EBOLA

Christina Liscynesky, MD
Assistant Professor of Internal Medicine
Division of Infectious Diseases
Associate Medical Director of Epidemiology
Sudan - June 27, 1976

- **Nazra Township Cotton factory storekeeper became ill**
  - 48 cases / 27 deaths
  - Contact was admitted to local hospital in Maridi

- **Unrelated cases continued in cotton factory workers July-Oct.**

Sudan 1976

- Barrier nursing/disposable isolation equipment established early October
- WHO team arrived on October 20, 1976
  - Isolation precautions
- Last case occurred on November 20, 1976

284 cases, 151 deaths (mortality rate 53%)

Zaire - September 1, 1976

- First Case in Yambuku hospital
- 5 syringes/needles
- Sept 30th - hospital closed
  - 11/17 HCW died
- Last case – Nov 5th

318 cases: 280 deaths
88% mortality

Content Providers: CDC/ Dr. Lyle Conrad; Photo Credit: Joel G. Breman, M.D., D.T.P.H; 1976

Ebolavirus

- Sudan ebolavirus (SUDV)
- Zaïre ebolavirus (EBOV)
- Taï Forest (Ivory Coast) ebolavirus (TAFV)
- Bundibugyo ebolavirus (BDBV)

- Reston ebolavirus (RESTV)
Guinea- December 2013

- Guéckédou, Guinea
  - 2yr old Child
  - Fever, black stool, vomiting
  - Onset Dec. 2, 2013; died Dec. 6, 2013

- Transmitted from HCW (patient #14) to neighboring towns
  - HCW died Feb. 10, 2014

- March 10, 2014 – Guinea Ministry of Health Notified

- March 14, 2014- Outbreak team in place

111 suspect cases: 79 deaths (71% mortality)

Transmission

- Zoonotic - introduced to humans through close contact with infected animal’s bodily fluids
  - **Fruit bats**
  - Chimpanzees
  - Gorillas
  - Monkeys
  - Forest Antelope
  - Porcupines
Human to Human Transmission

- Direct contact with infected bodily secretions

- Indirect contact with contaminated environments
  - In lab study: Ebola can remain active for up to 6 days
  - Environmental cxs: 2/33 samples positive for Ebola
    - Blood stained physical glove
    - Bloody IV insertion site

- Direct contact with infected corpses

- Men who survive can transmit virus via semen for up to 7 weeks

http://www.who.int/mediacentre/factsheets/fs103/en/


High Risk Exposures

- Percutaneous
  - needle stick or mucous membrane exposure to body fluids

- Direct care or exposure to body fluids without appropriate personal protective equipment (PPE)

- Participation in funeral rites
Low Risk Exposures

- Household member or other casual contact with an EVD patient

- Providing patient care or casual contact without high-risk exposure with EVD patients
Ineffective Transmission

Previous epidemics have calculated that 1 primary human case of Ebola generates only 1 to 3 secondary cases on average.

1 case of Measles in West Africa generates 14-17 cases.


Clinical Manifestations

- Incubation period of 8-10 days (range 2-21)
- Abrupt onset of fever, with HA and myalgia
  - Nausea, vomiting, abdominal pain, and diarrhea
  - Maculopapular rash by day 5-7
  - Chest pain, shortness of breath
  - Hemorrhage
  - Confusion, seizures

Differential Diagnosis

- Malaria
- Typhoid Fever
- Dengue
- Lassa Fever
- Shigellosis
- Meningococcal septicemia
- Plague
- Relapsing fever

- Marburg Virus
- Yellow fever
- Viral hepatitis
- Anthrax
- Chikungunya fever
- Leptospirosis
- Typhus
Pathogenesis

- Monocytes, macrophages, and dendritic cells are infected early
- Virus suppresses type 1 interferon responses and induces cytokine and chemokine release
- Virus replicates, released and migrates to local lymph nodes, travels through the lymphatic system to blood
- Virus disseminated throughout the body

Pathogenesis (cont)

- Lymphocytes undergo apoptosis, which undermines adaptive immunity
- Hepatocellular necrosis $\rightarrow$ DIC
- Adrenal necrosis $\rightarrow$ Hypotension, Impaired Steroid Synthesis

- Extensive tissue necrosis and shock
Diagnostic labs tests

- Ebola virus is detectable in blood only after onset of symptoms
- Detectable by real-time RT-PCR between 3 to 10 days post-onset of symptoms
Lab Abnormalities

- Leukopenia
- Thrombocytopenia – 50 to 100K range
- Transaminitis: AST>ALT
- Proteinuria may be present
- PT and PTT prolonged
- Fibrin elevated
Fatal Illness

- LFTS and D-dimer higher in fatal illness.
- Calcium <6mg/dL associated with death
- Median survival of 9 days
- Most patients die during the second week
- Alive on day 14 portends >75% survival
- Fatally infected patients do not develop an AB response

Treatment

- Supportive care
- Antibiotics for secondary infections

- September 4-5, WHO scheduled conference on potential Ebola therapies and vaccines in Geneva
Experimental Therapeutics

- **ZMapp™** - composed of three monoclonal antibodies directed against the Ebola Zaire virus strain.
- **TkM-Ebola** - small interfering RNAs targeting EV RNA polymerase L
- **AVI-7537** - which targets EV protein VP24 through an RNA interference technology
- **BCX-4430** - an adenosine analogue that is active against EV in rodents
- **chloroquine and imatinib**, have shown activity against EV in vitro and, in some cases, in rodent models.
Additional References

Dr. Margaret Isaacson as she was tending to the needs of an Ebola patient in a Yambuku, Zaire hospital theatre block that was used as a temporary ICU for Ebola patients during the country’s 1976 outbreak.

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CDC Ebola Hemorrhagic Fever site: www.cdc.gov/ebola


http://www.nejm.org/page/ebola-outbreak