

Research Application Summary

Comparison of *Peste des petits ruminants* (PPR) disease between Tanzania and Kenya

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Abstract

Peste des petit ruminants (PPR) is a new disease of goats and sheep in East Africa that has been causing major losses since 2007 and yet the risk factors involved and disease manifestation have not been described. In this research conducted both in Tanzania and Kenya, risk factors and disease manifestation are compared in both countries. The main symptoms of the disease that include emaciation, fever, ocular and nasal discharges, diarrhea and lesions in the mouth were reported in both countries. However, in Tanzania, there were symptoms in form of abortion and nodular lesions throughout the body. Post mortem lesions were also similar, except that in Tanzania, there were lesions and nodules in genitalia. In Kenya, experimental transmission of PPR was successfully done in six goats and six sheep. The PPR virus was confirmed through RT-PCR and ELISA tests in both countries. The research findings will be used to design disease awareness manuals for training. The experimental infection models will be used to evaluate potential vaccines and thus enhance chances of controlling PPR. The main risk factor that was found in both countries was introduction of new goats in unaffected areas. This information will be used to sensitise public sector policy makers and practitioners on the best ways to manage the disease.

Key words: Epidemiology, goats, *Peste des petit ruminants* virus, ruminants, sheep

Résumé

La *Peste des petits ruminants (PPR)* est une nouvelle maladie des chèvres et des moutons en Afrique de l'Est qui a été à l'origine de pertes importantes depuis 2007 et pourtant, les facteurs de risque impliqués et la manifestation de la maladie n'ont pas été décrits. Dans cette recherche menée en Tanzanie et au Kenya, les facteurs de risque et de manifestation de la maladie sont comparés dans les deux pays. Les principaux symptômes de la maladie qui incluent l'émaciation, la fièvre, les écoulements oculaires et nasaux, la diarrhée et des lésions dans la bouche ont été rapportés dans les deux pays. Toutefois, en Tanzanie, il y avait des symptômes sous la forme d'avortement et de lésions nodulaires dans tout le corps. Les lésions post mortem étaient également similaires, sauf que, en Tanzanie, il y avait des lésions et des nodules dans les organes génitaux. Au Kenya, la transmission expérimentale de la PPR a été faite avec succès sur six chèvres et six moutons. Le virus de la PPR a été confirmé par les tests RT-PCR et ELISA dans les deux pays. Les résultats de la recherche seront utilisés pour concevoir des manuels de sensibilisation à la maladie pour la formation. Les modèles d'infection expérimentale seront utilisés pour évaluer les vaccins potentiels et donc augmenter les chances de contrôler la PPR. Le principal facteur de risque qui a été trouvé dans les deux pays était l'introduction de nouvelles chèvres dans les zones non touchées. Cette information sera utilisée pour sensibiliser les décideurs du secteur public et les praticiens sur les meilleures façons de gérer la maladie.

Mots clés: Epidémiologie, chèvres, virus de la *Peste des petits ruminants*, ruminants, moutons

Background

Peste des petit ruminants (PPR) is a highly contagious, infectious and often fatal disease of sheep, goats and wild small ruminants. The disease is caused by *Peste des petit ruminants virus (PPRV)* classified under genus Morbillivirus (Gibbs *et al.*, 1979). The disease is endemic and common in sheep and goats in Asia, China, Middle East, Eastern parts of Europe, West, Central and East Africa (Ashley *et al.*, 2010; Dhar *et al.*, 2002; Shaila *et al.*, 1996). Since it was first reported in Turkana and Uganda border in 2007, the disease has since spread to almost throughout the arid pastoral districts in Kenya and Tanzania. *PPR* is transmitted by close contacts between infected animals in the febrile stage and susceptible animals (Gopilo, 2005).

Large quantities of the virus are shed through oculo-nasal discharges as well as the watery diarrhea. The can be detected

in secretions and excretions from an incubating animal 24 to 48 hours before the animal exhibits clinical symptoms. Fomites in contact with infected animals such as water, feed troughs and bedding could become additional sources of infection for a short period of time (Gopilo, 2005). However the *PPRV* is very labile thus limiting its survival period outside the host to a very short time (Lefvre and Diallo, 1990). There is no carrier status for *PPRV* (Gopilo, 2005). This study compares the manifestation of PPR in Kenya and Tanzania.

