R6557 – Field trialling of the capripox/rinderpest recombinant virus

C.J. Bostock and T. Barrett, Institute of Animal Health, Pirbright, UK

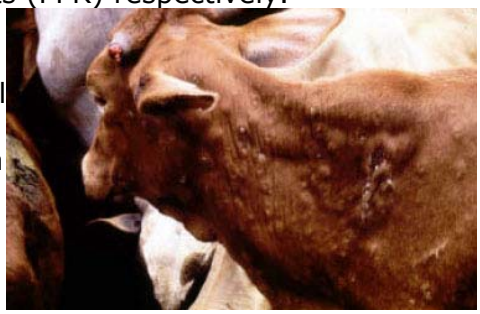
Executive summary

- Diseases caused by capripoxviruses affect around 650 million sheep and goats (as pox diseases) and 250 million cattle (lumpy skin disease – LSD). This constitutes a massive economic burden for many resource-poor farmers in Africa, damaging their livelihoods and limiting their opportunity to increase incomes.
- This project continued testing the efficacy of a dual vaccine against rinderpest and LSD in cattle, and against Peste des petits ruminants (PPR) in sheep and goats at the National Veterinary Research Centre, Kenya Agricultural Research Institute.
- The trial showed that at 24 and 36 months, challenge results were similar to those at the 6 and 12 months stage (see project R5033). More than 50% of animals were solidly protected while the remainder all recovered from a viral challenge that killed most non-vaccinated animals.
- The vaccine was originally developed at the high security facilities of the Institute of Animal Health, Pirbright, UK (R4661).

Project dates: April 1996 – March 1999

Background

Diseases caused by capripoxviruses affect around 650 million sheep and goats (as pox diseases) and 250 million cattle (lumpy skin disease – LSD). This constitutes a massive economic burden for many resource-poor farmers. Researchers at the Institute of Animal Health (IAH) have designed and produced a modified recombinant vaccine that can act as a carrier to control a range of diseases. Currently the new vaccine gives good short-term protection to cattle and small ruminants against rinderpest and Peste des petits ruminants (PPR) respectively.



Although rinderpest has been largely eradicated from many countries, it is still endemic in southern Sudan, Ethiopia, northern Kenya and Uganda and is still a problem in the north of India and Pakistan. These are areas associated with conflict where vaccination

campaigns are often sporadic and the movements of animals are not well monitored or controlled. This makes it very difficult to estimate how serious the disease problem is and thus hinders the plan for global eradication of rinderpest.

In addition, the current vaccine, an attenuated Plowright vaccine, needs to be kept cold to remain viable whereas the new one does not require a cold chain and so should be easier and cheaper to use. In order to know how to modify the vaccine to gain an enhanced immune response to give more individual animals protection, this project and its forerunner R5033CB built on previous experience from the development of a human measles vaccine and research on vaccinia/influenza recombinant vaccines in mice.

Objectives

The specific aims of this project were:

- To repeat the vaccination experiments carried out under project R5033CB using the vaccinia early/late promoter p7.5 rather than the promoter p11 used previously
- To complete the 3-year challenge of animals vaccinated with the original recombinant vaccine
- To construct a double capripox recombinant vaccine expressing both the H and F genes of the rinderpest virus

Highlights

This project successfully tested the efficacy of a dual vaccine against rinderpest and LSD in cattle in a trial in Kenya. At 24 and 36 months, challenge results were similar to those found at the 6- and 12-month stage. This showed that more than 50% of animals were solidly protected from rinderpest and LSD, while the remainder all recovered from a viral challenge that killed most non-vaccinated control animals. The project produced not only the individual F and H recombinants but a dual recombinant carrying both F and H genes.

Impact

A dual vaccine that would protect cattle against rinderpest and LSD in one vaccination would be of great economic benefit to many poor farmers in areas of the world where these diseases co-exist. The vaccine would also enable animal health workers to distinguish between vaccinated animals and those suffering from rinderpest. This would be a very useful tool in areas where mass vaccination is being stopped or campaigns have broken down because of conflict or cost.

The successful development of this type of vaccine would have a significant positive impact on the livelihoods of subsistence farmers and those dependent on the production of meat, wool, leather and dairy products from small ruminants. Improved vaccines would make

maintaining the good health of livestock easier and less costly. If this recombinant vaccine fully realises its potential in the next decade then a large market for veterinary vaccines would also be created.

Capacity building
As well as the knowledge gained from this project, undertaking research at the Kenya Agricultural Research Institute (KARI) will have strengthened the research capabilities of KARI at both strategic and adaptive levels. Staff will have gained important expertise both through the work and from the links established between KARI and IAH. This will enable them to continue to pursue in-country research and dissemination of knowledge and expertise that is vitally important to those involved in livestock keeping.

Collaborators

1. National Veterinary Research Centre (NVRC)
2. Kenya Agricultural Research Institute (KARI), Muguga, Kenya

Related projects

This project was an extension of project 5033CB carried out at the Kenyan Agricultural Research Institute (KARI), Muguga, Kenya and is part of the series
R4661 – Using sheep and goat pox vaccines to control rrinderpest, PPR, bluetongue, and foot and mouth diseases
R5033CB – Field trials of the capripox/rinderpest recombinant virus
R5504 – Inducing immune responses
R7048 – Development of a genetically marked rinderpest vaccine
R7362 – Developing a cheap and effective pen-side test that differentiates between vaccinated animals and those infected by the rinderpest virus

Selected publications

Ngichabe, C.K., Wamwayi, H.M., Barrett, T., Ngungu, E.K., Black, D.N. and Bostock, C.J. (1997) *Trial of a capripoxvirus–rinderpest recombinant vaccine in African cattle*. Epidemiology and Infection 118, 63–70.

Yamanouchi, K., Barrett, T. and Kai, C. (1998) *New approaches to the development of virus vaccines for veterinary use*. Revue Scientifique et Technique Office International Epizooties 17, 641–653.