Long-chain (n-3) polyunsaturated fatty acids are more efficient than alpha-linolenic acid in improving electroretinogram responses of puppies exposed during gestation, lactation, and weaning.

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Long-chain PUFAs (LCPUFAs) are essential for proper neural and retinal development in many mammalian species. We investigated puppies born to dogs fed diets containing varying amounts of vegetable and marine (n-3) fatty acids during gestation/lactation. The fatty acid compositions of dogs' milk and puppy plasma phospholipids were evaluated, and electroretinographic responses of the young dogs were determined after they were weaned to the same diets. Dogs' milk fatty acid composition reflected the diets fed during gestation/lactation. The milk of dogs fed a high alpha-linolenic acid (ALA) diet was enriched in ALA but not docosahexaenoic acid (DHA). Puppies fed this ALA-enriched milk accumulated more plasma phospholipid DHA than the low (n-3) fatty acid group. However, this accumulation was less than that obtained in puppies fed preformed DHA during development and suckling ($P < 0.05$). Electroretinograms (ERGs) of 12-wk-old puppies revealed significantly improved visual performance in dogs fed the highest amounts of (n-3) LCPUFAs ($P < 0.05$). These puppies demonstrated improved rod response (improved amplitude and implicit time of the a-wave, $P < 0.05$). Puppies from the low (n-3) fatty acid group exhibited the poorest ERG responses compared with the high-marine or high-vegetable (n-3) groups. A novel parameter devised in this study, the initial intensity at which the a-wave was detectable (i.e., threshold intensity), also demonstrated that retinal response of puppies consuming the (n-3) LCPUFA-containing diets occurred at lower light intensity, thereby exhibiting greater rod sensitivity, than the other diet groups. These findings indicate that preformed dietary (n-3) LCPUFA is more effective than ALA in enriching plasma DHA during perinatal development and results in improved visual performance in developing dogs.

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