

## Project title

Investigation on mortality and interactions of selected diseases in free-range chickens

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### Background

Within the last 10 years free-range and organic farming has expanded in Denmark due to consumer demands for improved animal welfare. Especially organic egg production has increased from almost nothing in 1996 to approximately 14 % of the marketed eggs in 2000. In total, approximately 100 commercial farms operate as organic table egg producers. However, high mortality represents a major problem in organic farming systems. According to the annual report from The Danish Poultry Council (2001), 5.9% and 9.6% mortality was observed in cage and deep litter systems respectively, while 15.9% died in the organic system. So far, no systematic studies on the causes of mortality have been carried out. However, the free range egg/organic egg production system in which the hen is offered access to outdoor facilities appear to result in a range of diseases among which several are not seen in indoor systems (cage or deep litter). Overall, the increased number of disease outbreaks in free-range/organic systems appear to be responsible for the increased mortality observed. Reports have indicated a broad range of diseases in free-range/organic systems, i.e., *Pasteurella multocida*, egg drop syndrome (*Adenovirus*), *E. coli* and *Histomonas meleagridis* (Black-head). Fowl cholera, caused by *P. multocida*, is seen in most species of birds and transmission from wild birds to domestic poultry has been demonstrated. Recent investigations showed that about 80% of the diagnosed cases of pasteurellosis in Danish poultry appeared in flocks that had access to outdoor areas. Furthermore, due to the outdoor conditions and the large flock size (up to 3.000 animals in organic layer flocks) parasitic diseases are very common. Several studies have shown that all animals are parasitized at a stage in their life and that especially *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria obsignata* and *Eimeria spp.* are common infections. A recent study in Denmark has shown that the flock prevalence of parasites is 100% in free range/organic systems, compared to 25% in confined indoor deep litter production systems. Recent studies have also shown that the interaction between for instance *Ascaridia galli* and *Pasteurella multocida* may result in an increased number of Pasteurella carrier animals enhancing the transmission of Pasteurella. Many of these infections and aspects are not common in conventional indoor systems due to the high level of management and biosecurity. The high level of morbidity/mortality in organic egg production represents an ethical problem and does not harmonize with the idea of high welfare, which is often connected with organic production. Due to ethical problems and poor performance there is a high demand for further investigation of the occurrence of diseases and their significance in organic table egg production systems and to elucidate the possible relationship between disease prevalence and production systems. In addition, we do not know how the synergistic or antagonistic effects of concurrent parasitic and bacterial diseases affect the immune system. This information can only be obtained through controlled experimental investigations including studies on the impact on the immune system.

### Objective

The aims of this project are: (i) to improve welfare of poultry under free-range conditions by investigating the occurrence of diseases, their interaction and significance in free-range table egg

production systems and to elucidate the possible relationship between disease prevalence and production systems and on this basis develop strategies to improve the disease prophylaxis in free-range poultry production systems; (ii) to investigate the host response using interaction studies between parasitic and bacterial infections which are of crucial importance for improving the health of free-range poultry.

The project will include the following steps:

1. Farm studies:

Longitudinal studies will be carried out in randomly selected flocks starting at the beginning of egg production until slaughter. Post mortems will be carried out on all dead animals and causes of diseases will be determined. Faeces and blood samples are regularly collected and examined for the presence of parasitic eggs and selected poultry diseases, respectively. Parameters related to biosecurity will be recorded for all the flocks.

2. Interaction studies:

To investigate avian immune response using interaction studies between parasitic and bacterial infections. The purposes of these experimental studies are to describe how the synergistic or antagonistic effects of concurrent parasitic and bacterial diseases affect the immune system.

### ***Progress - 2006***

- A paper enabling new insight into the molecular epidemiology of *Pasteurella multocida* ssp. *multocida*, the cause of fowl cholera, has been published in an internationally reviewed journal.
- A paper demonstrating an interaction between *A. galli* and *S. Enteritidis* has been accepted for publication in an internationally reviewed journal. The results of which suggest that under field conditions *A. galli* may increase colonization rate and prolong the duration of faecal excretion of *S. Enteritidis* in chickens
- A paper is ready for submission in an internationally reviewed journal. This paper indicates that *Histomonas meleagridis* may be important for the pathogenesis of APEC resulting in a secondary role of *E. coli* in flocks also infected with *H. meleagridis*
- One paper regarding the farm studies is in the process of being written.
- The Ph.D.–thesis has been written, except for the last part of the paper regarding the farm studies.

### ***Plans 2006 – early 2007***

- Hand in Ph.D. dissertation late 2006 – just after the last paper regarding the farm study is ready for submission.
- Defend the thesis early 2007

### **Publication**

Eigaard, N.M.; Permin, A.; Christensen, J. P.; Bojesen, A.M. and Bisgaard, M. (2006) [Clonal stability of \*Pasteurella multocida\* in free-range layers affected by fowl cholera](#). *Avian Pathology* 35(2):pp.165-172.\*

Permin, A.; Ambrosen, T.; Maag Eigaard, N.; Folden Fensburg, M.; Bojesen, M.; Christensen, J.P. and Bisgaard, M. (2002) Sygdomme og velfærd [Diseases and welfare]. In Dansk Veterinær tidsskrift, No 6, page pp. 12-16.\*