Surveillance for RVF in Eastern Africa with reference to the outbreaks in Kenya and Tanzania

Re-emergence of Rift valley fever in Southern Africa: how to better predict and respond ?"Bloemfontein (South Africa), February 16 – 18th, 2009

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Introduction 1

- Rift Valley Fever (RVF) is a viral haemorrhagic disease primarily of cattle, sheep, goats, camels, wildlife and humans
- Spread: - *Aedes* mosquitoes, other blood-sucking insects and through skin abrasions
- Virus persistence between outbreaks remains unclear

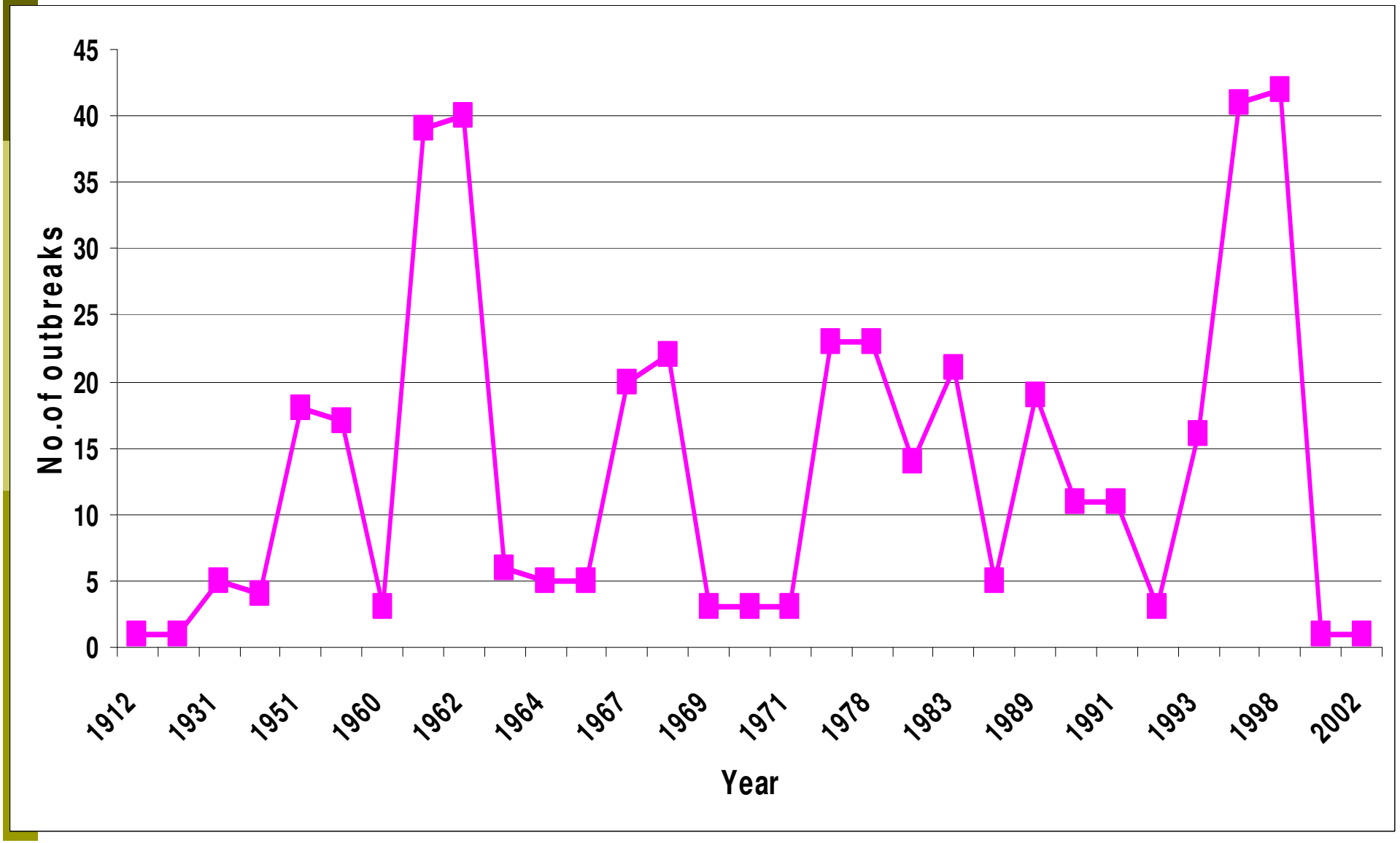
Introduction 2

- One of the most significant zoonotic disease problems in Africa
- The haemorrhagic human disease syndrome generates a high degree of panic among the human populations at risk

