Evaluation of Organic Compounds for Enhancing Microbial Coal Bed Methanogenesis

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Many believe that enhancing coal bed methane (CBM) production by stimulating native microbial populations is a promising strategy for reinvigorating coal beds from which natural gas has previously been exploited [1]. In this study, we enhanced microbial CBM production by adding organic compounds that increase coal bioavailability to microbial communities. Conversion of coal from the Powder River Basin, Montana to methane by native microbial populations was monitored in microcosms amended with castile soaps or emulsified soybean oil (EOS®), and in unamended coals. Castile soap and EOS® stimulated methane production resulting in up to 1.5 μmol methane produced per g of coal in 4 months. Extractable hydrocarbons in the aqueous phase were examined to evaluate what organics might be driving methane production. Prior to incubation, microcosms amended with castile soap and EOS contained abundant long-chain fatty acids (tetradecanoic, octadecanoic, oleic acids, and others), which are important intermediates in microbial methanogenesis. These compounds were largely absent after incubation, suggesting that methane production was stimulated by microbial utilization of these long-chain fatty acids, which may be sourced from the coal or from the amendments. Characterization of microbial populations should reveal population shifts attributable to the addition of amendments. These results provide important information about the pathways involved in enhancing microbial CBM production, which can be used to develop *in situ* strategies.

[1] Orem, W. H. 2013. USGS Fact Sheet 2012-3109