World Organisation for Animal Health
Founded in 1924

Regional Workshop on
Rift Valley Fever Surveillance in
Northern African Countries – PROVNA2

12 - 14 November 2024 Tunis, Tunisia

Surveillance of RVF

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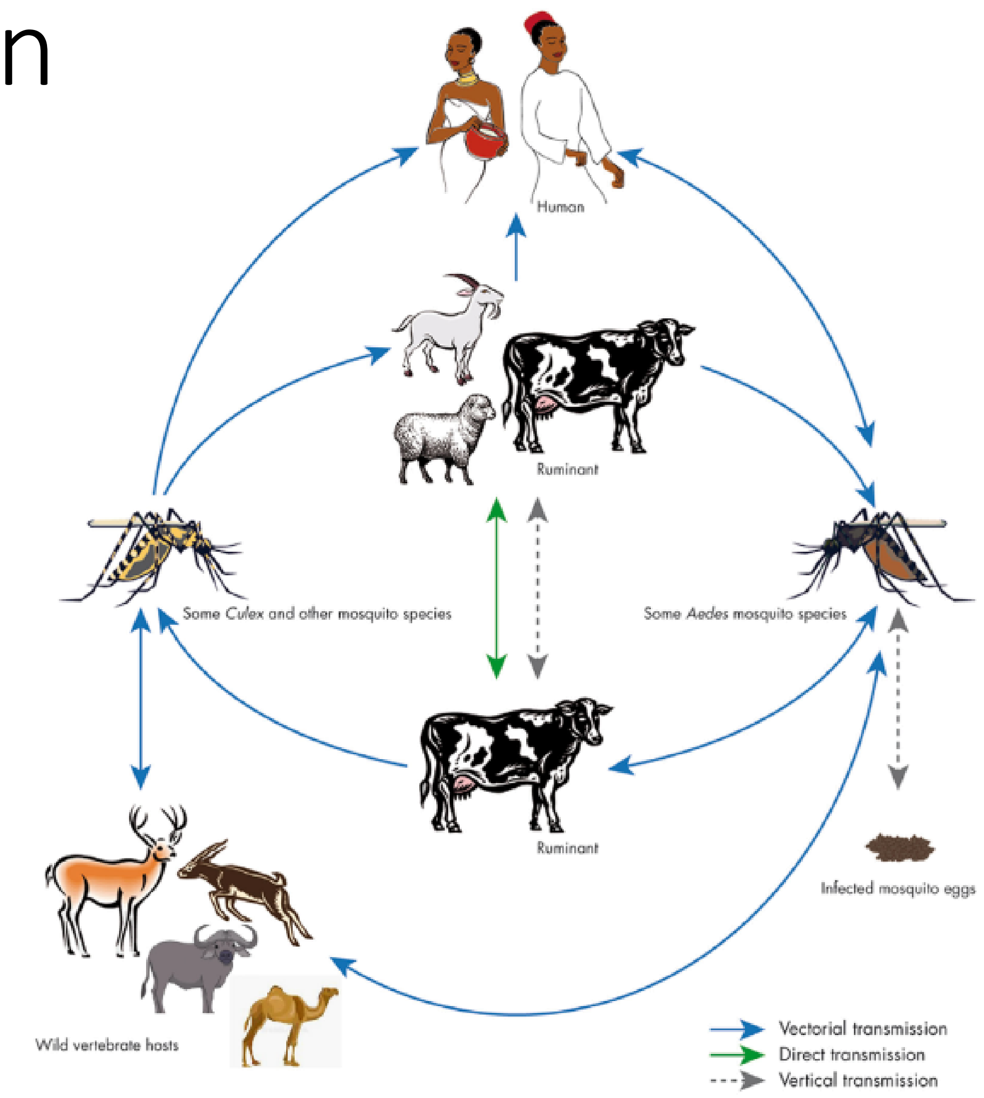
IZS ISTITUTO ZOOPROFILATTICO SPERIMENTALE DELL'ABRUZZO E DEL MOLISE "G. CAPORALE" TERAMO

