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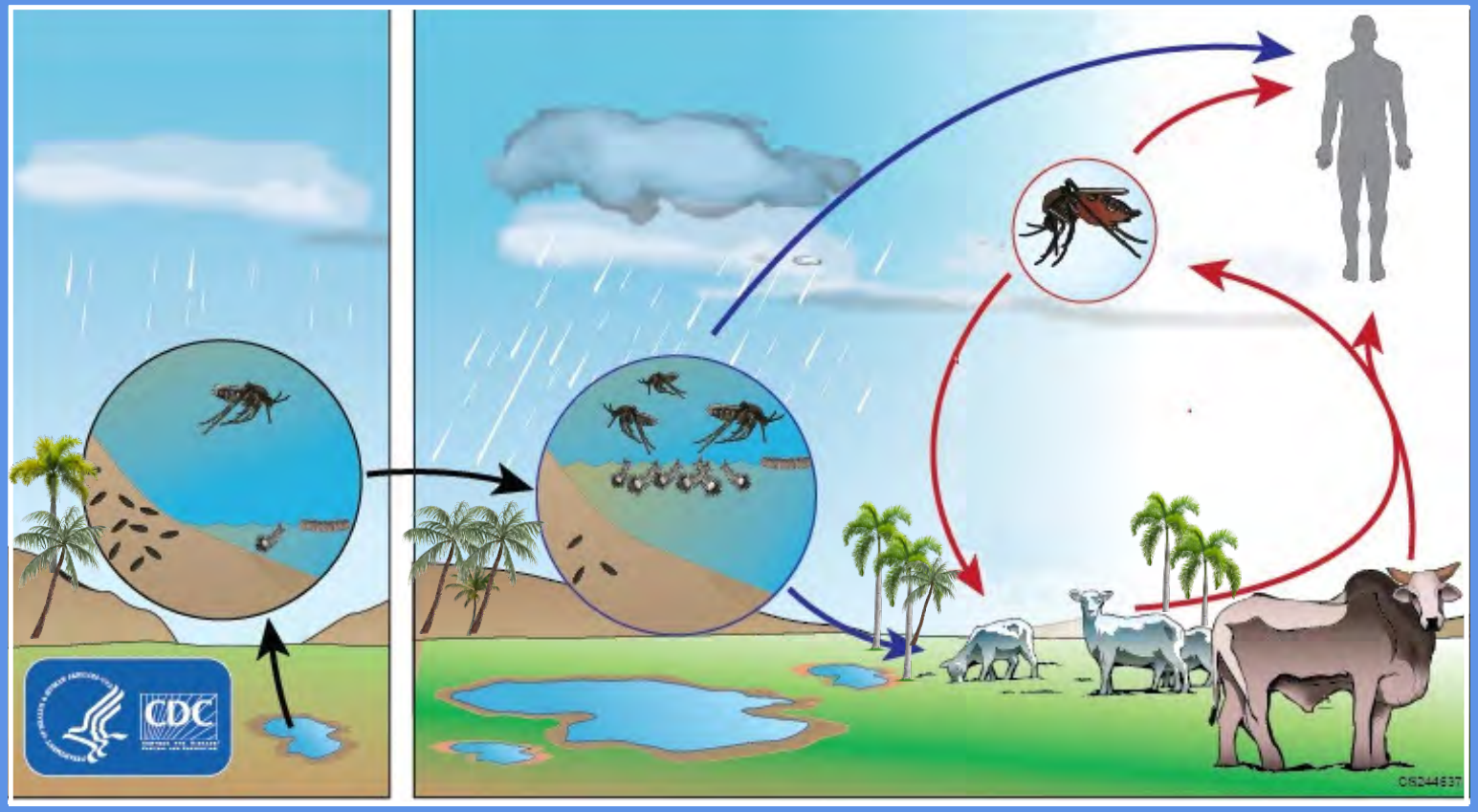
ONE HEALTH LEARNING TOOL

RIFT VALLEY FEVER
INDIAN OCEAN



https://www.cdc.gov/vhf/rvf/transmission/virus-ecology.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvhf%2Frvf%2Fresources%2Fvirus-ecology.html*

This booklet aims to educate medical and veterinary health professionals as well as employees of public and environmental services in the best practices surrounding the management of the Rift Valley fever. Its goal is to promote early notification and One Health collaborations in outbreak management.

ONE HEALTH EDUCATIONAL BOOKLET

RIFT VALLEY FEVER

Indian Ocean edition

RIFT VALLEY FEVER

ONE HEALTH EDUCATIONAL BOOKLET

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Worksheet summary

	Human	Animal	Environment
Impact	1 a, 1b		
Transmission cycles	1c, 1d, 8c	1c, 1d,1e	9a, 9b, 9c
Symptoms	3a, 3b	2a, 2b	
Diagnostics	4a, 6a, 6b	4b, 5a, 5b	
Investigation	8a, 8b	7a, 7b	
Control	10d	10c	11b
Prevention	8d, 11a	10a, 10b	10a, 10b, 12
Annexes			

Objectives and target audience

General objective: This educational booklet, composed of 12 independent worksheets, is a practical tool targeting professionals and field officers from various backgrounds in order to promote the best practice vis-à-vis the Rift Valley fever (RVF) in the region of the Indian Ocean, following the principals of One Health.

Specific objective: The booklet is composed of 12 worksheets, some of which are divided into several parts. The worksheets are organised in a logical sequence, but can be presented separately as standalone posters or educational supports, depending on the audience. Their contents summarize up-to-date scientific knowledge of the disease, and provides practical information on outbreak management , including procedures and precautions to put in place in the event of an outbreak or alert. They also detail prevention, communication and biosecurity strategies, all in very practical, ready-to-use manner.

Target audience : Field officers , professionals and decision makers in charge of surveillance, and disease management ,mainly, but not exclusively, from the following fields :

- animal health,
- environmental and occupational health
- human health
- vector control
- civil security

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Context of creation : These worksheets have been produced in frame of One Health research workforce operating in the region of the Indien Ocean (onehealth-oi.org)..

Use : The worksheets can be used in frame of training of groups or individuals, in simulation exercises. The trainers in charge are invited to adapt the use of the worksheet according to the purpose of the training. The worksheets can also be used for reference during real outbreaks, and in the context of epidemiological investigations.


Cécile Squarzoni © Cirad ASTRE 2019


Katerina Albrechtova © Cirad ASTRE 2023

Abbreviations

BSL : biosafety level

CAHW: Community Animal Health Worker

CIRAD :

CDC : Centers for Disease Control and Prevention

ELISA : enzyme-linked immunosorbent assay

IgM / IgG : Immunoglobulin type M/G

OH : One Health

IO : Indian Ocean

PCR : polymerase chain reaction

PPE : Personal protection equipment

RDT : Rapid Diagnostic Test

RT : reverse transcriptase

RVF : Rift Valley Fever

RVFV : Rift Valley Fever Virus

WHO : World Health Organisation

WOAH : World Organisation for Animal Health

Glossary of terms

Biosecurity: a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population.

Community health worker: are health care providers who live in the community they serve and receive lower levels of formal education and training than professional health care workers such as nurses and doctors. This human resource group has enormous potential to extend health care services to vulnerable populations, such as communities living in remote areas.

Community animal health worker: a person selected by his/her community who has received basic, non-formal training in animal-health care and engages in the prevention and treatment of animal diseases (in accordance with the country's legislation).

Epidemiological unit: a group of animals with a defined epidemiological relationship that share approximately the same likelihood of exposure to a pathogenic agent. This may be because they share a common environment or because of common management practices. Usually this is a herd or a flock.

Health : a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Notifiable disease: a disease listed by the Veterinary Authority that, as soon as detected or suspected, should be brought to the attention of this Authority, in accordance with national regulations.

Outbreak: the occurrence of one or more cases in an epidemiological unit.

Official veterinarian : Refers to a veterinarian authorized by the veterinary authority of his country to carry out some official tasks entrusted to him in relation to animal or public health or the inspection of goods.

Personal protective equipment : is protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection.

Standard precaution : measures used for all patient care. They're based on a risk assessment and make use of common sense practices and personal protective equipment use that protect healthcare providers from infection and prevent the spread of infection from patient to patient.

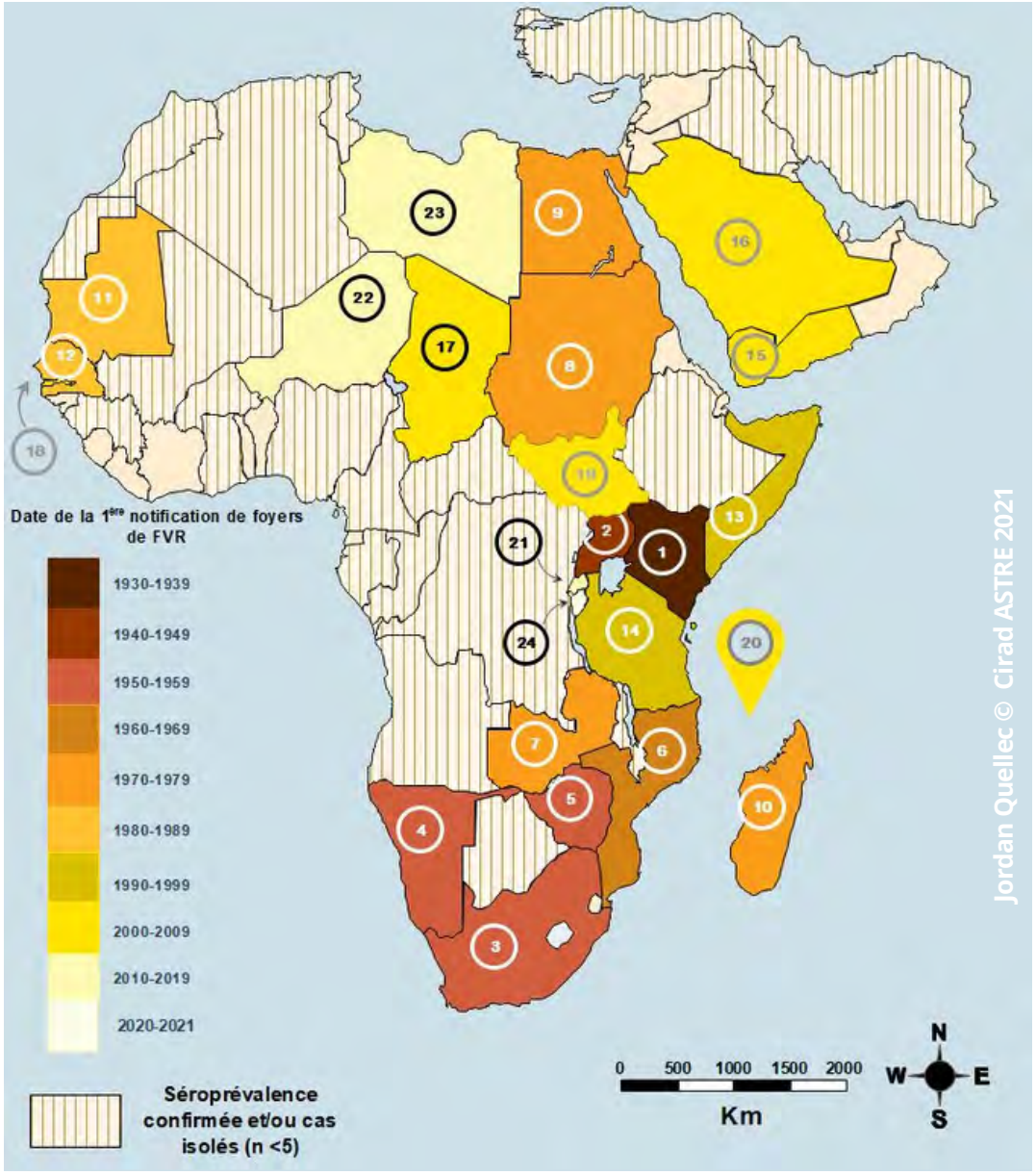
Veterinary authority: Refers to the government authority, including veterinarians and other professionals and competent to implement measures relating to the preservation of animal health, to manage international veterinary certification activities and to apply other standards and recommendations described in national regulations or to supervise their implementation throughout the national territory.

Viral hemorrhagic fevers : Include a spectrum of relatively mild to severe life-threatening diseases characterized by sudden onset of muscle and joint pain, fever, bleeding and shock from loss of blood. In severe cases, one of the most prominent symptoms is bleeding, or hemorrhaging, from orifices and internal organs.

Zoonoses : diseases and infections naturally transmitted between people and vertebrate animals.

