

**Title:** Non-invasive assessment of stress in commercial housing systems

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*Byline:*

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*Summary:*

Egg albumen corticosterone concentrations are used as a non-invasive measure of stress in laying hens because of their correlation with plasma corticosterone concentrations. This project determined the corticosterone concentrations in albumen of eggs collected from the three main production systems used in the Australian egg industry; conventional cages, free range and barn.

In the study, five free range (FR 1-5), four conventional cage (CC 1-4) and three barn (Bn 1-3) flocks were sampled at 24, 32, 42, 52, 62 and 72 weeks of age. From each of the participating farms, ninety eggs were collected at random when the hens were at the appropriate ages. For all except farm CC4, eggs were supplied by the producers who randomly selected the eggs from those laid on one day in the week of the specified flock age. Form CC4 is part of the University of Sydney, eggs were collected by researchers.

Egg and albumen weights, egg albumen corticosterone concentration and total corticosterone in albumen were determined for all eggs collected. The month of collection had no significant effects on egg weight ( $P=0.57$ ), albumen weight ( $P=0.72$ ), egg albumen corticosterone concentration ( $P=0.28$ ) or total albumen corticosterone in albumen ( $P=0.48$ ). The collection age had a significant effect ( $P<0.001$ ) effect on egg weight with it increasing from 24 to 42 weeks and then remaining relatively similar until the end of production. The age of collection had a significant effect on the egg albumen corticosterone concentration ( $P=0.02$ ) but no effect on the total amount of corticosterone in the albumen ( $P=0.13$ ). This is difficult to understand because of the strong positive relationship between concentration and total amount of corticosterone.

When farms are grouped into production systems there were no differences in mean corticosterone concentrations. For each production system the variation between farms was large and this limited the value of such a comparison.

For most farms the albumen corticosterone concentrations were high at the start of the production cycle and then decreased and remained stable during the later stages of the production cycle. This pattern of albumen corticosterone concentrations suggests that farm management in the early phases of the production cycle could be relevant to the extent of challenges hens need to deal with in their environment. Also, early rearing management could be designed to familiarise hens to the production housing and accommodate their adaptation to the housing transfer.

The mean albumen corticosterone concentrations over the entire production cycle tended to be lower in flocks with lower mortality. However, further data is needed to establish a definitive relationship. The data suggest that the elevated albumen corticosterone concentrations in the early stages of the production cycle are likely correlated with reductions in performance. Again, further data collection is needed to verify this relationship.

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