



# Causes, Risk Factors, and Prevention

## Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for ovarian cancer.

- [What Are the Risk Factors for Ovarian Cancer?](#)
- [Do We Know What Causes Ovarian Cancer?](#)

## Prevention

There is no known way to prevent most ovarian cancers. But there are things you can do that might lower your risk. Learn more.

- [Can Ovarian Cancer Be Prevented?](#)

## What Are the Risk Factors for Ovarian Cancer?

A risk factor is anything that changes your chance of getting a disease like cancer. Different cancers have different risk factors. For example, unprotected exposure to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for a number of cancers.

But risk factors don't tell us everything. Having a risk factor, or even several risk factors, does not mean that you will get the disease. And many people who get the disease may not have had any known risk factors. Even if a woman with ovarian cancer has a risk factor, it is very hard to know how much that risk factor may have contributed to the cancer. Researchers have discovered several specific factors that change a woman's likelihood of developing *epithelial* ovarian cancer. These risk factors don't apply to other

less common types of ovarian cancer like germ cell tumors and stromal tumors.

## Age

The risk of developing ovarian cancer gets higher with age. Ovarian cancer is rare in women younger than 40. Most ovarian cancers develop after menopause. Half of all ovarian cancers are found in women 63 years of age or older.

## Obesity

Various studies have looked at the relationship of obesity and ovarian cancer. Overall, it seems that obese women (those with a body mass index of at least 30) have a higher risk of developing ovarian cancer.

## Reproductive history

Women who have been pregnant and carried it to term before age 26 have a lower risk of ovarian cancer than women who have not. The risk goes down with each full-term pregnancy. Women who have their first full-term pregnancy after age 35 or who never carried a pregnancy to term have a higher risk of ovarian cancer.

Breastfeeding may lower the risk even further.

## Birth control

Women who have used oral contraceptives (also known as *birth control pills* or *the pill*) have a lower risk of ovarian cancer. The lower risk is seen after only 3 to 6 months of using the pill, and the risk is lower the longer the pills are used. This lower risk continues for many years after the pill is stopped.

A recent study found that the women who used depot medroxyprogesterone acetate (DMPA or Depo-Provera CI<sup>®</sup>), an injectable hormonal contraceptive had a lower risk of ovarian cancer. The risk was even lower if the women had used it for 3 or more years.

## Gynecologic surgery

Tubal ligation (having your tubes tied) may reduce the chance of developing ovarian

cancer by up to two-thirds. A hysterectomy (removing the uterus without removing the ovaries) also seems to reduce the risk of getting ovarian cancer by about one-third.

## **Fertility drugs**

In some studies, researchers have found that using the fertility drug clomiphene citrate (Clomid<sup>®</sup>) for longer than one year may increase the risk for developing ovarian tumors. The risk seemed to be highest in women who did not get pregnant while on this drug. Fertility drugs seem to increase the risk of the type of ovarian tumors known as "low malignant potential" (described in the section, [What Is Ovarian Cancer?](#)). If you are taking fertility drugs, you should discuss the potential risks with your doctor. However, women who are infertile may be at higher risk (compared to fertile women) even if they don't use fertility drugs. This might be in part because they haven't carried a pregnancy to term or used birth control pills (which are protective).

## **Androgens**

Androgens are male hormones. Danazol, a drug that increases androgen levels, was linked to an increased risk of ovarian cancer in a small study. In a larger study, this link was not confirmed, but women who took androgens were found to have a higher risk of ovarian cancer. Further studies of the role of androgens in ovarian cancer are needed.

## **Estrogen therapy and hormone therapy**

Some recent studies suggest women using estrogens after menopause have an increased risk of developing ovarian cancer. The risk seems to be higher in women taking estrogen alone (without progesterone) for many years (at least 5 or 10). The increased risk is less certain for women taking both estrogen and progesterone.

