METABOLIC FATE OF CHOLESTEROL IN RATS FED DIETS CONTAINING CANOLA OIL OR SAFFLOWER OIL

M.L. GARG

Type of dietary fat consumed influences cholesterol levels and metabolism in man and animals. Human studies examining the effects of dietary fats on cholesterol metabolism involve supplementing/altering the diet with particular fatty acids and then examining the lipoprotein cholesterol levels. A major limitation of these human studies is that they do not reveal what is happening at the tissue levels. For instance, feeding diets enriched with n-6 fatty acids reduces plasma cholesterol level but this is accompanied by a parallal increase in the liver cholesterol content (Garg et al. 1988), which may impair liver function. If this is true for humans, then the beneficial role of n-6 polyunsaturated fatty acids becomes questionable. The hypothesis, that canola oil, rich in monounsaturated and n-3 fatty acids lowers total body cholesterol unlike safflower oil rich in n-6 fatty acids which merely redistribute the exchangeable body cholesterol pools was tested.

Male weanling Sprague-Dawley rats, weighing between 40-50g were fed a semi-synthetic, isocaloric, nutritionally adequate diet containing 20% (w/w) fat but differing in the type of fat fed i.e. 180g beef tallow plus 20g safflower oil per kg of the diet (Control, BT diet), 200g safflower oil per kg of the diet (Safflower oil, SFO diet) and 200g canola oil per kg of the diet (Canola oil, CO diet).

	DIET		
	BT	SFO	CO
Serum Cholesterol (mg/dL)	160 ± 13^a	92 ± 9^b	131 ± 6^c
HDL-Cholesterol (mg/dL)	68 ± 14^a	50 ± 2^b	66 ± 12^a
Liver Cholesterol (mg/g)	5.2 ± 0.4^a	6.5 ± 0.2^b	5.8 ± 0.3^a

Values without a common superscript are significantly different, $p < 0.05$.

There was a significant reduction in the HDL-cholesterol concentration following the feeding of SFO diet whereas CO feeding had no effect. The cholesterol content in the hepatic tissue was increased by SFO diet while the CO had no significant effect as compared to the BT diet. Triacylglycerol concentration in the serum was lowered by both the SFO and CO diets to the same extent when compared to the BT diet. The level of triacylglycerol in the liver was not significantly altered by any of the diet treatments. To study the exchangeable body cholesterol pools, the rats were intubated with 1 μCi of ^{14}C-cholesterol (dissolved in 0.5 ml of the respective fat already being fed) and radioactivity incorporated into serum, liver, heart. spleen at various time intervals was determined. Feeding canola oil or safflower oil containing diets had no significant effect on the distribution of ^{14}C-cholesterol activity in various pools examined.

These data suggest that the liver accumulation of cholesterol following the feeding of a diet rich in safflower oil containing high levels of n-6 fatty acids may not be due to transfer of cholesterol from blood to the tissue pools. The possibility, that high dietary load of n-6 fatty acids may produce deficiency of lipotropic factors such as methionine, choline and cobalamin resulting into cholesterol accumulation in the liver, is currently being investigated.

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

Discipline of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, The University of Newcastle, New South Wales 2308