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Food quality effects of unsaturated fatty acids on larvae of the zebra mussel Dreissena polymorpha

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ABSTRACT: In standardized growth experiments, newly hatched larvae of the zebra mussel Dreissena polymorpha were fed diets representing different biochemical compositions. Algae that were rich in (n-3) polyunsaturated fatty acids (PUFAs), except for long-chained (>C18) PUFAs (Chlorella minutissima and Monoraphidium minutum) were of low food quality. Higher growth than on C. minutissima or M. minutum was supported by a culture of the cyanobacterium Aphanothece sp., which contained traces of a long-chained (n-3) PUFA, docosahexaenoic acid (DHA, 22: 6n-3). The alga Isochrysis aff. galbana, which contained high amounts of the longchained (n-3) PUFAs DHA and eicosapentaenoic acid (EPA, 20 : 5n-3), supported the highest growth. The alga Nannochloropsis limnetica, which differed from I. galbana by a deficiency in DHA, allowed slightly, but significantly lower, growth. Growth of larvae on N. limnetica was increased by enrichment of N. limnetica cells with a lipid extract of I. galbana, showing that larval growth on N. limnetica was limited by the deficiency of a compound that was present in I. galbana. Growth was also enhanced by feeding N. limnetica cells supplemented with DHA, but not by cells enriched with EPA, indicating that DHA was the limiting factor. We conclude that, on DHAdeficient food, the larvae of D. polymorpha were not able to sufficiently convert C18-PUFAs into long-chained (n-3) PUFAs and that the rates for elongation and desaturation of EPA into DHA limited growth.

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