Effect of organic and inorganic dietary selenium supplementation on gene expression in oviduct tissues and Selenoproteins gene expression in Lohman Brown-classic laying hens

ABSTRACT

Background: The oviduct of a hen provides a conducive environment for egg formation, which needs a large amount of mineral elements from the blood via trans-epithelial permeability. Eggshell is the calcified layer on the outside of an egg that provides protection and is critical for egg quality. However, little is known about the genes or proteins involved in eggshell formation, and their relationship to dietary microminerals. We hypothesized that dietary selenium supplementation in chickens will influence genes involved in eggshell biomineralization, and improve laying hen antioxidant capacity. The objective of this research was to investigate how organic and inorganic dietary selenium supplementation affected mRNA expression of shell gland genes involved in eggshell biomineralization, and selenoproteins gene expression in Lohman Brown-Classic laying hens. Results: Shell gland (Uterus) and liver tissue samples were collected from hens during the active growth phase of calcification (15-20 h post-ovulation) for RT-PCR analysis. In the oviduct (shell gland and magnum) and liver of laying hens, the relative expression of functional eggshell and hepatic selenoproteins genes was investigated. Results of qPCR confirmed the higher ($p < 0.05$) mRNA expression of OC-17 and OC-116 in shell gland of organic Se hen compared to inorganic and basal diet treatments. Similarly, dietary Se treatments affected the mRNA expression of OCX-32 and OCX-36 in the shell gland of laying hens. In the magnum, mRNA expression of OC-17 was significantly ($p < 0.05$) higher in hens fed-bacterial organic, while OC-116 mRNA expression was down-regulated in dietary Se supplemented groups compared to non-Se supplemented hens. Moreover, when compared to sodium selenite, only ADS18 bacterial Se showed significantly ($p < 0.05$) higher mRNA levels in GPX1, GPX4, DIO1, DIO2 and SELW1, while Se-yeast showed significantly ($p < 0.05$) higher mRNA levels in TXNRD1 than the non-Se group. Conclusions: Dietary Se supplementation especially that from a bacterial organic source, improved shell gland and hepatic selenoproteins gene expression in laying hens, indicating that it could be used as a viable alternative source of Se in laying hens. The findings could suggest that organic Se upregulation of shell gland genes and hepatic selenoproteins in laying hens is efficient.

Keyword: Antioxidant capacity; Gene expression; Laying hens; Organic; Oviduct; Selenium; Selenoprotein