemic Influenza Virus

FACT SHEET IS BEING PREPARED

CDC Guidance website: http://www.cdc.gov/h1n1flu/guidance/
La Crosse Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures.
- BSL-3 practices, containment equipment and facilities are recommended for work involving arthropods and/or potentially producing aerosols

Special considerations:
- Mosquito-borne virus

HAZARD IDENTIFICATION

Disease: La Crosse encephalitis

Transmission: mosquito bite

Incubation: 5-15 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol, organic solvents, detergents

MEDICAL

Signs and symptoms:
- Fever lasting 2-3 days
- Headache
- Nausea
- Vomiting
- Fatigue
- Lethargy
- Severe neuroinvasive disease can occur in children under the age of 16

Pre-exposure prophylaxis:
None

Diagnosis:
Testing serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer.
Treatment:
Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**
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**Volunteers and Visitors**
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**REFERENCES**

**CONTENT REVIEW**
This document has been reviewed by:
- CSU subject matter expert: Dr. Carol Blair
Middle East Respiratory Syndrome Virus (MERS-CoV, Formerly Human Coronavirus Erasmus)

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment

- BSL-3 and ABSL-3 Level practices, containment equipment and facilities are required for work involving virus culture and isolation, laboratory manipulation of virus stocks, and all work involving animals. All work with exposed animals or manipulation of virus in vitro will require use of a PAPR for respiratory protection.

Special considerations:

- **Healthcare:** There is very limited information on transmission, severity and clinical impact of this newly emerged coronavirus. Until transmission is better understood, it is recommended that patients under investigation and probable and confirmed cases should be managed according to CDC’s infection control recommendations for the coronavirus that caused SARS per Appendix A of the 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings (http://www.cdc.gov/hicpac/2007ip/2007isolationprecautions.html) and CDC’s Appendix 1, Supplement I of Public Health Guidance for Community-Level Preparedness and Response to SARS (http://www.cdc.gov/sars/guidance/I-infection/app1.html) which include:
  - Prioritized placement into a single patient room, with preference for Airborne Infection Isolation Room
  - Droplet Precautions are recommended in addition to Standard Precautions, and Airborne Precautions should be used for aerosol generating procedures.
  - Appropriate use of PPE:
    - Laboratory coat or gown and gloves are recommended during procedures and patient-care that might result in contact of clothing/exposed skin with blood /body fluids, secretions.
    - In addition, eye protection, particulate N95 masks or equivalent during procedures and patient-care likely to generate splashes or sprays of blood, body fluids, or secretions.
  - Vigilant environmental disinfection is recommended per http://www.cdc.gov/hicpac/Disinfection_Sterilization/3_2contaminatedDevices.html

VIABILITY/INACTIVATION

Inactivation:

- Autoclave sensitive
- Studies with SARS indicates effective disinfection after 1-minute contact time with 10% household bleach (5,000 ppm available sodium hypochlorite), 70% ethyl alcohol, and povidone-iodine (1% iodine)

Stability:

- Not specifically known, however, the closely related SARS-CoV is infectious in solution for up to 9 days, and 24 hours to 6 days in the dried state, and is heat labile.

HAZARD IDENTIFICATION

Transmission: At least one strain has the potential for a broad host range, indicating potential for zoonotic and human-to-human transmission.
**Communicability**: Unclear. May have originated from bats, and zoonotic infection and human-to-human transmission is a possibility.

**Incubation**: Unknown. The incubation period for SARS is usually 2-7 days with approximately 95% of patients developing symptoms within 10 days.

**Infectious dose**: Unknown

**MEDICAL**

**Signs and symptoms**:
- Symptoms have not yet been comprehensively defined, and may be similar to SARS, including prodromal symptoms of fever, myalgias and headache for the first 3–7 days followed by respiratory symptoms including non-productive cough. Dsypnea may follow and may progress to respiratory failure.
- CDC requests that state and local health departments report patients under investigation for infection to CDC. Severity of symptoms may vary, ranging from flu-like to symptoms to those for severe acute respiratory syndrome (SARS):
  - Criteria for investigation of infection can be found at [http://www.cdc.gov/coronavirus/ncv/case-def.html](http://www.cdc.gov/coronavirus/ncv/case-def.html) and include:
    - Acute respiratory infection, which may include fever and cough, AND
    - Suspicion of pulmonary parenchymal disease (e.g. pneumonia or acute respiratory distress), AND
    - Symptoms not already explained by any other infection or etiology, including all clinically indicated tests for community acquired pneumonia

**Pre-exposure prophylaxis**: None

**Medical Surveillance and Occupational Health**:
- Before the initiation of work involving HuCov EMC, personnel shall be enrolled in the CSU Occupational Health Medical Surveillance Program; and be appropriately trained and proficient in specific laboratory and safety practices for the work being performed.
- Personnel working with HuCov EMC should immediately contact their supervisor in the event of exposure or development of respiratory symptoms
  - Exposures: The procedure outlined below should be followed for exposures
  - Symptoms: If symptoms consistent with the above description occur, then personnel should seek medical attention from a CSU Authorized Treating Physician, per the CSU Illness Procedure:

**Diagnosis**:
- To increase likelihood of detection, it is recommended that multiple specimens are collected from different sites.
- Lower respiratory tract and stool specimens should be considered as priority for collection and testing.
Treatment:

Post-exposure prophylaxis:
- Evaluation and active monitoring for respiratory symptoms as discussed above (in addition to sore throat, rhinorrhea, chills, myalgia, headache) within 10 days of exposure
- Activity restrictions should be discussed with the health department

Treatment of clinical cases:
- No specific treatment is recommended except for meticulous supportive care.

WHAT TO DO IF AN EXPOSURE OCCURS

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1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
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   - Biosafety Incident report form: [link]
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1. Contact supervisor/PI
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3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form [link]

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form [link]

REFERENCES
- CDC disinfection guide (SARS): [link]
- CDC guide for sample collection: [link]
- CDC infection control guidelines: [link]
- CDC laboratory guidelines for isolation procedures: [link]
- CDC Medical surveillance (SARS): [link]
- CDC novel coronavirus update: [link]

CONTENT REVIEW

This document has been reviewed by:

• CSU subject matter expert: Dr. Richard Bowen
• CSU Institutional Biosafety Committee Physician: Dr. Joseph Lopez
• Colorado Health Medical Group, Occupational Health (Dr. Tracey Stefanon)
**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.

**Mycobacterium spp (NOT M. tuberculosis Complex or M. abscessus-chelonae Complex)**

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-2 Level practices, containment equipment and facilities are recommended for work involving potentially infectious materials
- BSL3 Level practices, containment equipment, and facilities may be required for certain activities involving concentrated culture, animal work, and/or activities that could potentially generate aerosols. Consult with CSU Biosafety office related to such work.

**Special Considerations**
- Many of the strains worked with at CSU are drug resistant and researchers should be aware of strains being worked with and antibiotic resistance profiles.
- Physical conditions that increase susceptibility to infection include: compromised immune system; pre-existing lung damage (e.g. cystic fibrosis, emphysema, smokers); and diabetes. Persons taking certain medications such as TNF alpha inhibitors and post-menopausal caucasian women are also more susceptible to infection.

**HAZARD IDENTIFICATION**

**Disease:** Usually pulmonary, cutaneous or lymphatic also possible; Infections with M. avium are primarily lymphatic

**Transmission:** Ingestion, inhalation, injections, wounds or abrasions; direct contact with environmental contaminants or clinical specimens from animals. Found in water, soil, domestic and wild animals. *M. avium* and *M. marinum* are zoonotic.

**Communicability:** Person to person transmission not evident.

**Incubation:** From 2 to 3 weeks or higher

**Infectious dose:** unknown in human

**VIABILITY/INACTIVATION**

**Stability:** Can survive on surfaces and in soil for months.

**Inactivation:**
- **Mycobacteria are very resistant to inactivation, and inactivation methods should consider susceptibility of the strain and species being worked with.**
- Mycobacteria are autoclave sensitive, but longer cycles may be required
- The following disinfectants may be effective for inactivation, depending on species, strain, and conditions:
  - 5% phenol or 5% formaldehyde
  - 2% glutaraldehyde is not effective against all species
  - 70% ethanol for surface decontamination
  - Minimum concentration of 20% bleach (10,000 ppm available sodium hypochlorite) *(Note that bleach should not be used when waste will be subsequently processed by autoclaving)*
MEDICAL

Signs and Symptoms:
- Non-specific symptoms - fever, chills, fatigue muscle aches, weight loss
- Pulmonary disease
  - Cough
  - Night sweats
  - Chest pain
- Cutaneous form - acquired through wound or break in skin:
  - Most commonly acquired from *M. marinum*, *M. leprae*, and *M. ulcerans*
  - Red, warm, tender, swollen, and/or painful lesion becoming ulcerative
- Lymphadenitis (swollen glands)

Pre-exposure prophylaxis:
- None

Diagnosis:
- Symptom based
- Direct smear microscopy for acid fast bacilli
- Culture of clinical specimens
- Histopathology of aspirates or biopsies
- For pulmonary symptoms, at least two sputum and one bronchial wash specimens collected on separate days for AFB analysis; A CXR or HRCT of the lungs and exclusion of other disorders like TB.
- Genetic methods (PCR, DNA probes, DNA fingerprinting)

Treatment:
- *Mycobacteria are inherently resistant to many drugs, and resistance depends on species and strain. Specific antibiotic regimes must be determined on a case-by-case basis.*
- **Post-Exposure Prophylaxis**
  - Prophylactic antibiotic regimen may be initiated, depending on the strain involved and the nature of the exposure
  - Rifabutin can be used in immunocompromised individuals post exposure to *M. avium*
  - Patient is monitored for symptoms
- **Treatment of clinical cases:**
  - Knowing the antibiotic sensitivity is helpful for guidance in determining the most appropriate treatment for each patient.
  - Persons who develop clinical signs are treated with a long-term combination of several antibiotics, which could include isoniazid, ethambutol, and/or macrolids,
  - Treatment of ulcerative lesions could include surgical removal of tissues.
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed.
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to an Authorized Treating Physician
3. After the visit, individual fills out the following forms:
   • Biosafety Incident report form:
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4. Employee follows up as directed.

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Volunteers and Visitors
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3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
• CDC Web Page, Mycobacterium avium: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/mycobacteriumavium_t.htm
• Emedicine, Atypical Mycobacterial Diseases: http://emedicine.medscape.com/article/1105570-overview
• Emedicine, Mycobacterium intracellularum: http://emedicine.medscape.com/article/222664-overview#a0156
• Hopkins Guides, Mycobacterium avium:
• Lab Tests: http://labtestsonline.org/understanding/conditions/ntm/
• National Jewish Hospital Web Page: http://www.nationaljewish.org/healthinfo/conditions/ntm/
  http://ntm.info/index.php

CONTENT REVIEW
This document has been reviewed by:
• CSU subject matter expert: Dr. Diane Ordway-Rodriguez
Mycobacterium chelonae-abscessus Complex

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment
- BSL-3 Level practices, containment equipment and facilities are recommended for work involving potentially infectious materials

Special Considerations
- Some strains worked with at CSU are drug resistant and researchers should be aware of strains being worked with and antibiotic resistance profiles.
- Physical conditions that increase susceptibility to infection include: compromised immune system; pre-existing lung damage (e.g. cystic fibrosis, emphysema, smokers); and diabetes. Persons taking certain medications such as TNF alpha inhibitors and post-menopausal caucasian women are also more susceptible to infection.

HAZARD IDENTIFICATION

Disease: Pulmonary most common, cutaneous and ocular infections also possible

Transmission: Ingestion, inhalation, injections, wounds or abrasions. Found in water, soil and dust. No human to human transmission has been documented. Infection usually caused by injections of substances contaminated with the bacterium or through invasive medical procedures employing contaminated equipment or material.

Communicability: Person to person transmission not likely

Incubation: Ranges from ~1-8 weeks, some reports up to a year

Infectious dose: unknown in human

VIABILITY/INACTIVATION

Stability: Can survive on surfaces and in soil for months.

