

Abstract

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Polyunsaturated fatty acids ameliorate aging via redox-telomere-antioncogene axis.

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OBJECTIVE: Polyunsaturated fatty acids (PUFA), a group of nourishing and health-promoting nutrients, ameliorate age-related chronic diseases. However, how PUFA especially n-3 PUFA exert anti-aging functions remains poorly understood. Here we link fish oil, docosahexaenoic acid (DHA) and arachidonic acid (AA) to the aging etiology via a redox-telomere-antioncogene axis based on D-galactose-induced aging mice.

FINDINGS: Both fish oil and PUFA enhanced hepatic superoxide dismutase (SOD) and catalase activities and cardiac SOD activities within the range of 18%-46%, 26%-65% and 19%-58%, respectively, whereas reduced cerebral monoamine oxidase activity, plasma F2-isoprostane level and cerebral lipid peroxidation level by 56%-90%, 20%-79% and 16%-54%, respectively. Thus, PUFA improve the in vivo redox and oxidative stress induced aging process, which however does not exhibit a dose-dependent manner. Notably, both PUFA and fish oil effectively inactivated testicular telomerase and inhibited c-Myc-mediated telomerase reverse transcriptase expression, whereas n-3 PUFA rather than n-6 PUFA protected liver and testes against telomere shortening within the range of 13%-25% and 25%-27%, respectively. Therefore, n-3 PUFA may be better at inhibiting the DNA damage induced aging process. Surprisingly, only DHA significantly suppressed cellular senescence pathway evidenced by testicular antioncogene p16 and p53 expression.

CONCLUSION: This work provides evident support for the crosstalk between PUFA especially n-3 PUFA and the aging process via maintaining the in vivo redox homeostasis, rescuing age-related telomere attrition and down-regulating the antioncogene expression.

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