

# Nairobi Sheep Disease: current level of surveillance, diagnostic capacity and economic impact in East Africa

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## Introduction

Nairobi sheep disease (NSD) is a tick borne (*Rhipicephalus appendiculatus*) viral disease of sheep and goats characterized by fever, hemorrhagic gastroenteritis and abortions in pregnant animals. It occurs in Kenya, Uganda, Tanzania, Somalia, Ethiopia and the Democratic Republic of Congo, however serological surveys have revealed a much wider distribution in Africa [1].

Although man is susceptible, human infection is rare causing a mild influenza-like disease, fever, joint pains, abdominal pain, headache and backache. Most clinical cases in man are laboratory acquired infections.

According to literature, NSD is believed to be the most pathogenic virus infection of sheep and goats (although less severe in goats) in eastern Africa with mortality rates ranging between 40%-90% in naïve sheep and is among the OIE listed diseases [2].

## The Disease status in East Africa

The disease appears to be latent in Kenya and Tanzania as there have been no reports in recent years according to the OIE, *World Animal Health Information Database*[3] and as accounted by the veterinary services in the respective countries. The last clinical occurrences of NSD in both countries were reported in 2003, whereas in Uganda the disease has never been reported in domestic or wild species.

## Kenya

Clinical disease was confirmed between 1996 and 2003, with suspicion of the disease in 2004 according to OIE Handistatus II [4].

Table 1: Details of the last disease outbreak in the year 2003[5].

Region	District	Sum of cases		Sum at risk
		Caprine	Ovine	
North Eastern	Wajir	90	51	506,000
	Ijara	60	45	88,036
Eastern	Isiolo	12	9	-
Rift Valley	Koibatek	21	6	289,400
Western	Vihiga	2	4	20,339

## Tanzania

NSD was reported between 1997 and 1999 where the clinical disease was confirmed and control measures of notification to District Veterinary Officers, surveillance and movement control inside the country were instigated. In 2001 there was suspicion of re-occurrence of the disease but without its verification. However the disease erupted again in 2003 during heavy rainfall experienced in that year [6].

Table 2: Details of the last Disease outbreak in the year 2003[7].

Region	District	Village	Date of observation	Disease	Sum of cases	Sum of deaths	Sum at risk
Arusha	Simanjiro	Loswaki (Terrat)	05-jun-03	Nairobi sheep disease	4	4	1,700
Arusha	Simanjiro	Sukuro	06-Apr-03	Nairobi sheep disease	6	2	8,900
Arusha	Simanjiro	Sukuro	13-May-03	Nairobi sheep disease	4	4	6,700

### Surveillance level of Nairobi Sheep Disease

In these three countries, the level of surveillance is passive to non-existent, with the disease being considered a non-notifiable or low priority disease of little if any economic impact to sheep productivity. The lack of re-occurrence of NSD for many years as in Kenya and Tanzania and non-occurrence in Uganda, limited knowledge on the disease by most field veterinary officers and prioritization of other endemic sheep diseases such as Blue tongue, Rift valley fever, sheep and goat pox, reckoned to be of more economic and public health importance has contributed to the low surveillance of NSD [Swai.E., Murekefu.W. and Rutebarika.C., personal communications, June-July 2013]. Moreover as compared to Kenya with a sheep population of 17,258,630, Uganda and Tanzania are not major sheep rearing countries with an approximate population of 3,548,348 and 3,629,544 respectively [8]. Sheep do not play a major economic role in the Tanzanian and Ugandan livestock industry, tentatively attributing to the low surveillance of sheep diseases considered to be less important such as NSD. [Rutebarika.C., personal communication, June 2013]

Of interest, *Rhipicephalus appendiculatus*, the principle tick vector of NSD virus (*Nairovirus*) and a major pest in cool, shaded, woody and shrubby savannas with  $\geq 24$  inches of rainfall, is rampant in Eastern, Central and Southern parts of Africa and considered as a one of the most economic important vectors due to its high cost of control and livestock mortalities it causes. The tick is also a major vector of other Tick borne Diseases such as Bovine Ehrlichiosis, Rickettsiosis (*Rickettsia*

*conorii*), *Thogoto Virus* and most notably East coast fever (*Theileriosis*) which kills at least 1.1 million cattle per year in sub Saharan Africa.[1b],[9].

### Diagnostic capacity for Nairobi sheep disease

Though NSD is regarded to be dormant in Kenya and Tanzania, the National Veterinary Services in all three countries have adequate diagnostic capacity and technical expertise in case of re-occurrence or occurrence of NSD with intact structures such as Epidemiology unit, Disease control unit, Central and Regional Laboratories, District and Field veterinary Officers and Veterinary Paraprofessionals. The National Laboratories are reasonably equipped with parasitology, Virology laboratories, Post-Mortem rooms, PCR rooms and adequate storage facilities for tissue and serum samples in liquid nitrogen refrigerators.

The central laboratories and regional laboratories (to some extent ) can conduct pertinent serological tests and DNA analysis to confirm NSD virus in samples, using guidelines provided by the OIE diagnostic manual [10] and commercial test kits.(Macharia.j , Ngeleja.C. and Mugabi.K-CVL,TVLA & NADDEC, personal communications ,july 2013)

Table 3: Diagnostic capacity of Nairobi Sheep Disease virus in the respective national laboratories

	Serological tests				Virus isolation			DNA analysis (polymerase chain reaction)
	AGID	CFT	ELISA	IFAT	BHK cells	Intracerebral infant mice inoculation	Susceptible Sheep inoculation	
<b>Central Veterinary Laboratory(Kenya)</b>	+	+	+	+	0	0	0	+..
<b>Tanzania Veterinary Laboratory Agency (TVLA)</b>	+	+	+	+	0	0	0	+
<b>National Animal Disease Diagnostics and Epidemiology Center (Uganda)</b>	+	+	+	0	0	0	0	+

Where :

- + Can perform the test, have technical expertise and diagnostic tools
- +.. Can carry out the test but too expensive to conduct.
- 0 Cannot perform the test, either lack technical expertise or diagnostic tools.
- AGID Agar Gel Immunodiffusion Test
- BHK Baby Hamster Kidney cells
- CFT Complement Fixation Test
- ELISA Enzyme-linked Immunosorbent Assay
- IFAT Indirect Fluorescent Antibody Test

Virus isolation using baby hamster kidney cells (BHK cells), intracerebral virus inoculation in mice and susceptible sheep inoculation has been difficult to perform due to thermal instability of the virus, lack of suitable materials and technical expertise. However the *Kenya Agricultural Research Institute* (KARI) has the competence if provided with relevant materials for virus isolation as they successfully isolated the virus in BHK cells while conducting research on NSD virus between 1993-1995 [Soi.R., personal communication, 22 June 2013]

### Conclusion

In Kenya, Tanzania and Uganda (although the disease has never been reported) there is suspicion that sheep and goat herds may be infected with NSD virus without showing clinical disease. This is possibly linked to enzootic stability from passive immunity through colostrum. [Soi.R., and Rutebarika.C.-KARI, MAAIF personal communications, June-July 2013]

As recommended by the competent authorities in all three countries, there is need to avail funds for active surveillance of Nairobi Sheep disease before recommending it to be delisted or maintained in the OIE list of diseases, as the disease status and prevalence in East Africa is vague and inconclusive.

### References

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