Ressources used on this worksheet: Doméon et Schuler, 2018
WHO, 2021

Rift Valley fever virus (RVFV) : global impact



Basic characteristics:

- RNA virus of genus *Phlebovirus*, family *Phenuiviridae*

Some recent outbreaks:

- 2022 Burundi
- 2021 **Madagascar**
- 2018-2019 **Mayotte** (142 human cases)
- 2018 Kenya (28 human cases; 6 dead)
- 2016 - present Uganda
- 2017 Gambia
- 2016 Angola
- 2016 Niger (over 2 million livestock affected)
- 2015 Mauritania
- 2013-2014 Senegal
- 2009-2011 South Africa
- 2000 Saudi Arabia and Yemen

Population exposed:

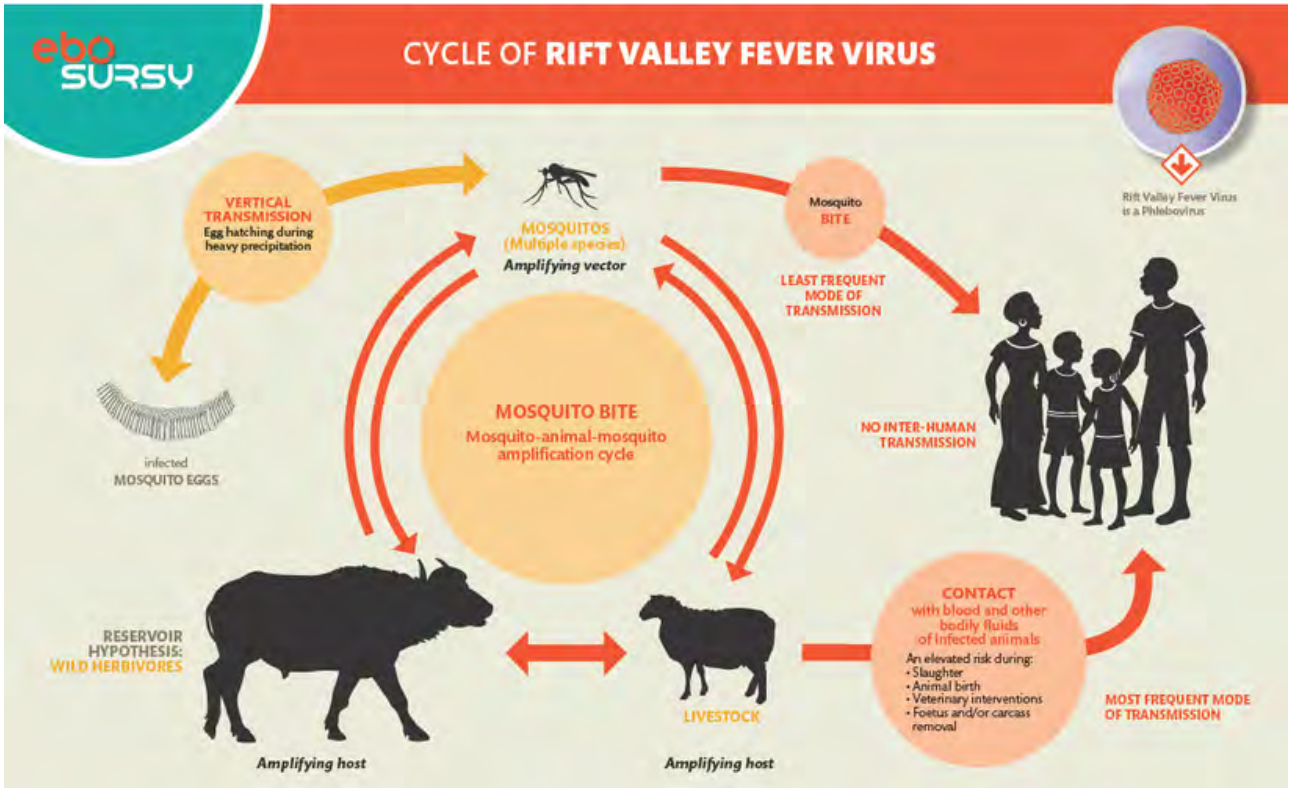
- The virus is present in Africa, on the Arabian peninsula and in the Indian Ocean
- The exposed population is estimated at approximately one billion

Economical and psychological burden for livestock keepers :

- Abortion storms
- Loss of herds
- Market closures
- Morbidity

Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/outbreaks/distribution-map.html

RVFV overview



Rift Valley fever is a viral zoonosis which mainly affects domestic ruminants. It can (less frequently) be transmitted to, and produce symptoms in, the wild animals and humans. While the majority of human cases display symptoms similar to a classical flu (transient fever and general malaise), about 2% of patients will develop a severe form of RVF, which can affect the function of multiple organs in the body simultaneously.

The virus was first described in the Rift Valley of Kenya in the 1930s ; its first epidemic recorded impacted mainly sheep. It became endemic in sub-Saharan Africa in the second half of the 20th century and has since spread towards the Middle East and Indian Ocean regions have been observed in the new millenium.

Many species of mammals can acquire and transmit the virus, but the most serious symptoms are usually observed in the goats, sheep, large ruminants (cows, buffaloes) and dromedaries (camels). Young animals are usually more severely affected than adults. Several species of wild animals can be accidentally infected by the virus, but their role in the transmission and maintenance of the disease remains unclear.

RVFV transmission

1) Between animals

There are two main pathways of transmission between susceptible animals; vector transmission (most common) and direct transmission by contact (inhalation or ingestion of virus-containing aerosols/droplets).

Mosquitoes of several species are able to transmis RVFV (biological transmission). Most commonly these include mosquitoes of the genera *Culex and Aedes* but also *Anopheles, Eretmapodites* and *Mansonia.* Under certain conditions, some other arthropods (eg. midges and flies) can transmit the virus mechanically.

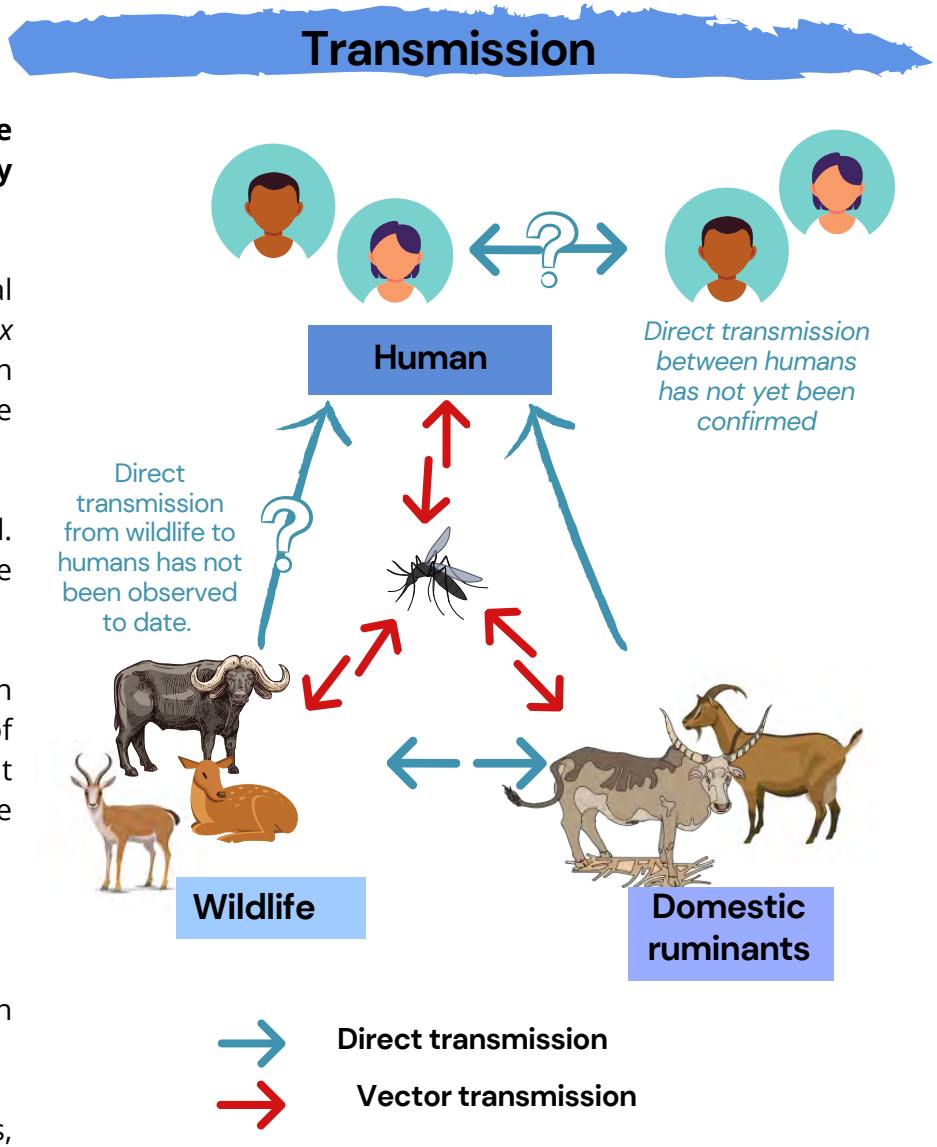
RVFV infects the insect vector during blood feeding on a viraemic animal. Viraemia is for the period of time when the virus circulates in the blood of the animal. It can last from several hours to several days.

The relative importance of different transmission pathways varies between environments; vector transmission is more frequent in areas with bodies of stagnating water, whereas direct transmission may be a more significant mode of transmission in areas with high population densities of susceptible animals.

2) Animal-to-human transmission

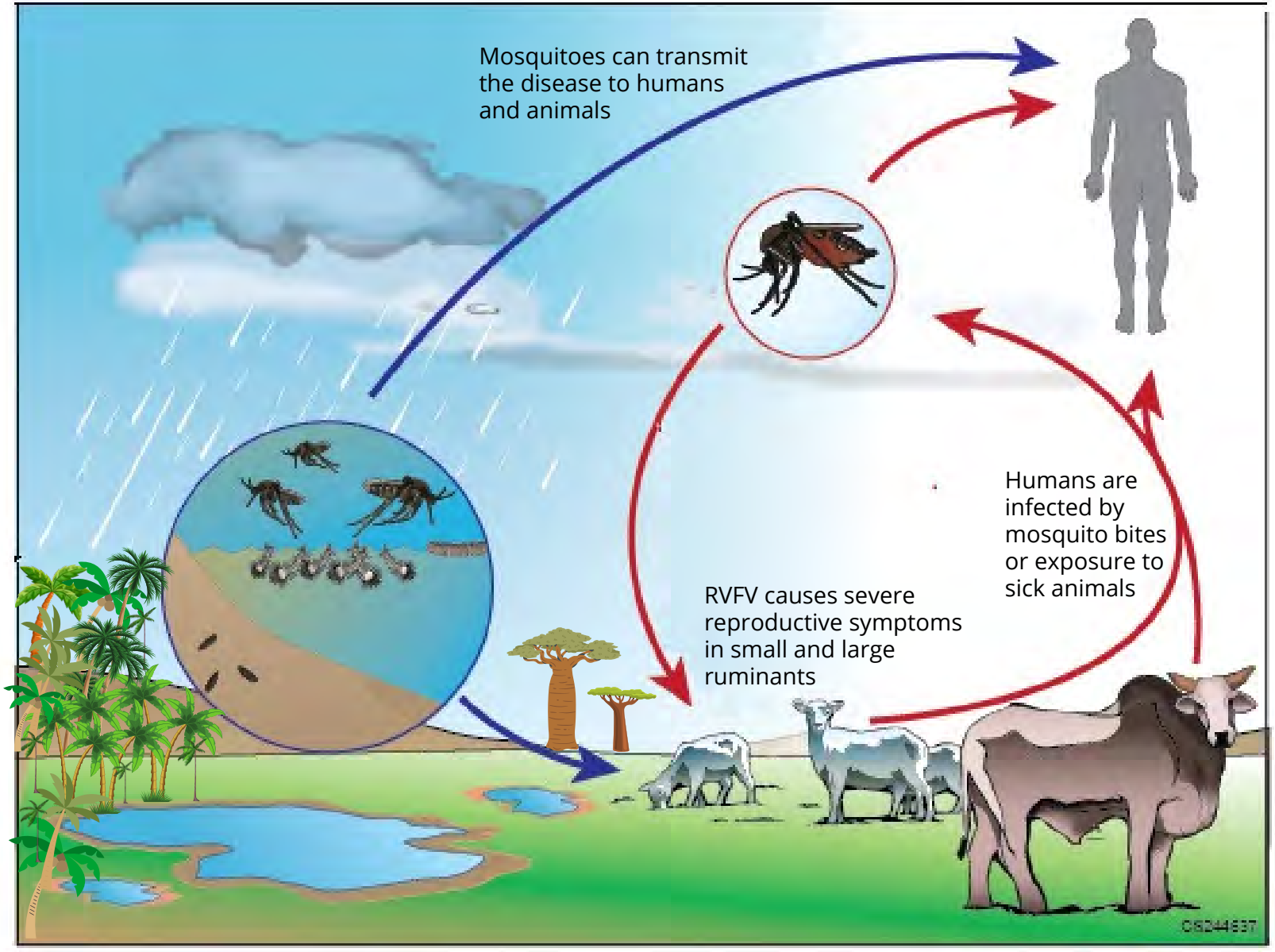
Most human infections of RVFV are a result of direct animal-to-human transmission, following exposure to animal blood or raw organs.

However, human infections have also been observed following vector bites, most commonly those of *Aedes* and *Culex*.



Ressources used on this worksheet: Pépin, 2011

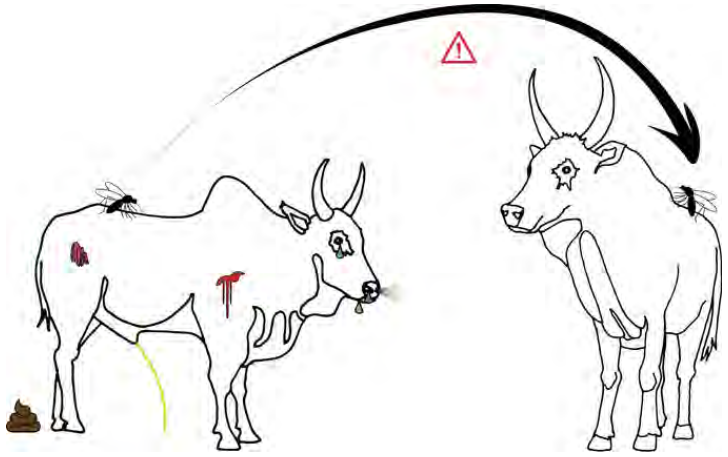
Transmission cycle



Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/transmission/virus-ecology.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvhf%2Frvf%2Fresources%2Fvirus-ecology.html

Animal-to-animal transmission

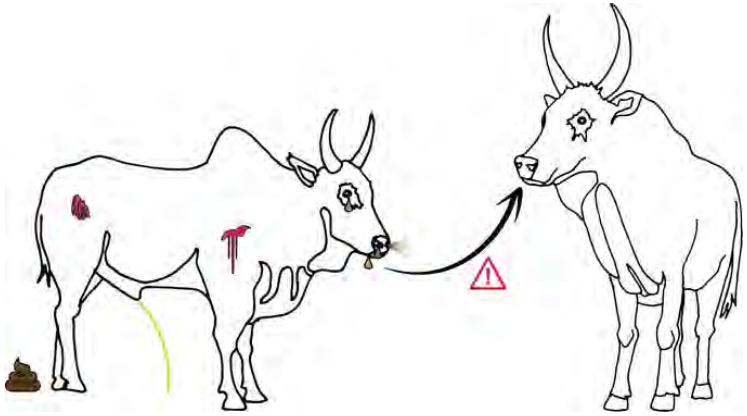
1) Vector transmission. The most common way to transmission between susceptible animals.