USAID APHIS

Transmission



SCIENTIFIC OPINION

EFSA Journal

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Rift Valley Fever – epidemiological update and risk of introduction into Europe

Hosts

Mortality >70%	High Mortality 10-70%	Serious but rarely lethal disease	Develop antibodies	Insensitive
Lambs	Ovine	Man	Dromedary	Birds
Goat kids	Calves	Bovines	Horse	Reptiles
Mice	Some rodents	Goats	Cat	Amphibians
Rats		African Buffalo	Dog	
Kittens		Asian Buffalo	Pig	
Puppies		Monkey	Rabbit	
			African monkey	
			Guinea pig	

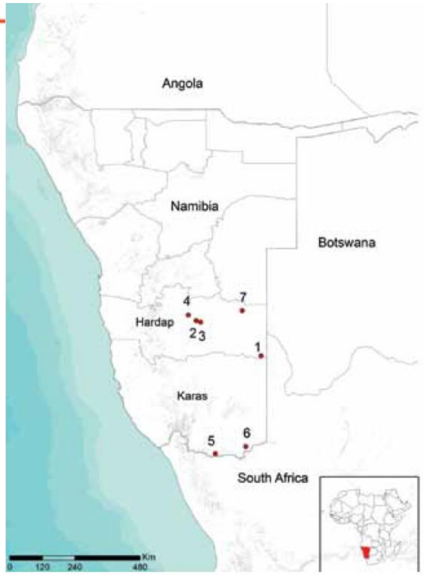
Habitats

Habitats

Aswan Dam (Egypt)

Tihama – Irrigation systems

Rift Valley Fever in Namibia, 2010



Libya 2021

Kindly provided by the Libyan colleagues

Inter-epizootic period

- Transovarial transmission
- The existence of reservoirs (wild ruminants, rodents)
- Low level circulation in domestic animals

Reservoirs

Rift Valley Fever Virus among Wild Ruminants, Etosha National Park, Namibia, 2011

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 22, No. 1, January 2016

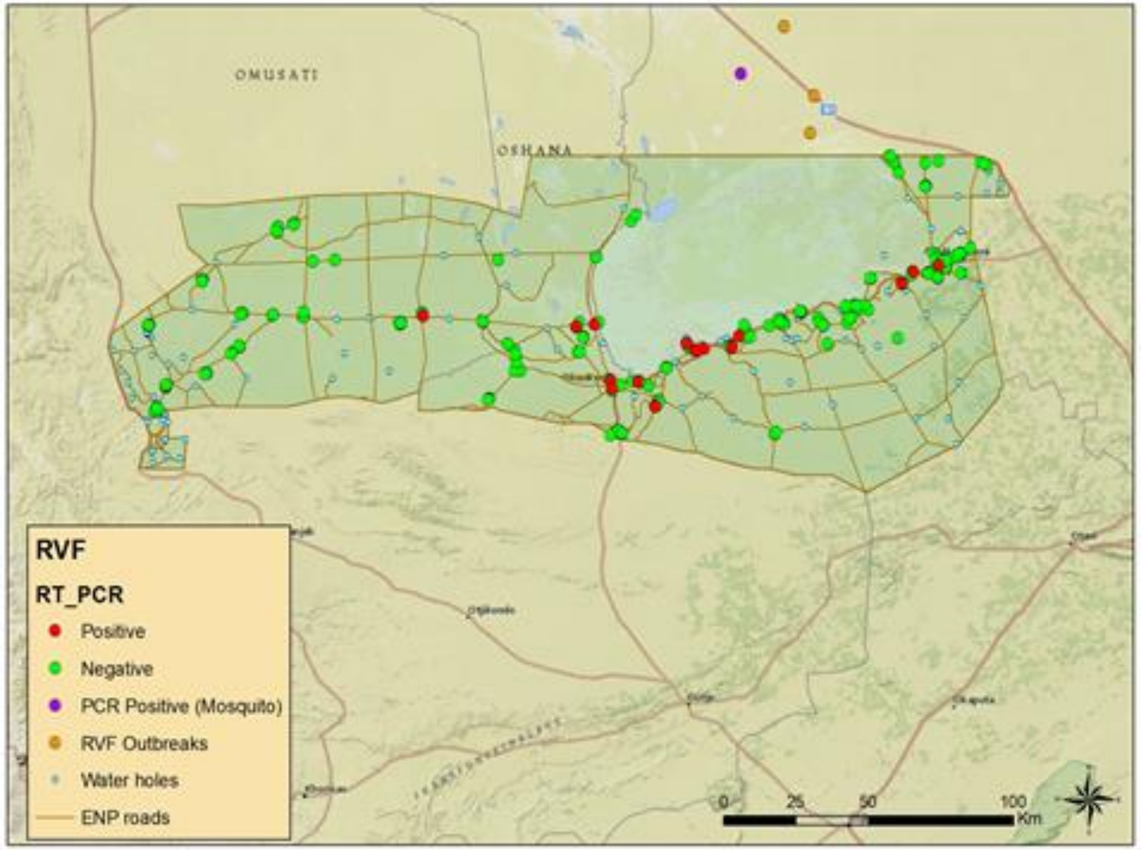
Andrea Capobianco Dondona, Ortwin Aschenborn, Chiara Pinoni, Luigina Di Gialleonardo, Adrianatus Maseke, Grazia Bortone, Andrea Polci, Massimo Scacchia, Umberto Molini, Federica Monaco

