

Research Application Summary

**Enhancing village chicken productivity through parasite management for effective newcastle disease vaccination in Kenya**

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**Abstract**

Newcastle disease (ND) is documented among the most important diseases of poultry in the world, causing devastating losses in both commercial and village chickens. It is capable of causing mortality rates of up to 100% of the flock and, as a viral disease, can only be effectively controlled through vaccination. The disease is endemic in village chickens in Eastern province of Kenya. On the other hand, parasites, which have a tendency of causing stress to the birds through nutrient consumption, blood sucking, and irritation, have been isolated at high levels from chickens from this area. Knowing that stress is associated with immune-suppression, it is important to establish the extent at which parasite burdens influence the effectiveness of ND vaccine. We hypothesize that the presence of internal and external parasites lowers ND vaccination response in village chickens. This study will, therefore, address the identified knowledge gaps with the aim of improving ND and parasite control in village chicken production. It will determine the extent at which external and internal parasite burdens influence vaccination response to ND in the productivity of village chickens, and will also establish (1) productivity and socio-economic parameters, (2) seasonal parasite burdens, and (3) effect of endoparasites and ectoparasites on ND vaccine response.

Key words: Kenya, Newcastle disease, parasite control, vaccination response

**Résumé**

La maladie virale des poules (ND) est reconnue dans plusieurs publications parmi les maladies les plus courantes de la volaille dans le monde, causant des pertes dévastatrices dans des poules de commerce et du village. Elle est capable d'entraîner des taux de mortalité jusqu'à 100% de la volaille et, comme maladie virale, ne peut être efficacement contrôlée que par la vaccination. La maladie est endémique chez des poules du village dans la province orientale du Kenya. D'une part, des parasites qui ont tendance à causer le stress aux oiseaux par la

consommation des nutriments, la succion du sang et l'irritation, ont été isolés aux niveaux élevés des poules de cette région. Sachant que le stress est associé à la suppression de l'immunité, il est important d'établir l'ampleur à laquelle les accablancements de parasite influencent l'efficacité du vaccin de ND. Nous présumons que la présence des parasites internes et externes abaisse la réponse de vaccination de ND chez des poules de village. Cette étude adressera, donc, les lacunes identifiées de connaissance dans le but d'améliorer le contrôle de ND et du parasite dans la production de poule de village. Il déterminera l'ampleur à laquelle les accablancements de parasites externes et internes influencent la réponse de vaccination au ND dans la productivité des poules de village, et établira également (1) les paramètres de productivité et socio-économiques, (2) des accablancements de parasites saisonniers, et (3) effet des endoparasites et des ectoparasites sur la réponse de vaccin de ND.

Mots clés: Kenya, La maladie virale des poules, contrôle de parasite, réponse de vaccination

## **Background**

Newcastle disease (ND) is considered the most devastating diseases of poultry in the world, causing mortality rates of up to 100%. The disease is endemic in village chickens in Eastern province of Kenya and parasites associated with the disease, have been isolated at high levels from chickens in this area. Knowing that stress is associated with immune-suppression, it is important to establish the extent at which parasite burdens influence the effectiveness of ND vaccine. We hypothesize that the presence of internal and external parasites lowers ND vaccination response in village chickens, and that control of parasites will lead to effective ND vaccination, enhanced village chicken productivity and improved socio-economic status of the community. Improving livelihoods, especially of the poor and the vulnerable, is in line with Millennium Development Goals and Kenya's Vision 2030.

The study will engage/train 2 MSc students, as well as involve farmers in the implementation of the project, in line with the RUFORUM strategic thrust in capacity building in agriculture, and Kenya's Strategies of Revitalisation of Agriculture (SRA).

## **Literature Summary**

In Africa and other developing countries, chicken industry is one of the biggest untapped economic potentials in rural areas which, if incorporated into a country's development plan, could

contribute greatly in speeding-up rural development (Njue *et al.*, 2002). It can compliment income from agricultural sales by providing cash to resource-poor households throughout the year. Over 70% of the 36 million chickens in Kenya are of indigenous type, kept in villages by resource-poor individuals (Njue *et al.*, 2002). Newcastle disease, caused by a virus, is documented as the most important disease of poultry in the world, causing devastating losses in both commercial and village chickens; it is capable of causing mortality of up to 100% (Spradbrow, 1997). Vaccination has been reported as the only safeguard against the disease (Alders and Spradbrow, 2001). Newcastle disease vaccination in village chickens has been reported to potentially increase household incomes derived from increased egg production and reduced chick mortality (Woolock *et al.*, 2004).

Newcastle disease has been shown to be endemic in Eastern Province of Kenya (Njagi, 2008; Njagi *et al.* 2010). The free-range chickens raised in this area have also been shown to have high carriage of parasites (Sabuni, 2009). There is a chance that, as a result of the nutrient consumption, blood sucking and irritation, these parasites would cause immune-suppression, thus affect immunological response to ND vaccination. The seasonal parasite dynamics in these indigenous chickens has also not been determined, neither has their influence on the response of the birds to ND vaccination. Establishing the effect of endoparasites and/or ectoparasites on effectiveness of ND vaccination, and the seasonality of the parasite burdens, will enable formulation of control strategies that will lead to effective control of ND, enhanced village chicken productivity and improved socio-economic status of the community.

## Study Description

The research will be done in two agro-ecological zones in Eastern province of Kenya. The study will be field-based and will involve farmers and other stakeholders, with continuous feedback through various fora. Before start of the study, an inception and stakeholder workshop will be held to map out research gaps and approach. Data collection on socio-economic and indigenous knowledge on chicken productivity, disease recognition and control will be collected through farmer-group discussions and filling-in of questionnaires. Parasite isolation and identification will be done through examination of fecal samples (floatation technique) and post-mortem examination of the birds. The birds' humoral and cell-mediated immunity to the ND vaccine will be determined using hemagglutination

inhibition, macrophage migration inhibition, and skin reaction tests. Effect of worm burdens on ND vaccine effectivity will be studied through selective treatments, vaccination and monitoring of respective immune responses by comparing them to the control groups.

### **Research Application**

Once the results are processed, a protocol on seasonal control of parasites will be recommended, as the farmers are advised to vaccinate their birds against ND following the laid-down vaccination regime. This is expected to lead to effective ND vaccination, enhanced village chickens' productivity, and improved socio-economic status of the community.

### **Acknowledgement**

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