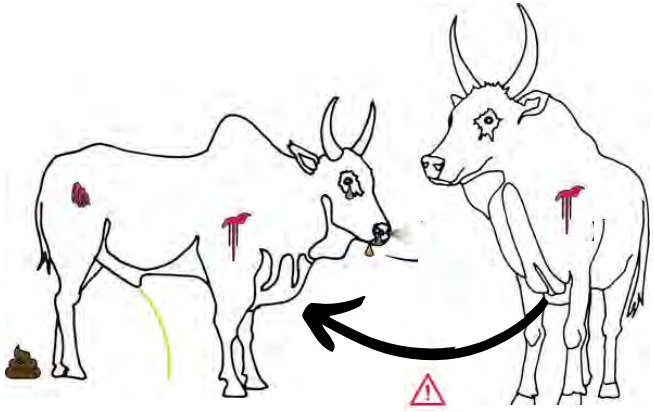


Typical vectors are mosquitoes of genus *Aedes, Anopheles, Culex, Mansonia*, and some others. Some insects can transmit the virus mechanically (eg. the flies of genus *Stomoxys*)

ATTENTION The FVR can be accidentally transmitted also by needles, for exemple during the mass vaccination campaigns.

2) Direct transmission (inhalation ou ingestion of contaminated body fluids (eg. milk or tears). Less frequent, but also important.



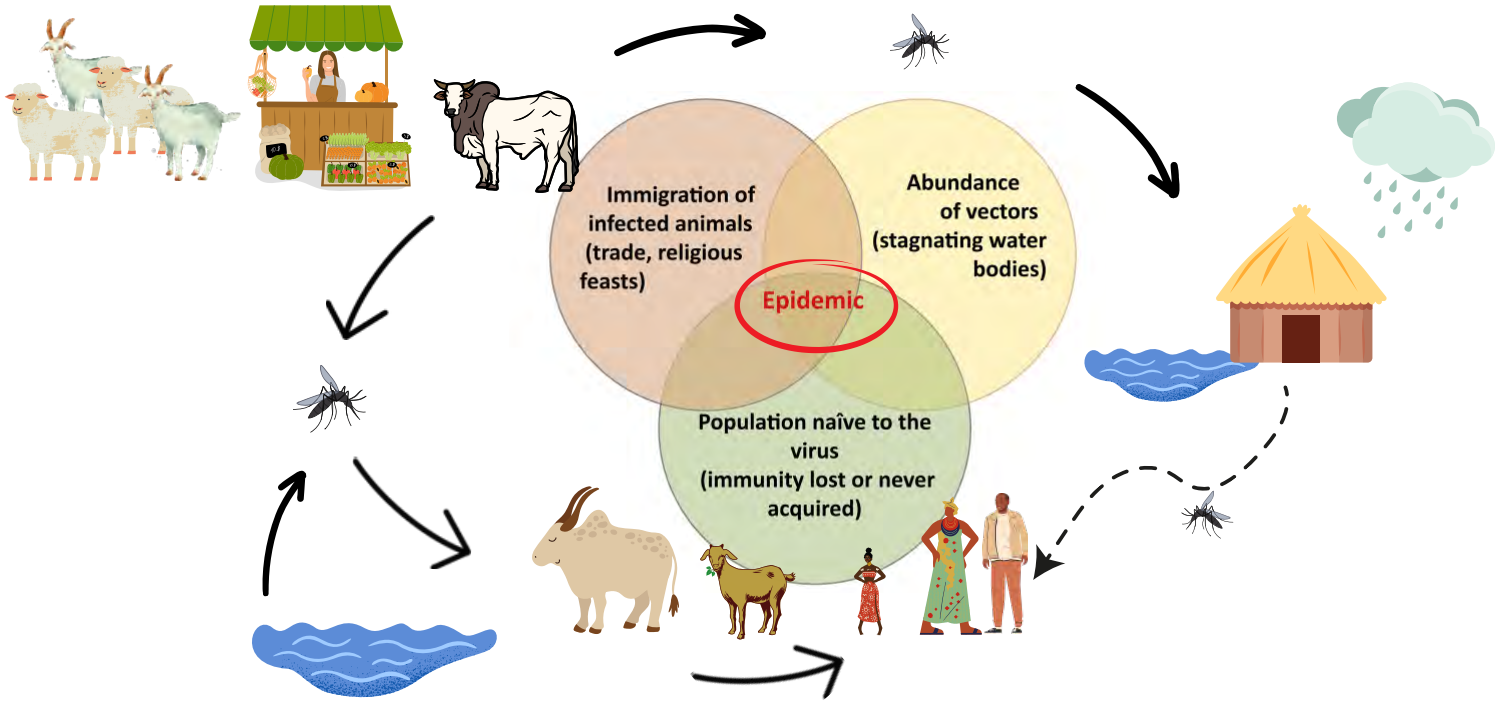


Factors triggering RVF epidemics

In the Indian Ocean region, some zones and countries remain RVF-free, while others report recurring outbreaks. In countries where RVFV persists (so called enzootic or endemic countries) there are periods of time known as "inter-epidemic periods" when RVFV circulates in animal population below the "epidemic threshold", meaning that there are so few symptomatic cases that the disease remains unnoticed by the veterinary and health services).

Epidemics can occur in both disease-free and disease-endemic zones, and are thought to be triggered by a combination of the following three factors:

- A population of sensitive animals naïve to the virus (animals which have not been infected by the virus since long time and hence they don't produce antibodies against the virus.
- Abundance of the vector (mosquitoes) ; this can come about due to specific agricultural activities or climate events (rice cultivation, flooding)
- The virus itself, introduced typically within animals newly introduced to the zone ; this has higher probability eg. during some religious feasts



Ressources used on this worksheet: Balenghien et al., 2013

2A Identifying RVF in animals

SPECIES CONCERNED

CATTLE AND BUFFALOES

SHEEP

GOATS

CAMELS

GENERAL OVERVIEW

- General information: The Rift Valley fever is an acute disease with potentially serious symptoms and high levels or mortality and morbidity.
- Virus : Genus *Phlebovirus*, family *Phenuiviridae*.
- Incubation period (the time between infection and occurrence of the first symptoms): from one to six days.

CLINICAL SIGNS

- Mass abortions (>60% of females in the herd; sometimes 100%; more frequent in naïve populations and in small ruminants)
- High morbidity (number of sick animals) and mortality (number of deaths); both pronounced mainly in young stock
- High fever, hyperthermia
- Nasal discharge (liquid containing mucus or pus leaking from the nose)
- Bloody diarrhea, vomiting
- Weakness, anorexia (animal does not eat)
- Muscular contractions
- Problems of locomotion / gait
- Icterus (yellow discoloration of mucous membranes)
- Petechiae (small bloody spots on skin and mucous membranes)
- At the autopsy : necrotic hepatitis (white spots on the liver)

SAMPLES

- Living animal: Blood on an anti-coagulant (Vacutainer 5ml EDTA) for ELISA ; sample non-vaccinated animals only !
- After autopsy : Liver, spleen, brain (+5g), aborted fetus, placenta

TREATMENT AND CONTROL

- There is no specific treatment, only supportive treatment can be administered.
- Dead animals, runts and other abortion products must be buried deep and destroyed with quicklime

Ressources used on this worksheet: Doméon et Schuler, 2018

2B

Main clinical signs of RVF in animals

Animal can be warm to the touch

Animal is not interested in food, it does not graze with others

Weakness : animal can have difficulty to stand up or walk

Drop in milk production

Nasal discharge : yellowish, sometimes bloody liquid coming out of the nose

Abortions with the highest frequency in goats

Abdominal pain, diarrhea, sometimes with blood

3A Identifying RVF in humans

GROUPS OF PARTICULAR CONCERN

HEALTH PROFESSIONALS

BUTCHERS AND ZOOTECHNICIANS

PREGNANT WOMEN AND VULNERABLE PEOPLE

GENERAL OVERVIEW

- General information : RVFV is a zoonotic virus with potentially severe manifestation in humans.
- Majority of infections will result in a benign form with mild or no symptoms; approximately. Severe forms are not frequent but their case-fatality ratio can go up to 20%.
- Incubation period : (the time between infection and occurrence of the first symptoms): between 2 and 6 days.

CLINICAL SIGNS

- **Benign form**

This form is similar to seasonal flu (sudden onset of fever, muscular and joint pain, headache...), in some cases however, it is also accompanied by sensitivity to light, vomiting or neck stiffness. Hence, the RVF can easily be mistaken for meningitis. The symptoms will generally last for 4 to 7 days.

- **Serious form**

A small proportion of the patients will develop a severe manifestation of the disease, generally taking the form of ocular disease (0.5 to 2 %), meningo-encephalitis (less than 1 %) or hemorrhagic fever (less than 1 %) .

This form can be mistaken for dengue, chikungunya covid 19 or other hemorrhagic fevers.

Fever and headache

Joint pain

Loss of weight

Weakness

Diarrhea, sometimes with blood

Vomiting, nosebleeds

Visual impairement

Dizziness, convulsions, sometimes hallucinations

Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/resources/posters.html

3B Differential diagnosis of RVF in humans

Chickungunya

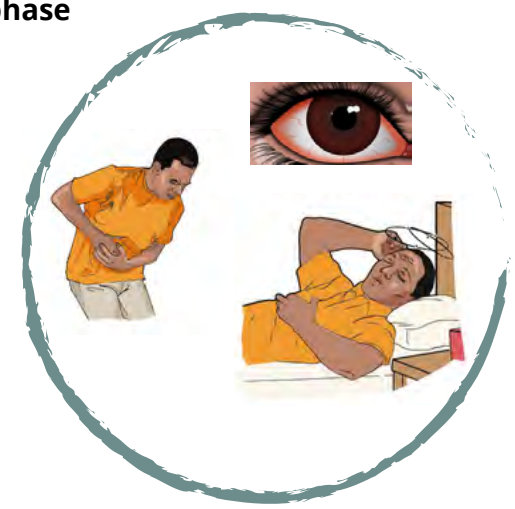
- Articular and muscular pain
- Lyphadenopathy
- Neurological form

Malaria

- Recurrent fever
- Chilles
- Nausea, vomitting

Rift Valley fever

- Mucopurulent nasal discharge (acute phase
- Neural impairment
- Bloody diarrhea (acute phase)



Typhoid

- Progressive fever
- Diarrhea or constipation
- Rash on the chest
- Céphalées
- Maux de gorge
- Toux

Lassa fever

- Sore throat
- Diarrhea, vomitting
- Oedematic face

Leptospirosis

- Fever and chills
- Vomitting
- Hemorragies
- Myalgie (muscular pain)

Covid 19

- Loss of smell
- Cough
- Respiratory difficulty
- Fever

Dengue

- Retro-orbital pain
- Cutaneous rush
- Myalgie, arthralgie
- Headache
- Hemorrhagies
- Leucopenia

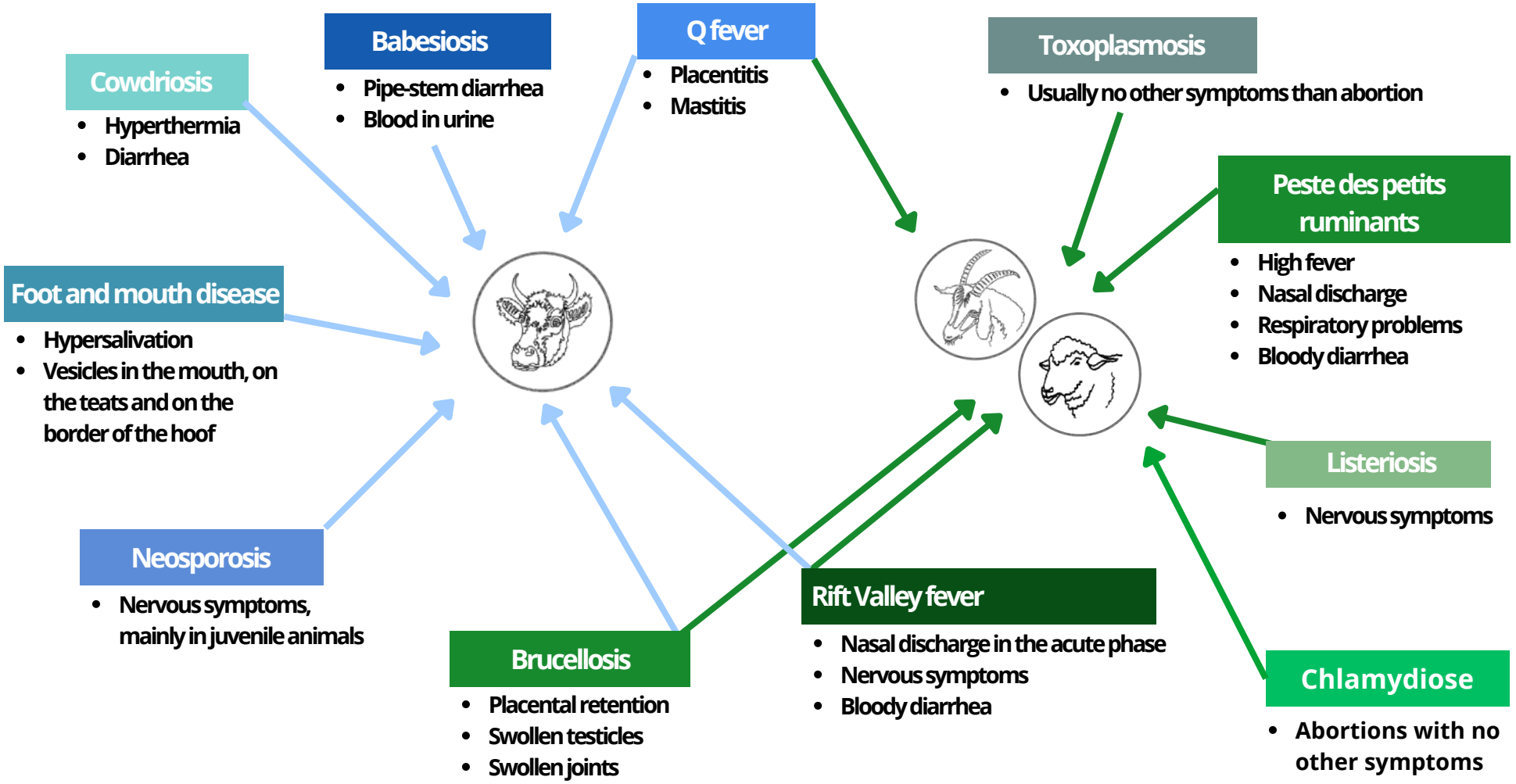
Ebola

- High fever
- Vomitting
- Bloody diarrhea
- Hemorrhagies (cutaneous and on the gums)
- Hematuria (blood in the urine)
- Rapid dehydration

Ressources used on this worksheet: WHO, 2019

Differential diagnosis of abortions in livestock

Several diseases should be considered in case of mass abortions in small and large ruminants:



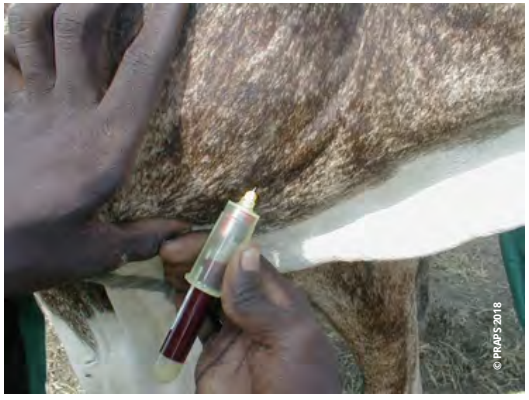
Ressources used on this worksheet: Doméon et Schuler, 2018 , Merck Veterinary Manual

5A Sampling and laboratory diagnosis in animals

- Sampling of the animals should always be based on a suspicion declared by an animal health professional. The veterinarian and / or the paravet will perform sampling and ensure the correct storage and delivery to an appropriate laboratory. Depending on the spectrum of diseases suspected, the samples might need to be sent to a regional reference laboratory.
- Each sample has to be accompanied by a dully filled data sheet (see annexes for an exemple).
- Each sample should be individually labeled.
- The samples should be transported as quickly as possible after being taken. It is important to prepare necessary equipment in advance (vaccine carrier, plastic bags, sample data sheets...).
- Different samples require different storage and shipping conditions (see table 5b for details). Adherence to these conditions is crucial in order to ensure the correct diagnosis.

