*Learning to Care for Those in Harm's Way*

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## Scientists protect mice from gamma radiation with deinococcus elixir

**Bethesda, MD** – They call it "Conan the Bacterium," and now it may be used to help save lives in the event of a nuclear disaster or terrorist attack.

Researchers at the Uniformed Services University of the Health Sciences have discovered a potent manganese (Mn)(II)-based antioxidant complex of the bacterium Deinococcus radiodurans that can be used to protect animals from radiation injury. The report, "MDP: A Deinococcus Mn2+-Decapeptide Complex Protects Mice from Ionizing Radiation," (http://http://dx.plos.org/10.1371/journal.pone.0160575)was released in PLOS ONE, August 8, 2016.

The team, led by the late Dr. Radha K. Maheshwari, the principal investigator and a former professor in the USU Department of Pathology, wanted to know whether (Mn)-peptide antioxidants (called "MDP") could be used to protect animals in the event of radiation exposure. They synthesized MDP in the laboratory, then administered it to mice exposed to doses of a lethal form of radiation – gamma rays. All of the mice treated with MDP survived exposure to radiation, with substantially reduced levels of radiation sickness, in comparison to 63% mortality and weight loss in the untreated animals. MDP significantly increased granulocyte-colony stimulating factor (G-CSF), a protein factor released by immune cells, recently approved by FDA for treating acute hematopoietic syndrome.

D. radiodurans is, according to the Guinness Book of World Records, the toughest bacterium on the planet. It can survive – and even thrive – in the most extreme environments, from the glaciers of Antarctica to the desiccated landscape of the Mojave Desert. It has even been found in highly radioactive soils at nuclear waste sites, and it is this unique ability to withstand high doses of radiation that has drawn generations of researchers hoping to harness the mechanisms of its resiliency for practical purposes.

"D. radiodurans has taught us – if you want to survive radiation: protect your proteins," explained study co-author Dr. Michael Daly, professor of Pathology at USU, who has devoted more than 25 years to studying the bacterium. Past research has shown that Deinococcus bacteria accumulate high concentrations of manganese (a metal element similar to iron) and peptides. These manganese-peptide antioxidants have proven to be remarkably radioprotective of proteins – the "machines" of the cell – including the enzymes needed to repair and reassemble DNA broken by radiation.

"Imagine being able to be treated in case of accidental radiation exposure" said Dr. Paridhi Gupta, a postdoctoral fellow in Maheshwari's lab and lead author on the paper.

“Our study is the first to demonstrate that these antioxidants are safe and can protect animals from radiation injury and death. These results open the door to all kinds of possibilities in the development of radioprotective pharmaceuticals.” The complex is patented and very easy to mass produce.

The five-year project, funded by the Defense Threat Reduction Agency, was a collaborative effort between scientists in the late Dr. Maheshwari’s group in USU’s Department of Pathology – Dr. Paridhi Gupta and Dr. Manoshi Gayen; Dr. Juliann G. Kiang and Ms. Joan Smith at Armed Forces Radiobiology Research Institute (AFRRI); Dr. Daly’s group, including Drs. Elena Gaidamakova, Vera Matrosova and Olga Grinchenko; and Dr. Barbara Knollmann-Ritschel in USU’s Department of Pathology.

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