

Lecithin Extracted from a Marine Source in the Form of Nanoliposomes Promotes Neural Network Arborization and Formation in Primary Neuronal Cultures

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Phospholipids, the main constituents of liposomes, in brain membranes, contain different polyunsaturated fatty acids (PUFA) that are critical for nervous system function and structure. The main PUFA in the brain are docosahexaenoic acid (DHA), derived from the omega-3 fatty acid, alpha-linolenic acid, arachidonic acid (AA) and docosatetraenoic acid, the last two of which derived from the omega-6 fatty acid, linoleic acid. Several studies have demonstrated the positive relevance of purified omega-3 and omega-6 PUFAs in brain structure and function. In this work, we developed highly specific natural nanoliposomes, extracted by low temperature enzymatic process without any organic solvent. Administration of these nanoliposomes to primary cortical neurons results in a significant increase of metabolic activity. Furthermore, the nanoliposomes from salmon lecithin promote neurite outgrowth and dendritic arborization. Our data suggest that the variety of fatty acids composition, especially mono and polyunsaturated fatty acids and different lipid classes, can significantly improve the formation and activity of neuronal networks. Nanoliposomes derived from natural sources such as fish can be used as carrier systems to transport MUFAs and PUFAs. These systems will not only be prepared from lecithins in an innovative green enzymatic extraction process that does not involve any solvents, but promise to be very efficient drug carriers.