

Studies on age pigments evolving into a new theory of biological aging

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Abstract

A variety of age pigment-like fluorophores have been recognized, identified and investigated during the past three decades. They are mainly the end-products of various side-reactions of essential biological processes. Among these, the lipid peroxidation-related fluorophores formed via aldehyde-protein crosslinking are of general importance. Fluorescent advanced glycation end-products formed during glycation/Maillard reactions, are oxygen independent, carbohydrate-associated age pigment-like substances. Age pigments, particularly those identified in retinal pigment epithelium, represent another type of age pigment that originates from polyenic biomolecules, including retinoids and carotenoids. Various alpha beta-unsaturated aldehydes can also react with the amino groups of nucleotides to induce biological alteration. Although age pigments can be produced from different types of biological materials, the crosslinking of carbonyl and amino compounds is a common toxiferous process during biological life. In the context of various aging phenomena and degenerative diseases, this process may constitute an essential mechanism of aging--the carbonyl toxification process of biological aging.