Inactivation:
- Mycobacteria are very resistant to inactivation, and inactivation methods should consider susceptibility of the strain and species being worked with.
- Mycobacteria are autoclave sensitive, but longer cycles may be required.
- *M. chelonae* is NOT susceptible to 2% glutaraldehyde
- The following disinfectants may be effective for inactivation, depending on species and strain:
  - in 5% phenol or 5% formaldehyde
  - 70% ethanol for surface decontamination
  - Minimum concentration of 20% bleach (10,000 ppm available sodium hypochlorite) *(Note that bleach should not be used when waste will be subsequently processed by autoclaving)*

MEDICAL

Signs and Symptoms:
- Non-specific symptoms - fever, chills, fatigue muscle aches, weight loss
- Pulmonary disease is the most common
• Dyspnea (shortness of breath)
• Hemoptysis (act of coughing up blood)
• Chest pain
• Severe bronchiectasis with impaired pulmonary function

• Cutaneous form- acquired through wound or break in skin:
  o Red, warm, tender, swollen, and/or painful around wound site.

• Lymphadenitis and bacteremia are rare

Pre-exposure prophylaxis:
• None

Diagnosis:
• Diagnosis from lesions is obtained through culture of pus or biopsy of infected tissue (CDCM).
  For pulmonary symptoms, at least two sputum and one bronchial wash specimens collected on separate days for AFB analysis; A CXR or HRCT of the lungs and exclusion of other disorders like TB (JH).
  Demonstrates visual growth on solid media within 7 days. Culture data is valuable in the treatment for drug susceptibility testing. If disease is severe, blood is drawn for culture.

Treatment:
• Mycobacteria are inherently resistant to many drugs, and resistance depends on species and strain. Specific antibiotic regimes must be determined on a case-by-case basis.
• Post-exposure prophylaxis:
  o Prophylactic antibiotic regimen may be initiated, depending on the strain involved and the nature of the exposure.
• Treatment of clinical cases:
  o Knowing the antibiotic sensitivity is helpful for guidance in determining the most appropriate treatment for each patient.
  o Infection with this bacterium usually does not improve with the usual antibiotics used to treat skin infections and is resistant to traditional antituberculosis agents. Antimicrobial therapy is more difficult with M. abscessus.
  o Draining collections of pus and administering the appropriate combination of antibiotics for a prolonged period of time for skin infections.
  o Amikacin, clarithromycin, tigecycline, and cefoxitin. Macrolides generally included in treatment regimen if possible (JH).

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REFERENCES
CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter experts: Dr. Diane Ordway-Rodriguez
Newcastle Disease

Avian Paramyxovirus-1 Infection,
Goose Paramyxovirus Infection

Last Updated: July 2008

Importance

Newcastle disease is a viral disease of birds with a wide range of clinical signs from mild to severe. This disease is caused by a diverse group of viruses; the milder strains are endemic in the United States, while highly virulent strains are exotic. The highly virulent form of Newcastle disease is one of the most important poultry diseases worldwide. Chickens are particularly susceptible, and may experience morbidity and mortality rates up to 100%. Outbreaks of virulent Newcastle disease have a tremendous impact on backyard chickens in developing countries, where these birds are a significant source of protein and this disease is endemic. In developed countries, where the more virulent forms of the virus have been eradicated, trade embargoes and restrictions cause significant economic losses during outbreaks. In the United States, one epidemic in 2002-2003 resulted in the death of more than three million birds and caused industry losses estimated at $5 billion. Low pathogenicity isolates, which are common in poultry worldwide, can decrease productivity but have no impact on international trade.

Although the most significant impact of Newcastle disease is on chickens, other species can also be affected. Some pet and zoo birds become ill after infection, while other species can carry and shed virulent viruses asymptomatically. These birds, particularly illegally imported psittacines, can introduce Newcastle disease viruses to disease-free countries. Newcastle disease is also an important cause of death during the first three months of life in cormorant colonies. Since the late 1990s, novel strains have caused outbreaks among geese (a species that is usually resistant to disease) in China.

Etiology

Newcastle disease is caused by viruses in the serotype avian paramyxovirus type 1 (APMV-1). These viruses, which are called either APMV-1 or Newcastle disease viruses (NDV), are members of the genus Avulavirus in the family Paramyxoviridae. APMV-1 strains maintained in pigeon populations have some antigenic differences from other NDV isolates, and are sometimes called pigeon paramyxovirus type 1 (PPMV-1).

APMV-1 strains are classified into three pathotypes based on their virulence in chickens. Lentogenic strains are the least virulent, mesogenic strains are moderately virulent, and velogenic strains are the most virulent. Most strains cluster toward the two extremes of virulence, and are either lentogenic or velogenic. Velogenic viruses can be subdivided into a neurotropic form, which is typically associated with respiratory and neurologic signs, and a viscerotropic form with hemorrhagic intestinal lesions. These clinical forms overlap and are rarely clear-cut, even in specific pathogen free (SPF) chickens.

Several tests can be used to assess the virulence of an APMV-1 strain, and countries may use different criteria to define Newcastle disease. The OIE defines Newcastle disease as an infection caused by a highly virulent APMV-1 virus – an isolate that has either 1) an intracerebral pathogenicity index (ICPI) of at least 0.7 in day-old chicks, or 2) an amino acid sequence that resembles those seen in highly virulent viruses (multiple basic amino acids at the C-terminus of the F2 protein and phenylalanine at residue 117 of the F1 protein). Such viruses must be reported to the OIE and have severe repercussions for international trade. The U.S. defines “exotic Newcastle disease” (END) as the disease caused by velogenic viscerotropic strains.

APMV-1 isolates can also be separated into two clades, called class I and class II, based on the genetic relationship between viruses. The vast majority of APMV-1 strains belong to class II, which is divided into at least nine genotypes (I to IX). Class I isolates have been found mainly in wild waterfowl, and are usually of low pathogenicity.

Species Affected

Newcastle disease primarily affects birds. Some avian species become ill, while others carry these viruses asymptomatically. Infections also occur in humans, but have not been reported in other species of mammals.
APMV-1 viruses are known to infect more than 250 species of birds in 27 orders; other avian species may also be susceptible. Wild birds, particularly waterfowl (order Anseriformes), tend to carry these viruses asymptomatically. Most of the viruses found in wild birds are lentogenic; however, virulent APMV-1 has become established in some cormorant populations (Phalacrocorax sp.; order Pelecaniformes) and causes disease in juvenile birds.

Susceptibility to illness varies widely among poultry and pet birds. Members of the order Phasianiformes (gallinaceous birds), particularly chickens, are highly susceptible to disease. Turkeys are less likely to develop severe symptoms, and the susceptibility of game birds (pheasants, partridges, quail and guinea fowl) varies with the species. Ducks and geese usually have no apparent infections, but some isolates (in genotypes VII and VI) have caused outbreaks among geese in China since the 1990s. Clinical cases have been described occasionally in ducks. Outbreaks have been reported in ostriches (order Struthioniformes). Pigeons (order Columbiformes) are susceptible to disease, and lentogenic or mesogenic APMV-1 viruses (PPMV-1) are endemic in pigeon populations. Susceptibility to disease varies widely in psittacine birds (order Psittaciformes); cockatiels often die or develop neurological signs, but some species tend to carry velogenic viruses subclinically.

Some birds found in the wild or in zoos also become ill. Penguins (order Sphenisciformes) are highly susceptible to Newcastle disease, and birds often die acutely. Fatal or severe disease has been reported in some raptors (order Falconiformes) including a bearded vulture (Gypaetus barbatus), some species of falcons, a captive white-tailed sea eagle (Haliaeetus albicilla) and a wild osprey (Pandion haliaetus). Other raptors tend to be resistant to disease. Illness has also been reported in gulls (order Charadriiformes) owls (order Strigiformes) pelicans (order Pelecaniformes) and a Northern gannet (Morus bassanus; order Pelecaniformes). Susceptibility varies among passerine birds (order Passeriformes), with some species excreting virus subclinically and others developing severe clinical signs. Occasional deaths have also been reported in Corvidae (crows and ravens).

Geographic Distribution

Velogenic APMV-1 is endemic in Asia, the Middle East, Africa, Central and South America, and parts of Mexico. Virulent strains are endemic in wild cormorants in the U.S. and Canada, but commercial poultry are free of velogenic isolates. Lentogenic isolates are found in poultry throughout the world, including the U.S. Mesogenic strains may also be found, but are less common.

Transmission

APMV-1 can be transmitted by inhalation or ingestion (fecal/oral route). Birds shed virus in both feces and respiratory secretions. Gallinaceous birds excrete APMV-1 for only 1 to 2 weeks, but psittacine birds often shed these viruses for several months. Some species of psittacine birds can excrete virus for more than a year. Prolonged shedding has also been reported in some members of other orders, including owls (more than four months) and cormorants (one month). Shedding can be sporadic. APMV-1 is present in all parts of the carcass, and some outbreaks in raptors have been linked to eating infected chicken, pigeon or quails. When the temperature is just above freezing (1-2ºC [34-35ºF]), this virus is reported to survive on chicken skin for up to 160 days and in bone marrow for nearly 200 days. The importance of aerosols in long distance transmission is controversial. In one study, APMV-1 was found 64 meters but not 165 meters downwind of an infected farm. The survival of aerosolized virus is probably dependent on humidity and other environmental factors, as well as the concentration of infected poultry. Some isolates can be transmitted through the egg to hatching chicks. Egg-associated transmission of highly virulent isolates is possible but uncommon, as the embryo usually dies unless the viral titer in the egg is low. Other sources of virus for newly hatched chicks are feces-contaminated eggshells and cracked or broken eggs.

APMV-1 is readily transmitted on fomites. Survival is prolonged on eggshells and especially in feces, compared to an inorganic surface (filter paper). Published information on virus survival is highly variable, probably because it is affected by the humidity, temperature, suspending agent and exposure to light. One study reported that APMV-1 survived in contaminated, uncleaned poultry houses for up to 7 days in summer, as long as 14 days in the spring, and 30 days during the winter. Another group reported virus isolation up to 16 days after depopulation of an unvaccinated flock. However, one study found that APMV-1 remained viable for up to 255 days in a henhouse, at ambient temperatures of –11ºC (12ºF) to 36ºC (97ºF). At 23-29ºC (73-84ºF), APMV-1 is reported to survive in contaminated litter for 10 to 14 days, and at 20ºC (68ºF) in soil for 22 days. Virus has also been recovered from earthworms for 4 to 18 days, and from experimentally contaminated lake water for 11 to 19 days. Flies might be able to transmit APMV-1 mechanically, but it is still uncertain whether insects can carry enough virus to infect poultry. The importance of arthropod-borne transmission may vary with the type of housing and flock management.

The epidemiology of APMV-1 is incompletely understood; however, wild birds, particularly waterfowl, may be the reservoir hosts for lentogenic viruses. These viruses could become more virulent after becoming established in poultry. Some recent outbreaks were apparently caused by velogenic viruses that emerged from local, low pathogenic isolates. Acquisition of virulence has also been reported in experimentally infected birds. Psittacine birds have introduced APMV-1 to poultry flocks in some outbreaks. Although early reports suggested that
virulent strains might be endemic in wild psittacine populations, these birds are now thought to become infected after capture. Cormorants could transmit velogenic viruses to poultry; gulls associated with cormorant colonies could also be a source of virus, and are more likely to visit farms. Lentogenic or mesogenic APMV-1 viruses are endemic in pigeon populations, and can become more virulent if they enter and cycle in poultry flocks.

**Incubation period**

The incubation period in poultry varies from 2 to 15 days depending on the virulence of the strain and the susceptibility of the population. In chickens infected with velogenic isolates, an incubation period of 2 to 6 days is common. Incubation periods up to 25 days have been reported in some avian species.

**Clinical signs**

The clinical signs vary with the pathogenicity of the isolate and the species of bird. In chickens, lentogenic strains usually cause subclinical infections or mild respiratory disease with coughing, gasping, sneezing and rales. Mesogenic strains can cause acute respiratory disease and neurologic signs in some chickens, but the mortality rate is usually low. Lentogenic or mesogenic strains can produce more severe symptoms if the flock is co-infected with other pathogens.

