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Researchers discover enzyme behind breast cancer mutations

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Researchers at the University of Minnesota have uncovered a human enzyme responsible for causing DNA mutations found in the majority of breast cancers. The discovery of this enzyme – called APOBEC3B – may change the way breast cancer is diagnosed and treated.

The findings from a team of researchers led by Reuben Harris, Ph.D., associate professor of biochemistry, molecular biology and biophysics and also a researcher at the Masonic Cancer Center, University of Minnesota, are published in the latest edition of *Nature*.

"We strongly believe this discovery will change the way mutations in cancer are viewed and, hopefully, it will allow cancer researchers to develop new treatments approaches that can prevent these mutations before they become harmful," said Harris.

Harris' quest to learn more about mutations in cancer initially began with HIV research. This previous work by Harris' lab and others indicated that APOBEC3B and related enzymes function normally to protect from infectious viruses like HIV-1.

During these studies, Harris' team developed specific tests to quantify the expression of each of the seven APOBEC3 genes, including APOBEC3B.

Harris and his team were able to apply these tests to the problem of mutation in breast cancer, showing only APOBEC3B is over-expressed

in patients' breast cancer cell lines and tumors.

"DNA mutations are absolutely essential for cancer development," said Harris. "Our experiments showed the APOBEC3B enzyme causes mutations in the genome of breast cancer cells. From this, we were able to reasonably conclude that the APOBEC3B is a key influencer in breast cancer."

However, Harris points out that APOBEC3B appears to be a biological "double-edged sword." It protects some cells from viruses such as HIV-1 yet produces mutations giving rise to cancer in others.

Harris stresses the need for additional research. If further studies confirm that high APOBEC3B levels indicate the early presence of breast cancer, a simple blood test could be a strategy for early detection.

Another goal for Harris is finding a way to block APOBEC3B from causing mutation, just as sunscreen prevents sun from causing mutations leading to melanoma. His collaborative HIV studies are already pointing toward such drug possibilities.

"Our next steps will focus on the connections between high levels of APOBEC3B, age and other genetic risk factors that are known breast cancer markers. Ultimately, we hope our discovery leads to better therapeutic outcomes for patients," said Harris.

Provided by University of Minnesota