New DNA discovery could revolutionize cancer treatment

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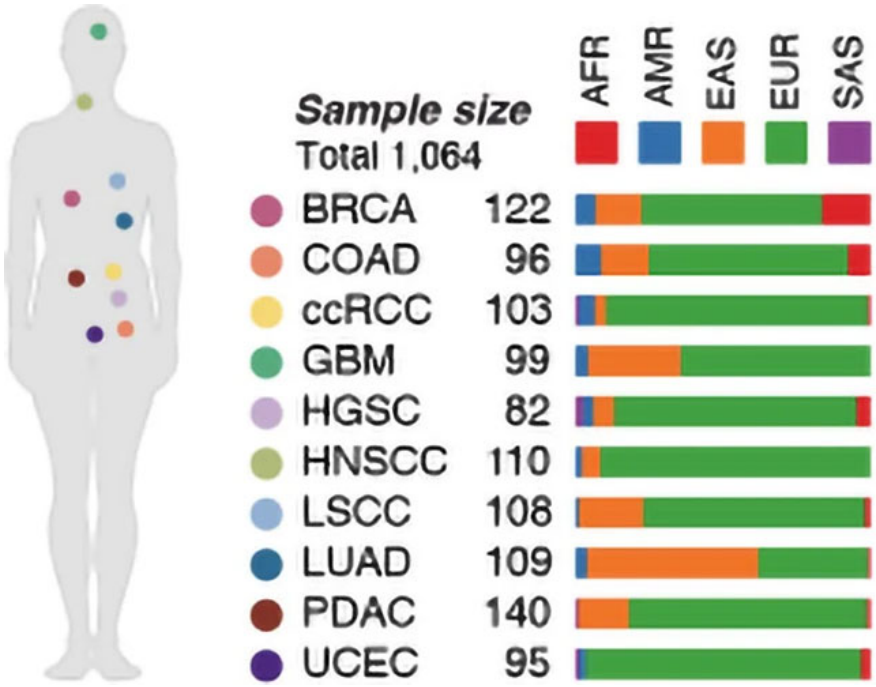
Unlike most cancer research, which focuses on mutations acquired over a lifetime, this study explored millions of genetic variants and their impact on protein activity in tumors. These findings could change the way we diagnose and treat cancer by taking into account each person's unique genetic background—not just the mutations in the tumor. This is a step toward truly personalized, holistic cancer care.

Genetics and the Potential Effects of Cancer

A new international study led by researchers at the Icahn School of Medicine at Mount Sinai, in collaboration with the National Cancer Institute's Clinical Tumor Proteomics Consortium (CPTAC), has revealed that the genes we inherit from birth, called germline genetic variants, play a much more important role in cancer than previously recognized.

This is the first study to show how millions of inherited genetic differences can influence the activity of thousands of proteins inside tumors. By analyzing data from more than 1,000 patients with 10 different types of cancer, researchers found that a person's inherited DNA can shape how cancer progresses in their body.



These insights could change the way cancer is treated. Currently, most treatments are guided by genetic mutations found in the tumor itself. This study suggests that taking into account more of a patient's inherited genetic background could improve the way cancer is diagnosed, risk is assessed, and treatment options are selected.

' *Everyone carries a unique combination of genetic variations from birth, and these genetic differences silently shape how our cells function throughout our lives,* ' said study co-author Zeynep H. Gümü?, PhD, Associate Professor of Genetics and Genomic Sciences at the Icahn School of Medicine. ' *These genetic variations can play an active role in how tumors form, how they grow, and even how they respond to treatment. This opens up new possibilities for tailoring cancer care based not only on the tumor itself, but also on a patient's underlying genetic makeup* .'

From somatic mutations to genetic variation

To date, most cancer research has focused on somatic mutations, changes that occur in cells throughout a person's lifetime. But germline genetic variations far outnumber somatic mutations, and their influence on cancer is not well understood.

To conduct the study, the researchers used a cutting-edge technique called precision peptidomics, which allows them to examine how specific genetic mutations modify the structure, stability, and function of proteins in cancer cells. By mapping more than 330,000 protein-coding genetic variants, the team discovered how these genetic differences can alter protein activity, influence gene expression, and even influence how tumors interact with the immune system.

The study suggests that inherited DNA changes can influence how genes are expressed and how proteins — key drivers of cancer behavior — are produced and regulated in tumors. These variations help explain part of the wide variation doctors see in how cancers appear, progress, and respond to different treatments.

The study adds to growing evidence that personalized cancer treatment should take into account not only a tumor's mutations but also a person's genetic background. However, the researchers caution that the study's findings are based on data from a group of patients of predominantly European descent, and further research is needed to ensure that these insights apply to diverse populations.