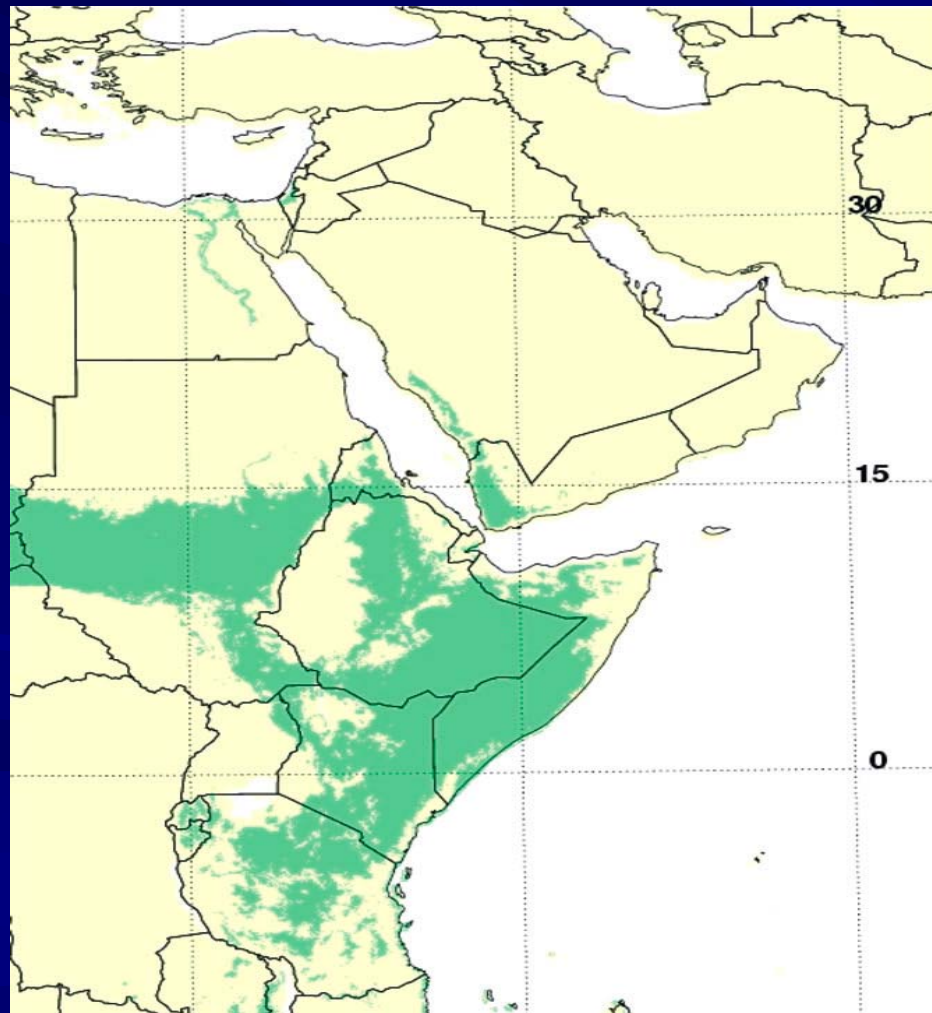


# Rift Valley Fever: Available Control Options

Kariuki Njenga, BVM, PhD

*Kenya Medical Research Institute, Nairobi, Kenya*

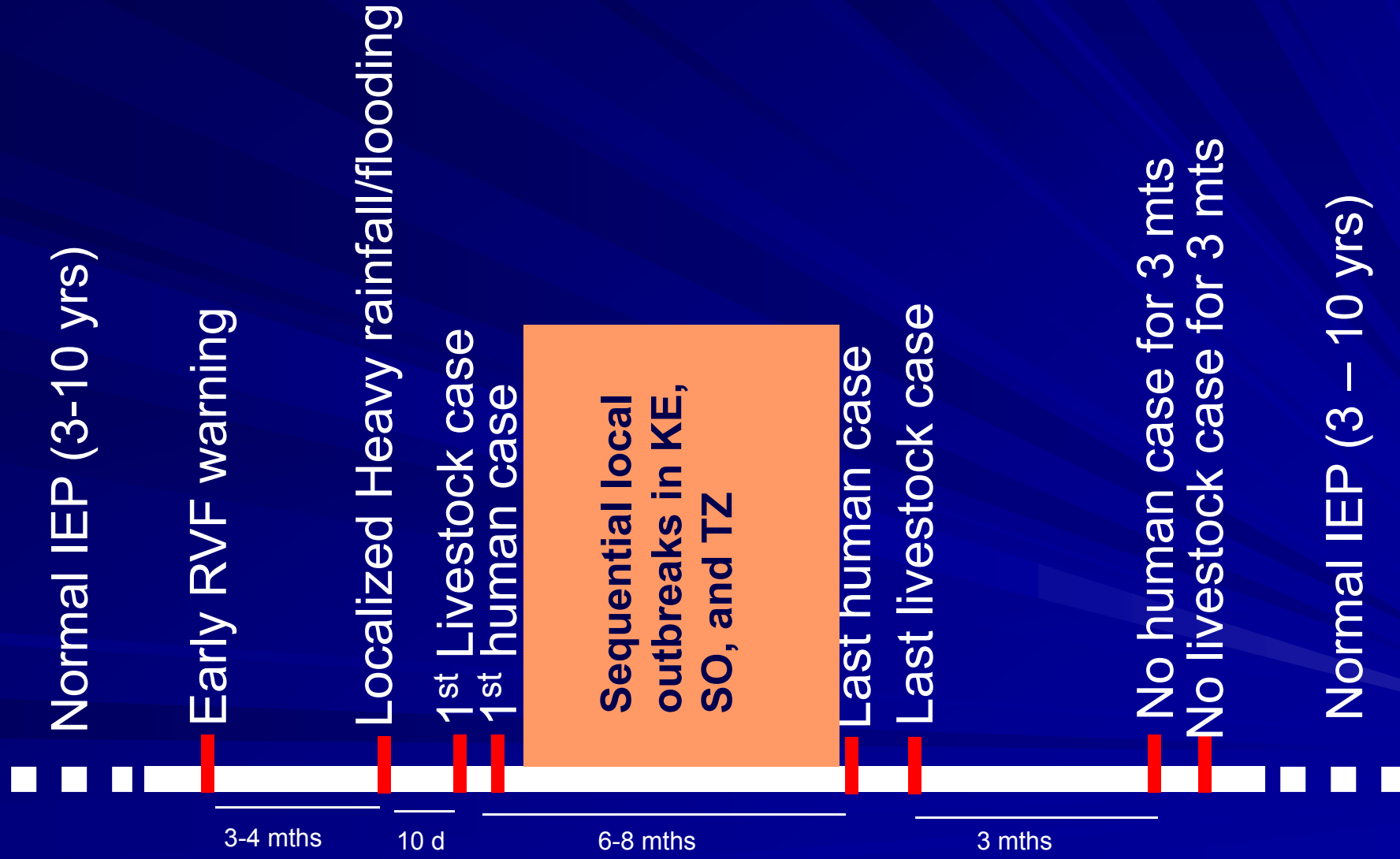


# Sequence of Events Related to Risk of RVF in the HOA

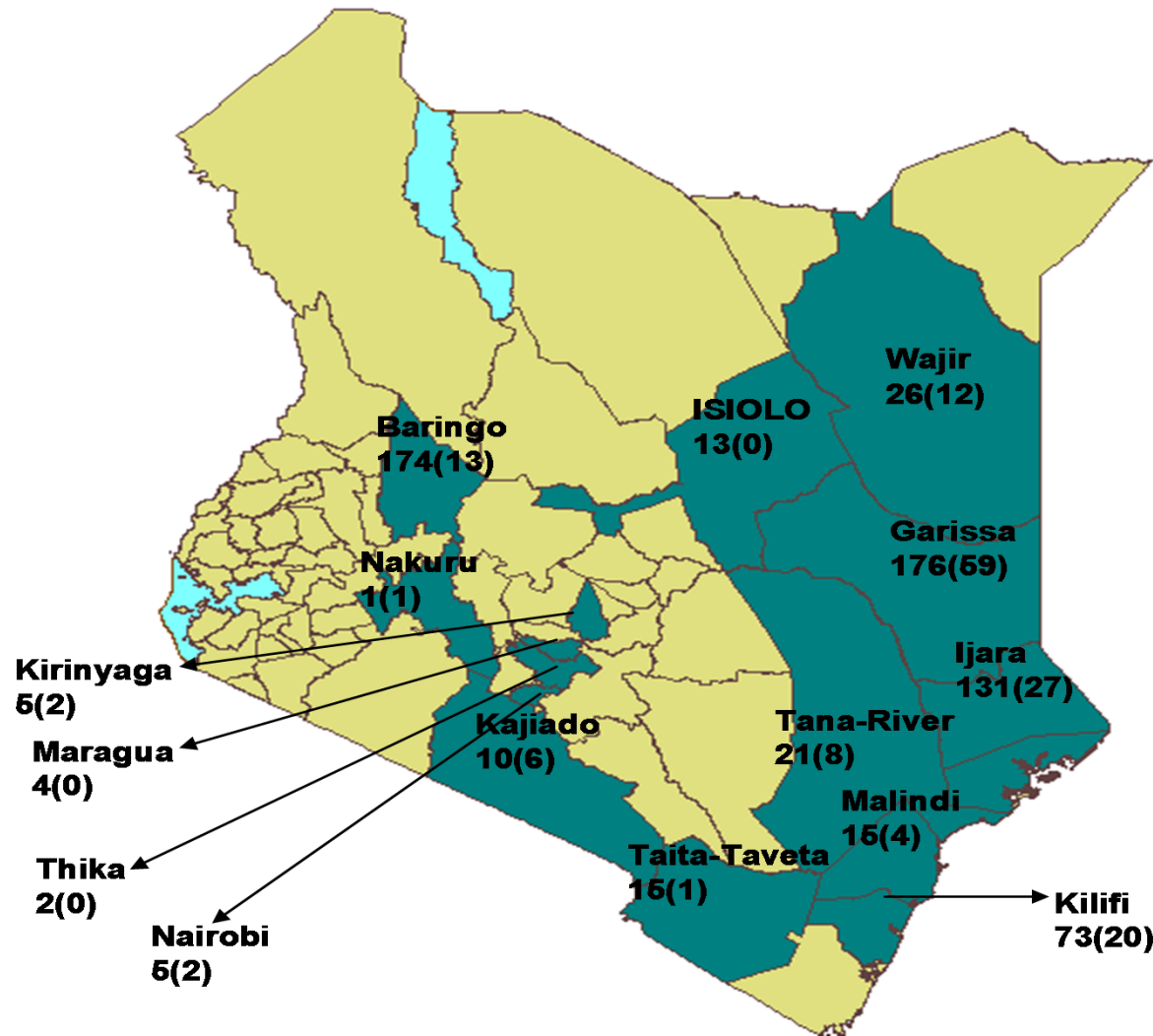
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1. Normal situation between outbreaks
2. Early warning of RVF and/or early warning of heavy rain
3. Localized prolonged heavy rains
4. Localized flooding reported
5. Localized mosquito swarms reported
6. First detection of suspected RVF in livestock
7. Laboratory confirmation of RVF cases in livestock
8. First report of human RVF case
9. Laboratory confirmation of first human RVF case
10. No new human cases for 6 months
11. No clinical livestock cases for 6 months
12. Post outbreak recovery

# Chronology of Events



# Reported Human RVF Cases (Deaths) in Kenya



1<sup>st</sup> Case Nov 26, 2006

NEP

333 of 700 (45%) cases

Baringo

174 of 700 (25%) cases

Kilifi

73 of 700 (10.4%) cases

Last case March 30, 2007

# RVF Outbreaks in Somalia

First case confirmed 20<sup>th</sup> January, 2007

**Total: 107 cases, 54 (50.5%) deaths**

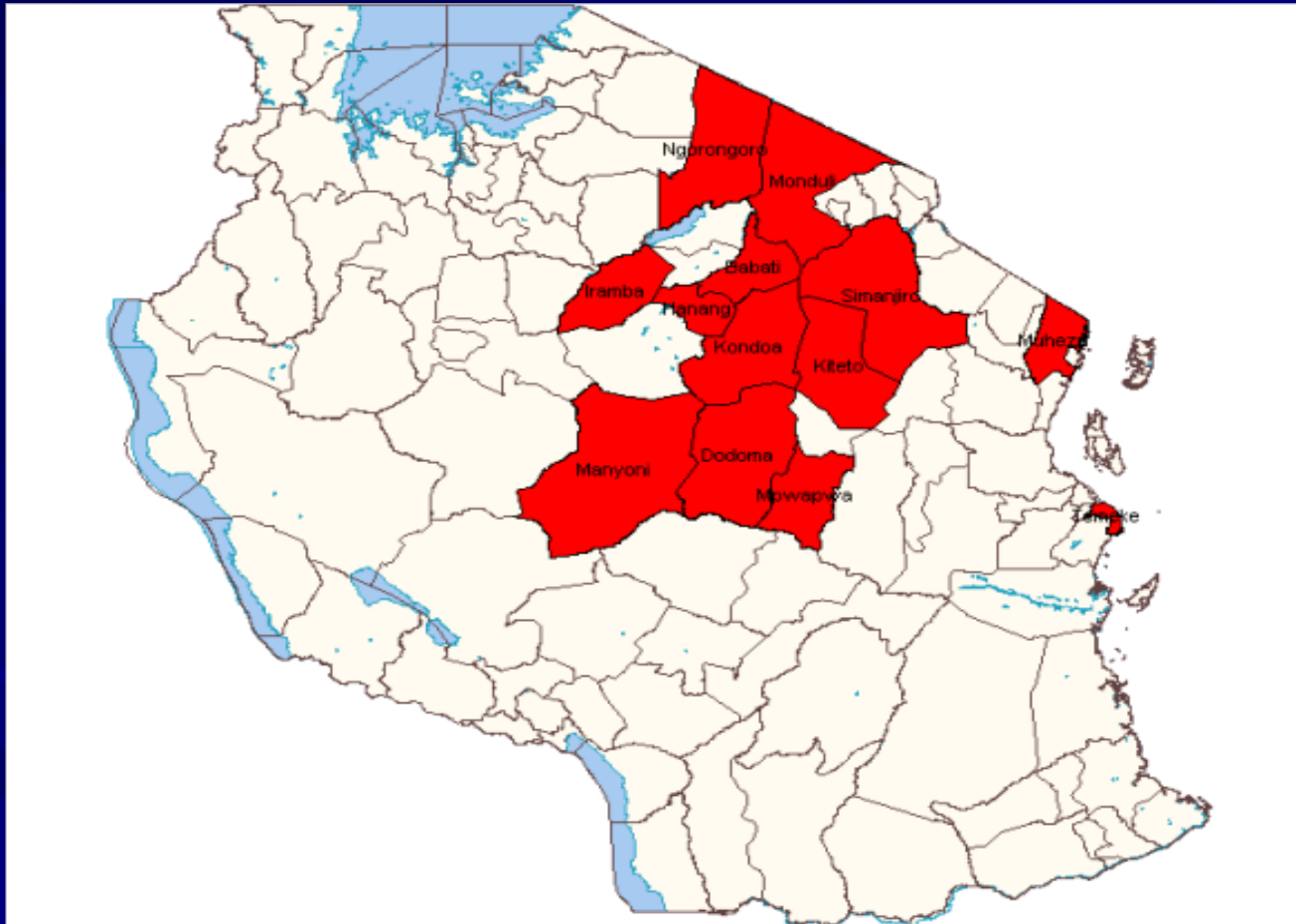