Table 1. Results of serologic and virologic testing of wild ruminants for Rift Valley fever virus, Etosha National Park, Namibia, 2011*

Animal and time of sampling	rRT-PCR	IgM	Total antibodies other than IgM	No. positive/no. tested (% positive)
Springbok (*Antidorcas marsupialis*), n = 230				
May–Jul	–	–	–	119/200 (59.5)
	–	–	+	37/200 (18.5)
	–	+	–	26/200 (13.0)
	+	–	–	11/200 (5.5)
	+	+	–	4/200 (2.0)
	+	–	+	3/200 (1.5)
Dec	–	–	–	20/45 (44.4)†
	–	–	+	25/45 (55.6)†
Wildebeest (*Connochaetes taurinus*), n = 53				
May–Jul	–	–	–	38/50 (76.0)
	–	–	+	12/50 (24.0)
Dec	–	–	–	6/7 (85.7)†
	–	–	+	1/7 (14.3)†
Black-faced impala (*Aepyceros melampus petersi*), n = 8				
Dec	–	–	–	3/8 (37.5)
	–	–	+	5/8 (62.5)

*rRT-PCR, real-time reverse transcription PCR.
†15 springbok and 4 wildebeest were recaptured during the second phase of sampling (December 2011).

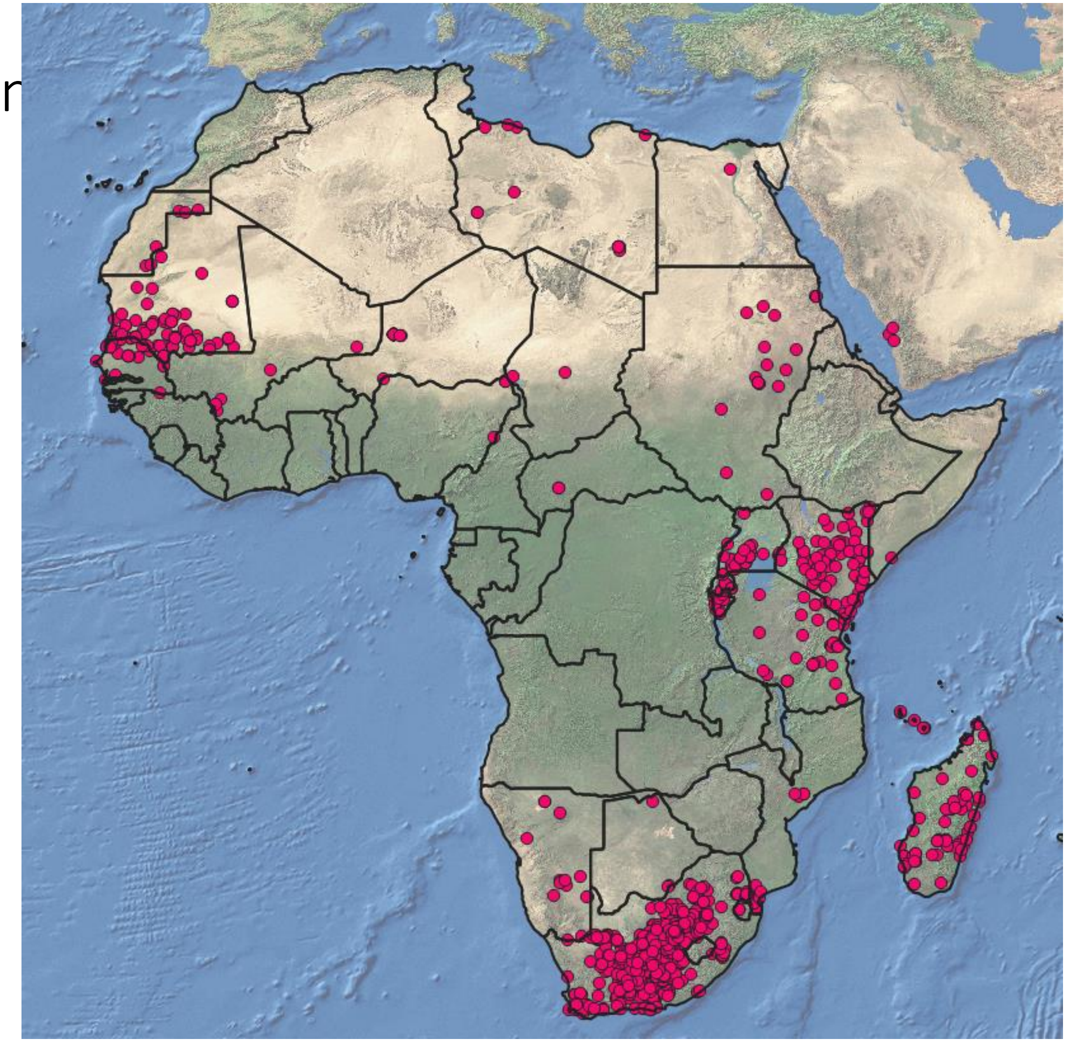
Reservoirs


OMUSATI
OSHANA
RVF
RT_PCR
Positive
Negative
PCR Positive (Mosquito)
RVF Outbreaks
Water holes
ENP roads
0
25
50
100
Km

Geographic distribution

- Historically confined to the countries of sub-Saharan Africa
- Incursions in Egypt
- Yemen and Saudi Arabia (2000)
- West Africa situation
- Libya (2021)

RVF cases (animals / human
2004-2022



Source: EMPRES-i

Objectives of surveillance activities

- Diseases that are present in the country/territory
  - For describing the spatial and temporal distribution of infection
  - For identifying the main transmission routes and risk factors
  - For estimating the incidence of infection and detecting the circulation of pathogens
- Diseases that are absent in the country/territory
  - For demonstrating freedom from disease status
  - For early detecting the incursion of new, (re)-emerging or exotic pathogens

Diseases that are present

- For estimating the incidence of infection / detecting the circulation of pathogens / estimating or assessing the spatio-temporal patterns of the infection
  - Repeated testing / **sentinel animals**
    - Seasonality must be taken into account and spatial distribution of sentinel animals is crucial
  - **Targeted surveillance**
    - In areas and period at major risk of transmission on the basis of the knowledge of vectors distribution and biology
  - Target surveillance on **selected hosts**
    - A throughout knowledge of the epidemiology of infection is needed
  - **Modelling** approaches

