

IMPROVING FOOD SECURITY IN AFRICA WITH NOVEL LIVESTOCK VACCINES

A SINGLE VACCINE TO PROTECT CATTLE, SHEEP, AND GOATS FROM FIVE MAJOR DISEASES.

Infectious diseases kill up to 25% of all livestock across Africa and some of these diseases threaten to spread to humans. Although vaccines are available for many livestock diseases, their cost, delivery, and need for refrigeration impede their widespread use, especially in isolated rural areas. A survey of livestock farmers showed that 97% had a desire for vaccines that protect against multiple diseases.

An inexpensive solution was developed during the two phases of this CIFS RF project: a heat-stable, single-dose vaccine that was shown in pilot studies to potentially protect cattle, sheep, and goats against five common diseases. This vaccine will make it easier for suppliers to streamline production, marketing, and distribution to reach farmers in rural areas.

PRIORITIZING THE NEEDS OF SMALLHOLDER FARMERS

This project cleared some of the most significant manufacturing and regulatory hurdles to further develop the vaccine and meet farmer needs. A single-dose vaccine was developed that is heat-stable and may not require refrigeration and can potentially provide livestock with long-term protection against five diseases: lumpy skin disease (LSD), sheep pox (SPP), goat pox (GTP), Rift Valley fever (RVF), and peste des petits ruminants (PPR).

Manufacturing vaccines based on farmer preferences should help to increase adoption of the vaccines, thereby reducing livestock losses, improving animal healthcare, and increasing the access of smallholder farmers to markets, which will ultimately help to improve their incomes. The vaccines are also good news for women farmers, whose livelihoods often depend on small livestock like sheep and goats.

SCALING UP THE MANUFACTURE OF LIVESTOCK VACCINES

Onderstepoort Biological Products (OBP), a South African veterinary vaccine manufacturer and project collaborator, helped to transition two candidate LSDV-RVF vaccines through the research and development manufacturing process stages. The LSD platform technology was transferred to OBP and the manufacturer has since produced master seed, seed stock, and vaccine stocks; selected and optimized preferred cell lines; established standard operating procedures; developed quality controls; and conducted stability testing (all regulatory requirements). These safety and efficacy trials confirmed that one of the candidate vaccines is safe, effective, and can be produced by any current LSD vaccine manufacturer.

The South African government lifted the restriction on the manufacturing of PPR vaccines during the course of the project, which cleared the way for OBP and other manufacturers to produce the LSDV-RVF-PPR vaccine. This technology platform, which allows for different diseases to be added to or eliminated from the vaccine, was refined. It can be tailored to meet the specific vaccine needs of various regions and may include combinations of LSD, SPP, GTP, RVF and PPR, as well as diseases which may emerge in the future. A second platform technology was also adopted for candidate vaccines to protect against African swine fever (ASF).

INFORMING POLICY AND USE



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Once registered, scaling up the use of these innovative vaccines will require training farmers and working with government agencies and companies to facilitate licensing, manufacturing, and distribution.

More than 288 farmers and animal healthcare practitioners were directly trained in livestock care and vaccine use and thousands more were indirectly trained to use the vaccine via farmer's days in which information materials on correct vaccine use etc. were distributed. A report on gender dynamics within small-scale livestock farming systems was prepared; and a brochure that communicated the results of the study to a non-scientific audience was distributed.

The project team also produced a report on regulatory requirements and policies on genetically-modified microorganism-based vaccines; prepared a review of the national/regional regulatory, policy, and legislative environment into which the two-in-one LSDV-RVF vaccine will enter; and held a stakeholder engagement workshop in South Africa to link producers to markets and farmers.

WHAT'S NEXT?

The benefits of the vaccine platform — notably its efficacy and easy adoption by current manufacturers — has attracted the interest of the biotechnology industry (e.g., OBP and Kenya Veterinary Vaccines Production Institute) and professional animal health consortia. A key benefit of the platform is that any country currently producing an LSD vaccine can use its existing production facilities and equipment to easily manufacture the LSDV-RVF-PPR and/or LSDV-RVF vaccine. This could become particularly valuable for regions of the Middle East and Europe that have seen a recent increase in LSD and PPR outbreaks. The project team and OBP have prepared budgets and timelines for proposed field trials and are seeking additional funding.

LEARN MORE ABOUT THIS PROJECT:

Project abstract: <https://www.idrc.ca/en/project/novel-livestock-vaccines-viral-diseases-africa-toward-improved-food-security-cifsr-phase-2>

Research in action: <https://www.idrc.ca/en/research-in-action/improving-food-security-africa-novel-livestock-vaccines>

KEY OUTPUTS

POLICY BRIEF

Gender, small-scale livestock farming and food security: policy implications in the South African context. Human Sciences Research Council (HSRC) Press 01/03/2015 Reddy V., Goga S., Timol F., Molefe F., Mather A., Chetty T., Wallace D. HSRC and ARC-OVI <https://hdl.handle.net/10625/54545>

BOOKS

Generation of recombinant capripoxvirus vectors for vaccines and gene knockout function studies. In: Vaccine Technologies for Veterinary Viral Diseases; part of Methods in Molecular Biology volume 1349 (2016) Hani Boshra, Jingxin Cao, Shawn Babiuk Canadian Food Inspection Agency, Public Health Agency of Canada http://link.springer.com/protocol/10.1007/978-1-4939-3008-1_10?no-access=true

The socioeconomics of livestock keeping in two South African communities: "A black man's bank". Human Sciences Research Council (HSRC) Press (2016) Reddy V., Goga S., Timol F., Molefi S. HSRC. <https://www.hsrbpress.ac.za/books/the-socioeconomics-of-livestock-keeping-in-two-south-african-communities>

ACADEMIC ARTICLES

Evaluating the impact of 2010 Rift Valley fever outbreaks on sheep numbers in three provinces of South Africa African Journal of Agricultural Research (2017) Mdlulwa Z., Ngwane C. B. Agricultural Research Council. <https://doi.org/10.5897/AJAR2016.11130>

Review: capripoxvirus diseases: current status and opportunities for control. Transboundary and Emerging Diseases (2015)
Tuppurainen E.S., et al www.doi.org/10.1111/tbed.12444

New vaccine to help smallholder farmers strengthen food security. 2017. Maziya M, Habiyaremye M, Chaminuka P and Mdlulwa Z.
HSRC Review Vol 15 Number 2, April-June 2017, page 23-24. <http://www.hsrc.ac.za/en/review/hsrc-review-june-2017/new-vaccine-for-smallholder-farmers>

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<https://idl-bnc-idrc.dspacedirect.org/browse?type=project&value=107848>

QUICK FACTS

Project location(s): Kenya, South Africa

Institutions: University of Alberta (Canada); Agricultural Research Council (ARC-OVI) (South Africa)

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