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Editorial

Peste des Petits Ruminants: A Deadly Animal Plague to be Eradicated

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Editorial

Small ruminants (sheep and goats) represent a significant part of the global livestock industry, majority (1.7 billion, ~80%) of which exists are in Asia and Africa, the two regions with highest concentration (~73%) of the poor people in the world [1]. Small ruminants are principally maintained by the poorer sections of the rural community for nutrition, livelihoods, economic development and for emergency requirement (against crop failure) to buy food and as cover for other expenses. In order to meet the global demand for meat and dairy products, livestock and livestock products have to increase significantly to keep pace with markets, this would be difficult to achieve if livestock-producing countries continue to suffer from a disease like Peste des Petits Ruminants (PPR), which has devastating effect on livestock productivity, producibility and sustainability.

PPR is also known as goat plague/ovine rinderpest/plague of small ruminants. It is a rinderpest-like disease of goats and sheep caused by a *Morbillivirus* (family *Paramyxoviridae*) [2]. The disease was first described by Gargadennec and Lalanne in the Ivory Coast, West Africa in 1942, a disease of sheep and goats that was similar to but different from rinderpest and was not transmissible to cattle. The disease is characterized by fever, diarrhoea, oculo-nasal discharge, dyspnea, leukopenia, and sloughing of the epithelium of oral and nasal mucosa followed by death which usually occurs 4–6 days after the onset of fever. PPRV infection leads to high morbidity (up to 100%) and mortality (up to 90%) and hence causing more devastating socioeconomic losses to poor farmers. Goats are usually more susceptible than sheep and the recovery rate is higher in sheep. Cattle can be infected with PPRV (subclinical infection) but is unable to transmit the disease to another host. Clinically, PPR may be confused with other diseases like capripox, Foot-and-Mouth Disease (FMD), bluetongue, contagious pustular dermatitis and contagious caprine pleuropneumonia [3]. In the last 20 years, PPR is spreading at an alarming rate approaching regions previously not affected. As a result, the disease is now endemic in large parts of the Asia and Africa. Countries in Europe, traditionally free of PPR, are at risk due to increasing global flow of livestock products. The incursion of PPR into an at-risk country such as Mongolia may have serious devastating effects on the 40 million small ruminants, contributing over 80% to the agricultural share of national GDP. If not contained, it could spread even further, causing more devastating socioeconomic losses to poor farmers, particularly women, who rely on sheep and goats for their livelihoods.

Rinderpest (cattle plague) has been successfully eradicated from the globe in 2011 [4]. Both PPRV and rinderpest virus (RPV) belong to the genus *Morbilliviruses* with some immunological cross-reactions and relatively similar clinical signs. RPV causes an acute lethal disease in cattle, whereas sheep and goats undergo subclinical infection. In contrast, PPRV causes an acute and highly fatal infection in goats/sheep without any obvious clinical disease in cattle/buffalo. After successful Global Rinderpest Eradication Program (GREP) in cattle, some important initiatives have been taken by national and international organizations to control PPR and finally eradicate it by replicating the tools and experience learnt during GREP. In this regard, The United Nations Food and Agriculture Organization (FAO) and the Office International des Epizootics (OIE) started two pilot programmes in 2013 for the control of PPR in Africa. India has started a PPR control program in 2010. Countries in the SAARC (South Asian Association for Regional Cooperation) have prepared a roadmap for progressive control and eradication of PPR in the region by 2020 [1].

About 62.5% (1.31 billion) of the global small ruminant population is at risk for PPR. According to FAO estimates, the production losses, morbidity and mortality and the treatment cost of PPR altogether are likely to cause economic loss of USD 2,972.5 millions/year during 2012-2017 in the SAARC region alone [5]. If a 3-year mass vaccination policy is adopted, a total of 3.93 billion vaccine doses (1.31×3= 3.93) will be required at the cost of $3.93 billion ($0.1 per dose of vaccine with an extrapolated unit cost of a vaccinated animal at $1.0). The capacity of vaccine manufacturing and political commitment for arrangement of funds for 3.93 billion vaccine doses is a major concern.

Since PPR is very similar to rinderpest, therefore, similar tools that were used to control rinderpest may be considered for control and eradication of PPR. The following reasons support control and eradication of PPR (i) There is only single serotype of PPRV and a perfect cross protection exist among different strains of PPRV. (ii) Vaccine provides long-lasting immunity (at least 4 years). (iii) PPRV infection does not lead to development of carrier state (persistent infection) in the susceptible animals. (iv) A close contact between the animals is required for effective transmission of the disease. (v) Virus is readily destroyed by heat and sunlight, therefore it does not survive for a long period of time outside the host, this requiring continuous source of susceptible animals for survival. (vi) Sufficient diagnostic tools are available. However, the vaccine should be used widely and

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consistently over a period of time to completely stop transmission of the virus in the affected regions, otherwise it may simply be wastage of the public funds and moreover helping the virus to perpetuate.

For actual control and eradication of the disease, following parameters should be carefully considered (i) Mass vaccination to achieve a herd immunity (>80%), which is required to block the effective transmission of the virus seems a difficult task in Asia and Africa in terms of availability of funds and veterinary infrastructure as well as capacity of the vaccine manufacturer to provide required doses of vaccines. (ii) The budget needed for a 3-year mass vaccination campaign to cover all the small ruminants population would be probably more than the actual economic loss caused by PPR. (iii) Due to migratory nature of the sheep and goats, control of animal movement seems a difficult task in South Asia and Africa where disease is endemic. (iv) The herd immunity will be evaded more quickly as compared to cattle because the annual turnover rate of the small ruminants is much higher than cattle. (v) Maintaining cold chain of the vaccine in rural areas is a difficult task. (vi) The role of other ruminants (wild and domestic) in the maintenance of PPRV is not well understood.

Though the entire investment in control and eradication of PPR cannot be expected to recover the economic losses immediately, its eradication would be meaningful economically as it will permanently eliminate the negative impacts of the disease. PPR eradication appears to be within our reach, but it will require a strong political will along with a sustained financial commitment as well as strategic partnerships with both the public and private sectors.

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