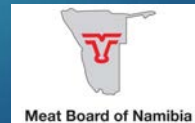


ESTABLISHING EQUIVALENCE OF TWO VACCINATION PROTOCOLS AS PART OF COMMODITY-BASED TRADE IN THE ZAMBEZI REGION OF NAMIBIA

DR FREDDY SAMUNTU



Introduction

- ▶ Livestock farming has always been the bread and butter for ordinary Namibian citizens wanting to make a living or an extra income in terms of marketability of their livestock and livestock products to high-end markets.
- ▶ Unfortunately, this benefit has been limited to farmers' north of the Veterinary Cordon Fence (VCF) (Thomson, Atkinson, Cassidy & Osofsky, 2013).
- ▶ Thomson *et al.* (2004; 2009; 2013; 2018); Thomson and Penrith (2015); Vosloo and Thomson (2017) concluded that Commodity Based Trade (CBT) recognises that a different approach is needed to encourage trade.

Problem Statement

- ▶ Most vaccinated cattle end up not being sent to the abattoir or slaughterhouses for commercial reasons and are used rather for ploughing pearl millet and maize fields.
- ▶ As a result, there is a negative cost-benefit to the government in terms of money spent on approved vaccination campaigns compared to revenue generated from livestock sales north of the VCF.
- ▶ The costs of procuring and administering the FMDV vaccine to animals in these regions are of great financial and economic burden to the DVS and the Namibian government (Final vaccination report V13/3/2, 2021).
- ▶ Local farmers are constantly challenged due to a lack of widespread acceptance of CBT products.

Problem Statement

- ▶ A modified approach is proposed by the author of this study proposal. This approach will be based on vaccination of commercial animals for the first time while entering the quarantine.

Research Questions

- ▶ Is there equivalence to WOAH Terrestrial Animal Health Code (TAHC) Article 8.8.22 in terms of structural proteins (SP) serology if government-approved vaccination is done in government-approved quarantine facilities, rather than vaccination in the field?
- ▶ Is there a difference in SP antibody responses to FMDV at slaughter in cattle vaccinated in the field compared to cattle vaccinated in a quarantine facility?

Hypotheses

We want to test that the null hypothesis that the proportion protected from vaccination in the quarantine camp is not less than 25% difference compared to the proportion protected from field vaccination. To this effect, the null and alternative hypotheses of interest are:

H₀: P₂ ≥ P₁

H_a: P₂ < P₁

Whereby P₂ represents the proportion of protected from vaccination in the quarantine camp and P₁ is the proportion protected from field vaccination.

Proportion protected: Using liquid phase blocking elisa (LPBE), defined as whereby a dilution factor of **1/90** is considered protected and a dilution factor of less than **1/40** is considered not protected when FMDV specific structural proteins are tested.

Overall aim

- ▶ Evaluate whether vaccination of animals for the first time when entering a quarantine facility before slaughter (abattoir) is equivalent to current FMDV vaccination campaigns in the WOAHA recognized endemic zone where animals are vaccinated tri-annually in the Zambezi regions.

Specific objectives

- ▶ To demonstrate equivalence between vaccination of animals for the first time when entering quarantine versus government-approved vaccination campaigns in the Zambezi Region with respect to WOAHA TAHC Article 8.8.22 using NSP and SP antibodies ELISA.
- ▶ To determine the FMDV SP antibody titre in study animals using an SP antibodies ELISA.

Benefits arising from this study

- ▶ The outcome of this research will aid in minimizing economic costs by potentially only vaccinating animals undergoing quarantine for CBT instead of every animal in the region.
- ▶ This approach will significantly decrease government expenditure in terms of vaccine acquisition, given that N\$ 6,000,000 was spent on a new FMDV type O vaccine alone during the first round of vaccination in the Zambezi region on 17th September 2021 (Schlettwein, 2021).
- ▶ The success of this study may lead to broader levels of acceptability of CBT by foreign trading partners for deboned beef meat (Naziri *et al.*, 2015; Rich & Perry, 2011; Thomson *et al.*, 2004; Paton *et al.*, 2010; MCA/LMEF/2010/02; MAC/LMEF/2012/04; FAO, 2021).

Benefits arising from this study

- ▶ A proposed strategy to enable commercialization of cattle without field vaccination.
- ▶ The proposed approach will attempt to match the current Namibian approved vaccination protocols for the FMD Protection and FMD infected zones in terms of NSP and SP antibody titres at time of slaughter with the end goal of proving equivalence between the two protocols.