Background 1

- 1900s:- RVF first recognized as a disease in sheep in Rift Valley province, Kenya
- 1930:- Virus isolated
- Intermittent outbreaks in Kenya
- 1950-51: A major epizootic
  - 500,000 sheep abortions
  - 100,000 sheep deaths
- 1997-98: Kenya, Africa
  - Largest outbreak reported
  - 89,000 humans cases - 478 deaths
- 2006-2007 outbreak

Number of RVF outbreaks in Kenya from 1912-2002 (5-15 year cycles)



Background 2

- Predictable outbreaks
- Epizootics of RVF in Africa occur often when unusually heavy rainfall is observed
- In an epizootic, virus circulates among infected arthropod vectors and mammalian hosts, particularly cattle and sheep.
  - They represent the most significant livestock amplifiers of RVF virus.
- The inter-epizootic survival of RVF Virus is believed to depend on transovarial transmission of virus in floodwater *Aedes* mosquitoes

Predisposing factors

- Susceptible animals
- Virus presence
- Increased vector populations
- Heavy persistent precipitation
- Flooding
- Vegetation cover

Control 1

- Vaccination
- Livestock movement controls –quarantines
- Stopping slaughter
- Vector control
- Livestock owners moving to high grounds with their animals
  - avoid areas with stagnant flood water that may host the vectors

Surveillance of RVF in Kenya

- Previous surveillance activities
  - KEMRI
  - KARI
  - CDC-KENYA
  - Other projects
  - KWS
  - Others

Surveillance: *2006-2007 outbreak*

Tracing both animal and human movements – people can become sick or die having travelled away from the infected areas

- Clinical examination of livestock at risk and serological monitoring
- Vector studies
- Surveillance in wild ruminants

Surveillance cont…

- Case definition

  Infectious disease showing at least one of the following:

  - Unusual number of abortions
  - Unusual number of stillbirths
  - Unusual number of deaths among young ruminants

- Identify risk areas
  - Proximity to infected areas
  - Historical occurrence of RVF
  - Ecological perceptiveness

Surveillance cont…

- Clinical examination of livestock carried out
- Outbreak investigation carried out and outbreak investigation form filled
- Appropriate samples collected
  - Blood in EDTA
  - Clotted blood
  - Liver, spleen and Lymph nodes on ice
  - Liver, spleen and Lymph nodes in buffered formalin
  - Foetal membranes
- Sites with no evidence of RVF, zero report
- Geo-references registered for all visited sites

RVF Wildlife Surveillance

- Serum samples collected from buffaloes, Giraffes, warthogs, Elands, Gerenuks
- Surveillance was based on