Use of sentinel hosts

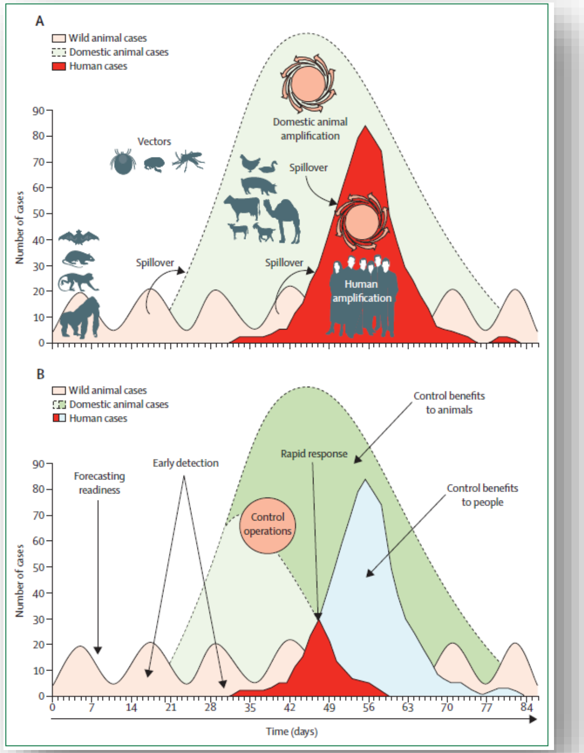
Cons

- Difficulties in selecting the right sites in lack of entomological information
- Need for a individual animal identification system
- Relevant load of field activities

