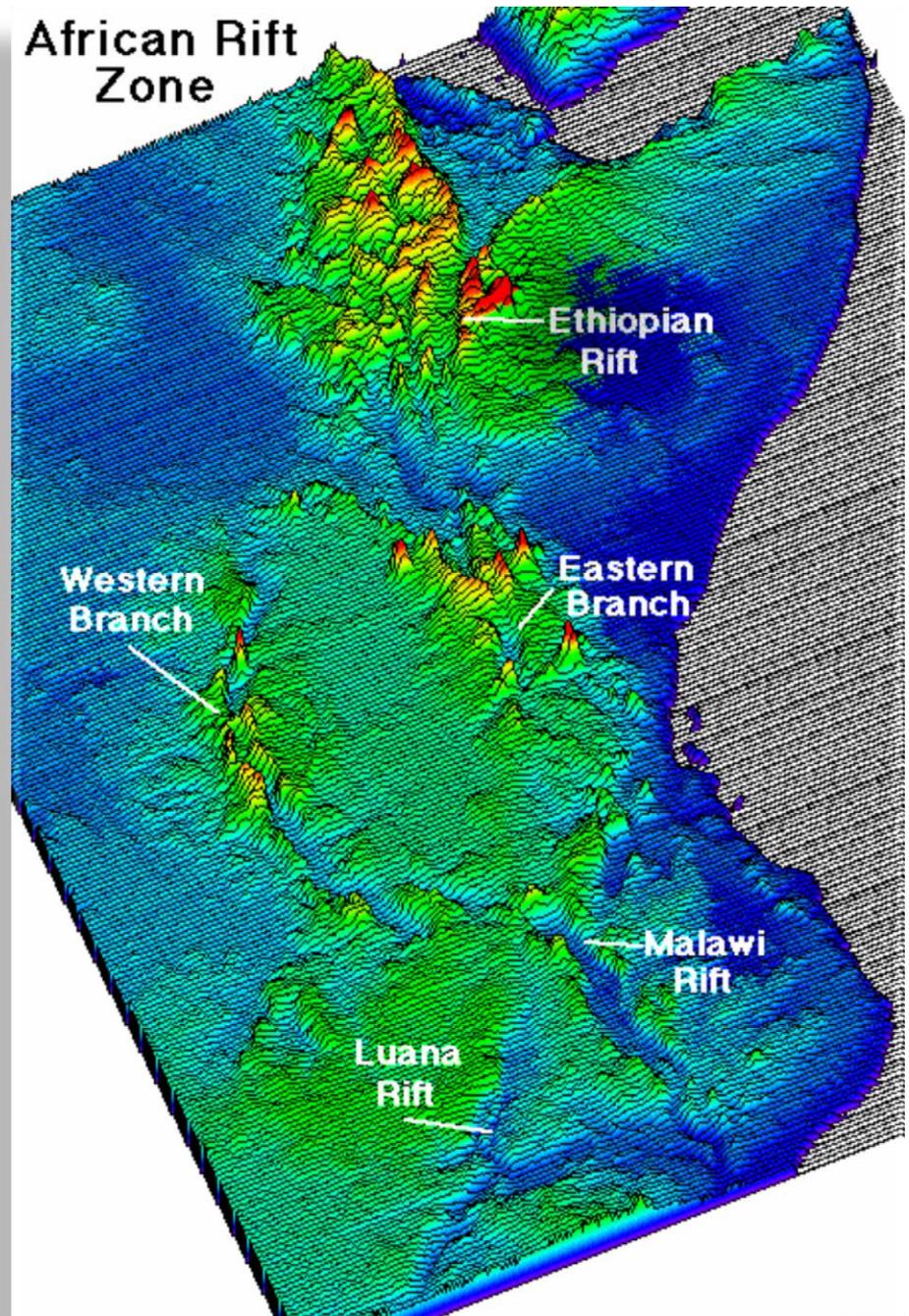
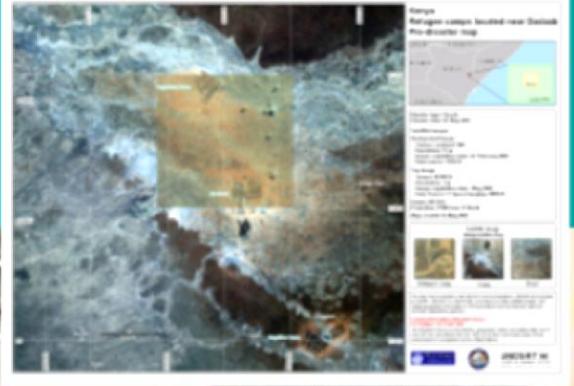
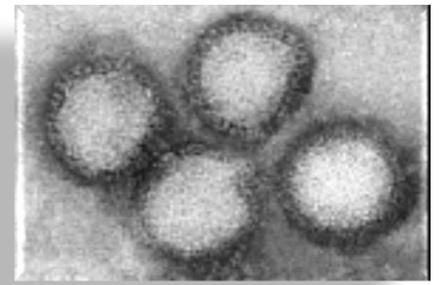


RIFT VALLEY FEVER



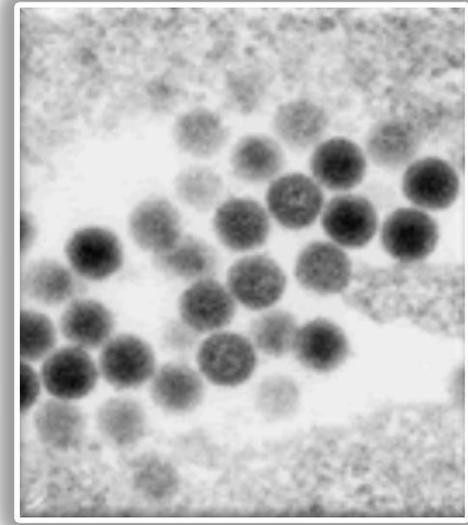


Rift Valley Fever



- Descritta per la prima volta nel 1930 in Kenya (focolaio di aborti e mortalità in agnelli)
- Specie sensibili: ovi-caprini, bovini, bufali, camelidi, primati, UOMO. Possono mostrare breve viremia cavalli, cani, gatti, suini, ratti, pipistrelli
- Razze autoctone più resistenti. Sintomi più gravi in animali giovani

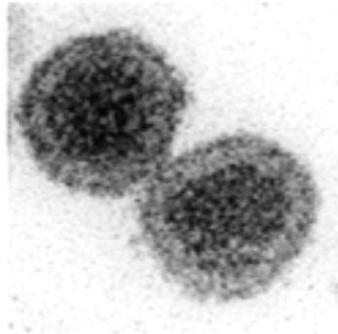
RIFT VALLEY FEVER



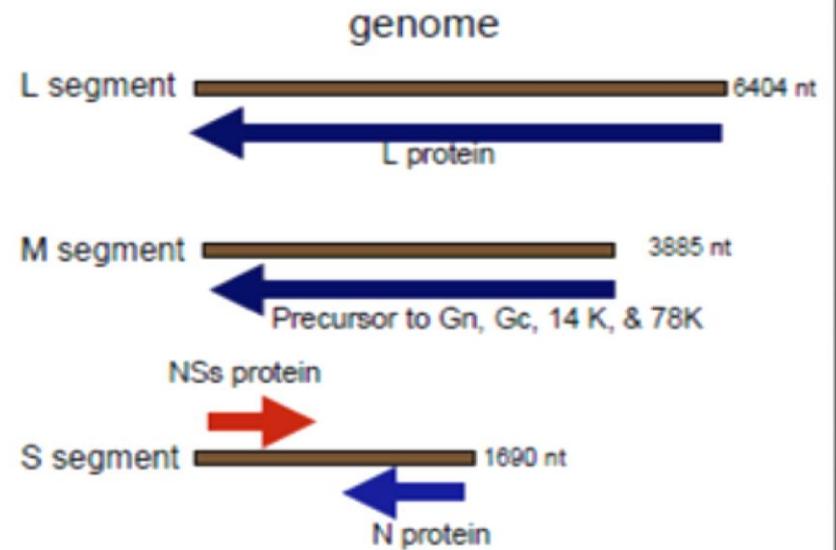
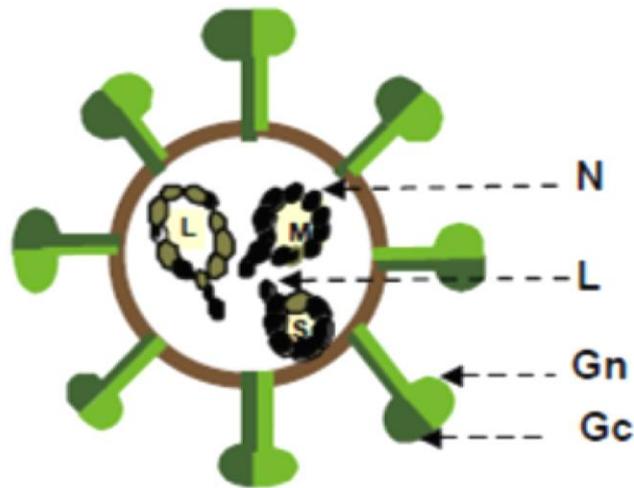
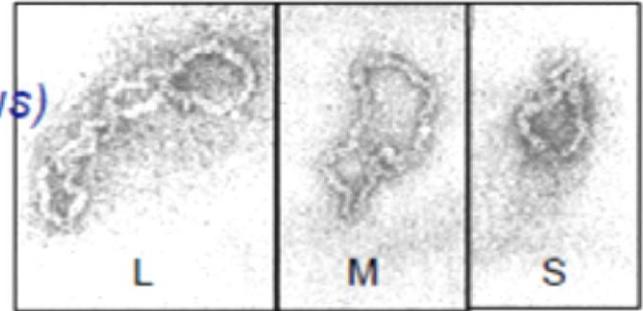
Malattia virale trasmessa da insetti ematofagi

Agente: Famiglia: Bunyaviridae, Genere: Phlebovirus
3 segmenti (S, M, L) di ssRNA ognuno contenuto in un singolo capside, envelope. Resiste mesi a 4°C, inattivato a pH < 6.8

Zoonosi, endemica in vaste aree dell'Africa, con epidemie ciclicamente ricorrenti, associate in genere a fenomeni di eccezionale piovosità



Rift Valley fever virus
(Bunyaviridae, *Phlebovirus*)



RIFT VALLEY FEVER

Negli animali trasmissione tramite vettori (*Aedes*, *Anopheles*, *Culex*, *Mansonia* etc...) e infezione transplacentare

L'uomo si infetta attraverso insetti ematofagi, per via cutanea (contatto con sangue, fluidi, organi e carni di animali infetti), aerosol, per via alimentare (latte di animali infetti). Non documentata la trasmissione uomo-uomo

Allevatori, veterinari, macellatori, laboratoristi categorie a rischio più elevato.



