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When your biological age is older than your chronological age, the risk of getting and dying of cancer rises

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Epigenetic age is a new way to measure your biological age. When your biological (epigenetic) age is older than your chronological age, you are at increased risk for getting and dying of cancer, reports a new Northwestern Medicine study.

And the bigger the difference between the two ages, the higher your risk of dying of cancer.

"This could become a new early warning sign of cancer," said senior author Dr. Lifang Hou, who led the study. "The discrepancy between the two ages appears to be a promising tool that could be used to develop an early detection blood test for cancer."

Hou is chief of cancer epidemiology and prevention in preventive medicine at Northwestern University Feinberg School of Medicine and co-leader of the cancer prevention program at the Robert H. Lurie Comprehensive Cancer Center of Northwestern University.

"People who are healthy have a very small difference between their epigenetic/biological age and chronological age," Hou said. "People who develop cancer have a large difference and people who die from cancer have a difference even larger than that. Our evidence showed a clear trend."

A person's epigenetic age is calculated based on an algorithm measuring 71 blood DNA methylation markers that could be modified by a person's environment, including environmental chemicals, obesity, exercise and diet. This test is not commercially available but is currently being studied by academic researchers, including a team at Northwestern.

In DNA methylation, a cluster of molecules attaches to a gene and makes the gene more or less receptive to biochemical signals from the body. The gene itself—your DNA code—does not change.

This is the first study to link the discrepancy between epigenetic age and chronological age with both cancer development and cancer death using multiple blood samples collected over time. The multiple samples, which showed changing epigenetic age, allowed for more precise measurements of epigenetic age and its relationship to cancer risk. Other studies have looked at blood samples collected only at a single time point.

The final paper was published Feb. 15 in *EBioMedicine*.

The study was a longitudinal design with multiple blood samples collected from 1999 to 2013. Scientists used 834 blood samples collected from 442 participants who were free of cancer at the time of the blood draw.

For each one-year increase in the discrepancy between chronological and epigenetic ages, there was a 6 percent increased risk of getting cancer within three years and a 17 percent increased risk of cancer death within five years. Those who will develop cancer have an epigenetic age about six months older than their chronological age; those who will die of cancer are about 2.2 years older, the study found.

"Our results suggest future researchers should focus on the epigenetic-

chronological age discrepancy for its potential to show a big picture snapshot of human health and disease at a molecular level," said first author Yinan Zheng, a predoctoral fellow at Feinberg.

Northwestern scientists now are studying whether individuals can lower their epigenetic age through lifestyle improvements such as increasing exercise and having a healthier diet, noted Brian Joyce, co-first author and predoctoral fellow at Feinberg.

  More information: The study is titled "Blood Epigenetic Age may Predict Cancer Incidence and Mortality."

Provided by Northwestern University

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