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FACT SHEET #39

Cornell University Program on
Breast Cancer and Environmental Risk Factors
in New York State (BCERF)

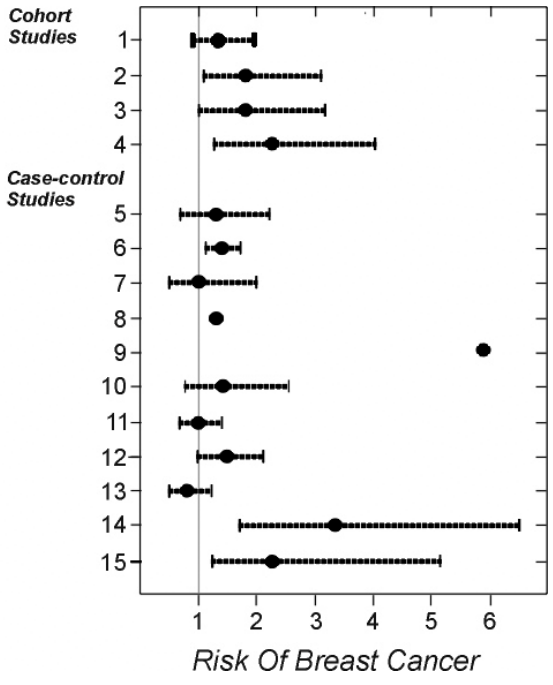
Meat, Poultry and Fish and the Risk of Breast Cancer

Current research suggests that there is a possible relationship between eating meat, especially beef and cured meats, and an increase in the risk of breast cancer. This relationship is uncertain for eating other meats such as pork and poultry. Eating fish appears to be unrelated to breast cancer risk. Some studies suggest that cancer-causing chemicals are formed when meat is cooked at high temperatures and for a long time. The results of this research are not entirely clear because of limits in the studies that have been published so far.

Does eating meat, in general, affect a woman's risk of breast cancer?

Eating meat may be associated with an increased risk of breast cancer, but, owing to differences in the results and design of studies examining this question, it is not possible to be sure about this risk. This is illustrated in the chart below, which shows results of 15 studies of the risk of getting breast cancer among women who eat a lot of meat compared to women who eat little meat. Each study is shown by a point on a thick horizontal line. On the chart a thin dotted vertical line is drawn through the number one because a value of one indicates no difference in risk between these two groups of women. Values greater than one (on the right side of the dotted line) indicate more risk and values less than one (to the left of the dotted line) indicate less risk. Each point is the estimated risk for high versus low meat consumption. The thick horizontal lines on either side of the points on the chart show the range within which we can be 95% sure of these results. This range is known as the 95% confidence limits. If 100 similar groups of women were studied, 95 of the groups would have findings in this range. Two of the studies, numbers eight and nine, do not have 95% confidence lines because their values were not reported. The chart shows that twelve of the studies saw that the women who ate large amounts of meat had a greater risk of breast cancer than the women who ate small amounts of meat. If the 95% confidence limits (shown by the thick lines on either side of the points) do not cross one, the point of no difference in breast cancer risk (the dotted vertical line), the results are said to be statistically significant. This indicates that there is adequate evidence that women with high and low meat intake differ in their risks of breast cancer. Five of the studies (numbers 2, 3, 4, 14 and 15 on this chart) that demonstrated increased risk had statistically significant results.

The design of the studies must also be considered. Researchers must design the studies to identify the effect of eating meat, itself, by allowing for changes in breast cancer risk from known breast cancer risk factors. Most of the studies of meat and breast cancer risk did not account for all the known breast cancer risk factors, some of which were identified after the studies were done. Unfortunately the effect, on the reported breast cancer risk, of omitted risk factors cannot be predicted and this makes us less sure whether the results seen were due to meat or some other risk factor(s). For example, women who ate more meat may have eaten fewer vegetables and fruits. Eating these foods is associated with lower breast cancer risk (see BCERF Fact Sheet # 18, *Fruits and Vegetables and the Risk of Breast Cancer*).



Does eating red meat affect a woman's risk of breast cancer?

Women who eat red meat (beef, pork or lamb) may have a higher incidence of breast cancer than women who do not. This is not certain because these studies suffer from many of the same problems as those above. The results of the eleven studies that examined this matter also differed. The majority of the studies reported an increase in risk of breast cancer among women who ate higher amounts of red meat. Four of the studies that reported a higher breast cancer risk had statistically significant results.