Benefits arising from this study

	Cattle numbers (n)	Number of vaccination campaigns (n)	Cost of vaccine (N\$/dose)*	Total Cost to Government (N\$)
Current vaccination	183,069	3	128.68	70,671,956.80
Quarantine vaccination	10000	2	128.68	2,573,600.00

Table 1. Cost comparison between current vaccination campaigns and quarantine vaccinations according to CBT in Zambezi region of Namibia
*July 2022

Benefits arising from this study

- ▶ A dossier will be submitted to the WOAHP seeking recognition of equivalence through the Namibian OIE delegate and adoption of the proposed modified approach should the research show benefits and an acceptable level of risk.
- ▶ The end goal being a provision formulated in WOAHP's article 8.8.22 for CBT in the Namibian context, meaning vaccination of only commercial animals destined for CBT.
- ▶ Stakeholder workshops will also be conducted within SADC to highlight the findings of this study and demonstrate the ungrasped potential and opportunities offered by CBT in geographical areas known to be endemic to FMD.

Research Methodology

Study area



Figure 2. Map of Katima Mulilo

Research Methodology

RESEARCH DESIGN

- ▶ Study animals will be selected based on systematic random sampling.
- ▶ Each animal will be individually identified via an infra-red ear tag and brand mark.
- ▶ Study animals shall be divided into four groups, A, B, C and D.

Research Methodology

- ▶ Study animals in groups A,B and D will be sourced from the Zambezi region.
- ▶ Group C will contain animals coming from south of the veterinary cordon fence. This group will contain animals termed as "naïve", meaning animals who have never been exposed to FMDV.
- ▶ Study animals in group D will be sourced from areas where cattle are in close contact with free roaming buffaloes and are confirmed FMD NSP positive through serological survey.

Research Methodology

- ▶ The Kopano quarantine facility shall be used for purpose of this research.
- ▶ This quarantine station is under the direct supervision of the Directorate of Veterinary Services (DVS). DVS under the Ministry of Agriculture, Water and Land Reform (MAWLR) is responsible for FMD vaccination campaigns in the Zambezi region and the rest of the affected regions. (DVS Circular v7, 2019; Hikufe, 2021; Naziri *et al.*, 2015).
- ▶ The study animals will be slaughtered at Meatco's Katima Mulilo abattoir, one of Namibia's export abattoirs. Correct bleeding, maturation, deboning, and deglanding as per standard DVS CBT protocol will be ensured.

Research Methodology

- ▶ For study animals receiving the FMD vaccine, Aftovax from the Botswana Vaccine Institute (BVI) will be used.
- ▶ Aftovax is a SAT1-SAT2-SAT3, serotype O and A purified FMD vaccine.

Research Methodology

Unit of analysis and sampling procedure

General inclusion and exclusion criteria for all four groups

Inclusion criteria

- ▶ Animals should be 1 year old or older.
- ▶ Animals of any sex.
- ▶ Ear tagged and branded.
- ▶ Animals should have a body condition score of 2.5 and above.

Exclusion criteria

- ▶ Sick animals.
- ▶ Pregnant animals.

Research Methodology

Sample size rationale

- ▶ A design power of 0.8 (80%) was chosen to establish sufficient power to be able to detect a significant difference between two proportions.
- ▶ The motive is to establish that there is less than 25% difference between the proportion protected from field vaccination and the proportion protected from vaccination in the quarantine camp.
- ▶ The use of a one-tailed test is because we are only interested in proving the possibility that the proportion conferred protection from vaccination in the quarantine camp is not lower than the proportion conferred protection from vaccination in the field.

Research Methodology



Home Prevalence - Freedom - Studies - Diagnostics - Sampling -

Analysed: Sun Aug 07, 2022 @ 12:49 UTC

Inputs

Proportion 1	0.7
Proportion 2	0.95
Confidence level	0.95
Power	0.8
Ratio of sample sizes (n2/n1)	0.25
Tails	1

Results

Sample sizes required

	Sample size
Sample size 1 (n1):	92
Sample size 2 (n2):	23
Total sample size (both groups):	115

