Analysis of Composition and Metabolic Potential of the Microbial Community for In Situ Bioremediation of a Long-Term Hexavalent Chromium-Polluted Site

Fanny A. Flores (fanny@ibt.unam.mx), Veronica Jiménez , Paloma Lara, and Katy Juárez-López (katy@ibt.unam.mx) (Instituto de Biotecnología de la Universidad Nacional Autónoma de México, Cuernavaca Morelos, México)

Background/Objectives. Hexavalent chromium is a dangerous mutagen and oxidizing agent. The excessive Cr(VI) industrial wastes and their inadequate disposal have resulted in anthropogenic pollution of soils. Indigenous bacteria have developed several strategies to resist high concentrations of Cr(VI), mainly through chromate efflux and Cr(VI) reduction to Cr(III). Trivalent chromium is less toxic, insoluble, and unable to permeate biological membranes. Microbial reduction of Cr(VI) can be enhanced by biostimulation, through electron donors addition as a safe and cost-effective technology. The efficiency of an electron donor in a contaminated sites depends of its physicochemical characteristics and the microbial community present. The aim of this work was to evaluate the efficiency of molasses as electron donor to promote Cr(VI) reduction in situ by indigenous microorganisms, Microbial diversity and their metabolic potential.

Approach/Activities. In situ biostimulation pilot assay was performed at 20 and 40 cm deep. After 15 days, 75% of Cr(VI) was reduced to Cr(III). Total DNA was extracted from soil samples and microbial diversity analysis was performed using high throughput sequencing of 16S rRNA amplicons (V3-V4), with Illumina MiSeq technology. Our results showed that *Halomonas spp* was the dominant genera and microbial diversity decreased during biostimulation. To analyze the active metabolically microorganisms, total RNA was extracted and sequenced the metatranscriptome using Illumina NextSeq 500 technology. A total of 22,618,158 readings were obtained. We identified two enzymes with chromate reductase activity and other genes related with resistance and Cr(VI) reduction. The most abundant transcripts also correspond to *Halomonas spp*.

Results/Lessons Learned. Our studies indicated that the bacterial community from this site, can survive and reduce Cr(VI) in very high concentrations with molasses as electron donor. This knowledge will allow us optimize chromium reduction by indigenous bacteria to design bioremediation strategies for this site.