# SME (Subsurface Metabolic Enhancement)

## Explanation and Feasibility

Metabolic enhancement has been the goal of all bioremediation research since its earliest inception and application to the reversal of environmental insult. It merely indicates the attempt to create conditions under which the metabolic capabilities of resident microbes are maximized.

These metabolic capabilities may be as simple as the transfer of single electrons between two substrates, or as complex as the interface between complex multi-component pathways. From the perspective of a microbial community, one of the most profound enhancements is the shift between anaerobic and aerobic growth regimes. Aerobic metabolism supports faster growth rates and a concomitant increase in associated degradation rates. Whenever the desired metabolic processes are amenable to aerobic conditions, rates of degradation will be increased by at least an order of magnitude.

The simple addition of oxygen, in whatever form, is not sufficient to guarantee enhanced metabolic properties. The demand placed on the system by the increased oxygen levels must be balanced by increased nutrients to fuel that demand. The pollutant substrate to be degraded only meets a portion of this requirement. The organic and inorganic needs of the microbial community must be supported across the board or one achieves only unbalanced growth, which quickly consumes limiting factors and achieves only limited results.

The patented process called "SME" has proven to be effective in balancing the demands of the subsurface community in the transition between anaerobic and aerobic metabolism. The critical elements that make this technique successful and patentable are related to what is to be delivered to the subsurface, how much to deliver, and when to deliver it. This is a precisely controlled system that allows the natural and adapted subsurface community to be optimally cultivated.

Alan R. Harker
Brigham Young University
Professor, Associate Dean
Microbiology & Molecular Biology
Alan_Harker@byu.edu