ZOONOTIC AND VECTOR-BORNE DISEASES

Alert: Rift Valley fever

Increased rainfall levels that have been reported during the last quarter of 2020 and in the first few weeks of 2021 which constitute risk for re-emergence of RVF outbreaks in South Africa, and in the region.

Rift Valley fever (RVF) is caused by a RNA virus that is transmitted by mosquitoes. Since it was first described in Rift Valley of Kenya in 1930, RVF virus (RVFV) has caused multiple outbreaks in Africa, including major outbreaks in South Africa and outside the African continent.

RVF in animals

The virus can cause severe disease in domestic ruminants and many wildlife species may also be affected. RVF outbreaks are associated with losses in livestock production and have devastating economic impact on farmers and traders of animal products due to trade embargos. Almost all pregnant animals will abort if they are infected with the virus, thus the outbreaks of RVF are often recognized following so-called "abortion storms". Newborn lambs and goat kids are extremely susceptible to RVFV infection with a very short incubation, rarely surviving longer than two days after the onset of illness. Mortality may exceed 90% in animals less than a week old.

RVF in humans

Humans are highly susceptible to RVFV infection, which they acquire in sub-Saharan Africa mostly from contact with blood, body fluids, or tissues of infected animals or by bites from infected mosquitoes. Human-to-human transmission has not been documented, but cases of prenatal or intrapartum transmission has been reported. While RVF epidemics can involve large numbers of individuals, the majority of infections in humans are unapparent or associated with moderate, nonfatal influenza-like illness. The rare, severe human cases may develop or haemorrhagic and/or encephalitic forms of the disease. Human cases with jaundice, neurological disease, or haemorrhagic complications are at increased risk of fatality. In some patients the disease is complicated by the development of ocular lesions (retinitis), resulting in temporary vision loss, but permanent blindness has also been reported.

Characteristics of RVF outbreaks

Epizootics of RVF have a number of simultaneous and interconnected features allowing for an accurate prediction and recognition of outbreak events, including:

- unusually heavy and persistent rainfall resulting in flooding over a wide area and subsequent abundance of vector competent (or "suitable") mosquitoes;
- sudden and simultaneous onset of abortions among domestic ruminants and a high mortality rate, particularly in new-born lambs, kids and calves;
- other severe, often haemorrhagic, clinical signs, gross and histological lesions, especially in the livers of young animals or aborted foetuses;
- the presence of usually benign febrile illness among people involved in handling the blood, tissues, secretions or excretions of infected animals (especially after abortion) or involved in the slaughtering and autopsying of infected animals.

Historically, RVF has been reported from all nine provinces of South Africa. During the last major outbreak in 2010, the largest number of cases were reported from the central plateau of the country, mostly from parts of the Free State and Northern Cape (Figure 2).

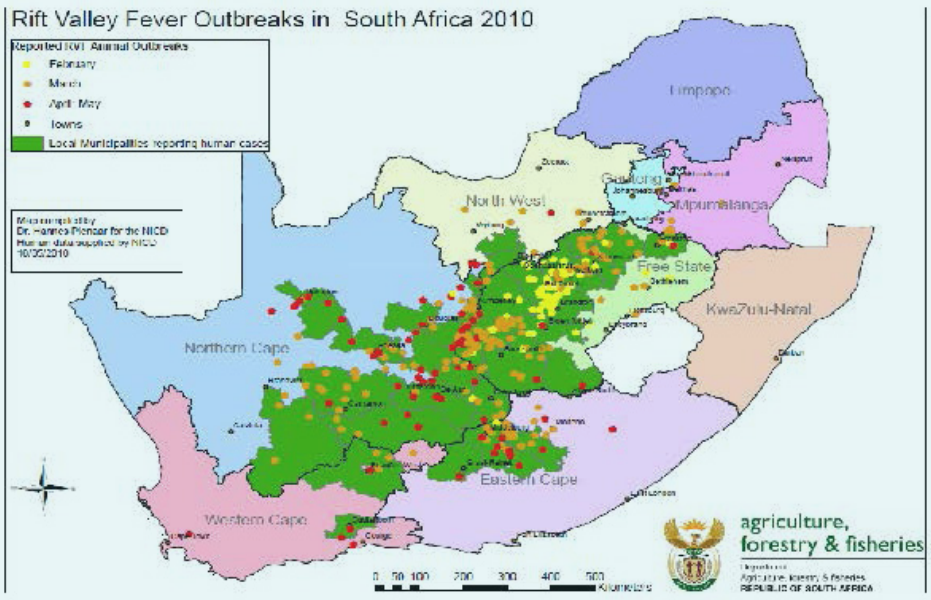

Figure 2. Geographic overlap of RVF cases in animals (red, yellow and brown circles) and humans (green area) in February-May 2010, South Africa (From Department of Agriculture, Land Reform and Rural Development

Source: Centre for Emerging Zoonotic and Parasitic Diseases, NICD-NHLS; januszp@nicd.ac.za

ZOONOTIC AND VECTOR-BORNE DISEASES

Outbreaks of RVF are closely correlated with above-normal rainfall and flooding. Present cumulative rainfall trend continues to depart from the 2010/2011 season in the Free State and central eastern regions of South Africa, when the most recent RVF epidemic occurred and it is well above the long-term cumulative daily mean (Figure 3). RVF outbreaks have historically occurred in central South Africa, but the country as a whole is at risk. Weather forecasts expect more rainfall over South Africa, with possibility of further heavy rain and localized flooding over the Free State, KwaZulu-Natal, North West and Mpumalanga provinces. Increased rainfall levels that have been reported during the last quarter of 2020 and in the first few weeks of 2021 constitute potential risk for re-emergence of RVF outbreaks in South Africa, and in the region.

Contact with blood and organs from sick or dead animals must be avoided or minimized, and personal protective equipment (PPE) (including plastic apron, examination gloves, respirator and eye protection such as safety goggles) should be provided and worn by persons who perform veterinary procedures and necropsies, or otherwise handle carcasses or aborted foetuses. Improved hand hygiene is also recommended to reduce risks of transmission when in contact with sick animals, carcasses or aborted foetuses. All products and tissues of animal origin such as the internal organs (liver, kidneys and lungs), meat and milk should be thoroughly cooked before eating. In times of an epidemic, in the affected areas, sick animals should not be eaten. Personal and community protection against mosquito bites through the use of insecticides, impregnated mosquito nets, insect repellants, wearing light colored clothing, long-sleeved shirts and trousers, and avoiding outdoor activity, particularly at peak mosquito biting times, is strongly recommend.

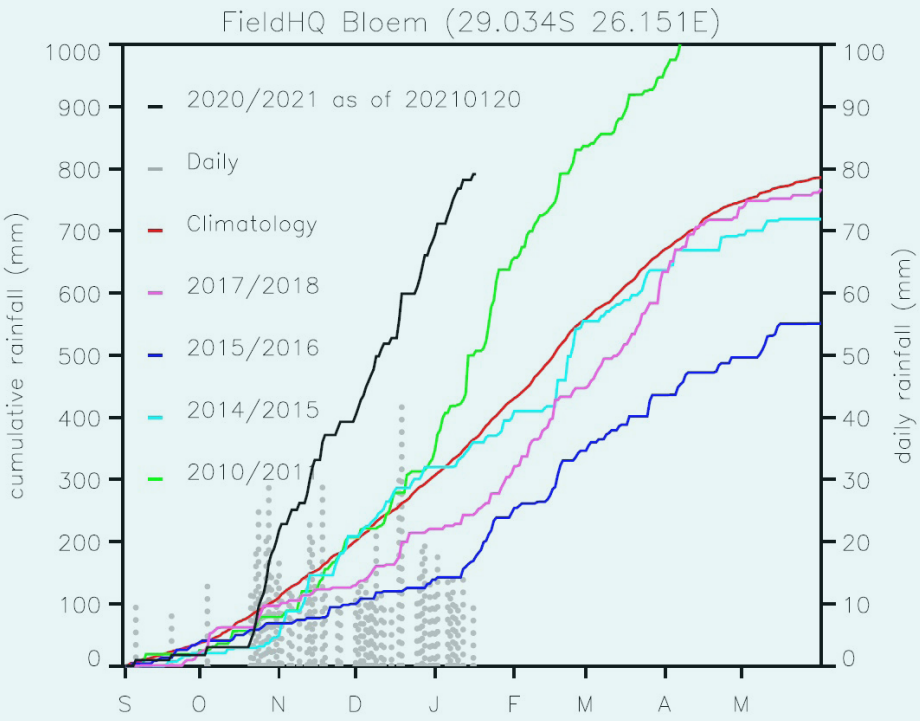

Figure 3. Rainfall trend in Bloemfontein, Free State, South Africa as of 13 January 2021. (current cumulative rainfall shown in black, for 2010/2021 season in green and long-term cumulative rainfall mean in red). Source: Ecohealth One Health RVF project in South Africa; Goddard Earth Sciences Technology and Research (MSU), Code 614, NASA Goddard Space Flight Center Greenbelt, MD 20771, USA.

