

The Threat of a Virus

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Infectious diseases –continuing threats

- In the 1950's, interest in the infectious diseases diminished as new antibiotics, vaccines, and treatment methods became available.
 - Tropical medicine was not well supported
 - Nobelist Macfarlane Burnett and others:
'Infectious diseases are substantially conquered: major efforts should now begin to be diverted to the chronic diseases'

Expanding populations and advances in virology brought new diseases:
Lassa, monkeypox, Marburg, Rift Valley, Kyasanur Forest Disease

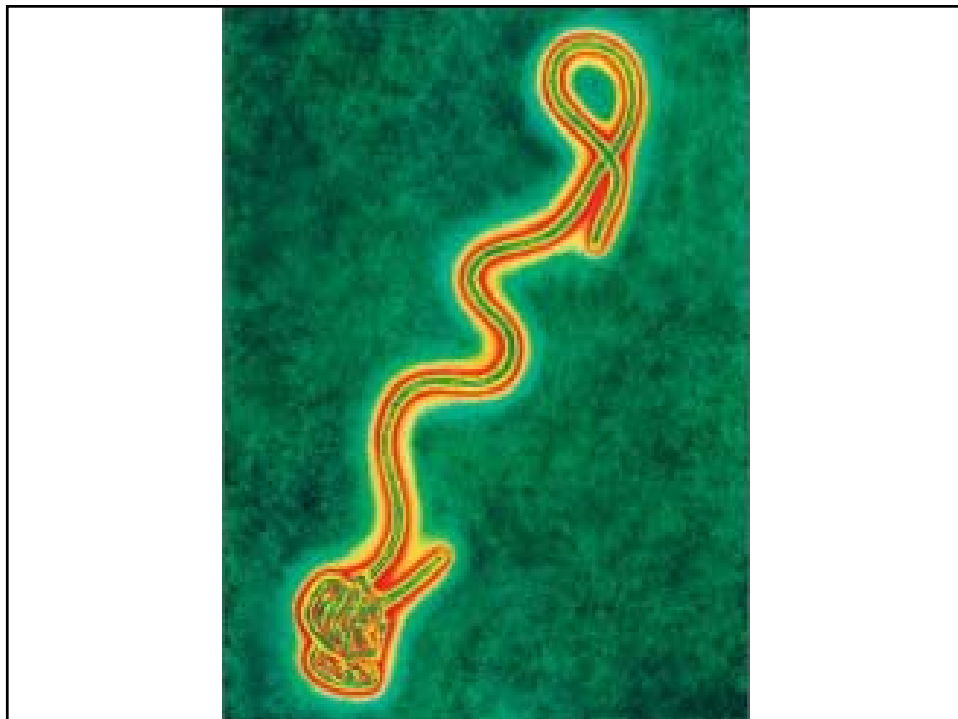
HIV appeared on the scene (1982) – and others

- Hendra, Nipah, SARS, MERS, dengue, new influenza strains
- **EBOLA (1976)**

How significant is the Ebola epidemic?

December, 2014

- "A colossus that continues to gather force"
Center for Strategic and International Studies
- "Spiraling out of control"
Dr. Tom Frieden, Director of CDC
- "Moving beyond our grasp"
Dr. David Navarro, UN Coordinator
- "The world is losing the battle to contain it"
Dr. Joanne Lieu, President MSF



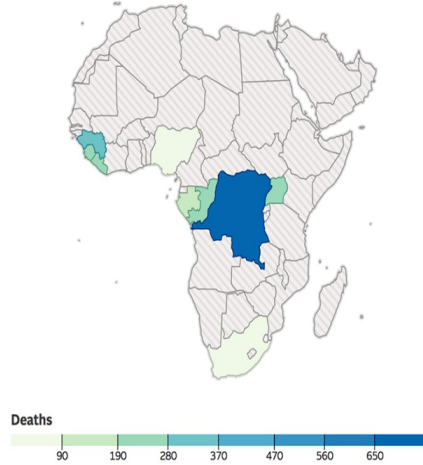
The Zaire Ebola epidemic--1976

- First case – Sept. 1: WHO organized team arrived Oct. 18
"Hemorrhagic fever epidemic : 11 of 17 hospital staff are dead"
 280 cases in 55 of 550 rural villages (pop. 238,000)
 Many cases due to contact in hospital (120 beds)
 Only 20% of household contacts but rapid spread at funerals
- Measures taken
 Isolation of ill patients in the hospital wards
 Gowns and masks for hospital staff
 Traditional burial practices strongly discouraged
- Last case on Nov. 9 (duration– 3 months)

