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Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) Mass Production Strategy

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ABSTRACT

Feeding the growing world population, particularly in developing countries, is the grand challenge of the future. This holds true not only on a quantitative basis, but qualitative as well. Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA) are highly unsaturated fatty acids (HUFA) of the ω-3 family which are important for brain and nerve development of infants and for the prevention of coronary heart diseases. Since humans are uncapable of synthisizing EPA and DHA, their requirement for those nutrients must be supplied with their food.

In principle, EPA and DHA can only be produced by fish, whether marine or fresh water. EPA and DHA in marine fishes originated from their feed, i.e. micro-organisms and plankton rich in both HUFAs, while fresh water fish have the ability to synthesize both from precursors lonolenic (18:3n) and linoleic (18:6n) acids. In addition, it should be remembered that in fish, most fatty acids are localized in eggs because egg is the place where fat and protein are stored during the process of vitellogenesis. For that reason, for the present, the fastest way of successful EPA and DHA mass production should be through fish egg production.

The freshwater nilem fish (*Osteochilis hasselti*) is the most appropriate fish for egg production. Feminisation technique of nilem fish could reach 80% from seed population with a time period for the formation of eggs, calculated from hatching, being around 6 month and ratio between egg- and body-weight of around 10%.

In addition to characteristics, the biosynthesis ability to make EPA and DHA of nilem fish should be elucidated. This can only be carried out by trials utilizing labelled precursors (^{14}C-linoleate and ^{3}H-linolenate), thus the pathways can be revealed. From information on the biosynthetic pathway, the optimal precursor composition in fish ration can be obtained for maximal EPA and DHA production and the respective enzymes involved known. With the advance in biotechnological engineering techniques, the responsible genes for the expression of the enzyme could be identified for use to insert in other fishes of consumer's preference (e.g. gourami, other common carp, eel, etc.). After conclusion of all these stages of studies, we are confident that food products from fish will have high EPA and DHA contents to ensure more intelligent population than is the situation today.