CXCIV. NOTE ON THE NUTRITIVE VALUE OF "GLAXO" AND "LIGHT WHITE" CASEINS

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(Received 12 July 1937)

COWARD *et al.* [1929] described a puzzling variation in response of vitamin A-deficient rats to large doses of cod liver oil, influenced apparently by the character of the casein used in the basal diets. The two varieties of casein used were Glaxo, a vitamin-free commercial casein, and light white (B.D.H.) casein. Rats which had ceased to grow on the former resumed growth when the latter was substituted in the basal diet, even though the light white casein had been thoroughly extracted with alcohol and ether. However, these extracts when fed separately with Glaxo casein were not equal in growth-promoting potency to the original light white casein, a fact which militated against the theory that a new fat-soluble accessory was concerned in the matter. The authors were convinced nevertheless that a deficiency in the nutritive value of the Glaxo casein as protein was not the sole explanation. Coward *et al.* [1931] further compared the growths of rats on diets containing light white casein, untreated, extracted with alcohol and ether and heated in the manner used in the production of Glaxo casein. The extraction made little difference in growth response and the heating destroyed only part of the assumed growth factor present in the light white casein.

Table I. *Comparison of growth values of Glaxo and light white caseins
fed at 8-10% levels*

	Glaxo casein	Light white casein	Raw casein (California)	Casein (California) heated at 140° for 30 min.
No. of rats	17	17	9	9
Length of period, days	35	35	28	28
Diet, % protein	8.5	8.5	9.1	9.9
Mean protein intake, g.	16.1	15.8	17.5	16.9
Range of protein intake, g.	13-19	14-19	14-20	14-20
Initial weights, g.	56	59	44	44
Mean gain, g.	27	26	37	29
Range of gains, g.	23-36	21-41	21-50	21-43
Mean gain per g. protein eaten	1.69	1.64	2.10	1.71

Through the courtesy of Dr Coward samples of the two kinds of casein actually used in these experiments were obtained and a comparison of both their growth and maintenance values carried out according to the procedures in use in this laboratory.

As shown in Table I, the growths obtained in two groups of young rats carefully paired as to litter, sex and food intake over a period of 35 days were practically the same on the two diets. These diets were made up of protein 8.5 (N=1.36), Crisco (hydrogenated cottonseed oil) 20, agar 4, Osborne and Mendel salt mixture 4, cornstarch to make 100. Supplements of Harris yeast

vitamin extract 100 mg. and cod liver oil 2 drops were given separately daily to each animal. The raw casein with which these British samples were compared is an acid-precipitated commercial product prepared in California which has been used in this laboratory in all the protein growth tests [Morgan, A. F., 1931] and for vitamin-free diets (after suitable extraction in the latter case). This casein, heated for 30 min. at 140°, was also fed at the same time. Obviously both British caseins are of lower biological value than the local raw casein and are of about the same growth value as the heat-treated casein prepared in this laboratory (Table I). Certainly there is no advantage in the use of the light white as compared with the Glaxo product. Whatever processes of manufacture are used in the preparation of both these caseins reduce their growth-promoting powers equally.

Another comparison of the four caseins was made with adult rats using the nitrogen balance method for determination of biological value. The technique previously described was used [Morgan, A. F., 1931] and results (Table II) with

Table II. *Comparison of biological values of various caseins as obtained on adult rats fed at 7 to 9 % level*

No. of rats	No. of periods	Daily food intake g.	Type of casein	Average body weight of rats g.	Daily N intake mg.	Faecal N mg.	Urinary N mg.	Food N absorbed mg.	Food N retained mg.	True digestibility %	Biological value
16	32	9	Raw	208	109	21	76	104	72	96	69
	32	10	Heated	202	139	27	98	130	74	93	57
	32	14	Low N	228	104	25	48	—	—	—	—
6	18	10	Glaxo	307	126	19	117	124	62	98	50
	18	9	Light white	339	134	21	124	129	66	96	51
	24	14	Low N	290	104	27	51	—	—	—	—

the California caseins were entirely similar to those often determined in this laboratory, 69 for the raw and 57 for the heated casein. Again the Glaxo and light white caseins were found to be alike and of the order of value of the laboratory-heated product, with biological values of 50 and 51. Since the digestibilities of all the caseins were quite similar, losses from the digestive tract could not account for the low biological values seen in three of the products.

A decreased growth rate due to the low nutritive values of these two caseins, Glaxo and light white, might well be expected, particularly since the level at which they were fed by Coward *et al.* [1929] was low, 15 % or about 12 % true protein. At such a level, growth of young rats on the raw casein has been found in this laboratory to be subnormal, slightly less than 2 g. per day, and on the heated protein, 1.7 g. per day. Therefore the improvement brought about by the substitution of "light white" for Glaxo casein in the experiments of Coward *et al.* [1929] must be ascribed to something other than superior value as protein.

SUMMARY

The growth values of Glaxo and light white caseins were estimated in growth per g. of protein eaten at 8–10 % level in the diet in 4 or 5 weeks by weanling rats. These were found to be alike and low, 1.6 to 1.7, as compared with the growth produced by raw acid-precipitated casein, 2.1, and similar to the value found for the raw casein heated at 140° for 30 min., 1.7.

Maintenance values of the same four caseins obtained by the nitrogen balance method with adult rats and expressed as "biological values" were in the same

order, the raw casein 69, heated casein 57, and Glaxo and light white 50 and 51.

Depressed growth might be expected from the use of the last two products in vitamin tests, particularly if fed at so low a level as 15 %, but such superiority as has been seen in the light white casein over the Glaxo cannot be ascribed to any better value as a protein.

REFERENCES

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