Technical notes of FTE3 "Improvement of animal health in the Sahel"

Fact Sheet 3: “Improving vaccination campaigns against contagious bovine pneumonia”

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Key messages:

- PPCB prevalence is high in PRAPS countries
- The effectiveness of vaccines against PCBs depends on strict adherence to good practices
- Experience shows that these good practices are not always followed on the ground
- Concrete and practical proposals are described

Introduction

In recent years, contagious bovine pleuropneumonia (CBPP) has seen its range increase in Africa (Senegal (Mbengue 2013), Gabon) and the number of outbreaks increase in areas where it was already present. One of the major results obtained by the PRAPS project was precisely to confirm, during the T0 survey (pre-vaccination survey), that the prevalence of the disease was very high in all the countries of the zone (Yansambou 2018), which shows that the vaccination policies followed up to that point have not been effective.

Vaccines against PPCBs have a proven track record in the past. In Australia, they led to a massive reduction in prevalence before Australia moved to a culling strategy for final eradication (Newton 1992). During the joint campaigns against PCB and rinderpest in Africa during JP15, PPCB had been checked. Studies in Namibia (Bamhare C., 2000) have shown that PPCB can be controlled with the correct use of the T1/44 vaccine. In three years, a vaccination programme has reduced the number of outbreaks by 95% (239 in 1997 and 10 in 1999) and the number of post-vaccination reactions has been minimal.

In practice, however, deviations from recommended uses can easily be seen in the field, which helps explain why vaccination campaigns are not working as well as hoped. This is because PPCB vaccines (T1/44 or T1sr strains) generally have titers marginally higher than the minimum doses recommended by the OIE (10^7 mycoplasmas per dose). Any event likely to lower this number could have the effect of making vaccines ineffective, which will have a double consequence: not protecting animals (losses for farmers) and inducing costs for society.

Purpose and scope

The note is intended for use by African veterinary services, African supra-national organisations and donors who would like to partner to promote much more effective immunisation campaigns against PCBs. Discussions during FTE3 agreed on several points:

1) Target 100% of cattle herds where vaccinations are organised

In fact, as the R_0 (number of secondary cases caused by infection of a primary case in a population totally susceptible) for PPCB is of the order of 2 to 4 (Lesnoff, 2004; Mariner 2005), the percentage of animals protected must be at least 50 to 75% to prevent the spread of the disease. Experience has shown that not all of the animals targeted are protected (refractory farms, breaking of the cold chain, limited duration of protection conferred in particular by T1sr, etc.). So targeting smaller proportions will not prevent the persistence of the disease. It should be remembered that the campaigns for rinderpest had been effective mainly because the vaccine conferred 'lifetime' protection, with a cumulative effect, during re-vaccination. This lifelong immunity does not exist for PPCBs, and requires additional vaccination effort to achieve and maintain the necessary coverage rates.

2) Harmonise vaccination campaigns with T1/44

The T1sr strain is often preferred because it never induces a post-vaccination reaction and therefore does not induce complaints from farmers. However, the duration of protection conferred by T1sr was established at 6 months. So when you target 100 percent of the animals with T1sr and you only vaccinate once, you get at best only 50 percent protection for the target population.

Post-vaccine reactions with T1/44 as opposed to T1sr are reported occasionally. However, animals that react with antibiotics can be treated and these reactions do not occur after re-vaccination. The duration of protection with this vaccine is 1 year.

3) Harmonise vaccination dates between border countries

Vaccination campaigns should be harmonised at regional level or across a block of countries and organised over short periods of approximately 2-3 months (over a quarter) in order to effectively mobilise energies and enable vaccination of all herds including transhumants wherever they are located.

4) Require batches with PANVAC certification (certificates available online on the PANVAC website: www.aupanvac.org)

This will ensure that the batches used meet the required standards. For the record, the controls carried out by PANVAC are free of charge.

5) Use vials of diluent in a volume that exactly matches the number of doses in each vial.

Diluents are an integral part of a vaccine and should be required to be tested by PANVAC at the same time as freeze-dried vaccine vials. The use of diluents with excessive volumes induces drifts in the field and losses of titer after reconstitution. For the record, the vaccine is rapidly inactivated when in the sun...

6) Promote PPCB vaccine presentation with 50 dose vials

One of the factors limiting the organisation of vaccination campaigns is the lack of contention corridors to allow rapid vaccination of herds. However, a reconstituted vial should be used promptly (while

keeping it at a mild temperature <37°C and protected from light). Using 50-dose vials would limit the time of use after reconstitution.

7) Limit the number of intermediate stockpiles between a country's central stockpile and vaccination teams

Any intermediate storage entails a risk of breaking the cold chain and brings no benefit to the final beneficiary (the breeder) but only recurring costs.

8) Equip vaccine storage freezers with temperature recording chips

As cold chain maintenance is one of the major critical factors for the effectiveness of campaigns, it is essential that this factor be controlled. The recording chips are now affordable and should be fitted to all freezers and refrigerators in the chain.

Synergies should also be found with other campaigns, whether it be PPR or for human vaccines such as measles or polio.

9) Perform titrations from field bottles

One of the disadvantages of PPCB vaccines is that they do not induce systematic and sustained seroconversion to provide a means of evaluating the effectiveness of vaccination campaigns. This is the only way to ensure that herds are properly vaccinated and to verify the title of the vaccines “at the foot of the animals”. This involves testing the vials just before use (possible if vaccinations are organised as campaigns).

It also means that national labs must be able to perform these securitisations and must be trained to do so.

References

Bamhare, C., 2000. CBPP surveillance in vaccinated areas: Namibia experience with CBPP vaccines prepared from the T1-44 and T1-sr strains, Second meeting of the FAO/OIE/OAU/IAEA consultative group on contagious bovine pleuropneumonia (CBPP). FAO, Rome, pp. 79-87.

Lesnoff, M., Laval, G., Bonnet, P., Workalemu, A., 2004. A mathematical model of contagious bovine pleuropneumonia (CBPP) within-herd outbreaks for economic evaluation of local control strategies: an illustration from a mixed crop-livestock system in Ethiopian highlands. Anim. Res. 53, 429-438.

Mariner, J.C., McDermott, J., Heesterbeek, J.A., Thomson, G., Roeder, P.L., Martin, S.W., 2006. A heterogeneous population model for contagious bovine pleuropneumonia transmission and control in pastoral communities of East Africa. Prev Vet Med 73, 75-91.

Mbengue, M., Diallo, A.A., Lo, F.T., Lo, M.M., Diop, M., Seck, P.S., Samb, Y., Diouf, M., Thiongane, Y., 2013. Re-emergence of contagious bovine peripneumonia in Senegal. Bull. Soc. Pathol. Exotic. 106, 212-215.

Newton, L.G., 1992). Contagious bovine pleuropneumonia in Australia: some historic highlights from entry to eradication. Aust Vet J 69, 306-317.

Yansambou, M.S., Diallo, A.A., Idi, M., Gagara, H., Haido, A.M., Bada Alambedji, R., 2018. Serological Prevalence of Contagious Bovine Pleuropneumonia in Niger in 2017. Frontiers in veterinary science 5, 238-238.