

## **Rift Valley fever From the Local to Global Concern. The lessons Learnt from the 2007 Outbreak of RVF in Sudan.**

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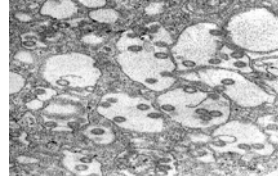
## **Background**

- Rift Valley fever is an emerging vector-borne zoonotic disease.
- The name of the disease was driven from the Rift valley place in Kenya where the disease appeared first time in 1931.



## Etiology

- ❑ Caused by Rift Valley Fever virus, genus Phlebovirus, a member of Bunyaviridae Family.



- ❑ Transmitted by + 30 mosquitoes species



## RVF Host Range

- ❑ It affects primarily different types of animals



RVF also affects humans

Patients with RVF in Mauritania



Patient with RVF in Somalia



## Symptoms and Clinical signs of RVF in Animals

- In general young animals get a severe form of the disease while the old suffers from a milder form.



Storm of abortion particularly in ewes.



## Post Mortem lesions



Nostrils showing hemorrhage and bloody discharge from nostrils  
Source Professor Coetzer, University of Pretoria





Intestine showing Petechial Hemorrhage  
Source Prof. Coetzer, University of Pretoria



Mucosal Hemorrhage in Abomasum  
Source Prof. Coetzer, University of Pretoria

## The forms of RVF in Humans

### 1- Mild form

It is a typical form in humans where person might suffer from sudden fever(37.5-40C), face flushing, eye congestion, headache, general muscles , joint pain and photophobia.

In most cases patients recovered spontaneously between 4 to 7 days.

In the mild form most of the cases remain unnoticed in African countries since it is difficult to diagnose RVF with the clinical signs.

It is also difficult to differentiate Mild feature from some other diseases like Malaria. This could be possible reason for the underestimation of RVF in some African countries.

## 2- Severe Form

### A- Hemorrhagic Form

In some outbreaks within 2 to 4 days patients might have Complications in terms of heamotemasis, petechial Purpuric skin, gingival bleeding and probably Jaundice.

50% of such cases die after 2 to 6 days.

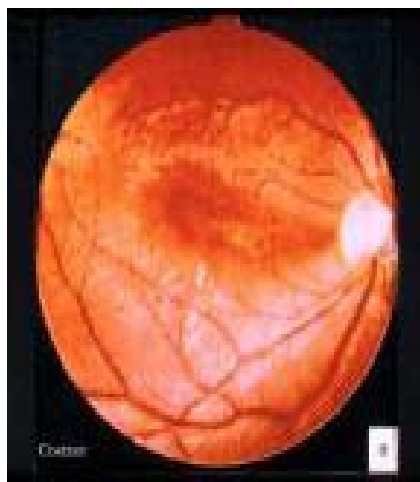


### B- Encephalitis Form

- This could be appear between 5 to 15 days after the fever onset.
- It might be associated with meningitis, paralysis and disorientation of the patient.

### C- Ocular Form

- The patient might suffer from unilateral or bilateral macular and possible retina hemorrhage.
- This could be within 7 to 20 days after the disease starts.
- The permanent loss of vision might include 1 to 10% of such cases.



### D- Renal Failure

- It Was very obvious in Saudi Arabia and Sudan



## Transmission of RVF

- From Animal to Human



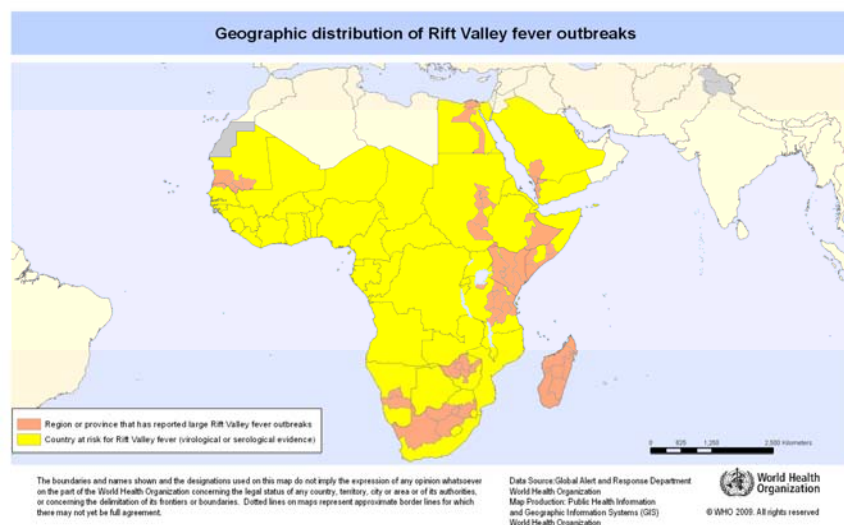
## From animal to animal or human via mosquitoes



