TITLE: Parasite control to enhance immune response to Newcastle disease vaccination in village chicken to improve productivity

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Introduction

- Free range poultry keeping is commonest and economically important poultry production system for peri-urban and rural farmers in Kenya.

- Poultry population: Approx. 31.8 M poultry,
  - 25.7 M are indigenous chicken (Kenya National Bureau of Statistics, 2010)

- Village chicken production is limited by:
  1. Newcastle disease (main one) and IBD
  2. Endo, Ecto and hemo-parasites, predation, theft and low levels of animal health and husbandry
Newcastle Disease

- Newcastle disease (ND): Viral disease of poultry and wild birds characterized by variable morbidity and mortality rates, signs and lesions.
- Classification of NDV: Mononegavirales, family Paramyxoviridae and genus Avulavirus.
  - Pathotypes of ND
    - Viscerotrophic velogenic (Doyle form)
    - Neurotrophic velogenic form (Beach type)
    - Mesogenic virus (Beaudette form)
    - Lentogenic virus (Hitchner form)
    - Asymptomatic enteric form
Newcastle disease (ND) is a major constraint to production of village chickens in many developing countries (Sprabrow, 1988; Alexander, 2001).

Success of village chicken production depends on effective control of NDV (Yongolo et al., 1997).

Vaccination prevents Newcastle disease in poultry (Alders and Spradbrow, 2001).

Many factors contribute to low ND vaccination antibody level response in poultry (Nyaga et al., 1985) and subsequent immunity.

Stress has been reported to cause immunosuppression (Njagi et al, 2010a).

Immunosuppression due to stress may be one major cause of poor vaccination response (Otim et al., 2005; Njagi et al., 2010a).

Previous Studies have focused on Newcastle disease in commercial birds but very little on domestic indigenous poultry.
Some Major Causes of Stress in Village Chicken

• Parasites: Ectoparasites, endoparasites and hemoparasites (Sabuni, 2007).

• Infectious agents: Bacteria and viruses,

• Poor nutrition, and

• Scavenging in search for food (walking long distances)

However, very little has been done to study the effects of stress on effectiveness of Newcastle disease vaccination.
**Poultry parasites**

- Poultry parasites cause low mortality, stress, & significantly hinder and lower chicken production (Sabuni, 2009).
- Endo and ectoparasites prevalence: 90-97% (Maina, 2005; Sabuni, 2009).
- **Endoparasites:**
  1. Nematodes (*Heterakis, Gonglonema, tetrameres, Acuaria, Ascaridia, Capillaria* species)
  2. Cestodes (*Raillietina* spp),
  3. Trematodes
- **Ectoparasites:**
  Mite, lice, tick and fleas
Effect of parasites on immune response

- Parasites can cause stress and subsequent immunosuppression.
- Controlling ecto- and endo parasites may reduce stress, immunosuppression and hence improve the efficacy of Newcastle disease vaccination.
- A controlled study by Honning et al. (2003) using indigenous chicken, demonstrated that *Ascaridia galli* infested chicken had a low level of antibody titres compared to those treated against parasites.
No study has been done on effect of endo and ectoparasites control on ND vaccination in village chicken.

Unlike Honning *et al.* (2003), this study will use free range village chicken of different age groups infected with endo and ectoparasites in the wet and dry seasons of the year.

It will also provide data for effective ND control measures to increase productivity and alleviate poverty in rural areas, in line with vision 2030.
OBJECTIVES

- **Broad objective**
  
  To determine whether parasite control enhances immune response to Newcastle disease vaccination in village chicken to improve productivity in Mbeere District

- **Specific objectives are to:**
  
  - Establish Newcastle disease antibody titres dynamics in the dry and wet seasons.
  - Determine effect of endo- and ectoparasite control on ND vaccine immune response
  - Determine village chicken productivity.

- **Hypothesis**
  
  Parasite control in village chicken enhances immune response to Newcastle disease vaccination and improves productivity.
**Study area**

- The study will be conducted in Mbeere District in Eastern Province.
- Altitude: 500-1200 m ASL
- Rainy seasons: Long (March to June), Short (Oct to Dec)
- Temperature: 20-30°C
- Agricultural activity: Livestock keeping (chicken), and crop (maize, millet and Greengram) production
- The site was purposively selected based on the large population (165,090) of free range chicken.
- Households with at least 10 chicken will be selected for the study.
Study chicken

Ages: Chicks (< 2 months), growers (2-8 months) and adults (> 8 months). (Sabuni, 2009).

Productivity parameters

Body weight, egg production, survival rates, number of chicks hatched, uses of eggs, etc will be determined using a questionnaire and direct observation.

Sample size

This will be done according to Martin et al (1987)

\[ N = \frac{4pq}{L^2} \]

Where; \( N \) = sample size, \( p \) = prevalence (50%), \( q = 1-p \) and \( L \) = Limit of error on prevalence taken at 10%

\[ = 4 \times 0.5 \times 0.5 = 100 \]

\[ 0.1^2 \]
Study design

- **Chicken production**
  - A questionnaire will be administered to heads of household, spouses, workers or other persons familiar with the chicken farming in the household. This will be done at the beginning and at the end of the study to collect productivity data.

- **Experimental design**
  - 28 homesteads with no previous history of vaccination or worm control will be randomly selected. These will be divided into 9 groups as given in Table 1.
Group 2 to 5 will be the control group for vaccination. For the negative control (group 1) two birds will be selected per homestead to a total of 24 birds of equal representation of the three age groups (8 chicks, 8 growers and 8 adults). A wing tag will be placed on the birds for identification.
Endo and ctoparasite control on ND immune response

• Birds harbouring parasites will be used.

• Drugs will be administered three weeks prior to vaccination and at 2 weeks intervals during the experiment.

• La sota vaccine will be used: Primary vaccination on day 0, a booster 14 days later, followed by another booster 1 month later.

• Group 6 to 9 will be treated and humoral and cell mediated responses to NDV vaccine will be measured.
Blood collection and immunity testing

- Blood will be collected and serology done using Haemmaglutination inhibition test (OIE, 2000) and the geometric mean titer (GMT) of each group calculated.

- Cell mediated immunity will be tested using cutaneous skin reaction test as described by OIE (2000)
Data Management

The data will be stored in a spreadsheet program (excel).

Descriptive analysis will be conducted on the production data collected from individual households.

Chi-squared will be used to evaluate association between parasite control and ND vaccination response.

Analysis will be done to assess the immune status of the birds and comparison will be done using ANOVA.
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<tr>
<th>ITEM</th>
<th>COST (Kshs)</th>
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<tr>
<td>30 birds@ shs 300 each</td>
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<td>Assistant @ kshs 300 per day*100 days</td>
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<td>Sampling materials (Questionnaires, needles, gloves, universal bottles etc)</td>
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<td>Vaccines @2.70*300 birds</td>
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THANK YOU