Good practice

For your own security and that of the animals, gloves should be worn during animal contact and sampling. Gloves, face mask and goggles are essential when performing autopsies, especially when there is a suspicion of RVFV !



Biosecurity

Appropriate waste management should be integrated into the sampling process. You can use locally available containers, such as empty plastic water bottles, to safely dispose of the needles and other potentially infectious material.

Ressources used on this worksheet: Doméon et Schuler, 2018 , Merck Veterinary Manual

5B Sampling and laboratory diagnosis in livestock

Sampling procedures will vary according to the epidemiological suspicion pronounced by the animal health professional in charge of the outbreak
Here are some of the most frequent causes of abortion storms in livestock herds.

Disease	State of the animal	Sample type	Preservation and transport conditions	Type of laboratory analysis
Babesiosis	Living animal	Whole blood (Vacutainer 5ml)	Refrigerate (+4 °C)	Direct : stained blood smear, molecular biology (PCR)
		Serum		Serology (ELISA)
Brucellosis	Living animal	Uterine and vaginal discharges, tissues of aborted fetuses, tissues of female reproductive organs and lymph nodes	Room temperature	Bacteriology (hemocultivation), molecular biology (PCR)
		Serum / Milk	Refrigerate (+4 °C)	Serology (Rose Bengal Test, Ring test, ELISA)
Cowdriosis	Living animal	Whole blood taken during the febrile phase (Vacutainer 5ml)	Refrigerate (+4 °C) if transported to the lab within 12h after sampling Freeze (-20 °C) if the transport is expected to take longer than 12h,	Direct : stained blood smear, molecular biology (PCR)
		Serum		Serology (ELISA)
	After authopsy	Brain tissue		Bacteriology (hemocultivation), molecular biology (PCR)
Toxoplasmosis and Neosporosis	Living animal	Serum	Refrigerate (+4 °C) if transported to the lab within 12h after sampling Freeze (-20 °C) if the transport is expected to take longer than 12h,	Serology (ELISA)
		Aborted fetuses		Molecular biology (PCR)
Listeriosis	Living animal	cerebrospinal fluid, aborted fetuses	Refrigerate (+4 °C) if transported to the lab within 12h after sampling Freeze (-20 °C) if the transport is expected to take longer than 12h,	Molecular biology (PCR), bacteriology
	After authopsy	Brain tissue		Molecular biology (PCR), histology

Ressources used on this worksheet: WOAH, 2022, Merck Veterinary Manual

5c Sampling and laboratory diagnosis in livestock

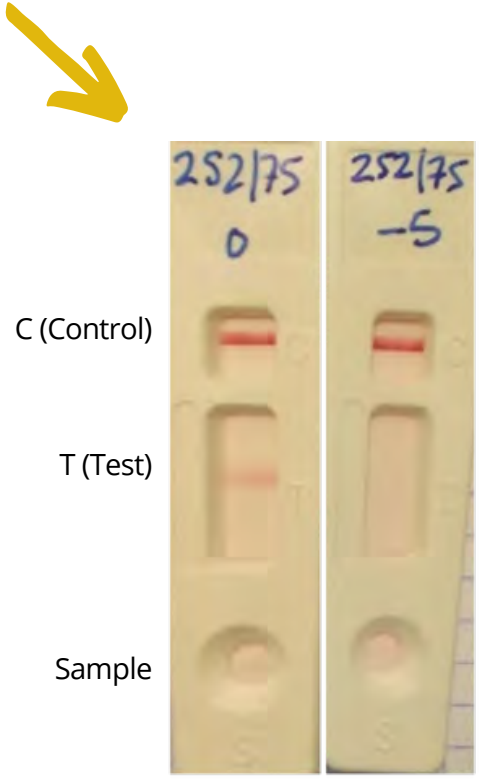
Sampling procedures will vary according to the epidemiological suspicion pronounced by the animal health professional in charge of the outbreak
Here are some of the most frequent causes of abortion storms in livestock herds.

Disease	State of the animal	Sample type	Preservation and transport conditions	Type od laboratory analysis
Foot and mouth disease	Living animal, sick since less than 10 days	Vesicular epithelium or fluid (cca 1 cm² or 1 g of sample originating from mucus membranes or interdigital tissue)	Epithelium : Place in transport medium of phosphate-buffered saline and refrigerate (+4 °C) Oropharyngeal swabs, vesicular liquid and serum : refrigerate (+4°C) if transported to laboratory within 12h, freeze (-80°C) if the transport is expected to take longer than 12h	Virus isolation, molecular biology (RT-PCR)
		If vesicles not present: oropharyngeal liquid or pharyngeal swab		
	Living animal, sick since more than 10 days	Serum		Serology (ELISA)
Rift Valley fever	Living animal in febrile phase	Uterine or vaginal secretions, female reproductive tissues and afferent lymph nodes, aborted fetuses	Refrigerate (+4 °C) if delivered to the laboratory within 48h Freeze (- 80°C) if the transport is expected to take longer than 48h.	Virus isolation, Molecular biology (PCR)
		Serum		Serology (ELISA for IgM, IgG)
	After autopsy	Liver, spleen, brain, (+5 g) aborted fetus		Virus Isolation, molecular biology (RT-PCR)
Q fever	Living animal	Serum (paired samples)	Refrigerate (+4 °C) if delivered to the laboratory within 48h Freeze (- 80°C) if the transport is expected to take longer than 48h.	Serology (Imunocapture ELISA)
	After autopsy	Liver, spleen (+5g)		Molecular biology (PCR)
Peste des petits ruminants	Living animal in febrile phase	Serum	Refrigerate (+4 °C) if delivered to the laboratory within 48h Freeze (- 80°C) if the transport is expected to take longer than 48h.	Serology (Imunocapture ELISA)
	After autopsy	Liver, spleen (+5g)		Molecular biology (PCR)

Ressources used on this worksheet: WOAH 2022 , Merck Veterinary Manual

Rapid diagnostic tests

- A rapid diagnostic test (RDT) allows for a preliminary diagnostic at the point of care (on the farm, next to the patient). This can speed up the treatment and/or isolation precautions.
- RDTs are available for the Rifs Valley fever, the small ruminant plague and the foot and mouth disease.
- All RDTs are very similar, but their use can slightly vary one from another; always read the instruction leaflet!
- The major advantages of the RDTs are the ease and rapidity of use, principales des TDR sont leur rapidité and the minimal quantity of the sample necessary.
- The RDTs for RVF work equally well with human and animal sera!



ATTENTION

The RDTs are normally used
- for a preliminary diagnosis of the first cases
- to speed up the detection of new cases, once the outbreak is declared

An outbreak should not be declared based on RDTs only; the declaration should supported by other diagnostic methods (namely PCR and serology)

Ressources used on this worksheet: Cetre-Sossah et al., 2019

5A Sampling and laboratory diagnosis in people

SAMPLING AND DIAGNOSTIC

- A diagnosis of RVF based solely on clinical symptoms can be tricky, as the clinical presentation of the disease is often non-specific and varies from one case to another. More specifically, it is very difficult to distinguish RVF from other diseases associated with high fever, both hemorrhagic (such as yellow fever) and non-hemorrhagic (such as malaria, shigellosis, typhoid fever, dengue, covid 19 and chickungunya). This is only possible by laboratory testing and verification in reference laboratories.

- Samples shall be collected and handled only by trained professionals, using appropriate protective equipment and in adherence with maximum level of biosafety (BSL 3).

SPECIMENS AND TESTS

- The virus or the immune response to it is detected in whole blood, serum or cerebrospinal fluid (the latter collected mainly when the disease takes the form of meningo-encephalitis) :
  - RT-PCR
  - IgG or IgM ELISA
  - Antigen detection
  - Virus isolation by cell culture

5B Sampling and laboratory diagnosis in people

CONFIRMATION OF THE DIAGNOSIS

The health professional in charge of the outbreak should decide which specimen type will be collected according to the clinical presentation and/or the anamnesis of the patients.

Diagnosis of the RVF requires special equipment and trained personnel. As such, it can only be confirmed in certified reference laboratories.

Laboratories adhering to biosafety level 2 can only perform the serologic techniques (ELISA) and thus diagnose the RVF indirectly.

Only biosafety level 3 laboratories are qualified to handle the virus and use direct tests such as virus isolation or PCR.

The table below summarises the methods and biological samples required.

CLINICAL PHASE	TYPE OF LABORATORY TEST	TYPE OF SAMPLE	PRESERVATION AND TRANSPORT
Viremic phase ; at least 3 days after the onset of the first symptoms	RT-PCR	Whole blood	Refrigerate (+4°C) if transported to the laboratory within 48h; Freeze (-80°C) if the transport is expected to take longer
As of day 6 after the onset of the symptoms	Serology (ELISA for IgM and IgG)	Whole blood	
Meningo-encephalitis	RT-PCR Serology (ELISA for IgM and IgG)	Cerebrospinal fluid	

Ressources used on this worksheet: de la Roque et Formenty, 2014

7A Epidemiological investigations in case of suspicion of RVF in livestock

Farmer

Every investigation starts with a notification from the field ; the farmers have a very important role to play here!

- Notify every animal suspected of the notifiable disease, every unexpected abortion event (frequency above a given threshold) and every sudden death to the veterinary personnel in charge of your area
- Do not touch, attempt to open or bury the animal before the arrival of the veterinarian in charge.

Veterinarian

The purpose of the investigation is to describe the qualitative and quantitative aspects of the declared health event. It usually evolves in the following steps (although not necessarily in the following order);

- Definition of the event in time and space.
- Field investigation aiming to obtain the maximum relevant information.
- Collection and analysis of the quantifiable data.
- Confirmation (or not) of the epidemiological signal.
- Understanding the event and identification of some of the potential causes.
- Recommendations in terms of control, prevention of the further spread and surveillance of the disease.

The main aims of the field investigation carried out by the veterinary personnel are the following :

- To collect the data and biological samples
- To put in place the first preventive measures
- To confine the outbreak and prevent further propagation of the disease
- To understand the origins of the infection
- To prevent the development of secondary outbreaks in the surroundings
- To inform the veterinary authorities about the evolution of the situation

The Veterinary Authority

The conclusions of the investigation will be analysed by the veterinary authority, which will decide upon the immediate measures to put in place, while waiting the confirmation of the suspicion by laboratory diagnostics.

7B Measures to put in place in case of an RVF outbreak in livestock

In case RVF is suspected in one or several herds, the following actions should be taken as a first response, of course always in line and within the limits of the national legislation :

The community animal health worker

- Notify the paravet or the veterinarian in charge of the area about every abortion or every animal with symptoms typical of RVF.
- In collaboration with the stock keeper, perform the clinical examinations of the herd, looking for all other potential cases.
- Destroy the mosquito hatching sites (water stagnating in small containers) within the farm.
- Advise the farmers and wider community on appropriate protection measures against the mosquitoes (nets, long clothing etc.) and appropriate measures of personal hygiene. A particular concern should be devoted to animal handlers and their protection.

The paravet

- Report the suspicion to a veterinarian.
- Define and implement the biosafety measures (boot bath, PEP...) in the affected farms. Advise farmers on the application of the biosafety measures.
- Count all the abortions and symptomatic cases in the herd.
- Take the biological specimens necessary for laboratory confirmation of the suspicion.
- Supervise the desinfection and destruction of the cadavers and the aborted fetuses.

The veterinarian

- Inform the public health authorities.
- Send samples the the laboratory.
- Reinforce the surveillance around the suspected herds or farms.
- Contribute to the epidemiologic data collection (see sheet 8b middle section)
- In coordination with the veterinary authority ;
  - Confine the suspected farm (ban all movements of animals and animal products in and out of the farm)
  - If outbreak confirmed: Delineate the infected zone and ban all movement of livestock (both within and between villages of the zone).
  - Put in place vaccination campaign of animals within the protection zone surrounding the outbreak (in line with the decision of the Veterinary Authority).

The community

- Non-governmental organisations, opinion leaders, religious and traditional authorities : support the public awareness campaigns targeting the communities in the affected zone.
- Farmers and farm personnel:
  Reinforce the use of protective equipment when manipulating animals and their produce (gloves; aprons, masks, ...)
- Consumers :
  Reinforce the use of biosecurity measures when handling animal products ; do not manipulate raw meat barehanded.

Epidemiological investigation in case of suspicion of RVF in human population

Health professionals

Patients

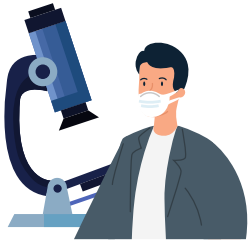
Methods and objectives of the investigation

'The investigation allows a suspicion of RVF infection to be confirmed or refuted by the analysis of biological samples and collection of epidemiological data. If RVF is confirmed, it helps to define the risk factors associated with exposure and contamination.