## From Mother to baby



## RVF from the local to Global Concern Emerging of the Disease



### Spatial Temporal Trend of RVF Global Occurrence 1931- 2011

Country	First outbreak	Geographical region
Kenya	1931	East Africa
South Africa	1951	South Africa
Namibia	1955	West Africa
Sudan	1973	Central Africa
Egypt	1977	North Africa
Saudi Arabia and Yemen	2000	Asia/ Arab Peninsula
Madagascar	2008	Indian Ocean
<b>Which is next?</b>	<b>When?</b>	<b>Where?</b>

### Trend of Morbidity and Mortality of RVF in humans during various outbreaks

Country	Outbreak Year	Total cases	No of Death	Case fatality%
Egypt	1977-1978	18000	598	3.3
Mauritania	1988	350	6	1.7
K.S.A	2000	882	125	14.2
Kenya	2006-2007	684	155	23
Tanzania	2006-2007	264	109	41
Somalia	2006-2007	114	51	43
Sudan	2007	698	222	31.5
Madagascar	2008	418	17	4
South Africa	2010	63	2	3

### Classification of RVF based on its threats

- RVF asserted as a notifiable disease of multispecies in List A by OIE. This list includes diseases that spread rapidly, crossing the national borders, with great public health, food insecurity and economic consequence.
- The disease also found one of the most global re-emerging zoonotic threats.
- RVFV was cited as biological warfare thus the bioterrorism adds new dimension to the RVF risk.

RVF was ranked by (GF-TAD) as of great concern as an animal disease which seriously affect human health.



### **Health Impacts of RVF**

- Case Fatality up to 43%
- Disability due to encephalitis, Renal failure or loss of vision.
- Threatening the life of mothers and offspring

### **Economic Impacts of RVF**

- Death of animals and abortion
- Jeopardization of Animal trade
- Devastating food security.
- Influence negatively tourist.
- Cost of control.

## The Impact of Climate Change on RVF

- ❑ Heavy rains associate with El Niño/Southern Oscillation (ENSO) and the increasing surface temperature of the eastern Pacific Ocean in East Africa – 3-7 years ( Kenya- Tanzania- Somalia- Sudan).





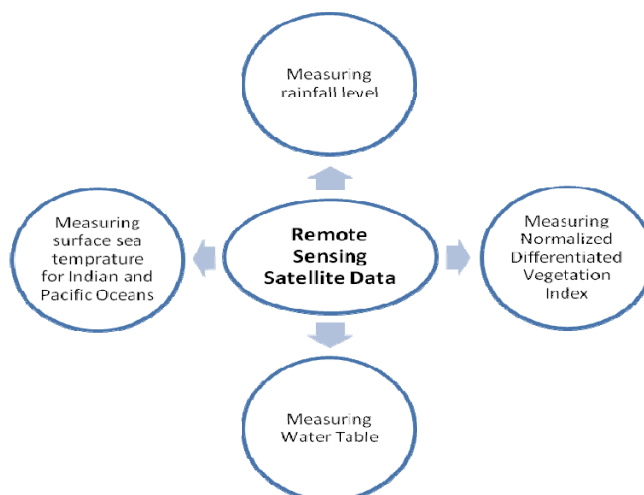
- Construction of dams increase the water table and humidity- good habitat for vector- Egypt and Senegal