Source: Centre for Emerging Zoonotic and Parasitic Diseases, NICD-NHLS; januszp@nicd.ac.za

ZOONOTIC AND VECTOR-BORNE DISEASES

Case definition and management

The case definition for human case RVF in South Africa is as follows:

A suspected case is defined as a person with recent contact with hoofed animals (sick or dead animals, aborted fetuses) and/or exposure to mosquito bites and presenting acutely with an influenza-like illness (which may include fever, myalgia, arthralgia or headache), or with encephalitis, haemorrhage, hepatitis and/or ocular pathology (retinitis) with or without fever, or a person with unexplained encephalitis, hepatitis or haemorrhagic illness.

The clinical features of COVID-19 may overlap with the presentation of RVF and RVF should be considered as differential diagnosis in cases that match the definition described above. RVF differential diagnosis include malaria, Crimean-Congo haemorrhagic fever (CCHF), tick-bite fever and other endemic arboviral infections such as West Nile and Sindbis fever and Wesselsbron disease.

Mild cases are self-resolving and patients are recommended to bedrest and to remain hydrated. Symptomatic treatment is assessed on case-to-case basis. Severe cases are also managed empirically but often required hospitalization. It is recommended to monitor fluid and electrolyte balance and renal function, blood pressure, oxygenation, rehydration, support of coagulation. Analgesic and pyretic drugs are provided as required. There are currently no antiviral drug therapies recommended to treat RVF.

RVF in humans is a Category I notifiable medical condition in South Africa (https://www.nicd.ac.za/nmc-overview/overview/).

Laboratory investigation

Specialized laboratory investigation is only recommended for those cases that meet the case definition. Laboratory investigation includes molecular (RT-PCR) and serological testing (ELISA). Virus isolation may be attempted when required. Differential diagnosis of RVF concerns a broad array of conditions, especially when first cases are encountered during yet unrecognized outbreaks. These include:

- malaria, rickettsial infections, Q fever,
- typhoid fever, dysentery, plague, brucellosis, leptospirosis,
- meningitis, other sepsis from bacterial infections, viral
- hepatitis, other viral haemorrhagic fevers, non-infectious
- causes of disseminated intravascular coagulopathy, and
- acute leukaemia.

While RVF remains a relatively rare disease in humans in South Africa, the risk of infection is humans are higher in occupational groups such as livestock owners, farmers and farm workers, abattoir workers or butchers and veterinarians or animal health technicians or wildlife capture and culling teams from outbreak areas. Veterinary and medical laboratory workers handling infectious clinical material are also at risk.

Testing for suspected human cases of RVF is performed at the Center for Emerging Zoonotic and Parasitic Diseases at the NICD. More information is available from the NICD website: https://www.nicd.ac.za/diseases-a-z-index/rift-valley-fever/.

Prevention and control

There are no licensed vaccines or chemotherapeutics available for RVF prevention and treatment in humans. Both inactivated and live-modified RVF veterinary vaccines are available in South Africa. Annual vaccination of domestic ruminants is the recommended strategy to prevent the disease in animals and consequently to reduce the risk of human infection. Most human infections result from contact with the blood or organs of infected animals. Transmission of the virus through infected mosquito bite is also possible, but less frequently reported. Activities related to infected animal husbandry and slaughter or butchering practices are risky especially during an outbreak. Contact with blood and organs from sick or dead animals must be avoided or minimized, and personal protective equipment (PPE) (including plastic apron, examination gloves, respirator, eye protection such as safety goggles) should be provided and worn by persons who veterinary procedures and necropsies, or otherwise handle carcasses or aborted fetuses. Improved hand hygiene is also recommended to reduce risks of transmission when in contact with sick animals, carcasses or aborted fetuses. All products and tissues of animal origin such as the internal organs (liver, kidneys and lungs), meat and milk should be thoroughly cooked before eating. In times of an epidemic, in the affected areas, sick animals should not be eaten. The risk associated with mosquito bites may be addressed to the application of insecticides, repellent, screening of windows and mechanical ventilation.

Source: Centre for Emerging Zoonotic and Parasitic Diseases, NICD-NHLS; januszp@nicd.ac.za