# RVF Outbreak in Tanzania

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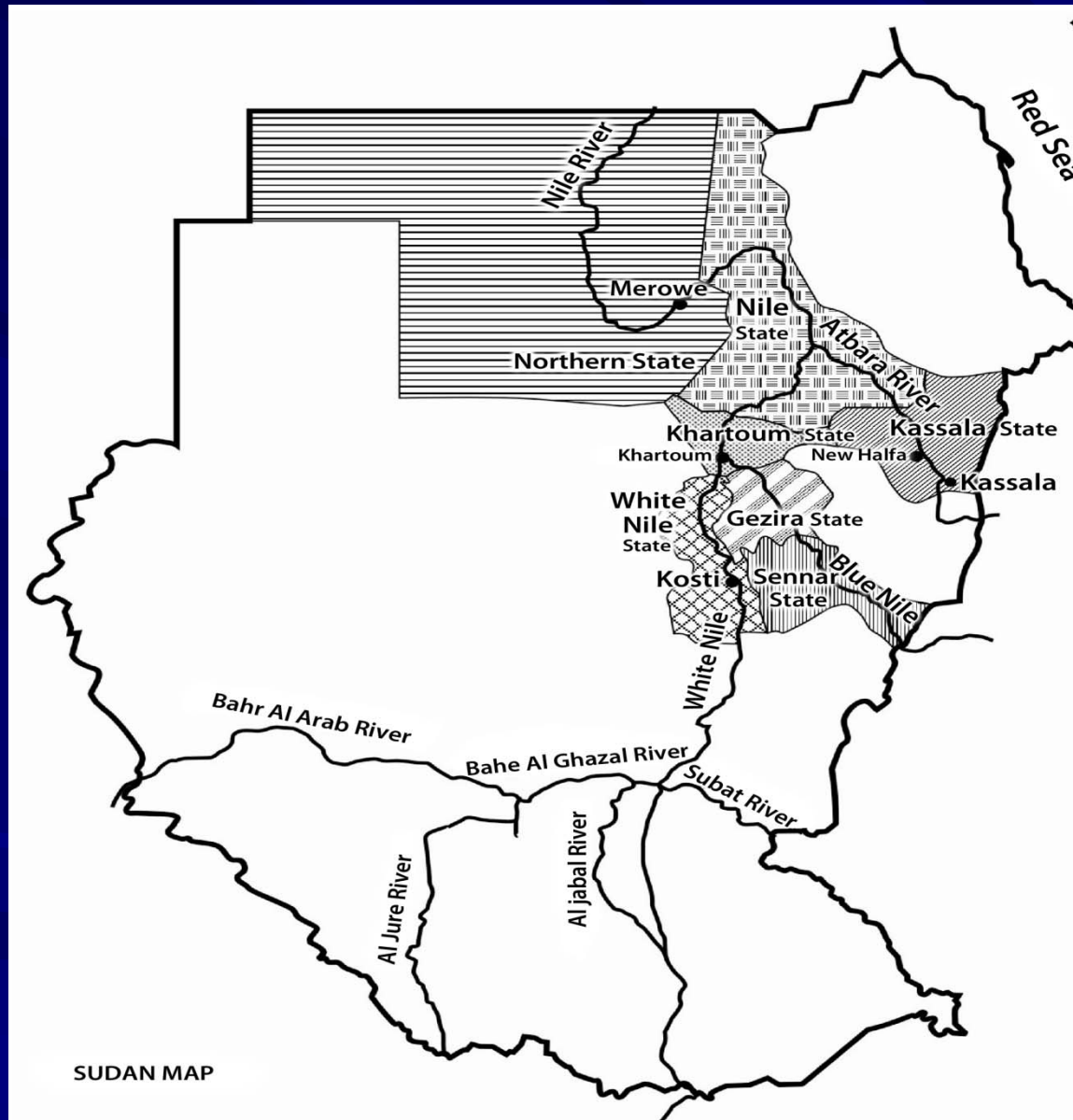
First case confirmed Feb 1st, 2007

Initial cases from Tanga and Arusha areas (N. Tanzania)



Last case – June 2, 2007

# RVF Outbreaks in the Sudans



1<sup>st</sup> case Oct 8, 2007

747 cases, 230 deaths

Outbreak declared over  
Jan 2008

[shaded areas=reporting states]

# RVF Control Options

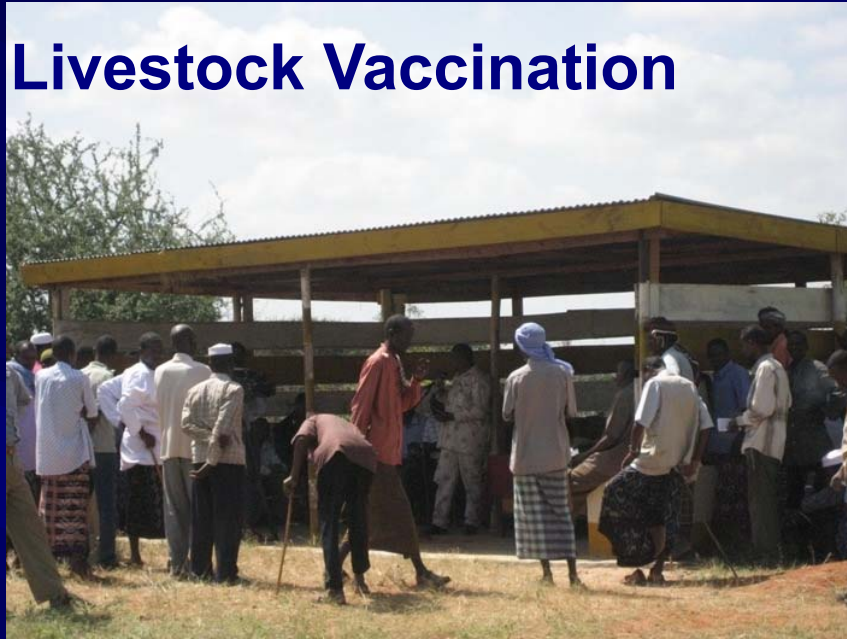
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- Livestock vaccination
- Public Education
- Slaughtering ban
- Livestock quarantine
- Vector control



# RVF Outbreak Response (Kenya 2006-07)

## Livestock Vaccination



## Public Education



# Outbreak Events in The Sudans (2007-08)

<b>Date</b>	<b>Event, Action, and/or Response</b>
June 2007	Early warning alert [12]
June–August 2007	Heavy rains and flooding [46,47]
September 2007	Suspected human RVF cases [13–15]
October 8–14, 2007	First human index case [12]
October 18, 2007	FMoH Sudan asks WHO for assistance [10]
October 24, 2007	FMoH and WHO teams start investigation [10,11]
October 28, 2007	Outbreak of RVF declared [10,11]
November 10, 2007	Outbreak of RVFV in livestock declared [11]
November 19, 2007	Start of targeted vaccination [73]
January 2008	End of outbreak [74]

doi:10.1371/journal.pntd.0001229.t001

# Control Option: Normal Non-Outbreak Periods

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## Public Education

General readiness

## Livestock Vaccination

Develop a clear policy on vaccination

- During inter-epizootic periods
- When risk of RVF outbreak is high and in face of outbreak

For endemic countries -Consider routine vaccination, for example on a cost-recovery basis in high risk areas

## Vector control

General readiness.

# Control Option: Early Rainfall Season Before Reporting of RVF Cases

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## Public Education

Target high-risk areas to encourage reporting of flooding, mosquito swarms, and suspected RVF cases.

## Livestock vaccination

- Vaccinate in high risk areas

## Vector control

- Order insecticide for application to livestock and pre-position in at-risk areas.

# Control Option: During RVF Outbreak

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## Public Education

Information for livestock keepers on vaccination of livestock in high risk areas THAT ARE NOT experiencing RVF outbreak

Information in affected areas about quarantine and slaughter ban.  
Encourage reporting of suspected RVF cases

Information on RVF for general public and livestock trader associations

## Livestock Vaccination

Do not vaccinate in areas where RVF is suspected or confirmed.

Supportive treatment carried out in areas where vaccination has been ruled out as a strategy.