Velogenic strains cause severe, often fatal, disease in chickens. The clinical signs are highly variable. Most birds are lethargic and inappetent, and the feathers may be ruffled. Conjunctival reddening and edema may be an early sign. Some birds develop watery, greenish or white diarrhea, respiratory signs (including cyanosis) or swelling of the tissues of the head and neck. Neurologic signs including tremors, clonic spasms, paresis or paralysis of the wings and/or legs, torticollis (twisted neck) and circling may also be seen. Nervous signs can occur concurrently with other symptoms but are generally seen later in the course of disease. Egg laying often declines dramatically, and eggs may be misshapen, abnormally colored, and rough or thin-shelled, with watery albumen. Sudden death, with few or no symptoms, is also common. Birds that survive for two weeks usually live but may have permanent neurological damage and/or a permanent decrease in egg production. The symptoms may be less severe in vaccinated birds.

Similar clinical signs are seen in other species of birds; however, either neurological signs or respiratory signs can predominate in some species. Newcastle disease is generally milder in turkeys than chickens, but some strains may cause significant disease. Severe clinical signs can sometimes be seen in game birds, particularly pheasants. Respiratory signs have been reported in some but not all outbreaks in pheasants. Guinea fowl sometimes become ill, but they can also carry velogenic isolates subclinically.

In psittacine birds, Newcastle disease may be acute, subacute, chronic or inapparent. The clinical signs are highly variable, but may include respiratory and/or neurologic signs, as well as diarrhea and sudden death. Respiratory signs tend to predominate in ostriches and emus, and these birds are usually less severely affected than chickens. Diarrhea, polydipsia, conjunctivitis and neurological signs are generally seen in pigeons and doves. Neurological signs, particularly talon convulsions and the inability to coordinate flight, are prominent in raptors. Sudden death may also occur. Geese and ducks are usually infected subclinically (with most strains), but illness is occasionally reported. Neurological signs, diarrhea, anorexia and sudden death may be seen in these birds. Respiratory symptoms appear to be rare in waterfowl.

In cormorant colonies, Newcastle disease is usually characterized by neurological signs, and illness is almost always limited to juveniles. Affected birds may be weak, with paresis or paralysis of one or both legs and/or wings, incoordination, tremors, torticollis and/or drooping of the head. Sick or dead birds can be found in the same nest as apparently normal nestmates. Older fledged cormorants may be seen trying to walk, fly, swim or dive. Sick or dead gulls and juvenile white pelicans have been seen near affected cormorant colonies. Sick pelicans had neurological signs similar to cormorants, such as unilateral or bilateral wing and or leg paralysis/ paresis, drooping neck, and an inability or reluctance to move; however, it has not been proven that these symptoms were caused by APMV-1. In addition to increased mortality, the only clinical signs reported in gulls were wing and/or leg paralysis or paresis.

**Post Mortem Lesions**

Significant gross lesions are usually found only in birds infected with velogenic strains. The head or peri-orbital region may be swollen, and the interstitial tissue of the neck can be edematous, especially near the thoracic inlet. Congestion or hemorrhages may be found in the caudal pharynx and tracheal mucosa, and diphtheritic membranes sometimes occur in the oropharynx, trachea and esophagus. Petechiae and small ecchymoses may be seen in the mucosa of the proventriculus. Hemorrhages, ulcers, edema and/or necrosis often occur in the cecal tonsils and lymphoid tissues of the intestinal wall (including Peyer’s patches); this lesion is particularly suggestive of Newcastle disease. Thymic and bursa hemorrhages may also be present, but can be difficult to see in older birds. The spleen may be enlarged, friable and dark red or mottled. Pancreatic necrosis and pulmonary edema can be found in some birds. The ovaries are often edematous or degenerated, and may contain hemorrhages. Some birds, particularly those that die suddenly, have few or no gross lesions. Similar lesions have been reported in geese, turkeys, pheasants and other species infected with virulent strains. In experimentally infected guinea fowl, the only significant lesions were hemorrhages at the tip of the glands of the proventriculus and in the cecal tonsil.
In chickens infected with less virulent strains, the lesions may be limited to congestion and mucoid exudates in the respiratory tract, and opacity and thickening of the air sacs. More severe lesions can be seen in birds with secondary bacterial infections.

**Morbidity and Mortality**

Morbidity and mortality rates vary greatly depending on the virulence of the strain and susceptibility of the host. Lentogenic and mesogenic viruses usually kill few birds; in poultry, the mortality rate is approximately 10% for mesogenic strains and negligible with lentogenic strains. Concurrent illnesses may increase the severity of illness and result in a higher death rate. In contrast, velogenic isolates have morbidity and mortality rates up to 100% in unvaccinated chickens. The onset of disease is usually rapid, and the virus often spreads quickly, particularly in group-housed flocks. Some isolates can affect young birds more severely. Vaccinated poultry tend to have milder infections. In one epidemic mainly affecting vaccinated chickens, flock mortality rates were 30% to 90%.

Other species of birds are usually affected less severely than chickens. Velogenic isolates can kill up to 100% of experimentally infected pheasants, but some individual birds may be resistant to disease, and the mortality rate reported during outbreaks is highly variable. From 22% to 77% of the pheasants in affected flocks died during one epizootic in Denmark, but in another outbreak in the U.K., the mortality rate was less than 3% even in the most severely affected pen. In guinea fowl, the mortality rate was 21% during one outbreak, and 8-100% in experimental infected birds (depending on the strain of the virus). Mortality rates as high as 28% have been reported in ostriches in some outbreaks, but few birds died in others. Newcastle disease is rarely severe in waterfowl; however, some velogenic strains circulating in China have an average morbidity rate of 17.5% and an average mortality rate of 9% in geese.

APMV-1 (PPMV-1) is endemic in pigeons and doves in many countries. In these birds, highly virulent strains have morbidity rates as high as 70% and mortality rates that approach 40%. Velogenic strains are endemic in cormorants, but adult birds do not appear to develop clinical signs or die. The estimated mortality during several outbreaks in juvenile cormorants ranged from less than 1% to 92%. Up to 90% of juvenile white pelicans near these colonies have died in some outbreaks; however, it has not been proven that the disease in pelicans was caused by APMV-1.

**Diagnosis**

**Clinical**

Newcastle disease should be considered, especially in chicken flocks, when the morbidity and mortality rates are high, and the symptoms could be consistent with this disease. Unexpected deaths are sometimes the first sign.

There are no pathognomonic gross lesions; however, some lesions may be suggestive, particularly when several carcasses are examined.

**Differential diagnosis**

The differential diagnosis for velogenic Newcastle disease includes other causes of septicemia, enteritis, respiratory disease and/or neurologic signs. In poultry, these diseases include fowl cholera, highly pathogenic avian influenza, laryngotracheitis, the diphtheritic form of fowl pox, psittacosis, mycoplasmosis, infectious bronchitis, aspergillosis, and management problems such as deprivation of water or feed, and poor ventilation. In pet birds, diseases to consider include psittacosis, Pacheco’s disease, salmonellosis, adenovirus, and nutritional deficiencies, as well as other paramyxovirus infections. In cormorants, botulism, fowl cholera and traumatic skeletal abnormalities are among the differentials.

**Laboratory tests**

Newcastle disease can be diagnosed by isolating APMV-1 from affected birds. This virus is usually recovered by inoculating samples into 9-11 day old embryonated chicken eggs. Chorioallantoic fluid from the eggs is tested for hemagglutinating activity, and any agents that hemagglutinate are examined for hemagglutination inhibition (HI) with a monospecific antiseraum to APMV-1. Some HI tests that use monoclonal antibodies can identify particular strains of APMV-1. APMV-1 can cross-react with some other avian paramyxoviruses, particularly APMV-3 and APMV-7, in the HI test.

The pathogenicity of the isolate can be quantified by 1) the mean death time (MDT) in chicken embryos, 2) the intracerebral pathogenicity index (ICPI) in 1-day old chicks, or 3) the intravenous pathogenicity index (IVPI) in 6-week old chickens. In the MDT assay, velogenic isolates have an MDT of less than 60 hours, mesogenic strains have an MDT of 60-89 hours, and lentogenic viruses have an MDT greater than 90 hours. The ICPI and IVPI tests are scoring systems that evaluate illness or death in chickens. The values in the ICPI test range from 0 to 2.0; the most virulent viruses approach 2.0, while lentogenic strains are usually close to 0.0. The values in the IVPI test are from 0 to 3.0; the IVPI for velogenic strains approach 3.0, while lentogenic strains and some mesogenic strains have IVPI values of zero. However, some viruses that can produce severe disease have IVPI values of zero; the ICPI test is generally preferred for this reason. Other variations of these tests are also used; some can distinguish viscerotropic (velogenic) from neurotropic strains.

Reverse-transcription polymerase chain reaction (RT-PCR), gene sequencing, restriction enzyme analysis and other molecular techniques are also used to identify APMV-1 in eggs or clinical specimens. Some of these tests can also determine the virus’s pathotype. Most isolates that are highly virulent for chickens have a particular sequence, 112R/K-R-Q-K/R-R116 (multiple basic amino acids) at the

**Newcastle Disease**

Last Updated: July 2008 © 2008  page 4 of 7
C-terminus of the F2 protein and phenylalanine at residue 117 of the F1 protein. The presence of this genetic sequence is enough to classify an isolate as highly virulent for the purposes of international trade. If this pattern is not present, the pathogenicity of the virus must be determined in the ICPI or other test. Rapid diagnostic tests, as well as tests using monoclonal antibodies, are optimized for more virulent viruses, and may not identify some lentogenic viruses (particularly Class I isolates).

Serological assays may be useful in some circumstances. Hemagglutination inhibition is the most commonly used serological test. Other tests include virus neutralization, hemagglutination and enzyme-linked immunosorbent assays (ELISA). Vaccination can interfere with serologic testing. In some species, immunohistochemistry may be used to detect antigens in tissues; this test is not performed routinely for diagnosis in chickens.

**Samples to collect**

Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease. Newcastle disease is zoonotic; samples should be collected and handled with all appropriate precautions.

Tracheal and cloacal swabs should be taken from live birds for virus isolation. If cloacal swabs might harm the bird, fresh feces may be collected instead. Whenever possible, samples should be taken in the early stages of disease. At necropsy, samples should be collected from the spleen, trachea, lung, intestines (particularly the cecal tonsil), intestinal contents, liver, kidneys, heart and brain. Oronasal swabs should also be taken. Samples for virus isolation should be collected from recently dead birds or moribund birds after euthanasia. Tissues may be collected separately or pooled; intestinal samples are generally processed separately. These samples should be kept cold (e.g. on wet ice), and swabs should be sent to the laboratory in transport medium. Similar tissues and feces are collected for RT-PCR and other molecular assays. Clotted blood or serum samples can be submitted for serology.

**Recommended actions if highly virulent Newcastle disease is suspected**

**Notification of authorities**

State and federal veterinarians should be informed immediately of any suspected cases of highly virulent (velogenic) Newcastle disease.

Federal: Area Veterinarians in Charge (AVIC):


State Veterinarians:


**Control**

Good biosecurity can help prevent Newcastle disease in poultry flocks. Flocks should not be allowed to contact domesticated poultry of unknown health status, any pet birds (particularly psittacines), and wild or feral birds (particularly cormorants, gulls and pigeons). Whenever possible, workers should avoid contact with birds outside the farm. Biosecurity measures include bird-proofing houses, feed and water supplies, minimizing travel on and off the facility, and disinfecting vehicles and equipment that enter the farm. Pests such as insects and mice should also be controlled. If possible, employees should shower and change into dedicated clothing for work. All in/ all out breeding (one age group per farm), with disinfection between groups, is also advisable. More detailed biosecurity guidelines can be found in the Internet Resources section of this fact sheet.

Similar biosecurity measures can protect birds kept in zoos or aviaries, or as pets (see Internet Resources). Establishing an effective biosecurity program can decrease the risk that hobby or pet birds would be euthanized during a Newcastle disease outbreak. Pet birds should be bought only from suppliers who can certify that the birds have been imported legally or bred in the U.S., and are healthy. Legally imported pet birds have been quarantined and tested for velogenic strains of APMV-1. Domestically raised birds are usually closed-banded. Some species such as Amazon parrots are difficult to raise domestically; vendors who are selling large numbers of young birds of these species (particularly when they are bargain-priced) without adequate documentation should be viewed with caution. Newly acquired birds should be isolated or quarantined for at least 30 days, and they should be monitored closely for signs of illness. Avian carcasses (of any species) that could be infected with velogenic Newcastle disease should never be fed to raptors, chickens or other birds. Illegally imported psittacines should be reported, because many of them may be carrying velogenic APMV-1.

