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Study Finds New Way to Clean Up Radioactive Sites, Protect Radiotherapy Patients, Astronauts

Bethesda, Md. – A new discovery by scientists could aid efforts to clean up radioactive waste sites, and could also help protect military personnel, cancer patients, and astronauts.

According to a collaborative study, led by researchers at the Uniformed Services University of the Health Sciences, published Dec. 20 in PLOS One, “Microbial cells can cooperate to resist high-level chronic ionizing radiation,” <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0189261>, the team examined growth characteristics of bacteria under high-level continuous gamma radiation. They found radiation-sensitive bacteria, *E. coli* (*Escherichia coli*), when mixed with radiation-resistant bacteria, *Deinococcus radiodurans*, can survive high doses of chronic ionizing radiation.

These findings suggest the *Deinococcus* bacteria (and also some fungi) — which express high concentrations of antioxidants — could be used as a natural radioprotective probiotic to protect microbes in the intestines of radio- and chemotherapy patients. These unexpected findings also suggest a new tool that could help protect military personnel and astronauts who experience gastrointestinal side effects from high levels of chronic ionizing radiation.

In 2004, it was discovered that radiation-sensitive bacteria were living alongside extremely radiation-resistant bacteria underneath a leaking Cold War radioactive waste tank holding leftovers from the Manhattan Project. The team of scientists at USU sought to better understand this mystery — why it is that, in radioactive waste sites, radiation-sensitive bacteria can survive where only extremely radiation-resistant bacteria usually grow.

Now, with this better understanding of the characteristics of the *Deinococcus* bacteria, the researchers believe that they could help expedite the clean-up of Cold War radioactive wastes by harnessing the capabilities of other more sensitive microbes.

“Importantly, this study also shows that many yeasts can grow as well as *Deinococcus* under high-level chronic gamma radiation. These microbes have shown us that cells deal with radiation in the form of a big blast in a very different way from radiation in the form of long exposures - say, following a nuclear power accident, such as Fukushima,” according to USU professor Dr. Michael J. Daly, who led the study.

The team of researchers also included Vera Y. Matrosova, a Henry M. Jackson Foundation for the Advancement of Military Medicine (HJF) staff scientist at USU, and Dr. Igor Shuryak, an assistant professor at the Center for Radiological Research at Columbia University. The project was supported by Defense Threat Reduction Agency grants to Shuryak (Defense Threat Reduction Agency, grant HDTRA-18774-M). The team in USU's Department of Pathology included HJF contract scientists Dr. Elena K. Gaidamakova, Dr. Rok Tkavc, Dr. Olga Grichenko, Ms. Polina Klimenkova and Mr. Robert P. Volpe. For more information on *Deinococcus* research, visit http://www.usuhs.edu/pat/Deinococcus/index_20.htm

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About USU

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