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## Human DNA repair process recorded in action

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Rad51 takes a leading role in the action. Always on call in the cell, molecules of the protein assemble into a long filament along a damaged or broken segment of DNA, where they help stretch out the coiled strands and align them with corresponding segments on the cell's second copy of the chromosome, which serves as a template for reconstruction. Because this protein is regulated by a gene linked to increased risk of breast cancer, BRCA2, it is also thought to play a role in suppression of that disease.

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With the ability to watch the assembly of individual filaments of Rad51 in real time, Kowalczykowski's team made a number of discoveries. Among those are that, in contrast to their bacterial counterparts, Rad51 filaments don't grow indefinitely. This indicates that there is an as-yet undiscovered mechanism that regulates the protein's growth, Kowalczykowski said.

Another surprising difference between the human and bacterial processes, Kowalczykowski said, is that Rad51 doesn't fall away from the DNA when repair is complete. Instead, proteins that motor along DNA are required to dislodge it.

"From a practical point of view, being able to record these single molecules gives us significant information regarding the assembly process," the researcher said. "Now we're able to measure this in a quantifiably meaningful way."

Source: [University of California - Davis](#)



*This filament composed of a fluorescently-labeled DNA molecule and the repair protein Rad51 grows progressively brighter and longer as more and more Rad51 molecules assemble onto the DNA. The sphere on the left is an optical trap holding the DNA in place.*

(Photo Credit: Stephen Kowalczykowski/UC Davis)

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