

# Ebola risk in the pig value chain in Uganda

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Ecosanté/Ecohealth



# Background



- Safe Food, Fair Food programme in Uganda
  - develop the pig value chain through risk based approaches to ensure food safety
  - Animal-source food products have a high nutritional value which enhances public health
  - the production, transportation, processing and retailing of these products provide income and employment to millions
  - animal-source foods are the single most important source of food-borne disease



# Risk Assessment

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- Systematic literature review to determine the threat of Ebola in the pig value chain in Uganda
  - increasing pig numbers and pig density in areas of Uganda where Ebola outbreaks have been recorded
- Goal: to determine whether further research resource mobilization was needed to ensure food safety in the pig value chain



# Ebolavirus in food?

- *Zaire ebolavirus*
  - central Africa - hunting, butchering and consumption of bushmeat, especially gorillas and chimpanzees.
  - DRC - handling and consumption of freshly killed bats



# Can it cause harm?

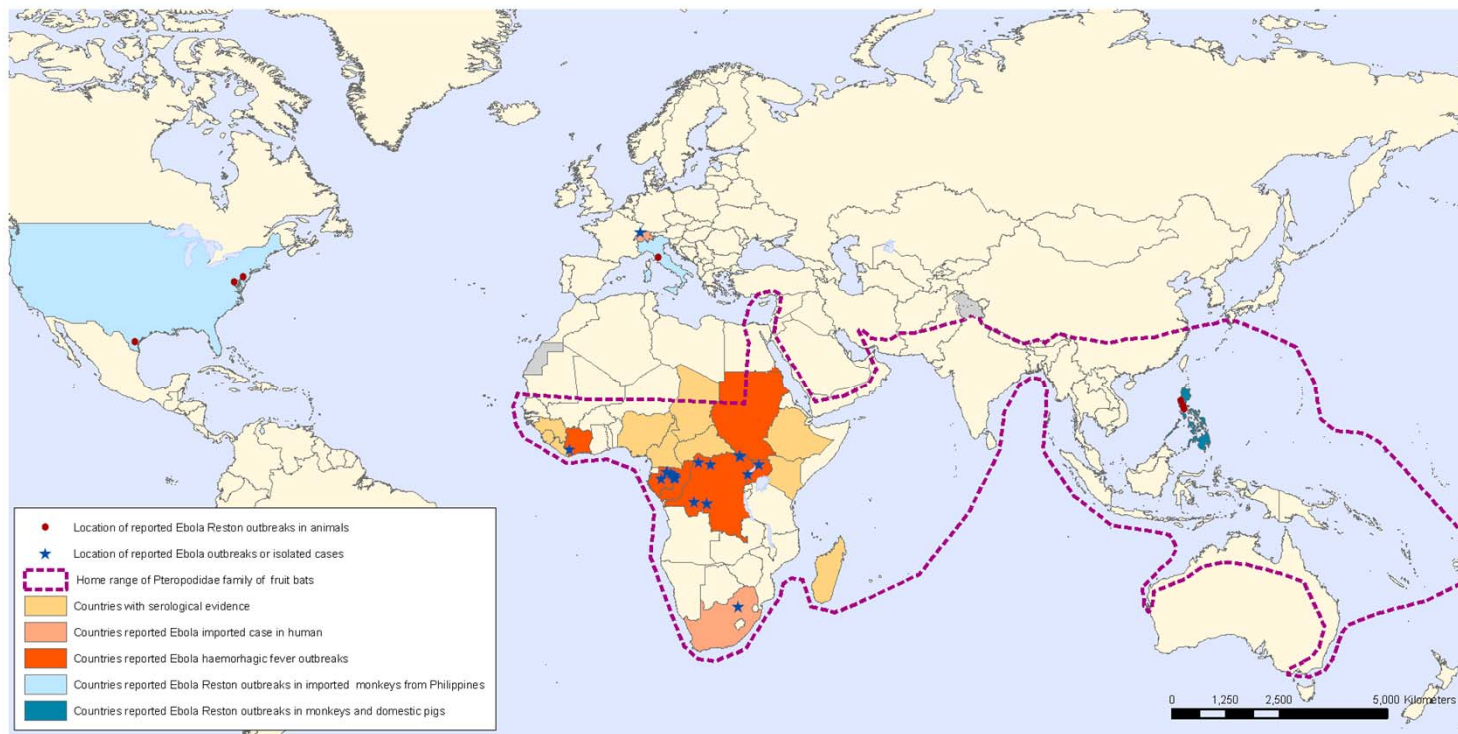
- In humans:
  - Case fatality of 25-90% varies by strain
  - Convalescence can be very slow
  - Public fear & social stigma
- In primates:
  - Death
- In pigs:
  - Asymptomatic to severe lung pathology and death





