Colorectal Cancer Risk and Red and Processed Meat

Large analysis shows high meat consumption bumps risk by as much as 40%. It also identifies two genetic variants that increase risk even more.

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People worried about colorectal cancer may want to put those hot dogs and hamburgers on hold this summer.

New research from a Fred Hutch Cancer Center collaboration with USC Norris Comprehensive Cancer Center and published in the March issue of the journal Cancer Epidemiology, Biomarkers & Prevention quantifies the risk posed by eating red or processed meat. The collaboration also found two genetic mutations that, for those carrying them, make eating red and processed meat even more hazardous.

Colorectal cancer is the third-most common cancer and the second leading cause of cancer death worldwide. According to estimates from the National Cancer Institute, more than 150,000 people in the U.S. will be diagnosed in 2024 with colorectal cancer and more than 53,000 people will die of it. Genome-wide association studies, many conducted by Fred Hutch, have reported over 200 genetic variants associated with colorectal cancer risk. Research has also shown that consuming red and processed meat is a known risk factor.

Fred Hutch molecular and genetic epidemiologist Ulrike (Riki) Peters, PhD, MPH, one of the principal investigators of this study, said by conducting a genome-wide gene-environment, or more specifically in this case, a gene-diet interaction analysis, they hoped to identify genetic variants that either increase or ameliorate risk for these cancers.

“We know that not everyone who eats bacon almost every day will develop colorectal cancer,” Peters said. “So we want to understand if the genetic background may play a role here.”

More meat, more risk

The research team started by pooling participants from a collection of 27 studies, analyzing genetic data from around 30,000 colorectal cancer patients and approximately 39,000 healthy

controls, all of European ancestry (the non-inclusive ancestry is also one of the study's limitations).

Cancer patient data was gleaned from three studies, the Genetics and Epidemiology of Colorectal Cancer Consortium, housed at Fred Hutch; the Colorectal Cancer Transdisciplinary Study and the Colon Cancer Family Registry. A questionnaire determined frequency of red and processed meat intake. Red meat was defined as beef, pork and lamb; processed meat included bacon, sausage, lunch/deli meat and hot dogs.

In addition to diet, the researchers looked at a number of different data points including age, amount of food intake, obesity or being overweight and other factors. Peters said their results showed that older adults, those who were obese and those who ate more calories on a daily basis, were at a greater risk for developing the disease.

Ditto for those who ate more meat.

"Participants with the highest intake of red meat had a 30% increased risk of colorectal cancer and those with the highest intake of processed meat had a 40% increased risk," said Peters, who holds the Fred Hutch 40th Anniversary Endowed Chair. "But this is an overall increased risk. Due to genetic variability, the risk can be higher in some people."

That variability is exactly what the researchers dug into next.

Some people are more susceptible to CRC risk

After generating data on more than 7 million gene variants within the study participants' genomes, the research team conducted a gene-environment interaction analysis.

They used a standard statistical analysis approach to identify one single-nucleotide polymorphism, or SNP, in chromosome 8 near the HAS2 gene, present in two thirds of the population. This gene variant upped the risk of colorectal cancer risk by 38% for those who consumed high amounts of red and processed meat.

They then used a novel two-step approach to identify pattern between meat consumption and colorectal cancer risk and discovered another SNP in chromosome 18, part of the SMAD7 gene, which is responsible for regulating a protein linked to iron metabolism. The researchers believe this variant also increased the risk of colorectal cancer, possibly by altering the way the body processes iron.

"These findings suggest that there's a subset of the population that faces an even higher risk of colorectal cancer if they eat red or processed meat," Peters said.

This study builds on years of research by Peters and her team, including a recent study which found that obesity and alcohol consumption were strongly correlated with colorectal cancers in people under age 50.

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