Chaperone enzyme provides new target for cancer treatments

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UNC scientists who study how cells repair damage from environmental factors like sunlight and cigarette smoke have discovered how a "chaperone" enzyme plays a key role in cells' ability to tolerate the DNA damage that leads to cancer and other diseases.

The enzyme, known as Rad18, detects a protein called DNA polymerase eta (Pol eta) and accompanies it to the sites of sunlight-induced DNA damage, enabling accurate repair. When Pol eta is not present, alternative error-prone polymerases take its place – a process that leads to DNA mutations often found in cancer cells.

In one known example, faulty DNA repair due to Pol eta- deficiency is responsible for the genetic disease xeroderma pigmentosum-variant, which makes patients extremely susceptible to skin cancers caused by exposure to sunlight. However, scientists did not know how the cells selected the correct DNA Polymerase for error-free repair of each type of DNA damage.

"We found that the mechanism that promotes the 'chaperone' enzyme to recruit Pol eta to sites of DNA damage is managed by another signaling protein termed 'Cdc7' which we know is essential to normal regulation of the cellular lifecycle," said lead author Cyrus Vaziri, PhD, who is an associate professor of pathology and laboratory medicine and member of UNC Lineberger Comprehensive Cancer Center. Thus cells employ Cdc7 to ensure accurate DNA repair during the stage of their lifecycle that is most vulnerable to cancer-causing mutations.

The study was published in November in the *Journal of Cell Biology*.

According to Vaziri, the dual role that Cdc7 plays in the cell lifecycle and DNA repair offers a promising target for potential cancer therapies.

"We know that cancer cells have high levels of Cdc7 activity and can evade some DNA-damaging therapies such as cis-Platinum through Rad18 and Pol eta activity. We may be able to target this pathway in platinum-resistant tumors to prevent DNA repair and enhance cancer cell killing by platinating agents," he said.

Provided by University of North Carolina School of Medicine