IDENTIFICATION AND QUANTIFICATION OF CHOLESTEROL OXIDES IN FOODS

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It is well established that elevated plasma low density lipoprotein (LDL) levels are associated with an increased risk of developing cardiovascular disease. Recently it has been established that oxidised LDL are more readily internalised by macrophages compared with native LDL. This oxidation is thought to be the result of polyunsaturated fatty acid oxidation. The role of cholesterol oxidation in LDL modification however remains unclear, although studies indicate that it is the oxidatively modified forms of cholesterol which are potenetially more atherogenic than 'pure' cholesterol itself (Hubbard et al. 1989).

The aims of this project were to test a variety of Australian foods for their content of the following common cholesterol oxides: cholesterol 5α,6α-epoxide, 4β-hydroxycholesterol, 7α–hydroxycholesterol, 7β-hydroxycholesterol, 22-ketocholesterol, 20α–hydroxycholesterol, 7-ketocholesterol, 25-hydroxycholesterol and cholestane-3β,5α,6β-triol. Total lipids were extracted using chloroform-methanol followed by saponification. The non-saponifiable cholesterol oxides were then extracted and concentrated using diethyl ether. Finally, quantification occurred using capillary gas liquid chromatography .

Food (n=3)	Total cholesterol oxides mg/ g lipid	mg/ 100g edible portion	% of total cholesterol
Eggs			
Fresh Egg Yolk	none detected	none detected	–
Fried Egg Yolk	0.4 ± 0.1	3.0 ± 0.3	2.1 ± 0.2
Boiled Egg Yolk	1.7 ± 0.2	15.6 ± 1.5	6.1 ± 0.6
Whole Egg Powder	1.0 ± 0.1	19.5 ± 1.6	4.4 ± 0.4
Egg Yolk Powder	1.2 ± 0.1	46.2 ± 2.1	4.9 ± 0.2
Baby Food			
Egg and Steak	0.6 ± 0.1	0.5 ± 0.1	10.4 ± 1.3
Egg Custard	1.0 ± 0.1	0.5 ± 0.1	11.2 ± 0.8
Infant Milk Formulas			
Brand 1	0.4 ± 0.1	6.5 ± 0.6	13.1 ± 0.8
Brand 2	0.6 ± 0.1	10.1 ± 1.6	31.7 ± 5.0
Biscuits			
Brand 1	0.1 ± 0.1	3.0 ± 0.1	11.8 ± 0.8
Brand 2	0.3 ± 0.1	15.8 ± 1.7	78.6 ± 8.0
Brand 3	0.4 ± 0.1	10.0 ± 0.8	45.3 ± 3.3
Brand 4	0.7 ± 0.1	14.2 ± 1.3	84.1 ± 5.0
Brand 5	0.7 ± 0.1	13.9 ± 1.1	59.1 ± 2.5

These findings indicate that cholesterol oxides are present in foods in small quantities. The levels detetected both in fresh egg yolk and the egg powders are consistent with those published in the literature (Eun Pie et al. 1990). The significance of this in terms of atherosclerosis still remains unknown.

EUN PIE, J., SPAHIS, K. and SEILLAN, C. (1990) J. Agric. Food Chem. 38: 973.
HUBBARD, N.A., ONO, M.S. and SANCHEZ, A. (1989) Prog. Food Nutr. Sci. 13: 17.

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