# The effect of body weight of laying hens on the intake of methionine-deficient diet.

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**Abstract**
Twenty seven heavy (2375.0g ± 20.7g) and 27 light (1860.9g ± 25.6g) hens were selected and placed in individual cages in the same house and given individual feed troughs. The two groups of birds were subjected to two types of feed: Feed 1 and Feed 2. Feed 1 matched NRC recommendations for layers, Feed 2 was deficient in methionine. The supplying of Feed 1 did not result in a statistical difference in the feed intake of the heavy and light group of birds. In contrast, when they were fed with Feed 2, there was a significant difference between the two groups in terms of feed intake.
(Key words: laying hens, body weight, feed intake, methionine)

## Introduction
Several investigators (e.g. Gous and Kleyn 1989; Roth *et al.,* 1990; Uzu *et al.,* 1993) noted that as the deficiency in methionine or other amino acids becomes severe, feed intake declines. In adult birds, an amino acid deficiency results in net catabolism of body proteins in order to supply the amino acids to prevent a distortion in the plasma and tissue amino acid levels. Thus, it was proposed by Mackenzie *et al.,* (1992) that a larger body supplies a greater pool of mobilisable proteins when birds receive an amino acid deficient diet. This pool can act as a source of limiting amino acids when the animals are given a deficient diet. An experiment was conducted to determine if heavy and obese hens would consume larger amounts of an amino acid deficient feed than smaller, slimmer hens because the latter were more sensitive to the deficiency.

## Materials and Methods
A flock of 1000 Lohmann Brown laying hens (50 weeks old) were investigated by palpation to identify those which had large or small amounts of abdominal fat content. Twenty seven heavy (2375.0g ± 20.7g) and 27 light (1860.9g ± 25.6g) hens were selected and placed in individual cages in the same house and given individual feed troughs. A methionine deficiency was induced by using a wheat-soya feed of 140 g/kg crude protein. Two types of feed were used: Feed 1 matched NRC recommendations for layers, Feed 2 was formulated to create a methionine deficiency. The first seven days of the experiment provided information on the normal feed intake of birds (regimen A). Birds then received Feed 2 for two days (regimen B), then Feed 1 for two days (regimen C). Regimens B and C were repeated, and the cycle was ended with regimen B. Finally the birds received Feed 1 for seven days (regimen D). Feed intake and egg production was recorded daily. The data were subjected to ANOVA by the statistical package Minitab (10.51v).

## Results and Discussion
The results summarised in Table 1 show that when on normal diet (regimen A), body weight had no significant effect on the birds' feed intake ($p>0.05$). However, when methionine was withdrawn from the feed (regimen B), the drop in feed intake by light bodied birds averaged 31.3% whereas by heavy bodied birds it averaged only 19.6%, although the reduction was substantial in both cases ($p<0.001$). That the intake of feed during regimens C, D and A were not significantly different ($p>0.05$) indicates that the addition of the essential amino acid is recognised by the hens and it leads to restored appetite within a day. The rate of egg production in both groups was not significantly different.

**Table 1. Comparison of feed intakes [g/day] of light and heavy birds during the regimens of the experiment.**

| | Regimens | | | |
|---|---|---|---|---|
| **Type of birds** | **A ( 7 days )** | **B ( 6 days )** | **C ( 4 days )** | **D ( 7 days )** |
| **Light Bird** | $103.1 \pm 2.5^{a}$ | $70.8 \pm 3.4^{b}$ | $97.3 \pm 3.4^{a}$ | $106.6 \pm 2.6^{a}$ |
| **Heavy Bird** | $104.6 \pm 2.8^{a}$ | $84.1 \pm 3.8^{c}$ | $101.4 \pm 4.1^{a}$ | $106.1 \pm 3.4^{a}$ |

[a,b,c] Effects of feeding regimens within a column or a row followed by different superscripts differ significantly ($p < 0.001$).
Mean ± SEM, n=27

It has been suggested (Boorman, 1979) that an amino acid deficiency disturbs metabolism and reduces food intake in proportion to the degree of the deficiency. It was expected that heavier birds have a higher maintenance feed (and amino acid) requirement however, in the present experiment, bird weight had no effect on feed intake. The heavy birds did not eat more than their light counterparts despite the 514g weight difference, which was probably due to a higher carcass fat content. Moreover, heavy birds reacted less to the change in methionine content in their feed than did light hens, as if they were less sensitive to the deficiency. It is possible that the heavy birds eat more and feel the amino acid deficiency less because of it, and then the excess energy is converted to carcass fat.

As a result of selection for smaller body weight and better feed efficiency, safety margins for adequate nutrition generally have become narrower. Thus, smaller hens are more efficient but, any disturbance to the balance of the diet will affect their feed intake. Thus, the difference between heavy and light birds towards the end of their laying period is possibly due, in part, to the differences in sensitivity to a deficiency. A possible cause of the different depression of food intake among heavy and light hens might be genetic variation in the sensitivity to the amino acids deficiency.

The results of the present experiment accord with an earlier study (Leclercq *et al*., 1993) in which the comparative utilisation of sulphur-containing amino acids (SAA) clearly demonstrated that the lean line is more sensitive to deficiencies in the SAA and lean lines used SAA more efficiently than the fat line. In the same experiment, it was observed that plasma amino acid profiles differed between lines for several amino acids. Therefore, suggesting that the metabolism of these is different between genotypes.

**Conclusion**

Feeding a methionine deficient diet to hens for 48 hours to determine the feed intake depression could be used as a rapid method to identify hens which are more or less efficient; it might be used as an adjunct to the estimation of residual food intake as a measure of feed efficiency.

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