

In a sea of viruses

Belinda Beresford

- Science is the belief in the ignorance of experts
- Richard Feynman

- Viral haemorrhagic fevers
- zoonotic
- Nosocomial
- Fomites

Zoonotic - a chronic infection, stay alive in the host for long whiles, or have a non-human reservoir in which to live while waiting for new hosts to pass by. In fact, for many 'human' diseases, the human is actually an accidental victim and a dead-end host. (This is the case with rabies, anthrax, tularemia, West Nile virus, and many others). Thus much of human development has been in relation to zoonotic, not epidemic, diseases.

Fomites – inanimate objects that can carry pathogens

Many modern diseases, even epidemic diseases, started out as zoonotic diseases. It is hard to be certain which diseases jumped from other animals to humans, but there is good evidence that measles, smallpox, influenza, HIV, and diphtheria came to us this way. The common cold, and tuberculosis may also have started in other species.

Nosocomial – result from treatment in a healthcare setting, secondary to the original problem.

Fomites – stethoscopes, neckties, medical equipment

Viral Haemorrhagic Fevers

- RNA viruses
- Arenaviridae – Lassa, Virus X
- Filoviridae – Marburg, Ebola
- Bunyaviridae – Rift valley fever virus, Crimean-Congo
- Togaviridae -
- Flaviviridae – yellow fever, dengue fever
- The real Black Death?

Possible that the Black Death was actually a VHF and not the Bubonic plague.

- Yellow fever – mosquitoes
- Dengue - mosquitoes
- Lassa – urine/faeces, direct transmission
- Ebola – reservoir unknown
- Marburg – reservoir unknown
- Crimean-Congo haemorrhagic fever (CCHF) – ticks
- Rift valley fever (RVF) – mosquitoes

Yellow fever – particularly bad about it – there is a vaccine. Not a perfect vaccine, but there is still a vaccine that would prevent many deaths.

Dengue – spreading rapidly

Lassa- multimammate mouse – 20 offspring at once

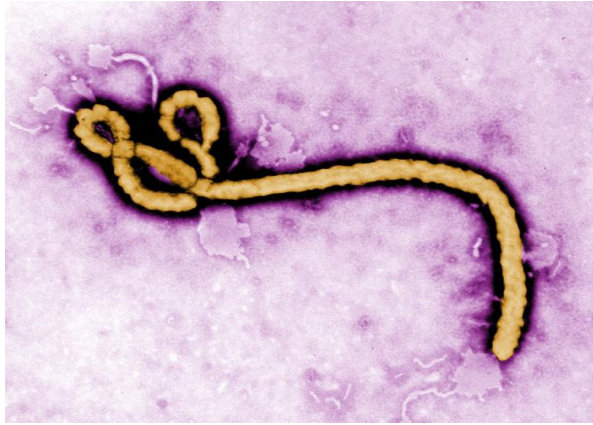
Ebola haemorrhagic fever

- Discovered 1976 Zaire/Sudan
- Ebola River.
- Four subtypes – Ebola – Zaire, - Sudan, Cote d'Ivoire, - Reston
- One of most virulent viral diseases known - Zaire strain approx 90%
- Death in 50-90% of clinically ill cases
- 1 871 cases
- 1 296 deaths documented between 1976 2005 approx 70%
- Transmission - direct contact with the blood, body fluids and tissues of infected people and chimpanzees, fomites
- Where does it come from – possibly bats
- Not known to be airborne – except Reston
- Killing gorillas

Found in all kinds of animals, primates, duikers

Ebola cont.

