Investigators identify genes that contribute to radiation resistance

July 21 2014

A team of researchers from the University of Wisconsin have identified 46 genes in *Escherichia coli* that are necessary for its survival at exceptionally high levels of radiation. The paper appears ahead of print in the *Journal of Bacteriology*.

"The research has revealed new pathways of cellular self-repair, including DNA pathways that in humans that may help protect us from cancer," says corresponding author Michael M. Cox.

High doses of radiation are deadly not only to humans, plants, and animals, but to microbial cells generally. Nonetheless, certain bacteria, notably *Deinococcus radiodurans*, are highly resistant to high level radiation. *E. coli* normally lacks such radiation resistance, but resistant strains were developed by subjecting them to increasing levels of radiation, and harvesting the survivors of each generation.

The 46 genes did not result from the mutations created under high radiation levels, but rather genes that exist in the normal, wild-type *E. coli*. The results reinforce the notion that survival after high doses of ionizing radiation does not depend on a single mechanism or process, but instead is multifaceted.

"We established a role for genes involved in processes as diverse as central metabolism and the synthesis and maintenance of the cell wall in radiation survival," says Cox. "Perhaps most important, we identified eight genes of unknown function that play substantial roles in radiation

survival."

The benefits of this research and its progeny could be substantial, says Cox. "Our understanding of how cells deal with ionizing radiation is very rudimentary. Our work provides an expanded map of the cellular functions that are most directly involved in ameliorating the effects of ionizing radiation. It has revealed some potentially new pathways by which cells repair their DNA and more generally repair their cellular proteins and other components after exposure to high levels of radiation ."

One gene, previously of unknown function, has a role in repairing double strand breaks in DNA. "The gene is related to a human gene called XPB, and it may help elucidate some key DNA repair pathways in humans that help protect us from cancer," says Cox.

Provided by American Society for Microbiology