Characterization of the Acidophilic, Iron Reducer, *Geobacter* sp. FeAm09

O.M. HEALY[1], J. SOUCHEK[1], A. HEITHOFF[1], B. LAMERE[1], D. PAN[1], G. HOLLIS[1], W.H. YANG[2], W.L. SILVER[3] AND K.A. WEBER[1]*

[1]University of Nebraska, Lincoln, NE 68588, USA (*correspondence: kweber@unl.edu)
[2]University of Illinois, Urbana, IL 61801, USA
[3]University of California, Berkeley, CA 94720, USA

Iron (Fe) is the fourth most abundant element in the Earth's crust and plays a significant role controlling the geochemistry in soils, sediments, and aquatic systems. As part of a study to understand the microbially-catalyzed couple between iron and nitrogen (N) biogeochemical cycling in soils, an iron reducing isolate, strain FeAm09, was obtained. Strain FeAm09 was isolated from acidic, Fe-rich soils collected from a tropical forest (Luquillo Experimental Forest, Puerto Rico). Strain FeAm09 is a rod-shaped, motile, Gram-negative bacterium. Taxonomic analysis of the near complete 16S gene sequence revealed that strain FeAm09 is 94.7% similar to *Geobacter lovleyi*, placing it in the genus *Geobacter* within the Family *Geobacteraceae* in the *Deltaproteobacteria*. Characterization of the optimal growth conditions revealed that strain FeAm09 is a moderate acidophile with an optimal growth pH of 5.0 (range pH: 4.0 - 6.0). The optimal growth temperature was 37°C. Growth of FeAm09 was coupled to the reduction of soluble Fe(III), Fe(III)-NTA, with H_2, fumarate, ethanol, and various organic acids and sugars serving as the electron donor. Insoluble Fe(III), in the form of synthetic ferrihydrite, was reduced by strain FeAm09 using acetate or H_2 as the electron donor. The use of H_2 as an electron donor in the presence of CO_2 and absence of organic carbon indicates that strain FeAm09 is an autotrophic Fe(III)-reducing bacterium. Together these data describe the first acidophilic, autotrophic *Geobacter* species. In a previous study on these tropical soils, the number of Fe-cycling bacteria found rivalled those found in saturated sediments (lake-bottoms) and saturated soils (wetlands) where Fe(III) reduction is more commonly recognized as a dominant mode of microbial respiration. Furthermore, Fe(III) reduction was identified as a primary driver of carbon mineralization in these tropical soils. This suggests that in addition to Fe cycling, *Geobacter* sp. FeAm09 is likely to play a primary role in carbon cycling in iron-rich tropical soils.