EVALUATION OF MAGNESIUM OXIDE INTESTINAL ABSORPTION IN LAYING HENS

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Abstract: In poultry, magnesium is involved in many important physiological processes, from bone metabolism, modulation of a great number of enzyme activity to egg shell formation and resistance. The aim of the present research was to evaluate whether feed introduced MgO is intestinally absorbed and its level in different tissues. The experiment was performed over a period of 41 days, on 35 weeks old laying hens, RossoSL hybrid. The combined standard feed was supplemented with MgO in two different doses, 1g/kg feed and 3g/kg feed. At the end of the experiment, the animals from the control group that received only standard feed and the two groups of MgO supplemented ones were slaughtered. Samples of serum, liver, pectoral and thigh muscles and also thigh bone were collected. The evaluation of Mg content, assayed by atomic absorption spectroscopy, revealed that both experimental groups presented changes in magnesium levels. In sera, livers and thigh muscles, Mg content increased with the dose of supplemented MgO. In the pectoral muscle, the increase in Mg was higher in the lower supplemented groups (1g MgO/kg feed), about 11% over the control, while in the group that received 3g MgO/kg feed the Mg content was only with 4.1% over. A different behaviour against MgO supplementation was reached for thigh bone, where the Mg content deceased with 2% in the first group, and with 10.3% in the group that received the highest MgO supplementation. The obtained results demonstrate that MgO is absorbed at the intestinal level, even in an inorganic form, and more, induces changes in the magnesium level of the different organs and consequently may influence their metabolism.

INTRODUCTION

Magnesium is one of the most important macrominerals for living organisms because of the numerous biochemical reactions and physiological processes in which it is involved. In animal food, magnesium comes in different combinations, organic and inorganic. Organic forms or chelated combinations include aspartate, malate, succinate, citrate, proteinate. The inorganic sources are chloride, carbonate, oxide.

Most of the researches that investigated the biodisponibilty of magnesium combinations agree with the hypothesis that chelated (organic) forms are the most absorbable (5).Recent studies emphasized that magnesium feed supplementation induced beneficial effects on the egg shell quality and resistance (2,3).

The aim of the present study was to investigate the relationship among MgO content of the feed and its level in different organs, in order to evaluate if it really represents a cheap and absorbable form of magnesium.

MATHERIAL AND METHOD

The experiment was performed over a period of 41 days, on 35 weeks old laying hens, RossoSL hybrid. The combined standard feed was supplemented with MgO in two different doses, 1g/kg feed and 3g/kg feed. There were used three groups hens, control, and
experimental, - each of 8 individuals, from the same poultry farm. At the end of the experiment, the animals from the control group that received only standard feed and the two groups of MgO supplemented ones were slaughtered. Samples of serum, liver, pectoral and thigh muscles and also thigh bone were collected. The evaluation of Mg content was assayed by atomic absorption spectroscopy.

RESULTS AND DISCUSSIONS

Blood serum, as a metabolic reflection of the whole body, emphasizes the most obvious changes in magnesium content, as a consequence of MgO supplementation. Thus, the first experimental group, supplemented with only 1g MgO/kg feed, presented an increased level of magnesium with 36%, as compared to the control, and the second had a Mg level higher with 70%. These results, presented in figure 1, sustain the hypothesis that Mg of the oxide combination is absorbed at a high rate at the intestinal level of laying hens even when is administered in an inorganic form.

Figure 1. Magnesium concentration in serum
An important commentary of these results is that the assay method used determines the total magnesium concentration, both ionic and protein bound.

Liver, as an important reservoir of magnesium presented an increased concentration in this element, but in a smaller extent than blood 2% and 3.3% respectively (figure 2).

Figure 2. Magnesium content of the liver

Figure 3. Magnesium content of the pectoral muscle
The most intriguing results of this experiment were recorded at thigh bone magnesium content. It decreased concomitantly with MgO supplementation, with 2% in the first group and 10.3% at the higher dose of magnesium (figure 5).

Figure 4. Magnesium content of the thigh muscle

Figure 5. Magnesium content of the thigh bone
Oral absorption of MgO, represent a controversial subject, as it’s presented by other researchers’ studies, performed on mamalian species (1,4). In this view, our results sustain the hypothesis that, at least in poultry, it reaches a significant absorption.

CONCLUSIONS

1. Feed supplementation with MgO induced an increase of magnesium content of the serum, proportional with the administered dose 36% and 70% respectively.
2. Other organs, as liver, pectoral and thigh muscles and thigh bones, were sensitive to MgO content of the food, changes of Mg level being emphasized.
3. The above presented results demonstrate that MgO may represent an available source of magnesium in poultry.

BIBLIOGRAPHY