7190 P

# Nutritive Value of Raw and Heated Casein With and Without Added Amino-acids.

ETHELYN O. GREAVES AND AGNES FAY MORGAN.

*From the Laboratory of Household Science, University of California, Berkeley.*

Experiments previously reported[1] have shown a loss in nutritive value of wheat gluten and casein when these proteins had been exposed to a temperature of 150 C. for 30 minutes. In an attempt to determine the site of injury to the protein molecule thus indicated new experiments have been made using supplements of various amino-acids to the diets containing raw and heated casein.

The casein in the present series was heated uniformly at 140°C. in a thin layer for 30 minutes. The growth of young rats fed diets containing various levels of the raw and heated casein as sole sources of protein and the nitrogen balance or biological value of such diets for mature rats were used as criteria of the nutritive efficiency of the proteins. These procedures were then repeated, the diets being supplemented with various amino-acids. The methods are described in a former publication.[1]

*Results of Growth Experiments.* Young rats fed for 28 days from weaning diets containing raw and heated casein at 9, 12, 15, 18, and 22% levels grew better in all cases on the raw casein. Eight to 16 rats were used for each diet tested. The food intakes were quite similar but the resulting growth was in all cases less when the heated casein was used. The gain in weight per gram of protein eaten was greatest at the 12% level for both raw and heated casein and decreased slightly with each increase in level. However, the difference between the two types of diet, raw and heated, remained nearly the same, 0.20 to 0.34, at all levels, the values being 2.10 to 1.61 for the raw, and 1.76 to 1.40 for the heated diet.

The 12 and 15% raw and heated casein diets were then fed, supplemented by 0.2% lysine, histidine, tyrosine, cystine and tryptophane respectively. Again 8 to 16 rats were used in each case, except with the tryptophane, lysine and histidine on which groups of 6 animals each were fed. The tryptophane and tyrosine supplements did not increase the growth promoting value of either the raw or the heated casein. The cystine increased the growth promoting effect of both raw and heated casein uniformly about 15% above

[1] Morgan, A. F., King, F. B., Boyden, R. E., and Petro, V. A., *J. Biol. Chem.*, 1931, **90**, 771.

the unsupplemented values but the difference between the raw and heated proteins was still maintained. It seems probable that the cystine is not the damaged part of the molecule.

Both lysine and histidine supplements increased the value of the heated casein without affecting that of the raw. The gains per gram of protein eaten became 1.89 and 1.96 in these cases instead of 1.76 for the unsupplemented heated diet as compared with 2.00 and 2.14 for the supplemented and 2.10 for the unsupplemented raw diet. Both lysine and histidine appear to be injured by the heating process.

*Results of Biological Value Determinations.* The method suggested by Mitchell[2] was that used for the nitrogen balance determinations. Eight young adult male and 8 similar female rats were the subjects and all diets were made up containing 9% crude casein. Biological values were determined in duplicate on each of these rats with raw and heated casein alone and when supplemented by 0.2% (of the diet) cystine, tyrosine and lysine. The values obtained were for raw casein 68 and for heated casein 58. Addition of tyrosine made no change, cystine increased both values equally, lysine increased only that for the heated casein. Thus the difference between values for raw and heated protein unsupplemented is 10, supplemented with tyrosine 10, supplemented with cystine 12, but supplemented with lysine is only 3.

It is concluded that heating casein for 30 minutes at 140°C. produces a definite change in the lysine and histidine fraction of the protein which results in a measurable lowering of its nutritive value to rats.

## 7191 P

### Effect of Feeding Egg Yolk on Liver Lipids of Rats.

RUTH OKEY, EDITH YOKELA AND GEORGIAN KNOCK.

*From the Laboratory of Household Science, University of California, Berkeley.*

The deposition of fat and sterol-ester in the livers of animals fed diets rich in cholesterol has been reported by a number of workers. The following is a report of one of a series of experiments made to determine the influence of other dietary constituents than sterol on this lipid deposition in the livers of rats.

The experimental diet fed contained dried egg yolk powder 25.3%,

[2] Mitchell, H. H., *J. Biol. Chem.*, 1924, **58**, 873.