

EFFECT OF DIETARY PROTEIN ON THE PLASMA FREE AMINO ACIDS OF RABBITS

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Rabbits fed low-fat, cholesterol-free semipurified diets containing casein rapidly become hypercholesterolaemic and develop atherosclerosis (Roberts 1981). When soy-protein isolate is substituted for casein the animals maintain normal low levels of plasma cholesterol. Experiments with amino acid mixtures suggest that the effect of casein is at least partly due to its amino acid composition (Carroll 1981). This raised the possibility that the proteins may be affecting the plasma free amino acid pool and in so doing affecting the plasma cholesterol level.

To study this possibility, two groups of rabbits (Castle Hill Laboratory White) were maintained on low-fat, cholesterol-free semipurified diets containing either casein or soy-protein isolate. In the first experiment, after 17 weeks, animals from each diet were starved overnight, blood was collected by heart puncture and plasma was separated and analysed, after deproteinising, for amino acids. In the second experiment, after 7 weeks, animals were starved as before but fed at 0900 hours and blood taken 4 h later. Thus both fasting and post-prandial aminograms were obtained.

As expected, the mean plasma cholesterol concentrations increased in those fed casein compared to those fed soy. In the fasting state, total circulating levels of free amino acids were higher in casein-fed rabbits. However, the only significant ($P < 0.05$) differences in individual amino acids were higher levels of histidine and methionine in those fed casein. In the fed state there was no difference in total free amino acids. Of individual amino acids, lysine was higher ($P < 0.01$) and arginine lower ($P < 0.01$) in casein-fed animals than in those fed soy. This resulted in a significantly higher lysine/arginine ratio in the casein-fed animals (3.5 ± 0.09 vs 1.2 ± 0.16 ; Mean \pm SEM).

Mean (\pm SEM) plasma cholesterol (mg/dL) and free amino acid (nmol/mL) concentrations

	Fasting		Post-prandial	
	Casein (6)	Soy (6)	Casein (5)	Soy (6)
Total cholesterol	314 \pm 90	66 \pm 9	111 \pm 13	50 \pm 11
Total amino acids	3496 \pm 239	2994 \pm 126	2258 \pm 284	2295 \pm 149
Histidine	192 \pm 10	129 \pm 10	90 \pm 9	77 \pm 4
Methionine	76 \pm 5	54 \pm 5	42 \pm 7	194 \pm 8
Lysine	339 \pm 24	266 \pm 30	257 \pm 15	194 \pm 8
Arginine	170 \pm 19	146 \pm 18	73 \pm 7	164 \pm 17

Since rabbits tend to nibble continuously, the results for the post-prandial free amino acids probably reflect the main plasma situation. Kritchevsky (1979) has suggested, and provided evidence for, the ratio of lysine to arginine in the diet being important in the development of hypercholesterolaemia and atherosclerosis. Rabbits fed a soy-protein diet supplemented with lysine to augment the lysine/arginine ratio to that of casein (2.0) became hypercholesterolaemic. The difference in plasma amino acids reported here for the fed state would support that hypothesis.

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