HOW DO MICROBES SURVIVE?

Additional Resource

The main environmental conditions that determine where a species of microbe can live are:

- Nutrient availability
- Solute concentration (osmolarity) and water activity
- Oxygen (O_2) concentration
- Temperature
- pH
- Light intensity
- Radiation
- Pressure
- Host immune/defence systems

Oxygen requirements	
Obligate aerobes	Essential requirement for O_2 as terminal electron acceptor in aerobic respiration. Can detoxify reactive oxygen species (ROS).
Facultative anaerobes	Respire aerobically if O_2 is available but switch to fermentation if is it is not. This is because fermentation does not require O_2 or involve an electron transport chain (ETC), but it makes less ATP than aerobic respiration. Can detoxify ROS.
Aerotolerant anaerobes	Do not require O_2 for respiration. Grow equally well in presence or absence of O_2. Can detoxify ROS.
Obligate anaerobes	Respire via fermentation and/or anaerobic respiration. Do not grow in the presence of O_2 because they cannot detoxify ROS.
Microaerophiles	Respires aerobically but requires O_2 levels between 2–10%. Damaged by atmospheric O_2 levels (20%). Can only partly detoxify ROS.

Temperature range	
Psychrophile	Grows at 0°C. Optimal growth at 15°C or lower.
Psychrotolerant	Grows at 0-7°C. Optimal growth between 20°C and 30°C.

Mesophile	Optimal growth at 20 - 45°C.
Thermophile	Grows at 55°C or higher. Optimal growth usually 55 - 65°C.
Hyperthermophile	Optimal growth 85 - 110°C.

pH range	
Acidophile	Optimal growth at pH 5.5 or lower.
Neutrophile	Optimal growth at pH 5.5 – 8.0.
Alkaliphile	Optimal growth pH 8.0 or higher.