Ebola

The Deadly African Virus

Presented by
Claudia Hacker
Ebola Virus Introduction

- First appeared in Africa 1976
- “African Hemorrhagic Fever”
  - acute, mostly fatal disease
  - causes blood vessel “bursting”
  - systemic (all organs/tissues)
  - humans and nonhuman primates
- Excluding ‘2000 outbreak
  - 1,500 cases
  - over 1,000 deaths
Ebola Taxonomy

Scientific Classification

Order: *Mononegavirales*
Family: *Filoviridae*
Genus: *Ebola like viruses*
Species: *Ebola*

Subtypes

- Ebola-Zaire, Ebola-Sudan, Ebola-Ivory Coast
  - disease in humans
- Ebola-Reston
  - disease in nonhuman primates
Filoviridae or “Filoviruses”

- Most mysterious virus group
- Pathogenesis poorly understood
- Ebola
  - natural history/reservoirs unknown
  - exist throughout the world
  - endemic to Africa
  - filamentous ssRNA^- (antisense) viruses

Image courtesy of the Centers for Disease Control
Ebola Pathogenesis

- Enters Bloodstream
  - skin, membranes, open wounds

- Cell Level
  - docks with cell membrane

- Viral RNA
  - released into cytoplasm
  - production new viral proteins/ genetic material

- New viral genomes
  - rapidly coated in protein
  - create cores
Ebola Pathogenesis, cont

• Viral cores
  – stack up in cell
  – migrate to the cell surface
  – produce trans-membrane proteins
  – push through cell surface
  – become enveloped by cell membrane

• ssRNA\(^{-}\) Genome Mutations
  – capable of rapid mutation
  – very adaptable to evade host defenses and environmental change

• Theory
  – virus evolved to occupy special niches in the wild
Symptoms and Diagnostic Tests

• Early symptoms
  – muscle aches, fever, vomiting
  – red eyes, skin rash, diarrhea, stomach pain

• Acute symptoms
  – bleeding/hemorrhaging from skin, orifices, internal organs

• Early Diagnosis
  • very difficult
  • signs & symptoms very similar to other infections

• Laboratory Test
  • PCR detection
  • ELISA (enzyme-linked immuno-absorbant) assay
Treatment

• No Standard Treatment available

• Patients receive supportive therapy
  • treating complicating infections
  • balancing patient’s fluids and electrolytes
  • maintaining oxygen status and blood pressure
Prevention

• No vaccines!

• Patients are isolated

• Medical Staff Training
  – western sanitation practices
    • intake
    • care during stay
    • after patient dies

• Infection-control Measures
  – complete equipment and area sterilization
Prevention

After Death

Virus contagious in fluids for days

• Burial use extreme caution
  – handling and transport
  – cultural practices/ religious belief
  – incinerate all waste !!!!
• Reservoirs in Nature
  – largely unknown
  – possibly infected animals (primates?)

• Transmission
  – direct contact blood/secretions of infected person
  – possible airborne (Reston primate facility)

• Onset of illness abrupt
  – incubation period: 2 to 21 days
  – infections are acute and mostly deadly
Latest Morbidity and Mortality Reports

• Ebola-Reston Virus Infection Among Quarantined Nonhuman Primates -- Texas, 1996
  – report describes death and blood testing of cynomolgus monkey imported from the Philippines held in a private quarantine facility in Texas

• Outbreak of Ebola Hemorrhagic Fever ---Uganda, August 2000--January 2001
  – report describes surveillance and control activities related to the EHF outbreak
  – presents preliminary clinical and epidemiologic findings
**Current Basic Research**

- The assembly of Ebola virus nucleocapsid requires virion-associated proteins 35 and 24 and posttranslational modification of nucleoprotein
  - Report describes distinct VP35 and VP24 proteins mechanism of regulation for filovirus assembly
  - suggests new approaches for viral therapies and vaccines for Ebola and related viruses

- Detection of antibodies against the four subtypes of Ebola virus in sera from any species using a novel antibody-phage indicator assay
  - assesses the presence of specific antibodies in serum
  - describes development of a novel assay for the detection of seroconversion irrespective of Ebola virus subtype or animal species
References

• Reemergence of Ebola Virus in Africa; Anthony Sanchez et al, EID Volume 1 * Number 3 July-September 1995
  [http://www.cdc.gov/ncidod/EID/vol1no3/sanchez.htm]

• Viral Hemorrhagic Fever, Healthlink, Medical College of Wisconsin, 2000
  [http://healthlink.mcw.edu/article/956159073/8EFL]

• Isolation and Phylogenetic Characterization of Ebola Viruses Causing Different Outbreaks in Gabon
  Emerging Infectious Diseases, National Center for Infectious Diseases, Centers for Disease Control and Prevention, February 5, 1997
  [http://www.cdc.gov/ncidod/EID/vol3no1/courbot2.htm]

• Hemorrhagic fevers; Julia Barrett, Gale Encyclopedia of Medicine, Gale Research, 1999
  [http://www.findarticles.com/cf_dls/g2601/0006/2601000652/p1/article.jhtml]

• Key Issues in the Prevention and Control of Viral Hemorrhagic Fevers Clarence J. Peters, MD, Special Pathogens Branch/Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases/Centers for Disease Control and Prevention, 1997
  [http://www.cdc.gov/od/ohs/sympsium/symp43.htm]

• Scientific Stock Images Library; Russell Kightley Media, Australia

• Outbreak of Ebola Hemorrhagic Fever ---Uganda, August 2000--January 2001,
  Morbidity and Mortality Weekly Report, Vol 50, No 05;73, 02/09/2001 / 50(05);73-7
  [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5005a1.htm]

• Ebola-Reston Virus Infection Among Quarantined Nonhuman Primates -- Texas, 1996
  Morbidity and Mortality Weekly Report, Vol 45, No 15;314, April 19, 1996 / 45(15);314-316
  [http://www.cdc.gov/mmwr/preview/mmwrhtml/00040920.htm]


Detection of antibodies against the four subtypes of ebola virus in sera from any species using a novel antibody-phage indicator assay.; Meissner F et al., PMID: 12350353