Vaccines are used in chickens, pheasants and other species. In addition, birds in aviaries, breeding farms and zoos are often vaccinated. Vaccination can protect birds from clinical signs but does not necessarily prevent virus replication and shedding. Sentinel chickens are sometimes used to monitor vaccinated flocks.

Outbreaks are eradicated with quarantines and movement controls, depopulation of all infected and exposed birds, and thorough cleaning and disinfection of the premises. Effective disinfectants include chlorhexidine, sodium hypochlorite (6%), phenolic disinfectants and oxidizing agents (e.g. Virkon®). APMV-1 can also be inactivated by heat (56°C [133°F] for 3 hours or 60°C [140°F] for 30 min), acid (pH 3), ether and formalin; the efficacy of formalin varies with the temperature. Whether flies are competent vectors for APMV-1 is still uncertain, but fly control is prudent on and near infected farms.
eradication begins, the facilities should be treated with insecticides that can kill adult flies. Insect control should be continued until disinfection is complete. Farms must generally remain empty for a few weeks before restocking; the specific time may vary with the climate, season and other factors. During some eradication programs, government agencies may collect and test birds that die suddenly in any facility. This measure can be helpful in recognizing new cases.

Public Health

Velogenic strains of APMV-1 can cause conjunctivitis in humans, usually when the person has been exposed to large quantities of virus. Laboratory workers and vaccination crews are affected most often. Poultry workers are rarely infected, and handling or consuming poultry products does not appear to be a risk. The conjunctivitis usually resolves rapidly without treatment, but APMV-1 is shed in the ocular discharges for 4 to 7 days. All direct or indirect contact with birds should be avoided during this time.

Mild, self-limiting influenza-like disease with fever, headache and malaise has also been reported in humans; in some cases, it is uncertain whether the illness was caused by APMV-1 or misdiagnosed by cross-reactions in serologic tests. A recent report, confirmed by virus isolation, suggests that APMV-1 could cause serious opportunistic infections in people who are immunosuppressed. A patient developed fatal pneumonia 18 days after receiving a peripheral blood stem cell transplant. There was no history of contact with poultry, and the isolate was most closely related to APMV-1 viruses from pigeons.

Internet Resources

California Department of Food and Agriculture. Newcastle Disease Information
http://www.cdfa.ca.gov/ahfss/Animal_Health/Newcastle_Disease_Info.html

The Merck Veterinary Manual
http://www.merckvetmanual.com/mvm/index.jsp

United States Animal Health Association. Foreign Animal Diseases

United States Department of Agriculture (USDA). Biosecurity for the Birds
http://www.aphis.usda.gov/animal_health/birdbiosecurity/

World Organization for Animal Health (OIE)
http://www.oie.int

OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals
http://www.oie.int/international-standard-setting/terrestrial-manual/access-online/

Newcastle Disease

OIE Terrestrial Animal Health Code
http://www.oie.int/international-standard-setting/terrestrial-code/access-online/

References


Jørgensen PH, Herzeg J, Lomniczi B, Manvell RJ, Holm E, Alexander DJ. Isolation and characterization of avian paramyxovirus type 1 (Newcastle disease) viruses from a flock of ostriches (Struthio camelus) and emus (Dromaius novaehollandiae) in Europe with inconsistent serology. Avian Pathol. 1998;27:352-8.


Newcastle Disease


O’ Nyong-Nyong Virus

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures.
- BSL-3 practices, containment equipment and facilities are recommended for arthropod work

Special considerations:
- Mosquito-borne virus

HAZARD IDENTIFICATION

Disease: Epidemic polyarthritis and rash

Transmission: Mosquito bite, aerosol transmission in research

Incubation: greater than 8 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, organic solvents, detergents

MEDICAL

Signs and symptoms:
Typically a Self-limiting febrile viral disease
- Arthralgia (joint pain) or arthritis in the knee, ankle or small joints of the extremities
- Maculopapular (flat red area) rash
- Buccal (cheeks, mouth) and palatal (tongue) enanthema (lesions on the mucous membrane)

Pre-exposure prophylaxis:
None

Diagnosis:
- Testing serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer.

Treatment:
Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
• Treatment is supportive and symptomatic

**Disclaimer**
This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**

WHAT TO DO IF AN EXPOSURE OCCURS

**Employees, Graduate Students, Work Study**

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form:
     [http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf](http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf)
   • Workers’ Compensation (within 4 days or as soon as possible):
     [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student Not Paid by CSU**

1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form
   [http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf](http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf)

**Volunteers and Visitors**

1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form
   [http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf](http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf)

**REFERENCES**


**CONTENT REVIEW**

This document has been reviewed by:

• CSU subject matter expert: Dr.Carol Blair
**Powassan Virus**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-3 Level practices, containment equipment and facilities are recommended for potentially infected clinical or experimental tissues, cultures, animals or arthropods.

**Special considerations:**
- tick borne disease

**HAZARD IDENTIFICATION**

**Disease:** Powassan encephalitis

**Transmission:** ticks, consumption of raw milk

**Incubation:** 7-14 days

**Infectious dose:** unknown

**VIABILITY/INACTIVATION**

**Stability:** Does not survive outside the host

**Physical Inactivation:**
- Autoclave sensitive

**Chemical Inactivation:**
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite, 70% ethanol, 2% gluteraldehyde

**MEDICAL**

**Signs and symptoms:**
- Acute inflammatory disease involving the brain, spinal cord, and meninges
- Asymptomatic and mild cases
- Severe infections:
  - Stupor, disorientation, coma, tremors, convulsions, spastic paralysis, neurologic sequelae, death

**Pre-exposure prophylaxis:**
- None

**Diagnosis:**
Testing serum at day 0 and day 14 to check for antibody.

**Treatment (Post-Exposure Prophylaxis/Treatment):**
- Treatment is supportive and symptomatic
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form: http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   • Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
• Handbook of Zoonoses: Viral by George W. Beran (Available at: https://evolve.elsevier.com/cs/product/97803230444783?role=student)
• Public Health Agency of Canada: http://www.phac-aspc.gc.ca/msds-ftss/msds121e-eng.php

CONTENT REVIEW
This document has been reviewed by:
• CSU subject matter expert: Dr. Gregory Ebel

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**
Rabies Virus

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures
- BSL-3 and ABSL-3 level practices, containment equipment and facilities are required when aerosols are likely

Special considerations:
- High fatality rate!
- All personnel working with the virus or infected animals should be immunized and have demonstrable anti-viral titers.

HAZARD IDENTIFICATION

Disease: Rabies, Hydophobia

Transmission: Saliva containing virus introduced by bite or scratch, aerosol.

Communicability: Person to person possible but rare and only documented in transplant recipients

Incubation: 10 days to many months

Infectious dose: Unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- UV radiation and lipid solvent sensitive
- Susceptible to 1% sodium hypochlorite, 2% glutaraldehyde, 70% ethanol, formaldehyde

MEDICAL

Signs and symptoms:
***Once symptoms occur Rabies is ~100% Fatal – DO NOT WAIT FOR SYMPTOMS***
- Malaise
- Fever
- Headache
- Discomfort, pain
- Anxiety
- Confusion
- Agitation
- Insomnia
- Abnormal behavior
- Sensitivity to light and sound
- Delirium
- Hallucinations
- Slight or partial paralysis
- Hypersalivation
- Difficulty swallowing
- Pharyngeal spasms upon exposure to liquids
- Convulsions
- Furious hyperexcitability
- Hydrophobia
- Death within 2 to 10 days from onset of symptoms
Diagnosis:
Serology – ELISA or EIA to check for IgM
Saliva – Virus isolation or RT-PCR

Treatment:
- **Pre-exposure prophylaxis:**
  - VACCINATION AVAILABLE
  - From the 2008 ACIP Recommendations for human rabies prevention: Table 5 below describes the pre-exposure prophylaxis schedule, and Table 6 determines who might get vaccinated
- **Post-exposure prophylaxis:**
  - From the 2008 ACIP Recommendations for human rabies prevention: Table 3 below displays the prophylaxis guide based on animal exposure
  - From the 2010 ACIP Recommendations for use of a reduced (4-dose) vaccine schedule for post-exposure prophylaxis to prevent human rabies: Table 3 displays the post-exposure prophylaxis schedule

**TABLES FROM 2008 RECOMMENDATIONS OF THE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES**

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5703a1.htm

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**TABLE 5. Rabies pre-exposure prophylaxis schedule — United States, 2008**

<table>
<thead>
<tr>
<th>Type of vaccination</th>
<th>Route</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Intramuscular</td>
<td>Human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (POECV); 1.0 mL (deltoid area), one each on days 0, 7, and 21 or 28</td>
</tr>
<tr>
<td>Booster†</td>
<td>Intramuscular</td>
<td>HDCV or PCECV; 1.0 mL (deltoid area), day 0 only</td>
</tr>
</tbody>
</table>

*Day 0 is the day the first dose of vaccine is administered.
†Persons in the continuous-risk category should have a serum sample tested for rabies virus neutralizing antibody every 6 months, and persons in the frequent-risk category should be tested every 2 years. An intramuscular booster dose of vaccine should be administered if the serum titer falls to maintain a value of at least complete neutralization at a 1:5 serum dilution by rapid fluorescent focus inhibition test.
**TABLE 6. Rabies pre-exposure prophylaxis guide — United States, 2008**

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Nature of risk</th>
<th>Typical populations</th>
<th>Pre-exposure recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>Virus present continuously, often in high concentrations. Specific exposures likely to go unrecognized. Bite, nonbite, or aerosol exposure.</td>
<td>Rabies research laboratory workers; rabies biology production workers.</td>
<td>Primary course. Serologic testing every 6 months; booster vaccination if antibody titer is below acceptable level.*</td>
</tr>
<tr>
<td>Frequent</td>
<td>Exposure usually episodic, with source recognized, but exposure also might be unrecognized. Bite, nonbite, or aerosol exposure.</td>
<td>Rabies diagnostic laboratory workers, cavers, veterinarians and staff, and animal-control and wildlife workers in areas where rabies is enzootic. All persons who frequently handle bats.</td>
<td>Primary course. Serologic testing every 2 years; booster vaccination if antibody titer is below acceptable level.*</td>
</tr>
<tr>
<td>Infrequent (greater than population at large)</td>
<td>Exposure nearly always episodic with source recognized. Bite or nonbite exposure.</td>
<td>Veterinarians and animal-control staff working with terrestrial animals in areas where rabies is uncommon to rare. Veterinary students. Travelers visiting areas where rabies is enzootic and immediate access to appropriate medical care including biologics is limited.</td>
<td>Primary course. No serologic testing or booster vaccination.</td>
</tr>
<tr>
<td>Rare (population at large)</td>
<td>Exposure always episodic with source recognized. Bite or nonbite exposure.</td>
<td>U.S. population at large, including persons in areas where rabies is enzootic.</td>
<td>No vaccination necessary.</td>
</tr>
</tbody>
</table>

*Minimum acceptable antibody level is complete virus neutralization at a 1:5 serum dilution by the rapid fluorescent focus inhibition test. A booster dose should be administered if the titer falls below this level.

