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# Ovarian Cancer 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.

- [Ovarian Cancer Risk Factors](#)
- [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?](#)

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# Ovarian Cancer Risk Factors

A risk factor is anything that increases your chance of getting a disease like cancer. Different cancers have different risk factors. Some risk factors, like smoking, can be changed. Others, like a person's age or family history, can't be changed.

But having a risk factor, or even many, does not mean that you will get the disease. And

some people who get the disease may not have any known risk factors. Researchers have discovered several risk factors that might increase a woman's chance 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.

## **Factors that increase your risk of ovarian cancers**

### **Getting older**

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.

### **Being overweight or obese**

Obesity has been linked to a higher risk of developing many cancers. The current information available for ovarian cancer risk and obesity is not clear. Obese women (those with a body mass index [BMI] of at least 30) probably have a higher risk of developing ovarian cancer, but not necessarily the most aggressive types, such as high-grade serous cancers. Obesity may also negatively affect the overall survival of a woman with ovarian cancer.

### **Having children later or never having a 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.

### **Taking hormone therapy after menopause**

Women using estrogens alone or with progesterone after menopause have an increased risk of developing ovarian cancer compared to women who have never used hormones.

### **Having a 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.

### **Having a family cancer syndrome**

Up to 25% of ovarian cancers are a part of [family cancer syndromes](#)<sup>1</sup> resulting from inherited changes (mutations) in certain genes.

#### ***Hereditary breast and ovarian cancer syndrome (HBOC)***

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 found. This syndrome is linked to a high risk of [breast cancer](#)<sup>2</sup> as well as ovarian, fallopian tube, and primary peritoneal cancers. The risk of some other cancers, such as [pancreatic cancer](#)<sup>3</sup> and [prostate cancer](#)<sup>4</sup>, are also increased.

Mutations in *BRCA1* and *BRCA2* are also responsible for most inherited ovarian cancers. 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%.

#### ***Hereditary nonpolyposis colon cancer (HNPCC)***

Women with this syndrome have a very high risk of [colon cancer](#)<sup>5</sup> 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*, *MSH2*, *MSH6*, *PMS2*, and *EPCAM*. The lifetime risk of ovarian cancer in women with hereditary nonpolyposis colon cancer is about 10%. Up to 1% of all ovarian epithelial cancers

occur in women with this syndrome. Another 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](#)<sup>6</sup>. This syndrome is caused by mutations in the gene *MUTYH*.

### ***Other genes associated with hereditary ovarian cancer***

Besides the gene mutations mentioned above, there are other genes linked to ovarian cancer. These include *ATM*, *BRIP1*, *RAD51C*, *RAD51D*, and *PALB2*. Some of these genes are also associated with cancers such as [breast](#)<sup>7</sup> and [pancreas](#)<sup>8</sup>.

### **Using fertility treatment**

Fertility treatment with in vitro fertilization (IVF) seems to increase the risk of the type of ovarian tumors known as "borderline" or "low malignant potential" (described in [What Is Ovarian Cancer?](#)<sup>9</sup>). Other studies, however, have not shown an increased risk of invasive ovarian cancer with fertility drugs. If you are taking fertility drugs, you should discuss the potential risks with your doctor.

### **Having had 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.

## Smoking

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

## Factors with unclear effects on ovarian cancer risk

### Androgens

Androgens, such as testosterone, are male hormones. There appears to be a link between certain androgens and specific types of ovarian cancer, but further studies of the role of androgens in ovarian cancer are needed.

### Talcum powder

It has been suggested that talcum powder might cause cancer in the ovaries if the powder particles (applied to the genital area or on sanitary napkins, diaphragms, or condoms) were to travel through the vagina, uterus, and fallopian tubes to the ovary.

Many studies in women have looked at the possible link between talcum powder and cancer of the ovary. Findings have been mixed, with some studies reporting a slightly increased risk and some reporting no increase. Many case-control studies have found a small increase in risk. But these types of studies can be biased because they often rely on a person's memory of talc use many years earlier. One prospective cohort study, which would not have the same type of potential bias, has not found an increased risk. A second found a modest increase in risk of one type of ovarian cancer.

For any individual woman, if there is an increased risk, the overall increase is likely to very be small. Still, talc is widely used in many products, so it is important to determine if the increased risk is real. Research in this area continues.

### Diet

Some studies have shown a reduced rate of ovarian cancer in women who ate a diet high in vegetables or a low fat diet, but other studies disagree. The American Cancer Society recommends following a healthy eating pattern that includes plenty of fruits, vegetables, and whole grains, and that limits or avoids red and processed meats, sugary drinks, and highly processed foods. 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.

## Factors that can lower risk of ovarian cancer

### Pregnancy and breastfeeding

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. 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 risk is lower the longer the pills are used. This lower risk continues for many years after the pill is stopped. Other forms of birth control such as tubal ligation (having fallopian tubes tied) and short use of IUDs (intrauterine devices) have also been associated with a lower risk of ovarian cancer.