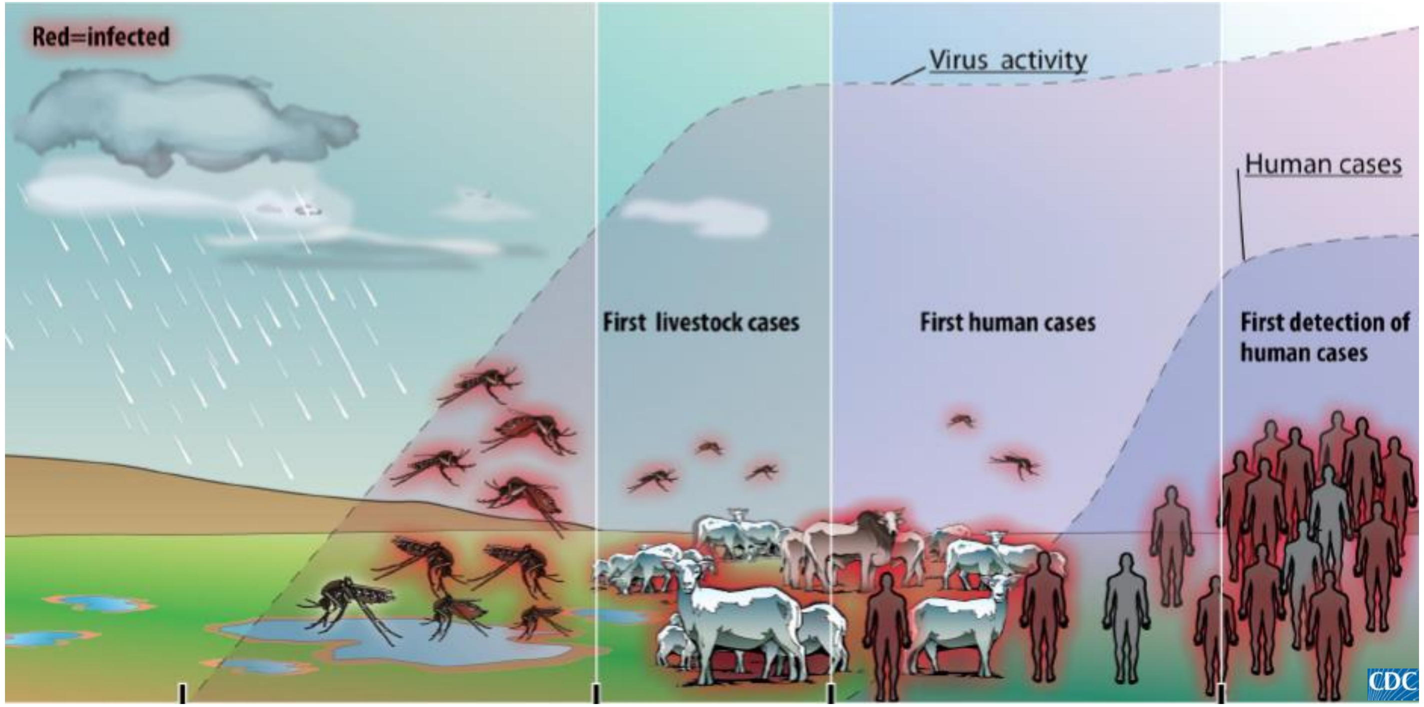
Pros

- It can give precise information about place and time of pathogen circulation
- Sentinels may be tested for various pathogens / infections

Targeting on species early infected in the transmission cycle



Karesh et al., 2012



Targeting on host species early infected

Cons

- Comprehensive knowledge of the epidemiology of the disease is needed
- In case of targeting on non domestic species: difficulties for performing sampling on wild animals
- In case of targeting on vectors: difficulties in the estimation of the Se of the system, feasibility of sampling