RIFT VALLEY FEVER

Aedes sp.: trasmissione transovarica

Le uova di *Aedes vexans* resistono anche per anni nel terreno per schiudersi in occasione di piogge intense che comportano allagamento

RIFT VALLEY FEVER

Epidemie di RVF si verificano in annate particolarmente piovose, quando uova di zanzara (*Aedes*) trovano le condizioni adatte per schiudersi. Le uova infette danno origine a insetti adulti a loro volta infetti, in grado di riavviare la trasmissione dell'infezione

El Niño / IOD

Rainfall

Vegetation growth + Floods

Vector population increase
(primary focal areas)

Increased RVF
circulation in animals

Implication of other vectors

Vector dispersal

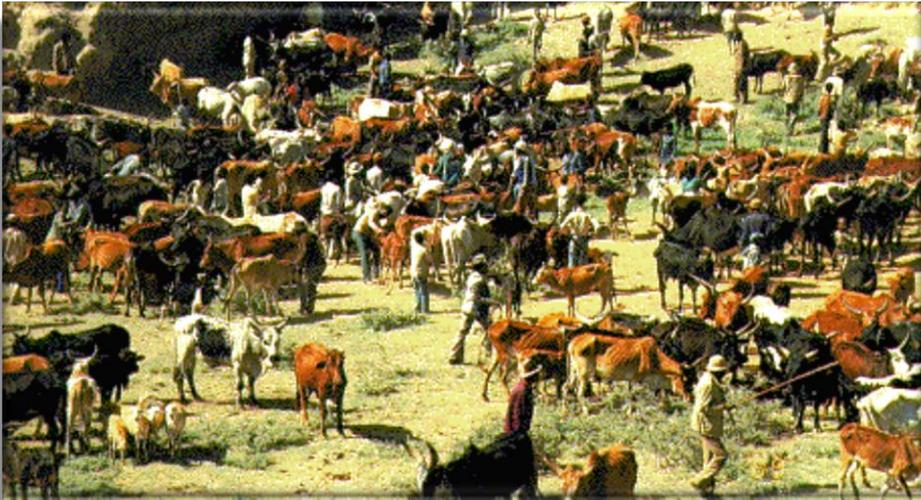
Animal movements

Full extent of the
RVF epizootic

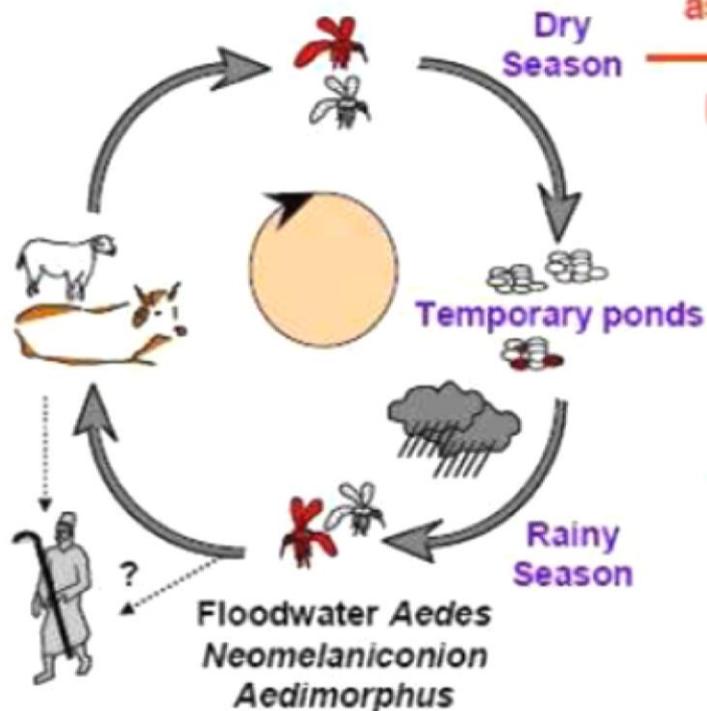
RIFT VALLEY FEVER



L'infezione ricorre in aree a clima umido/tropicale (Rift Valley), in aree di savana semiaride (Corno d'Africa), in aree a clima arido (Penisola Arabica), in aree irrigue (Senegal, valle del Nilo)



Endemic Cycle

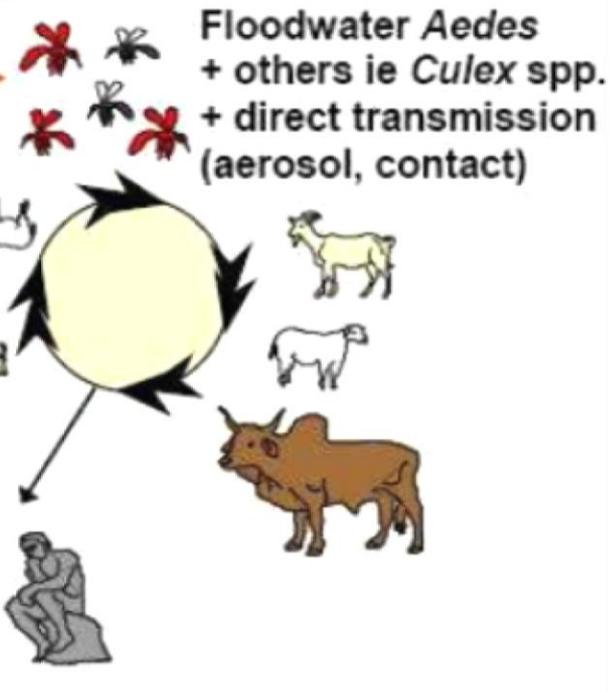


The virus persists during dry seasons and inter-epizootic periods through vertical transmission, inside drought resistant floodwater Aedes eggs.

Epidemic Cycle

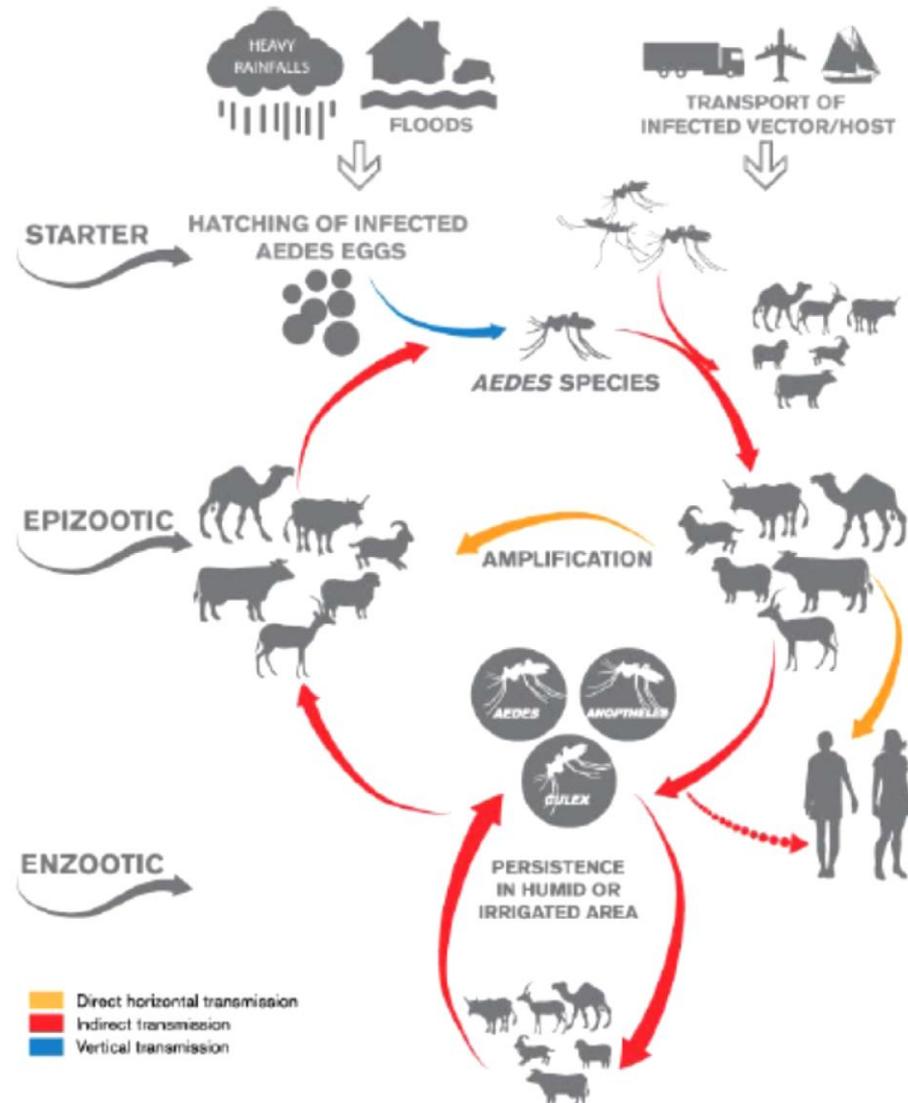
Climatic factors (heavy rainfall associated with ENSO)

Human irrigation practices



Flooding results in a mass-hatching of Aedes eggs, some of which are infected, leading to a new RVF outbreak.

