

## THE ROLE OF SAPONINS IN THE ADSORPTION OF BILE ACIDS BY DIETARY FIBRE

DAVID OAKENFULL\* and DOROTHY E. FENWICK\*

It has been proposed that dietary fibre may lower plasma cholesterol in man (Burkitt & Trowell, 1975) possibly by adsorption of bile acids which are consequently lost *via* the faeces. Replenishment of the body bile acid pool is accomplished by an increase in hepatic catabolism of cholesterol.

Saponins are amphiphilic non-ionic compounds of plant origin consisting of a hydrophobic steroid or triterpene group attached to a sugar residue. They are strongly surface active and are not absorbed from the gastrointestinal tract. Although it has been shown that many plant fibre fractions do, indeed, bind bile acids *in vitro* (Eastwood & Hamilton, 1968) on investigation we found that only those fibre preparations containing saponins showed significant adsorption.

Fibre fractions were prepared by finely chopping plant material and extracting first with water at 100°C and then with ethanol (78°C) and acetone (25°C). In those tissues with a high protein content, the material was additionally digested with pronase. Adsorption was determined by shaking the dry fibre preparation with either sodium cholate or sodium deoxycholate and measuring the change in free bile acid concentration.

Only the preparations containing saponins were found to significantly adsorb bile acids, i.e. soya beans, mung beans, chick peas, spinach and sunflower seeds. Non-absorbing fibre included lemon albedo, 'dry grain' (a residue from brewing), apple, sawdust, wheat bran, rolled oats and lignin. When saponins were removed (by Soxhlet extraction with 80% ethanol-water) binding was abolished.

Plant materials which contain saponins have hypocholesterolaemic effects in man or experimental animals (Horlick *et al.*, 1967; Mathur *et al.*, 1968) whereas wheat bran, which is devoid of saponins, has no effect (Truswell & Kay, 1976). The present experiments indicate that this cholesterol-lowering effect of dietary fibre which contains saponins could be due to increased faecal bile acid excretion. It may therefore be suggested that diets high in foods which contain saponins could be of therapeutic benefit in the control of elevated plasma cholesterol.

## REFERENCES

- BURKITT, D.P. & TROWELL, H.C. (1975). 'Refined Carbohydrate Foods and Disease'. Academic Press, London.
- EASTWOOD, M.A., & HAMILTON, D. (1968). *Biochim. biophys. Acta* **152**, 165.
- HORLICK, L., COOKSON, F.B., & FEDEROFF, S. (1967). *Circulation* **35-36**, 11.
- MATHUR, K.S., KHAN, M.A., & SHARMA, R.D. (1968). *Br. med. J.* *i*, 30.
- TOPPING, D.L., HOOD, R.L., ILLMAN, R.J., STORER, G.B. & OAKENFULL, D.G. (1978). *Proc. Aust. Nut. Soc.* **3**.
- TRUSWELL, A.S., & KAY, R.M. (1976). *Lancet* *i*, 367.

---

\*CSIRO Division of Food Research, P.O. Box 52, North Ryde, N.S.W. 2113