CARBON FIXATION GENES IN BIOMINING MICROORGANISMS

C. Zammit[1], L. Mutch[1], H. Watling[2], E. Watkin[1]

[1]*Curtin University of Technology, School of Biomedical Science, Perth, Australia,* [2]*Parker Cooperative Research Centre for Integrated Hydrometallurgy Solutions, Perth, Australia*

Background and aims: Studying metabolic pathways will help provide a better understanding of the role of different microorganisms within biomining environments. The majority of microorganisms involved in biomining are autotrophs which rely on atmospheric carbon fixation for growth. The aim of this study is to investigate genes involved with carbon fixation in a range of biomining microorganisms.
Methods: Genes that encode for key enzymes in the Calvin Cycle (the ribulose-1,5-bisphosphate carboxylase/oxygenase large-subunit genes *cbbL* and *cbbM*) and the Modified 3-Hyroxypropinase Cycle (the carboxyltransferase subunit gene *pccB*) were selected. Universal primers designed from multiple sequence alignments were used to amplify genes from *Sulfobacillus thermosulfidooxidans, Acidimicrobium ferrooxidans, Acidithiobacillus ferrooxidans, Acidithiobacillus thiooxidans, Acidithiobacillus caldus, Sulfolobus metallicus, Acidianus brierleyi* and *Metallosphaera sedula*. Partial gene sequences were generated and specific primers were designed for each of the microorganisms.
Results: Universal primers designed were shown to amplify the following genes in the subsequent microorganism/s; *cbbL* red: *S. thermosulfidooxidans*, *cbbL* green: *Am. ferrooxidans, At. ferrooxidans, At. thiooxidans* and *At. caldus,* and *pccB*: *S. metallicus*, *A. brierleyi* and *M. sedula*. Partial sequences for the *cbbL* red gene of *S. thermosulfidooxidans,* the *cbbL* green of *Am. ferrooxidans, At. thiooxidans* and *At. caldus* and the *pccB* gene of *M. sedula* are described.
Conclusions: Sequences generated will assist in further research into the carbon fixation cycles of biomining microorganisms. The specifically designed primers will be used in quantitative reverse transcriptase polymerase chain reaction (qRT-PCR) to further investigate these microorganisms role within biomining environments.