# Geographic Distribution

## Geographic distribution of Ebola haemorrhagic fever outbreaks and fruit bats of Pteropodidae Family

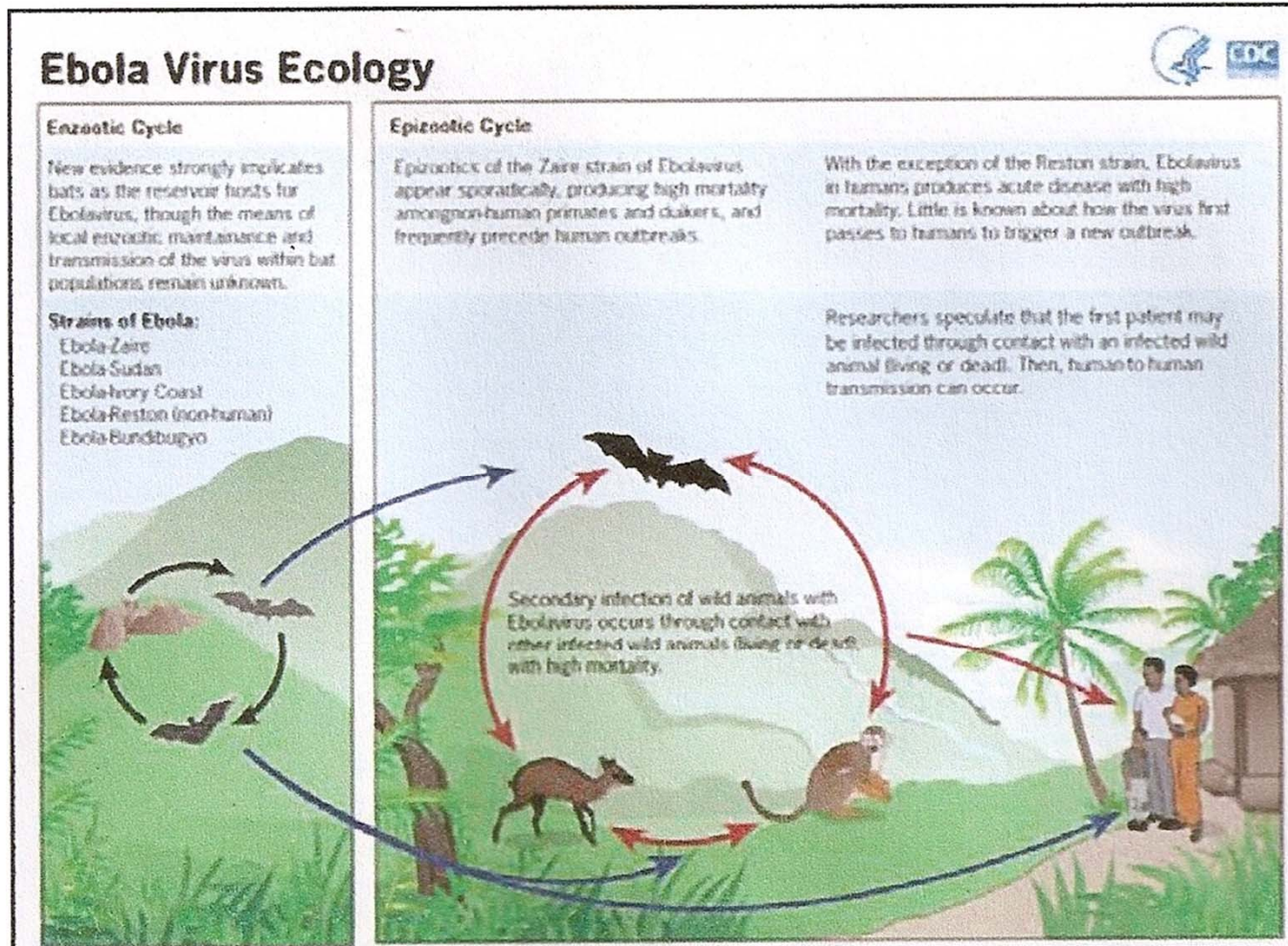


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: Global Alert and Response Department  
World Health Organization  
Map Production: Public Health Information  
and Geographic Information Systems (GIS)  
World Health Organization

 World Health  
Organization  
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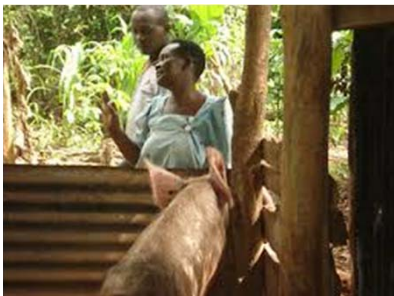
# Transmission to humans