- Links to outbreaks in animal populations should be sought. The human cases should be actively sought; patients histories should be documented and analysed in order to identify the potential risk factors, namely ;
  - handling of sick animals ;
  - performing veterinary procedures ;
  - living in the contaminated zone, in proximity to livestock.

- Efforts and procedures should be put in place in order to allow for early identification of potential severe cases of the disease and ensure the appropriate patient care, in order to maximise the survival rates and minimize the long-term disabilities caused by the disease.

- It is necessary to ensure the timely transport of samples to the laboratory and their examination by competent personnel.



- If you feel sick, visit the hospital immediately
- Seek care early to help your chances of survival if you become seriously ill.

IN CASE OF HIGH FEVER, CONSULT YOUR MEDICAL PRACTITIONNER IMMEDIATELY

Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/resources/posters.html

8B Mesures to put in place in case of suspected RVF in human populations

If RVF is suspected in a community, the following actions should be taken in frame of the first response, in line and within the limits of the country's legislation :

The health professionals

Hospital managers:

- Implement and supervise the standard precautions, make sure that all staff is aware of precautions pertinent for their role.
- Ensure regular deliveries of personal protective equipment.
- Asign a ward suitable for isolation of confirmed cases. Supervise correct workflow of materials, including waste management.
- Keep the relatives of hospitalized persons well informed about care given to the patiens.

Health personnel:

- Reinforce the personal protective measures during examinations (goggles, masks, gloves)
- Triage of cases
- Isolation of confirmed cases

Multidisciplinary outbreak investigation team:

- Reinforce the case detection ; ensure that all field staff understands well the case definition.
- Map out the cases and the deaths registered every month. Trace an epidemic curve.
- Map the confirmed cases; their domicile and the placed they work.
- Collect the information available about the cases; analyze the distribution of according to age and sex
- Determine any risk factors or predisposing factors of the disease. The awareness about these factors can facilitate the control of the disease in human population.
- Multidisciplinary collaboration between veterinary and health professionals is crucial to maximize the joint capacity of case detection.

Community (NGOs, religious groups, schools, associations)

- Build community awareness of the disease to allow for early detection of cases
- Strengthen the public awareness of the preventive measures against disease transmission, of personal protection against mosquito bites and the good practices of safe animal product handling.
- Prevent the spread of fake news and rumors by transparent communication.

Environmental sanitary officers

- Carry out an entomological investigation in order to identify all possible vectors of the virus present in the area.
- Where possible, organise larvicide treatment of the stagnant waters, all in collaboration with the ehalth authorities.

Ressources used on this worksheet: WHO, 1998

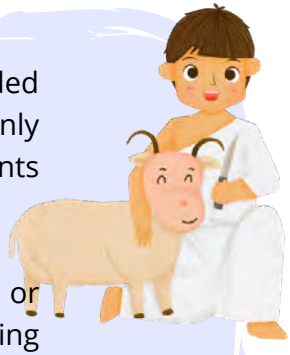
8c Propagation of RVF in human populations

- The propagation of RVF in human populations is usually preceded by an outbreak in livestock. In some cases, this connection is only observed retrospectively, after the analysis of data from patients treated for febrile or hemorrhagic syndromes.

- Most human cases of RVF result from exposure to the blood or organs of infected animals. RVFV can be transmitted during slaughtering or meat processing, while assisting in calving or kidding or while handling aborted fetuses. Thus, RVF is most often considered to be an occupational hazard of farmers, meat workers and veterinarians. There is some anecdotal evidence of RVF infection resulting from the consumption of non-pasteurized milk from infected animals, but this has not been validated scientifically.

- Human infection have also been observed as a result of bites by infected mosquitoes (mainly *Aedes* and *Culex*). In the risk zones , vigilance is recommended towards the disease and its vectors, as RVF often re-emerges after rainy periods/seasons that promote vector abundance.

- Human-to-human transmission is considered extremely rare. The vast majority of cases results from animal-to-human transmission. However, it remains a theoretical possibility and the health professionals in contact with RVF-positive patients should employ standard measures of personal protection.



<u>Is there a risk to pregnant women?</u>

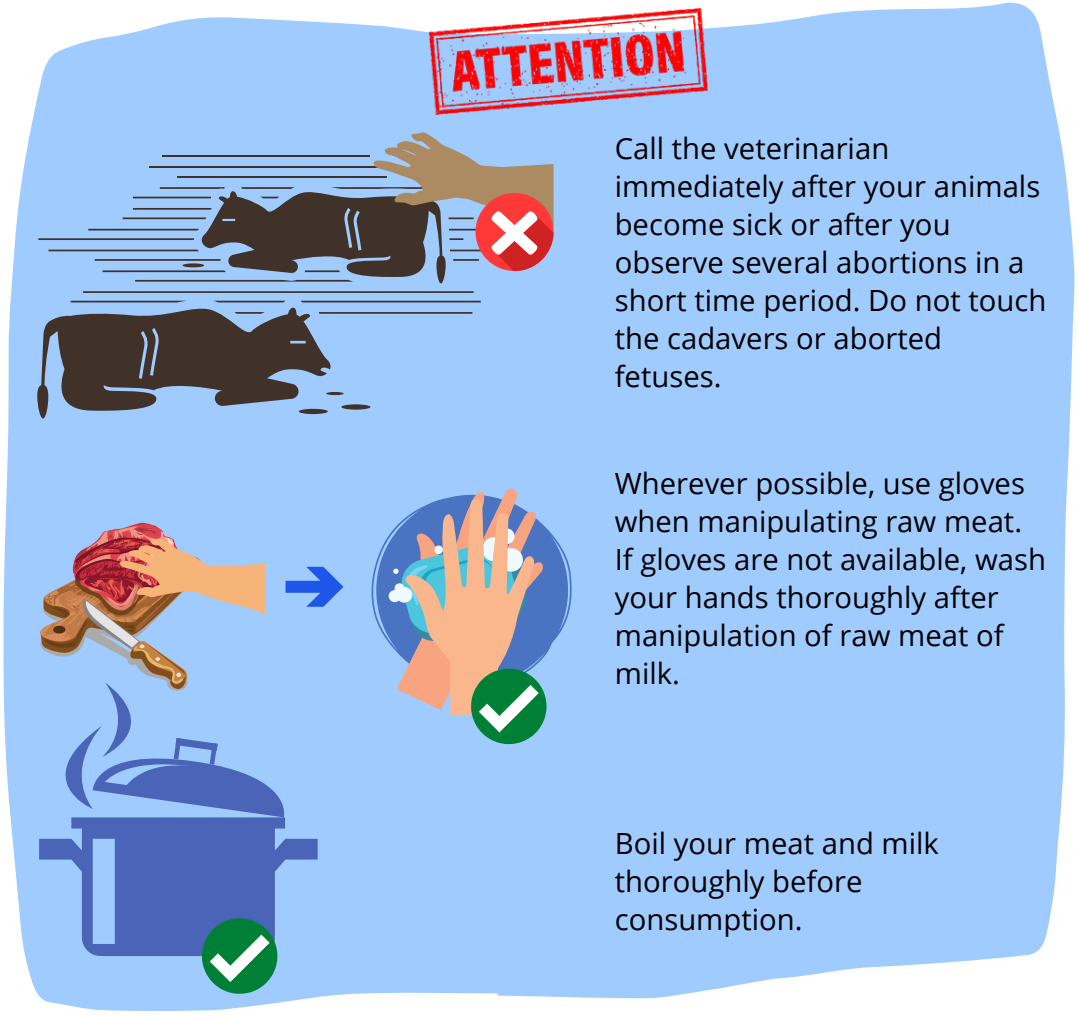
Abortion is a very typical sign of RVF in animals. However, it remains unclear whether RVFV has a similar impact during pregnancy in humans.

Structural differences between the human and ruminant placenta are thought to result in a lower risk of RVFV passing from mother to unborn-child in people. And historically, there has only ever been one report of this occurring.

However, as ~2% of people develop severe symptoms, as thus RVF remains a potential threat for mothers and their unborn children.

How to prevent propagation of RVF in humans

Certain professions, such as stock keepers, farmers, butchers or veterinarians, are more at risk of RVF infection than others. The use of personal protective equipment in the workplace is essential (wearing gloves, goggles, aprons and disinfecting tools and work surfaces).



Call the veterinarian immediately after your animals become sick or after you observe several abortions in a short time period. Do not touch the cadavers or aborted fetuses.

Wherever possible, use gloves when manipulating raw meat. If gloves are not available, wash your hands thoroughly after manipulation of raw meat of milk.

Boil your meat and milk thoroughly before consumption.

In case of suspected RVF, the measures to be taken in order to prevent further propagation of the epidemics and control of the disease are as follows;

- Avoid all but necessary contact with the sick people.
- Do not consume products originating from diseased animals.
- Reinforce the vector control, including destruction of the mosquito hatching sites and measures of personal protection (mosquito nets, long clothes).
- Increase awareness of health professionals and the community about the symptoms indicating severe forms of RVF in humans.

Protect yourself against the mosquito bites by using mosquito nets and repellents and by wearing long clothes covering your legs and arms !

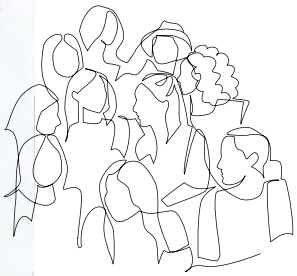
Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/resources/posters.html

One Health strategy of RVF control

An emergency plan should be prepared in advance, emphasizing early detection of an outbreak. The goal is to take a timely action in order to confine the outbreak and minimize the consequences for public health, economy and community in general. To reach this goal, inter-sectorial collaboration is necessary to reach this goal.

Sociological and anthropological intervention

- Socio-cultural evaluation
- Engagement of influential persons ; opinion-leaders, womens' and youth associations, traditional healers, political and religious authorities
- Use of formal and informal communication channels
- Listening and taking into account the communities preoccupations



Psychological support

Clinical care

Human cases

- Triage of patients with severe and benign symptoms
- Supportive clinical care for severe cases
- Clinical trials

Farms

- Isolation of sick animals
- Supportive care for symptomatic animals
- Protection against disease vectors
- Active surveillance for disease symptoms

Ethical aspects

Media

COORDINATION

Logistics

- Security management
- Coordination of field teams
- Accommodation and restauration
- Budgeting and compensations
- Means of transport

Vector control

Epidemiological investigation and surveillance

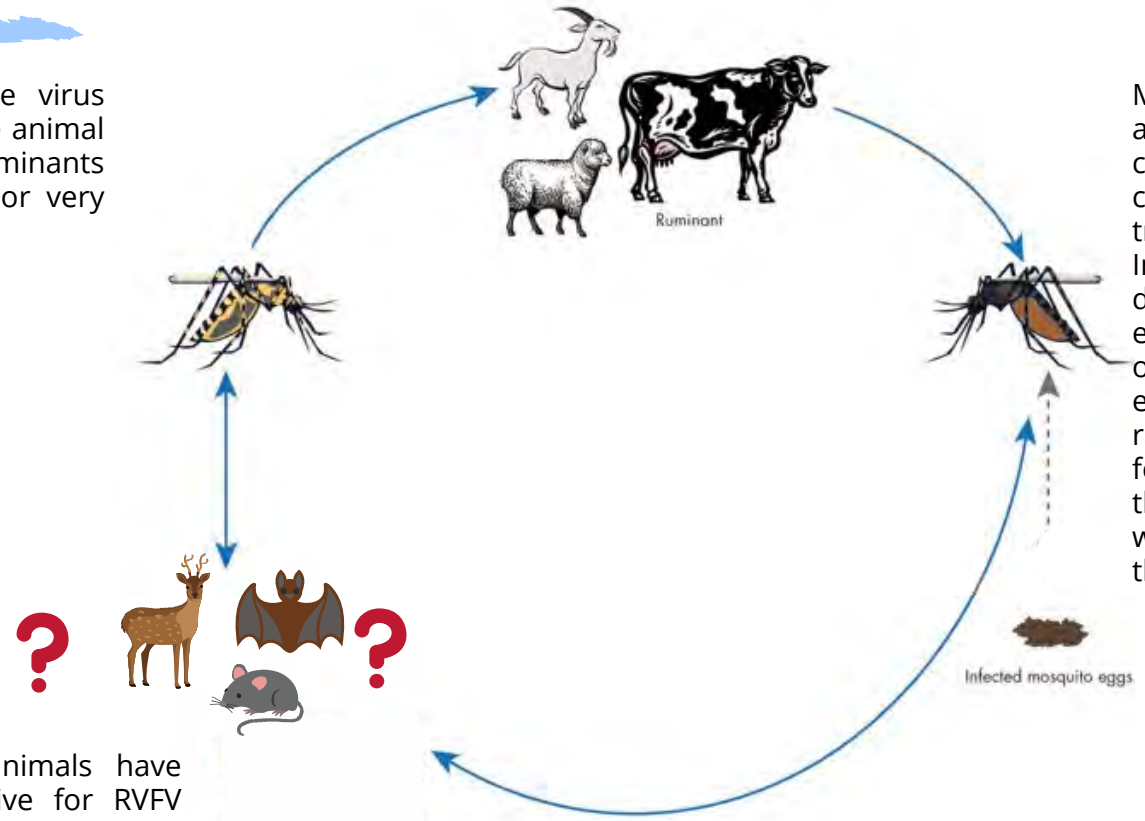
- Active outreach to detect the cases
- Biological sampling
- Laboratory analysis
- Data analysis
- Set up of One Health intervention team

Environmental health : Vector transmission

RVFV circulates between the mosquitoes and the mammals in various , sometimes complex, ways, which are influenced by climatic conditions.
We know of three different cycles of transmission :

1) Enzootic cycle

In an enzootic zone, the virus circulates unnoticed in the animal population (domestic ruminants and wildlife), causing no or very little symptoms.



Mosquitoes of the genus *Aedes* are capable to maintain the circulation of RVFV due to their capacity of vertical transmission.
Infected females can lay drought-resistant eggs in the environment, which can hatch once the humidity of the environment rises (after the rains). The newly hatched females are already carrying the virus and can transmit it while sucking the blood of their hosts.

Many species of wild animals have tested serologically positive for RVFV (RVFV-specific antibodies were present in their blood) while showing no symptoms of the disease. However, their role as a reservoir of the virus has not been scientifically proven and their significance remains unclear.