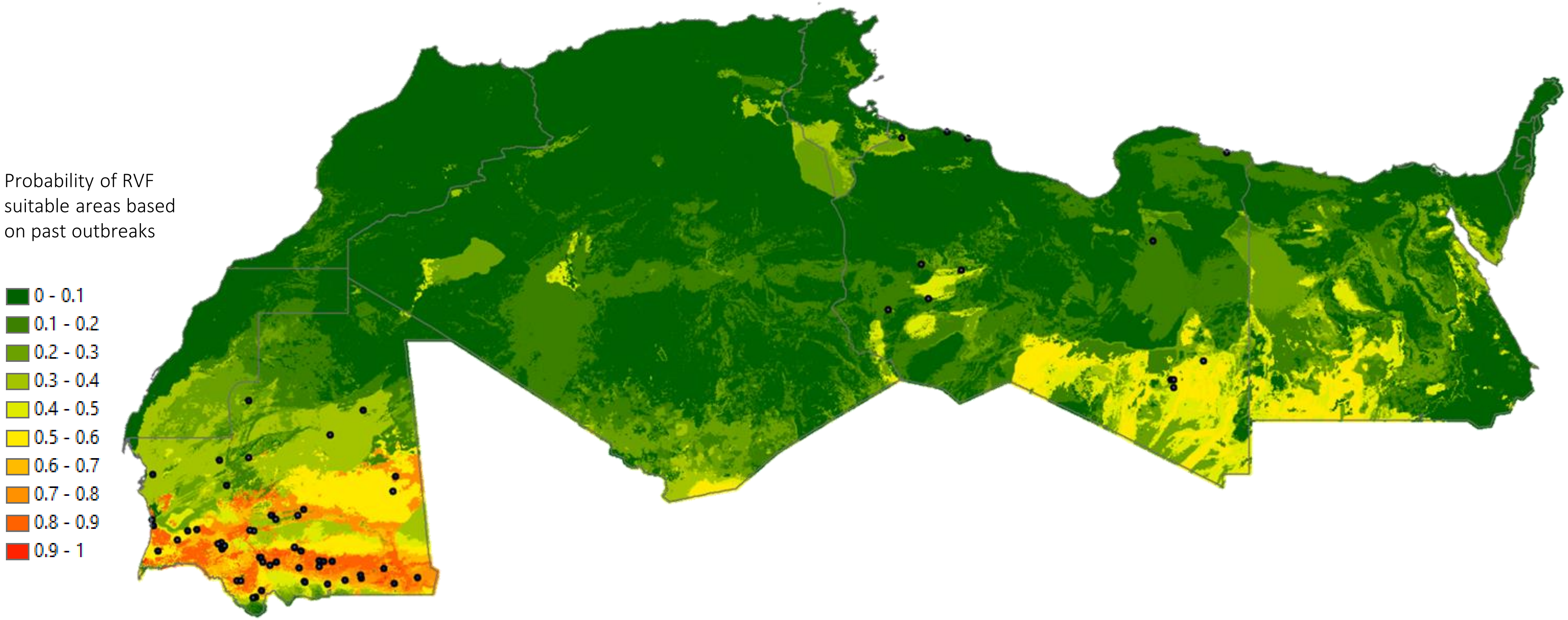
Pros

- Useful for zoonoses to detect the infection before human cases will occur
- Reduction of costs due to the targeting approach

Modelling

APPLICATION of ECOREGIONS in North Africa

RVF outbreaks 2018-2022 - with ecoregions map



Modelling

Cons

- High level of uncertainty due to precision and quality of occurrence / absence data
- Variability of climatic factors

Pros

- Useful to target surveillance efforts on areas and periods more at risk

Surveillance of RVF in countries where outbreaks were observed - conclusions

- Focus on geographical areas:
    - Of most probable exposure
    - With habitat conditions favourable for mosquito proliferation
    - Where sampling is logistically more feasible

- Period of time of highest mosquito activity
- Integration with surveillance activities already in place

Where the disease is absent

- Performances of the surveillance system (Sensitivity and Specificity) MUST be assessed
- Estimation of expected delay in infection detection
- Random approaches are not useful
- Passive surveillance is always needed for clinically detectable diseases
- Risk-based approaches are the best options

Pathways for RVF spread

- Live animals
  - Relevant in Africa and Middle East
- Wind dispersal mosquitoes
  - Winds may disseminate mosquitoes across long distances, especially over sea
- Mosquitoes carried by airplanes / sea cargo
  - Invasive Mosquitoes in Europe: *Aedes aegypti, Aedes albopictus, Aedes japonicus, Aedes koreicus* are some examples