**TABLE 3. Rabies postexposure prophylaxis guide — United States, 2008**

<table>
<thead>
<tr>
<th>Animal type</th>
<th>Evaluation and disposition of animal</th>
<th>Postexposure prophylaxis recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dogs, cats, and ferrets</td>
<td>Healthy and available for 10 days observation R rabid or suspected rabid Unknown (e.g., escaped)</td>
<td>Persons should not begin prophylaxis unless animal develops clinical signs of rabies.* Immediately begin prophylaxis. Consult public health officials.</td>
</tr>
<tr>
<td>Skunks, raccoons, foxes, and most other carnivores; bats†</td>
<td>Regarded as rabid unless animal proven negative by laboratory test§</td>
<td>Consider immediate prophylaxis. Consult public health officials.</td>
</tr>
<tr>
<td>Livestock, small rodents (rabbits and hares), large rodents (woodchucks and beavers), and other mammals</td>
<td>Consider individually</td>
<td>Consult public health officials. Bites from squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, other small rodents, rabbits, and hares almost never require antirabies postexposure prophylaxis.</td>
</tr>
</tbody>
</table>

* During the 10-day observation period, begin postexposure prophylaxis at the first sign of rabies in a dog, cat, or ferret that has bitten someone. If the animal exhibits clinical signs of rabies, it should be euthanized immediately and tested.
† Postexposure prophylaxis should be initiated as soon as possible following exposure to such wildlife unless the animal is available for testing and public health authorities are facilitating expeditious laboratory testing or it is already known that brain material from the animal has tested negative. Other factors that might influence the urgency of decision-making regarding initiation of postexposure prophylaxis before diagnostic results are known include the species of the animal, the general appearance and behavior of the animal, whether the encounter was provoked by the presence of a human, and the severity and location of bites. Discontinue vaccine if appropriate laboratory diagnostic test (i.e., the direct fluorescent antibody test) is negative.
§ The animal should be euthanized and tested as soon as possible. Holding for observation is not recommended.
TABLE FROM 2010 RECOMMENDATIONS OF THE ADVISORY COMMITTEE ON USE OF REDUCED (4-DOSE) VACCINE SCHEDULE FOR POSTEXPOSURE PROPHYLAXIS TO PREVENT HUMAN RABIES


TABLE 3. Rabies postexposure prophylaxis (PEP) schedule --- United States, 2010

<table>
<thead>
<tr>
<th>Vaccination status</th>
<th>Intervention</th>
<th>Regimen*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not previously vaccinated</td>
<td>Wound cleansing</td>
<td>All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidine-iodine solution) should be used to irrigate the wounds.</td>
</tr>
<tr>
<td></td>
<td>Human rabies immune globulin (HRIG)</td>
<td>Administer 20 IU/kg body weight. If anotanically feasible, the full dose should be infiltrated around and into the wound (s), and any remaining volume should be administered at an anotanical site (intramuscular [IM]) distant from vaccine administration. Also, HRIG should not be administered in the same syringe as vaccine. Because HRIG might partially suppress active production of rabies virus antibody, no more than the recommended dose should be administered.</td>
</tr>
<tr>
<td></td>
<td>Vaccine</td>
<td>Human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) 1.0 mL, IM (deltoid area†), 1 each on days 0, 3, 7 and 14.$</td>
</tr>
<tr>
<td>Previously vaccinated***</td>
<td>Wound cleansing</td>
<td>All PEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as povidine-iodine solution should be used to irrigate the wounds.</td>
</tr>
<tr>
<td></td>
<td>HRIG</td>
<td>HRIG should not be administered.</td>
</tr>
<tr>
<td></td>
<td>Vaccine</td>
<td>HDCV or PCECV 1.0 mL, IM (deltoid area†), 1 each on days 0 and 3.</td>
</tr>
</tbody>
</table>

* These regimens are applicable for persons in all age groups, including children.
† The deltoïd area is the only acceptable site of vaccination for adults and older children. For younger children, the outer aspect of the thigh may be used. Vaccine should never be administered in the gluteal area.
$ Day 0 is the day dose 1 of vaccine is administered.
† For persons with immunosuppression, rabies PEP should be administered using all 5 doses of vaccine on days 0, 3, 7, 14, and 28.
*** Any person with a history of pre-exposure vaccination with HDCV, PCECV, or rabies vaccine adsorbed (RVA); prior PEP with HDCV, PCECV or RVA; or previous vaccination with any other type of rabies vaccine and a documented history of antibody responses to the prior vaccination.

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study

1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form:
     http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   • Workers’ Compensation (within 4 days or as soon as possible):
     http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

---

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**
Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
- ACIP Post Exposure Vaccination Recommendations: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5902a1.htm
- CDC Web Information: http://www.cdc.gov/rabies/
- Iowa State University Technical Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/rabies.pdf

CONTENT REVIEW
This document has been reviewed by:
- CSU subject matter expert: Dr. Richard Bowen
**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.

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**Rickettsia prowazekii**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

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**CONTAINMENT AND SPECIAL PRECAUTIONS**

**Containment**
- BSL-3 level practices, containment equipment and facilities are required for infectious or potentially infected materials, animals, or cultures

**Special Considerations**
- Select Agent

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**HAZARD IDENTIFICATION**

**Disease:** Typhus Fever, Epidemic Typhus, louse-borne typhus fever

**Transmission:** Through ectoparasite bites during feeding or by contamination of bites or wounds with ectoparasite feces; the primary ectoparasite of concern is the human body louse. Can also be transmitted via aerosol transmission of contaminated feces, dried ectoparasite tissues, or cultures and tissue homogenates.

**Communicability:** Person-to-person spread is not documented. Humans can spread the disease to ectoparasites, therefore, infection could occur through exposure to ectoparasites of infected individuals.

**Incubation:** 10-14 days

**Infectious dose:** Less than 10 infectious particles

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**VIABILITY/INACTIVATION**

**Inactivation:**
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde

**Stability**
- Can survive in infected ectoparasite feces for 100 days or more.

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**MEDICAL**

**Signs and symptoms:**
- One to three days of malaise, then abrupt onset of acute symptoms, including:
  - Severe headache and fever
  - Muscle and joint pain
  - Rash
  - Black indented scab at site of bite
  - Abdominal pain, diarrhea
  - Chills
  - Cough
  - CNS symptoms include delirium, seizures, coma, hearing loss
Pre-exposure prophylaxis:
None

Diagnosis:
- PCR test on skin biopsy of rash or bite scab, or EDTA whole blood
- Immunoassays of skin biopsy of rash or bite scab

Treatment
Post-exposure prophylaxis:
- Antimicrobial therapy indicated, early treatment is critical

Treatment of clinical cases:
- Antimicrobial therapy:
  - 200 mg doxycycline daily 3-14 days, or 2.2 mg/kg body weight per dose twice daily

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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3. Individual goes to their personal physician, or as otherwise directed by their physician
REFERENCES

- CBW website: http://www.cbwinfo.com/Biological/Pathogens/RP.html

CONTENT REVIEW

This document has been reviewed by:
- CSU subject matter expert: Dr. Richard Bowen
RICKETTSIA RICKETTSII

PATHOGEN SAFETY DATA SHEET - INFECTION SUBSTANCES

SECTION I - INFECTIOUS AGENT

NAME: Rickettsia rickettsii

SYNONYM OR CROSS REFERENCE: Rocky Mountain Spotted Fever (RMSF), Brazilian Spotted Fever, Tobia Fever, fiebre maculosa, fiebre manchada, New World Spotted Fever, Tick- borne typhus fever, Sao Paulo Fever

CHARACTERISTICS: Rickettsia rickettsii is an obligate intracellular alpha proteobacteria that belongs to the Rickettsiaceae family(1,2,3). It is a small (0.2-0.5 µm by 0.2-0.3 µm) pleomorphic, gram-negative cocccobacillus which multiplies by binary fission and has both DNA and RNA(1,2,3).

SECTION II – HAZARD IDENTIFICATION

PATHOGENICITY/TOXICITY: RMSF is a potentially fatal tick-borne disease normally causing moderate to severe illness(1). It can appear as an abrupt onset of fever (typically higher than 38.9 ºC), malaise, headache, anorexia, nausea, vomiting, abdominal pain, photophobia, diarrhoea and neck stiffness(1,3). The characteristic maculopapular rash usually appears 2-5 days after the other symptoms, starting on wrists and ankles before progressing to the rest of the body(1). 95% of children and 80% of adults have the rash; however, absence of the rash is more common in fatal cases and cases involving the elderly or African-Americans(1). The rash is due to the infection of host vascular endothelial cells and is a multisystem vasculitis that can lead to necrotic or gangrenous lesions in severe cases(1,3). Mucosal ulcers, postinflammatory hyperpigmentation, jaundice, cough, pneumonia, acute renal failure, lymphadenopathy, hepatomegaly, splenomegaly, conjunctivitis, peripheral, periordial and optic disk oedema, arterial occlusion, retinal vein engorgement, retinal haemorrhage and retinal sheathing are some of the complications that can be caused by RMSF(1,3). After the skin, the CNS is the most affected system and people over 15 are at higher risk of developing CNS complications(2). 40% of all patients reported neurological abnormalities such as meningismus, seizures, altered mental states, temporary deafness, lethargy and amnesia(1,3). The symptoms can last 2 weeks although some patients have neurological sequelae lasting up to one year after disease onset. 20% of untreated cases are fatal compared to 5% of treated cases(1). Mortality rates are higher for patients over the age of 60(1). The symptoms of RMSF can be confused with meningococcemia, various viral infections and other tick-borne diseases(1,2).

EPIDEMIOLOGY: The disease is restricted to the Americas where it is common in the United States of America, Western Canada, Mexico, Panama, Costa Rica, Argentina, Brazil, Colombia and Bolivia (1,2,3). It is the most common tick-borne disease in the USA where 250-1200 cases are reported each year(1). 90-93% of the cases reported in the USA occurred between April and October with most of them occurring in rural and suburban areas(1,3). The highest infection rates were among children between 5-9, Caucasians and men(3). Infections are more common in tick-infested areas(1).

HOST RANGE: Humans, dogs, rodents, small mammals and ticks(1,4).

INFECTIOUS DOSE: The precise infectious dose for R. rickettsii is unknown; however rickettsiales generally have a very low infectious dose. The bite of a single tick is sufficient to cause RMSF in humans(1,3). Dogs that were inoculated with approximately 3000 vero cells infected with RMSF or...
infected with 10 ticks all developed clinical symptoms of the disease (5).

**MODE OF TRANSMISSION:** RMSF is usually spread by the bite of an infectious tick where the bacterium changes from a dormant avirulent state to a pathogenic state (1). The tick normally needs to be attached for a 4-6 hour period in order to transmit the disease to humans (1). *Rickettsia rickettsii* can also be spread through contact with the tick’s infected saliva, blood, bodily fluids or feces (1,2,3). Human-to-human transmission has not been confirmed but aerosols are a potential source of infection (4,2).

**INCUBATION PERIOD:** The incubation period is from 2-14 days after the bite of an infected tick (1,3).

**COMMUNICABILITY:** Human-to-human transmission through infectious droplets is suspected but still remains to be proven (7). Ticks are infective for life (2).

**SECTION III - DISSEMINATION**

**RESERVOIR:** The disease is maintained by transovarial and transstadial passages in ticks where it is then spread to humans, dogs, rodents and other mammals (1,2). Small mammals can serve as amplifying hosts by maintaining the bacteria in their blood (they are infective for a maximum of 8 days) and then passing it to a tick during a blood meal (6).

**ZOO NOSIS:** The disease is spread from ticks to humans through the bite, or contact with tick feces or internal contents (1,2,3). Mammals (such as dogs) can also spread the ticks to humans, thus spreading the RMSF infection (2,4).

**VECTORS:** Several tick species are responsible for the spread of this disease (1). *Dermacentor variabilis* is most prevalent in the United States of America, *Demacentor andersoni* in the Rocky Mountains and in Canada, *Rhipicephalus sanguineus* in Mexico, *Amblyomma cajennense* in Central and South America and *Amblyomma aureolatum* in Brazil (1).

**SECTION IV – STABILITY AND VIABILITY**

**DRUG SUSCEPTIBILITY:** Tetracyclines and chloramphenicol are the only drugs that are confirmed as being effective against an infection by *Rickettsia rickettsii* (1). The most effective and recognized antibiotic used to treat RMSF is doxycycline (1,3).

**SUSCEPTIBILITY TO DISINFECTANTS:** Gram-negative bacteria are susceptible to 1% sodium hypochlorite, 4% formaldehyde, 2% glutaraldehyde, 70% ethanol, 2% peracetic acid, 3- 6% hydrogen peroxide and 0.16% iodine (4).

**PHYSICAL INACTIVATION:** *Rickettsia rickettsii* is susceptible to moist heat (121 ºC for at least 15 minutes) and dry heat (170 ºC for at least 1 hour) (2).

**SURVIVAL OUTSIDE HOST:** The organism is stable in tick tissues, feces and blood or hemolymph; however, it does not survive long outside its host (1,6,10).