Environmental health : Vector transmission

RVFV circulates between the mosquitoes and the mammals in various , sometimes very complex, ways, which are influenced by climatic conditions. We know of three different cycles of transmission :

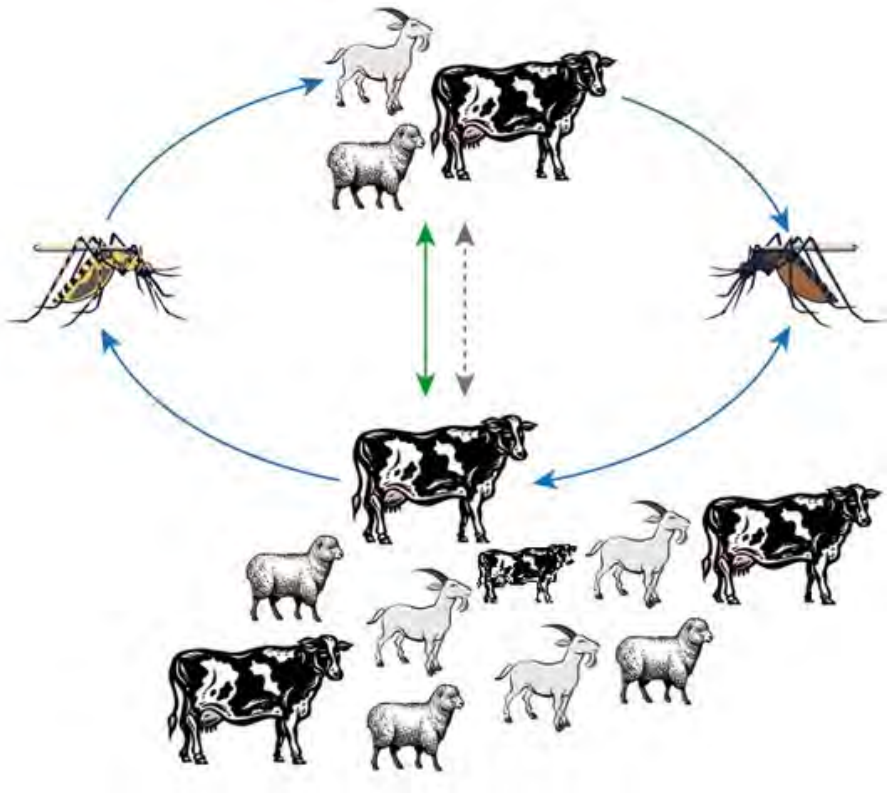
2) Epizootic cycle

A combination of several triggering factors results in RVF becoming epizootic (there are more animal cases than usual and the disease alerts the stock keepers). Triggering factors may include;

- Introduction of naive animals (with no RVFV-specific antibodies) to an enzootic area - this can occur eg. due to seasonal migration or during religious feasts
- Climatic conditions (eg. heavy rains) or agricultural activities (eg. rice cultivation) favor accumulation of stagnating water. The water bodies encourage the proliferation of mosquito populations.
- Mixing and movements of infected and uninfected animals (trade, barter)

During an epizootic outbreak, the RVF manifests as a sever as a severe, often deadly disease with zoonotic potential;
The most severe presentation usually occurs in pregnant females (30-50 % mortality and abortions up to 100 %) and young animals (mainly in lambs ; haemorrhagic fever followed by death within 36 hours in 90 % of cases).

Large ruminants such as cattle are relatively more resistant than small ruminants such as sheep and goats. The mortality ranks among 5-10 % in adult cattle and 20 % in calves.



Mosquito bites are the main mode of transmission, but direct transmission by close contact between the animals is also possible. Domestic ruminants act as amplifying hosts of RVFV. The virus replicates in their bodies to a significant level, which then increases the frequency of vector to other hosts, including humans.

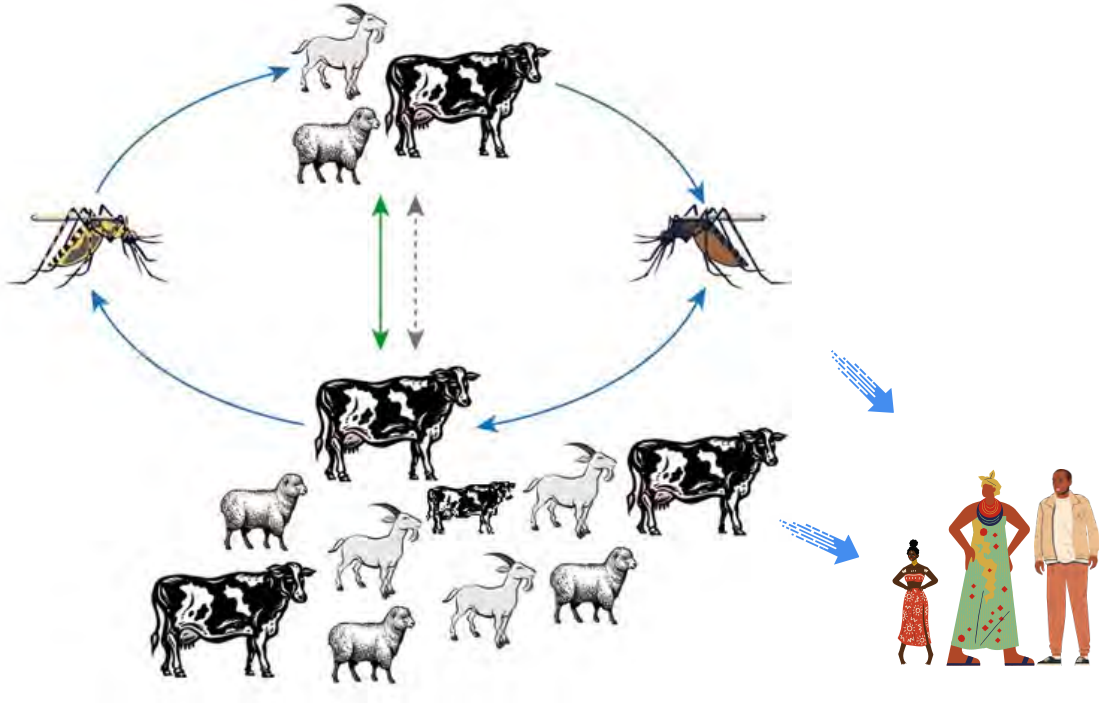
Environmental health : Vector transmission

RVFV circulates between the mosquitoes and the mammals in various , sometimes very complex, ways, which are influenced by climatic conditions. We know of three different cycles of transmission :

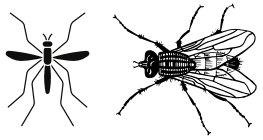
3) Epidemic cycle

Human disease usually occurs soon after the onset of an epizootics. Transmission of the RVFV mainly occurs from animals to humans by unprotected contact with sick animals (inhalation of infected aerosols) or infected raw animal products (slaughtering animals, handling carcasses, aborted fetuses or raw meat).

The possibility of vector transmission from an animal to a human also exists and can be significant in some contexts (eg. it was shown to play an important role in an outbreak in Egypt in 1977). More than thirty mosquito species have the competence to transmit the virus; most often *Aedes*, but also *Culex*, *Anopheles* or *Mansonia*.



RVFV has been found not only in the mosquitoes, but also in other arthropods, such as ticks, flies and midges (phlebotomus, simulides...). However, transmission is thought to be mechanical, not biological, in non-mosquito vectors.
Human-to-human transmission has not been observed. A single case of transmission from mother to her child have been documented.
Infection by consumption of raw milk remains a real possibility, although it is not well documented and has not been verified experimentally.
All documented outbreaks occured rural settings; to date (November 2022) no outbreaks have originated in rural areas.



Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/resources/posters.htm

10A Integrated vector control

		Examples	Advantages	Disadvantages and precautions
Control of adult mosquitoes 	**Mass trapping**	CO2 traps, gravid traps	Low cost Traps reusable	Need for high coverage in order to achieve a good impact
	Personal protection	Repellents Clothes covering the arms and legs Mosquito nets	Easy to implement Personal responsibility	Can be inaffordable for some communities or social strata
	Chemical methods	Indoor and outdoor spraying, with or without residual effect	Very efficient (in short term)	Risk of developing resistance ; importance of correct use Efficacy only temporary
	Biological and alternative methods	Sterile insect technique (SIT) Use of parasitoids and entomophagous fungi Genetic modifications	Environment-friendly	Some of these methods are in the research phase, often need of large and high-maintenance infrastructures (eg. breeding sterile insects)
Larval control 	**Larval habitat reduction**	Emptying small water reservoirs Drying marches	Efficient Low cost Potential for community involvement	Labor intensive
	Chemical methods	Organophosphates Insect growth regulators	Very efficient; elimination of vectors before they are capable of disease transmission	Not feasible if the water bodies are too large (eg. after the floods) Environmental risk (aquatic fauna) ; forbidden around sources of drinking water
	Microbiological methods	Bti (bacteria)	No residues and no resistance	
	Biological and alternative methods	Essential oils Methods using fish and copepodes	Environment-friendly techniques	In phase of research / development ; not fully approved for use

ATTENTION

Both indoor and outdoor spraying are regulated by the national legislation and shall always be performed by trained personnel

Ressources used on this worksheet: Roiz et al., 2018

10B Reducing larval sources at community level

What can we all do in order to minimise the development of mosquito vectors in the neighborhood?

Small everyday actions with big impact

In the kitchen : Emptying any remaining liquid in small open containers

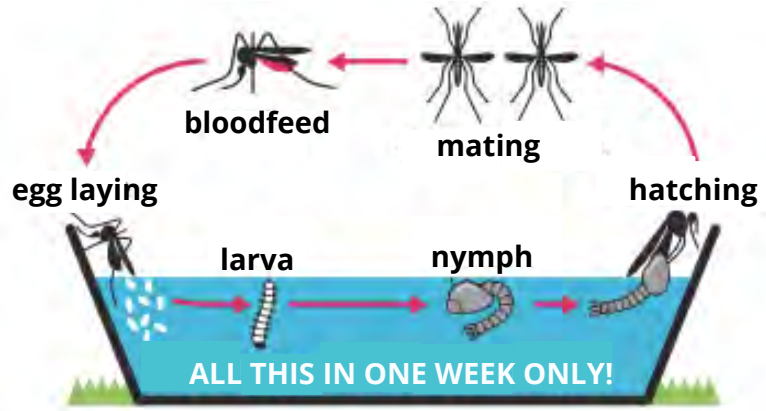
Covering any liquid-containing containers by tissue net or wire mesh

In the yard : Emptying water from tyres

Disposing all waste in a bin with a cover

Life cycle of a mosquito (reproduction, egg-laying, development)

This is why its so important to eliminate all possible sources of larval development ; all small objects containing water or other liquid:



DID YOU KNOW?

80% of larval sources is created by people; in and around human settlements

A mosquito can lay 100 eggs in 3 days and can do so for a period of 1 month (the whole of his adult life)

10c Care and treatment for RVF patients

Supportive treatment

- Majority of the RVF human cases is relatively mild and self-limiting ; no specific treatment is required for these cases. For the severe cases, general support treatment remains necessary, such as intravenous fluids and antibiotics in case of secondary infections.
- Milder cases usually recover within one week. In more severe cases, some complications (such as encephalitis, hepatitis, nephropathy, hemorrhagies or ocular symptoms) can be expected and can persist up to 60 days post-infection. Symptomatic follow-up is recommended for at least one month.
- Standard precautions shall be taken by the health personnel while taking care of patients tested positively for RVF. While viraemic, these patients cans be the source of infection for others ; their ward should be protected against mosquitoes.
- Anti-glaucoma medication or artificial tears can be used to relieve the ocular symptoms.

ATTENTION

The WHO **does not** recommend the use of **ribavirine**, an antiviral medicament previously used, due to delayed side-effects and mortality (severe encephalitis) observed in some of the cases treated from RVF.

Vaccination

An inactivated vaccine for human use has been developed, but not yet approved for a routine use. So far it is being used under an experimental protocol and it is allocated only for persons at high risk of acquiring the disease. Some other vaccine candidates are being studied.

10 Control and treatment of RVF in livestock

Treatment

There is no specific treatment for the disease. The benign forms generally do not require any treatment and appropriate nursing case can be administered to the severe forms, if possible ; anti inflammatory drugs, intravenous liquids, antibiotics to prevent secondary infection.
No drugs should be given without the approval of the veterinarian !

Vaccination

A ring vaccination campaign (protecting the herds around the outbreak) can be put in place by the Veterinary Authority.
Several veterinary vaccines have been developed : both inactivated and live attenuated. Depending on the type of the vaccine, a single injection can confer immunity for a period from 6 months up to one year.

The vaccination can only be applied on healthy herds that has not yet been contaminated by RVFV. The vaccination is discouraged if the disease has already been declared close-by (as in situations where there are probably high number of asymptomatic carrier animals, vaccination could actually contribute to spreading the disease)

ATTENTION

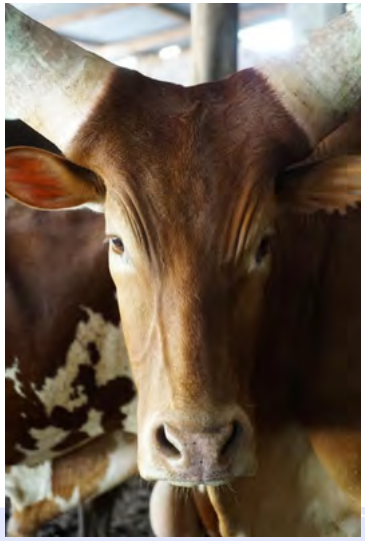
- the vaccination is regulated by national legislation ; every vaccination has to be authorized by the Veterinary Authority

Prevention of vector infestation

The animals in zones with high risk of infection can be treated by insecticide spraying eg. by **deltamethrine.**

Control measures

- Ban and/or restrict the movements of the animals
- Avoid shared grazing (small and large ruminants on the same pasture) and contact between the herds
- Sanitary slaughter can be carried out in conditions favoring its efficacy



Sanitary slaughter can be efficient in the begining of the epidemics, provided that the infected zone is well defined.
It the disease is already widely spread all over the territory (which can happen quite fast on the islands), there is no benefit to carry out the sanitary slaughter.

