Disease Eradication through Thermostable PPR Vaccines

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Summary

“Peste des Petites Ruminants” (PPR) is a serious disease of goats and sheep across Africa. Also known as “sheep and goat plague”, this is a fast-spreading viral disease with high mortality rates, especially among younger animals. Its symptoms are rapidly elevated body temperature, with affected animals displaying discharges from the eyes and nose, sores in the mouth, troubled breathing, coughing, foul-smelling diarrhea, and death. PPR is spread by airborne droplets from infected animals with the virus targeting lymph tissue. Incubation periods range between three to ten days. There is no cure for PPR, but mortality rates are reduced with antibiotics that prevent secondary pulmonary infections. The best control measure is achieved through vaccination, particularly when delivered through sub cutaneous injection at the age of 4 months and is effective for about four years. It is also important that producers be aware of this disease and isolate any infected animals at an early stage of development. Economic losses from PPR across Africa and Asia are estimated to be US $2.1 billion per year.

Technical Description

A homologous live attenuated vaccine protects small ruminants against PPR. Vaccination offers lifetime immunity for animals other than breeding bucks and rams. In the past, the main constraint limiting the widespread use of this vaccine within eradication programs was the requirement for cold storage maintain the stability of the vaccine. More recently, the development of thermostable PPR vaccine overcomes this challenge. Two such vaccines are available; the ILRI thermotolerant PPR vaccine produced by the Thermovac process, and Xerovac, an older vaccine. Both vaccines are proven effective in several countries and demonstrated stability at ambient temperatures up to seven days for Thermovac to two weeks for Xerovac, withstanding temperature spikes of 40°C. Both vaccines are central to eradication efforts mobilized by the World Organization for Animal Health and the Food and Agriculture Organization of the United Nations. The standards of the Pan African Veterinary Vaccine Centre of the African Union recommend thermostability of 25°C for 10 days or 40°C for 2 days. The advantages of a thermostable vaccine include reduced storage costs, improved vaccine effectiveness and increased coverage of more animals in less time. Improved awareness and proper early response are also important elements of eradication campaigns.

Uses

Massive vaccination campaigns are underway. During 2019 and 2020, FAO assisted in the administration of 50 million doses in several countries including Central Africa Republic, Eritrea, Guinea, Kenya, Liberia, Sierra Leone, South Sudan, Tanzania, and Yemen. The World Organization for Animal Health OIE also delivered 19 million doses of the vaccine to Burkina Faso, Mauritania, Togo. The TAAT Livestock Compact worked with NARS partners to administer 37,000 doses of the PPR vaccine to small ruminants in Mali and Ethiopia.

Composition

The Xerovac thermostable vaccines are produced using the live attenuated Nigeria 75/1 vaccine strain. The process involves stabilizing agent and lyophilization but is not described in detail here.

Means of application

PPR is a notifiable disease, meaning that outbreaks must be reported to national veterinary authorities. Disease surveillance is an essential component of control efforts that considers animal movement, quarantine of affected farms, and identification of high-risk areas with inappropriate biosecurity measures that threaten infection and spread.

Agroecologies	Dryland area, Highlands, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Burkina Faso, Cameroon, Kenya, Niger, Nigeria, Somalia, South Sudan, Tanzania, Uganda.
Available in	Burkina Faso, Cameroon, Kenya, Niger, Nigeria, Somalia, South Sudan, Tanzania, Uganda.
Solution Forms	Management.
Solution Applications	Disease control, Livestock Production.
Agricultural Commodities	Small livestock.
Target Beneficiaries	Commercial farmers, Small-scale farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

For reliance upon PPR vaccination to become the norm among small ruminant producers, thermostable vaccines must be both available and affordable. Producers must be willing to pay for the administration of vaccine and comply with the instructions of animal health professionals. These experts must be trained and certified according to national regulatory standards.

Production Costs

The vaccine is relatively inexpensive as each administered dose costs between US $0.5 and $1.0 per animal. Vaccinators work in organized teams under the supervision of an experienced veterinarian. An investment of only US $300 is sufficient to mobilize a local animal health technician into profitable vaccination enterprise.

Customer Segmentation

Sourcing vaccines from the reliable suppliers, cold chain management and vaccine injection are regulated practices to ensure that administrated vaccines are effective. Consumer confidence is essential to eradication efforts and misuse can inadvertently introduce new diseases.

Potential Profitability

All goats and sheep should be vaccinated regardless of their scale of production. A well-organized vaccinator can treat up to 5,000 animals per month and operate a business with a fair return on investment.

Licensing Requirements

Administration of vaccines and biologicals, including the thermostable PPR vaccine, is strongly governed by national authorities. Vaccinators and veterinarians are licensed to operate by national authorities, animal owners require no permits to do so, and are rather encouraged or required to have all their animals treated.

Innovation as Public Good

The formulation and production of vaccines are private intellectual property, while some are available as Public Good.

Solution Images



A goat showing severe symptoms of PPR infection



Vials of thermostable vaccine ready for use



Vaccinating a young goat with the thermostable PPR vaccine

Institutions

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE