



CO-ADMINISTRATION OF FOWL POX AND NEWCASTLE DISEASE VACCINES BY NON-INVASIVE ROUTES TO SMALLHOLDER CHICKEN IN HANANG DISTRICT OF THE MANYARA REGION OF TANZANIA

K. Stuke^{1*}, A. Makundi², J.J. Mwanadota³, E. J. Poole^{4,5} and J. Salt¹

1 R&D, GALVmed; **2** The Open University of Tanzania (OUT), **3** Centre for Infectious Disease of the Tanzania Veterinary Laboratory Agency (TVLA), **4** International Livestock Research Institute (ILRI), **5** Statistics for Sustainable Development (Stats4SD)

*Kristin.Stuke@galvmed.org

Background

Outbreaks of Newcastle Disease and Fowl Pox have a tremendous impact on indigenous scavenging chickens in developing countries where these birds are a significant source of protein and income. The diseases are preventable by locally available vaccines. However, a barrier exists for the application of Fowl Pox vaccine by wing-web stab, as this is considered as invasive veterinary practice and therefore limited to veterinarians or paraprofessionals under veterinary supervision. Community animal health workers in many developing countries are not legally allowed to administer parenteral products.

Objective

The aim of this study was to demonstrate that the concurrent administration of commercial Fowl Pox and Newcastle Disease vaccines when given by non-invasive routes is safe and elicits immunity, shown by local (for Fowl Pox) or serological (for Newcastle Disease) immune reactions, in chicken in smallholder settings in Tanzania.