The most important measure to be taken in order to prevent the further dissemination of RVF is an absolute halt of movements of all animals and animal products to and from the infected zone.

In case of observation of cases of RVF in wildlife, it is recommended to minimise the risks of contact between the wildlife and domestic ruminants :

- Restrain the grazing at wildlife interface ;
- Reinforce the clinical surveillance of herds ;
- Put in place a systematic clinical surveillance of wildlife

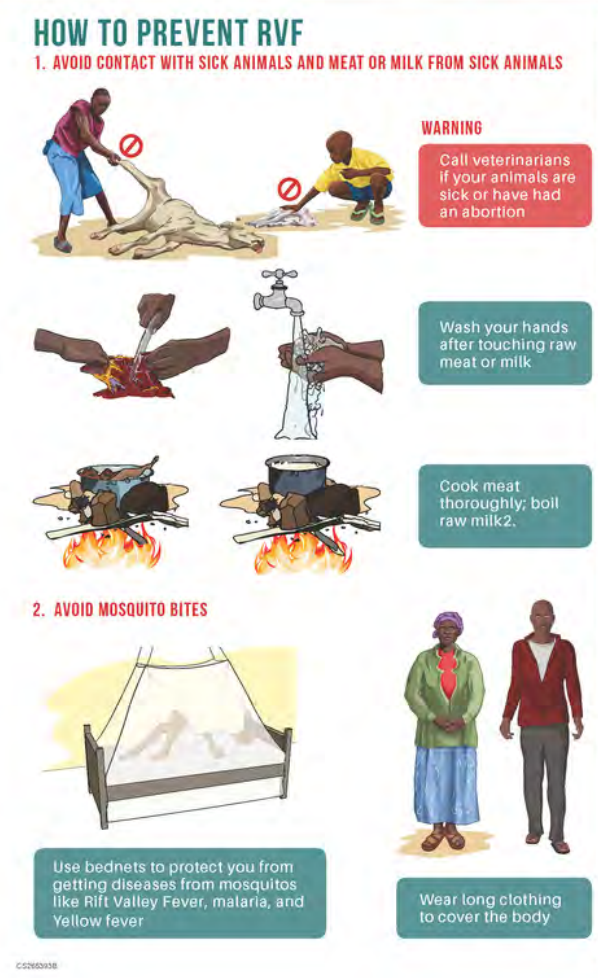
Communication et prevention

Public health campaigns for awareness and risk reduction

RVF is most commonly transmitted to humans via contaminated aerosols (small drops of bodily liquids entering the body through eyes, nose or mouth). Only an early and wide communication can prevent human cases of the disease and can avoid unnecessary deaths. Is is important to reinforce the notions of correct occupational protective equipment, personal hygiene and protection from biting vectors.

Public health recommendations should focus on these main points :

- **Minimise the risk of animal-to-human transmission caused by hazardous farming practices.** Wash your hands regularly, wear masks, gloves and protective clothes while handling living sick animals, their carcasses or processing raw animal products.
- **Minimise the risk of animal-to-human transmission caused by hazardous consumption practices. Do not consume raw milk, meat or blood.** Avoid purchasing animal products on informal markets.
- **Everyone can protect themselves from mosquito bites** by using impregnated mosquito nets, repellent sprays and light-colored clothes with long sleeves and trousers / skirts down to the ankles. Where possible, avoid outdoor activities at dusk and the dawn (peaks of vector activity).
- If you are a farmer, do not hesitate to declare any suspicions to your veterinarian. Avoid contact of your animals with animals from other farms.



Ressources used on this worksheet: https://www.cdc.gov/vhf/rvf/resources/posters.htm

12 RVF early warning system

Measures to be taken in countries free of RVF or between epidemics

Environment :

- Risk mapping ; use of satellite imagery to monitor the reactions of the vegetation to the rain -> detection of at-risk zones
- Strenghtening the laboratory capacities (eg. participation in interlaboratory comparative tests, external audits...)

Public health :

- Awareness-building of health professionals
- Syndromic surveillance of hemorrhagic fever (differential diagnostic dengue-RVF-chickungunya)

Veterinary services:

- Awareness building among at-risk professions (veterinarians, butchers, stock keepers)
- Active surveillance programmée ; regular sampling of sentinel herds with the objective of early detection of the infection before the contamination of human populaiton
- Health checks and quarantine of imports
- Consider revision of legislative concerning vaccines (possibility of rapid deployment)

Reference and other laboratories

Laboratories accredited by WOAH

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Example of a questionnaire ; investigation of RVF outbreak in livestock

Annex - Autopsy techniques in ruminants

Definition and purpose

- The autopsy is the continuation of the clinical examination performed on the same animal after its death or on other animals with the same symptoms.

- The autopsy has two essential goals :

1. To detect any possible lesions on the internal organs, in order to guide or further confirm the diagnosis ;
2. To take samples for laboratory analysis.

- The best results are obtained on animals that have been slaughtered by bleeding; the sooner after the death the better the results.

Precautions

- The sooner after the death of the animal, the better the results of the autopsy ;

- An autopsy performed too late can bring about some misleading observations and does not allow for sampling ;

- In order to be considered valid, the autopsy has to be completed (all organ systems examined as described below) ;

- The autopsy examination shall not be limited to organs or organ systems which are expected to be infected. Often, the apparently healthy organs (and the samples originating therein) can be a source of valuable information.

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

Annex - Autopsy techniques in ruminants

How to prepare for an autopsy

- Examination of the dead animal before autopsy :

1. Interview the herder and fill in the corresponding sheet ("autopsy and sampling") ;
2. Note all your observation on the cadaver before the autopsy is started :

- General state : good / average / bad ;
- Presence of ectoparasites : ticks, fleas, lice ;
- Observation of the mucous membranes : anemia (paleness), congestion (redness), icterus (yellow discoloration) ;
- Gingival, lingual, oral, nasal or ocular lesions ;
- Examination of natural orifices ; nasal or ocular discharge, diarhea, hemorrhage ;
- Take samples of ectoparasites, cutaneous scabs, faeces, vulvar discharge.

The basic equipment:

- A pair of gloves **;**
- **A mask ;**
- **A pair of goggles ;**
- **A large , well sharpened knife** ;
- A pair of scissors ;
- A protocol / worksheet to record the findings.

If sampling is foreseen :

- A small knife or a scalpel ;
- Sampling containers.

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

Annex - Autopsy techniques in ruminants

Technique – Opening the corpse

- Position the body on its right side ;
- Raise the left shoulder and the left thigh by dislocating it ;
- Fold the two limbs partly detached towards the back of the animal ;
- Carefully cut open and remove the skin starting from the white line in the connective tissue and then slightly turning the animal over to proceed on the right side.
- Observe the appearance of the skin muscles (their color, presence of hemorrhages) and the appearance of the connective tissue (color, consistency);
- Observe the appearance of the muscle sections on the shoulder and thigh ;
- Open the abdominal wall by first making a small hole in the umbilicus and working on either side of linea alba. Be careful not to damage the walls of the digestive tract, whose contents would contaminate the other organs and potential samples.
- Open the chest cavity. To do this, incise the diaphragm along the ribs and then cut the ribs near their connection to the sternum (cartilage region). Proceed to make a second incision in front of the first rib.
- Fold the costal flap towards the animal's back ;
- Observe the organs in place : general appearance, presence of fluid in the abdominal and thoracic cavities (abundance, colour, viscosity)

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

Annex - Autopsy techniques in ruminants

Technique – Inspection of the organs

First note the possible presence of a fluid in the pericardial sac by carefully incising it and pulling it from the heart; note the color and the quantity of the liquid. A normal pericardial sac should not contain any liquid. Observe also the appearance of the pericardium and proceed to examine the thoracic organs.

1) The lungs

The lungs must be examined with particular attention because they are the organs the most frequently affected by tropical diseases.

Normal lungs are completely free in the rib cage. Note any adhesion between the lungs and the thoracic cage on both sides ; the adhesion indicates pleurisy. Describe its appearance (fibrinous, purulent, fibrous...)

2) Heart

Remove the heart from its pericardial sac and cut off the vessels connecting the heart to other organs.

Examine the outer surface of the heart and look for the following lesions by removing the blood covering the surface with the blade of the knife; degeneration (various discolorations) or petechieae (small bleeding spots).

The heart cavities can be visualized by a deep incision ; observe the appearance of the myocardium and endocardium.

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

Annex - Autopsy techniques in ruminants

Technique – Inspection of the internal organs

3) Liver

The liver can be removed by cutting off the adhesions of the diaphragm and the associated blood vessels.

Note its volume, colour, consistency, presence of nodules, abscesses, cysts, flukes or other parasites. Record the volume of the gallbladder (normal or extended).

4) Spleen

Spleen can be found next to the rumen in the diaphragmatic region. Note its color, size and consistency upon section.

5) Kidneys

IThe kidneys can be easily removed by hand. Remove their capsule by incising it and observe their external appearance.
Note the presence of petechiae or infarction (small round zones of degeneration) then incise longitudinally and check the appearance of the different zones : medullary and cortical zone 'often localisation of nephritis) as well as the possible presence of abscess or pus (pyelonephritis).

6) Lymph nodes

The mesenteric lymph nodes located between the intestinal folds of the mesentery.
After removing them, note their external and internal appearance (congested, haemorrhagic, purulent)
.

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

Annex - Autopsy techniques in ruminants

Technique – Inspection of internal organs

7. Brain

The brain must be examined every time nervous disorders are observed. Opening th skull requires the use of large knife or a saw.

To access the brain, after removing the skin, proceed to incise the skull. Then remove the flap form the severed skull and observe the external aspect of the brain ; edema, congestion, hemorrhage, cysts (coenurus of Tenia)

Cut the bone marrow below the bulb and the optic nerves in front of the brain and completely remove the brain form the skull.

8. Digestive tract

It is examined as the last organ.

Start by examination of the stomachs ; observe the contents and the walls. It is very common to find peaces of fabric, rope or plastics in the rumen.
After removing the contents, observe the appearance of the mucous membranes. then start examining the intestines: note the external appearance of the different portions (bloating, congestion, bleeding)

Proceed to open the portions that appear abnormal and observe the mucosa. Look for parasites, ascaris, tapeworms, strongles, especially in the abomasum and small intestine. Pay particular attention to the sphincters ; pylorus, cardiac sphincter, ileo-caecal valve. They are a common site of lesions (ulcers, hemorrhages) which occur as a result of viral diseases.

Sources utilisés sur cette fiche: Doméon et Schuler, 2018

WHAT YOU NEED TO KNOW ABOUT
RIFT VALLEY FEVER (RVF)

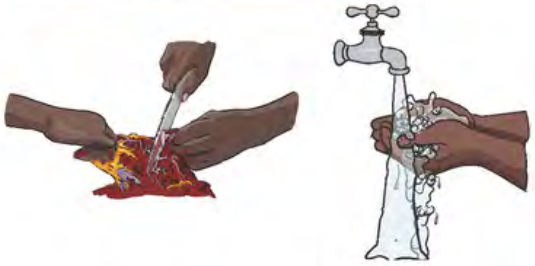
WITH GOOD KNOWLEDGE AND GOOD INFORMATION, WE CAN PREVENT PEOPLE AND ANIMALS FROM GETTING RIFT VALLEY FEVER.

HOW TO PREVENT RVF

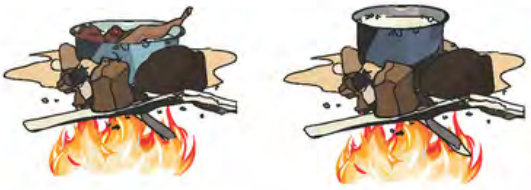
1. AVOID CONTACT WITH SICK ANIMALS AND MEAT OR MILK FROM SICK ANIMALS

WARNING

Call veterinarians if your animals are sick or have had an abortion



Wash your hands after touching raw meat or milk



Cook meat thoroughly; boil raw milk2.

2. AVOID MOSQUITO BITES

Use bednets to protect you from getting diseases from mosquitos like Rift Valley Fever, malaria, and Yellow fever

Wear long clothing to cover the body

WHEN ANIMALS OR FAMILY MEMBERS ARE SICK:

- Report sick livestock, abortions, and unexpected deaths to the local veterinarian.
- Do not handle or bury dead livestock. Call the local veterinarian to dispose of the body correctly.

- If you feel sick, visit the local clinic or hospital.
- Seek care early to help your chances of survival if you become seriously ill.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS265393B

WHAT YOU NEED TO KNOW ABOUT
RIFT VALLEY FEVER (RVF)

WITH GOOD KNOWLEDGE AND GOOD INFORMATION, WE CAN PREVENT PEOPLE AND ANIMALS FROM GETTING RIFT VALLEY FEVER.

SIGNS OF A RIFT VALLEY FEVER OUTBREAK

- Many unexpected pregnancy losses in goats, sheep, and cattle
- Stillbirths and births of weak animals
- Illness and death of young livestock (less than one year of age)

SYMPTOMS OF RVF IN ANIMALS

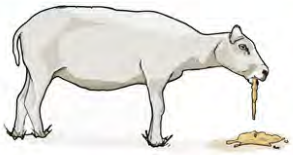

Animal may feel hot to the touch


Not eating: an animal that suddenly stops eating may be sick


Weakness: animal may not be able to stand or move around


A sudden decrese or drop in milk production


Water from nose: a clear or blood colored liquid may drip from the nose


Vomiting


Diarrhea: the animal may have running stomach. May be bloody or not.

Once animals recover from Rift Valley Fever, they are no longer able to infect people.

RVF IN PEOPLE

Those at greatest risk of getting Rift Valley Fever are people with contact with sick animals, including:

- Animal health workers
- Herders, other people who take care of sick animals
- Abattoir workers and people involved in slaughtering sick animals
- People who may touch the bodies of sick or dead animals
- Those who may handle uncooked meat or drink raw milk of sick animals

Typically, people infected with Rift Valley Fever recover 2-7 days after mild illness; however, a small number of people develop much more severe symptoms.

Signs of serious illness in people include: vomiting, diarrhea, muscle or joint pain, intense fatigue, abdominal pain, and unexplained bleeding.

One person cannot infect another person with Rift Valley Fever.

Seeking care early is an important way to help your chances of survival if you become seriously ill. Although there is no cure for RVF, there is supportive care, such as transfusions and IV fluids that can help save lives.

