

STABLE ISOTOPE PROBING (SIP) TO EVALUATE AIR SPARGING AT A XYLENE IMPACTED SITE

Greg Davis*

Dora Ogles

Brett Baldwin

Microbial Insights, Inc.
2340 Stock Creek Blvd.
Rockford, TN 37853-3044
Voice: 865-573-8188
Fax: 865-573-8133
gdavis@microbe.com

Glenn White

Haley and Aldrich
Rochester, NY

Kerry Sublette

The University of Tulsa
Tulsa, OK

Stable isotope probing (SIP) with ¹³C labeled xylene was used in an in situ microcosm study to definitively determine whether air sparging would enhance biodegradation of xylenes at a site impacted by finishing products (paints and coatings). Bio-Trap® Samplers containing ¹³C labeled xylenes were deployed in three impacted air sparge wells and a control well under anoxic conditions for approximately 18 days. Following deployment, Bio-Trap samplers were recovered for chemical analysis to determine the loss of ¹³C xylene, incorporation of ¹³C into phospholipids fatty acids (PLFA), ¹³C enriched dissolved inorganic carbon (DIC), and the abundance of aromatic oxygenase genes. Differences in PLFA profiles revealed a decrease in anaerobic biomarkers in air sparge wells and qPCR showed elevated copies of aromatic oxygenase genes in most air sparge wells relative to the control well. Thus air sparging resulted in a shift in the subsurface microbial community and appeared to stimulate growth of aerobic xylene degrading bacteria. Loss of ¹³C xylene from Bio-Traps deployed in air sparge wells ranged from 16% to 40% compared to only 6% for the control well suggesting that air sparging would accelerate xylene removal. Furthermore, ¹³C enriched PLFA biomass and ¹³C enriched dissolved inorganic carbon were substantially greater in Bio-Traps deployed in the air sparge wells conclusively demonstrating that the greater loss of labeled xylenes in the air sparge wells was due to enhanced biodegradation.

###