Ebola outbreaks– 1976 to 2012

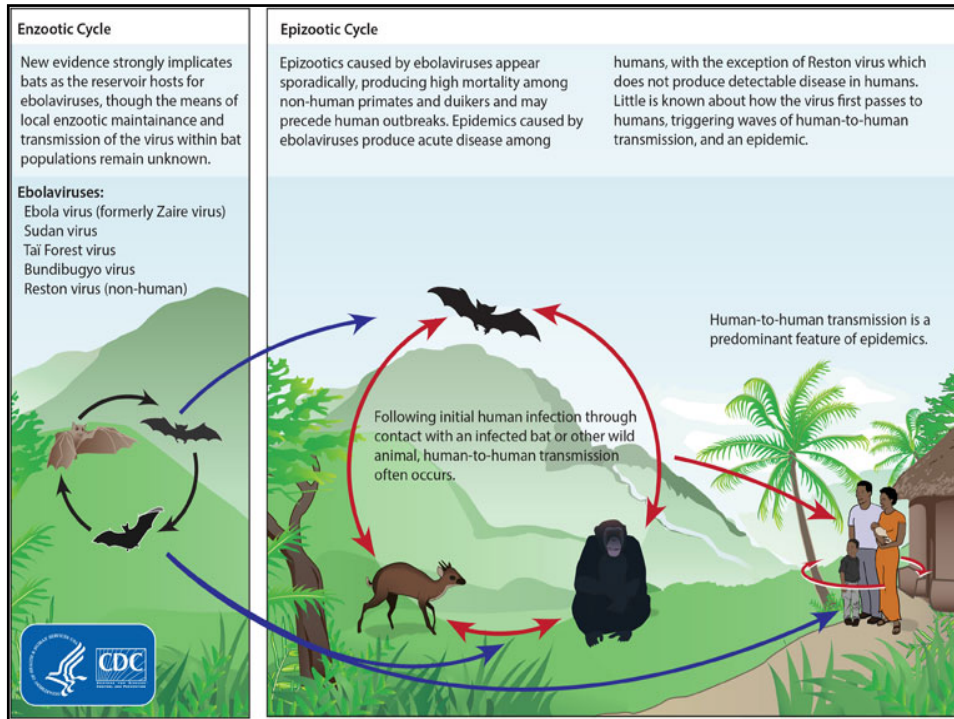
- Over the 36 year period, 17 outbreaks
- Size of outbreaks – 17 cases to 425 cases
- Countries involved -- all in central part of Africa
 Primarily in Democratic Republic of the Congo (Zaire)
 Also in bordering areas of Uganda, Sudan, Gabon
- Case-fatality rates: generally 50 to 75%
- Pattern of spread: household, burial practices, hospital
Note: No outbreaks in major urban area
All were stopped within weeks to a few months
- Small-scale laboratory research programs began

Ebola deaths 1976-present



Source: CDC.





Clinical characteristics of Ebola

See: WHO Ebola Response Team: NEJM: 371;1481-1496

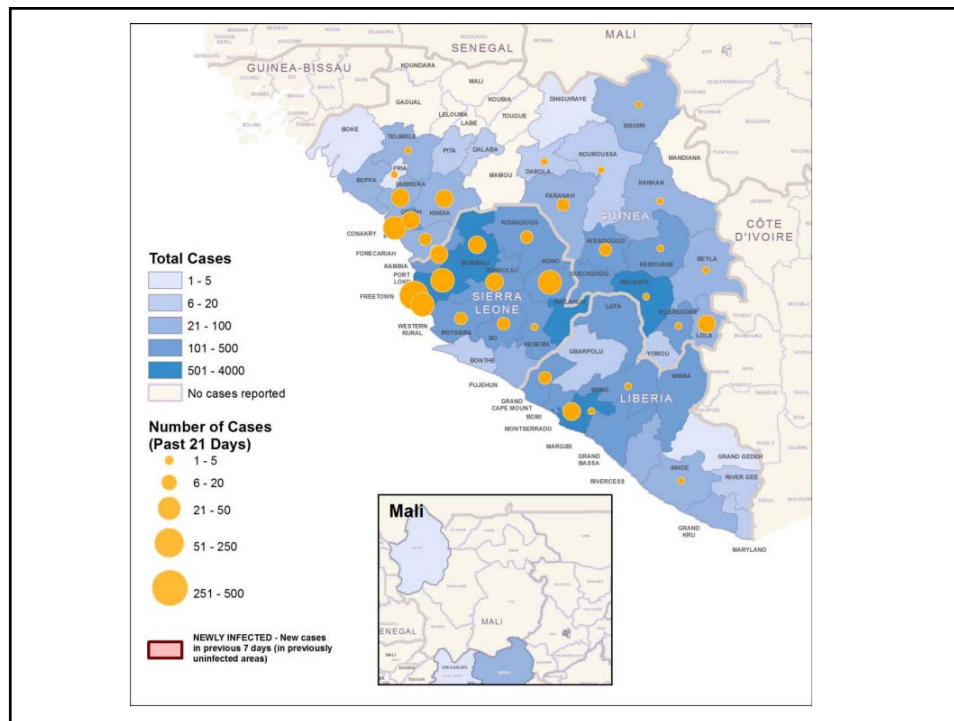
- Clinical manifestations (%) (~500 cases)