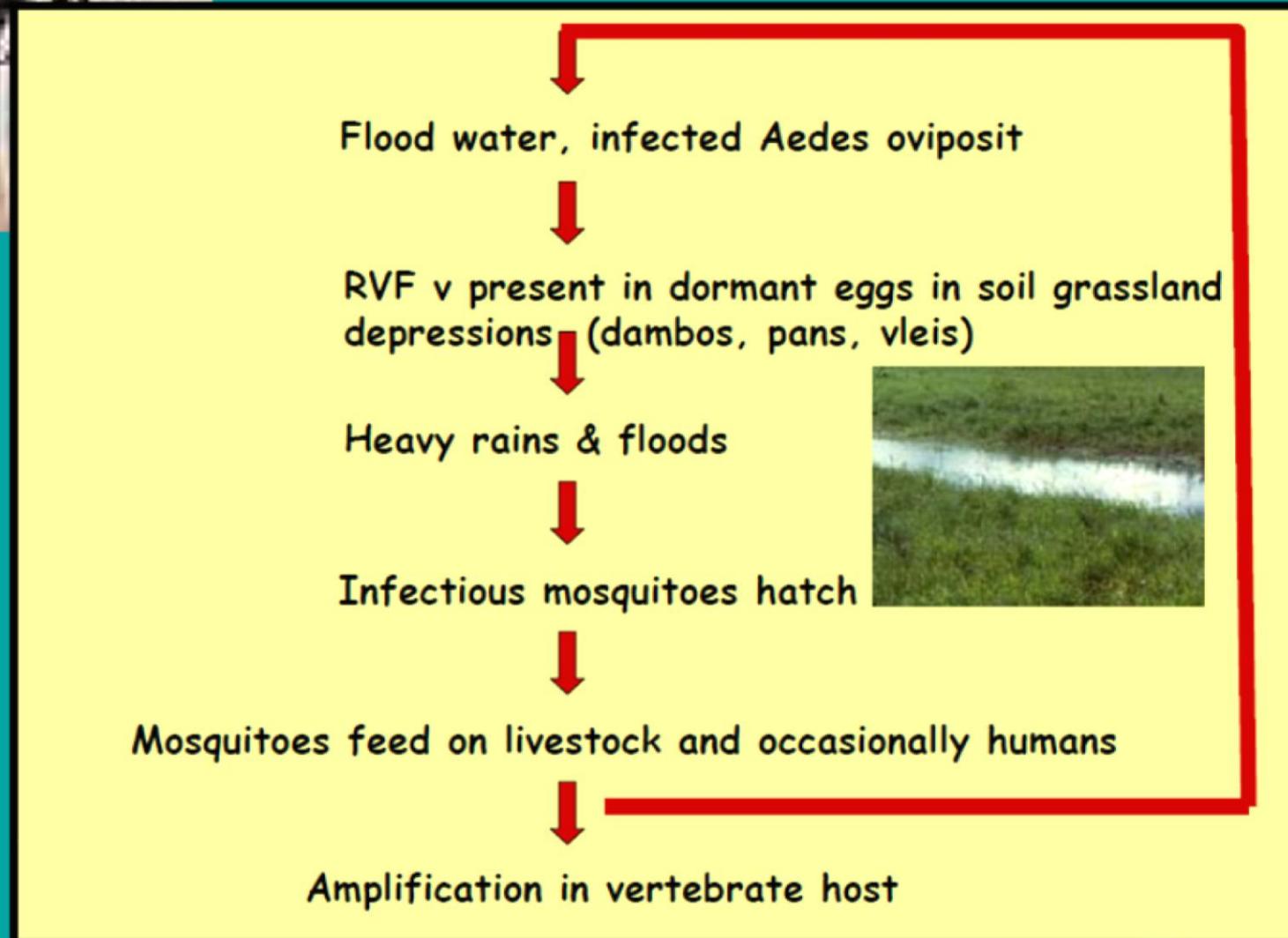
Figure 3: RVF transmission cycle



Source: FAO.

Natural Cycle Of RVFV:

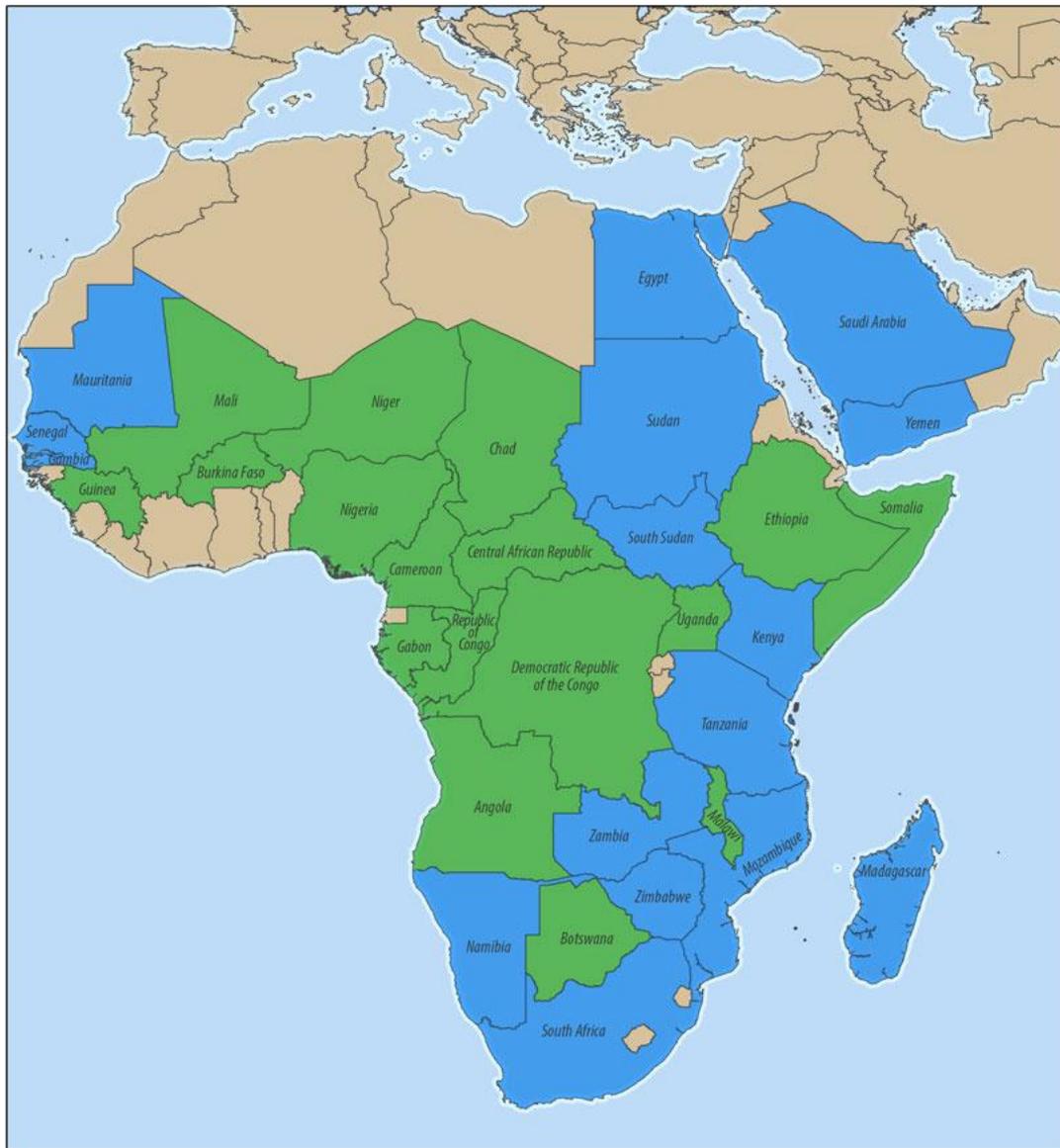
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RIFT VALLEY FEVER

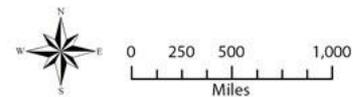
Ripetute epidemie successive, con intervalli irregolari 3 - 10 anni (gravissima quella in Egitto nel 1977 per numero di casi umani: 200000 casi, 60000 malati gravi, 600 decessi, gravi perdite in campo animale)

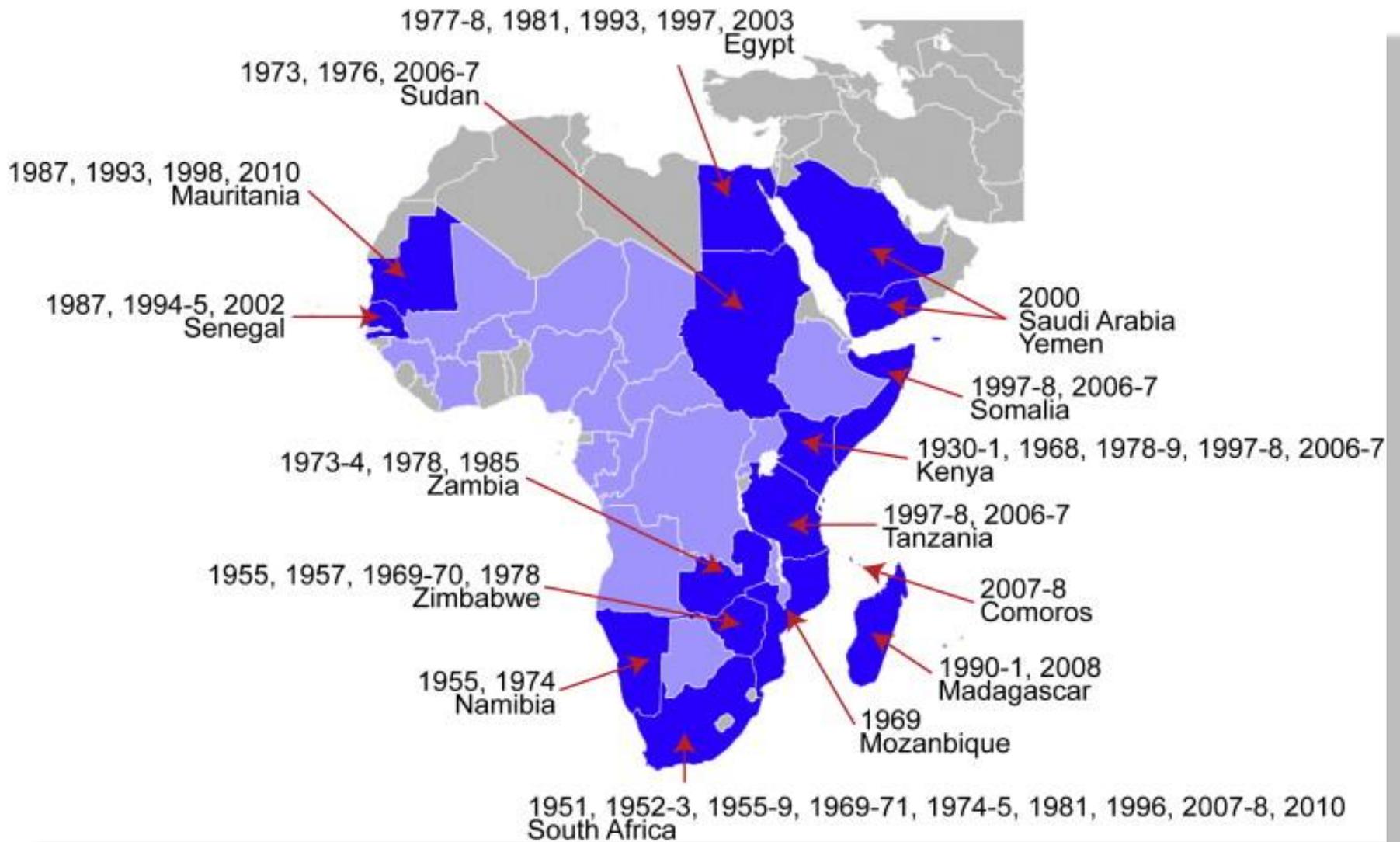
Nel 2000 l'infezione si presenta al di fuori del continente africano: Arabia Saudita (884 casi, 124 morti) e Yemen (1087 casi, 121 morti)