**SECTION V – FIRST AID / MEDICAL**

**SURVEILLANCE:** Monitor for symptoms. The presence of the pathogen can be confirmed using a variety of laboratory techniques (11). Immunofluorescent assays (IFAs) and ELISAs can be used to identify antibodies to the bacteria; however, sera must be tested at least 7 days after the appearance of symptoms in order to detect seroconversion because IgG antibodies do not appear until a minimum of 7 days after the onset of the disease (3). A four-fold increase in titres of paired samples or a convalescent titre greater 1/64 is considered diagnostic (1). The bacteria can be visualized using Giemsa and Gimenez staining methods. Immunohistochemical staining of skin biopsies can be useful in patients presenting with rash (1,2,3). Immunohistochemical staining is the most useful method to diagnose RMSF in severe cases (12). PCR of blood, biopsy tissues and ticks is possible although this technique is not sensitive enough to be commonly used to diagnose RMSF and most diagnoses of the disease are retrospective (1,2).
Note: All diagnostic methods are not necessarily available in all countries.

**FIRST AID/TREATMENT**: Appropriate antibiotic therapy (i.e. doxycycline) should be initiated at the onset of RMSF-like symptoms without waiting for laboratory confirmation of the diagnosis\(^{(11,13)}\). 100 mg of doxycycline should be taken twice a day for 5-7 days and until the patient is afebrile for at least 2-3 days\(^{(1,2)}\). For children weighing less than 45 kg, a 2.2 mg/ kg twice daily dose of doxycycline is recommended for 5 to 7 days\(^{(1,2)}\).

**IMMUNIZATION**: None\(^{(11)}\)

**PROPHYLAXIS**: The administration of the appropriate antibiotic treatment before any signs of clinical illness is not recommended\(^{(2)}\).

### SECTION VI - LABORATORY HAZARDS

**LABORATORY-ACQUIRED INFECTIONS**: 63 laboratory-acquired infections have been reported as of date with 11 deaths\(^{(11)}\). The 11 fatal cases were associated with manipulating infected eggs, tissue cultures or ticks, and the respiratory route, mucous membrane contact, needle puncture wounds or cuts were involved\(^{(13)}\). 9 cases were reported in the same lab over a 6 year period, all caused by infectious aerosols\(^{(2)}\).

**SOURCES/SPECIMENS**: Tissues and blood from ticks or infected animals\(^{(1)}\).

**PRIMARY HAZARDS**: Accidental parenteral inoculation and exposure to infectious aerosols are the primary hazards when working with RMSF\(^{(11)}\). Infected mammals and arthropods are also a risk\(^{(11)}\).

**SPECIAL HAZARDS**: None

### SECTION VII – EXPOSURE CONTROLS / PERSONAL PROTECTION

**RISK GROUP CLASSIFICATION**: Risk group 3\(^{(14)}\).

**CONTAINMENT REQUIREMENTS**: Containment Level 3 facilities, equipment, and operational practices for work involving infected or potentially infected material, including necropsy of infected animals, arthropods, inoculation, incubation and harvesting of embryonated eggs or tissue cultures.

**PROTECTIVE CLOTHING**: Personnel entering the laboratory should remove street clothing and jewellery, and change into dedicated laboratory clothing and shoes, or don full coverage protective clothing (i.e., completely covering all street clothing). Additional protection may be worn over laboratory clothing when infectious materials are directly handled, such as solid-front gowns with tight fitting wrists, gloves, and respiratory protection. Eye protection must be used where there is a known or potential risk of exposure to splashes\(^{(15)}\).

**OTHER PRECAUTIONS**: All activities with infectious material should be conducted in a biological safety cabinet (BSC) or other appropriate primary containment device in combination with personal protective equipment. Centrifugation of infected materials must be carried out in closed containers placed in sealed safety cups, or in rotors that are loaded or unloaded in a biological safety cabinet. The use of needles, syringes, and other sharp objects should be strictly limited. Open wounds, cuts, scratches, and grazes should be covered with waterproof dressings. Additional precautions should be considered with work involving animals or large scale activities\(^{(15)}\).

### SECTION VIII - HANDLING AND STORAGE

**SPILLS**: Allow aerosols to settle and, wearing protective clothing, gently cover spill with paper towels and apply appropriate disinfectant, starting at the perimeter and working towards the centre. Allow sufficient contact time before clean up (30 min)\(^{(15)}\).

**DISPOSAL**: Decontaminate all wastes before disposal by incineration or steam sterilization\(^{(15)}\).
**STORAGE:** The infectious agent should be stored in a sealed and identified container in a level 3 containment laboratory(15).

**SECTION IX – REGULATORY AND OTHER INFORMATION**

**REGULATORY INFORMATION:** The import, transport, and use of pathogens in Canada is regulated under many regulatory bodies, including the Public Health Agency of Canada, Health Canada, Canadian Food Inspection Agency, Environment Canada, and Transport Canada. Users are responsible for ensuring they are compliant with all relevant acts, regulations, guidelines, and standards.

**UPDATED:** July 2010

**PREPARED BY:** Pathogen Regulation Directorate, Public Health Agency of Canada.

Although the information, opinions and recommendations contained in this Pathogen Safety Data Sheet are compiled from sources believed to be reliable, we accept no responsibility for the accuracy, sufficiency, or reliability or for any loss or injury resulting from the use of the information. Newly discovered hazards are frequent and this information may not be completely up to date.

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**REFERENCES:**


Date Modified: 2011-02-18
Rift Valley Fever Virus

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment
- BSL-3 Level practices, containment equipment and facilities are required for work involving potentially infected materials. ABSL-3 Level practices are required for studies involving rodents.

Special considerations:
- Select Agent
- Mosquito borne disease

HAZARD IDENTIFICATION

Disease: Rift Valley Fever

Transmission: Mosquito, direct contact through open wound with blood or organs of infected animal, aerosols

Incubation: 3-12 days, typically 2-6 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Stability: Virus remains viable in aerosols for more than 1 hour at 25 C. Quickly destroyed by pH changes in decomposing carcasses, virus can survive for as long as 4 months at 4 C in neutral or alkaline pH, mixed with serum or other proteins.

Inactivation:
- Autoclave sensitive
- Resistant to neutral and alkaline pH, can survive 8 years below freezing
- Susceptible to low pH, lipid solvents, detergents and sodium or calcium hydroxide

MEDICAL

Signs and symptoms:
- Fever
- Weakness
- Back pain
- Dizziness
- Weight loss
- Recover 2-7 days post infection
- More severe disease –
  - Hemorrhagic fever
  - Encephalitis
  - Ocular disease

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Pre-exposure prophylaxis:

Investigational vaccine through USAMRIID

Diagnosis:
Serology – Neutralization tests, ELISA or EIA to check for IgM
RT-PCR
Serum taken:
Day of exposure, and 10-14 days post infection to detect 4-fold rise in titer

Treatment:
- Post-exposure prophylaxis:
  - Supportive care and possibly ribavirin and interferon
- Treatment of clinical cases:
  - Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Biosafety Incident report form: [link]
   - Workers’ Compensation (within 4 days or as soon as possible): [link]
4. Employee follows up with CSU Authorized Treating Physician

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1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
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1. Contact supervisor/PI
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REFERENCES

- CDC Website: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/Fact_Sheets/Rift%20Valley%20Fever%20Fact%20Sheet.pdf
- Iowa State University Fact Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/rift_valley_fever.pdf
- WHO Fact Sheet: http://www.who.int/mediacentre/factsheets/fs207/en/

CONTENT REVIEW

This document has been reviewed by:
- CSU subject matter expert: Dr. Richard Bowen
Semliki Forest Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

**Containment:** BSL-3 Level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, cultures, or mosquitoes.

**Special considerations:**
- Mosquito-borne virus
- Immunocompromised should take caution

HAZARD IDENTIFICATION

**Disease:** Self-limiting and mild

**Transmission:** Mosquito bite, aerosol transmission in laboratory

**Incubation:** unknown

**Infectious dose:** unknown

VIABILITY/INACTIVATION

**Inactivation:**
- Autoclave sensitive
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol, organic solvents, detergents

MEDICAL

**Signs and symptoms:**
- Usually asymptomatic or very mild
- When present, symptoms include headache, fever, myalgia (muscle pain)
- Only one fatal case known. Patient was immunocompromised, suffered encephalitis due to a laboratory exposure to high concentration of virus.

**Pre-exposure prophylaxis:**
None

**Diagnosis:**
Unknown

**Treatment:**

**Post-exposure prophylaxis:**
- Supportive care

**Treatment of clinical cases:**
- Treatment is supportive and symptomatic
WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   • The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   • Biosafety Incident report form:
     http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
   • Workers’ Compensation (within 4 days or as soon as possible):
     http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up with CSU Authorized Treating Physician

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)
4. After the visit to CSU Health Network, student fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
• BMBL: http://www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf
• Atkins, Gregory J., B. J. Sheanan and P. Liljestrom. (1999). The molecular pathogenesis of Semliki Forest Virus: a model virus made useful? Journal of General Virology, 80, 2287-2297 (http://vir.sgmjournals.org/content/80/9/2287.full)

CONTENT REVIEW

This document has been reviewed by:
• CSU subject matter expert: Dr. Carol Blair
Severe fever with thrombocytopenia syndrome virus expands its borders

Ying Wu1 and George F Gao1,2

Emerging Microbes and Infections (2013) 2, e36; doi:10.1038/emi.2013.36; published online 19 June 2013

The war on emerging pathogens is intensifying in 2013.

The outbreak of avian-origin influenza A (H7N9) virus in eastern China1,2 has reminded the world of the imminent threat of unexpected pathogens, including an “old” virus, influenza. Recent conversation has centered on H5N1, H9N2, H7N3, and H7N7, but never before had we considered H7N9 to be the cause of outbreaks of human infection or the next possible pandemic. Maybe we have to take a closer look at the possibility of reassortment among any of the 16 hemagglutinins and 9 neuraminidases subtypes, and even within the newly identified bat-derived, influenza-like virus H17N10.3,4

A new coronavirus, called human coronavirus Erasmus Medical Center (hCoV-EMC) (with a recent proposed new name as Middle East respiratory syndrome coronavirus, or MERS-CoV in abbreviation), has caused alarm in the Middle East, as human infection was first reported in March 2012.5 In one year, as of May 12, 2013, there have been 34 cases, with 18 fatalities in total (www.who.org). More importantly, human-to-human transmission has been reported, with second-generation infections in France and the UK in those individuals who have had close contact with patients with a history of travel to the Middle East.

Less publicized but equally significant, the recently emerged severe fever with thrombocytopenia syndrome virus (SFTSV) expanded its geographic spectrum in 2012–2013, from China to the USA, and now to Japan.

SFTSV-induced disease was first suspected in China in 2009, and the virus was isolated and confirmed in 2011.6 SFTSV is a new member of the genus Phlebovirus, with over 70 known members in the genus, which is in the family Bunyaviridae. Although the phlebovirus has been found in Africa and Europe for many years, SFTSV is the first-ever virus of this type isolated in China.6–10 The virus is known as the Heartland virus after the name of the place (Heartland, Missouri) where the virus was first isolated in the USA. The Heartland virus is phylogenetically distinct from SFTSV isolated in China, although similar clinical manifestations have been observed.9

Early this year, SFTSV was confirmed in western regions of Japan. Officials referred to the etiological agent of this outbreak as the same that caused disease in China, or SFTSV. However, these two agents are similar but not identical. As Dr. William L. Nicholson from the USA Centers for Disease Control and Prevention (CDC) suggested, these viruses could be considered as “cousins.”

The viruses from three countries are too different to be linked in their transmission. The viruses are most likely of the same type but with local origins. In fact, both USA Heartland virus- and Japanese SFTSV-infected patients were retrospectively confirmed, and travel by certain patients can be traced back to 2009 for the USA and the summer of 2012 for Japan. Scientists from both countries are now working on several earlier suspected cases. There is no evidence that the patients in the USA or Japan had travelled to China. Therefore, it seems the virus has been in the USA and Japan for some time. The three viruses may not have a common origin but certainly cause similar or even the same symptoms and clinical outcomes.