- November 2007 Uganda confirmed an Ebola outbreak
- New species confirmed
- 149 cases – 37 deaths



Ebola virus

CDC/ Cynthia Goldsmith

Weaponization

- No vaccine/treatment
- Biosafety Level 4 agent
- Category A bioterrorism agent
- A select agent by the CDC.
- Japan's Aum Shinrikyo cult
- Too good a killer

Category A also includes : Anthrax, Botulism, Plague, Smallpox, Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses

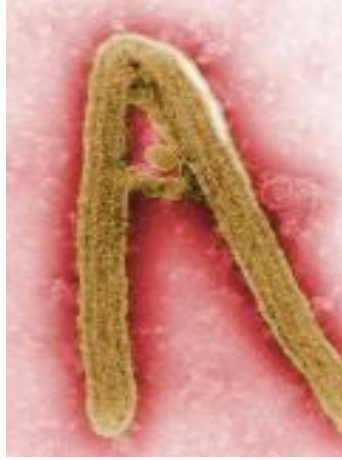
Apparently leader apparently led about 40 members to Zaire in 1992 – possibly an attempt to get a sample. Cult that carried out the sarin attack effectiveness as a biological-warfare agent is compromised by its extreme deadliness and its level of contagion: a typical outbreak spreads through a small village or hospital, infects the entire population, and then runs out of potential hosts, dying out before reaching the wider community.

Vaccines

- Rare, fatal
- How prove it works
- 2 animal rule – show in humans induces the same response as 2 different species

Marburg

- 1967 Marburg, Germany
- Primates
- Uganda, Kenya, Zimbabwe
- Host to human?
- Human to human
- 23 – 25% cases die



Marburg
CDC



Marburg fever – Uige, Angola 2005

Bringing out the dead.

Dengue fever/haemorrhagic fever

- Breakbone fever
- Four closely related viruses – - don't cross protect flavivirus
- First definite report 1789
- Transmission understood in 20th century
- Similar geographical spread as malaria
- Disease spread by population movements in World War II

Bone pain a common symptom

Dengue cont.

- Mosquito-borne
- Major international public health concern – predominantly in urban and semi-urban areas in tropics
- Dengue haemorrhagic fever (DHF) 1950s
- A leading cause of hospitalization and death among children in parts of Asia.
- Some 2,5 billion people – two fifths of the world's population –at risk
- DHF fatality rates can exceed 20% without proper treatment
- WHO estimates 50 million dengue infections worldwide every year.

Recovery from infection by one provides lifelong immunity against that virus but confers only partial and transient protection against subsequent infection by the other three viruses. There is good evidence that sequential infection increases the risk of developing DHF.

Crimean-Congo hemorrhagic fever (CCHF)

- Tick-borne
- Crimea 1944, Congo 1969
- Domestic and wild animals – appears to be little clinical disease –
- Especially common in East and West Africa
- RNA virus
- Clinical disease in humans - 30% mortality rate.
- Outbreaks in humans – infected animals or people
- Transmitted human to human
- Fomites

Up to 80% in animals in one study in SA

Rift Valley Fever

- First identified: Kenya in 1931.
- Epidemics in animals –
- Transmitted to humans – mosquito, contact with infected animal parts eg milk, inhalations
- No human-to-human transmission of RVF has been documented
- No infection of HCW – if infection control precautions
- Haemorrhagic fever: approximately 50%.
- Death - three to six days after symptoms

Yellow Fever

- Endemic in areas of Africa and the Americas – can have epidemics
- "yellow" - jaundice in some patients.
- Humans and monkeys
- Mosquito is the reservoir – eggs can lie dormant through the dry season.
- At least 80% of the population must have immunity to yellow fever to prevent epidemics
- 15% of patients who become acutely ill go into the "toxic phase"
- Half will die within 10-14 days.
- Mortality in epidemics high as 85%.

jaundice and complains of abdominal pain with vomiting. Bleeding can occur from the mouth, nose, eyes and/or stomach. Once this happens, blood appears in the vomit and faeces. Kidney function deteriorates; this can range from abnormal protein levels in the urine (albuminuria) to complete kidney failure with no urine production (anuria).