Literature Summary

In general goats are more susceptible to *PPR* than sheep; with sheep undergoing a milder form of the disease (Lefevre and Diallo, 1990). There are considerable differences in the epidemiologic pattern of the disease in different ecological systems and geographical areas (Gopilo, 2005). In the Sahel region sero-prevalence of 75% is observed in pastoralist small ruminants and in most cases the disease is muted or subclinical (Grenfell and Dobson, 1995). Clinical *PPR* is more prevalent in the humid and sub humid regions of West Africa with morbidity of 80% to 90% resulting to mortality of about 50% to 80% (Lefevre and Diallo, 1990). In the Arabian country of Oman, the disease maintains itself in susceptible yearling population with an increase in incidence being a reflection of increased number of susceptible young goats/sheep recruited rather than seasonal upsurge in the viral activity (Taylor *et al.*, 1990). The epidemiology of *PPR* in Eastern Africa is less clearly understood. The link between the disease pattern and factors that could influence the disease dynamics including socio-cultural and economic factors such as nomadism, transhumance, livestock trade or livestock rustling has yet to be fully established. Risk factors for sero-positivity in small ruminants in Tanzania have been reported as ruminant species, livestock production system and sex in sheep (Swai *et al.*, 2009). In a study carried out in Ethiopia, the analysis of the national serological data concluded that further studies needed to be carried out to investigate the association of the presence of disease with management practices (Waret-Szkuta *et al.*, 2008). Some of the reported general factors relating to introduction of the disease in a flock according to Gopilo (2005) relate to history of recent movement or gathering of sheep and/or goats; change season that lead to nomadic animals movements resulting to shared grazing; and introduction of recently purchased or rustled animals. Other factors include intensified change in husbandry and trading practices; cultural ceremonies that result in exchange of small stock as gifts and presents; and contacts with infected wildlife.

Study Description

The study is a comparison of PPR disease epidemiology and manifestation in the two East African countries of Tanzania and Kenya in order to determine common and unique elements. It is based on the PhD work of Simon Kihu in Kenya and MSc work of Epaphras A. Muse in Tanzania. Simon has completed his field work and is currently performing ELISA for antibody analysis and PCR tests for virus confirmation. Alex in Tanzania has already submitted two manuscripts one of which is already in print. The methods applied included semi-structured questionnaires, participatory tools like focus group discussions, ELISA monoclonal test, RT-PCR, experimental infection of 12 goats and sheep; field visits and sample taking.

Research Application

In Tanzania, the disease was reported by farmers for the first time in goats and sheep in February 2009. Investigations revealed that PPR was first introduced into Likuna village of Newala district in 2009 through newly goats purchased from the Pugu livestock market located about 679 km in Dar es Salaam city. These animals were introduced about one week prior to the disease outbreak. Other villages in close proximity of this village that reported outbreak of PPR in the same month were Kikuyu, Makote, Namiyonga, Lidumbe and Mkunya. It was confirmed that these five villages had also received some of these goats from Pugu Livestock Market. The disease spread to neighbouring Tandahimba district through buying sick and cheap animals from Newala district. The overall PPR sero-prevalence was 31% (95% CI=24.9-37.6%) in the two districts in Tanzania. In Kenya, the main risk factors in Turkana include the introduction of new goats either through purchase or inter-clan exchanges. The common clinical signs were high fever (41°C), depression, anorexia, severe purulent lacrimation (severe conjunctivitis) resulting into reddening of conjunctiva and matting of the eyelids, severe purulent nasal discharges (severe rhinitis), respiratory distress and coughing and oral lesions (necrosis and ulceration of mucous membrane). All superficial palpable lymph nodes were enlarged. There was high kid mortality (28%-40%).

The unique signs in Tanzania included severe nasal wounds. There were hard non-painful nodules freely moving with the skin all over the body. Two households reported abortions in pregnant goats. At post mortem, the lesions in sheep were less severe, and included nodules at the commissures. The lungs had hepatisation, emaciation and generalised lymphadenopathy. There were also ulcers on the soft and hard palates, lips and oral cavity. There was orchitis and posthitis in animals

with ulcerated nodules on the scrotum and prepuce respectively. In Kenya, the disease was experimentally used to infect six goats and six sheep and typical signs and post mortem lesions were re-produced. RT-PCR and ELISA test are currently underway to confirm the virus.

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