



Contagious Bovine Pleuropneumonia

Novel types of vaccines ?



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Introduction

Contagious bovine pleuropneumonia (CBPP) is a severe infectious disease affecting ruminants of the *Bos* genus, characterized by unilateral lesions of pleurisy and pneumonia. CBPP is caused by *Mycoplasma mycoides* subsp. *mycoides* "Small Colony" (MmmSC) and it is transmitted by direct contact solely. Its distribution is not exactly known but recent reports show that it is expanding in Africa and that it is threatening regions that have been CBPP-free for decades (Fig 1). Acutely infected animals may be responsible for the rapid transmission of the disease while chronic carriers, with lesions known as "sequestra", may be responsible for the long term persistence of the disease in a region. Control strategies are based on various measures such as slaughter, movement control, antibiotic treatment and vaccination. The vaccines that have been used for decades in Africa were developed by Sheriff and Piercy and consist of a MmmSC strain that has been attenuated empirically by *in-vitro* passages. These vaccines have a number of advantages and drawbacks (Table 1) and when used alone they never allowed an eradication of the disease. One of the reasons is that African governments **do not invest sufficiently** in animal disease control and that there is a lack of incentive for the investment in the development of new and more efficient products as CBPP is not threatening developed countries.

For these reasons, it was decided to evaluate the potential of new types of products within the "VACNADA" project. These products consisted in inactivated preparations of MmmSC antigen injected with adjuvants that could be compatible with the development of multivalent vaccines. The objectives were to check if these vaccines elicited a noticeable sero-conversion and, more importantly, if they were able to induce a protection.

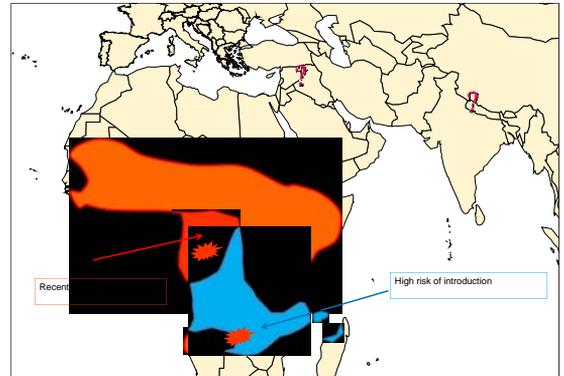
CBPP vaccines, strains T1/44 and T1sr

Advantages

- Quite cheap to produce
- Very long conservation at -20°C once freeze-dried
- Easy administration (sub-cutaneous)
- T1sr: completely safe
- Transient sero-conversion (allows detection of outbreaks)
- Repeated vaccinations result in good protection

Drawbacks

- Thermolability (freeze-dried or reconstituted)
- Freeze-drying needs industrial skill
- T1/44: has some residual virulence
- Lack of sero-conversion does not allow sero-monitoring of vaccination campaigns
- A single administration does not yield a good immunity
- Protection is short-lived (T1sr: 6 months, T1/44: one year)
- Eradication cannot be achieved with vaccination alone
- CBPP is not a threat for developed countries



Material and Methods

Antigen production: performed at CIRAD with strain MmmSC 8740, inactivation with BiEthyleneimine
 Oil-adjuvant emulsification: performed at SEPPIC, Castres, France
 Administration: one dose subcutaneously (KARI), two doses intramuscularly (LCV)
 Challenge: by the in-contact with intubated animals procedure
 Serology: by cELISA, IDEXX performed at LCV and KARI

Results and Discussion

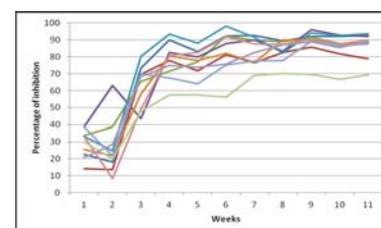
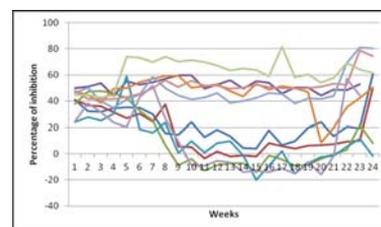
In KARI, the animals that were immunized with a single dose subcutaneously presented variable sero-conversions. A single animal sero-converted while five of them had unexpected declining titer after the seventh week.

No protection was evidenced in that group as compared to non-vaccinated control groups

In LCV, the animals that were immunized twice intramuscularly presented a remarkable sero-conversion with most animals reaching titers of 90 percent of inhibition at the time of challenge.

Complete protection was evidenced in that group.

Protection to CBPP is basically dependent on the cellular immune response, hence the sero-conversion that was evidenced here is only a marker of immune stimulation. Further work is needed to decipher which components of the immune response lead to protection.



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