### **Does climate change could shape the pattern of RVF in Future?**

- ☐ Global warming provide suitable environment for RVF vectors.
- ☐ Population dynamic of the vectors based on environmental condition such as temperature and humidity.
- ☐ Few degrees of temperature increasing can lead to multiply of mosquito population.
- ☐ Milder winter enable mosquitoes to survive

### Forecasting of Rift Valley Fever using Remote Sensing Satellite Data.



Source: Data adapted from David and Martin (2003), Anyamba et al (2009) and FAO/WHO (2009)

### The 2007 outbreak of RVF in Sudan The story of interaction among environment, animal and human health

#### Geography of Sudan

- Sudan is located at the north eastern part of Africa
- This location makes Sudan a bridge between Africa and Middle East.
- Sudan was considered the largest country in Africa and Middle East with area of 2.5 million square.
- This vast area make it the tenth largest country in the world.

- The RVF outbreak occurred between September to January 2007 after 34 years of the first outbreak in the country 1973.
- The outbreak was associated with unusual heavy rain(343MM).
- 230 death out of 747 human diagnosed cases( case fatality 30.8%).
- Unknown numbers of animals affected.

Sequence of events, actions, and response related to the RVF outbreak in Sudan 2007.

June 2007	Early warning alert
June-August 2007	Heavy rains and flooding
September 2007	Suspected human RVF cases
October 8-14, 2007	First human index case
October 18, 2007	Federal Ministry of Health (FMoH) Sudan asks WHO for assistance
October 24, 2007	FMoH and WHO teams start investigation
October 28, 2007	Outbreak of RVF declared
November 10, 2007	Outbreak of RVFV in livestock declared
November 19, 2007	Start of targeted vaccination
January 2008	End of outbreak

Map of Sudan showing the 5 states where RVF was reported

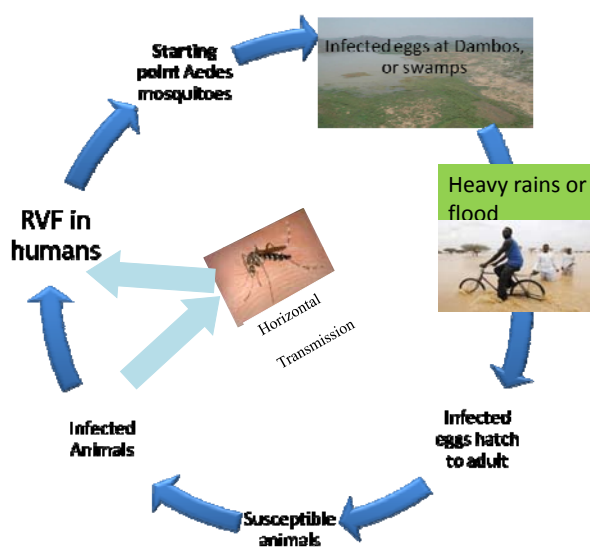


## The ecology of the affected States

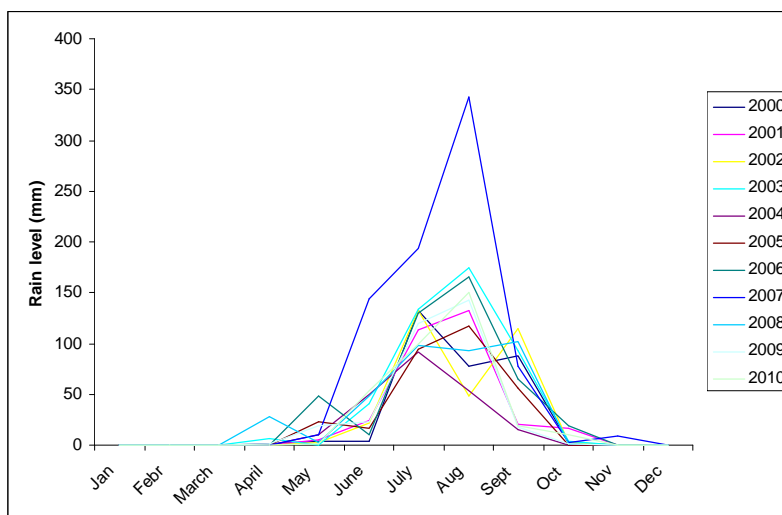
- The White Nile, Sennar and Gezira state are an agricultural states.
- Gezira has one of the biggest agricultural scheme in the world and there were many cases particularly for those who live near water canal



