Abstract

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Docosahexaenoic acid supplementation fully restores fertility and spermatogenesis in male delta-6 desaturase-null mice.

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BACKGROUND: Delta-6 desaturase-null mice ((-/-)) are unable to synthesize highly unsaturated fatty acids (HUFAs): arachidonic acid (AA), docosahexaenoic acid (DHA), and n6-docosapentaenoic acid (DPAn6). The (-/-) males exhibit infertility and arrest of spermatogenesis at late spermiogenesis.

OBJECTIVE AND METHODS: To determine which HUFA is essential for spermiogenesis, a diet supplemented with either 0.2% (w/w) AA or DHA was fed to wild-type ((+/+)) and (-/-) males at weaning until 16 weeks of age (n = 3-5).

RESULTS: A breeding success rate of DHA-supplemented (-/-) was comparable to (+/+). DHA-fed (-/-) showed normal sperm counts and spermiogenesis. Dietary AA was less effective in restoring fertility, sperm count, and spermiogenesis than DHA. Testis fatty acid analysis showed restored DHA in DHA-fed (-/-), but DPAn6 remained depleted. In AA-fed (-/-), AA was restored at the (+/+) level, and 22:4n6, an AA elongated product, accumulated in testis. Cholesta-3,5-diene was present in testis of (+/+) and DHA-fed (-/-), whereas it diminished in (-/-) and AA-fed (-/-), suggesting impaired sterol metabolism in these groups. Expression of spermiogenesis marker genes was largely normal in all groups.

CONCLUSION: In conclusion, DHA was capable of restoring all observed impairment in male reproduction, whereas 22:4n6 formed from dietary AA may act as an inferior substitute for DHA.

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