Proteomic Analysis in *Acidithiobacillus ferrooxidans* Cells Exposed to Chalcopyrite: Differential Expression Between Attached and Free Cells

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Acidithiobacillus ferrooxidans is a chemoautotrophic Gram-negative bacterium able to oxidize ferrous iron and reduced sulfur compounds to obtain energy and used in leaching operations to recover metals from mineral sulfides. Chalcopyrite is a copper sulfide containing ferrous iron ($CuFeS_2$) and is the most abundant mineral source of copper found in nature. However, the leaching rate of chalcopyrite is very low and the mechanisms involved in the bioleaching process by *A. ferrooxidans* are poorly understood. We used a proteomic approach to investigate the proteins differentially expressed between *A. ferrooxidans* strain LR cells attached and not attached (free) to chalcopyrite, after exposure to this mineral. The analysis was performed by coupling either SDS-PAGE (periplasmic fraction) or two-dimensional electrophoresis (total protein) and mass spectrometry. We identified in the periplasmic fraction of the attached cells higher expression of the thiamin biosynthesis protein, major outer membrane protein (omp40), peptidyl-prolyl cis-trans isomerase, pyridoxamine 5-phosphate oxidase and the hypothetical proteins AFE_1901 and AFE_0712, whereas hypothetical AFE_2233 and Gat B/Ygey domain proteins were repressed. For total protein analysis, a significant induction was observed for the major outer membrane protein 40 (omp40), glycosyl transferase and the hypothetical proteins AFE_1382, AFE_1927 and AFE_3062, whereas adenylylsulfate reductase and phosphoribulokinase (cbbP), among others were repressed. We concluded that *A. ferrooxidans* shows a distinct response in chalcopyrite-attached cells in comparison to not attached cells.

Key words: proteomic analysis, *A. ferrooxidans*, chalcopyrite, periplasmic proteins

Supported by: Vale Company, Brazil.