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Conceptual note from FTE3

'Field validation of a combined vaccination/treatment strategy to eradicate PPCB'

Introduction

In recent years, contagious bovine pleuropneumonia (CBPP) 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 main results of the PRAPS project was to confirm, during the T0 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 prepared for use by African veterinary services, African supra-national organisations and donors who would like to partner to test new control strategies on the ground and assess their potential impact.

Whereas:

1) Control of PPCB based solely on vaccination provides disease control but not eradication (Note 1). See Australian Eradication Experiment (Newton 1992)
2) Slaughter-based disease prophylaxis is not realistic in the current African context
3) Antibiotic treatments used alone result in clinical cure and drastic reduction of excretion but do not result in bacteriologic cure.
4) Currently, antibiotic treatments are widely used without any control, which puts people at high risk of developing antibiotic resistance.

Objective of the study:

Field testing of a strategy for the eradication of PCBs based on the joint use of vaccination to protect susceptible animals and antibiotic therapy to treat animals with PCBs

This new strategy is the result of an understanding of pathogen transmission pathways and modelling 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, labs...)
3) The prevalence of PPCBs in the study area should be at a high level (Note 2)

4) That the participation of the breeders be acquired

Sequence of operations:

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) (Note 3). In these conditions incentives must be granted (free of charge? compensations 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 of sick animals free of charge with an antibiotic active on mycoplasmas, the quality of which is assured and which can be administered in a single injection (for example long-acting tetracyclines or others...). 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)

Test duration: three years

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

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

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

In any case, this activity corresponds to the initial objectives of the PRAPS...

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