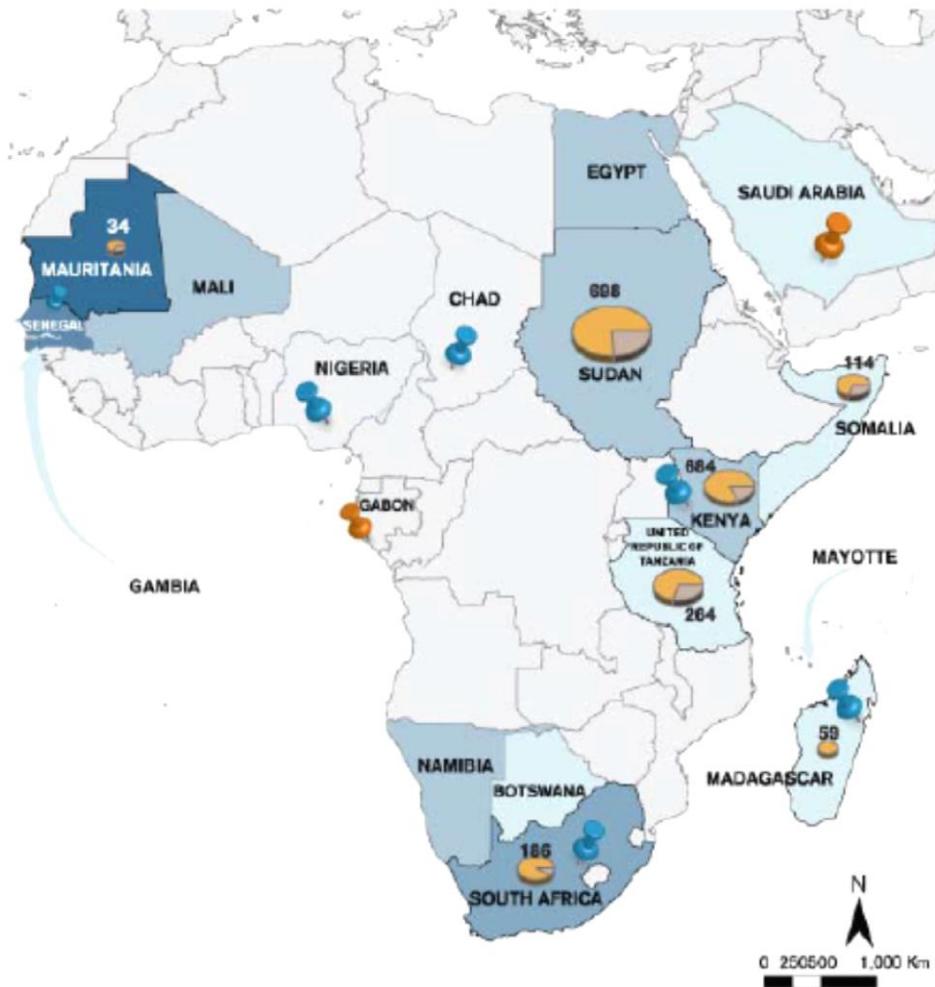


RIFT VALLEY FEVER DISTRIBUTION MAP

- Countries reporting endemic disease and substantial outbreaks of RVF
- Countries reporting few cases, periodic isolation of virus, or serologic evidence of RVF infection
- RVF status unknown

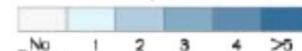






Legend

Total number of years when the disease was reported (OIE)

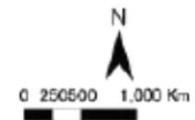


No Report

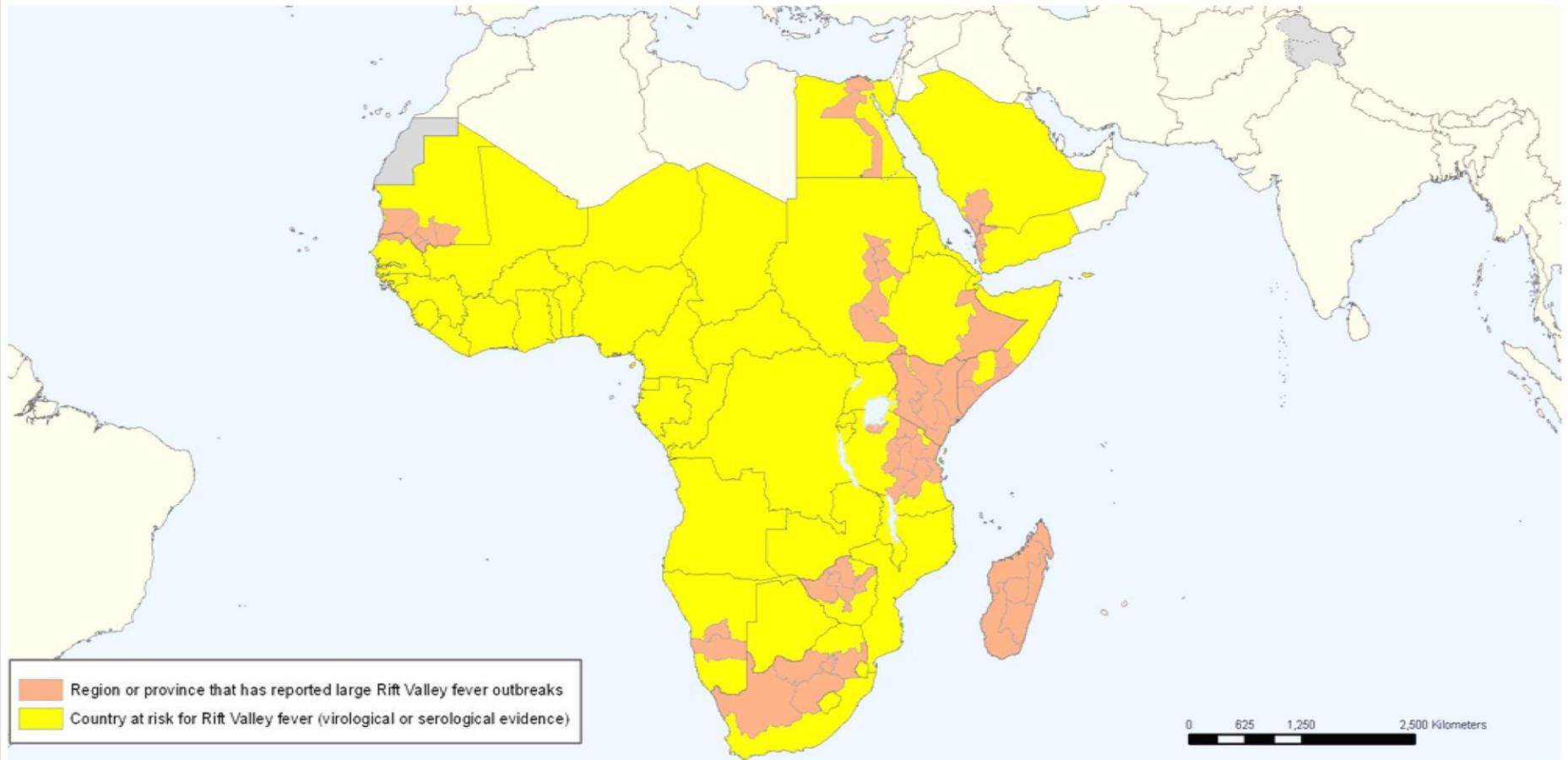
● Inter-epidemic serological evidence in animals

● Inter-epidemic serological evidence in humans

Number of human cases (WHO)



Geographic distribution of Rift Valley fever outbreaks



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

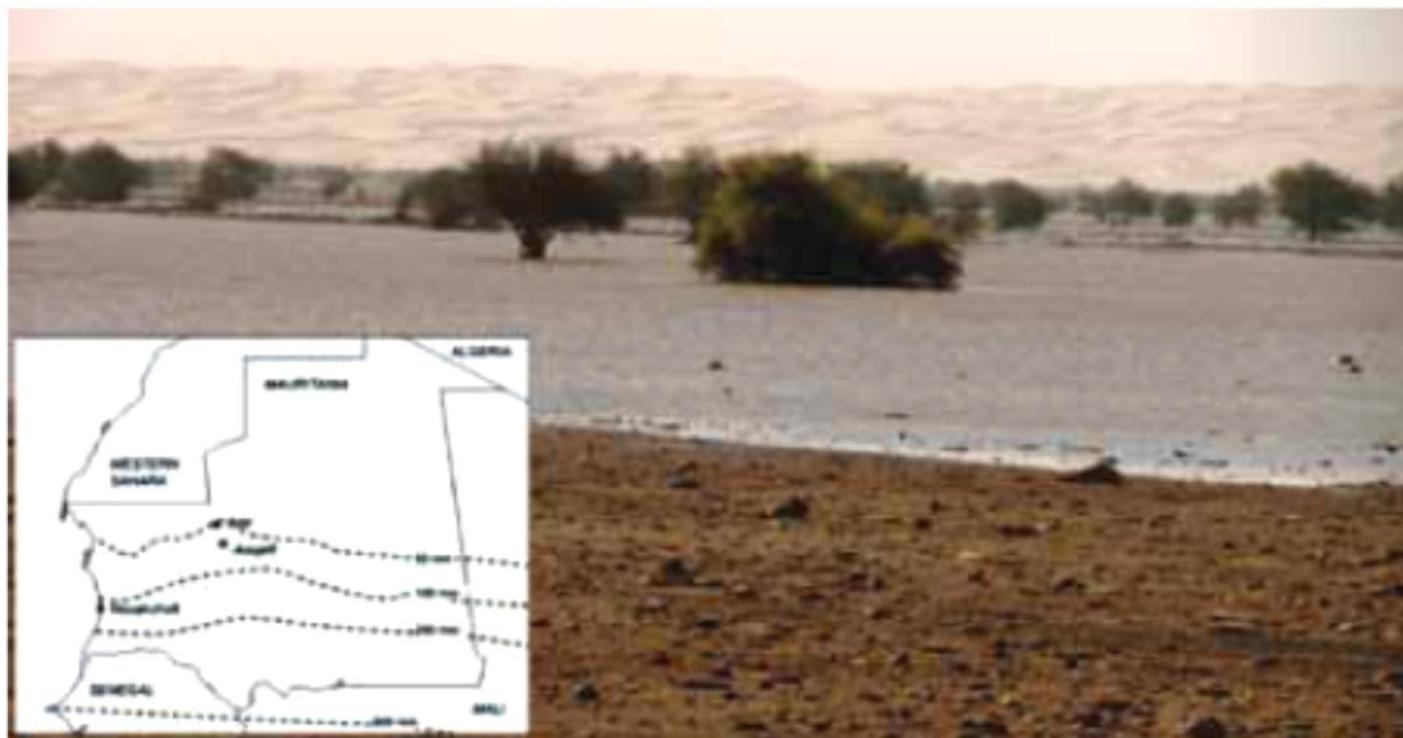


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Major Rift Valley fever outbreaks and reported cases among humans, 1997–2010*

