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Would Circulating Cholesteryl Esters be Considered as Markers for Fatty Acid Composition of the Human Retina?

L. Bretillon¹, N. Acar¹, S. Gregoire¹, G. Thuret², A. M. Bron³, P. Gain² and C. Creuzot-Garcher³,¹

¹INRA, University of Burgundy, Eye & Nutrition Research Group, Dijon, France
²University Hospital, Biology, Engineering and Imaging of Corneal Grafts, JE2521, University Jean Monnet, Saint Etienne, France
³Ophthalmology, University Hospital, Dijon, France

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Abstract

Purpose: Lecithin Cholesterol Acyl Transferase (LCAT) and Cholesteryl Ester Transfer Protein (CETP) are the main lipid transfer proteins which activities are involved in the metabolism of cholesteryl esters (CE) in LDL and HDL. Active remodeling of circulating lipoproteins has been reported in the retina and retinal pigment epithelium (RPE). We previously published that CE in RPE/choroid may participate to the metabolism, and possibly uptake of dietary fatty acids in the retina, especially linoleic acid that is typically of dietary origin (Bretillon et al. Exp. Eye Res. 2008;87,521-528). In the present work, we questioned whether circulating CE fatty acid composition, LCAT and CETP activities may be markers for fatty acid profile of the retina.

Methods: Eyeballs were collected from nine human donors (body donation to science). The neuroretina was dissected from RPE/choroid, and a piece of the extra orbital fat was collected. Blood was sampled, and plasma was separated from red blood cells. Plasma phosphatidylcholine (PC), triglycerides and CE were prepared. The fatty acid composition of the neuroretina, phospholipids and cholesteryl esters of RPE/choroid, extra-orbital fat, plasma fractions and red blood cells was determined by gas chromatography. Estimates of LCAT and CETP activities were calculated from fatty acid data. Correlation coefficients were calculated to determine associations between adipose tissue fatty acid composition, LCAT and CETP estimates and fatty acid in the ocular structures.

Results: The higher linoleic acid in plasma CE, plasma PC and adipose tissue, the greater linoleic acid in PL from RPE/choroid (r=0.96, 0.94 and 0.87, p<0.001, respectively). Linoleic acid in plasma CE also mirrored linoleic acid in the neuroretina (r=0.65, p=0.05). DHA (docosahexaenoic acid from the omega 3 series) in PL from RPE/choroid and LCAT activity were in association with each others (r=0.67, p<0.05). Similarly, linoleic acid in the neuroretina was closely associated with circulating LCAT activity (r=0.73, p=0.03). No association was found with CETP activity.

Conclusions: Circulating CE and LCAT activity are potent markers for the fatty acid composition of the human retina. Such markers may be useful tools in intervention trials, especially in those testing the prevention of retinal aging and age related macular degeneration by omega 3 fatty acids.

Keywords: lipids • nutritional factors • retina