

Diet: Red Meat and the Risk of Colorectal Cancer

Colorectal cancer is the second most common form of cancer in the Western World. According to the International Agency for Cancer Research (IACR) 940,000 cases of colorectal cancer are diagnosed each year and there are 492,000 deaths from the disease. In the United States alone there are about 135,400 new cases every year and 56,700 people will die. In the UK it is the third most common cancer in men and second most common cancer in women, with over 34,000 new cases a year. These statistics make grim reading.

As with many forms of cancer, some risk factors are beyond a person's control. Your risk of developing the disease increases with your – it is more common in the over fifties. Having a close family member who has had bowel cancer or suffering yourself from other bowel problems and conditions, such as ulcerative colitis and Crohn's disease also increase your risk factors. Lifestyle factors may also play their part such as being overweight or obese, having a diet that is low in fiber, not exercising enough, smoking and drinking too much alcohol.

However, recent research has particularly focused on the association between diet and colorectal cancer – more specifically the link between red meat consumption and the risk of developing the disease. In a study published in the *Journal of the American Medical Association* last year (Chao *et al.* JAMA. 2005;293:172-182) researchers examined the relationship between recent and long-term meat consumption and the risk of incident colon and rectal cancer. A cohort of 148 610 adults aged 50 to 74 years (median, 63 years), residing in 21 different states across the US, provided information about the types of meat they ate and how often firstly in 1982 and then again in 1992/1993. The researchers recorded diagnosis of, and deaths from, colon or rectal cancer up until 31st August 2001. The study showed that people who ate a large amount of red meat over a long period of time may be 30 to 40 percent more likely to develop colorectal cancers and that people who ate the most processed meats were 50 percent more likely to develop such cancers. However, people who ate more fish and poultry compared with red meat appeared to be less likely to develop colorectal cancers.

In another study published by the IACR researchers prospectively followed 478 040 men and women from 10 European countries who were free of cancer at enrolment between 1992 and 1998. They collected information on diet and lifestyle at baseline. After an average follow-up period of 4.8 years, 1329 incident colorectal cancers were documented. The researchers specifically examined the relationship between intakes of red and processed meat, poultry, and fish and colorectal cancer risk. They also found that that colorectal cancer risk was positively associated with high consumption of red and processed meat and that there was an inverse association with fish intake.

Given that the evidence points to the fact that the chance of developing colorectal cancer is a third higher for people who regularly eat more than two portions per day of red and processed meat compared with those who eat less than one portion per week, the question of why this should be so needed to be answered.

Researchers at the Medical Research Council (MRC) Dunn Human Nutrition Unit in Cambridge, led by Professor Sheila Bingham, and the Open University Department of Chemistry in Milton Keynes, led by Dr David Schuker, set out to try and establish a biological correlation or physiological changes which could explain the epidemiological evidence. Their research, published earlier this year in the journal *Cancer Research* may help to explain the link between eating red and processed meat and the increased risk of developing colorectal cancer.

As there are no blood-borne risk markers for colorectal cancer, the researchers studied cells from the lining of the colon from healthy volunteers who had consumed either red meat, vegetarian, high red meat or high fiber diets for 15 days. They specifically looked to see whether eating red meat altered the DNA of these cells.

The scientists discovered that when a red meat diet was compared with a vegetarian diet, levels of DNA damage increased. The DNA damage was specific to substances, called N-nitrosocompounds, Work carried out by a team led by Professor David Shuker at the Open University, based in Milton Keynes in the UK, had already established that the N-nitrosocompound derivatives of common amino acids found in meat lead to these very characteristic changes to the structure of DNA. The N-nitrosocompounds are formed in the large bowel (the colon and rectum) after eating red meat. Some of these compounds may combine with DNA and alter it so that it is more likely to undergo harmful changes or mutations that increase the likelihood of cancer. The DNA damage may be repaired naturally in the body, and fibre in the diet may help the process. If it is not repaired then cancer can develop.

As Professor Bingham noted “it is the first definite link between red meat and the very first stage in cancer.” As such, the researchers believe that their findings could help to develop a screening test for very early changes related to the disease.

By way of reference, the following standards were used in the 2005 study by Chao *et al.*:

What is meant by the term red meat and processed meat?

Red meat includes beef, lamb, pork and liver. Processed meats include bacon, sausages, ham and cold cuts of meat. Some of the meats fall into both categories.

How much red meat is a large amount?

Eating a lot of red meat is defined as:

- about 85g (3oz) or more a day for men
- about 55g (2oz) or more a day for women

It's interesting to note that the amount of meat found in a large hamburger from a fast food restaurant is about 85g.

How much processed meat is a large amount?

Eating a lot of processed meat was defined as:

- 30g (1oz) eaten on five or six days of the week for men
- 30g (1oz) eaten on two or three days of the week for women

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