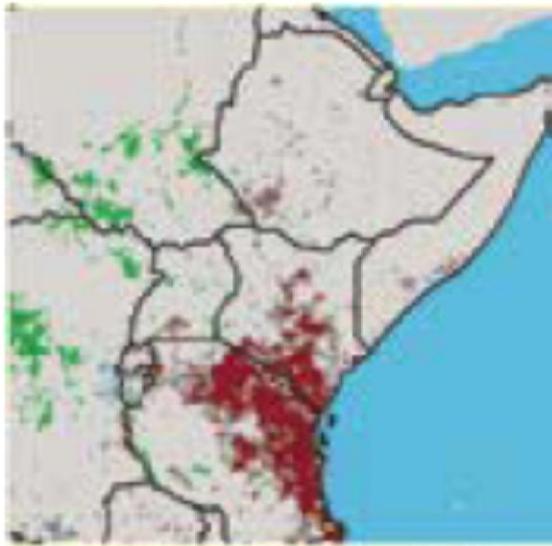
Outbreak dates	Geographic distribution	Estimated no. cases	No. cases reported	No. deaths confirmed	Precipitation	Control measures
1997 Dec–1998 Jan	Kenya, Somalia, Tanzania	89,000	No documented reports	478	Heavy rainfall and flooding	Active surveillance; safety education; distribution of masks, gloves; slaughterhouse monitoring
1998 Sep–Dec	Mauritania	No documented estimates	300–400	6	Heavy rainfall	Active surveillance; public awareness/education; mosquito control; animal movement control
2000 Aug–2001 Sep	Saudi Arabia, Yemen	20,000†	886	123	Rainfall; virus introduction	Active surveillance; public awareness/education; mosquito control; animal movement control
2006 Nov–2007 Mar	Kenya	75,000	700	158	Heavy rainfall and flooding	Active surveillance; public awareness/education; mosquito control; ban on livestock slaughtering; closure of livestock market; vaccination Jan 2007
	Somalia	30,000	114	51		
	Tanzania	40,000	264	109		
2007 Sep–2008 Jan	Sudan	75,000	747	230	Heavy rainfall and flooding	Active surveillance; public awareness/education; targeted vaccination; ban of livestock imports by Saudi Arabia and Egypt
2008 Jan–Jun	Madagascar	10,000	476	19	Heavy rainfall	Active surveillance; public awareness; mosquito control; animal movement control
2008 Oct–2009 May	Madagascar	No documented estimates	236	7	Heavy rainfall	Active surveillance; public awareness; mosquito control; animal movement control
2010 Feb–2010 May	South Africa	No documented estimates	242	26	Sustained heavy rains	Public awareness/education; mosquito control
2010 Sep–2010 Dec	Mauritania	No documented estimates	63	13	Heavy rainfall	Public awareness; mosquito control; animal movement control

Figure 1: One of the main outbreak foci



Note: Flooding at Lefrass oasis (30 km north of Atar) persisted for about ten weeks, enabling mosquito populations to develop. The insert shows the locations of Atar and Aoujeft and the average isohyets for 1965 to 2002.
Source: FAO, Land and Water Development Division.

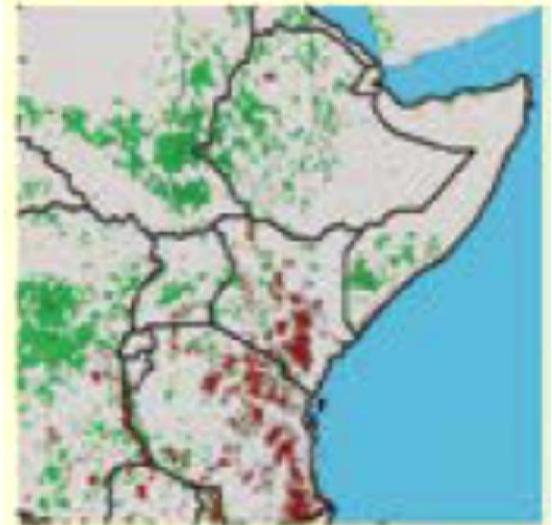
Mauritania, epidemia settembre-ottobre 2010



January 1997



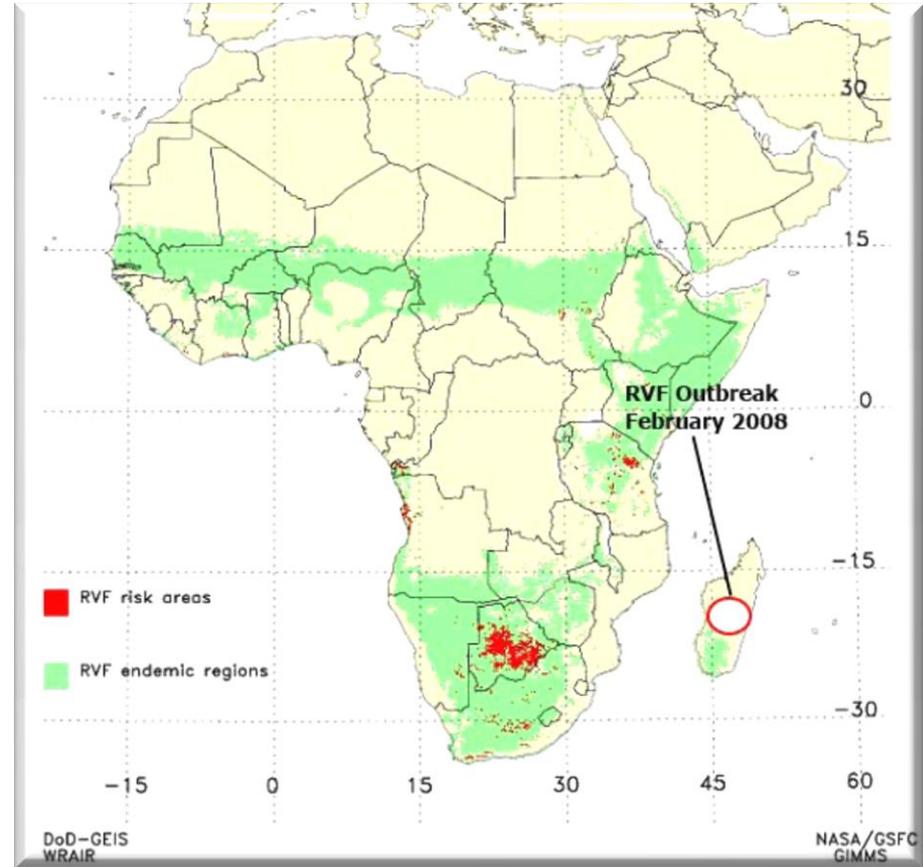
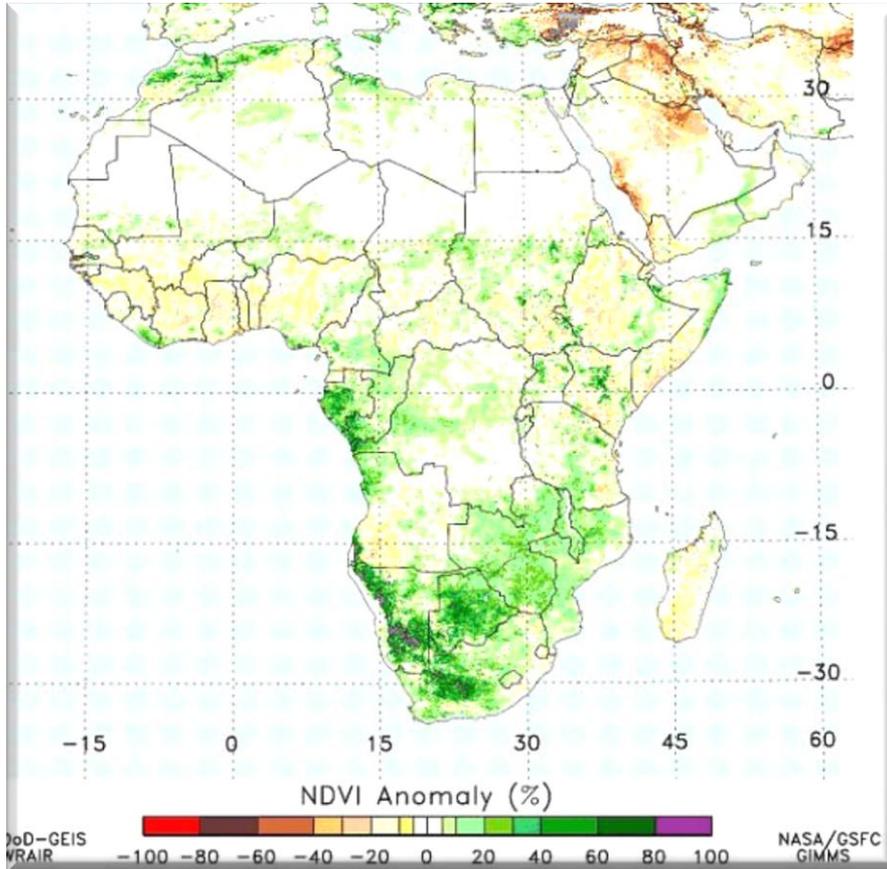
January 1998