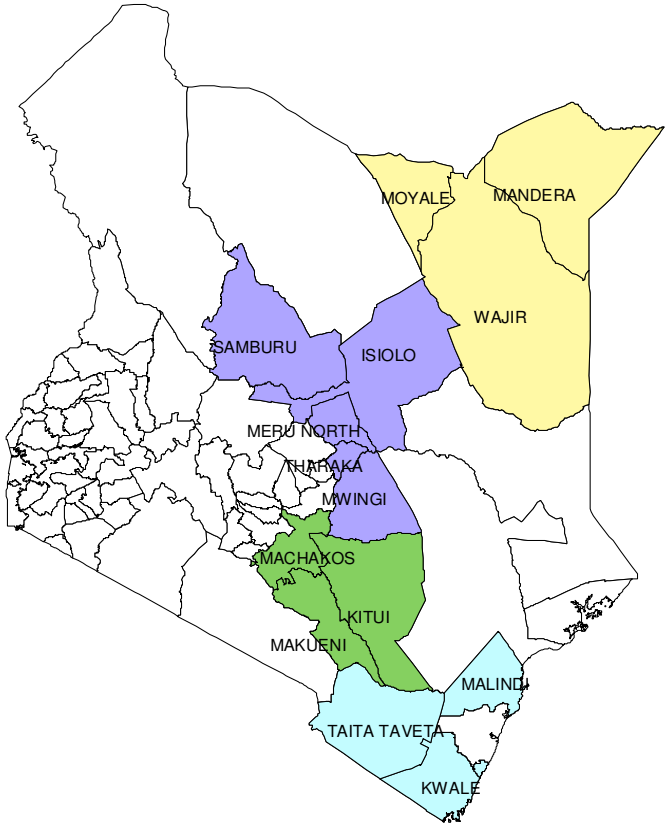
  - areas where the outbreak occurred

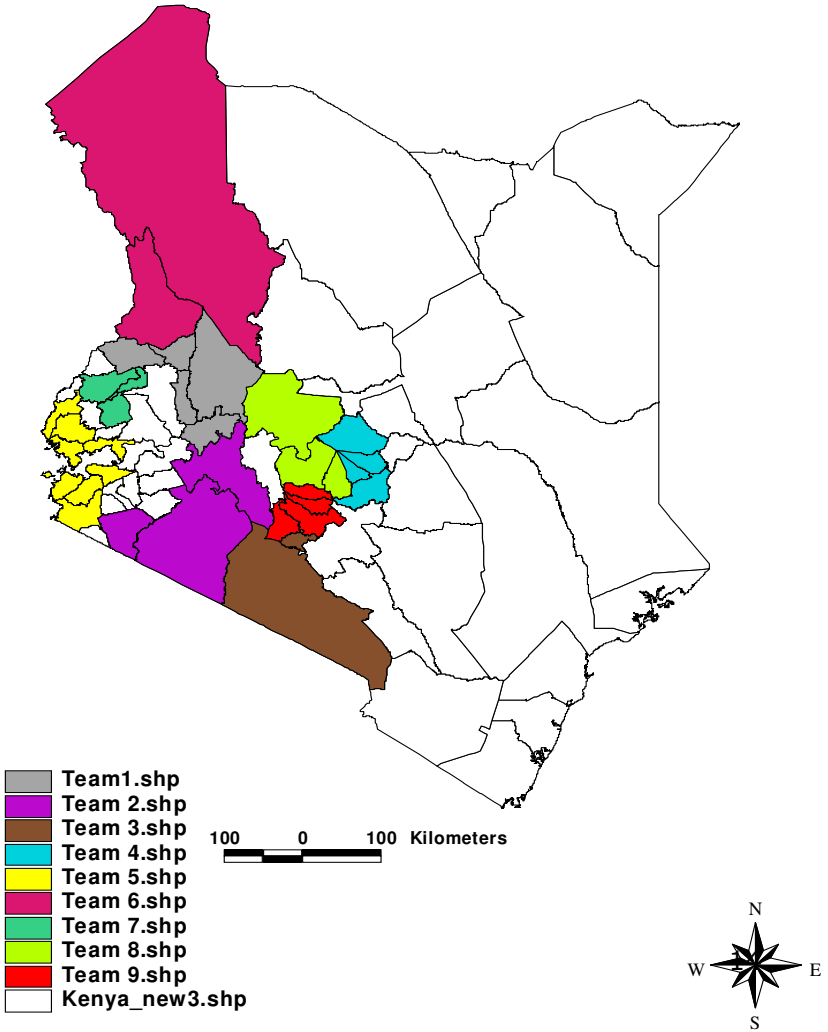
  -Opportunistically during Rinderpest surveillance
- Surveillance in all areas where unusual wildlife deaths were reported

RVF Surveillance areas

Adjacent districts to determine the spread

known endemic foci areas - based on Previous infections, areas ecologically conducive for vector habitation