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

### Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/genetics/family-cancer-syndromes.html](http://www.cancer.org/cancer/cancer-causes/genetics/family-cancer-syndromes.html)
2. [www.cancer.org/cancer/breast-cancer.html](http://www.cancer.org/cancer/breast-cancer.html)
3. [www.cancer.org/cancer/pancreatic-cancer.html](http://www.cancer.org/cancer/pancreatic-cancer.html)
4. [www.cancer.org/cancer/prostate-cancer.html](http://www.cancer.org/cancer/prostate-cancer.html)
5. [www.cancer.org/cancer/colon-rectal-cancer.html](http://www.cancer.org/cancer/colon-rectal-cancer.html)
6. [www.cancer.org/cancer/bladder-cancer.html](http://www.cancer.org/cancer/bladder-cancer.html)
7. [www.cancer.org/cancer/breast-cancer/risk-and-prevention/breast-cancer-risk-factors-you-cannot-change.html](http://www.cancer.org/cancer/breast-cancer/risk-and-prevention/breast-cancer-risk-factors-you-cannot-change.html)
8. [www.cancer.org/cancer/pancreatic-cancer/causes-risks-prevention/what-causes.html](http://www.cancer.org/cancer/pancreatic-cancer/causes-risks-prevention/what-causes.html)
9. [www.cancer.org/cancer/ovarian-cancer/about/what-is-ovarian-cancer.html](http://www.cancer.org/cancer/ovarian-cancer/about/what-is-ovarian-cancer.html)

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Last Revised: January 26, 2021

# What Causes Ovarian Cancer?

We don't yet know exactly what causes most ovarian cancers. As discussed in [Ovarian Cancer Risk Factors](#), 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.

The most recent and important finding about the cause of ovarian cancer is that it starts in cells at the tail ends of the fallopian tubes and not necessarily in the ovary itself. This new information may open more research studies looking at preventing and screening for this type of cancer.

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.

## Gene changes related to 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. Mutations in these genes can lead to the development of cancer.

### Inherited genetic mutations

A small portion of ovarian cancers occur in women with inherited 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*).

Genetic tests can detect 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 [Genetics and Cancer](#)<sup>1</sup>.

### Acquired genetic changes

Most mutations related to ovarian cancer are not inherited but instead occur during a woman's life and are called acquired mutations. In some cancers, these types of mutations 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 mutations. Research has suggested that tests to identify acquired mutations 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.

### Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/genetics.html](http://www.cancer.org/cancer/cancer-causes/genetics.html)

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Last Revised: April 11, 2018

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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 the most common type of ovarian cancer, epithelial ovarian cancer. Much less is known about ways to lower the risk of developing germ cell and stromal tumors of the ovaries, so this information does not apply to those types. It is important to realize that some of these strategies lower your risk only slightly, while others lower it much more. Some strategies are easily followed, and others require surgery. If you are concerned about your risk of ovarian cancer, talk to your health care professionals. They can help you consider these ideas as they apply to your own situation.

### Avoiding certain risk factors

Some risk factors for ovarian cancer, like getting older or having a family history, cannot be changed. But women might be able to lower their risk slightly by avoiding other risk factors, for example, by staying at a healthy weight, or not taking hormone replacement therapy after menopause. See [Risk Factors for Ovarian Cancer](#) to learn more.

### Oral contraceptives

Using oral contraceptives (birth control pills) decreases the risk of developing ovarian cancer for average risk women and BRCA mutation carriers, 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 such as slightly increasing breast cancer risk. 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 certain types of 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.

Another option for average risk 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 bilateral salpingectomy) along with the uterus (a hysterectomy). 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, but there is enough information that it may be considered an option to reduce ovarian cancer risk in average risk women.

## **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, 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. See [Genetics and Cancer](#)<sup>1</sup> to learn more.

Using oral contraceptives is one way that high risk women (women with BRCA1 and BRCA2 mutations) can reduce their risk of developing ovarian cancer. But birth control pills can increase breast cancer risk in women with or without these mutations. This increased risk appears highest while women are actively taking birth control pills but can continue even after stopping them. Research is continuing to find out more about the risks and benefits of oral contraceptives for women at high ovarian and breast cancer risk.

Tubal ligation may also effectively reduce the risk of ovarian cancer in women who have *BRCA1* or *BRCA2* mutations. Usually this type of surgery is not done alone and is typically done for reasons other than ovarian cancer prevention.

Sometimes a woman may want to consider having both ovaries and fallopian tubes removed (called a bilateral salpingo-oophorectomy) 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 may be recommended for 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 in the lab 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](#)<sup>2</sup> 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.

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.

## Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/genetics.html](http://www.cancer.org/cancer/cancer-causes/genetics.html)
2. [www.cancer.org/cancer/breast-cancer.html](http://www.cancer.org/cancer/breast-cancer.html)

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Last Revised: April 11, 2018

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