

Living Room, Transportation, and Biofilm Community: The Overlooked Infrastructure in Subsurface Microbial Biodegradation

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Background/Objectives. It is commonly thought that if one can identify a microbe, usually a bacterium, which degrades a contaminant of interest, then simply introducing that microbe into the subsurface will result in site remediation. But bacteria have their own physiological needs. Some of these metabolic needs are acknowledged and catered to in bioaugmentation and biostimulation efforts. Typically, these efforts supply nutrients, sources of nitrogen, and electron acceptors as appropriate. These same efforts, however, need to consider that subsurface is already inhabited and additional subsurface transport may be needed to support larger microbial communities. If a larger, sustainable microbial community is to be established, accommodations must be made. The presentation will demonstrate that physical space is necessary to build microbial communities capable of sustained bioremediation and that the provision of physical space, in addition to typical biostimulation efforts, results in biofilm formation.

Approach/Activities. The presentation will demonstrate the centrality of microbial living room and the associated features of “room to move” and “places to grow” to sustainable bioremediation through the presentation of key elements from the peer-reviewed literature and laboratory experiments. Field data will illustrate the same points. The presentation is highly visual with pictures of aquifer cores, microscope imaging of microbes, and genome data. The presentation will not be a bunch of slides with words

Results/Lessons Learned. The audience will understand that a successful, sustainable effort at bioremediation requires that microbes be accommodated with the space necessary to live. Providing space supports biofilm formation and increased microbial community abundance, richness, and evenness. The failure to provide “living room” will result in poor performance and the ongoing need for intervention to sustain bioremediation.