

Chemerin in egg white, oviduct and during the embryo development in Pekin duck

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Breeding companies goal's is the production of viable and robust one-day old duckling. But, a major issue is the uncontrolled embryo mortality during egg incubation. Thus, the intensive genetic selection has resulted in the production of animals with reproductive disorders. New fertility biomarkers are necessary to improve reproductive performances in genetic program.

The aims were to (1) quantify chemerin concentrations in egg white during the cycle of laying for two successive generations of pekin ducks (2) determine a link between chemerin concentrations in egg white and egg and reproductive performances (egg weights, laying, fertility and hatchability) (3) evaluate a heritability on two generations and (4) investigate the presence of chemerin in reproductive tract and during the embryo development.

Eggs from 50 mother and respective offspring pekin ducks were collected during five days at three period: before and after the laying peak and at the end of laying. For each egg, an albumen sample was collected to measure chemerin concentrations by ELISA assay. The reproductive tract was also collected to determine the chemerin expression in magnum. Moreover, pekin eggs were incubated to determine the expression of chemerin in embryonic annexes (allantoic and amniotic sac) during the embryo development. A third experiment consisted to inject pekin eggs with different treatments: control (PBS), IgG and chemerin antibodies (0.01, 0.1 and 1 µg/mL) at embryonic day 9 of incubation to evaluate the embryo mortality.

During the cycle of laying, chemerin concentrations in egg white significantly decreased. Chemerin amounts in egg white were negatively correlated with albumen weight ($r = -0.33$, $p = 0.036$) and not associated with any reproductive parameters. Between generations, we obtained an estimation of the heritability of 0.29 ± 0.17 . By RT-qPCR, chemerin expression was higher in magnum compared to the other region of oviduct. During the incubation, chemerin levels in allantoic fluid were unchanged during the incubation whereas significantly increased from ED16 in amniotic fluid. Eggs injected with the high quantity of anti-chemerin antibody (1 µg/mL) showed a significant increase of embryo mortality (82.45 ± 1.44 %) compared to eggs injected with control treatment (28.65 ± 6.15 %)

The concentration of chemerin in egg white was variable during the cycle of laying for duck breed. Chemerin is a hormone locally produced by the magnum region of the oviduct tract, leading to its accumulation in the egg white during the egg formation. During egg incubation, chemerin in egg white was transferred into the amniotic sac to support the embryo growth. Our findings suggest that chemerin could exert a beneficial role in pekin duck development. Our biomarker seems to be heritable to the offspring and it could be used as new tool in genetic selection.

Keywords: chemerin, egg white, embryo, pekin duck, genetic selection