## **Family history of ovarian cancer, breast cancer, or colorectal cancer**

Ovarian cancer can run in families. Your ovarian cancer risk is increased if your mother, sister, or daughter has (or has had) ovarian cancer. The risk also gets higher the more relatives you have with ovarian cancer. Increased risk for ovarian cancer can also come from your father's side.

A family history of some other types of cancer such as colorectal and breast cancer is linked to an increased risk of ovarian cancer. This is because these cancers can be caused by an inherited mutation (change) in certain genes that cause a family cancer syndrome that increases the risk of ovarian cancer.

## Family cancer syndromes

About 5 to 10% of ovarian cancers are a part of [family cancer syndromes](#) resulting from inherited changes (*mutations*) in certain genes.

### Hereditary breast and ovarian cancer syndrome

This syndrome is caused by inherited mutations in the genes *BRCA1* and *BRCA2*, as well as possibly some other genes that have not yet been identified. This syndrome is linked to a high risk of [breast cancer](#) as well as ovarian, fallopian tube, and primary peritoneal cancers. The risk of some other cancers, such as [pancreatic cancer](#) and [prostate cancer](#), are also increased.

Mutations in *BRCA1* and *BRCA2* are also responsible for most inherited ovarian cancers. When these genes are normal they help prevent cancer by making proteins that keep cells from growing abnormally (they act as *tumor suppressors*). But if you have inherited a mutation (defect) in one of these genes from either parent, this cancer-preventing protein is less effective, and your chances of developing breast and/or ovarian cancer increase. Mutations in *BRCA1* and *BRCA2* are about 10 times more common in those who are Ashkenazi Jewish than those in the general U.S. population.

The lifetime ovarian cancer risk for women with a *BRCA1* mutation is estimated to be between 35% and 70%. This means that if 100 women had a *BRCA1* mutation, between 35 and 70 of them would get ovarian cancer. For women with *BRCA2* mutations the risk has been estimated to be between 10% and 30% by age 70. These mutations also increase the risks for primary peritoneal carcinoma and fallopian tube carcinoma.

In comparison, the ovarian cancer lifetime risk for the women in the general population is less than 2%.

### PTEN tumor hamartoma syndrome

In this syndrome, also known as Cowden disease, people are primarily affected with thyroid problems, thyroid cancer, and breast cancer. Women also have an increased

risk of ovarian cancer. It is caused by inherited mutations in the *PTEN* gene.

## **Hereditary nonpolyposis colon cancer**

Women with this syndrome have a very high risk of [colon cancer](#) and also have an increased risk of developing cancer of the uterus (endometrial cancer) and ovarian cancer. Many different genes can cause this syndrome. They include *MLH1*, *MLH3*, *MSH2*, *MSH6*, *TGFBR2*, *PMS1*, and *PMS2*. An abnormal copy of any one of these genes reduces the body's ability to repair damage to its DNA. The lifetime risk of ovarian cancer in women with hereditary nonpolyposis colon cancer (HNPCC) is about 10%. Up to 1% of all ovarian epithelial cancers occur in women with this syndrome. An older name for HNPCC is Lynch syndrome.

## **Peutz-Jeghers syndrome**

People with this rare genetic syndrome develop polyps in the stomach and intestine while they are teenagers. They also have a high risk of cancer, particularly cancers of the digestive tract (esophagus, stomach, small intestine, colon). Women with this syndrome have an increased risk of ovarian cancer, including both epithelial ovarian cancer and a type of stromal tumor called *sex cord tumor with annular tubules* (SCTAT). This syndrome is caused by mutations in the gene *STK11*.

## **MUTYH-associated polyposis**

People with this syndrome develop polyps in the colon and small intestine and have a high risk of colon cancer. They are also more likely to develop other cancers, including cancers of the ovary and [bladder](#). This syndrome is caused by mutations in the gene *MUTYH*.