WHEN ANIMALS OR FAMILY MEMBERS ARE SICK:

If you notice an abnormal number of spontaneous abortions, stillbirths or increased numbers of of premature deaths in animals, report it to veterinary services for coordination and reporting of testing, and, if necessary, inform the Ministry of Health.

Contact: _____

When testing and drawing samples from animals, veterinarians should follow the recommendations below. To avoid contact live with bodily fluids sick or dead animals, or products of abortion, veterinarians should wear gloves, boots, long sleeves, and a face shield to protect against splashing.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS265393D

WHAT YOU NEED TO KNOW ABOUT RIFT VALLEY FEVER (RVF)

WITH GOOD KNOWLEDGE AND GOOD INFORMATION, WE CAN PREVENT PEOPLE AND ANIMALS FROM GETTING RIFT VALLEY FEVER.

FOR HERDERS, FARMERS, BUTCHERS AND ABATTOIR WORKERS

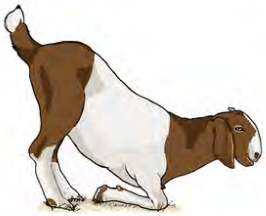
With Rift Valley Fever, usually animals such as goats, cattle, and sheep become sick first and then humans become sick. Humans can become sick after they have been in contact with sick animals. RVF does not spread from one person to another person.

RIFT VALLEY FEVER IN ANIMALS

RVF is very serious in animals. It causes aborted pregnancies, or being born dead, and increased death in young animals.

OTHER SYMPTOMS IN ANIMALS INCLUDE:


Loss of appetite


Weakness


Decreased milk production


Vomiting


Nasal discharge


Diarrhea

Tell your village leaders and health officials if you notice these signs and symptoms.
Once animals recover from Rift Valley Fever, they are no longer able to infect people.

RIFT VALLEY FEVER IN PEOPLE

Most people with RVF have no symptoms at all or only mild illness.
RVF does not spread from one person to another person.

People who do become ill might experience:

Fever Weakness Stomach pain Diarrhea Joint pain Dizziness Weight loss

Typically, patients recover 2-7 days after onset of illness if treatment is sought early.
In a small number of patients, more serious illness can happen, including symptoms of:

- Vomiting
- Bleeding (blood in vomit, blood in diarrhea, bleeding gums, red eyes)
- Headaches, coma, or seizures
- Blurred vision, reddening of the eyes, decreased vision, and sometimes loss of vision

WHEN ANIMALS OR FAMILY MEMBERS ARE SICK:

- Report sick livestock, abortions, and unexpected deaths to the local veterinarian.
- Do not handle or bury dead livestock. Call the local veterinarian to dispose of the body correctly.

- If you feel sick, visit the local clinic or hospital.
- Seek care early to help your chances of survival if you become seriously ill.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS265393C

CYCLE OF **RIFT VALLEY FEVER VIRUS**

Rift Valley Fever Virus is a Phlebovirus

VERTICAL TRANSMISSION
Egg hatching during heavy precipitation

infected **MOSQUITO EGGS**

MOSQUITOS (Multiple species)
Amplifying vector

Mosquito **BITE**

LEAST FREQUENT MODE OF TRANSMISSION

MOSQUITO BITE
Mosquito-animal-mosquito amplification cycle

NO INTER-HUMAN TRANSMISSION

RESERVOIR HYPOTHESIS: WILD HERBIVORES

Amplifying host

LIVESTOCK

Amplifying host

CONTACT with blood and other bodily fluids of infected animals

An elevated risk during:
- Slaughter
- Animal birth
- Veterinary interventions
- Foetus and/or carcass removal

MOST FREQUENT MODE OF TRANSMISSION

This project is financed by the European Union

Institut Pasteur

IRD

cirad

World Organisation for Animal Health
Founded as OIE

RIFT VALLEY FEVER

RIFT VALLEY FEVER (RVF) DISEASE is a zoonosis caused by a phlebovirus that primarily affects animals but can also cause human infections. **SYMPTOMS IN BOTH ANIMALS AND HUMANS** can be severe. In areas at risk, livestock vaccination is an effective means of combating this illness.

UNDERSTANDING THE VIRUS CYCLE OF RIFT VALLEY FEVER

CONCERNED SPECIES

High susceptibility	Susceptible	Moderate susceptibility	Low susceptibility (Inapparent infection)
Lambs, young goats, puppies, kittens, mice	Calves, sheep	Bovines, goats, buffalos, humans	Camels, horses, pigs, dogs, cats, rabbits

RESERVOIR

Hypothesis of **wild herbivores.**

VECTORS

Multiple species of mosquito, particularly the *Aedes*, *Culex* and *Anopheles* types can carry the virus.

MODES OF TRANSMISSION

- **Animal to animal transmission occurs through:**
  - Bites from infected mosquitos.
  - Direct animal-animal contact with bodily fluids, particularly contaminated blood (during abortions, licking, or simple contact).
- **Human transmission occurs through:**
  - Bites from infected mosquitos.
  - Direct contact with the blood or organs of infected animals.
  - Consumption of raw or undercooked meat and/or unpasteurized dairy products.
  - There is no evidence of human to human transmission.

ENVIRONMENTAL FACTORS

Close correlation between RVF and periods favouring mosquito population growth like **heavy rainfall** and **unseasonably warm temperatures** related to the El Niño phenomenon.

CLINICAL SIGNS

~100% abortion rate in pregnant sheep.

~100% mortality rate of **lambs and young goats** less than 8 days old.

WARNING SIGNS in animals

- **High mortality** without other clear symptoms among **very young animals.**
- **Large-scale abortion,** which can reach up to 100%.
- **High fever** (>42°C) accompanied by other signs: anorexia, jaundice, foul and watery diarrhoea, bloody and mucus-filled nasal discharge in animals over two weeks old.

PEOPLE AT RISK

People involved in raising animals, including agricultural workers, slaughterhouse staff, and veterinarians are often among the most at risk.

PRINCIPAL SYMPTOMS in humans

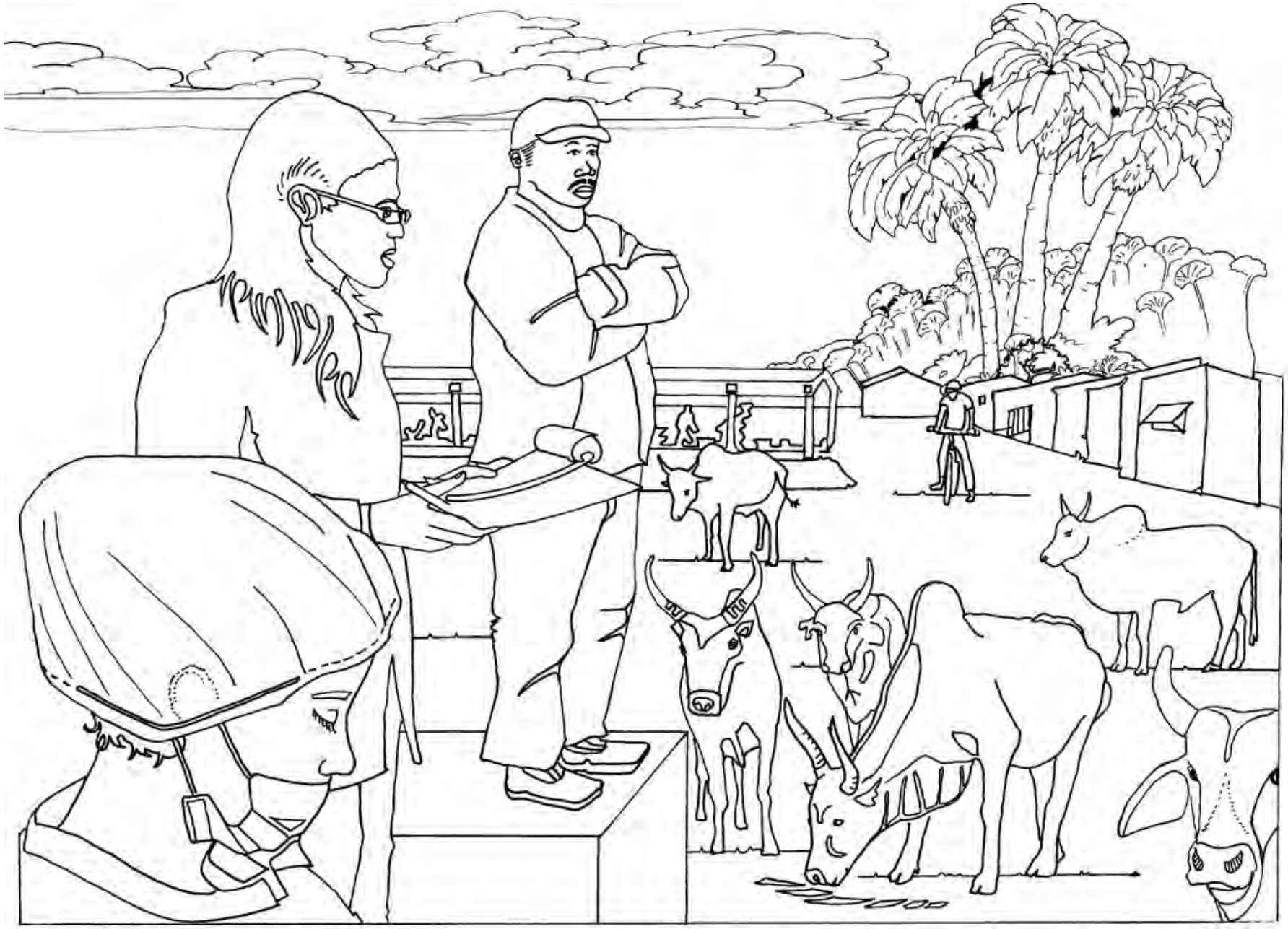
- **Incubation period:** 2 to 6 days.
- **Flu-like symptoms** with sudden on-set fever, headaches, muscle pain, and joint pain.
- **In certain severe forms of the disease** (< 5% of cases), symptoms can also include bloody vomiting, a decrease in or loss of vision, and neurological complications.
- **Duration of symptoms:** 4 to 7 days.

WHAT SHOULD YOU DO WHEN YOU SUSPECT A CASE IN LIVESTOCK?

1. **ENSURE GOOD COORDINATION** between Wildlife Services, Veterinary Services and Public Health Services.
2. **ADHERE TO GOOD PRACTICES** for personal protection (gloves, protective clothing), especially when visiting slaughterhouses and delivering veterinary services.
3. **COLLECT SAMPLES,** if possible, and send them to the national veterinary laboratory or a reference laboratory.
4. **BURY THE CARCASS** sufficiently deep between two layers of quicklime or burn it as described in *Article 4.12.6 of WOAH Terrestrial Code*.
5. **NOTIFY WOAH BY E-MAIL OR FAX OR THROUGH WAHIS** of every confirmed case of a WOAH-listed disease (like RVF) as per *Article 1.1.3 of WOAH Terrestrial Code*.

WHAT MESSAGES SHOULD YOUR SHARE WITH AT-RISK COMMUNITIES?

1. **WEAR** light coloured, long clothing.
2. **APPLY INSECT REPELLENT,** if available, on all exposed skin, as well as on livestock.
3. **USE MOSQUITO NETS** treated with insecticide.
4. **PROTECT YOUR HANDS AND ANY EXPOSED SKIN** when handling sick or dead livestock.
5. **QUICKLY ALERT VETERINARY SERVICES** about un-explained animal abortions and/or deaths.
6. **AVOID** stagnant puddles of water in and around homes.



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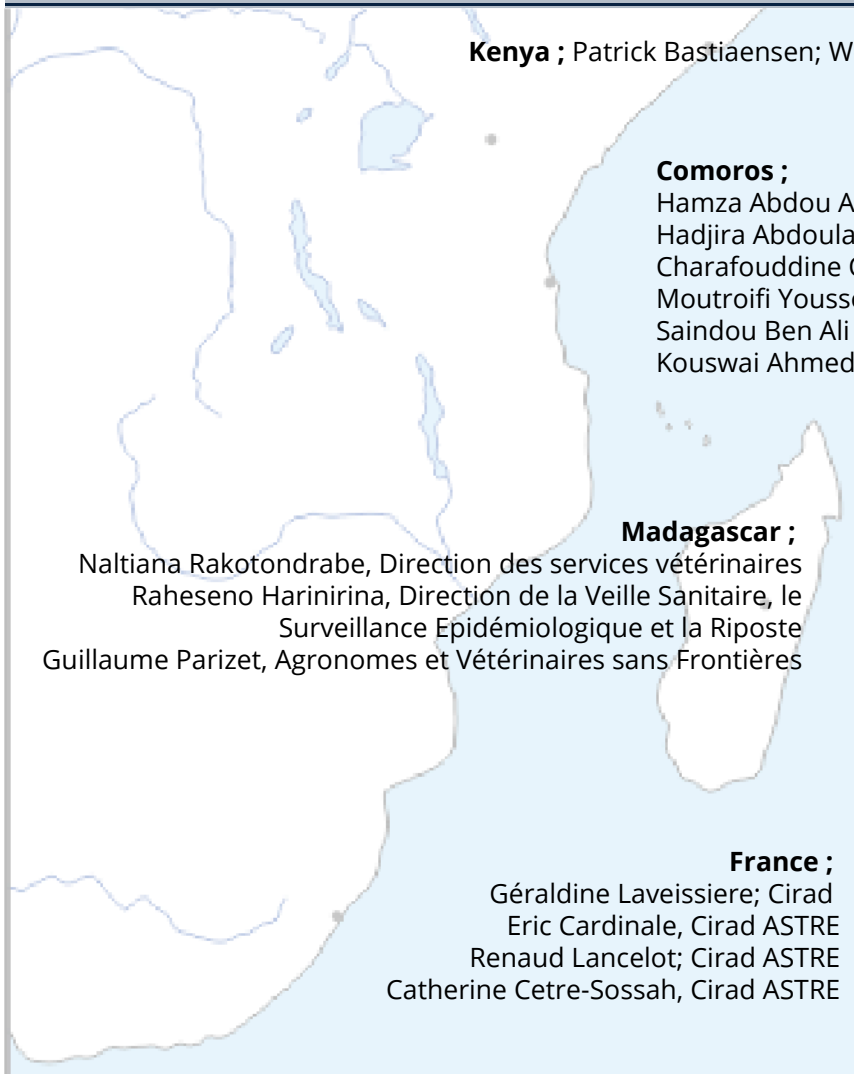
Annex - Authors and editors



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