

Long-chain and very long-chain polyunsaturated fatty acids in ocular aging and age-related macular degeneration

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Retinal long-chain polyunsaturated fatty acids (LC-PUFAs, C12-C22), play important roles in normal human retinal function and visual development, and some epidemiological studies of LC-PUFAs intake suggest a protective role against the incidence of advanced age-related macular degeneration (AMD). On the other hand, retinal very long-chain PUFAs (VLC-PUFAs, Cn>22) have received much less attention since their identification decades ago due to their minor abundance and more difficult assays, but recent discoveries that defects in VLC-PUFA synthetic enzymes are associated with rare forms of inherited macular degenerations have refocused attention on their potential roles in retinal health and disease. We thus developed improved gas chromatography coupled with mass spectrometry (GC-MS) methods to detect LC-PUFAs and VLC-PUFAs, and we then applied them to the study of their changes in ocular aging and AMD. With ocular aging, some VLC-PUFAs in retina and retinal pigment epithelium (RPE)/choroid peaked in middle age. Compared to age-matched normal donors, docosahexaenoic acid, adrenic acid and some VLC-PUFAs in AMD retina and RPE/choroid were significantly decreased, while the ratio of n-6/n-3 PUFAs was significantly increased. All these findings suggest that deficiency of LC-PUFAs and VLC-PUFAs, and/or an imbalance of n-6/n-3 PUFAs may be involved in AMD pathology.