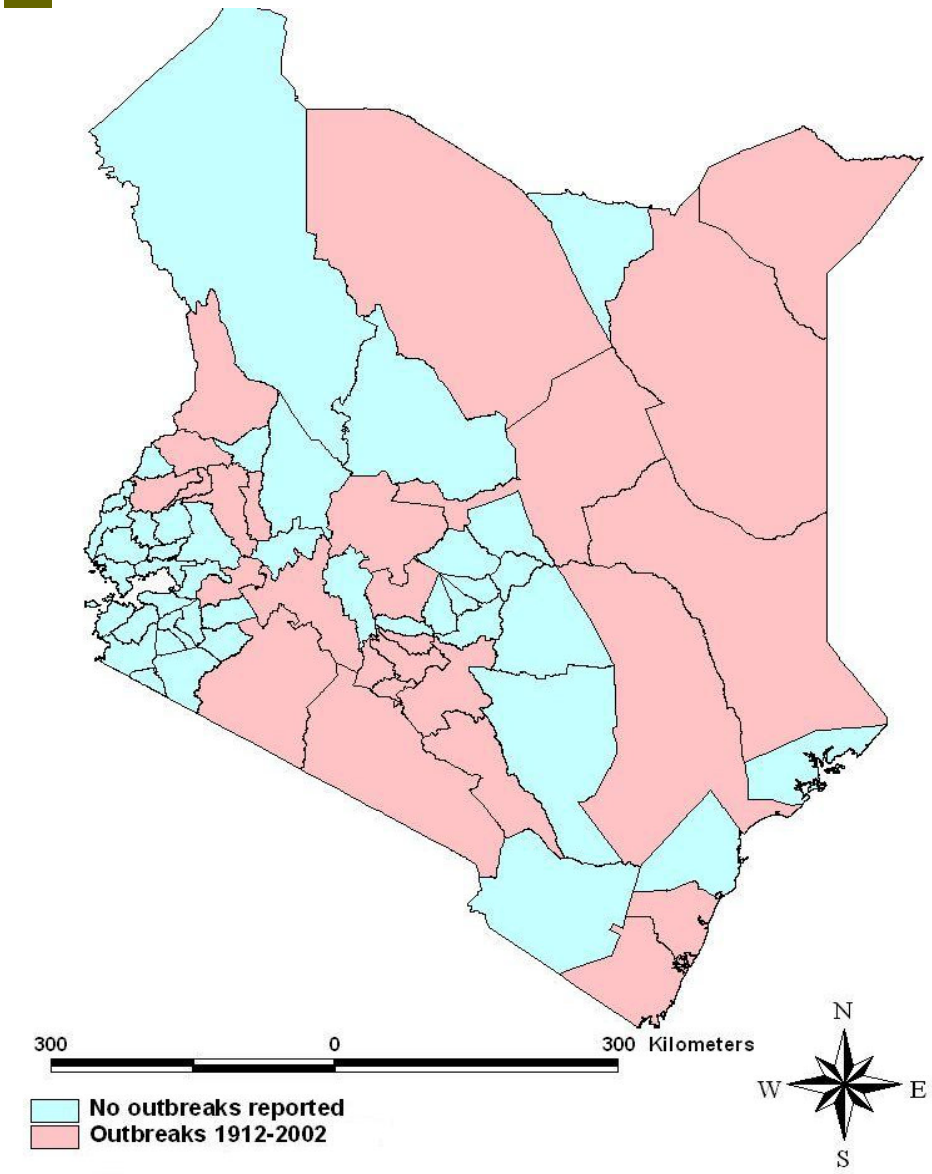




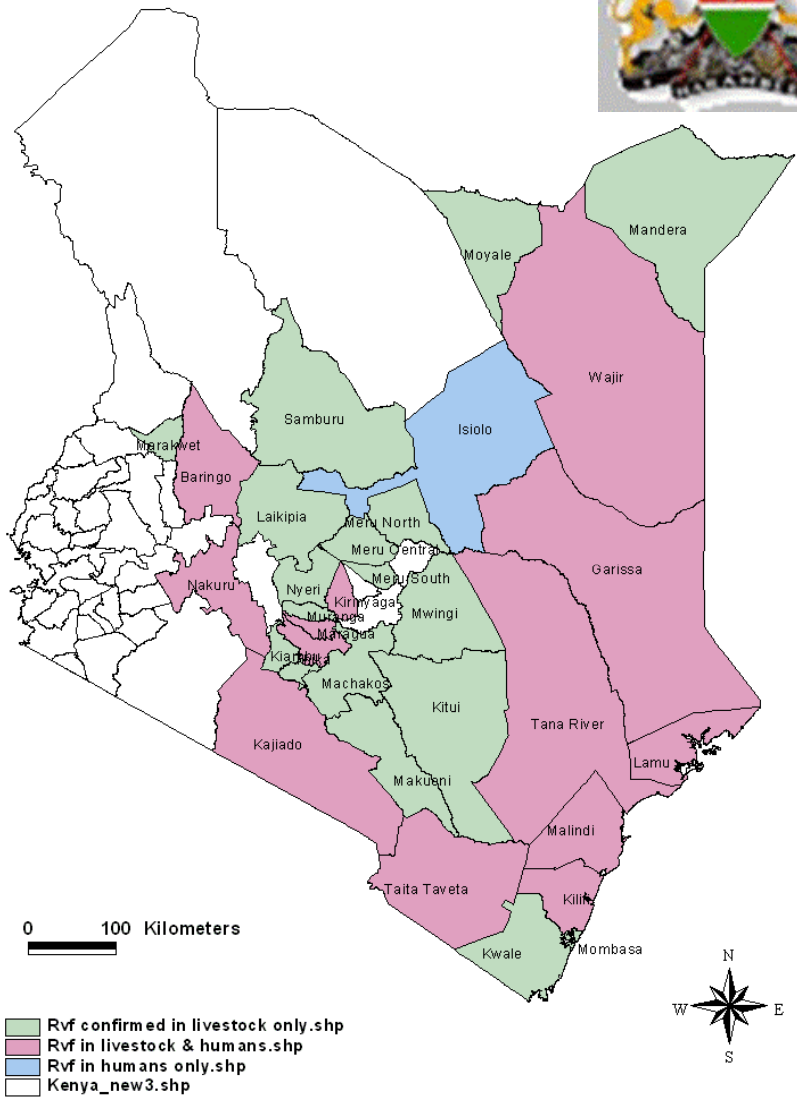
Laboratory Analysis

- A total of 3,969 samples have been submitted to CVL
- Total of 2,500 samples processed
  - IgM & IgG ELISA
  - Ag ELISA
  - RT PCR

RVF spread 1912-2002



March 2007



Economic Impact of RVF

- Greatest overall loss - a total ban on livestock trade from RVF-infected areas.
- 1997/98 RVF epidemic in East Africa - cessation of the lucrative trade in small ruminants to Middle East countries.
- Estimated loss of US$ 250-350 million
