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Molecular characterization of bacteria to oxidize As(III) for water treatment in rural communities; study case Xichu, Guanajuato. Mexico

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Abstract

Arsenic (As) concentration of 98 μg L-1 was found in Xichu River waters, which exceed the limits established by the WHO and the Mexican normativity NOM-127. This concentration is a potential risk for the population. It is necessary the search of available technology to remove As form drinking water in the most affected regions (rural communities), due to socioeconomic situation which they are in. In addition, at the same time disables them to implement a conventional As removal treatment. Bioremediation of water using As resistant bacteria-based technologies may provide a better alternative. Through the application of statistical analysis it was possible to corroborate the capacity of three bacteria strains to growth in As(III) stress conditions: Rhodoccocus gordoniae, Microbacterium hydrocarbonoxydans and Psedomonas kribbensis. The presence of aox genes was corroborated in 2 strains. PHB production could represent a value-added sub-product after a biological stress, e.j., biological treatments. In this study, it is proposed the use of synchrotron techniques to identify the localization of the As transformation either intracellular or extracellular, and the observation of possible compounds in the cellular membrane that can interact with As(III) by biosorption or bioaccumulation. Moreover, these synchrotron techniques may help to study the As speciation in water samples and in media culture before and after bacteria interaction. Some synchrotron techniques such microscopies (SEM/EDS), microespectroscopy (SR-FTIR) and XAS (X-ray Absorption Spectrospy) are proposed for further studies.

About

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