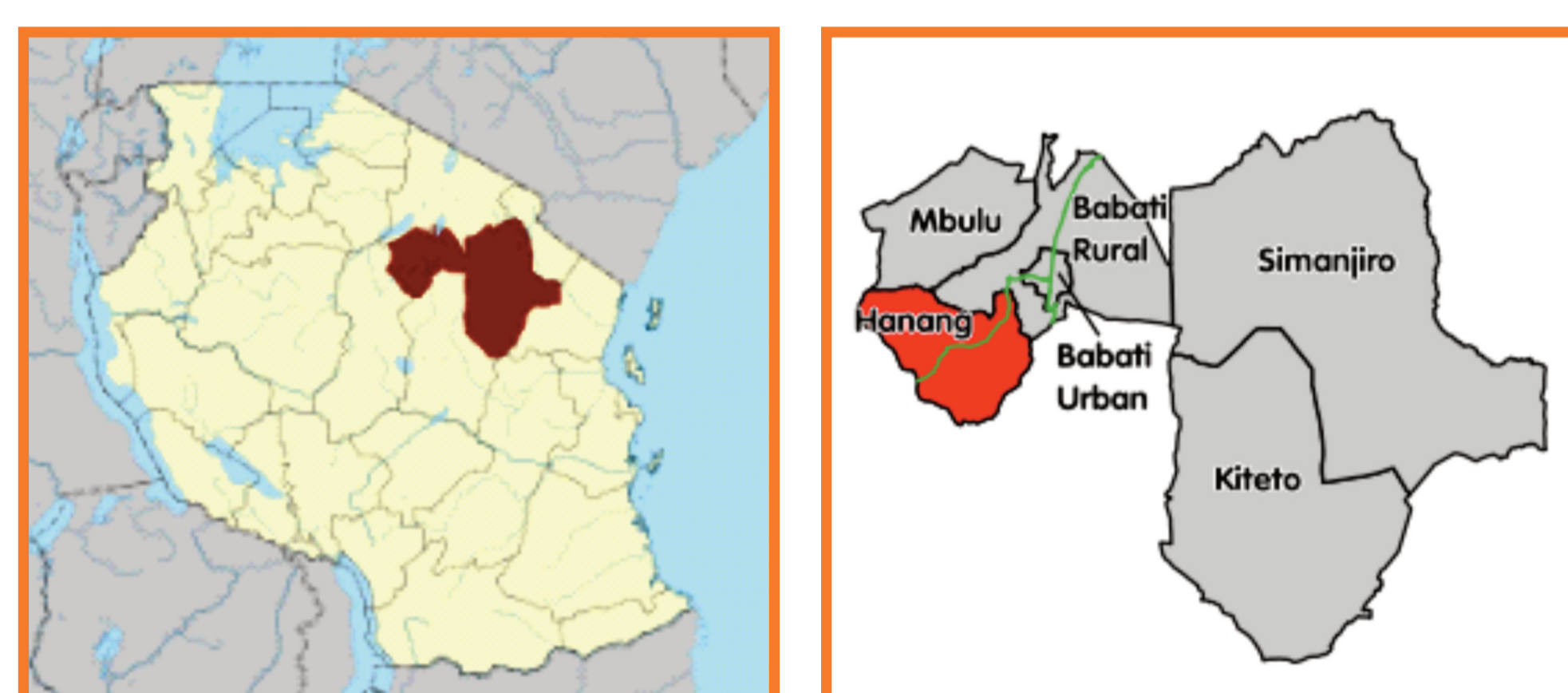


Figure 1: Map of the study area in Hanang District, Manyara Region, Tanzania

Materials and Methods

This study followed a cluster-randomised controlled design. 1173 chickens from 242 households in 7 villages in Hanang District of Manyara Region in Tanzania were enrolled. Prior to study start, Owner Informed Consent forms were obtained, and approval was given by the Ministry of Agriculture Livestock and Fisheries of the Republic of Tanzania. On Day 0 birds were vaccinated. A commercial modified live Fowl Pox vaccine was administered to Group 1 birds. For this, a group of adjacent feathers was plucked from a bird's thigh and a vaccine-dipped pigeon pox vaccine brush (Medipox, Medpet, South Africa) was rubbed with an upward motion inside the opening of the exposed holes of the feather follicles. A commercial live ND vaccine was administered to Group 2 birds. Group 3 and 4 were vaccinated with both vaccines. Group 5 served as unvaccinated sentinel group. On Days 7, 9 and 21 General Health Observations were performed on all birds and the FP-vaccinated birds were observed for 'take reactions'. On Days 0 and 21 blood samples were collected from the ND-vaccinated birds and Group 5 birds. The duration of the study for each household was 21 days. Antibody titres to ND virus were tested by haemagglutination inhibition (HI) test according to OIE standard procedures. The Open Data Kit (ODK) Collect App was utilised for data collection.

Table 1: Study Design

Group	No. of Birds	No. of Households across 7 villages	Test Vaccines	Dose Volume	Route of Vaccination	Age at Vaccination
1	237	49	FP	0.017mL*	Feather-follicle	4–16 weeks
2	234	48	ND	0.06mL	Eye-drop	4–16 weeks
3	240	52	ND + FP	0.06mL + 0.017mL* (concurrently)	Eye-drop + Feather-follicle	4–16 weeks
4	220	45	ND + FP	0.06mL + 0.01mL (concurrently)	Wing-web + Feather-follicle	4–16 weeks
5	242	49	n/a	n/a	n/a	4–16 weeks

FP: Fowl Pox (CEVAC FP L®), Ceva; containing strain PII (Cutter) at approx. EID₅₀ 10^{2.4} per dose (mean of pre- and post-vaccination titres determined by TVLA); ND: Newcastle Disease (CEVAC NEW L®), Ceva; containing the LaSota lentogenic strain at approx. EID₅₀ 6x10^{2.5} per 0.06mL dose (mean of pre- and post-vaccination titres determined by TVLA); * The dose volume used by feather-follicle administration was estimated in a previous GALVmed study to be 0.017mL.

Results

No Adverse Events ascribable to vaccination were observed.

Take Reactions: Prior to Fowl Pox vaccination, the administration sites (thigh or wing-web) of chickens were confirmed to be normal. The administration sites were observed on Day 7 and/or 9 and on Day 21 post-administration to achieve assessment of takes on at least one occasion. Overall, out of the chickens that were observed 96% of Group 1 (216/225) and Group 4 (203/211) chickens, and 94% (219/234) out of Group 3 chickens had vaccine take reactions. A generalised linear mixed model of the proportion of birds with take reactions in a household, with village as a random effect, showed no clear difference across Groups 1, 3 and 4 ($p=0.427$). In all, but two cases, lesions had subsided by Day 21.

