耐冷菌の脂肪酸組成とその生育温度依存性

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Effects of Growth Temperature on Fatty Acid Composition of Psychrotolerant Bacteria

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Psychrophiles are defined as organisms that have optimal growth temperature below 15°C and maximal growth temperature below 20°C. Psychrotolerant microbes are able to grow at low temperatures with lower rates, and they have growth optima in the range of mesophiles. These extremophiles are good model organisms for study of cold adaptation strategies of lives. However, the number of the isolates which are truly psychrophilic or psychrototerant is still insufficient to discuss about general features and mechanisms of cold adaptation of lives.

In order to find novel psychrophiles, we have isolated a large number of bacterial strains from Antarctic soil. Some of the isolates showed psychrophilic or psychrotolerant growth properties, and in particular, strains SA4127, SA4129, SA4125 grew well at -5°C. Strain SA4127 was aerobic rods, motile, and psychrophilic. It grew optimally around 10°C, and did not grow at 20°C. Strain SA4129 and SA4125 were also aerobic rods, motile, and grew optimally around 15 and 25°C, respectively.

The figure 1 shows growth temperature ranges of the three strains and major fatty acids of the cells growing at 10°C. In general, some of cold adapted organisms are thought to prefer a kind of polyunsaturated fatty acids (PUFAs) such as eicosapentaenoic acid which contributes for liquidity of the cell membrane at low temperature. However, no PUFA was detected from the three isolates, indicating that they adapted cold environment by alternative strategies. In order to clarify this point, we have investigated the effects of growth temperature on fatty acid composition of the three isolates.

The results of GC-MS analysis indicated that the fatty acid compositions of the cells were regulated in different patterns between the strains. The strategies for liquidity of the bacterial cell membrane may be more complicated than previously thought.

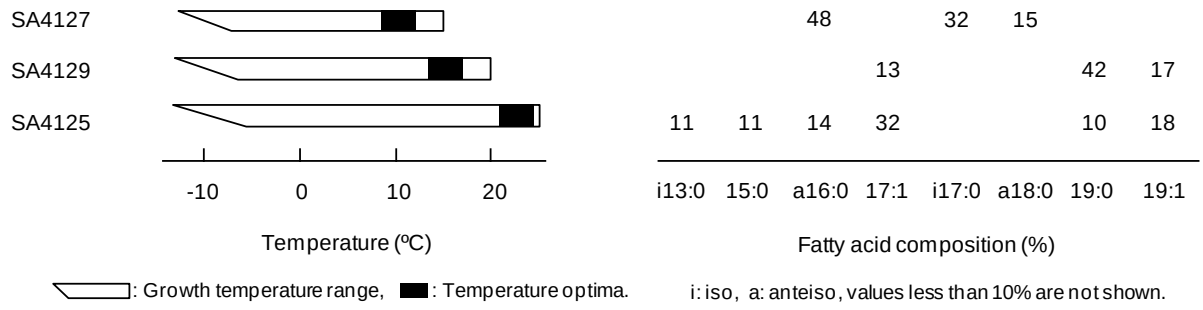

Figure 1. Growth temperature ranges and major fatty acids of starains SA4127, SA4129, and SA4125.
The fatty acids were extracted from the cells growing at 10°C.