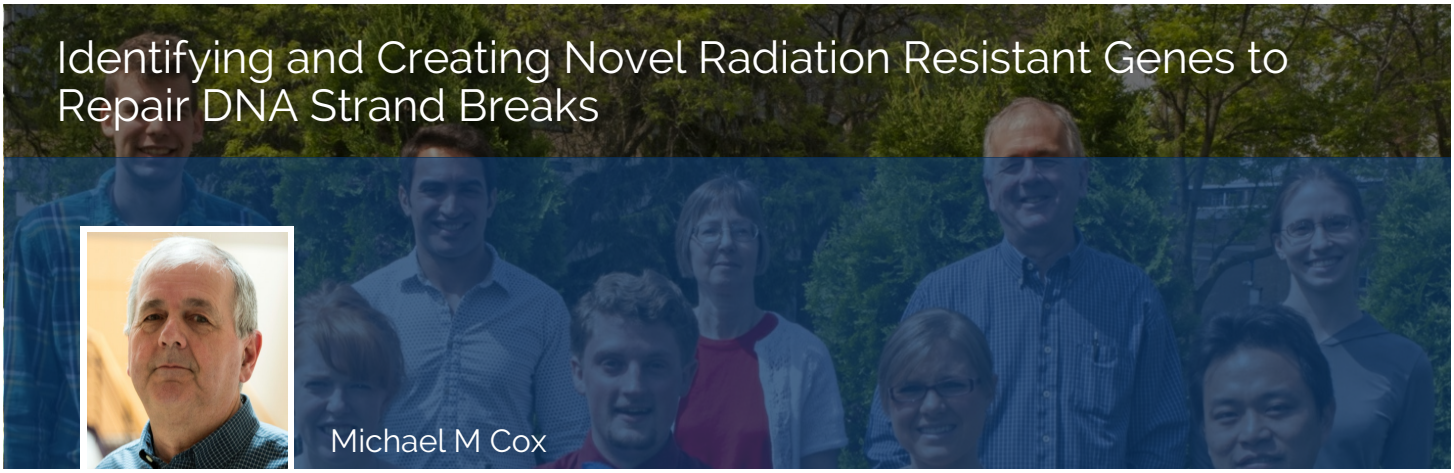
Identifying and Creating Novel Radiation Resistant Genes to Repair DNA Strand Breaks



Michael M Cox

CURRENT RESEARCH

Improving cancer treatments, forensic analyses, and drug development through bacterial directed evolution

The most serious DNA lesion in a chromosome or cell molecule is a DNA double strand break. These breaks often occur during replication of a cell or when exposed to radiation. If left unrepaired, one DNA strand break can be lethal. Dr. Michael M. Cox, professor in the Department of Biochemistry at University of Wisconsin-Madison uses novel genetic recombination methods to understand the biology and biochemistry of DNA double strand break repair in bacteria. His lab is invested in using directed evolution of bacteria to create ionizing radiation resistant bacteria and provide a precise definition of the molecular processes that underlie radiation resistance. Working with novel bacterial enzymes that play an important role in double strand break repair, this research will lead to improved cancer therapies, forensic DNA analyses, and the development of effective pharmaceuticals and probiotics.

Radiation resistant bacteria have the most robust double strand break repair system in biology. Deinococcus radiodurans is a fairly well-studied bacterium that can survive extreme levels of ionizing radiation (measured in Grey units (Gy), a lethal dose of ionizing radiation for humans is three to five Gy; this bacterium can survive 5,000 Gy). When hit with high levels of radiation, the bacteria's DNA endures thousands of double strand breaks, and its genome is destroyed. However, Deinococcus can completely reconstruct its chromosome within two hours, as it places the overlapping pieces together. Dr. Cox wants to create cells that are even more radiation resistant than Deinococcus.

Because Deinococcus produces more than 4,000 proteins, identifying which proteins are important in DNA repair can be a time-...

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AFFILIATION

University of Wisconsin-Madison

EDUCATION

- Ph.D. 1974-1979,Brandeis University
- Postdoctoral Fellowship 1982,Stanford University

AWARDS

- Evelyn M. Mercer Professor in Biochemistry, 2013-2023
- Elected American Association for the Advancement of Science (AAAS) Fellow, 2011
- University of Wisconsin Regents' Teaching Excellence Award, 2009
- WARF Kellett Mid-Career Faculty Research Award, 2000
- Vilas Associate Award, University of Wisconsin Graduate School, 1998
- and 3 more...

RESEARCH AREAS

Life Science, Genomics / Congenital, Infectious, Oncology / Cancer

FUNDING REQUEST

Your contribution will help fund Dr. Cox's continued research in understanding DNA double strand break repair and developing improved radiation resistant genes. Costs to run his research program total $500K/year for personnel and lab equipment. To find crucial mutations in these directed evolution studies, an enormous amount of DNA sequencing resources are required, which total $750K for 5 years. A donation of any amount supports the pursuance of his innovative research in DNA strand repair; fund Dr. Cox.