Viral Hemorrhagic Fevers
Viral Hemorrhagic Fevers

- Diverse group of illnesses caused by RNA viruses from 4 families:
  - Arenaviridae, Bunyaviridae, Filoviridae, Flaviridae
  - Differ by geographic occurrence and vector/reservoir
  - Share certain clinical and pathogenic features

- Potential for aerosol dissemination, with human infection via respiratory route (except dengue)

- Target organ: vascular bed

- Mortality 0.5 - 90%, depending on agent
Viral Hemorrhagic Fevers

• Category A agents
  – Filoviruses
  – Arenaviruses

• Category C agents
  – Hantaviruses
  – Tick-borne hemorrhagic fever viruses
  – Yellow fever
Viral Hemorrhagic Fevers
Transmission

• Zoonotic diseases
  – Rodents and arthropods main reservoir
  – Humans infected via bite of infected arthropod, inhalation of rodent excreta, or contact with infected animal carcasses

• Person-to-person transmission possible with several agents
  – Primarily via blood or bodily fluid exposure
  – Rare instances of airborne transmission with arenaviruses and filoviruses

• Rift Valley fever has potential to infect domestic animals following a biological attack
# Viral Hemorrhagic Fevers

## Summary of Agents

<table>
<thead>
<tr>
<th>Virus Family</th>
<th>Virus/Syndrome</th>
<th>Geographic occurrence</th>
<th>Reservoir or Vector</th>
<th>Human-human transmission?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arenaviridae</strong></td>
<td></td>
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<tr>
<td></td>
<td>Junin (Argentine HF)</td>
<td>S.America</td>
<td>Rodents</td>
<td>Lassa Fever – yes, via body fluids; others – not usually</td>
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<tr>
<td></td>
<td>Machupo (Bolivian HF)</td>
<td>S.America</td>
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<td></td>
<td>Guanarito (Brazilian HF)</td>
<td>S.America</td>
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<tr>
<td></td>
<td>Sabia (Venezuelan HF)</td>
<td>S.America</td>
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<tr>
<td></td>
<td>Lassa (Lassa Fever)</td>
<td>West Africa</td>
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<tr>
<td><strong>Flaviridae</strong></td>
<td></td>
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<tr>
<td></td>
<td>Yellow Fever</td>
<td>Tropical Africa, Latin America</td>
<td>Mosquitoes</td>
<td>Yellow Fever – blood infective up to 5d of illness; Others - No</td>
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<tr>
<td></td>
<td>Dengue Fever</td>
<td>Tropical areas</td>
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<td></td>
<td>Kyanasur Forest Disease</td>
<td>India</td>
<td>Ticks</td>
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<tr>
<td></td>
<td>Omsk HF</td>
<td>Siberia</td>
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<tr>
<td>Bunyaviridae</td>
<td>Congo-Crimean HF</td>
<td>Crimea, parts of Africa, Europe &amp; Asia</td>
<td>Ticks</td>
<td>Congo-Crimean Hemorrhagic Fever – yes, through body fluids; Rift Valley Fever, Hantaviruses – no</td>
</tr>
<tr>
<td></td>
<td>Rift Valley Fever</td>
<td>Africa</td>
<td>Mosquitoes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hantaviruses (Hemorrhagic Renal Syndrome/Hantavirus Pulmonary Syndrome)</td>
<td>Diverse</td>
<td>Rodents</td>
<td></td>
</tr>
<tr>
<td>Filoviridae</td>
<td>Ebola HF</td>
<td>Africa</td>
<td>Unknown</td>
<td>Yes, body fluid transmission</td>
</tr>
<tr>
<td></td>
<td>Marburg HF</td>
<td>Africa</td>
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</tr>
</tbody>
</table>
Viral Hemorrhagic Fevers
Clinical Presentation

• Clinical manifestations nonspecific, vary by agent

• Incubation period 2-21 days, depending on agent

• Onset typically abrupt with filoviruses, flaviviruses, and Rift Valley fever

• Onset more insidious with arenaviruses
Viral Hemorrhagic Fevers
Initial Symptoms

Prodromal illness lasting < 1 week may include:

