

好冷菌および耐冷菌の脂質－その機能評価

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Lipids of psychrophilic and psychrotrophic bacteria, previous and current perspectives

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Microbial membranes consist of various types of polar lipids which serve as a hydrophobic matrix of the cell. Fatty acid constituents of the polar lipids have important functions in regulating membrane fluidity. Particularly, the membrane modulating function of unsaturated fatty acids at low temperature has been regarded as a dogma. In this presentation, 52 mostly new reported cold-adapted bacteria (psychrophiles and psychrotrophs) from 33 genera were used to compare their polar lipid and fatty acid compositions in the adaptation to cold environments. The bacteria were placed into three possible groupings, based on their habitat isolated, growth temperature range as well as Gram staining. The lipid composition of psychrophilic and psychrotrophic bacteria varies depending on taxonomy and the groupings above, with no unifying characteristics specific to cold-adapted bacteria. However, the distribution of some fatty acids was relatively specific. Monounsaturated fatty acids, which are produced from saturated fatty acids by oxygen-dependent fatty acid desaturases are major fatty acid components in psychrophilic and psychrotrophic bacteria. Long chain polyunsaturated fatty acids (LCPUFAs) such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are products of polyketide synthase that does not require molecular oxygen to introduce double bonds to the fatty acids, were exclusively found in Gram negative, marine bacteria. Such LCPUFAs are considered not only to be a modulator of membrane fluidity at low temperature but also serve other functions as well while iso and anteiso branched fatty acids were found more in Gram positive, terrestrial and psychrotrophs. Psychrotrophs exhibited greater fatty acid diversity than psychrophiles, which appears to be an adaptation for a wider growth temperature range compared to the specialized psychrophiles

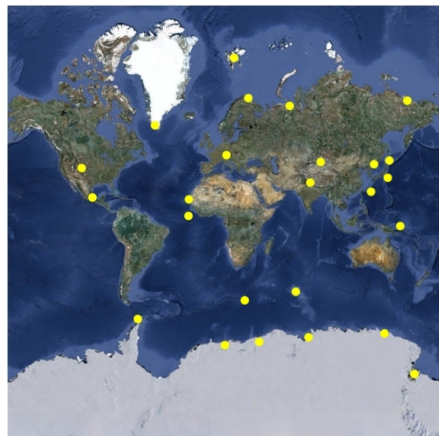


Figure 1: Distribution of microorganisms included in the investigation on lipid and fatty acid compositions of psychrophiles and psychrotrophs. Samples outside the polar zone were obtained from cold mountain peaks or deep sea. Yellow dots mark the site of isolation.

Reference:

Bin Haji Mohd Taha A.I., Ahmed, R.Z., Motoigi, T., Watanabe, K., Kurosawa, N., Okuyama, H., 2012, Lipids in cold-adapted microorganisms. *In* Yumoto eds., *Cold-adapted Microorganisms*, Horizon Scientific Press, UK, in press.