## **Personal history of breast cancer**

If you have had breast cancer, you might also have an increased risk of developing ovarian cancer. There are several reasons for this. Some of the reproductive risk factors for ovarian cancer may also affect breast cancer risk. The risk of ovarian cancer after breast cancer is highest in those women with a family history of breast cancer. A strong family history of breast cancer may be caused by an inherited mutation in the *BRCA1* or *BRCA2* genes and hereditary breast and ovarian cancer syndrome, which is linked to an increased risk of ovarian cancer.

## **Talcum powder**

It has been suggested that talcum powder applied directly to the genital area or on sanitary napkins may be carcinogenic (cancer-causing) to the ovaries. Some studies suggest a very slight increase in risk of ovarian cancer in women who used talc on the genital area. In the past, talcum powder was sometimes contaminated with asbestos, a known cancer-causing mineral. This might explain the association with ovarian cancer in some studies. Since the 1970s, however, body and face powder products have been required by law to be asbestos-free. Proving the safety of these newer products will require follow-up studies of women who have used them for many years. There is no evidence at present linking cornstarch powders with any female cancers.

## **Diet**

A study of women who followed a low-fat diet for at least 4 years showed a lower risk of ovarian cancer. Some studies have shown a reduced rate of ovarian cancer in women who ate a diet high in vegetables, but other studies disagree. The American Cancer Society recommends eating a variety of healthful foods, with an emphasis on plant sources. Eat at least 2 ½ cups of fruits and vegetables every day, as well as several servings of whole grain foods from plant sources such as breads, cereals, grain products, rice, pasta, or beans. Limit the amount of red meat and processed meats you eat. Even though the effect of these dietary recommendations on ovarian cancer risk remains uncertain, following them can help prevent several other diseases, including some other types of cancer.

## **Analgesics**

In some studies, both aspirin and acetaminophen have been shown to reduce the risk of ovarian cancer. However, the information isn't consistent. Women who don't already take these medicines regularly for other health conditions should not start doing so to try to prevent ovarian cancer. More research is needed on this issue.

## **Smoking and alcohol use**

Smoking doesn't increase the risk of ovarian cancer overall, but it is linked to an increased risk for the mucinous type.

Drinking alcohol is not linked to ovarian cancer risk.

- [References](#)

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Last Medical Review: August 5, 2014 Last Revised: February 4, 2016

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## Do We Know What Causes Ovarian Cancer?

We don't yet know exactly what causes most ovarian cancers. As discussed in the previous section, we do know some factors that make a woman more likely to develop epithelial ovarian cancer. Much less is known about risk factors for germ cell and stromal tumors of the ovaries.

There are many theories about the causes of ovarian cancer. Some of them came from looking at the things that change the risk of ovarian cancer. For example, pregnancy and taking birth control pills both lower the risk of ovarian cancer. Since both of these things reduce the number of times the ovary releases an egg (ovulation), some researchers think that there may be some relationship between ovulation and the risk of developing ovarian cancer.

Also, we know that tubal ligation and hysterectomy lower the risk of ovarian cancer. One theory to explain this is that some cancer-causing substances may enter the body through the vagina and pass through the uterus and fallopian tubes to reach the ovaries. This would explain how removing the uterus or blocking the fallopian tubes affects ovarian cancer risk. Another theory is that male hormones (androgens) can cause ovarian cancer.

Researchers have made great progress in understanding how certain mutations (changes) in DNA can cause normal cells to become cancerous. DNA is the chemical that carries the instructions for nearly everything our cells do. We usually look like our parents because they are the source of our DNA. However, DNA affects more than the way we look. Some genes (parts of our DNA) contain instructions for controlling when our cells grow and divide. DNA mutations (defects) in these genes can lead to the development of cancer.