January 1999

Differenze in Normalized Differentiated Vegetation Index in anni diversi

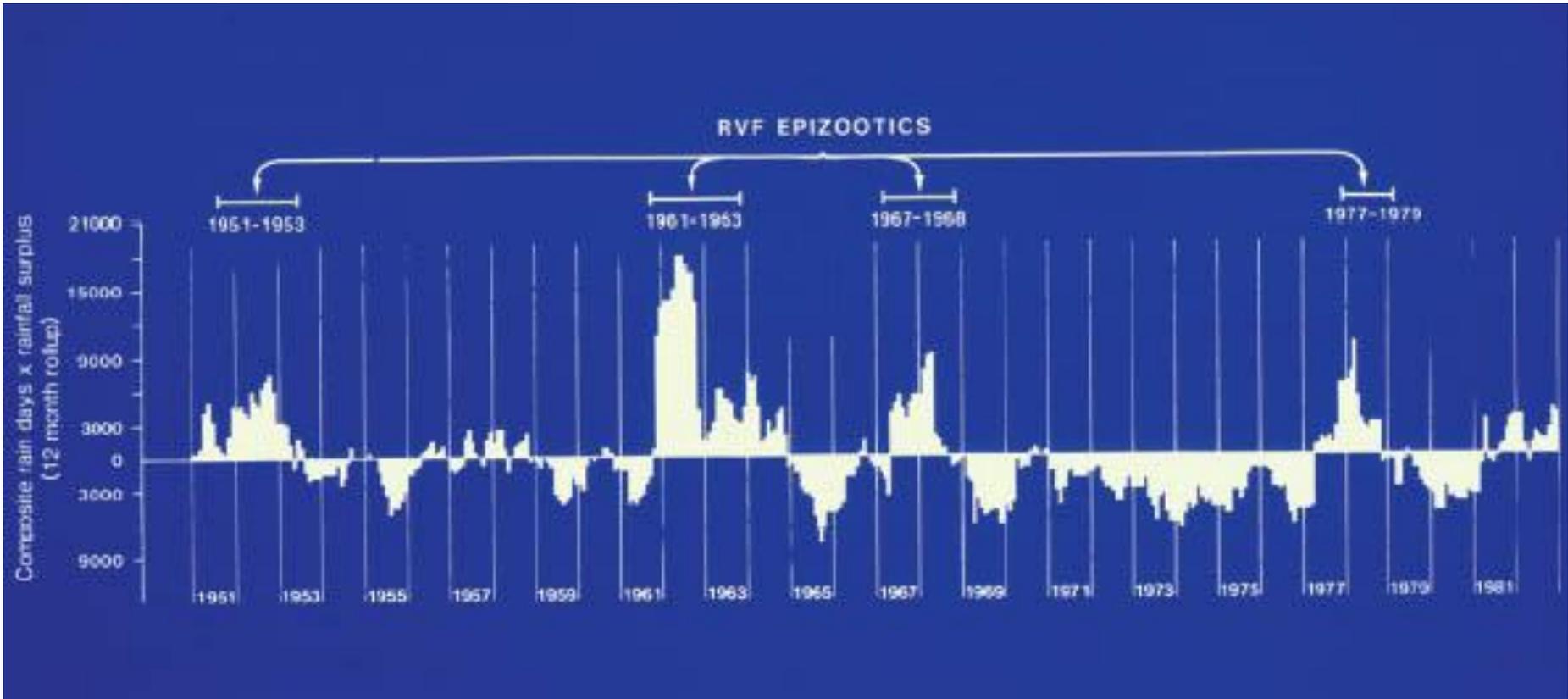
NDVI anomalies (a) and Rift Valley Fever Risk map (b) for February 2008



NDVI anomalies during February 2008, showing elevated vegetation conditions in East Africa (+60 - +80 %) and south western Africa associated with above normal rainfall. Areas shown in red indicate areas at risk for RVF activity; those shown in green are within an RVF endemic region or in areas where RVF virus has been identified; and those shown in yellow have negligible risk.

Source: A.Anyamba, NASA Goddard Space Flight Center

Correlazione tra episodi epidemici di RVF e persistenza di piovosità

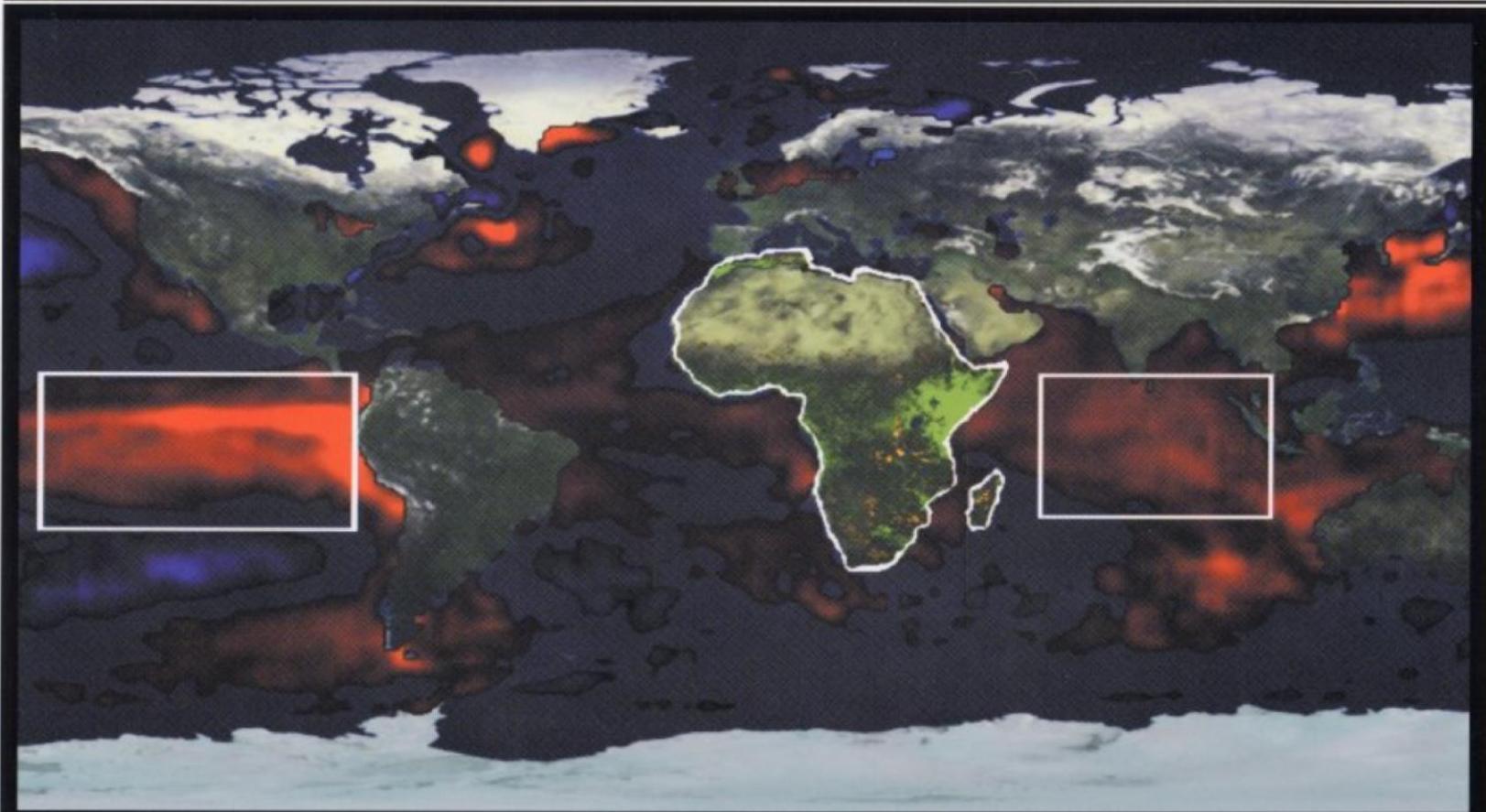




National Aeronautics and
Space Administration

Goddard Space Flight Center

Using Satellites to Track Rift Valley Fever



Scientists have discovered that the combination of warmer-than-normal equatorial Pacific Ocean temperatures associated with El Niño and rising sea-surface temperatures in the western equatorial Indian Ocean can trigger outbreaks of Rift Valley Fever in eastern Africa. This February 1998 image of sea-surface temperature and vegetation, from the Advanced Very High Resolution Radiometer (AVHRR) onboard the National Oceanic and Atmospheric Administration's (NOAA) polar-orbiting weather satellites, illustrates the close relationship between ocean temperature (warmer-than-normal ocean temperatures are shown in red, cooler-than-normal temperatures shown in blue), rainfall, and their impacts on land vegetation (greener-than-normal vegetation shown in light green). The two warm pools of water (highlighted in the boxes) affect atmospheric circulation patterns such that there is an increase in rainfall over a large area of eastern Africa, which can lead to large-scale outbreaks of mosquito-borne diseases.



