

# Director's Digest



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## Blood Proteins as Nutrients

Protein recovered from the plasma of bovine blood was found to sustain normal growth when fed to young rats as the sole source of dietary nitrogen. The companion protein fraction isolated from the hemoglobin is deficient in but one amino acid and gives the same growth performance when supplemented with isoleucine according to the results of an investigation conducted at Texas A&M University under sponsorship of the Fats and Proteins Research Foundation.

Despite a world-wide shortage of food protein the use of proteins from slaughterhouse blood has, with few exceptions, remained unexploited. These proteins, which have been isolated as bland, almost colorless powders, could serve as valuable protein sources in foods. Recovery of the proteins and their emulsifying properties were announced in earlier issues of the Director's Digest (No. 96, June 20, 1972 and No. 106, April 26, 1973).

Complete rations differing only in the source of protein were fed to 24-day old rats (ten per group) for periods of one to three weeks. These diet compositions are given in Table I.

Table I: Composition of diets (g/100 g on air-dried basis)

Constituent	Diet I (Casein)	Diet II (Plasma)	Diet III (Globin)	Diet IV (Globin + Ile)
Protein	10.0	11.2	10.8	10.8
Cornstarch	70.0	68.8	69.2	68.0
Corn Oil	10.0	10.0	10.0	10.0
Cellulose	5.0	5.0	5.0	5.0
Salt mixture	4.0	4.0	4.0	4.0
Vitamin mixture	1.0	1.0	1.0	1.0
Antioxidant	0.1	0.1	0.1	0.1
DL-Isoleucine	--	--	--	1.2

When, after one week, it became apparent that the globin-containing diet was causing a severe weight loss, one half of group III was continued for the remaining two weeks on the globin diet supplemented with isoleucine. Table II summarizes the weight gains for the three week feeding trial.

Table II

Protein efficiency ratio and weight change of rats fed blood protein diets.

Group	Protein Source	No. in Group	Initial <sup>a</sup> Body wt. (g.)	Gain in <sup>a</sup> Body wt. (g./3 wks)	Protein <sup>a</sup> Intake (+ Standard Error) (g./3 wks)	P.E.R
I	Casein	10	61.4	45.4	23.4	1.94 ± 0.08
II	Plasma	10	60.9	46.4	21.6	2.15 ± 0.08
III	Globin	5	61.3	-23.3	12.1	-1.93 ± 0.12
IV	Globin & Globin <sup>b</sup> + DL-Isoleucine	5	62.3	11.0	17.2	2.24 ± 0.12 <sup>c</sup>

- a) All weights represent means for group.
- b) Rats in group IV were fed Diet III for 1 week and Diet IV for the following 2 weeks.
- c) P.E.R. for this group would not be strictly comparable to the other values, and is shown as "apparent P.E.R."

Protein efficiency ratios (P.E.R.) were calculated by dividing average total protein intake into average weight gain per animal in each of the groups. The five rats remaining on the globin diet showed signs of severe protein deficiency which led to death after six weeks. Those five rats receiving the isoleucine-supplemented globin diet, however, recovered rapidly from the deficiency. After the third week it was evident that those groups on plasma protein and isoleucine-supplemented globin actually outperformed in weight gains those rats receiving the reference standard diet containing casein as the protein source (Figure 1.)

Although the plasma and globin proteins have not as yet been commercialized, blood would appear to provide a nutritionally valuable and economically competitive source of protein supplements for the future. Reprints of this article entitled "Nutritive Value of Globin and Plasma Protein Fractions from Bovine Blood" by C. R. Young, R. W. Lewis, W. A. Landmann and C. W. Dill, which was published in Nutrition Reports International, 8, (4) 211-217 (1973), are available upon request from the FPRF office.

Figure 1.

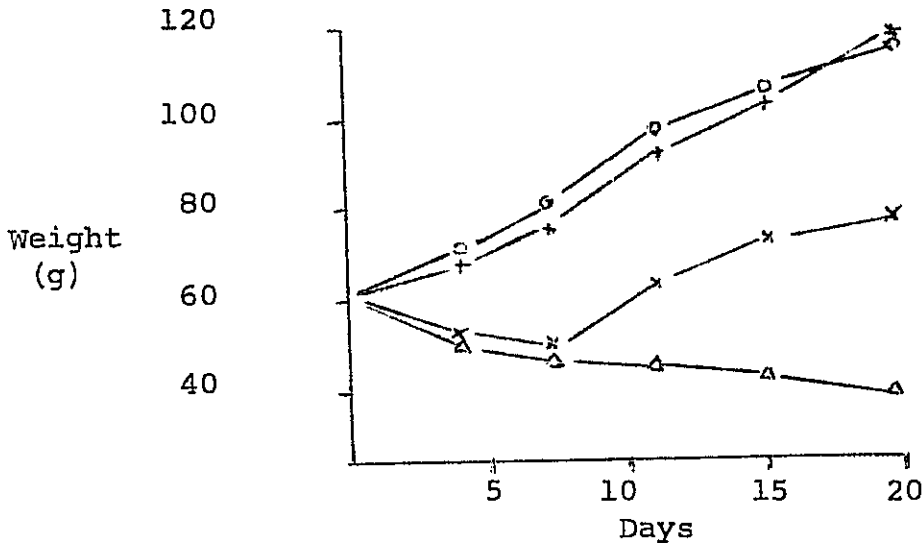


Figure 1 - Growth rate (mean body weight) of rats fed diets whose protein sources were casein (O), plasma (+), globin (Δ) and globin plus isoleucine supplement after the first week (X) for the experimental period.