

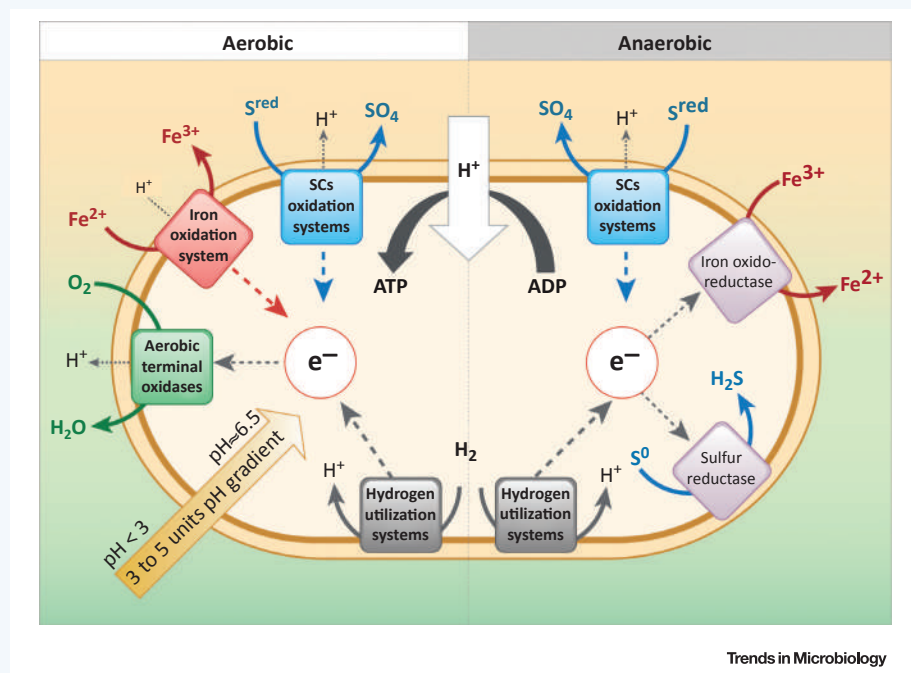
Acidithiobacillus ferrooxidans

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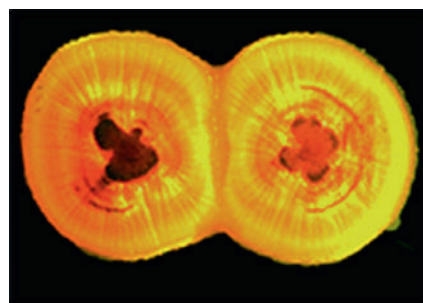
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Acidithiobacillus ferrooxidans is by far the most widely studied of all extremely acidophilic prokaryotes. While it is found in many types of natural low-pH environments in a variety of geoclimatic contexts, it has been more widely cited in anthropogenic (mostly mine-impacted) environments. It is responsible for accelerating the oxidative dissolution of sulfide minerals, causing the generation of polluting acidic metal-rich drainage waters but also facilitating the recovery of base and precious metals from mineral leachates. It can colonize barren mineral landscapes, is a driver of ecological successions in acidic biotopes, and is an important model organism in astrobiology. It catalyses the dissimilatory oxidation of iron, sulfur, and hydrogen, and the reduction of iron and sulfur, and has a major impact in the geochemical cycling of these elements in low-pH environments. This infographic summarizes the fundamental phylogeny, physiology and genomic features of this extremophile.



Trends in Microbiology

TAXONOMY AND CLASSIFICATION:

DOMAIN: Bacteria

PHYLUM: Proteobacteria

CLASS: Acidithiobacillia

ORDER: Acidithiobacillales

FAMILY: Acidithiobacillaceae

GENUS: *Acidithiobacillus*

Facultative anaerobe, non-fermentative, Gram-negative, obligate chemolithotroph, extreme acidophile, does not form endospores

KEY FACTS:

Initially described as a species of *Thiobacillus*, later reclassified as *Acidithiobacillus*. Now acknowledged as a member of an entirely new proteobacterial class, the Acidithiobacillia.

The type strain (ATCC 23270 = DSM 14882 = NCIB 11820) was isolated from coal mine drainage in the USA in the early 1950s and deposited as '*Ferrobacillus ferrooxidans*', a mixed culture which likely contained other species of iron-oxidising acidithiobacilli and heterotrophic acidophiles.

Extreme and obligate acidophile, derives chemiosmotic energy from the naturally occurring large transmembrane pH gradient (extracellular pH typically 1.5–3.0, and intracellular pH 6.5); most strains grow optimally at ~pH 2, and have a minimum growth pH value of ~1.3.

Chemolithotrophic, uses exclusively inorganic electron donors: reduced and elemental sulfur (S^{red}), ferrous iron (Fe²⁺), and hydrogen (H₂); mesophilic.

Facultative anaerobe; uses molecular oxygen, ferric iron, or sulfur as electron acceptor.

Obligate autotroph, fixes carbon dioxide via the Calvin–Benson–Bassham cycle in carboxysomes; facultative diazotroph.

Produces large quantities of rusticyanin, a soluble blue periplasmic copper-family protein when grown on iron.

The type strain genome was the first acidophile to be sequenced, and consists of a single circular chromosome of 2.98 Mbp, with no plasmids, no proviruses, and few integrated mobile genetic elements.

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