

TABLE 6.4. Tolerances of life-forms

Type of Environment	Examples of Environments	Mechanism(s) of Survival	Practical Uses
High temperature (thermophiles)	Hydrothermal vents, hot springs, volcanoes	Amino acid changes, increase H-bonds, metal cofactors	Thermostable enzymes
Low temperature (psychrophiles)	Antarctic Ocean, glacier surfaces	Antifreeze proteins, solutes	Enhancing cold tolerance of crops
High hydrostatic pressure (barophiles)	Deep sea	Solute changes	
High salinity (halophiles)	Evaporating ponds and seas, salt evaporators	Solute changes, ion transport, protein amino acid adaptation	Industrial enzymes; soy sauce production
High pH (alkaliphiles)	Soda lakes	Transporters	Detergents
Low pH (acidophiles)	Mine tailings	Transporters	Bioremediation
Desiccation (xerophiles)	Evaporating ponds, deserts	Spore formation, solute changes, starvation tolerance, DNA repair, scavenge free radicals	Freeze-drying additives
High radiation (radiophiles)	Nuclear reactors or waste sites, high-altitude surfaces	Absorb radiation, enhance DNA repair, scavenge free radicals	Bioremediation