# Control Option: During RVF Outbreak

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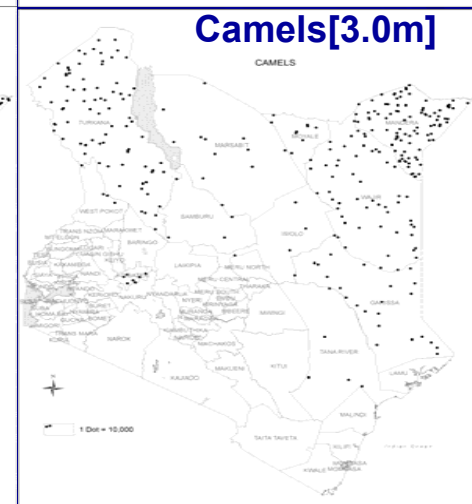
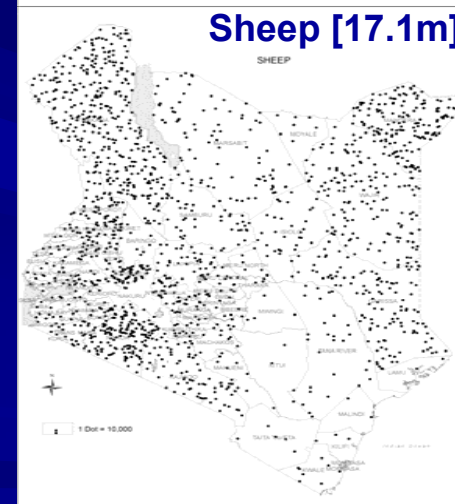
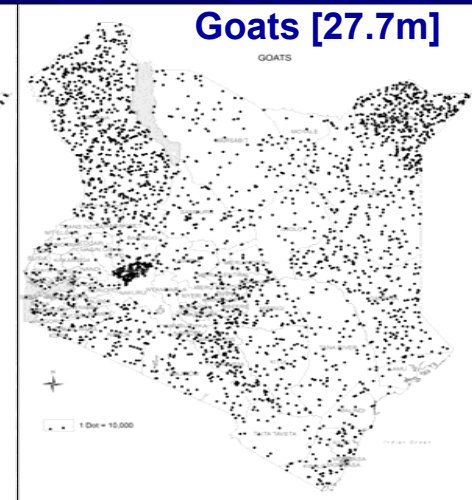
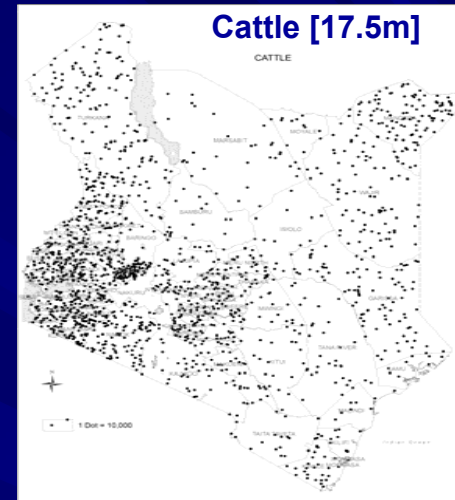
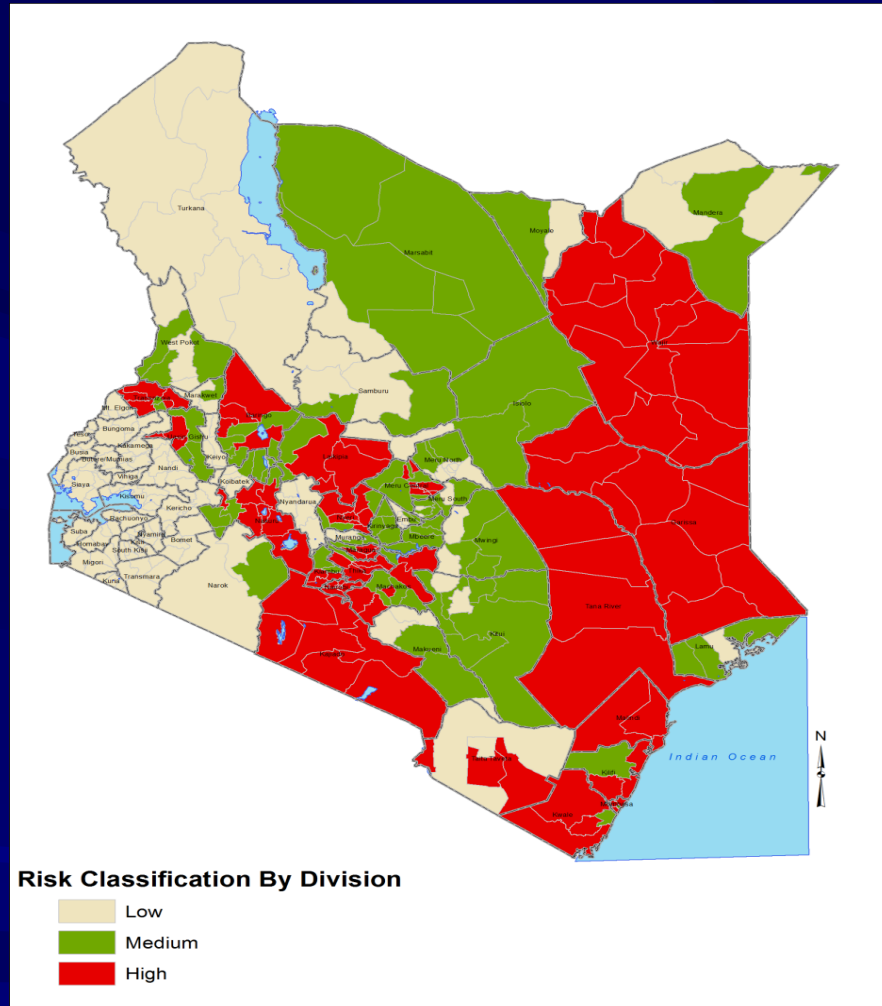
## Quarantine and slaughter ban