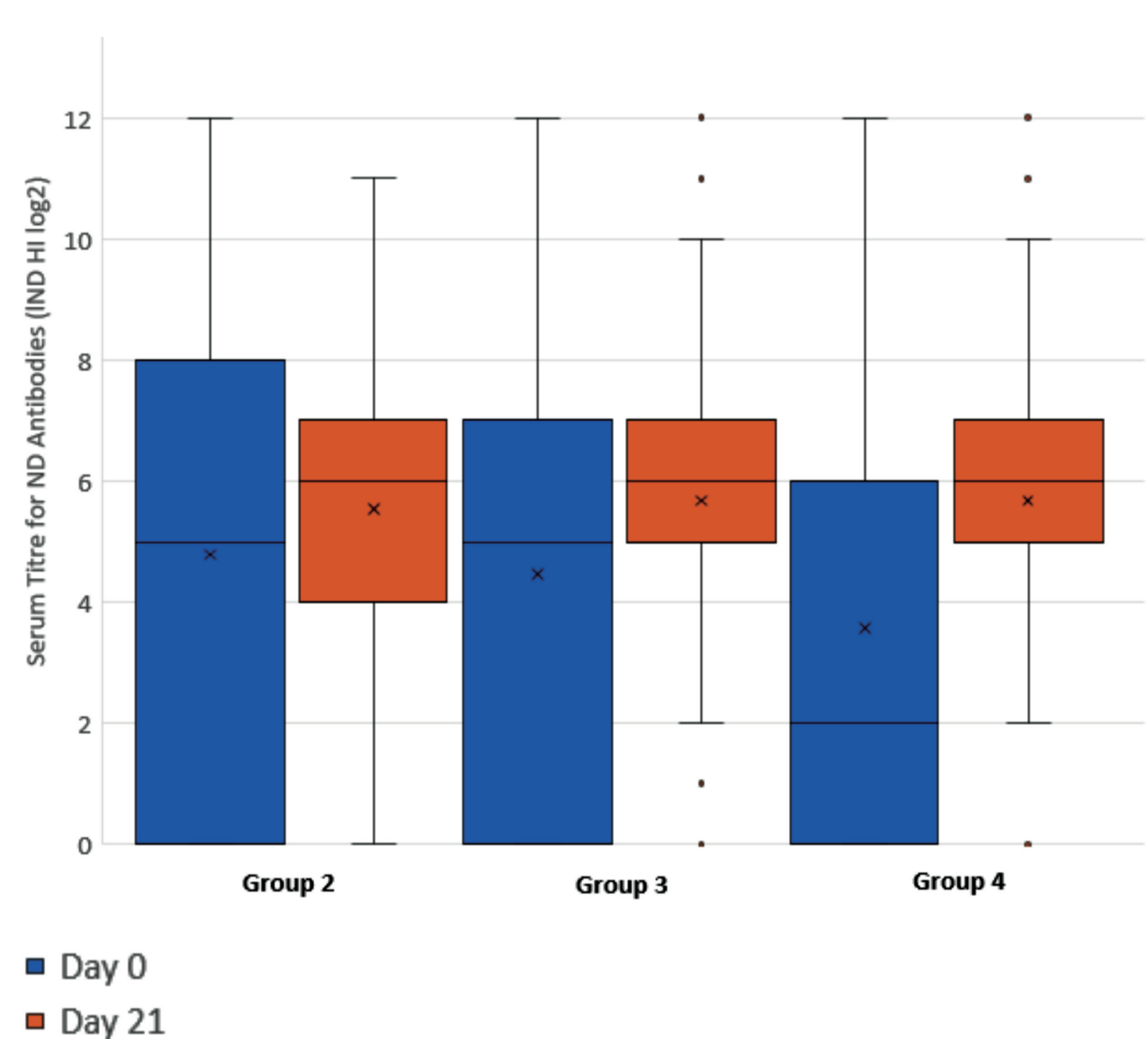


Figure 3: Serum ND HI Titres

A positive ND HI titre (Log₂ transformed: ≥ 4) is evidence for protective immunity to Newcastle Disease. X: Mean value

Group 2: Chickens were vaccinated with Newcastle Disease Vaccine by eye dropper

Group 3: Chickens were vaccinated with Fowl Pox Vaccine (feather-follicle technique (brush)) and Newcastle Disease Vaccine (eye dropper)

Group 4: Chickens were vaccinated with Fowl Pox Vaccine (feather-follicle technique (brush)) and Newcastle Disease Vaccine (wing-web stab)



Fowl Pox nodules on the thigh of a chicken vaccinated with Fowl Pox Vaccine by feather-follicle technique (brush).

Fowl Pox nodules on the wing of a chicken vaccinated by wing-web stab.

Figure 2: Take Reactions – a take is a fowl pox lesion that consists of a swelling of the skin, a nodule, or a scab, at the site where the vaccine was applied, and its presence is evidence of successful immunisation.

Serology: Prior to vaccinations, 54.6% (298/546) of chickens in the study area were positive for antibodies to Newcastle Disease, indicating that the birds were either exposed to the virus or had maternally-derived antibodies. Seroprevalence rates amongst unvaccinated smallholder chickens in this study are in line with findings of other researchers in Africa. The mean Day 0 ND HI titre on the log₂ scale was 4.8 (± 3.8) for Group 2; 4.5 (± 4.0) for Group 3; and 3.6 (± 3.8) for Group 4. Three weeks after vaccination, the percentage of birds that were ND positive had increased to 87.5%, 87.0%, and 89.3% in Group 2 ($n=152$), Group 3 ($n=161$), and Group 4 ($n=140$), respectively. Mean ND-HI log₂ titres were 5.5 (± 2.4) in Group 2, 5.7 (± 2.8) in Group 3, and 5.7 (± 2.2) in Group 4. There was no evidence of difference between the vaccinated groups (Mixed Effect Linear Regression Analysis with random effects for village and household: $p=0.881$). During the study period the mean antibody titre against ND virus declined in the unvaccinated sentinel chickens (Group 5) from 3.7 log₂ (± 4.2) on Day 0 to 1.4 log₂ (± 2.7) on Day 21 indicating that the virus was not circulating in the study area. In no case was ND or FP observed to cause mortality.

Conclusion

Administration of live Fowl Pox vaccine by feather-follicle route could be a practical solution for veterinary paraprofessionals and community animal health workers to legally administer the Fowl Pox vaccine during their Newcastle vaccination activities. This is beneficial in terms of reducing costs and reducing the number of separate interventions.

References:

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Contact: info@galvmed.org
www.galvmed.org