



Radiation Resistant Halophiles

The Challenge: There is an obvious need for the proper understanding of the affects of radiation on human health. *Civil Defense Perspectives (CDP)*, recently warned that "the government is protecting Americans with extremely costly measures against non-threats, while leaving them totally vulnerable to the really big threats." Therefore, studying extremophiles, organisms which are highly resistant to multiple stressors, including radiation, desiccation, and salinity, may provide helpful insights concerning protection against radiation and biothreats. Halophiles share many basic biological features with mammalian and human cells, such as the biochemistry of DNA replication and repair and may be used as a model to study the biochemistry of resistance to radiation.

UMBI Solution: To understand the basis for radiation resistance and to determine the maximum tolerance to ionizing radiation, UMBI scientists have exposed cultures of the model halophile *Halobacterium* sp. NRC-1 to multiple cycles of irradiation with progressively higher doses of electrons. These studies resulted in identification of four highly-resistant radiation mutants. Whole genome DNA microarray analysis of these mutants showed that all four strains have upregulated a set of specific genes. Given the common role that these genes have in DNA repair in bacteria and humans, this information may be relevant to human cell response to high radiation doses. Elucidation of these molecular mechanisms of radiation tolerance will allow improved protection strategies against potential biothreats, such as nuclear attacks, and might potentially enable design of novel cancer therapies. This data can also be useful in the study of astrobiology and the survivability of humans in space.

Commercial Applications:

- A system to study enhanced resistance to radiation
- Regulated genes may be studied to elucidate new protection strategies against potential biothreats and medical applications in cancer therapy
- Biological sensors for radiation

Stage of Development: Preclinical

Patent Status: Pending PCT patent application

Licensing Potential: UMBI is seeking non-exclusive and exclusive licensees to all or part of this technology. The inventors would welcome the opportunity to work with any licensee to further refine or extend the capabilities of this invention.

Inventor & UMBI Reference: DasSarma, 07-025

Relevant Publications:

1. DeVeaux LC, Müller JA, Smith J, Petrisko J, Wells DP, DasSarma S. Extremely radiation-resistant mutants of a halophilic archaeon with increased single-stranded DNA-binding protein (RPA) gene expression. *Radiat Res.* 2007 Oct;168(4):507-14.

2. Boubriak I, Ng WL, Dassarma P, Dassarma S, Crowley DJ, McCready SJ.
Transcriptional responses to biologically relevant doses of UV-B radiation in the
model archaeon, Halobacterium sp. NRC-1. Saline Systems. 2008 Aug 29;4(1):13.

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