Table IV. Results of Protein Assay Using Protein-Depleted Rats

Protein Source	Protein % in ration (N × 6.25)	Rat Weight, G. Initial	Rat Weight, G. Final	Rat Weight, G. Gain	Food Intake, G. Food	Food Intake, G. Protein	Gain,[a] G./G. Protein
Casein, gelatin, DL-methionine	9.61	199.7	233.3	33.7	136.3	13.10	2.57±0.06
Casein	9.53	195.6	234.8	39.2	138.7	13.22	2.96±0.03
Lactalbumin	9.88	199.4	249.7	50.2	140.8	13.91	3.61±0.14

[a] Mean and standard error of mean.

5.72% of the protein from casein, 2.56% of the protein from gelatin, and 0.1% from DL-methionine. The amino acid values were taken from published tables (*1*) and were not determined on the preparations fed. In assay 5 the deficit of these three amino acids was corrected by adding crystalline amino acids to the lactalbumin ration. The addition of these three amino acids significantly increased the nutritive value of lactalbumin.

Assay 6 was carried out at a dietary level of 9% of protein and during a second repletion period, but it adequately confirms the findings of assay 3 (12% of protein, first repletion period) with respect to the superiority of casein over lactalbumin as the sole source of protein for the chick. When fed in combination with gelatin and DL-methionine, casein and lactalbumin give approximately equal performance. Lactalbumin was substituted for casein on an equal protein basis.

To compare chick and rat responses, three of the proteins assayed on chicks were fed to protein-depleted rats according to the method of Cannon as modified by Wissler (*9*). Mature rats were fed a protein-free ration until they had lost approximately 27% of their original body weight. The depletion period was 32 days. During the 10-day assay period they were fed diets containing 9% protein. Each assay diet was fed to 9 rats. The results of this rat assay on the casein, gelatin, and DL-methionine mixture, casein and lactalbumin are given in Table IV. The composition of the casein, gelatin, and DL-methionine mixture was the same as that used in the chick ration containing 9% protein from this source. The mixture of casein, gelatin, and DL-methionine was significantly lower in nutritive value than the other two proteins for the rat. Lactalbumin was significantly superior to casein.

Discussion

In biological studies, it is most desirable to work directly with the species of animal to which the results will be applied. The data reported herein show that it is practical to apply to the chick, with a minimum of modification, certain techniques and equipment intended for rats. Considering the well known differences in amino acid requirements of chicks and rats and the differences in growth response to the same protein noted in these data, the chick should be the test animal of choice in evaluating proteins intended for poultry rations.

In early exploratory work, two 4-week growth tests were carried out on chicks. In these tests, chicks were held in battery brooders for 3 weeks on a ration containing one half the amounts of casein, gelatin, and DL-methionine present in the complete ration shown in Table I. They were then placed in individual cages and fed test rations containing approximately 13% of the protein from the casein, gelatin, and DL-methionine mixture, casein, and lactalbumin. Average gain per gram of protein consumed under these conditions were as follows: casein, gelatin, and DL-methionine mixture, 2.23 grams; casein, 1.34 grams; and lactalbumin, 0.71 gram. Whereas these three protein sources occupied the same relative positions with respect to nutritive values as they did in the weight regeneration method, the growth response of casein and lactalbumin was small and it seemed unlikely that satisfactory assays could be carried out at lower levels of protein in the ration.

Using the protein-depleted chick, it is possible to carry out satisfactory assays at dietary levels of 6.5, 9, or 12% of protein. Thus it is possible to assay a wide variety of poultry ration ingredients including those which contain a small amount of protein. The authors' experience has mostly been with rations containing 9% of protein as products in which interest centered could be fitted into this type of ration.

The superiority of lactalbumin over casein, as the sole source of protein for the rat, has been adequately demonstrated (*6*, *8*), but there are species differences in this respect as shown by Mueller (*7*). The results of the present study show that casein is superior to lactalbumin as the sole source of protein for the chick. However, no single source of protein is ever relied upon in any practical poultry ration.

The quality interrelationships of individual milk proteins to cereal and seed meal proteins as they occur in poultry rations is beyond the scope of this paper. This assay method could, however, be applied to such mixtures.

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Corrections

Spectrophotometric Semimicrodetermination of Ergosterol in Yeast

On page 36 [J. Agr. Food Chem. **5**, 360 (1957)] in Figure 1, curve 1 should represent 24(28)-dehydroergosterol and curve 2, ergosterol.

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Stability of Certain B Vitamins Exposed to Ethylene Oxide in the Presence of Choline Chloride

On page 957 [J. Agr. Food Chem. **4**, 956 (1956)] in the second line of the first column, the word "corn" should have been "cornstarch."

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