

Risk factors and socio-economic effects associated with spread of *Peste des petits ruminants* in Turkana district, Kenya

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Abstract

Peste des petit ruminants (PPR) is a highly contagious, infectious and often fatal disease of sheep, goats and small wild ruminants. In Kenya *PPR* was first suspected in 1992 and confirmed in Turkana District in 2007. Turkana community livelihoods were devastated following the loss of small stock due to the disease. The Government of Kenya estimated annual losses of over US\$ 13 million during the 2007-2008 outbreaks. The disease is relatively new in Kenya. Thus, the extents of the disease socio-economic impacts as well as the risk factors that are responsible for its introduction and spread in Kenya remain poorly understood.

Key words: *Peste des petit ruminants*, Risk factors, socio-economic, livelihoods, Turkana

Résumé

La *Peste des petits ruminants (PPR)* (PPR) est une maladie très contagieuse, infectieuse et souvent mortelle des moutons, des chèvres et des petits ruminants sauvages. Au Kenya, la *PPR* a d'abord été soupçonnée en 1992 et puis confirmée dans le district de Turkana en 2007. Les moyens de subsistance de la population de Turkana ont été dévastés suite à la perte du petit bétail provoquée par cette maladie. Le gouvernement du Kenya a estimé les pertes annuelles de plus de 13 millions \$ US durant l'apparition de 2007-2008. La maladie est relativement nouvelle au Kenya. Ainsi, l'ampleur des impacts socio-économiques de la maladie et les facteurs de risque qui sont responsables de son introduction et sa propagation au Kenya demeurent mal compris.

Mots clés: *Peste des petits ruminants*, facteurs de risque, socio-économique, moyens de subsistance, Turkana

Background

Peste des petit ruminants (PPR) in Kenya was first suspected in 1992 (Wamwayi *et al.*, 1995; FAO, 2008) and confirmed in Turkana District in 2007 (ProMed-Mail, 2007). The *PPR*

outbreaks in Turkana have had devastating effects on the Turkana community livelihood following the loss of small ruminant stocks due to the disease (Meyers *et al.*, 2008). In Kenya 14.4 million small stocks are at risk of infection with PPR. These small ruminant flocks contribute significantly to the main source of livelihood for the majority of the rural population and especially in the arid and semi-arid districts. The Government of Kenya estimates the annual losses due to PPR to be over US\$ 13 million (GOK, 2008). *Peste des petit ruminants* (PPR) is a highly contagious, infectious and often fatal disease of sheep, goats and wild small ruminants. The disease has been associated with an increase of animal movement for commercial and trade purposes, transhumance and nomadic customs, climatic changes and extensive farming practices (FAO, 2008). The disease is relatively new in Kenya. Thus the extents of the disease socio-economic impacts as well as the risk factors that are responsible for its introduction and spread in Kenya remain poorly understood.

Literature Summary

Peste des petit ruminants (PPR) was first described in Cote d'Ivoire in West Africa by Gargadennec and Lalanne in 1942. The disease is caused by PPR virus which has only one serotype with four distinct lineages (Barret *et al.*, 1993a). *Peste des petit ruminants* is so far found only in Asia and Africa. PPR is transmitted by contacts between infected animals in the febrile stage and susceptible animals (Gopilo 2005). In general goats are more susceptible than sheep, with sheep undergoing a milder form of the disease (Lefevre and Diallo, 1990). The PPR disease epidemics can cause mortality rates as high as 90% in native sheep and goat populations.

The disease is ranked by communities among the top ten diseases of small ruminants (Diallo, 2006). Recovered animals and vaccinated animals develop life-long immunity. Lambs and kids from recovered and vaccinated mothers have protective maternal antibodies that persist for 3 to 4 months. There are considerable differences in the epidemiologic pattern of the disease in different ecological systems and geographical areas (Gopilo, 2005). Control of the PPR is through livestock movement control and immunization of the susceptible flocks with PPRV homologous vaccine made from strain Nigeria PPRV 75/1 LK6 Vero 70. An economic analysis for assessing benefits of vaccination against PPR in Niger revealed that the program was highly beneficial (Diallo, 2006).

Study Description

The study location is in Turkana District within Kenya inhabited by Turkana people. It borders with Ethiopia, Sudan and Uganda. The study will include participatory rural appraisal, desk-top study and serology. The participatory epidemiology will be used to find out Turkana community's and local animal health service providers' perception of PPR disease, its socio-economic impact and various control measures instituted to stem spread of the disease. This will be done using semi-structured questionnaires and focused group discussions. A desk-top study will be carried out to document and evaluate the various PPR control strategies currently put in place by Kenyan Government including the overall costs and benefits of the control interventions. The sero-prevalence survey will be a cross-sectional study and will aim at determining the level of herd immunity.

The unit of study will be the *Adakar*. An *Adakar* is occupied by a cluster of often-related Turkana households that pursue similar socio-economic activities such as search for pasture, water and security under a trusted leader. The study will focus on six administrative divisions namely, Loima, Orropoi, Kakuma, Lokichogio, Kaalich, and Kibish being the international frontier divisions that made initial reports on PPR disease outbreaks in 2006. The *Adakars* will be identified through local veterinary workers and key informants. Six to 25 respondents groups (*Adakars*) will be selected to participate in the study. For those that require parametric statistical tests such as proportional piling, 50 to 73 respondents groups (*Adakars*) will be selected to participate (Catley, 2003). Ten *Adakars* will be selected from each division resulting in a study sample of 60 *Adakars* for the PE study exercises.

A PPR antibody sero-prevalence survey will be carried out for determination of flocks' immune protection level. Sample sizes for sero-prevalence sampling will be determined using the formula by Martin *et al.* (1987) giving a total of 384 serum samples per species assuming sero-prevalence of 50%. A sero-prevalence analysis will be done using competitive Enzyme-Linked Immuno-sorbent Assay C-ELISA which will be done following the method given by Singh *et al.* (2004). Cost benefit analysis will be undertaken to establish economical and social viability of PPR control measure so far undertaken. Factor analysis of PPR risk assessment will be done including a logistic regression modeling to evaluate predictive ability of the established PPR risk factors. Further a stochastic model will be developed to inform on PPR disease dynamics and evaluate the most appropriate control strategies.

Research Application

The PPR disease in Eastern Africa and particularly in Kenya is not well understood since there are very limited studies that have been carried out in an attempt to elucidate the status of the disease in the region. The disease has caused massive losses on livestock assets of the Kenyan pastoral communities to date. This study is aimed at informing the policy development in regard to control, prevention and eventual eradication of the disease. Further insights from the study will inform rehabilitation of affected communities so that they can regain meaningful livelihood through pastoralism.

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