- The OIE regulations recommend the banning of livestock exports from an RVF infected country for 3 years following an outbreak.

Impact cont…

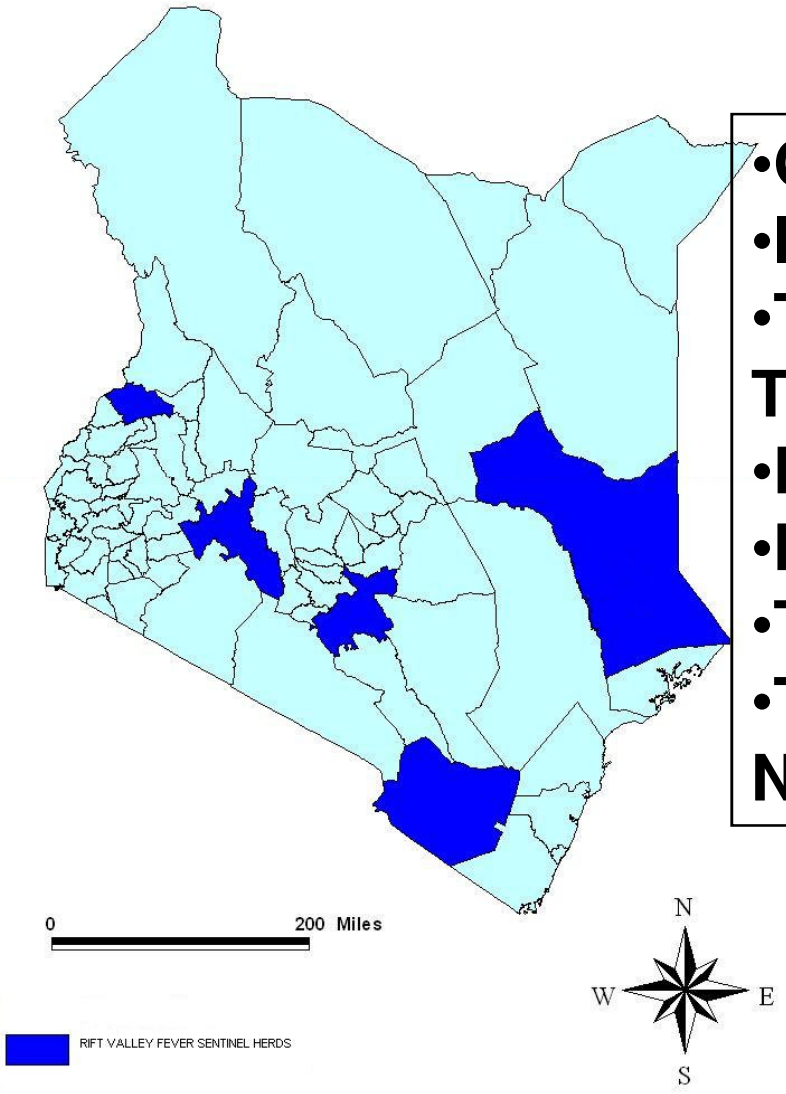
Parameter	Value (KSh)
Total herd meat loss due to RVF (20,237,829 kg)	1,251,909,117
Total milk loss due to RVF (21,134,520 litres)	221,912,460
Net losses to business actors	2,320,000,000
Government expenditure in control measures	200,000,000
TOTAL COST OF OUTBREAK (excluding value of human lives lost)	**3,993,821,577**