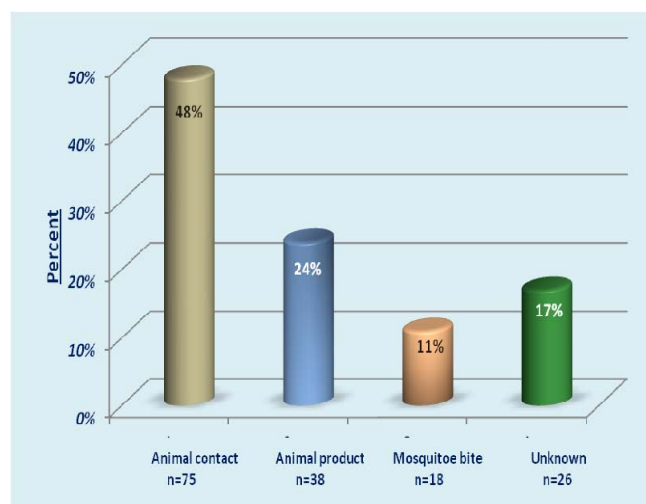
## Epidemiology of RVF in Sudan



### The association between RVF and heavy rains in White Nile state, Sudan

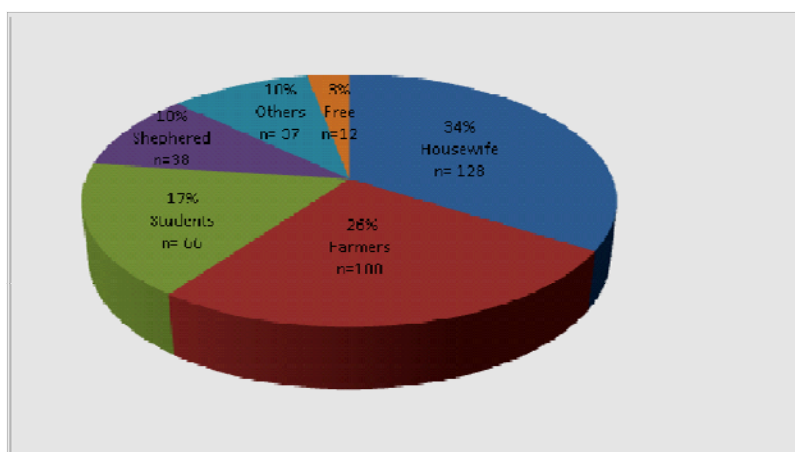


### Risk Factors of RVF in Gezira State





### Distribution of RVF Patients in Sudan by Profession



### Symptoms and signs among 157 RVF Human patients in Sudan

Symptoms and Signs	%Percent among the patients%
Fever	90
Renal Failure	60
Epistaxis	36
Hematemesis	36
Jaundice	35
Bleeding gums	21
Coma	11
Sub-conjunctival hemorrhage	10
Hematuria	16

Source El-Imam et al 2009.

### Urbanization of RVF?

- Mosquitoes with RVFV are found around and in the cities
- Animals with RVFV IgG seroprevalence (have had a RVFV infection) have been detected around and in the cities
- Large movement of people from rural areas – demographic change

### Addressing One Health One World approach to Confront RVF

- We are living together, human, animal and environment in one planet.
- The human health is a result of sustainable relation among, environment, animal health and human health.

- RVF is a very good example of such One Health relation.
- In order to confront RVF, we highly need multidisciplinary planning as well as multi disciplinary teams must work together to disrupt the life cycle of the RVF in different stages.



### Take Home Message



- ☐ Globalization and global climate creating conditions conducive to RVF to Europe and U.S.A.
- ☐ “Climate change is disrupting natural ecosystems in a way that is making life better for infectious diseases such as RVF”
- ☐ The public health consequences will be devastating in new unaffected areas unless well preparedness takes in to consideration
- ☐ The One Health approach is the best Strategy to confront the emerging RVF

- The risk for unaffected area are animal movement or trade and mosquitoes.

Thanks for Your Attention



Questions and Comments Please