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News Release

Tough Enough for Mars, but *Deinococcus* is from Earth

BETHESDA, Md. – Results of a recent study titled “*Deinococcus geothermalis*: The Pool of Extreme Radiation Resistance Genes Shrinks,” will be published in the Sept. 26 edition of *PLoS ONE*. The study headed by Michael J. Daly, Ph.D., associate professor at the Uniformed Services University of the Health Sciences’ (USU), Department of Pathology, reports the whole-genome sequence of *Deinococcus geothermalis*, which is only the second for an extremely radiation- and desiccation-resistant bacterium. The first was for the Guinness World Records-holder *Deinococcus radiodurans*, which for 50 years has been the subject of extensive investigations aimed at solving the mystery of how this microbe and its close relatives survive immense doses of x-rays and gamma-rays.

Most surprisingly, many of the unique *D. radiodurans* genes that were strongly implicated in resistance over the last decade have turned out to be unrelated to its survival, and are not present in *D. geothermalis*. Using computer-based systems to compare the *D. geothermalis* genome sequence with the sequence of *D. radiodurans*, a minimal set of genes which encode extreme resistance was defined. Far fewer genes than initially believed appear to be responsible for the extreme resistance trait, which bodes well for the long-term prospects of conferring radiation resistance to other organisms. The phenomenal resistance of *Deinococcus* bacteria has given rise to numerous descriptions of their origin, including that they evolved on Mars under harsh cosmic radiation. The present analysis firmly places the origin of *Deinococcus* bacteria on Earth, where the evolutionary steps that led to their survival mechanisms clearly occurred in their terrestrial ancestors - most likely in a desert near you.

The complete manuscript can be read in *PLoS ONE* at: <http://www.plosone.org/doi/pone.0000955>. *PLoS ONE* is an open-access, peer-reviewed journal which reports primary research from all disciplines within science and medicine. By not excluding papers on the basis of subject area, *PLoS ONE* facilitates the discovery of the connections between papers whether within or between disciplines.

Deinococcus geothermalis was chosen for whole-genome sequencing by the U. S. Department of Energy (DOE), Office of Science, Office of Biological and Environmental Research with Dr. Daly as the Principal Investigator. The genome sequence was acquired at the DOE-Joint Genome Institute (JGI), Walnut Creek, CA, and subjected to comparative analysis at the National Center for Biotechnology Information, National Library of Medicine, National Institutes of Health (NIH), Bethesda, Md. *D. geothermalis* was previously engineered by Daly’s group for cleanup of radioactive waste sites. The three-year project was a collaboration between USU, DOE-JGI, NIH, DOE’s Advanced Photon Source and Pacific Northwest National Laboratory, and the Russian Academy of Sciences.

USU is located on the grounds of the National Naval Medical Center in Bethesda, Md. The university provides military and public health-relevant education, research, service and consultation to the nation and the world, pursuing excellence and innovation during times of peace and war.

For more information or to speak with Dr. Daly, call the Office of External Affairs at (301) 295-1219.