DIETARY N-6 AND N-3 FATTY ACIDS AFFECT FAECAL CHOLESTEROL EXCRETION IN RATS VIA DIFFERENT MECHANISMS

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Type of dietary fat consumed influences cholesterol levels and metabolism in man and animals. Recent animal studies have demonstrated that n-6 fatty acids lower plasma cholesterol levels which is accompanied by a parallel increase of cholesterol level in the liver tissue (Garg et al 1988), suggesting that n-6 fatty acids may not lower overall body cholesterol levels but may merely redistribute the exchangeable cholesterol body pools. On the other hand n-3 fatty acids of plant or marine origin lower plasma and/or hepatic cholesterol levels (Garg et al. 1988). The present experiments were carried out to elucidate further the mechanisms by which dietary n-6 and n-3 fatty acids modulate cholesterol metabolism.

The effect of n-6 and n-3 fatty acids enriched diets on plasma and liver cholesterol as well as on faecal excretion of neutral sterols and bile acids were examined. To examine this, 28 male Sprague-Dawley rats were divided into four groups (n=7) and were fed a isocaloric, isocholesterolemic, nutrionally adequate diet containing 20% (w/w) fat for four weeks. The diets contained high amounts of either beef tallow, sunflower oil, linseed oil or fish oil. Rat faeces were collected on a weekly basis and blood and livers were obtained at the end of the feeding period.

	Cholesterol Excretion (mg/day)		
	Total	Neutral Sterols	Bile Acids
Tallow	17.73 ± 2.63^{a}	12.13 ± 1.53^{a}	5.60 ± 2.00^{a}
Sunflower Oil	27.54 ± 3.13^{b}	22.22 ± 2.96^{b}	5.33 ± 1.62^{a}
Linseed Oil	26.53 ± 2.09^{b}	16.68 ± 0.93^{c}	10.97 ± 2.78^{b}
MaxEPA Oil	17.39 ± 2.05^{a}	12.45 ± 2.36^{a}	4.94 ± 1.58^{a}

Values without a common superscript are significantly different $P<0.05$

The cholesterol content of the serum was not affected by any of the diet treatments. Liver cholesterol was significantly increased in animals fed the n-6-enriched diet. There was a significant increase in the faecal excretion of neutral sterols in the n-6 fatty acid group. Fish oil or linseed oil diet had no effect on the excretion of neutral sterols. Feeding α-linolenic-enriched diet significantly increased the excretion of bile acids, however fish oil diet had no effect on bile acid excretion. The sunflower diet showed also a significant rise in bile acid excretion, but to a lesser extent than the linseed oil diet. Surprisingly, fish oil diet had no effect on cholesterol levels in the rats fed this diet.

These data suggest that n-6 and n-3 fatty acids affect cholesterol excretion by different mechanisms. N-6 fatty acids appear to be increasing the flow of cholesterol from liver into bile and subsequently into faeces. N-3 fatty acids seem to be affecting the metabolism of cholesterol into bile acids, leading to higher excretion in the faeces.

GARG, M.L., SEBOKOVA, E., WIERZBICKI, A.A., THOMSON, A.B.R. and CLANDININ, M.T. (1988). Lipids 23: 847.

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