“Dambo” in Kenya





Arabia Saudita: ecosistemi interessati dall'epidemia di RVF del 2000



Importanza dell'allerta precoce

- Attivazione sorveglianza su popolazioni umane e animali
- Restrizione alle movimentazioni animali, misure quarantenarie, chiusura mercati
- Sensibilizzazione di key community figures e del pubblico
- Controllo vettori
- Divieto macellazione animali malati
- Vaccinazione degli allevamenti non infetti

RIFT VALLEY FEVER

Diagnosi:

- diretta: identificazione virale (IF, VN, ELISA) da siero, sangue, fegato, milza, cervello di feti abortiti o animali in stato febbrile;
- PCR
- indiretta: ELISA, SN, IHA

RIFT VALLEY FEVER - Controllo

Controllo dei vettori, protezione dal loro morso, controllo della movimentazione animale

Vaccino vivo attenuato: ceppo Smithburn, stabile, immunogeno, contenuto costo di produzione, può causare aborto o malformazioni fetali

Vaccini spenti: necessitano di più interventi, scarsamente efficaci per il bovino

La vaccinazione ad epidemia già iniziata può essere rischiosa per l'uso dell'ago su più animali, con conseguente possibile trasmissione del virus da animali con infezione subclinica ad animali non infetti

Vaccini per l'uomo: sperimentali

Rift Valley fever host range and disease severity

Mortality ~100%	Severe illness Abortion Mortality	Severe illness Viremia Abortion	Infection Viremia	Refractive to infection
Lambs Calves Kids Puppies Kittens White mice Hamster Field mice Door mice Field voles	Sheep Cattle Goats Water buffalo Humans	Monkeys Camels Rats Gray squirrels	Horses Cats Dogs Monkeys	Guinea pigs Rabbits Pigs Hedgehogs Tortoises Frogs Chickens Canaries Pigeons Parakeets

Altamente suscettibili	Suscettibili	Moderatamente suscettibili	Suscettibili, infezione inapparente	Resistenti
Agnelli neonati	Vitelli	Bovini	Equini	Uccelli
Capretti neonati	Pecore	Capre	Suini	Rettili
Cuccioli di cane		Bufali	Cani	Anfibi
Gattini		Camelidi	Gatti	
Hamster		Uomo	Conigli	
Topi			Cavie	

PATOGENESI

- Passaggio del virus per via linfatica dal punto di ingresso ai linfonodi regionali → replicazione → viremia primaria → infezione organi (milza, fegato, cervello, surrenali, polmoni, reni), con intensa replicazione, necrosi, viremia imponente
- Coagulazione intravasale disseminata, vasculite, trombocitopenia
- anemia, shock, insufficienza epatica e renale
- lesioni oculari: foci ischemici retinici, occlusione trombotica di arteriole e capillari → edema retina, perdita trasparenza a causa di essudato/emorragie, eventuale distacco
- encefalite, foci necrotici cervello

RIFT VALLEY FEVER

Sintomi nell'uomo:

- sindrome febbrile (cefalea, mialgia, nausea, fotofobia) con guarigione in 4-7 gg
- sindrome emorragica (ittero, melena, ematemesi, petecchie, morte) (<1%)
- Meningoencefalite (<1%)
- Patologia oculare (lesioni retiniche) (<2%)
- Letalità <1%

RIFT VALLEY FEVER

Sintomi negli animali: incubazione 1 - 3 gg., febbre, depressione anoressia, difficoltà respiratorie, coliche, vomito, scolo nasale sieroso-emorragico, gastroenterite emorragica, encefalite. Aborto come conseguenza di infiammazione e necrosi dei cotiledoni. Nei neonati la mortalità arriva al 90%

RIFT VALLEY FEVER

Lesione primaria: necrosi epatica, focale negli adulti, estensiva in feti e neonati. Fegato ingrossato, consistenza friabile, giallastro, con petecchie emorragiche. Emorragie cutanee, a carico delle sierose, enterite emorragica

Rift Valley Fever



Rift Valley Fever



Figure 2: Observed clinical symptoms of RVF in camels during field investigation in the Adrar region



A Conjunctivitis and ocular discharge, haemorrhages of the gums, and oedema of the trough.

B Haemorrhages of gums and tongue.

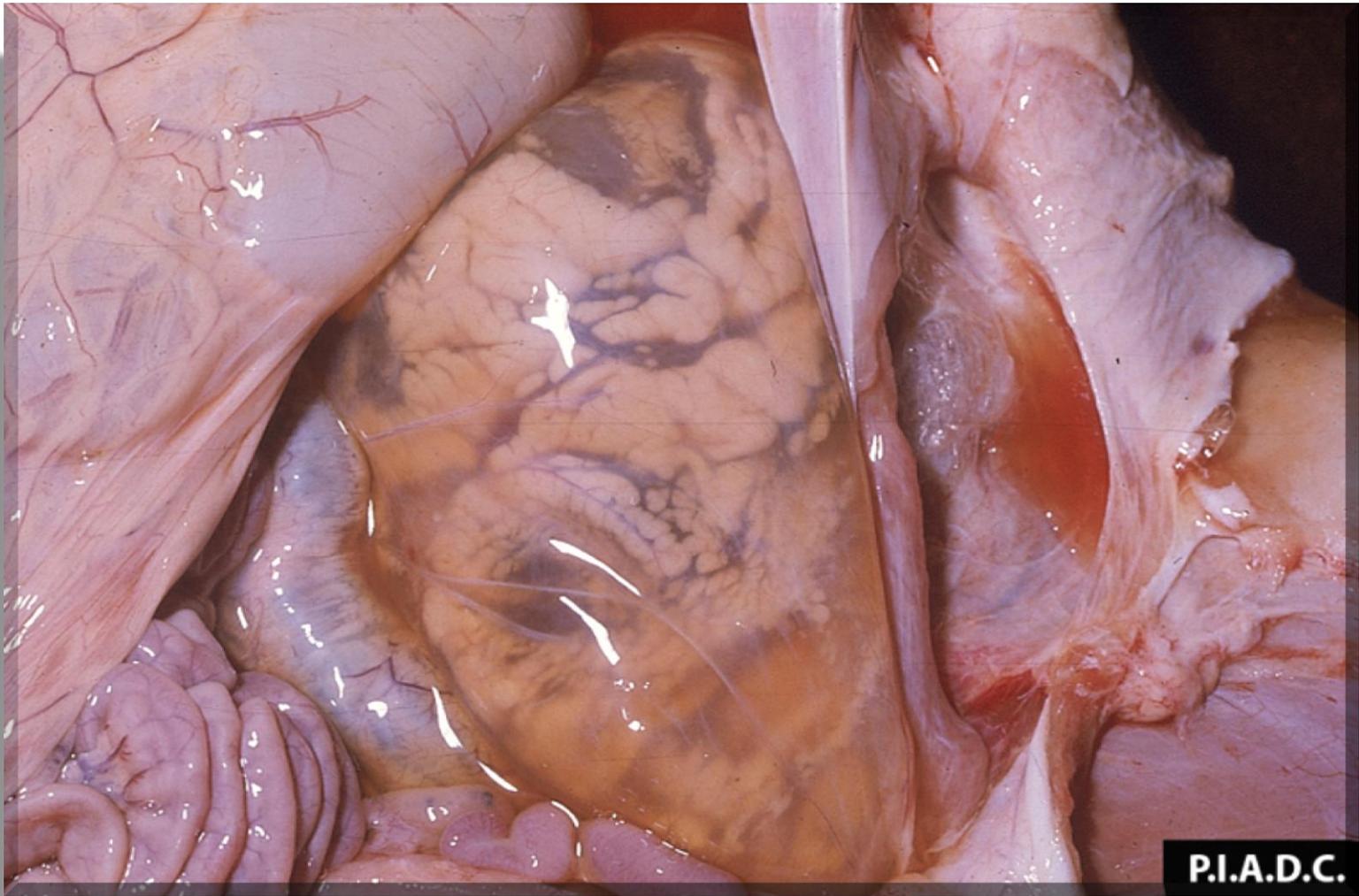
C Oedema at the base of the neck.

D Foot lesions (cracks in the sole), with secondary myiasis.

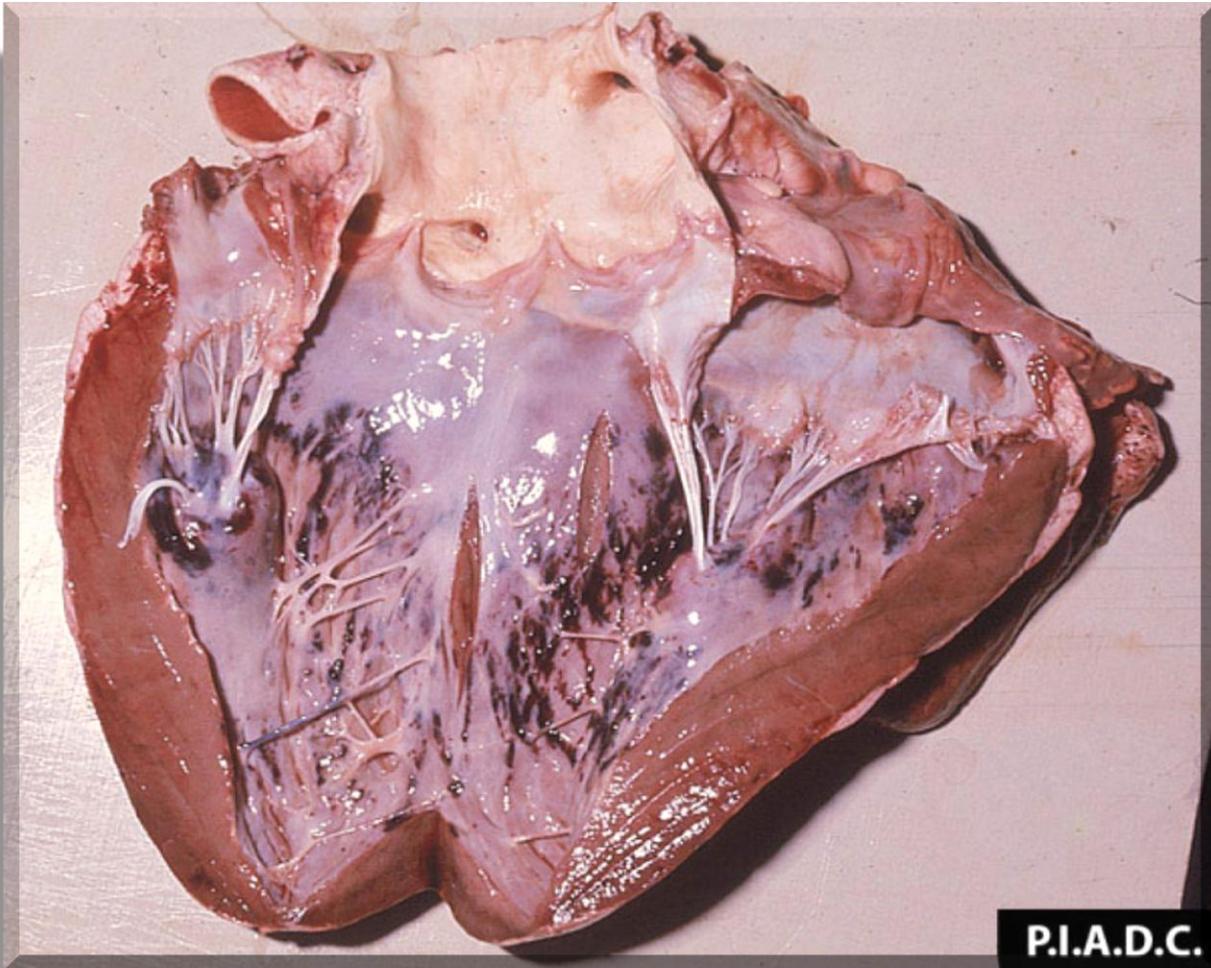
E Dead camel, with evidence of abortion, convulsions, and arching of the neck.