Fever	87
Headache	53
Anorexia	64
Vomiting	68
Diarrhea	66
Muscle, joint pain	38
Unexplained bleeding	18
- Patients and death rate (~1000 cases)

<u>Age</u>	<u>%</u>	<u>Death rate (%)</u>
<15	14	73
15-44	61	66
45+	25	80
- Interval between exposure and death: 5 to 20 days

Dimensions of the present epidemic

- Began in Guinea -- Dec. 2013; first reports to WHO – March 2014
- Cases and deaths (as of 17 January)
 - 21,171 cases; 8371 deaths (actual-probably 2 to 4 times this)
 - Over 550 cases were health staff– more than half died
- Three countries account for almost all cases
 - Guinea, Liberia, Sierra Leone – 20 million people
 - Area is 85% as large as Thailand; 33% as many people
- Imported into Nigeria*, Mali*, Senegal, Spain, U.S., U.K.
 - *limited local spread of cases



Basic strategy for control

SPREAD OF VIRUS IS BY DIRECT CONTACT- not droplets

- Isolate patients in a restricted treatment center or hut
 - Provide food and water
 - No visitors allowed
- Persons who come into contact with patient to wear gown, mask, covering for head and feet
- Dead bodies to be transferred in a sealed bag by special teams
- Bodies to be deeply buried
- Family and close contacts to be checked for next 21 days
(Attempts to isolate contacts for 21 days abandoned)





Challenges of gowns and masks

- Extreme shortages of equipment of all types
- Limited time for wearing because of heat (60-90 min.)
- Challenge of removing gowns and masks without skin or eye contact
- Decontamination of gear

Among other problems

- Patients feared hospitals – many resisted entry and sometimes fled
Health care staff were masked, wearing identical gowns
Visitors were not allowed.
Patients fearful: not more than one in four would leave the hospital alive
Acute shortages of IV fluids, drugs of all types
- Recruitment of health staff (national and international) is difficult
- Traditional burial rituals are firmly embedded
May extend over many days and involve numerous friends and family
Customary practice is for participants to touch or stroke body

Ebola generated panic and fed a disaster

- Commercial impact
 - Most airlines suspended flights
 - Some shipping lines refused to dock
 - Business and tourist travel came to a standstill
- International restrictions
 - Screening of all travelers from the 3 countries for any suggestive symptoms; possible 21 day isolation and/or daily monitoring
 - Some countries applied these and other stipulations to some or all individuals intending to visit from various countries of Africa
- Economic and development impacts now foreseen to be catastrophic.

What of the future?

- Will Ebola spread throughout Africa? To other countries?
 - How soon will we have drugs for treatment?
 - What about vaccines?
- Are there other viruses which should concern us?

Lessons to be learned

- There will be other epidemic threats!
Increasing densities of population, more frequent and rapid travel, and closer contact with natural ecosystems dictate more viral diseases spreading more rapidly.
- Early detection, diagnosis, and rapid control are essential
Infectious disease expertise in major medical centers
Laboratories for diagnosis and research
Field epidemiologists to characterize and respond
- Public Health infrastructure for communication, public mobilization

An historical perspective

- One of the most feared of epidemic problems was smallpox in a densely populated city -- this was despite the fact that we had a good vaccine to protect contacts and to prevent its spread.
- Last year, the Ebola virus invaded, for the first time, three comparatively small cities -- Conakry, Monrovia, and Freetown. No one in the population had natural immunity and there was no protective vaccine available.
- The results were disastrous.