

Thermophiles their extreme environment and biological adaptations

The boiling point for water is 100°C. As with humans, the highest temperature at which most animals and plants can live is about 40°C. Above 50°C the only organisms that can survive the heat are some groups of bacteria and archaea.

A **thermophile** is an organism that thrives at relatively high temperatures, between 45 and 80 °C. Many thermophiles are archaea. It has been suggested that thermophilic eubacteria are among the earliest bacteria on the planet Earth.

As a prerequisite for their survival, thermophiles contain enzymes that can function at high temperature. Some of these enzymes are used in molecular biology (for example, heat-stable DNA polymerases for PCR), and in washing agents. (1)

The environment for thermophiles

Thermophiles are found in various geothermally heated regions of the Earth such as hot springs like those in Rotorua and deep sea hydrothermal vents.

Volcanic areas in many places of the world are associated with hot springs. The temperature of these hot springs can go up to 100°C. They are generally acidic and corrosive as well as being very hot. The cause of the hot spring areas is magma being close to the surface of the Earth and open to rain water which seeps into the ground (1)

Cyanobacteria in New Zealand

Floating mats of cyanobacteria are present in hot pools in most of New Zealand's geothermal areas. An exception is the Rotokawa region near Taupō, where most springs are highly acid, with very few cyanobacteria. The cyanobacteria can carry out photosynthesis in hot weather and not worry about the heat. Cyanobacteria can survive in hot springs because they have enzymes and these enzymes let them survive. These enzymes allow other life processes to continue. Respiration for example would be carried out so as the cyanobacteria can reproduce. All life processes are fitted to hot water conditions. (2)