Prevent movement of animals from infected area to disease-free areas

Consider slaughter ban in affected areas

Ensure that only properly identified animals enter the supply chain and markets.

# Kenya: RVF Risk Map



27.8% in high, 38.4% in medium, 33.8% in low risk areas

# Livestock Vaccination: Situations and Control Approaches

<b>RVF Situation</b>	<b>Examples of countries</b>	<b>Current Control Strategy</b>
Endemic with regular outbreaks	Kenya, Tanzania, Egypt, Senegal, Mali	Vaccination at sign of outbreak Egypt: continuous vaccination No vaccination
Endemic with sporadic/re-occurring outbreaks	South Africa, Saudi Arabia	Continuous/yearly vaccination
Free high risk	Middle East, North Africa	(Active) surveillance
Free low risk	Europe, Americas	Surveillance, talks of vaccine banks

Limited continuous vaccination of livestock in Africa:

- Cost of yearly vaccination
- Safety concerns: difficulties to determine physiological stages of pregnant animals
- Irregularity of outbreaks (years without signs of outbreak)
- Policy aspects: vaccination not always covered by government



# Livestock Vaccination: Issues to Consider

## ❑ Endemic regions

- Yearly vaccination
- Intermittent multiyear vaccination\*
- Multivalent or combination vaccine, consisting of RVF antigen & antigen of a vaccine likely to be used regularly
  - RVF+LSD; RVF+ s/g pox; RVF + CBPP
- Thermostability

## ❑ Set up regional vaccine bank

- FAO/ NGO/Private company
- Need storage facility

## ❑ Free regions/ Prevent epidemics

- Elimination of possible source of re-infection
- Use of non-replicating antigen vaccine
- Early and rapid onset of immunity, even in young animals

## ❑ DIVA

- Positive marker: export of animals from endemic countries
- Negative marker: for detecting infection

# Public Education, Quarantine, Slaughter Ban

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1. Remain the most effective methods during the outbreak warning and outbreak phases.
2. Quarantine and slaughter ban works for a short period, primarily because most of the affected areas in GHA are the ASALs whose people are dependent on livestock for food and income.
3. Involvement of local and religious leaders is critical for effectiveness of public education.
4. Targeted messaging in high risk areas may be more effective than single national messaging

# Vector Control

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1. There is no known biological control of the vector.
2. More effective in preventing human infections rather than livestock infections.
3. Use of insecticides on livestock was carried out in Kenya but its effectiveness in preventing spread of disease among animals or humans has not been demonstrated
4. Large scale vector control (aerial spraying) frequently attempted but not effective because of expansiveness of affected areas and cost.

# Livestock Vaccination

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1. Most experts agree that an effective livestock vaccination program can significantly mitigate an RVF outbreak (or even prevent it).
2. Unfortunately no country in the GHA has an RVF livestock vaccination policy, in part because of the long inter-epizootic periods (up to 10 years)
3. The promise of registering new safer RVF vaccines is encouraging.
4. Efforts towards developing multivalent vaccines to increase uptake by farmers should be continued.
5. Efforts to establish regional RVF vaccine bank should continue, as solution for vaccinating in response to RVF warnings

# Livestock Vaccination: The Question?

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What would be an effective routine vaccination program for RVF (how long does herd immunity last?)

# Conclusions

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1. Development of a country-specific RVF risk map is useful in producing an cost-effective control program.
2. Livestock vaccination remains the best long-term RVF control program.
3. During an outbreak, public education, quarantine and slaughter ban are the effective control methods.