真核微生物類による長鎖多価不飽和脂肪酸含有リン脂質の生成と低温適応性

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Formation of long-chain polyunsaturated fatty acid-containing phospholipids and cold-temperature adaptability in eukaryotic microorganisms

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Long-chain polyunsaturated fatty acids (LCPUFAs) such as eicosapentaenoic acid (EPA), arachidonic acid (ARA), and docosahexaenoic acid (DHA) are known to have various physiological functions. Ethyl ester of EPA is commercially used as an antithrombotic drug. Much attention is paid to DHA, because it has anti-allergic, anti-Alzheimer's dementia, and many other physiological functions. The source of these LCPUFAs is now mostly marine fish-oil, that is, triacylglycerols (TGs) that were esterified with EPA, ARA, or DHA. However, LCPUFA-containing TG taken-in by humans, for example, must be metabolized into free fatty acids and then LCPUFA in a free acid form converted to their Coenzyme A or acyl-carriert protein derivatives. On the other hand, LCPUFAs are building structures of membrane phospholipids (PLs) of various humans' tissues such as nervous and reproductive organs, where LCPUFA-containing PLs exhibit various physiologically important roles. Although marine fish-oil is the major source of LCPUFAs, it has complex fatty acid composition, which makes the cost of preparation of highly pure individual LCPUFA oils very high. To overcome these problems eukaryotic microorganisms that produce LCPUFAs have become another source of LCPUFAs. Actually, oils produced by fermentation of eukaryotic microorganisms such as *Crypthecodinium cohnii*, a dinoflagellate, are now commercially available. In this case, however, the molecular form of LCPUFAs is TG. Recently, we developed the method to produce DHA-containing PLs using a thraustochytrid-like microorganism which is known to accumulate DHA as TG. The method (a glucose-starvation method) is schematically shown in Figure 1 and can be employed to produce PLs that are esterifies with various types of LCPUFAs. Thus produced PUFA-containing PLs are expected as a source of another type of PUFAs. In this study, physiology, particularly their cold-temperature adaptability, of eukaryotic microorganisms accumulating LCPUFA-containing TG and those accumulating LCPUFA-containing PLs are presented.

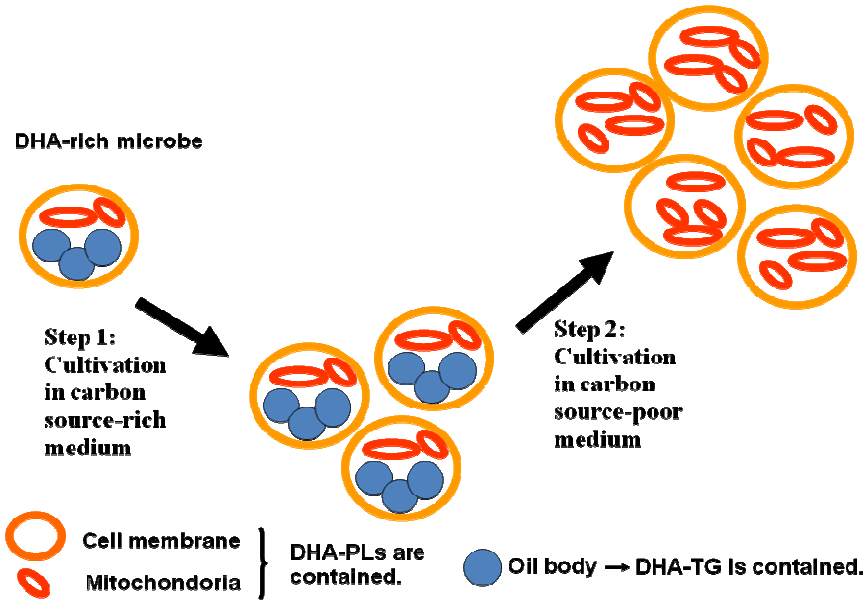

Figure 1. Schematic presentation of the glucose-starvation method to produce DHA-containing PLs (DHA-PLs) from DHA-containing TG (DHA-TG).

References

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