The Deepwater Horizon oil spill: Ecogenomics of the deep-sea plume

TERRY C. HAZEN

Lawrence Berkeley National Laboratory, Berkeley, CA USA (tchazen@lbl.gov)

The explosion on April 20, 2010 at the BP-leased Deepwater Horizon drilling rig in the Gulf of Mexico off the coast of Louisiana, resulted in oil and gas rising to the surface and the oil coming ashore in many parts of the Gulf, it also resulted in the dispersment of an immense oil plume 4,000 feet below the surface of the water. Despite spanning more than 600 feet in the water column and extending more than 10 miles from the wellhead, the dispersed oil plume was gone within weeks after the wellhead was capped – degraded and diluted to undetectable levels. Furthermore, this degradation took place without significant oxygen depletion. Ecogenomics enabled discovery of new and unclassified species of oil-eating bacteria that lives in the deep Gulf where oil seeps are common. Using 16s microarrays, functional gene arrays, clone libraries, lipid analysis and a variety of hydrocarbon and micronutrient analyses we were able to characterize the oil degraders. Metagenomic sequence data was obtained for the deep-water samples using the Illumina platform. In addition, single cells were sorted and sequenced for the some of the most dominant bacteria that were represented in the oil plume; namely uncultivated representatives of *Colwellia* and *Oceanospirillum*. The results provide information about the key players and processes involved in degradation of oil, with and without COREXIT, in different impacted environments in The Gulf of Mexico. This data suggests that a great potential for intrinsic bioremediation of oil plumes exists in the deep-sea and other environs in the Gulf of Mexico.

Silver nanoparticle-reactive oxygen species interactions: Application of a charging-discharging model

D. HE, A.M. JONES, S. GARG AND T.D. WAITE*

University of New South Wales, Sydney, NSW, Australia 2052 (di.he@student.unsw.edu.au, adele.jones@unsw.edu.au, s.garg@unsw.edu.au, *correspondence: d.waite@unsw.edu.au)

A complex interplay between AgNPs, Ag^+, superoxide and H_2O_2 exists with an understanding of these interactions potentially at the core of the bactericidal behavior of silver species [1-3]. This work is focused on obtaining a better understanding and, to the extent possible, quantification of the interaction between AgNPs and ROS.

The ability of these particles to catalytically decompose H_2O_2 was examined by measuring the decay of H_2O_2, the re-formation of AgNPs and the subsequent degradation of Ag^+ [4]. A kinetic model based on the concept of electron storage and subsequent discharge by AgNPs has been developed and found to adequately explain all results obtained [5-7].

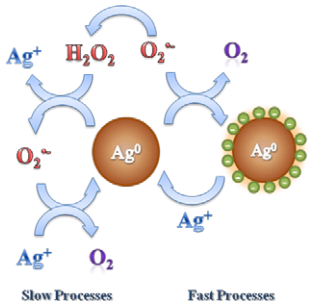

Figure 1: Schematic presentation of the action of AgNPs as electron pool in ROS reactions.

[1] Morones *et al*. (2005) *Nanotechnology* **16**, 2346. [2] Hwang *et al*. (2008) *Small* **4**, 746. [3] Kohn & Nelson (2007) *Environ. Sci. Technol.* **41**, 192. [4] Guo *et al*. (2008) *J. Photoch. Photobio. A* 193, 89. [5] Henglein (1979) *J. Phys. Chem.* **83**, 2209. [6] Henglein & Lilie (1981) *J. Am. Chem. Soc.* **103**, 1059. [7] Henglein (2001) *Langmuir* **17**, 2329.