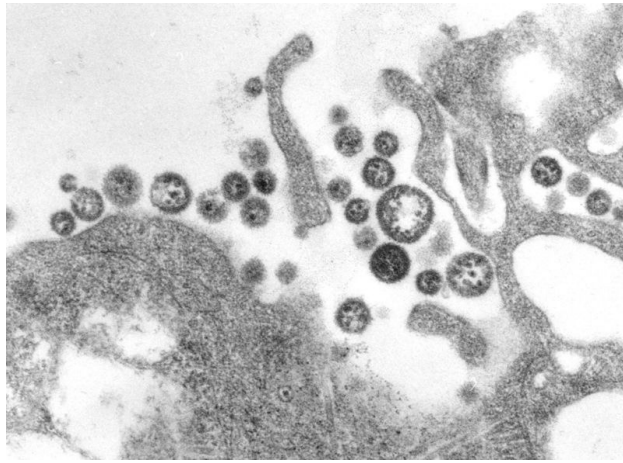
Yellow fever cont.

- Effective vaccine - 60 years – BUT
- Number of people infected over the last two decades has increased and yellow fever is now a serious public health issue again.
- yellow jack, black vomit, American Plague

Yellow fever has been a source of several devastating epidemics.[3] Yellow fever epidemics broke out in the 1700s in Italy, France, Spain, and England.[4] 300,000 people are believed to have died from yellow fever in Spain during the 19th century.[5] French soldiers were attacked by yellow fever during the 1802 Haitian Revolution; more than half of the army perished from the disease.[6] Outbreaks followed by thousands of deaths occurred periodically in other Western Hemisphere locations until research, which included human volunteers (some of whom died), led to an understanding of the method of transmission to humans (primarily by mosquitos) and development of a vaccine and other preventive efforts in the early 20th century.

Lassa fever

- Haemorrhagic fever form: death rate approximately 50%.
- The overall case-fatality rate is 1%, up to 15% among hospitalized patients.
- While mild/no observable symptoms in about 80% of
- Estimates 300 000 to 500 000 cases of Lassa fever
- 5 000 deaths across West Africa.
- Maternal death/foetal loss – + 80% during the third trimester.
- Animal reservoir - multimammate rat
- Rodents get chronic infection, asymptomatic
- Haemorrhagic disease – death 3/6 days after symptoms



Lassa virus – arenavirus

and now Virus X

- Johannesburg 2008
- Arenavirus
- Apparent mortality: 80% (4/5)
- Unusual presentation – lack of bleeding
- Possible natural recombinant two other arenaviruses
- No samples – first person
- Some samples – second, third, fourth, fifth

Some issues...

- Don't Panic – Douglas Adams
- Reality must take precedence over public relations, for nature cannot be fooled.
– Richard P. Feynman

Those who like science fiction might remember this, from Douglas Adams.
Those who don't well, it's standard government response to a problem.
Personally, when I hear someone in authority I immediately start to worry – if they weren't thinking of panicking then why did they have to mention it? But then I'm just a cynical old hack.

Fire!

- When do you shout fire in a crowded theatre?
- Terrifying – horrible way to die, no real treatment
- Great headlines – XDR-TB
- We die too quickly
- No realistic response – so Don't Panic

When it becomes airborne

BUT

- “125 people in isolation in Sandton Clinic – it’s being kept secret”
- Sandton clinic – about 250 operational beds
- Whose fault was it?
- Lack of communication –
 - doctors tried
 - Hospitals tried
 - Government communication

Beds – from Sandton website – that means about half of Sandton clinic was being used with sick people in isolation.

Government communication – headache, fever,

Why South Africa?

- Top class medical care – if you can pay for it
- Top class research – NHLS, NICD, Sizwe Hospital
- Biosafety level 4 laboratory – only one on the continent

People medi-evacuated in – profitable
Good way for private hospitals to fill unfilled beds
Class

Questions

- Why is a private sector, for profit facility being the front line at an epidemic like this
- This is a public health measure
- Who was co-ordinating response
- How get private and public service to work together
- Government again – Sorry, DoH, Gauteng department of Health

Possibly, relict of the past. For much of the time appeared that lots of research into running a public health system was being researched in geneva, fortunately new minister of health.

Capacity constraints

- Need to wake up – we need a coherent and implementable response
- Infectious diseases are rising
- Difference between public health and clinical care
- Need to the media

Famous line, sunlight is the best disinfectant

- 2007 World Community Grid
- Computer modelling of the yellow fever virus (and related viruses),
- Similar to SETI@Home

Hamba Kahle Sophia