## Inherited genetic mutations

A small portion of ovarian cancers occur in women with inherited gene mutations linked to an increased risk of ovarian cancer. These include mutations in the *BRCA1* and *BRCA2* genes, as well as the genes related to other family cancer syndromes linked to an increased risk of ovarian cancer, such as *PTEN* (PTEN tumor hamartoma syndrome), *STK11* (Peutz-Jeghers syndrome), *MUTYH* (MUTYH-associated polyposis, and the many genes that can cause hereditary nonpolyposis colon cancer (*MLH1*, *MLH3*, *MSH2*, *MSH6*, *TGFBR2*, *PMS1*, and *PMS2*). (These syndromes were discussed in the [previous section](#)).

Genetic tests can detect gene mutations associated with these inherited syndromes. If you have a family history of cancers linked to these syndromes, such as breast and ovarian cancers, thyroid and ovarian cancer, and/or colorectal and endometrial (uterine) cancer, you might want to ask your doctor about genetic counseling and testing. The American Cancer Society recommends discussing genetic testing with a qualified cancer genetics professional before any genetic testing is done. For more on this, see our document [Genetic Testing: What You Need to Know](#).

## Acquired genetic changes

Most DNA mutations related to ovarian cancer are not inherited but instead occur during a woman's life. In some cancers, acquired mutations of certain genes leading to the development of cancer may result from radiation or cancer-causing chemicals, but there is no evidence for this in ovarian cancer. So far, studies haven't been able to specifically link any single chemical in the environment or in our diets to mutations that cause ovarian cancer. The cause of most acquired mutations remains unknown.

Most ovarian cancers have several acquired gene mutations. Research has suggested that tests to identify acquired changes of certain genes in ovarian cancers, like the *TP53* tumor suppressor gene or the *HER2* oncogene, can help predict a woman's prognosis. The role of these tests is still not certain, and more research is needed.

- [References](#)

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# Can Ovarian Cancer Be Prevented?

Most women have one or more [risk factors](#) for ovarian cancer. But most of the common factors only slightly increase your risk, so they only partly explain the frequency of the disease. So far, what is known about risk factors has not translated into practical ways to prevent most cases of ovarian cancer.

There are several ways you can reduce your risk of developing epithelial ovarian cancer. Much less is known about ways to lower the risk of developing germ cell and stromal tumors of the ovaries. The remainder of this section refers to epithelial ovarian cancer only. It is important to realize that some of these strategies reduce the risk only slightly, while others decrease it much more. Some strategies are easily followed, and others require surgery. If you are concerned about your risk of ovarian cancer, you may want to discuss this information with your health care professionals. They can help you consider these ideas as they apply to your own situation.

## Oral contraceptives

Using oral contraceptives (birth control pills) decreases the risk of developing ovarian cancer, especially among women who use them for several years. Women who used oral contraceptives for 5 or more years have about a 50% lower risk of developing ovarian cancer compared with women who never used oral contraceptives. Still, birth control pills do have some serious risks and side effects. Women considering taking these drugs for any reason should first discuss the possible risks and benefits with their doctor.

## Gynecologic surgery

Both tubal ligation and hysterectomy may reduce the chance of developing ovarian cancer, but experts agree that these operations should only be done for valid medical reasons -- not for their effect on ovarian cancer risk.

If you are going to have a hysterectomy for a valid medical reason and you have a strong family history of ovarian or breast cancer, you may want to consider having both ovaries and fallopian tubes removed (called a *bilateral salpingo-oophorectomy*) as part of that procedure.

Even if you don't have an increased risk of ovarian cancer, some doctors recommend that the ovaries be removed with the uterus if a woman has already gone through menopause or is close to menopause. If you are older than 40 and you are going to have a hysterectomy, you should discuss the potential risks and benefits of having your ovaries removed with your doctor.

## **Prevention strategies for women with a family history of ovarian cancer or BRCA mutation**

If your family history suggests that you (or a close relative) might have a syndrome linked with a high risk of ovarian cancer, you might want to consider genetic counseling and testing. During genetic counseling (by a genetic counselor or other health care professional with training in genetic risk evaluation), your personal medical and family history is reviewed. This can help predict whether you are likely to have one of the gene mutations associated with an increased ovarian cancer risk.

