

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

Fact Sheet 4: “Field validation of a combined vaccination/treatment strategy enabling the eradication of contagious bovine peripneumonia’

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Key messages:

- PPCB prevalence is high in PRAPS countries
- Farmers use antibiotics in an undefined/anarchic context
- Vaccination campaigns can provide control but not eradication
- A mixed strategy, substituting antibiotic treatments for slaughter, could lead to eradication and should be validated.
- Antibiotic resistance monitoring should be linked in a one health approach

Introduction

In recent years, contagious bovine pleuropneumonia (CBPP), due to a mycoplasma, *M. mycoides* subsp. *mycoides* (Mmm), has seen its range increase in Africa (Senegal (Mbengue 2013), Gabon...) and the number of outbreaks 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. This raised questions about the utility of antibiotic treatments (Amanfu 2006). In practice, farmers make extensive use of often misguided antibiotic treatments. These poor practices increase the risk of developing antibiotic resistance (Lee 1987) for both mycoplasmas and other bacteria pathogenic to animals and humans (Doare 2015). Moreover, slaughter policies are increasingly difficult to implement even in countries that have the means to do so (Fisher 2003). There is therefore an urgent need to shift paradigms and explore new strategies to combat and eventually eradicate PCBs. Indeed, in the long term, eradication is the most economical solution (Zessin 1985) for both breeders and society, in particular by reducing the use of antibiotics. Mathematical models of PPCB transmission showed that the combination of vaccination and treatment was always superior (Lesnoff 2004).

Purpose and scope

This note has been written for African veterinary services, African supra-national organisations and donors who would like to partner to test new control strategies combining the combined and rational use of antibiotics and vaccination in the field and assess their potential impact. This note follows the recommendations of the 2015 FAO/OIE/WHO Advisory Group on PCB (note

Whereas:

- 1) The control of PPCB based solely on vaccination allows control of the disease but not eradication (see Note 1 at the end of the document). See the Australian eradication experiment (Newton 1992)
- 2) Slaughter-based disease prophylaxis is not realistic in the current African context
- 3) Antibiotic treatments used alone can result in clinical cure and drastic reduction of excretion but do not result in bacteriologic cure.
- 4) Currently, antibiotic treatments are widely used by farmers in the field without any control, which poses a high risk of developing antibiotic resistance.

Objective of the study:

To test in the field a strategy for the control of PCBs, for their eradication, based on the joint use of vaccination to protect healthy animals, and antibiotic therapy to treat animals suffering from PCBs, the purpose of which will be slaughter.

This new strategy is the result of an understanding of pathogen transmission pathways and modelling work that has shown synergy between the two actions.

Conditions for implementation:

- 1) Have a sufficiently large and well-defined area
- 2) Be relatively easy to access for veterinary teams (vaccinators, laboratories...)
- 3) The prevalence of PPCBs in the study area should be at a high level (see Note 2 at the end of the document)
- 4) That the participation of the breeders be acquired

Conduct of operations over a period of 3 years:

- 1) Raising awareness among farmers to explain the purposes and methods of implementation and to win their support.
- 2) Carry out vaccination campaigns with the T1/44 strain targeting 100% of the herds in the area (batch controlled by PANVAC and re-checked in the field) (see Note 3 at the end of the document). In these circumstances, incentives should be granted (free of charge or compensated by antiparasitic treatments)
- 3) Identification of residual outbreaks during the marketing year
 - a. Rapid confirmation of the outbreak (rapid agglutination on blade in animals showing symptoms)
 - b. Samples taken for laboratory confirmation (Mmm isolation and cELISA serology)
 - c. Epidemiological investigation to identify potential source of outbreak and economic impact
- 4) Treatment (free of charge) of diseased animals with an antibiotic active on mycoplasmas of assured quality and which can be administered in a single injection (e.g. long-acting tetracyclines, etc.). Marking these animals to ensure they will then go to the slaughterhouse and will not be resold.

- 5) Monitoring of antibiotic resistance
 - a. On strains of Mmm isolated during laboratory confirmation
 - b. On environmental samples (multidrug-resistant coliforms)

Indicators of success

- The number of indigenous PCB outbreaks detected in years 2 and 3
- Seroprevalence of PPCB at the end of the 3-year study compared to a homologous area that did not benefit from antibiotic treatments

Expected benefits

For farmers:

Economic losses have been reduced

For veterinary services:

Coordinated actions involving all actors on the ground will have been companies that can serve as a model for larger actions.