# Ebolavirus in pigs

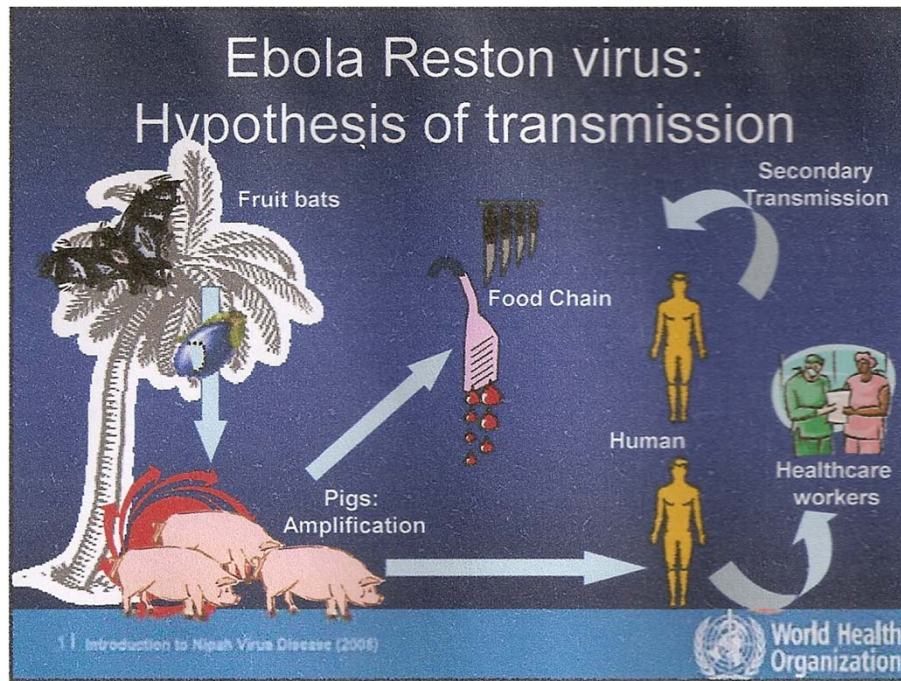
- 2008, Philippines, Reston Ebola was accidentally discovered
  - particularly pathogenic porcine reproductive and respiratory syndrome virus (PRRS) outbreak
  - Symptoms:
    - high fever of 41°C
    - labored breathing, coughing, nasal discharge
    - loss of appetite, diarrhea, skin hemorrhage and reddish discoloration with some pigs found in recumbent position
    - High nursery house and growing house mortalities were observed
    - sows had previously been affected by high fever and abortions.



- 2011, experimental infection with *Zaire ebolavirus*



# Suspected modes of transmission: PIGS



- Intermediary hosts
  - Transmission from fruit bats to pigs to humans
- Amplifying hosts
  - wild & domestic pigs
- Aerosol transmission
  - Infection between experimentally infected pigs and naïve pigs
- Direct contact with fruit bats & their bodily fluids

# Suspected modes of transmission: HUMANS



- Contact with reservoir (bats): hunters, miners, ecologists, tourists
- Contact with secondary hosts (pigs, primates): hunters, farmers, slaughter house workers
- Contact with human (patients): family, nosocomial infections, burial practices



# Suspected modes of transmission: FRUIT BATS

- Competition for fruit between fruit bats and non-human primates



clustering of animals



increased likelihood of spillover

- Contact with Infectious virus in:

- saliva
- feces (guano) or urine
- Birthing fluids



- Once humans infected: human-to-human transmission

# Source of Infection for Confirmed Ebola Cases



Virus Strain	Date	Location	Source of Infection	# of cases	Case fatality rate (%)
Zaire	1976	Zaire	Unknown	318	88
	1977	Zaire	Unknown	1	100
	1994	Gabon	Contact with NHPs	49	65
	1995	DRC	Unknown	315	88
	1996	Gabon	Contact with NHPs	37	57
	1996	Gabon	Contact with NHPs	60	75
	2001	Gabon/DRC	Contact with NHPs	123	79
	2003	DRC	Contact with NHPs	143	90
	2003	DRC	Contact with NHPs	35	83
	2004	Russia	Lab accident	1	100
	2005	DRC	Unknown	12	75
	2007	DRC	Contact with bats	264	71
	2008	DRC	Unknown	32	47
Sudan	1976	Sudan	Unknown	284	53
	1976	England	Lab accident	1	0
	1979	Sudan	Unknown	43	65
	2000	Uganda	Unknown	425	53
	2004	Sudan	Unknown	17	42
Côte d'Ivoire	1994	Côte d'Ivoire	Necropsy of chimp	1	0
Bundibugyo	2007	Uganda	Unknown	102	42



# Conclusions

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- Pig production in Uganda has significantly increased over the last 30 years
- Overlap of fruit bat habitats (and their dropped fruit, excrement, saliva and urine) and pig rearing areas
- Population growth will increase wildlife-livestock-human contact and increase demand for safe pig products
- Source of infection unknown for several Ebola outbreaks in Uganda



# Further ILRI Work

- Collection of 1200 pig sera & whole blood samples in 3 districts
- Analysis by RT-PCR
  - Generic
  - Sudan ebolavirus
- Results expected in early 2014



# The way forward

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## 1. Research gaps:

- Specific risk factors to infection in pigs and best bet interventions to prevent and control infection
- Quantify risk to pig health & production, human health & food security

2. Develop a reporting mechanism for farmers to report suspected cases to the appropriate authorities.

3. Build capacity in country for laboratories to be able to diagnose and confirm *Ebolavirus* in domestic livestock and wildlife

4. Develop tools to train pig farmers in the prevention of Ebola in their pigs and their households.



# Thank You!



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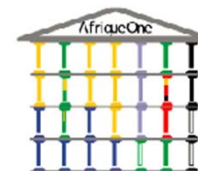


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