In China, SFTSV has caused an approximately 12% case fatality rate (CFR), which is an alarming number for this country.6,11 Retrospective cases in Japan have an even higher CFR, with four deaths out of eight confirmed cases (additional suspected cases still need to be confirmed). The infected areas in China are concentrated in central China, covering six provinces. The major clinical symptoms and signs in the patients from the three countries are the same: high fever, thrombocytopenia, leucopenia, and elevated levels of serum hepatic enzymes. Although this group of viruses is transmitted by ticks, there is evidence in China that person-to-person transmission was highly probable through direct blood contact when the index patients had high viremia.12–14 Therefore, SFTSV is indeed a dangerous pathogen, and precautionary measures should be implemented in epidemic areas. Although no virus has yet been isolated from ticks, reverse transcription polymerase chain reaction (RT-PCR) tests on tick samples revealed evidence of virus.

To prevent infection and a possible epidemic, a call for vaccine development has been made in China. Scientists from the China CDC are working on this task in collaboration with large pharmaceutical companies. As high-level viremia is observed in acutely infected patients, therapeutic human-origin monoclonal antibodies or even antisera will serve as lifesaving agents that should be developed in the near future. Studies on pathogenesis, tick transmission, and useful animal models should also be pursued. A comparative study of the viruses from China, the USA, and Japan will
answer many questions about the origins and diversity of these viruses.

Indeed, our war on emerging pathogens may never end.
Sindbis Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures.
- BSL-3 practices, containment equipment and facilities are recommended for insect work

Special considerations:
- Mosquito-borne virus

HAZARD IDENTIFICATION

Disease: Epidemic polyarthritis and rash

Transmission: Mosquito bite

Incubation: less than 7 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Stability: Survives at room temperature in blood for up to 2 days.

Inactivation:
- Autoclave sensitive
- 1% sodium hypochlorite (500 ppm available sodium hypochlorite), 70% ethanol, 2% gluteraldehyde, organic solvents/detergents

MEDICAL

Signs and symptoms:
- Typically a self-limiting febrile disease:
  - Fever
  - Rash
  - Arthralgia (joint pain) or arthritis
  - Lassitude (diminished energy)
  - Headache
  - Myalgia (muscle pain)
  - Rash on trunk progressing to face, legs, palms, soles—lasts ~10 days
  - Jaundice – rare
  - Myocardial damage – rare
Pre-exposure prophylaxis:

None

Diagnosis:

Testing serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer.

Treatment:

Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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3. After the Emergency Room visit, individual fills out the following forms:
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2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
- CDC Information: [http://www.cdc.gov/ncidod/eid/vol10no5/03-0689.htm](http://www.cdc.gov/ncidod/eid/vol10no5/03-0689.htm)

**CONTENT REVIEW**

This document has been reviewed by:

• CSU subject matter expert: Dr. Carol Blair
**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.

St. Louis Encephalitis Virus

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

**Containment:**
- BSL-3 Level practices, containment equipment and facilities are required for work involving potentially infected materials, animals, cultures, or mosquitoes.

**Special considerations:**
- Mosquito-borne virus

HAZARD IDENTIFICATION

**Disease:** St. Louis encephalitis

**Transmission:** Mosquito bite

**Incubation:** 4-21 days

**Infectious dose:** unknown

VIABILITY/INACTIVATION

**Inactivation:**
- Autoclave sensitive
- 1% - 10% bleach (500- 5000 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, organic solvents, detergents

MEDICAL

**Signs and symptoms:**
- Most infections are asymptomatic
- Acute inflammatory disease of short duration, potentially involving the brain, spinal cord and meninges
- Severe infections have acute onset:
  - High fever
  - Headache
  - Nausea
  - Myalgia (joint pain)
  - Malaise (discomfort)
  - Meningeal signs – stupor, coma, convulsions, paralysis
  - Individuals over 60 have high rate of acute encephalitis

**Pre-exposure prophylaxis:**
None

**Diagnosis:**
Testing Serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer
Treatment:
Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
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2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student Not Paid by CSU**
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

**Volunteers and Visitors**
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician

**REFERENCES**
- CDC Information on Symptoms and Treatment: [http://www.cdc.gov/sle/](http://www.cdc.gov/sle/)

**CONTENT REVIEW**

This document has been reviewed by:
- CSU subject matter expert: Dr. Carol Blair
**Mycobacterium tuberculosis Complex (MTC)**  
*(M. tuberculosis, M. bovis, M. microti, M. africanum, M. pinnipedii, M. caprae, and M. canetti)*

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

### CONTAINMENT AND SPECIAL PRECAUTIONS

**Containment**
- BSL-3 Level practices, containment equipment and facilities are required for work involving infectious materials, animals, cultures and for activities with a high potential for aerosol production
- BSL2 practices and containment equipment can be utilized for handling some clinical specimens. Consult with CSU Biosafety office related to such work.

**Special Considerations**
- Many of the strains worked with at CSU are drug resistant and researchers should be aware of strains being worked with and antibiotic resistance profiles.
- Immuno-compromised individuals and those with pre-existing lung damage (e.g. cystic fibrosis, emphysema, smokers) are more susceptible.

### HAZARD IDENTIFICATION

**Disease:** Tuberculosis (TB). There is more than one form of TB. For most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop them from growing. The bacteria are thought to remain alive in the body but can become active later. When there is infection but there are no signs or symptoms of TB, this is called latent TB infection and is manifest by evidence of a positive skin test or blood test (see below) but with no symptoms of disease. However, some people can go on to develop active TB from the latent infection. People with a compromised immune system such as certain immune problems, malignancies, medications, diabetes, other diseases and especially HIV are at particular risk of tuberculosis.

**Transmission:** Direct contact with mucous membranes or broken skin, injection, injection, aerosols, fomites; M. bovis can be transmitted by eating or drinking contaminated, unpasteurized milk products, and by inhalation of bacteria in the exhalation of infected animals

**Communicability:** Person to person by the aerosol route

**Incubation:** 2-12 weeks from infection to the development of a positive TB skin test or blood test for TB.

**Infectious dose:** as low as 1-10 bacilli, organisms can be stable in the environment

### VIABILITY/INACTIVATION

**Stability:** Can survive on surfaces and in soil for months.

**Inactivation:**
- Mycobacteria are very resistant to inactivation, and inactivation methods should species and strain being worked with.
- Mycobacteria are autoclave sensitive, but longer cycles may be required
The following disinfectants may be effective for inactivation, depending on species, strain, and conditions:
  - Sensitive to 5% phenol or 5% formaldehyde, 2% glutaraldehyde.
  - Minimum of 20% bleach (10,000 ppm available sodium hypochlorite) (Note that bleach should not be used when waste will be subsequently processed by autoclaving)
  - For a list of EPA Registered tuberculocidal products: http://www.epa.gov/oppad001/list_b_tuberculocide.pdf

**MEDICAL**

**Signs and symptoms:**
- A cough that lasts 3 weeks or longer
- Pain in the chest
- Coughing up sputum and/or blood
- Weakness or fatigue
- Weight loss
- No appetite
- Chills
- Fever
- Night sweats

**Pre-exposure prophylaxis:**
BCG vaccine is available but not used routinely in the United States.

**CSU TB Surveillance:** All personnel with the potential for occupational exposure to the MTB complex must be enrolled in the TB Surveillance Program. This consists of routine tuberculin skin testing every 6 or 12 months, depending on risk.

**Diagnosis:**
- TB Tuberculin Skin Test: Consists of injecting a small amount of tuberculin fluid (purified protein derivative of TB) under the skin to check for an inflammatory reaction (induration). Test must be read 48 to 72 hours by a trained health care professional.
- Blood test: Interferon-Gamma Release Assay (IGRA) may be used and is often done on individuals that are TB skin test positive or BCG vaccinated to determine if the skin reaction could be specific to tuberculosis.
- Chest X-Ray
- Culture of sputum
- Direct smear microscopy for acid fast bacilli
- Genetic methods (PCR, DNA probes, DNA fingerprinting)

**Treatment:**
- **Post-Exposure Prophylaxis**
  - Prophylactic antibiotic regimen may be initiated, depending on the strain involved and the nature of the exposure.
  - Skin testing is performed the day of the incident, then 10 weeks later and patient is monitored for symptoms.
- **Treatment of clinical cases:**
  - Persons who develop latent infection are offered treatment (usually isoniazid for 9 months). Treatment for active disease due to tuberculosis is dependent on the antibiotic susceptibility of the strain of *M. tuberculosis*.
Treatment could be a combination of isoniazid (INH), rifampin (RIF), ethambutol (EMB) and pyrazinamide (PZA) if the strain is fully susceptible.

**Disclaimer**

WHAT TO DO IF AN EXPOSURE OCCURS

**Employees, Graduate Students, Work Study**
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed.
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to an Authorized Treating Physician.
3. After the visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up as directed.

**Student Not Paid by CSU**
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Student goes to CSU Health Network (Formerly Hartshorn Health Services)

**Volunteers and Visitors**
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician

**REFERENCES**
- CDC Web Page: http://www.cdc.gov/tb/
- MMWR Recommended Treatment of Exposed Individuals: http://www.cdc.gov/mmwr/preview/mmwrhtml/00031296.htm
- MMWR Recommended Treatment of Infected Individuals: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm
- Sanger Institute: http://www.sanger.ac.uk/resources/downloads/bacteria/mycobacterium.html
CONTENT REVIEW
This document has been reviewed by:

- CSU subject matter experts: Drs. Karen Dobos and Mary Jackson
**Vesicular Stomatitis Virus**

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

**CONTAINMENT AND SPECIAL PRECAUTIONS**

Containment:
- BSL-2 Level practices, containment equipment and facilities are recommended for work involving potentially infectious materials, animals, cultures, or mosquitos.
- BSL-3 Level practices, containment equipment and facilities are required for inoculation of large animals with field isolates of virus.

Special considerations:
- Exotic VSV is a USDA Select Agent (Indiana Subtypes: VSV-IN2, VSV-IN3), Requires a USDA permit to ship.
- Most commonly acquired from contact with infected hosts (cattle, horses)
- Vector-borne transmission possible in some cases

**HAZARD IDENTIFICATION**

Disease: Vesicular stomatitis

Transmission: aerosol, needlesticks, direct contact with skin abrasions, contact with animals, fomites, sand flies, and black flies.

Communicability: No evidence of person-to-person transmission

Incubation: 1-6 days

Infectious dose: unknown

**VIABILITY/INACTIVATION**

Inactivation:
- Autoclave sensitive

Inactivation:
- Autoclave sensitive
- UV light
- Lipid solvents
- 1-10% bleach (500-5000 ppm sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, 2.5% phenol, 0.4% HCL, 2% sodium carbonate, 4% sodium hydroxide, 2% iodophore disinfectants

Stability: Can survive up to 4 days on items contaminated with infected saliva
- Can survive up to 4 days on items contaminated with infected saliva (out of direct sunlight)
MEDICAL

Signs and symptoms:
- Fever
- Muscle aches
- Headache
- Malaise
- Vesicles are RARE
- Recovery in 4 to 7 days

Pre-exposure prophylaxis:
None

Diagnosis:
Serum testing for antibody at day 0 and day 7-14 (or 14-35 days after symptoms occur). Confirmation by viral isolation from throat swabs or blood. PCR available

Treatment (Post-Exposure Prophylaxis/Treatment):
Supportive treatment for symptomatic cases - Disease is self-limiting

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed.
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to an Authorized Treating Physician.
3. After the visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): http://www.ehs.colostate.edu/WWorkComp/Home.aspx
4. Employee follows up as directed.

Student Not Paid by CSU
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Student goes to CSU Health Network (Formerly Hartshorn Health Services)

Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician
REFERENCES

- http://www.cfsph.iastate.edu/Factsheets/pdfs/vesicular_stomatitis.pdf

CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter expert: Dr. Richard Bowen
West Nile Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

**Containment:** BSL-3 Level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, cultures, or mosquitos.

**Special considerations:**
- Can cross placenta and present in breast milk

HAZARD IDENTIFICATION

**Disease:** West Nile Fever, Neuroinvasive West Nile

**Transmission:** mosquitos, exposure to broken skin or mucous membranes, needlesticks, transplacental and breast milk. Potential hazard in handling, including necropsy of infected birds.

