

**The intermittent feeding of particulate calcium to
choice-fed laying hens**

by

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3. Rur. Sc.

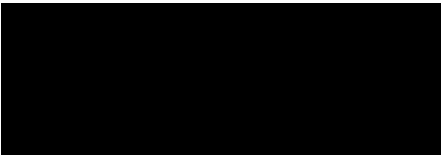
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Declaration

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree.

I certify that all help received in the preparation of this thesis, and all sources used, have been acknowledged.



Robert Donald Taylor

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Summary

The use of the intermittent feeding of coarse shellgrit, as a calcium source, was examined in a series of experiments to determine the ability of the laying hen to adjust her calcium intake when denied access to her calcium source for fixed periods extending over several days.

The intermittent feeding of shellgrit to laying hens was investigated as a potential means of reducing the problem of calcium separation in feeding systems to laying hens. The problem of the separation of feed ingredients in all types of long feeding systems in modern poultry housing has been recognised since the practice of providing complete, ground rations to layers commenced. This problem was highlighted in a review by Belyavin (1994).

There is evidence that the laying hen can produce eggs more efficiently if allowed to regulate her own calcium intake with the provision of a separate calcium source. This efficiency occurs as the laying hen obtains her calcium requirement directly whilst avoiding the excessive intake of energy and protein which may occur, at times, in conventional feeding systems when all feed ingredients are supplied as a single, complete ration. In conventional systems, excessive intakes of energy and protein may occur due to changes in the environment or production which are unallowed for in the dietary formulation.

The intermittent provision of a coarse shellgrit was applied to a highly successful Australian commercial medium-hybrid brown egg laying strain of hen. The experimental approach was to provide shellgrit on a daily basis or to extend a period of deprivation of this shellgrit over one, two or four days. Hens were choice-fed a diet of whole wheat and a protein concentrate mash (422 g/kg crude protein and 40.1 g/kg calcium) with calcium supplied as a graded shellgrit.

The choice-fed laying hens used in these experiments selected their diet accurately to meet their energy, protein and calcium requirements as influenced by long term environmental effects. This selection, however, was confounded in the final experiment when the hens were inadvertently provided with a protein concentrate contaminated with large particles of limestone and bone.

A series of three feeding trials indicated that layers provided with shellgrit daily, or intermittently over various fixed periods of days, ate a similar amount of shellgrit on a daily basis. The hens fed shellgrit intermittently achieved similar intakes of shellgrit by adjusting their shellgrit intake to that of *ad libitum* fed hens, multiplied by the number of days for which the shellgrit had been withheld.

The hens ate similar amounts of feed, in similar proportions of ingredients and produced eggs at similar rates. Egg production was excellent throughout the experimental periods, from 95.1 % at 37-42 weeks of age to 88.5 % at 70 weeks of age. These production rates always exceeded the breeders' targets.

Eggshell quality was significantly reduced only when the period of shellgrit withdrawal from the hen was greater than 3 days. A trend to lower eggshell quality measures was found for the hens from 37 to 70 weeks of age for all the treatments and was exacerbated when shellgrit was supplied on an intermittent basis. The number of cracked or broken eggs was similar across all the treatments during the experiments.

Three further experiments explored the effects of intermittent shellgrit supply on bone and gut metabolism and physiology, the effect of shellgrit shape upon calcium intake and the effect of an alteration in the level of provision of the protein concentrate to allow for seasonal temperature changes.

There was an increase in the proportion of medullary bone in the femora of hens provided with shellgrit intermittently. There were no differences in the proportional weights of crops, proventriculi or gizzards of these hens. There was however, a difference in the crop contents of wheat and protein concentrate between hens provided shellgrit daily and intermittently. It is suggested that providing shellgrit on an intermittent basis may alter the diurnal pattern of intake of feed ingredients by the hens.

Cone-shaped shells caused a drastic initial reduction in shellgrit intake and a trend to lower overall calcium intake. Providing the protein concentrate at a rate lower than suggested by the initial feed formulation caused a reduction in calcium intake. In the short term, neither result affected egg production by the hens.

Hens provided with shellgrit every three or four days produced wet, formless excreta which is a problem for the practical storage and disposal of excreta in modern housing. There was a trend towards a marginally lower energy utilisation of the diet selected by hens provided with shellgrit on an intermittent basis.

The use of an intermittent supply of a particulate calcium source may provide a possible method of overcoming the problem of calcium separation in modern feeding systems. A rapid visual check of the levels and evenness of distribution of a coarse calcium source allows the producer to be fully cogniscent of calcium availability to his hens.

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