Some studies examined beef and pork separately. Eating beef may be associated with increased risk of breast cancer. This association has been examined in ten different studies. A greater number of the studies, including five studies that were statistically significant, saw a rise in breast cancer risk linked to eating beef. It is not clear if there is a connection between eating pork and the risk of breast cancer. Eleven studies have examined this issue with conflicting results.

Does eating poultry change a woman's risk of breast cancer?

The results of studies looking at this question are not in agreement. It is not possible to tell if there is an association between eating poultry and breast cancer risk. Fourteen studies have examined this question and the results are inconsistent.

Does eating fish change a woman's risk of breast cancer?

Eating fish has no association with breast cancer risk. The results of these studies are in general agreement. Ten of thirteen studies saw no connection between eating fish and breast cancer risk. Of the studies that did see a connection between eating fish and breast cancer risk, two reported an increase in risk and one reported a decrease in risk.

There is evidence that fish oils slow the development of mammary cancer in animals but the research in humans is less clear (see BCERF Fact Sheet #27 *Dietary Fat and the Risk of Breast Cancer*). The studies described above examined fish in general rather than fish oil.

Fish living in contaminated waters can accumulate environmental contaminants. Studies of breast cancer in women who eat sport fish caught in contaminated waters have not been conducted. Fish consumption advisories are especially important for pregnant women, and can be obtained from the New York State Department of Health at their web site, http://www.health.state.ny.nysdoh/environ/fish00.htm or by calling the Center for Environmental Health at 1-800-458-1158. The Environmental Protection Agency also maintains sport fish consumption information for bodies of water through out the United States and can be contacted at 1-513-489-8190. These concerns would not include fish bought in grocery stores, which are tested by the United States Food and Drug Administration.

Does eating cured meat affect a woman's risk of breast cancer? Are there other health concerns associated with cured meat?

Eating cured meats may be associated with an increased risk of breast cancer. This conclusion is not definite because of the same study problems discussed above. In addition, all of the studies of this topic did not define cured meats the same way and were not always looking at the same products. Twelve different studies have examined this issue. The majority reported an increase in the risk of breast cancer associated with eating processed meat products. Four of the studies, which reported an increased risk, had statistically significant results. Cured meats use nitrates and nitrites as preservatives and would include hot dogs, sausage, salami, bacon, lunchmeats and some types of ham.

Is the way and amount meat is cooked linked to changes in breast cancer risk?

How meat is cooked and how well it is cooked may be related to breast cancer risk. When meat is cooked, especially at high temperatures, ingredients within it can form two types of cancer-causing chemicals, heterocyclic amines and polycyclic aromatic hydrocarbons. The formation of the heterocyclic amines has been studied the most. Many things can affect the formation of these chemicals in meat during cooking such as the type of meat, how it is prepared before cooking, how it is cooked, and how much it is cooked. Two key factors are the method of cooking and how well the meat is cooked. Formation of heterocyclic amines is increased by cooking methods that use high temperatures like frying, broiling or grilling. In addition, meats that are cooked to the level of well-done or more contain the highest concentrations of heterocyclic amines. Polycyclic aromatic hydrocarbons are also formed by high temperatures and are seen in grilled, broiled and fried meats. Increased formation of these chemicals would also be expected in well-done meat. Large amounts of both these chemicals are also found in pan drippings, and gravies made from drippings.

A number of studies have looked at the connection between the way meat is cooked and breast cancer risk. Six studies have examined the association of eating fried meats and the risk of breast cancer. In four of these studies women who ate fried meat had an increased risk of breast cancer which was statistically significant. Three studies have evaluated the link between broiling meats and breast cancer. One large study reported no connection; however, a smaller study reported a statistically

significant increase in the risk of breast cancer. Two studies have examined the relationship of eating grilled (barbecued, charred) meat to breast cancer risk. The larger study reported no connection between eating grilled meat and breast cancer risk and the other reported an increased risk of breast cancer.

One study has examined the connection between the how well-done meat is cooked and breast cancer risk. In this study the authors were able to show a statistically significant relationship between the doneness of meat eaten (hamburger, beefsteak or bacon) and breast cancer risk. The more these meats were cooked, the greater their association with breast cancer risk.

