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Article: Watching DNA Repair In Real Time

Author: Robert Karl Stonjek
Date: Sep 22, 2006 10:55

Watching DNA Repair In Real Time
Direct observations of DNA are giving new insights into how genetic material
is copied and repaired.

"We can monitor the process directly, and that gives us a different
perspective," said Roberto Galletto, a postdoctoral scholar at UC Davis and
first author on a paper published Sept. 20 on the Web site of the journal
Nature.

In E. coli bacteria, molecules of an enzyme called RecA attach themselves
along a DNA strand, stretching it out and forming a filament. A piece of
complementary DNA lines up along side it, and pieces of DNA can be swapped
in to repair gaps in the original strand. A similar protein, called Rad51,
does the same job in humans.

"How RecA and Rad51 assemble into filaments determines the outcome of DNA
repair, but very little is known about how assembly is controlled," said
senior author Stephen Kowalczykowski, professor in

the sections of
Microbiology and of Molecular and Cellular Biology and director of the
Center for Genetics and Development at UC Davis. Genes that control the
human gene, Rad51, have been linked to increased risk of breast cancer.

Galletto attached a short piece of DNA to a tiny latex bead and placed it in
a flow chamber, held by laser beam "tweezers." Fluid flowing past made the
DNA stream out like a banner. Then he nudged it into an adjacent channel
containing fluorescently-tagged RecA. After short intervals of time, he
moved it back to the first chamber to observe the results.

By repeatedly dipping the same piece of DNA into the fluorescent channel,
the researchers could see the RecA form clusters of four to five molecules
on the DNA. Once those clusters had formed, the DNA/RecA filament rapidly
grew in both directions. The measurements made in those experiments will be
the baseline for future studies of both RecA and Rad51, Kowalczykowski said.

The new work adapts an approach developed by Kowalczykowski and Ronald J.
Baskin, professor of molecular and cellular biology, to study single enzymes
at work unwinding DNA strands. That research was first published in Nature
in 2001.

In addition to Galletto, Kowalczykowski and Baskin, the research team
included postdoctoral scholar Ichiro Amitani. The work

was funded by the
National Institutes of Health and a fellowship awarded
to Galletto by the
Jeane B. Kempner Foundation.

Source: University of California - Davis
http://www.sciencedaily.com/
releases/2006/09/060921202309.htm

Posted by
Robert Karl Stonjek

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