# Psychrophilic Bacteria Encyclopedia Article

## Psychrophilic Bacteria

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# Psychrophilic Bacteria

Psychrophilic (cold loving) **microorganisms**, particularly **bacteria**, have a preferential temperature for growth at less than 59° F (15° C). Bacteria that can grow at such cold temperatures, but which prefer a high growth temperature, are known as psychrotrophs.

The discovery and growing understanding of psychrophilic microorganisms has increased the awareness of the diversity of microbial life on Earth. More than 100 varieties of psychrophilic bacteria have been isolated from the deep sea. This environment is very cold and tends not to fluctuate in temperature. Psychrophilic bacteria are abundant in the near-freezing waters of the Arctic and the Antarctic. Indeed, in Antarctica, bacteria have been isolated from permanently ice-covered lakes. Other environments where psychrophilic bacteria have been include high altitude cloud droplets.

Psychrophilic bacteria are truly adapted for life at cold temperatures. The **enzymes** of the bacteria are structurally unstable and fail to operate properly even at room (or ambient) temperature. Furthermore, the membranes of psychrophilic bacteria contain much more of a certain kind of lipid than is found in other types of bacteria. The lipid tends to be more pliable at lower temperature, much like margarine is more pliable than butter at refrigeration temperatures. The increased fluidity of the membrane makes possible the chemical reactions that would otherwise stop if the membrane were semi-frozen. Some psychrophiles, particularly those from the Antarctic, have been found to contain polyunsaturated fatty acids, which generally do not occur in prokaryotes. At room temperature, the membrane of such bacteria would be so fluid that the bacterium would die.

Aside from their ecological curiosity, psychrophilic bacteria have practical value. Harnessing the enzymes of these organisms allows functions such as the cleaning of clothes in cold water to be performed. Furthermore, in the Arctic and Antarctic ecosystems, the bacteria form an important part of the food chain that supports the lives of more complex creatures. In addition, some species of psychrophiles, including *Listeria monocytogenes*, are capable of growth at refrigeration temperatures. Thus, spoilage of contaminated food can occur, which can lead to disease if the food is eaten. Listeriosis, a form of **meningitis** that occurs in humans, is a serious health threat, especially to those whose **immune system** is either not mature or is defective due to disease or therapeutic efforts. Other examples of such disease-causing bacteria include *Aeromonas hydrophila*, *Clostridium botulinum*, and *Yersinia enterocolitica*.