Oxygen dependent arsenic reduction of *Aeromonas hydrophila* HS01

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Arsenic is of global concern as more than 40 million people worldwide are exposed to its contamination via consumption of water and food. Fate and transport of arsenic in the environment are significantly influenced by bacterial transformation. Here we report a study of varied arsenic reductivities by *Aeromonas hydrophila* HS01 under different oxygenated conditions. Our microcosm study showed that HS01 can reduce arsenate to arsenite under aerobic conditions, but its reductivity no longer exists in the absence of oxygen. Same oxygen dependence of reductivity was found regardless of different carbon sources including lactate, acetate, propionate and citrate fed to the cells. Moreover, the rate of arsenate reduction is also very sensitive to the oxygen concentration. As dissolved oxygen changes from near zero to 120 μg/L, the arsenate reduction rate sharply increases to a maximal value. The rate slightly decreases even though the dissovled oxygen increased gradually from 120 to 2180 μg/L. Genomic sequencing data showed that HS01 has ArsC and ACR3, two arsenic reduction related gene, but it does not possess arsenate respiration gene (Arr). RNA quantification showed that the expression of ArsC and ACR3 gene is high under aerobic conditions and very low under anaerobic conditions. ArsC is a reductas converting intracellular arsenate to arsenite, and the reduced arsenite need to be exported from the cells by an energy-dependent efflux process of ACR3. Hence, it is highly likely that, under aerobic conditions, HS01 can use oxygen as the electron acceptor and its high activity enhances the reduction and efflux of arsenate. However, under anaerobic conditions, HS01 may have no alternative electron acceptor, and its activity and arsenate reductivity becomes insignificant. This study reported an arsenic reduction function of *Aeromonas hydrophila* and elucidated possible mechanisms underlying its oxygen dependent arsenic reductivities.

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