- High fever
- Headache
- Malaise
- Weakness
- Exhaustion
- Dizziness
- Muscle aches
- Joint pain
- Nausea
- Non-bloody diarrhea
Viral Hemorrhagic Fevers
Clinical Signs

- Flushing, conjunctival injection ("red eye")
- Pharyngitis
- Rash
- Edema
- Hypotension
- Shock
- Mucous membrane bleeding
VHF Surveillance: Clinical Identification of Suspected Cases

• Clinical criteria:
  – Temperature 101° F (38.3° C) for <3 weeks
  – Severe illness and no predisposing factors for hemorrhagic manifestations
  – 2 or more of the following:
    • Hemorrhagic or purple rash
    • Epistaxis
    • Hematemesis
    • Hemoptyisis
    • Blood in stools
    • Other hemorrhagic symptoms
    • No established alternative diagnosis

JAMA 2002;287
Adapted from WHO
Viral Hemorrhagic Fevers
Treatment

• Supportive care

• Correct coagulopathies as needed

• No antiplatelet drugs or IM injections

• Investigational treatments, available under protocol:
  – Ribavirin x 10 days for arenaviridae and bunyaviridae
  – Convalescent plasma w/in 8d of onset for AHF
Viral Hemorrhagic Fevers
Management of Exposed Persons

• Medical surveillance for all potentially exposed persons, close contacts, and high-risk contacts (i.e., mucous membrane or percutaneous exposure) x 21 days
  – Report hemorrhagic symptoms (slide 47)
  – Record fever 2x/day
    • Report temperatures ≥ 101°F(38.3°C)
      ■ Initiate presumptive ribavirin therapy

• Percutaneous/mucocutaneous exposure to blood or body fluids of infected:
  – Wash thoroughly with soap and water, irrigate mucous membranes with water or saline
Viral Hemorrhagic Fevers
Management of Exposed Persons

• Patients convalescing should refrain from sexual activity for 3 months post-recovery (arenavirus or filovirus infection)

• Only licensed vaccine: Yellow Fever

• Investigational vaccines: AHF, RV, HV

• Possible use of ribavirin to high-risk contacts of CCHF and LF patients
Viral Hemorrhagic Fevers
Infection Control

• Airborne & contact precautions for health care, environmental, and laboratory workers

• Negative pressure room, if available
  – 6-12 air changes/hour
  – Exhausted outdoors or through HEPA filter

• Personal protective equipment
  – Double gloves
  – Impermeable gowns, leg and shoe coverings
  – Face shields and eye protection
  – N-95 mask or PAPR
Viral Hemorrhagic Fevers
Infection Control

• Dedicated medical equipment for patients
• If available, point-of-care analyzers for routine laboratory analyses
  - If unavailable, pretreat serum w/Triton X-100
  - Lab samples double-bagged & hand-carried to lab
• Prompt burial or cremation of deceased with minimal handling
  - Autopsies performed only by trained personnel with PPE
Viral Hemorrhagic Fevers
Summary of Key Points

• A thorough travel and exposure history is key to distinguishing naturally occurring from intentional viral hemorrhagic fever cases.

• Viral hemorrhagic fevers can be transmitted via exposure to blood and bodily fluids.
Viral Hemorrhagic Fevers
Summary of Key Points

• Contact and airborne precautions are recommended for health care workers caring for infected patients.

• Post-exposure management consists of surveillance for fever and hemorrhagic symptoms, and possibly ribavirin therapy for symptomatic individuals.
Case Reports

• Tularemia
  MMWR Morb Mortal Wkly Rep 2001;50(33)

• Viral Hemorrhagic Fevers
  MMWR Morb Mortal Wkly Rep 2001;50(5)
Resources

• Centers for Disease Control & Prevention
  – Bioterrorism Web page:  http://www.bt.cdc.gov/
  – CDC Office of Health and Safety Information System (personal protective equipment)

    http://www.cdc.gov/od/ohs/

• USAMRIID -- includes link to on-line version of Medical Management of Biological Casualties Handbook

    http://www.usamriid.army.mil/
Resources

• Office of the Surgeon General: Medical Nuclear, Biological and Chemical Information
  
  http://www.nbc-med.org

• St. Louis University Center for the Study of Bioterrorism and Emerging Infections
  
  http://bioterrorism.slu.edu