

THE ECOLOGY OF MICROORGANISMS

1

The following reading passage mentions some groups of microorganisms capable of living in different environmental conditions. Try to match the names of the microorganisms with the descriptions, then read the passage and check if you were right.

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|------------------|--------------------------|---|
| a. barophiles | <input type="checkbox"/> | 1. organisms capable of growing at a moderate temperature |
| b. halophiles | <input type="checkbox"/> | 2. organisms capable of growing at a low temperature |
| c. mesophiles | <input type="checkbox"/> | 3. organisms capable of growing at a high temperature |
| d. osmophiles | <input type="checkbox"/> | 4. organisms capable of growing in a salty environment |
| e. psychrophiles | <input type="checkbox"/> | 5. organisms capable of growing under high environmental pressure |
| f. thermophiles | <input type="checkbox"/> | 6. organisms capable of growing under high osmotic pressure |

Microorganisms are ubiquitous and make up a significant percentage of the total biomass on the earth. One of the most important factors affecting the rate of microbial growth is the environmental temperature. There is a minimum temperature below which growth will not occur. Above an optimum temperature there is a rapid drop in the rate of growth.

Most microorganisms are capable of growth in a temperature range of 20-30°C. Most microorganisms have a growth optimum between 20 and 40°C and are called mesophilic. However, those inhabiting cold environments such as polar areas can grow at much lower temperatures. These microorganisms are called psychrophilic and may cause trouble in food stored in refrigerators over a long period. Other microorganisms called thermophiles can grow at temperatures as high as 80-100°C, when the great majority of living organisms would rapidly die. In fact, it seems that microorganisms can grow at any temperature as long as water is in a liquid state. A distinction must be drawn between growth and survival. Although most microorganisms are rapidly killed above their maximum growth temperature, they are not necessarily killed below their minimum growth temperature.

As with temperature, the pH range at which a microorganism will grow varies considerably. Most organisms grow best at pH near neutrality, bacteria usually slightly on the alkaline side and algae and fungi on the acid side. However, some microbes can grow at extreme values of low or high environmental pH.

The presence or absence of oxygen divides organisms into three main classes: strict aerobes require oxygen, facultative anaerobes can obtain their energy in the absence of oxygen, strict anaerobes have an energy-producing system which does not require oxygen, and in addition, they are actually poisoned by oxygen. The aerobic or anaerobic nature of a microorganism is related to the normal natural environment of that organism.

Most microbes are capable of growing within a fairly wide range of environmental osmotic pressure. However, the colonization of such environments as salt lakes, salt pans, and the oceans requires specialized organisms called osmophiles or halophiles.

The only natural environments with hydrostatic pressures high enough to inhibit the growth of most microorganisms are the depths of the oceans. Here we find colonization by specialized barophiles. Most microorganisms are killed by high doses of electromagnetic radiation, particularly in the ultraviolet range, and by smaller doses of ionizing radiations. Death occurs mainly by damage to DNA. Visible light is essential to the growth of photosynthetic microorganisms since it provides their energy source.

(from: J.F. Wilkinson, *Introduction to Microbiology*, Blackwell Scientific Publications)

2 Say whether these statements are true or false and correct them when necessary.

- a. Microorganisms live everywhere on the earth.
- b. Microorganisms can grow neither at very low nor at very high temperatures.
.....
- c. Psychrophilic microorganisms live at very high temperatures.
- d. Microorganisms live in liquid water, in ice and in water vapour.
- e. High temperatures are lethal for most microorganisms.
- f. Facultative aerobes need oxygen to obtain energy.
- g. Strict anaerobes cannot live in the presence of oxygen.
- h. Most microorganisms can live at any level of osmotic pressure.
- i. Prokaryotes can live over a wider range of environmental conditions than eukaryotes.
.....
- j. Microorganisms can degrade any synthetic compound.

3 Choose the correct alternative among the words in italics.

- a. The rate of growth of microorganisms *decreases / increases* at temperatures above the optimum.
- b. Psychrophilic microorganisms live at *higher / lower* temperatures than mesophilic microorganisms.
- c. The range of temperature at which microorganisms can survive is *narrower / wider* than that at which they can grow.
- d. High temperatures are *less / more* lethal to microorganisms than low temperatures.
- e. Bacteria grow at a more *acid / alkaline* pH than algae and fungi.
- f. Osmophiles can grow at a very *high / low* level of osmotic pressure.
- g. *Higher / Lower* doses of ionizing radiations than of electromagnetic radiations are needed to kill microorganisms.
- h. Visible light has *negative / positive* effects on photosynthetic microorganisms.

4 Answer these questions about The ecology of microorganisms.

- a. What is the best temperature for mesophilic microorganisms?
- b. What kind of microorganisms can grow in refrigerated foods?
- c. What is the maximum temperature at which thermophiles can grow?
- d. What is the ideal pH value for most microorganisms?
- e. What do aerobes need to obtain energy?
- f. What microorganisms can live in the deep waters of the oceans at very high hydrostatic pressure?
- g. Why are most microorganisms killed by high doses of radiations?
- h. What do photosynthetic microorganisms need for living?