**Incubation:** 3-12 days

**Infectious dose:** unknown

VIABILITY/INACTIVATION

**Inactivation:**
- Autoclave sensitive
- 1% sodium hypochlorite, 3% hydrogen peroxide, 70% ethanol, 2% glutaraldehyde, 1% iodine, phenolics and 3-8% formaldehyde

MEDICAL

**Signs and symptoms:**

**West Nile Fever**
- Flu-like symptoms
- Anorexia
- Nausea
- Swollen lymph nodes
- Vomiting
- Sore throat
- Conjunctivitis
- Skin rash on chest, stomach or back
- Fever
- Headache
- Resolve in 2 to 6 days
Neuroinvasive West Nile

- Encephalitis – changes in consciousness, disorientation, ataxia, incoordination, tremors, involuntary movements
- Meningitis – fever, headache, stiff neck, photophobia
- Flaccid paralysis – resembles polio, weakened limbs, muscle aches, abnormal bowel and bladder control, dizziness, vertigo

Pre-exposure prophylaxis:
NONE – no vaccine currently approved for use in US

Diagnosis:
Serology – presence of IgM in serum or cerebrospinal fluid, ELISA, plaque reduction neutralization tests, indirect immunofluorescence, (Cross reactivity with yellow fever, Japanese encephalitis, St. Louis encephalitis, or dengue)
Serum taken:
Day of exposure, and 10-14 days post infection to detect 4-fold rise in titer

Treatment (Post-Exposure Prophylaxis/Treatment):
Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
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Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
REFERENCES

- CDC Website: http://www.cdc.gov/ncidod/dvbid/westnile/index.htm
- Iowa State University Fact Sheet: http://www.cfsph.iastate.edu/Factsheets/pdfs/west_nile_fever.pdf

CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter expert: Dr. Richard Bowen
Yellow Fever Virus

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CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-3 level practices, containment equipment and facilities are required for infectious or potentially infected materials, animals, cultures, or insects
- Yellow fever vaccine, YFV-17D, may be handled at BSL-2

Special considerations:
- Mosquito-borne virus

HAZARD IDENTIFICATION

Disease: Yellow fever

Transmission: Mosquito bite

Communicability: No evidence of person to person transmission

Incubation: 3-6 days

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% - 10% bleach (500-5000 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde, organic solvents, detergents

MEDICAL

Signs and symptoms (The majority of infected persons have no illness or only mild illness)

May be viremic for 3-6 days before symptoms occur:
- Fever and chills
- Severe headache
- Back pain
- Muscle aches
- Nausea
- Fatigue
- Weakness

Remission:
- Fever and other symptoms subside, and most people recover.

Toxic phase:

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**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**
• High fever returns
• Jaundice
• Bleeding from nose, mouth, and eyes
• Headache
• Back pain
• Nausea
• Vomiting (black vomit)
• Abdominal pain
• Fatigue
• Bruising
• Protein in urine

Late stages:
• Hypotension
• Shock
• Metabolic acidosis
• Acute tubular necrosis
• Heart, liver and Myocardial dysfunction
• Cardiac arrhythmia
• Confusion
• Seizures
• Coma

Pre-exposure prophylaxis:
• Live vaccine available – a single dose lasts 10 years or more, booster needed after 10 years
• All researchers working in CSU’s BRB Virology Phase III Facility must be vaccinated prior to working with YFV
• Vaccination for visitors

Diagnosis:
• Testing serum taken at day of exposure and day 14 to check for 4-fold rise in antibody titer
• IgM ELISA (MAC-ELISA) for serum antibodies during first 5 days after exposure
• RT-PCR for virus RNA during first 5 days after exposure

Treatment:
  Post-exposure prophylaxis:
  • Supportive care
  Treatment of clinical cases:
  • Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

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Volunteers and Visitors
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Individual goes to their personal physician, or as otherwise directed by their physician
4. Individual fills out Biosafety Incident Report form
   http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf

REFERENCES
- CDC Information for Health Care Providers: http://www.cdc.gov/yellowfever/healthCareProviders/index.html
- WHO Fact Sheet: http://www.who.int/mediacentre/factsheets/fs100/en/

CONTENT REVIEW
This document has been reviewed by:
- CSU subject matter expert: Dr. Carol Blair

http://www.ehs.colostate.edu/WBiosafety/PDF/IncidentReportForm.pdf
- Workers’ Compensation (within 4 days or as soon as possible):
  http://www.ehs.colostate.edu/WWorkComp/Home.aspx

4. Employee follows up with CSU Authorized Treating Physician
Yersinia pestis

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment
- BSL-3 level practices, containment equipment, and facilities are required for work involving infectious body fluids, tissues, animals and cultures.

Special considerations:
- Select Agent, Tier 1
- Zoonotic

HAZARD IDENTIFICATION

Disease: Bubonic, pneumonic and septicemic plague

Transmission: Bite of infected flea, inhalation, animal-to-human or person-to-person transmission by human fleas or directly in pneumonic plague, handling infected tissues, touching or skinning infected animals

Communicability: Person to person spread possible through aerosol transmission

Incubation: Generally 1-8 , depending on form: Percutaneous: 2-8 days; pneumatic 1-6 days; Septicemic 1-4 days

Infectious dose: Unknown

VIABILITY/INACTIVATION

Stability: Viable in soil, water, carcasses, hides, and grains for several weeks, and longer at near freezing temperatures. Killed within several hours of exposure to sunlight and disinfectants, or within 15 minutes of exposure to 55°C. Aerosolized bacteria will survive up to one hour, depending on conditions.

Inactivation:
- Autoclave sensitive
- 1% Sodium hypochlorite, 70% Ethanol, 2% glutaraldehyde, iodines, phenolics and formaldehyde

MEDICAL

Signs and symptoms:
- Bubonic (flu-like, with enlarged lymph nodes)
  - Sudden onset:
    - Headache
    - Fever
    - Malaise (discomfort)
    - Swollen and painful lymphnodes
  - Myalgia (joint pain)
  - Vomiting, nausea
  - Abdominal pain
**Pneumonic (Lung infection)**
- Sudden onset:
  - High fever
  - Headache
  - Malaise (discomfort)
  - Myalgia (joint pain)
  - Cough (could have bloody sputum)
- Chills
- Nausea, vomiting
- Diarrhea, abdominal pain
- Respiratory failure

**Septicemic (Blood infection)**
- Sudden onset:
  - Fever
  - Headache
  - Chills
  - Malaise (discomfort)
  - Myalgia (joint pain)
- Nausea, Vomiting
- Abdominal pain
- Hypotension
- Meningitis -- rare

Pre-exposure prophylaxis:
NONE – Vaccine currently unavailable in the United States

Medical Surveillance:
- Before working with or around this agent, individuals must enroll in CSU’s medical surveillance program through the CSU Occupational Health Program.

Diagnosis:
- CDC Resource for diagnosis: [http://www.cdc.gov/plague/healthcare/clinicians.html](http://www.cdc.gov/plague/healthcare/clinicians.html)
- Organism cultured from sputum, blood or aspirates of lymph node on blood agar, MacConkey or infusion broth.
- PCR and immunoassays done at CDC-Fort Collins.
- Latex agglutination tests, passive hemagglutination and complement fixation tests available.
- Serum taken:
  - Day of exposure (or as early as possible) and 4-6 weeks after disease onset and >14 days post infection to detect 4-fold rise in titer

Treatment:
- CDC Resource for clinicians: [http://www.cdc.gov/plague/healthcare/clinicians.html](http://www.cdc.gov/plague/healthcare/clinicians.html)
- **Post Exposure Prophylaxis:**
  - Doxycycline (100 mg, orally every 12 hours); Ciprofloxacin (500 mg, orally every 12 hours). **Chemoprophylaxis should be started within 24 hours and continue for 7 days after last known or suspected exposure**
- **Treatment of clinical cases:**
  - Streptomycin (streptomycin 30 mg/kg/day administered IM in 2 divided doses) for 10 days
- Gentamicin can be used due to toxicity or immediate nonavailability of streptomycin (5 mg/kg IV once daily or 2 mg/kg loading dose followed by 1.7 mg/kg IV every 8 hours)
- Tetracycline: loading dose 2g then 2g daily in 4 divided doses for 7 to 10 days
- Chloramphenicol 25 mg/kg every 6 hours IV

**WHAT TO DO IF AN EXPOSURE OCCURS**

**Employees, Graduate Students, Work Study**
1. Employee notifies Biosafety (970-491-0270) and/or Occupational Health Program Coordinator (970-420-8172) to inform where medical attention will be sought and if transportation is needed
   - The Principal Investigator/Supervisor must also be notified
2. Employee goes to Emergency Room
3. After the Emergency Room visit, individual fills out the following forms:
   - Workers’ Compensation (within 4 days or as soon as possible): [http://www.ehs.colostate.edu/WWorkComp/Home.aspx](http://www.ehs.colostate.edu/WWorkComp/Home.aspx)
4. Employee follows up with CSU Authorized Treating Physician

**Student Not Paid by CSU**
1. Contact supervisor/PI
2. Student or supervisor contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed
3. Student goes to CSU Health Network (formerly Hartshorn Health Services)

**Volunteers and Visitors**
1. Contact supervisor/PI
2. Contact Biosafety (491-0270) or Occupational Health (420-8172) to inform where attention is being sought, and to arrange transportation if needed.
3. Individual goes to their personal physician, or as otherwise directed by their physician

**REFERENCES**
- CDC Website: [http://www.cdc.gov/plague/](http://www.cdc.gov/plague/)
- CDC Information for Clinicians: [http://www.cdc.gov/plague/healthcare/clinicians.html](http://www.cdc.gov/plague/healthcare/clinicians.html)
- Iowa State University Fact Sheet: [http://www.cfsph.iastate.edu/Factsheets/pdfs/plague.pdf](http://www.cfsph.iastate.edu/Factsheets/pdfs/plague.pdf)
CONTENT REVIEW

This document has been reviewed by:

- CSU subject matter expert: Dr. Richard Bowen
- Licensed Physicians: Occupational Health Services (principal: Dr. Tracy Stefanon)
Zika Virus

Principal investigators are responsible for communicating this information to staff working with or around this agent, and for mitigation of associated risks. This document is not intended to be used as a sole source for diagnosis, medical treatment, or medical advice. Consult a CSU Authorized Treating Physician for concerns about work related medical conditions.

CONTAINMENT AND SPECIAL PRECAUTIONS

Containment:
- BSL-2 level practices, containment equipment and facilities are recommended for infectious or potentially infected materials, animals, or cultures

Special considerations:
- Mosquito-borne virus
- Closely related to Dengue virus

HAZARD IDENTIFICATION

Transmission: Mosquito bite

Incubation: Unknown

Infectious dose: unknown

VIABILITY/INACTIVATION

Inactivation:
- Autoclave sensitive
- 1% bleach (500 ppm available sodium hypochlorite), 70% ethanol, 2% glutaraldehyde organic solvents, detergents

MEDICAL

Signs and symptoms:
- Mild symptoms, lasting only 2-4 days:
  - Fever
  - Conjunctivitis
  - Transient arthritis, mainly in smaller joints of hands and feet
  - Maculo-papular rash (often starting on the face, then spreading)

Pre-exposure prophylaxis:

NONE – no vaccine currently approved for use

Diagnosis:
- Serum taken:
  - Day of exposure and from acutely ill patients 5 days after onset of fever. Serological tests may cross react with other flaviviruses.
- RT-PCR (CDC, Fort Collins)
Treatment

Post-exposure prophylaxis:
- Supportive care

Treatment of clinical cases:
- Treatment is supportive and symptomatic

WHAT TO DO IF AN EXPOSURE OCCURS

Employees, Graduate Students, Work Study
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3. Individual goes to their personal physician, or as otherwise directed by their physician

REFERENCES
- ProMed Mail Post, Archive Number 20130529.1744108: http://www.promedmail.org/direct.php?id=20130529.1744108

**CONTENT REVIEW**

This document has been reviewed by:
- CSU subject matter expert: Dr. Brian Foy

**Disclaimer** This document is for informational purposes ONLY. This document should not be used in lieu of professional medical attention, and medical professionals should seek appropriate resources for diagnosis and treatment.**