Key protein aids in DNA repair

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Scientists have shown in multiple contexts that DNA damage over our lifetimes is a key mechanism behind the development of cancer and other age-related diseases. Not everyone gets these diseases, because the body has multiple mechanisms for repairing the damage caused to DNA by aging, the environment and other human behaviors - but the mechanisms behind certain kinds of DNA repair have not been well-understood.

In a paper published today in the journal *Nature*, researchers at the University of North Carolina at Chapel Hill's Lineberger Comprehensive Cancer Center have shown that a particular protein - called Ku - is particularly adept at healing damaged strands of DNA.

According to Dale Ramsden, PhD, associate professor in the department of biochemistry and biophysics and a member of the curriculum in genetics and molecular biology, Ku is a very exciting protein because it employs a unique mechanism to repair a particularly drastic form of DNA damage.

"Damage to DNA in the form of a broken chromosome, or double strand break, can be very difficult to repair - it is not a clean break and areas along the strand may be damaged at the level of the fundamental building blocks of DNA - called nucleotides," he notes.

Broken chromosomes can be compared to a break in a strand of yarn made up of several different threads or plies. Unless scissors are used to cut the yarn, the strand frays and may break or be damaged at several

different places up and down the length of the yarn. These rough ends get "dirty" - making them harder to repair.

"It has been assumed in the past that double strand breaks are the most difficult class of DNA damage to repair and it is often presumed that they simply can not be repaired accurately," says Ramsden.

The team found that the protein Ku, which has long been appreciated for its ability to find chromosome breaks along a strand of DNA, actually removes the "dirt" at broken chromosome ends, allowing for much more accurate repair than believed possible.

"This protein actually heals at the nucleotide level as well as the level of the chromosome," says Ramsden, comparing its action to washing and disinfecting a cut before trying to sew it up to promote healing.

The team is hopeful that the discovery of this mechanism for DNA repair may lead to a target for treatment of age-related diseases caused by chromosome damage in the future.

Provided by University of North Carolina