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Summary

The influence of Dermanyssus gallinae invasions on corticosterone levels in laying hens and the genetic diversity of the ectoparasite population

Dermanyssus gallinae (De Geer 1778) is one of the most persistent parasites in commercial layer poultry farming. *Dermanyssus gallinae* invasions cause serious economic losses in the poultry sector. This ectoparasite compromises the health status and welfare of birds, decreases egg production and egg quality, and causes chronic stress. Corticosterone levels are a reliable indicator of stress, and they need to be assessed to effectively eliminate *D. gallinae* invasions in poultry. Therefore, the aim of this study was to evaluate the effect of natural *D. gallinae* invasions on corticosterone levels in laying hens under commercial poultry housing conditions in different stages of the production cycle and in response to various treatment methods, and to determine the genetic diversity of the *D. gallinae* population. The study involved three experiments (D I-III). The severity of the invasion and the structure of the ectoparasite population were determined with a patented system of traps. Corticosterone levels were analyzed in fecal samples with the use of the immunoenzymatic assay (ELISA).

In experiment D I, corticosterone levels and the structure of the *D. gallinae* population were evaluated in Hy-line Brown hens kept in two houses (groups K1 and K2) during the production cycle. Fecal samples and traps were collected on 10 dates. In group K1 with a high ectoparasite burden, corticosterone levels were positively correlated with invasion severity. In group K2 with a low ectoparasite burden, corticosterone levels increased periodically, and each elevation was preceded by an increase in invasion severity. These results indicate that *D. gallinae* influence layers and cause chronic stress regardless of invasion severity.

In experiment D II, the effects of selected treatment methods on invasion severity, the structure of the *D. gallinae* population, and corticosterone levels in laying hens were determined. The experiment was conducted in three poultry houses (groups K3-K5). Group K3 was treated with Aquamax Acari (Wąbrzeźno, Poland); group K4 was treated with Dergall (ICB

Pharma, Poland); and group K5 was the control (no treatment). Fecal samples and traps were collected on four dates (once before the treatment and three times after the treatment). Invasion severity, the structure of the ectoparasite population and corticosterone levels differed across groups receiving various treatments. The treatment itself was a source of additional stress for hens. Therefore, invasion severity and the structure of the ectoparasite population should be monitored individually in each layer house to determine the pathway of the invasion. This approach is key to effectively minimizing *D. gallinae* invasions.

In experiment D III, the genetic diversity of the *D. gallinae* population was analyzed in five commercial poultry farms in Poland, and its similarity to ectoparasite isolates from other countries was evaluated. The analysis focused on a fragment of the cytochrome c oxidase (COI) subunit gene. A total of 38 own isolates and 338 sequences deposited in GenBank were analyzed. The 46 haplotype, which was homologous to the isolates from the United Kingdom, the Netherlands, Belgium, Japan and South Korea, was the predominant haplotype (90%). These results indicate that the *D. gallinae* population is characterized by high genetic homogeneity, which suggests a common origin. Detailed analyses of the genetic diversity of ectoparasite species provide valuable information about their migration within and across countries.