Title: Understanding the physiology of shell pigmentation and colour deterioration in laying hens
AECL Project No: 1UN121
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Summary

Eggshell colour is regarded as an aspect of egg quality, from the consumer perspective. Loss of colour occurs naturally as hens grow older but can occur in younger hens, with free range production systems implicated as being at higher risk. Different commercial egg production systems have their own advantages and disadvantages, which is why all three production systems (cage, barn, free range) exist in Australia and many other countries.

In this project, a series of field-based and experimental studies was conducted to address questions relating to the problem of loss of shell colour in commercial laying hens.

The project commenced with an experiment to determine where in the eggshell (and therefore at what stage of shell production in the oviduct) pigment deposition occurred. Other studies within the project examined the effect of transferring birds from free range production, where shell colour had deteriorated, into cages to monitor effects on shell colour. The possible role of vitamin D in the loss of shell colour was investigated in both short and long-term studies. Three studies sourced eggs from typical commercial free range farms for the monitoring of shell quality. The effects of oviposition time and position of an egg in a clutch were investigated. Additionally, eggshells stored from a previous AECL project on the effect of infectious bronchitis virus on egg quality were examined for the levels of pigment present.

The project also included an experiment, conducted at the molecular biological level, to identify the differences in gene expression at different stages of the egg production cycle, and the changes occurring in gene expression of selected genes when shell colour deteriorates as the result of feeding the coccidiostat, Nicarbazin, to laying hens to cause severe loss of shell colour.

Although shell colour tended to be darker in eggs from cage production systems than those from barn or free range systems, loss of shell colour in free range flocks is not an inevitable consequence of free range production. The findings of the project indicate that maintenance of shell colour is possible in all production systems. It is possible that good commercial practice in rearing, bringing the pullets into lay and maintaining the hens throughout the production cycle are of greater importance than the type of production system.

Keywords

eggs; brown eggshell colour; eggshell quality; eggshell pigmentation; eggshell colour deterioration; brown pigment; protoporphyrin; hen age; layer production systems