Sources: Socioeconomic studies by DVS and ILRI

Follow up after the 2006-2007 outbreak

- Technical Committee comprising stakeholders jointly chaired by DVS and DOPHS – meetings weekly initially, bimonthly later
- Weekly weather reports
- Draft contingency plan in place- need to be operationalised
- Surveillance alongside other TADS e.g. PPR surveillance
- Review of sentinel herds and locations

Placement of the Sentinel herds



- **Garissa**
- **Ijara**
- **Taita Taveta**
- **Nakuru**
- **Machakos**
- **Thika**
- **Trans Nzoia**

Year	Vaccines doses
1997	0
1998	183,300
1999	11,600
2000	500
2001	11,600
2002	59,000
2003	8,900
2004	0
2005	20,000
2006	0
2007	2,550,300
2008	1,078,414

Lessons learnt

- Close collaboration between MOH and MOLD for control of zoonotic diseases
  - Standing zoonosis surveillance and response unit
- Need for emergency preparedness plan and early warning systems
  - Review and strengthen sentinel herds
  - Close collaboration with KWS and meteorological department
  - Need for review on policies on livestock vaccinations
- Need for strengthening laboratory capacity
- Social mobilization early during an outbreak is key to control
- Coordination important in outbreak response
- Strengthening surveillance systems

Conclusion

- Outbreaks of RVF have been predictable,
- It has an inter-epidemic period,
  - For us to prevent its reoccurrence
  - OR
  - We prepare for it a naïve population for it to ravage through when conditions are favourable
- Must we always allow it to continue surviving?
- Is it always ahead of us?

Conclusion

- complete S, M and/or L genome segment sequence from 31 RVF virus specimens (period December 2006-May 2007 and different geographic areas)
  - Concurrent circulation of multiple virus lineages,
  - gene segment reassortment and common ancestry of the 2006/2007 outbreak viruses with those from the 1997-1998 east-African RVF outbreak.
  - Evidence of recent increases in genomic diversity and effective population size 2 to 4 years prior to the 2006-2007 outbreak was also found, indicating ongoing RVF
  - virus activity and evolution during the inter-epizootic/epidemic period

Conclusion

- These findings have implications for further studies of basic RVF virus ecology, the design of future
- surveillance/diagnostic activities and highlight the critical need for safe and effective
- vaccines and antiviral compounds to combat this significant veterinary and public health threat.

Remarks

- Experts need to work together – work on RVF need to be harmonised
  - Research work
  - Vaccine development
- Lobbying for governments support on RVF activities during the inter-epidemic period
  - Funding- For surveillance during inter-epizootic period
  - Emergency funds
  - Personnel
  - No political interference

References

- Department of Veterinary Services-Kenya reports
- Multiple virus lineages sharing recent common ancestry were associated with a large Rift Valley fever outbreak among livestock in Kenya during 2006-2007 (Brian et al)

THANKS FOR LISTENING