

HOW DIETARY SAPONINS LOWER PLASMA CHOLESTEROL

D.G. OAKENFULL and G.S. SIDHU

Plant foods rich in saponins - chickpeas, alfalfa and soybean, for example - are known to be hypocholesterolaemic. Animal feeding experiments have shown that some saponins directly cause an increase in the faecal excretion of cholesterol while others cause the elimination of cholesterol indirectly by increasing the faecal excretion of bile acids (Topping et al. 1980). We present evidence for a molecular interaction of certain saponins and bile acids which reduces reabsorption of bile acids from the small intestine.

Viscometry, light scattering, fluorescence and dialysis techniques were used to study interactions between bile acids (mainly cholate) and purified saponins from soybean, soapwort (*Saponaria officinalis*) and quillaja (*Quillaja saponaria*). Intestinal absorption was measured by circulating in vivo appropriate isotonic solutions containing the purified saponins (1.0%), bile acids (3.0 mM) and L-leucine (2.5 mM) through twin loops of rat intestine of approximately equal length - upper (U) and lower (L) - from the entire length of the jejunum and ileum (for details see Oakenfull and Sidhu 1983).

The physico-chemical studies showed strong interactions between cholate and soybean or soapwort saponins which when fed are known to increase faecal excretion of bile acids. In aqueous solution large micelles are formed, containing several hundred molecules of cholate and saponin in an elongated 'stack'. The formation of these micelles reduced the rate of dialysis of cholate and to a smaller extent of L-leucine. This was reflected in inhibitions of absorption of cholate and L-leucine by the intestinal loops.

Rate constants for absorption (10^5 min^{-1} per cm length) of sodium cholate and L-leucine by loops of rat intestine in vivo (means and standard errors are given)

| Treatment | Cholate | | L-leucine | |
|------------|-------------------------|--------------|---------------------------|--------------------------|
| | U | L | U | L |
| No saponin | 7.2 ± 0.6 | 20.2 ± 1.8 | 38.4 ± 2.9 | 43.2 ± 3.0 |
| Soybean | 4.1* ± 0.7 | 6.8*** ± 1.4 | 30.03 ^{NS} ± 3.1 | 27.7** ± 3.5 |
| Soapwort | 4.8** ± 0.9 | 9.1** ± 0.8 | 28.4* ± 3.6 | 35.4 ^{NS} ± 2.8 |
| Quillaja | 6.3 ^{NS} ± 1.6 | 12.7** ± 1.0 | 15.9*** ± 1.4 | 23.9*** ± 1.6 |

Statistical significance with respect to no saponin treatment:

NS not significant; * P < 0.05; ** P < 0.01; *** P < 0.001

Quillaja saponin, which has a smaller effect on faecal excretion of cholate (Topping et al. 1980), also showed a smaller effect on cholate absorption than the other two saponins. The nutritional significance of the effects of the three saponins on L-leucine absorption remains to be explored.

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