It is important to remember that all meats and especially ground meats should be cooked sufficiently to kill any potentially harmful bacteria. The United States Department of Agriculture (USDA) recommends the use of a meat thermometer since the meat color is not a good indicator of doneness (see the USDA Food Safety and Inspection web site http://www.fsis.usda.gov/oa/pubs/grilsmok.htm or call 1-800-535-4555).

Does meat fat play a role in the possible association between breast cancer risk and eating meat?

Three studies have examined this question directly and all three found that the change in breast cancer risk associated with eating meat was not due to the fat content of the meat. However, the high saturated fat content of some meats remains a health concern, especially for heart disease risk.

What is the role of protein in breast cancer risk?

The relationship of the amount of protein in a woman's diet and breast cancer risk has been examined by a number of studies. No clear conclusion can be drawn from these studies because they report different results. Some studies reported a higher risk of breast cancer connected with high amounts of protein in a woman's diet, others reported lower risk and some found no association between breast cancer risk and protein in a woman's diet.

Does eating a vegetarian diet decrease a woman's risk of breast cancer?

Current studies of women eating Western-style vegetarian diets have not shown that they have a lower risk of breast cancer than nonvegetarian women have. A recent study combining the data of five cohort studies examining vegetarians in the United States, Germany and England found that the death rate from breast cancer in vegetarian women was no different from that of women in the general population. The women in these studies were selected only because they do not eat meat. There was no evidence that they ate more fruits and vegetables, which may be associated with lower breast cancer risk. The major health difference noted between vegetarians and nonvegetarians was a lower death rate from heart disease among the vegetarians.

Do hormones given to animals affect breast cancer risk of women who eat meat?

This question has not been studied directly. Women who eat meat from hormone treated animals have not been compared to women who eat meat from untreated animals. Examination of the animal's hormone levels indicate that if the animals are correctly treated and slaughtered, the levels of hormones may be slightly elevated in their meat. But, these hormone levels are still within the range found in untreated animals. The use of hormones for the production of meat has been reviewed by the Food and Drug Administration (FDA). Scientists at the FDA do not believe that eating meat from hormone treated animals has human health effects. (See BCERF Fact Sheet #37—*Consumer Concerns about Hormones in Food*)

Does eating meat affect the survival of women who have had breast cancer?

Two cohort studies have examined meat consumption and the survival of women with breast cancer. Both studies looked at red meat consumption but they came to different conclusions. One study reported an increased risk of death among breast cancer survivors associated with eating red meat and the other, much larger study, reported no association between death and red meat in the diet. Neither of these results was statistically significant. The larger study also examined eating poultry and found it connected with a statistically significant decrease in the risk of death for breast cancer survivors. This decrease in the risk of death was linked to animal but not vegetable protein. Eating animal protein (but not red meat) was linked to a statistically significant decrease in the risk of death; eating vegetable protein had no association with the risk of death from breast cancer.

What research needs to be done?

Further study is needed to clarify and determine the following.

- The level of breast cancer risk linked to eating red meats, cured meats and poultry
- The potential association of meat cooking method and doneness with breask cancer risk
- Methods to limit the formation of possible cancer-causing chemicals during the cooking of meat
- The possible connection between increased survival of women with breast cancer and eating animal protein, except red meat
- Methods to better estimate the amount of meat, proteins and animal fats people eat

What can women do now?

- Choose 2 servings (total of 6 oz) of lean meat, fish, chicken, beans or nuts daily as recommended by the Unites States Department of Agriculture (USDA) Food Guide Pyramid. The Food Guide Pyramid can be found at http://warp.nal.usda.gov:80/fnic/Fpyr/pyramid.html or by contacting the USDA Center for Nutrition Policy and Promotion at (202) 606-8000.
- Do not cook meat to beyond well-done but use a meat thermometer to make sure that potentially harmful bacteria have been killed. Include baked or stewed meat dishes that use lower cooking temperatures.
- Include plenty of fruits, vegetable and whole grains in your diet

An extensive bibliography on *Meat, Poultry and Fish and the Risk of Breast Cancer* is available on the BCERF web site: http://www.cfe.cornell.edu/bcerf/

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