	GROUP A	GROUP B	GROUP C	GROUP D
Sample size (n)	92	92	23*	92
Specific inclusion criteria	Cattle vaccinated at least twice by DVS under field conditions. Animals from north of the veterinary cordon fence.	Cattle which were vaccinated within the last six months in the field. Animals from north of the veterinary cordon fence.	Naïve animals. Never vaccinated or been exposed to FMDV. Animals from south of the veterinary cordon fence.	Natural infection, unvaccinated animals which are (NSP antibodies positive) . Animals from north of the veterinary cordon fence.
Number of days in quarantine (d)	30	30	60	60
Number of times to be vaccinated in quarantine (t)	0	1	2	2

Asterisk (*): Number restricted due to funding limitations

Research Methodology

Quarantine & Blood collection

- ▶ For animals undergoing quarantine for 30 days, blood (serum) will be collected on day of entry and on day of departure to the abattoir.
- ▶ For animals undergoing quarantine for 60 days, blood (serum) will be collected on day of entry, on day 30 and on day of departure to the abattoir.
- ▶ Blood samples will be collected from the jugular vein or coccygeal (tail) vein in 6 ml serum blood tubes. The blood serum samples will then be centrifuged and stored in 5 ml labelled cryovial tubes.
- ▶ These labelled cryovial tubes will be sent to Central Veterinary Laboratory (CVL) for the determination of FMDV antibodies against both FMDV-specific structural proteins and FMDV-specific non-structural proteins.

Research Methodology

Vaccination

- ▶ For animals getting vaccinated once, the vaccine will be given on day of entry into the quarantine.
- ▶ For animals getting vaccinated twice, the vaccine will be given on day of entry and on day 21.

Research Methodology

Abattoir

- ▶ On last day of quarantine, study cattle will be transported to the approved export abattoir in cleaned and disinfected vehicles without stopping or coming in contact with other animals.
- ▶ Upon arrival at the abattoir, cattle will be inspected for signs of FMD on arrival and rested for 12 hours before slaughter.
- ▶ Study animals will then follow normal abattoir procedures.

Research Methodology

Data gathering instrument and methods

- ▶ A register will then be generated with groupings A to D. Blood sample tubes will be labelled with ear tag number, date of blood collection, sex, breed, and age of animal.

Data analysis and interpretation

- ▶ Raw data will be stored in Microsoft Excel and descriptive statistics will be used to interpret the data.

Project Timeline

- ▶ Proposed start month of project is November 2022. The project will run until May 2023.

References

- ▶ Thomson, G., Penrith, M.-L., Atkinson, S. J., Cassidy, D and Osofsky, S. A. 2013. Balancing livestock production and wildlife conservation in and around southern Africa's transfrontier conservation areas. [Thomson_Balancing_2013.pdf](#)
- ▶ V.13/3/2/5/4 (2020). FMD Vaccination Campaign Report. Rundu state vet. Directorate of Veterinary Services.
- ▶ World Organization for Animal Health. (2021). Foot and mouth disease. <https://www.oie.int/en/disease/foot-and-mouth-disease/>
- ▶ OIE, 2016. Terrestrial Animal Health Code online. Available at: OIE (World Organization for Animal Health) Terrestrial Animal Health code. <https://www.oie.int/en/what-we-do/standards/codes-and-manuals/>
- ▶ No. 7 of 2021. Veterinary Public Health Notification. Directorate of Veterinary Services.
- ▶ No. 3 of 2022. Veterinary Public Health Notification. Directorate of Veterinary Services.

References

- ▶ Thomson, G., Penrith, M.-L., Atkinson, S. J. and Osofsky, S. A. 2018. Guidelines on Commodity-Based Trade Approaches for Managing Foot and Mouth Disease Risk in Beef in Southern Africa. 3rd Edition. Technical Report on behalf of Cornell University's AHEAD Program. 17 pp.
- ▶ Rich, M, K., & Perry, B, D. (2011). Whither Commodity-Based Trade? Development Policy review, 2011. <https://www.researchgate.net/publication/227535164>
- ▶ MCA/LMEF/2010/02 (2010). Development of Export opportunities for Beef Products from the Zambezi Region.
- ▶ MCA/LMEF/2012/04(2012). Development of Export opportunities for Beef Products from the Zambezi Region.

References

- ▶ V13/3/2, 2021. Final vaccination report. Katima Mulilo State Vet. Directorate of Veterinary Services.
- ▶ FAO, 2021. Namibia – Building agricultural resilience to animal pests and diseases. Case study. Rome. <https://doi.org/10.4060/cb6946en>
- ▶ Table 2. Katima Mulilo Urban constituency
https://upload.wikimedia.org/wikipedia/commons/8/8d/Wahlkreis_Katima_Mulilo-Stadt_%282014%29.svg