



Dietary soybean protein and serum cholesterol

Dear Sir:

In their recent metabolic ward study, Grundy and Abrams (1) fed liquid formula diets, containing either casein or soy protein as the sole protein source, to 14 patients. It was found that the type of dietary protein, which was the only dietary variable, had no effect on the level of plasma total cholesterol and the distribution of cholesterol between lipoprotein fractions. These results agree with the lack of differential effect of diets differing only in their protein constituents, which were soy protein or a mixture of animal proteins, on the level of serum total cholesterol in hypercholesterolemic subjects, as reported by Holmes et al (2) and Shorey et al (3).

Grundy and Abrams (1) wondered why their results were different from those obtained by Sirtori and colleagues (4, 5). The latter workers reported that soy protein feeding in type II hyperlipoproteinemic patients reduced the level of plasma cholesterol by 20 to 30% (4, 5). As also pointed out by Grundy and Abrams (1), the consumption of the soybean protein diet in the studies of Sirtori and coworkers (4, 5) also involved other changes in the diet, including the elimination of dietary cholesterol. It is thus not possible from these studies to assess the effect of the dietary protein independently.

However, quite a number of studies have been published in the last few years in which the type of protein was the only dietary variable, and most of these were not discussed by Grundy and Abrams (1). These studies reported either a small effect or no effect of the type of dietary protein on serum lipoproteins in short-term controlled experiments in healthy subjects, and a slightly larger effect in hyperlipemic patients. Thus Wolfe et al (6) found that replacement of animal protein by soybean protein signifi-

cantly lowered plasma cholesterol by 14% in hypercholesterolemic men. These workers also found a remarkable lowering of serum triglycerides in their patients, a finding now confirmed by Grundy and Abrams (1). Goldberg et al (7) reported that soybean protein, when compared to animal protein, resulted in a significant reduction in the plasma concentration of total cholesterol by about 4% in type II hypercholesterolemic patients. Our own controlled studies with healthy volunteers (8, 9) have demonstrated that casein, when compared to soybean protein isolate, did not significantly affect the level of serum total cholesterol. However, the diet containing soybean protein isolate caused a slight decrease in cholesterol in the low-density lipoproteins, and a slight rise in the cholesterol concentration in the high-density lipoproteins; these differences being significant (8, 9). The changes resulted in a 7 (9) to 14% (8) increase in the high-density/low-density lipoprotein cholesterol ratio. It was remarkable that this effect was found only with soybean protein isolate and not with a cruder concentrate (9). This does not support the suggestion (1) that differences in the type of soy protein used are a cause of the differences between the results of Sirtori and coworkers (4, 5) and of other groups. There are some slight differences between the results of the various trials (1-3, 6-9) in which dietary protein was the only variable, but these could well be due to chance, because in most experiments the samples studied were quite small.

Thus when all the experiments done up until now are considered, it would appear that soybean protein, when compared to casein or other animal proteins added to the diet, has only a small effect or no effect at all on the level of serum cholesterol in man. In contrast, in various animal species, especially the rabbit, soybean protein has been

shown to have a pronounced hypocholesterolemic action compared with casein. When young rabbits were fed duplicate portions of the diets fed to our volunteers, the casein diet caused 50% higher serum cholesterol levels than the soybean protein diet within 2.5 wk (8). This indicates a species-dependent sensitivity to dietary protein. However, it is also possible that an experimental period of 4 to 6 wk, the length of time most experiments are carried out, is not long enough to observe a protein effect in humans. Furthermore, it is conceivable that in young, rapidly growing infants clear effects of the type of dietary protein might be seen, because the hypercholesterolemic effect of casein was only observed in young growing rabbits and not in their mature counterparts (10).

AC Beynen, PhD

Department of Laboratory Animal Science
Veterinary Faculty
State University of Utrecht
3508 TD Utrecht
The Netherlands

*CE West, PhD
JMA Van Raaij, PhD
MB Katan, PhD*

Department of Human Nutrition
Agricultural University
6703 BC Wageningen
The Netherlands

References

1. Grundy SM, Abrams JJ. Comparison of actions of soy protein and casein on metabolism of plasma lipoproteins and cholesterol in humans. *Am J Clin Nutr* 1983;38:245-52.
2. Holmes WL, Rubel GB, Hood SS. Comparison of the effect of dietary meat versus dietary soybean protein on plasma lipids of hyperlipidemic individuals. *Atherosclerosis* 1980;36:379-87.
3. Shorey RL, Bazan B, Lo GS, Steinke FH. Determinants of hypocholesterolemic response to soy and animal protein-based diets. *Am J Clin Nutr* 1981;34:1769-78.
4. Sirtori CR, Agradi E, Conti F, Mantero O, Gatti E. Soybean-protein diet in the treatment of type-II hyperlipoproteinaemia. *Lancet* 1977;1:275-7.
5. Descovich GD, Ceredi C, Gaddi A, et al. Multi-center study of soybean protein diet for outpatient hypercholesterolaemic patients. *Lancet* 1980;2:709-12.
6. Wolfe BM, Giovanetti PM, Cheng DCH, Roberts DCK, Carroll KK. Hypolipidemic effect of substituting soybean protein isolate for all meat and dairy protein in the diets of hypercholesterolemic men. *Nutr Rep Int* 1981;24:1187-97.
7. Goldberg AP, Lim A, Kolar JB, Grundhauser JJ, Steinke FH, Schonfeld G. Soybean protein independently lowers plasma cholesterol levels in primary hypercholesterolemia. *Atherosclerosis* 1982;43:355-68.
8. Van Raaij JMA, Katan MB, Hautvast JGAJ, Hermus RJJ. Effects of casein versus soy protein diets on serum cholesterol and lipoproteins in young healthy volunteers. *Am J Clin Nutr* 1981;34:1261-71.
9. Van Raaij JMA, Katan MB, West CE, Hautvast JGAJ. The influence of diets containing casein, soy isolate, and soy concentrate on serum cholesterol and lipoproteins in middle-aged volunteers. *Am J Clin Nutr* 1982;35:925-34.
10. West CE, Deuring K, Schutte JB, Terpstra AHM. The effect of age on the development of hypercholesterolemia in rabbits fed semipurified diets containing casein. *J Nutr* 1982;112:1287-95.

Plasma pyridoxal phosphate in diabetics

Dear Sir:

We read the article by Hollenbeck et al (1) on the adequacy of a high carbohydrate diet in diabetes with great interest. We are especially interested and intrigued by the findings of low levels of pyridoxal phosphate (Pal-P) in these young diabetic women. This laboratory has been performing analyses of Pal-P for many years. Our normal values are 20 to 60 nmol/l in plasma. With increasing

age there is a tendency to lower values (2).

Pal-P was determined in 133 diabetic patients. Among 32 children less than 18 yr old only one had Pal-P below normal values. This patient had a HbA1 value of 17.7% and is known to be totally negligent in the management of his disease, both regarding diet and insulin. Of the 101 older patients not less than 26 had Pal-P less than 20 nmol/l.

Their mean age was somewhat higher,