THE UTILIZATION OF CASEIN AND AMIDE NITROGEN BY CHICKENS

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For over thirty years there has been a controversy concerning the utilization of amide nitrogen, especially urea, by animals. Papers having reference to this subject are entirely too numerous to review in this brief report; therefore only typical illustrations are referred to. Nehring and Schramm (1937) find that when 15% of urea replaces an equivalent amount of protein the ration is well utilized by sheep. These authors draw similar conclusions for cattle and sheep in other reports, while Honcamp and Schneller (1923) conclude that sheep cannot use urea. Krebs (1937) describes the stimulation of digestion in cattle by urea, and Voltz (1919) reports that ruminants can utilize urea in place of digestible proteins. He believes that bacteria can synthesize urea into protein, and that this protein is utilized by the animal. Morgen (1924) also believes that 40% of the nitrogen of a cattle ration can be replaced by urea. Carstens and Prufer (1938) are of the opinion that laying hens do not utilize urea. Kriss and Marcy (1939) do not find urea to be of any value for rats. The purpose of this investigation is to ascertain whether a portion of the protein nitrogen of the accepted growing ration used for chickens in this station may be replaced by an equivalent amount of casein or by an equivalent amount of urea.

EXPERIMENTAL

One hundred day-old chicks, hatched from eggs from the college flock, were wing-banded, individually weighed, and divided into three lots. These were placed into battery brooders where they received similar care and were weighed weekly. Three rations were used.

For Lot 1, the regular growing ration containing yellow corn, whole wheat, alfalfa, dried milk, dried meat scraps, minerals, and cod-liver oil was employed. This is termed the control ration.

Lot 2 received a similar ration to which was added 10% casein in place of the meat scraps. This is referred to as the casein ration.

Lot 3 received the so-called urea ration, 2.5% urea being substituted for an equivalent amount of meat scraps, calculated upon the nitrogen content basis. The growth curves plotted from the average weekly weights are shown in the accompanying charts. The growth of lot 2 is indicated in Figure 2 by the highest curve and that of those receiving the regular growing ration by the middle curve, while the lowest curve represents those consuming the urea. From these curves it is evident that casein constitutes a source of highly available protein. These observations concerning the use of casein have been previously reported from this laboratory. It is believed that this better growth is due in part to the decrease in the amount of ash in the ration as well as to the fact that casein is a splendid source of nitrogen. The results indicate that the chicks in lot 3 derived no supplement from the urea; in fact, their growth corresponded to that of chicks consuming a ration without supplement. Figure 1 shows this in an even more convincing manner. The casein-consuming chicks were not only heavier, but better feathered and more matured. It is often said that animals have little ability to synthesize proteins from simple materials, but are dependent upon plants or bacteria to prepare a more or less complex protein for their utilization. It has been postulated that bacteria in the digestive tract of

ruminants may synthesize urea into a usable form. In the case of the chicken with a comparatively short digestive tract, it may be postulated that urea is not synthesized into protein owing to lack of bacterial action.

CONCLUSION

Casein furnishes a splendid source of protein for chick rations, while urea is apparently useless, presumably because of a lack of bacterial synthesis.

Since reporting this project the author has read research bulletin number 120, from the University of Nebraska, entitled, "The Utilization of Food Elements by Growing Chicks" IX. "The Nitrogen of Urea," by C. W. Ackerson, W. E. Ham, and F. E. Mussehl, in which the authors have arrived at practically the same conclusions by another method.

LITERATURE CITED

Carstens, P. and J. Prufer, 1938. Zuchlungskunde 13: 109.

Honcamp, F. and E. Schneller Biochem. Z. 138: 461.

Krebs, Kurt, 1937. Biedermanns Zentr. B. Tierernähr. 9: 394.

Kriss, Max and L. F. Marcy, 1939. J. Nutrition 19: 151.

Morgen, A. et al., 1924. Landw. Vers. Sta. 103: 1.

Nehring, K. and W. Schramm 1937. Landw. Vers. Sta. 128: 191.

Voltz, Z. 1919. Spiritusind. 42: 223.

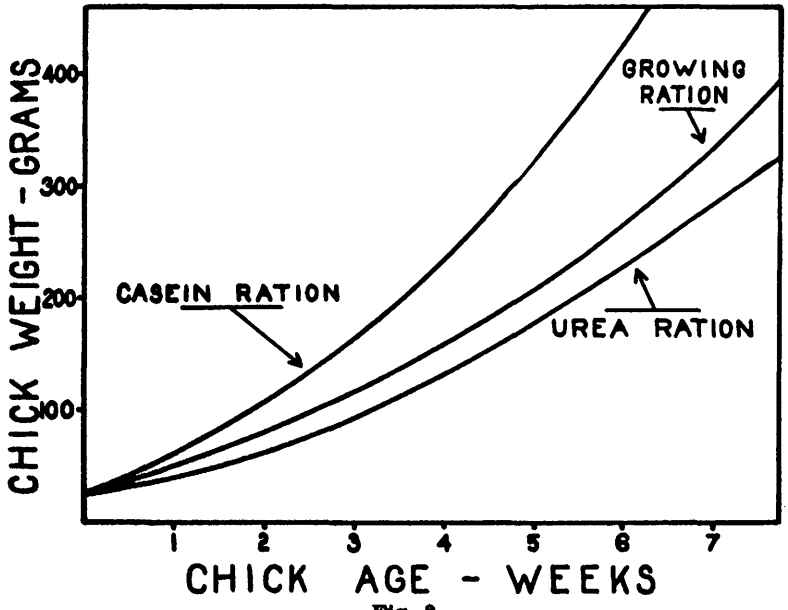

Fig. 2