The counselor will also discuss the benefits and potential drawbacks of genetic testing with you. Genetic testing can help determine if you or members of your family carry certain gene mutations that cause a high risk of ovarian cancer. Still, the results are not always clear cut, and a genetic counselor can help you sort out what the results mean to you.

For some women with a strong family history of ovarian cancer, knowing they do not have a mutation that increases their ovarian cancer risk can be a great relief for them and their children. Knowing that you do have such a mutation can be stressful, but many women find this information very helpful in making important decisions about certain prevention strategies for them and their children. More information about genetic testing can be found in our document [Genetic Testing: What You Need to Know](#).

Using oral contraceptives is one way that many women can reduce their risk of developing ovarian cancer. Oral contraceptives also seem to reduce this risk for women with *BRCA1* and *BRCA2* mutations. But birth control pills can increase breast cancer risk in women without these mutations. This increased risk continues for some time after these pills are stopped. Studies that have looked at this issue in women with *BRCA* mutations haven't agreed about what effect birth control pills have on breast cancer risk. Some studies have shown an increased risk of breast cancer, while some have not. Research is continuing to find out more about the risks and benefits of oral contraceptives for women at high ovarian and breast cancer risk.

It isn't clear if tubal ligation effectively reduces the risk of ovarian cancer in women who

have *BRCA1* or *BRCA2* mutations. Studies that have looked at this issue haven't agreed about this. Researchers do agree that removing both ovaries and fallopian tubes (salpingo-oophorectomy) helps protect women with *BRCA1* or *BRCA2* mutations against ovarian (and fallopian tube) cancer.

Sometimes a woman has this surgery to reduce her risk of ovarian cancer before cancer is even suspected. If the ovaries are removed to prevent ovarian cancer, the surgery is called *risk-reducing* or *prophylactic*. Generally, salpingo-oophorectomy is recommended only for very high-risk women after they have finished having children. This operation lowers ovarian cancer risk a great deal but does not entirely eliminate it. That's because some women who have a high risk of ovarian cancer already have a cancer at the time of surgery. These cancers can be so small that they are only found when the ovaries and fallopian tubes are looked at under the microscope (after they are removed). Also, women with *BRCA1* or *BRCA2* gene mutations have an increased risk of primary peritoneal carcinoma. Although the risk is low, this cancer can still develop after the ovaries and fallopian tubes are removed.

The risk of fallopian tube cancer is also increased in women with mutations in *BRCA1* or *BRCA2*. Sometimes early fallopian tube cancers are found unexpectedly when the fallopian tubes are removed as a part of a risk-reducing surgery. In fact, some cancers that were thought to be ovarian or primary peritoneal cancers may have actually started in the fallopian tubes. That is why experts recommend that women at high risk of ovarian cancer who are having their ovaries removed should have their fallopian tubes completely removed as well (salpingo-oophorectomy).

Research has shown that premenopausal women who have *BRCA* gene mutations and have had their ovaries removed reduce their risk of [breast cancer](#) as well as their risk of ovarian cancer. The risk of ovarian cancer is reduced by 85% to 95%, and the risk of breast cancer cut by 50% or more.

Another option for women who do not wish to have their ovaries removed because they don't want to lose ovarian function (and go through menopause early) is to have just the fallopian tubes removed (a salpingectomy). They may choose to have their ovaries removed later. This has not been studied as well as removing both the ovaries and fallopian tubes at the same time, so it isn't clear how much this affects the risk of cancer. It is clear that to have the greatest effect on breast cancer risk, the ovaries need to be removed by the time the woman is 35.

Some women who have a high risk of ovarian cancer due to *BRCA* gene mutations feel that having their ovaries and fallopian tubes removed is not right for them. Often doctors recommend that those women have screening tests to try to find ovarian cancer early. These tests are discussed in the next section.

- [References](#)

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