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Red Blood Cell Levels of Choline-Phospholipids as a Mirror of Retinal and Optic Nerve Compositions: Human Data

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Abstract

Purpose: The lipid composition of red blood cell membranes is currently admitted to reflect that of nervous tissues, including the retina and the optic nerve. We have shown previously specific alterations of red blood cell levels of individual species of phosphatidyl-cholines (PC) and plasmeyl-cholines (PlsC) in primary open angle glaucoma (POAG) patients (Acar *et al*, *Exp Eye Res* 2009: 840-853). In order to assign these circulating modifications to ocular changes, the aim of this work was to identify in humans, plausible associations in the levels PC and PlsC between red blood cells, retina and optic nerve.

Methods: Red blood cells, retinas and optic nerves were collected from nine donors (body donation to Science). Following lipid extraction, total phospholipids were isolated using silica cartridges. The individual species of PC and PlsC were quantified by HPLC-ESI-MS/MS on a triple quadrupole MS instrument. Correlations were estimated for each compound to determine plausible associations between circulating and tissue concentrations.

Results: Several associations were found between red blood cell and retinal and/or optic nerve levels of individual species of PC and PlsC. For PlsC, the associations were mainly with the optic nerve whereas they were restricted to the retina for PC. PlsC18:1/22:4 in red blood cells was positively associated with PlsC18:1/16:0 in the optic nerve ($r=0.75$, $p=0.04$) and PlsC18:0/22:4 with PlsC18:1/22:4 and PlsC18:1/20:2 ($r=0.82$, $p=0.02$ and $r=0.91$, $p=0.004$, respectively). On the other hand, PC18:0/22:6 in red blood cells was positively associated with PC18:1/22:6 and PC22:6/22:6 in the retina ($r=0.67$, $p=0.003$ and $r=0.74$, $p=0.01$, respectively).

Conclusions: The red blood cell concentrations of some individual species of PlsC and PC appear to reflect their levels in the optic nerve and in the retina, respectively. Since PlsC are known to be concentrated in myelin and PC in retinal cells, the alteration of their levels in red blood cells of POAG patients may suggest optic nerve demyelination and retinal cell loss processes.

Keywords: lipids • retina • optic nerve

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