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Animal pathways

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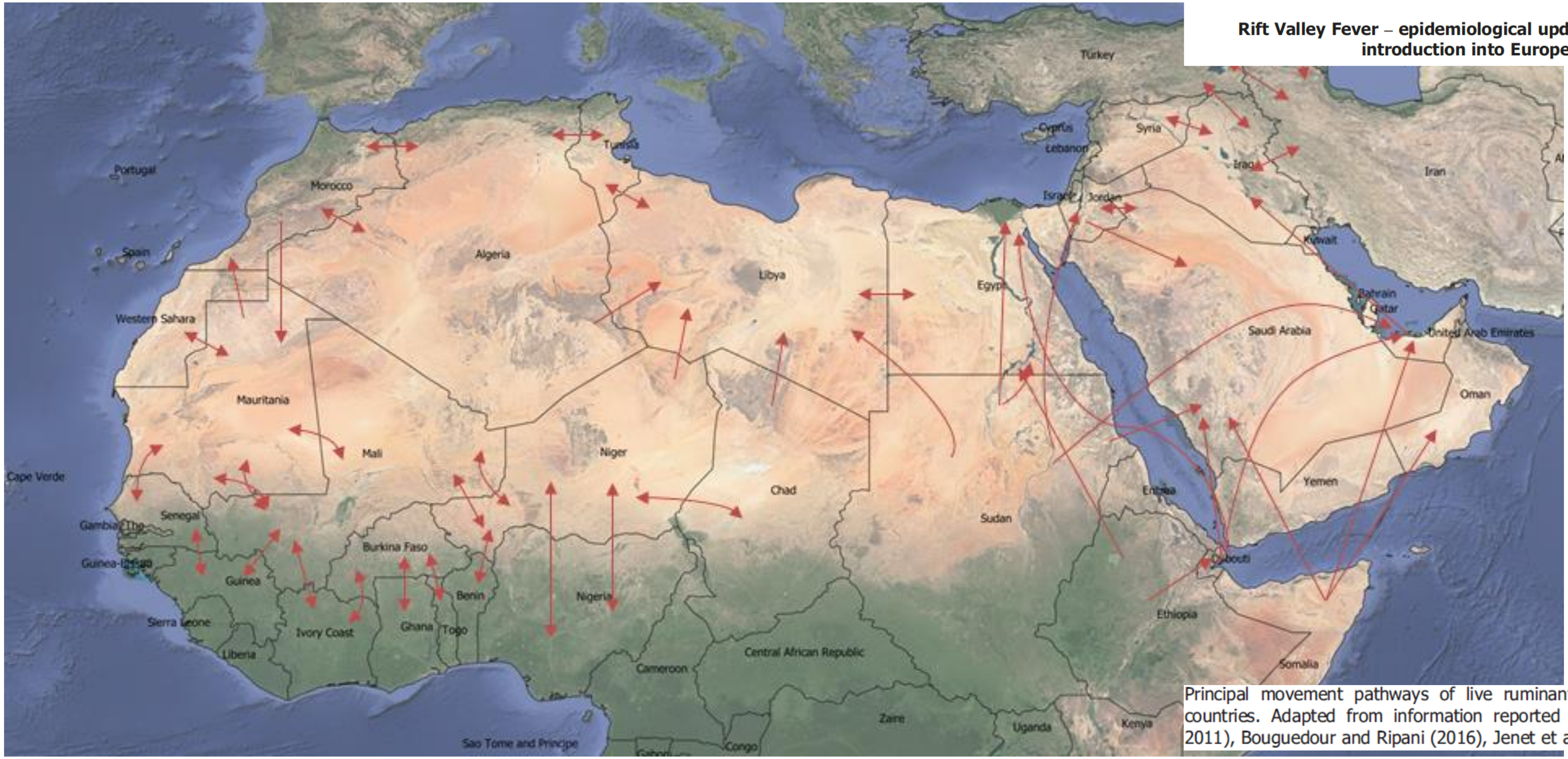
Rift Valley Fever – epidemiological update and risk of introduction into Europe



Principal movement pathways of live ruminants across North African and Middle East countries. Adapted from information reported by Bouslikhane (2015), (Di Nardo et al., 2011), Bouguedour and Ripani (2016), Jenet et al. (2016)

Syndromic surveillance

- Surveillance that uses health-related information (clinical signs or other data) that might precede (or may substitute for) formal diagnosis.
- This information may be used to indicate a sufficient probability of a change in the health of the population either to deserve further investigation or to enable a timely assessment of the impact of health threats which may require action.
- This type of surveillance is not usually focused on a particular hazard, so can be used to detect a variety of diseases or pathogens-including new (emerging) diseases.
- This type of surveillance is particularly applicable for early-warning surveillance

Syndromic surveillance

Cons

- A very large and exhaustive dataset is needed, covering a sufficient time period (historical data)
- Difficulties in setting the “alarm” level (“false alarm” or “not detected events”)
- Confounding factors may hamper the performances of the system

Pros

- Reduced costs
- Applicable to a large set of illnesses/syndromes
- It can be useful also for sub-clinical diseases

Surveillance of RVF in countries where outbreaks were **not** observed - conclusions

- Focus on geographical areas:
  - Of most probable RVF introduction (closeness with infected areas / animal collection sites from infected countries)
  - With habitat conditions favourable for mosquito proliferation
  - Where sampling is logistically more feasible
- Period of time of highest mosquito activity
- To decide the lowest level of prevalence to be detected (design prevalence)


Thank you