

OCCURRENCE AND DIVERSITY OF POLYHYDROXYALKANOATE-PRODUCING BACTERIA IN ANTARCTIC SOILS

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Microorganisms are integral members of natural environments, being involved with primary production and the cycling of nutrients. Prokaryotes, in comparison with eukaryotes, are especially adaptive and they evolve more readily to survive even in extreme environments. The survival mechanisms evolved in prokaryotes have therefore attracted much scientific interests and studies.

Many bacteria naturally synthesise and accumulate polyhydroxyalkanoates (PHA) intracellularly, a phenomenon widely believed to be a means of storing nutrients for later use. Much is known about PHA-producing bacteria but these are mainly non-polar strains. The objective of this study is to first assess the occurrence of PHA-producing bacteria in Antarctic environments, then to assess the diversity based on the genetics of the PHA biosynthetic system which influence the types of carbon source that the bacteria could utilise to convert to PHA, and the chemical composition and properties of the PHA. The ability to synthesise PHA and the genetics of the producer bacteria may reflect a functional role for the bacteria and may indicate an evolutionary process in ecologically-distinct sites in Antarctica.

Bacteria were isolated from soils and sediments collected from protected and impacted sites around Casey station. The isolates were screened by 2 methods: by culturing in limiting medium containing Nile Red, and by staining the cells with Nile Blue A. Positive isolates were differentiated by the presence of the Type II PHA synthase genes which code for the key enzyme involved in the synthesis of the medium-chain-length PHA. This was determined by polymerase chain reaction using specific primers. The physiology and metabolism of Antarctic PHA-producing bacteria would be compared with tropical strains.