

# Meat, especially if it's well done, may increase risk of bladder cancer

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People who eat meat frequently, especially meat that is well done or cooked at high temperatures, may have a higher chance of developing bladder cancer, according to a large study at The University of Texas M. D. Anderson Cancer Center presented at the American Association for Cancer Research 101st Annual Meeting 2010. This risk appears to increase in people with certain genetic variants.

"It's well known that meat cooked at high temperatures generates heterocyclic amines (HCAs) that can cause cancer," said study presenter Jie Lin, Ph.D., assistant professor in M. D. Anderson's Department of Epidemiology. "We wanted to find out if meat consumption increases the risk of developing [bladder cancer](#) and how genetic differences may play a part."

## Meat-eating habits examined

According to the American Cancer Society, almost 71,000 new cases of bladder cancer were diagnosed in this country last year, and more than 14,000 people died because of the disease. Men are at much higher risk of developing bladder cancer than women.

HCAs form when muscle meats, such as beef, pork, poultry or fish, are cooked at high temperatures. They are products of interaction between [amino acids](#), which are the foundation of proteins, and the chemical creatine, which is stored in muscles. Past research has identified 17

HCAs that may contribute to cancer.

This study, which took place over 12 years, included 884 M. D. Anderson patients with bladder cancer and 878 people who did not have cancer. They were matched by age, gender and ethnicity.

Using a standardized questionnaire designed by the National Cancer Institute (NCI), researchers gathered information about each participant's dietary habits. They then categorized people into four levels, ranging from lowest to highest [red meat](#) intake.

## **Well-done red meat nourishes cancer risk**

The group with the highest red-meat consumption had almost one-and-a-half times the risk of developing bladder cancer as those who ate little red meat.

Specifically, consumption of beef steaks, pork chops and bacon raised bladder [cancer risk](#) significantly. Even chicken and fish - when fried - significantly raised the odds of cancer.

The level of doneness of the meat also had a marked impact. People whose diets included well-done meats were almost twice as likely to develop bladder cancer as those who preferred meats rare.

Further questioning of a subset of 177 people with bladder cancer and 306 people without bladder cancer showed that people with the highest estimated intake of three specific HCAs were more than two-and-a-half times more likely to develop bladder cancer than those with low estimated HCA intake.

"To quantify intakes of HCAs, we began three or four years ago to gather information on meat-cooking methods and doneness level, and

then used a program developed by the NCI to estimate intakes of three major HCAs," Lin said. "These data gave important information about the relationship between HCAs and bladder cancer."

## **Genetic variants increase incidence**

To take the investigation a step further, researchers analyzed each participant's DNA to find if it contained genetic variants in the HCA metabolism pathways that may interact with red meat intake to increase the risk of cancer.

People with seven or more unfavorable genotypes as well as high red-meat intake were at almost five times the risk of bladder cancer.

"This research reinforces the relationship between diet and cancer," said Xifeng Wu, M.D., Ph.D., professor in M. D. Anderson's Department of Epidemiology and lead author on the study. "These results strongly support what we suspected: people, who eat a lot of red meat, particularly well-done red meat, such as fried or barbecued, seem to have a higher likelihood of bladder cancer. This effect is compounded if they carry high unfavorable genotypes in the HCA-metabolism pathway."

Wu said this research is a step toward a future in which a comprehensive cancer-risk prediction model will integrate environmental, diet and genetic risk factors to predict an individual's chances of developing cancer.

Provided by University of Texas M. D. Anderson Cancer Center

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