Studies on antibiotic resistance will have been initiated

For society

The risk of antibiotic resistance will have decreased

Studies and training will have been possible during these trials

Notes:

Note 1

Vaccination alone does not allow eradication strategies based solely on vaccination condemn countries to perpetuate these actions forever (cf. Northern Namibia, or Senegal) or risk having outbreaks resurface. Current campaigns, which often protect only a small proportion of herds, are ineffective at controlling the disease.

Note 2

If the herd prevalence in an area is of the order of 30%, this means that outbreaks have occurred in the last two years in 30% of these herds (taking into account the decline in antibody titres over time.

If the area consists of about 10000 head with an average size of 100 animals/herd, then we can expect to have about 15 outbreaks per year. With about 10% of the animals exhibiting clinical signs this corresponds to 150 antibiotic treatments.

Note 3

This activity is in any case consistent with the initial objectives of the PRAPS.

Note 4: Conclusions of the PPCB Advisory Group (FAO Rome 2015)

29 October 2015, Rome - Contagious bovine pleuropneumonia (CBPP) is one of the most important infectious diseases of cattle in Africa. Some 26 countries in the continent are affected by the disease which is spreading to countries and areas where the disease has been previously eradicated or has never been reported. In affected countries, the disease has serious implications on food security and livelihoods caused by mortality, loss of milk production and drastic weight loss in chronic cases of the disease. The latest state can result in reduced draught power with direct impact on food production.

The control of the disease has been constrained by several factors including the deterioration in the quality of veterinary services, lack of financial resources to mount sustained control programmes against the disease and uncontrolled cattle movement within and between countries. The control of CBPP currently suffers from lack of concerted actions and financial support, which has resulted in gradual spread of the disease throughout much of the continent.

The continuing spread of CBPP disease throughout Africa and the urgent need to review current knowledge on disease dynamics in the continent prompted by the Food and Agriculture Organisation of the United Nations (FAO) together with the World Organisation for Animal Health (OIE), African Union - Interafrican Bureau for Animal Resources (AU-IBAR) and the Joint FAO/IAEA Division to convene a technical meeting to assess the situation of the disease, take stock of the latest developments in diagnosis and prophylactic tools since the last FAO CBPP consultative group meeting held in Rome in November 2006 and suggest actions for improvement of CBPP control in Africa. The meeting was held at FAO, Rome from 14 - 16 October 2015, with the participation of 20 CBPP experts in addition to technical staff from FAO, OIE, the Joint FAO/IAEA Division and GALVmed. The representatives of AU-IBAR and PANVAC were connected by Skype.

The programme of the meeting included different sessions with technical presentations on the disease situation in Africa and in selected countries (Senegal, Zambia and Kenya), (ii) prevention and control strategies, (iii) update on diagnostics and surveillance tools, (iv) update on vaccine developments, and (v) update on the use of antibiotics in CBPP control. These presentations were followed by roundtable discussions on CBPP dynamics with a view to lay out the technical and policy approaches for sustainable progressive control and ultimately eradication of the disease in Africa.

A central question during the meeting was about the feasibility of eradication of CBPP worldwide and in Africa. The experts agreed that due to several factors hindering CBPP control, global and continental CBPP remains a challenging and distant goal. However, elimination of the disease in an infected country or region can be achieved by combined control measures and effective control of animal movements. The strategic approach to CBPP should be based on progressive control leading ultimately to area-wide freedom from the infection. Existing tools can be used for a successful coordinated control programme, when applied appropriately.

The main recommendations emanating from this meeting focus on some of the below-mentioned areas:

- There is need for stronger political commitment in Africa which prioritises CBPP as a major disease to convince governments, regional organisations, international bodies and funding partners invest in CBPP control as a basis for improving food security, people's livelihoods and general wellbeing
- Developing phased and coordinated CBPP control programmes which are flexible enough to be adapted to local epidemiological and socio-economical contexts
- Exploring the possibility of combining control of CBPP with other diseases as part of animal health care
- There is urgent need to conduct pilot studies as proof of concept to demonstrate CBPP can be controlled by combination of vaccination and controlled use of antibiotics (as alternative to stamping out which not feasible in many places)
- Public Private Partnership should be operationalised to ensure effective delivery systems of animal health interventions particularly vaccination and surveillance activities, as part of strengthening veterinary services
- The national public veterinary services should bear policy and overall strategy responsibility of CBPP control while implementation (or operationalisation) should involve the private sector, local authorities and NGOs
- Socio-economic impact assessments of CBPP on people's livelihoods need to be conducted to justify the anticipated expenditure required for progressive control of CBPP
- Smart partnership should be encouraged for research and validation of new tools (vaccines and diagnostics) to incorporate them into updated and more cost-effective strategies. The main driver of research in new vaccines should be at least two years protection.

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