

High copper concentration reduces biofilm formation in *Acidithiobacillus ferrooxidans* by decreasing production of extracellular polymeric substances and its adherence to elemental sulfur

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Abstract

Acidithiobacillus ferrooxidans is an acidophilic bacterium able to grow in environments with high concentrations of metals. It is a chemolithoautotroph able to form biofilms on the surface of solid minerals to obtain its energy. The response of both planktonic and sessile cells of *A. ferrooxidans* ATCC 23270 grown in elemental sulfur and adapted to high copper concentration was analyzed by quantitative proteomics. It was found that 137 proteins varied their abundance when comparing both lifestyles. Copper efflux proteins, some subunits of the ATP synthase complex, porins, and proteins involved in cell wall modification increased their abundance in copper-adapted sessile lifestyle cells. On the other hand, planktonic copper-adapted cells showed increased levels of proteins such as: cupredoxins involved in copper cell sequestration, some proteins related to sulfur metabolism, those involved in biosynthesis and transport of lipopolysaccharides, and in assembly of type IV pili. During copper adaptation a decreased formation of biofilms was measured as determined by epifluorescence microscopy. This was apparently due not only to a diminished number of sessile cells but also to their exopoly-saccharides production. This is the first study showing that copper, a prevalent metal in biomining environments causes dispersion of *A. ferrooxidans* biofilms.

Significance: Copper is a metal frequently found in high concentrations at mining environments inhabited by acidophilic microorganisms. Copper resistance determinants of *A. ferrooxidans* have been previously studied in planktonic cells. Although biofilms are recurrent in these types of environments, the effect of copper on their formation has not been studied so far. The results obtained indicate that high concentrations of copper reduce the capacity of *A. ferrooxidans* ATCC 23270 to form biofilms on sulfur. These findings may be relevant to consider for a bacterium widely used in copper bioleaching processes.

Palabras clave

Palabras clave de autor:[Biofilms](#); [Copper resistance](#); [Biomining](#); [Acidithiobacillus ferrooxidans](#); [Sulfur](#); [Quantitative proteomics](#)

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