Rift Valley Fever, feto ovino, versamenti in cavità toracica e addominale



Rift Valley Fever, feto ovino, edema perirenale

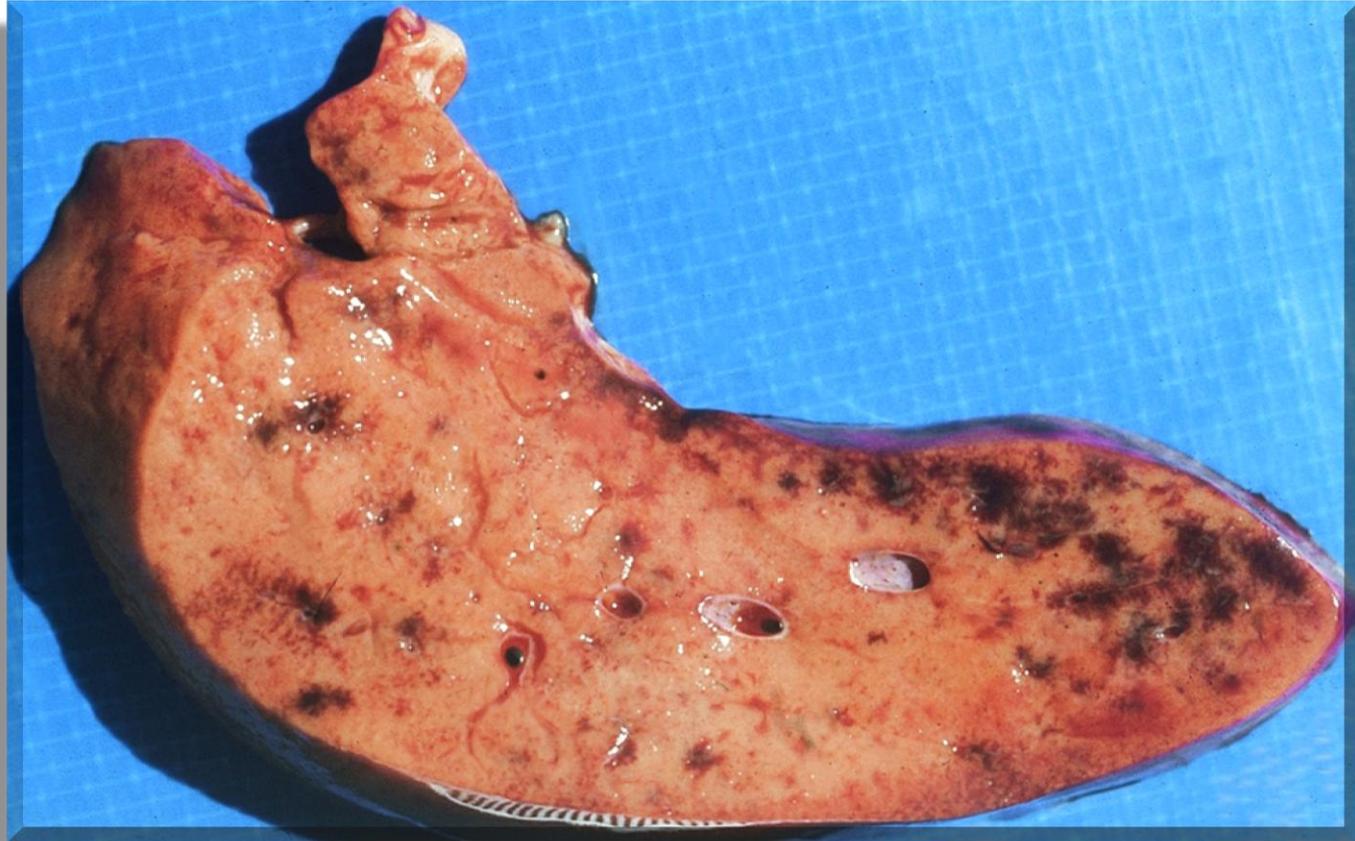


Rift Valley Fever, pecora, endocardio emorragico



Rift Valley Fever, pecora, fegato con emorragie petecchiali

Rift Valley Fever



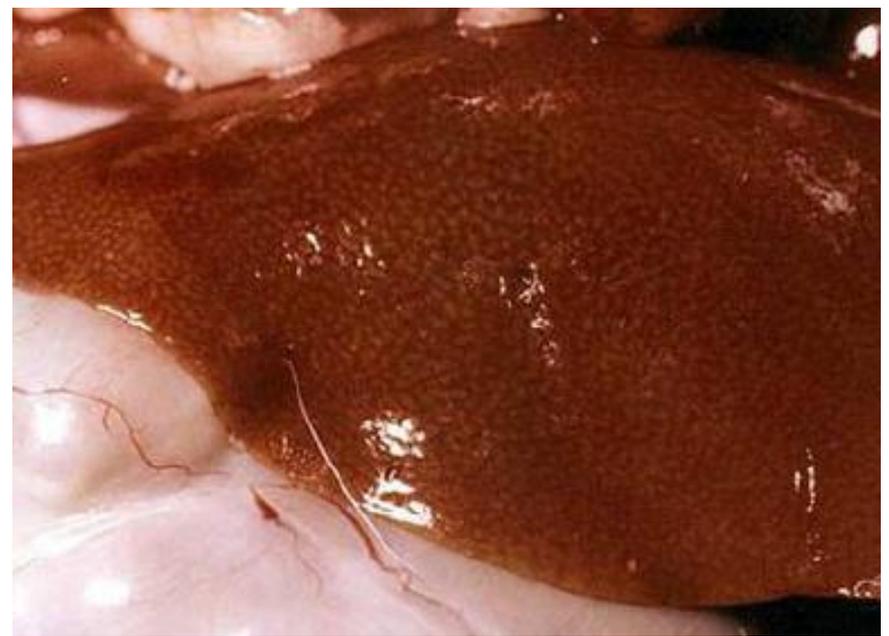
Rift Valley Fever, pecora, fegato con aree emorragiche



Rift Valley Fever, pecora, fegato congesto



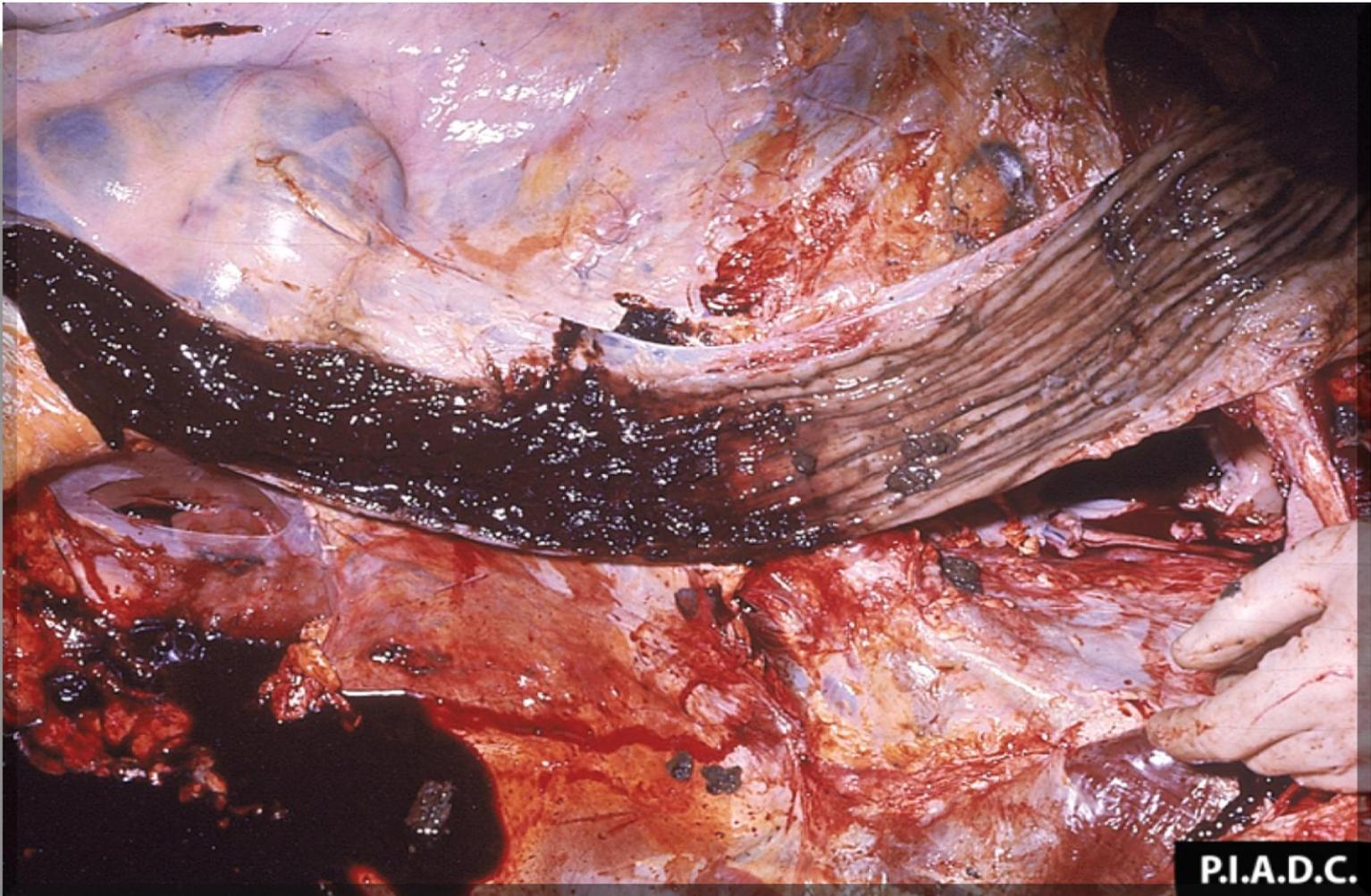
Hepatic syndrome, vasculitis and necrosis of the liver





Rift Valley Fever, pecora, sierose emorragiche





Rift Valley Fever, pecora, colite emorragica



Rift Valley Fever, pecora, colon emorragico



Rift Valley Fever, milza con emorragie subcapsulari

<http://www.fao.org/docrep/006/y4611e/y4611e00.htm#Contents>