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# Kidney 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 kidney cancer.

- [Risk Factors for Kidney Cancer](#)
- [What Causes Kidney Cancer?](#)

## Prevention

At this time there is no way to prevent kidney cancer. But there are things you can do that might lower your risk for it. Learn more.

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

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# Risk Factors for Kidney Cancer

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

But having a risk factor, or even several risk factors, does not mean that you will get the

disease. And some people who get the disease may have few or no known risk factors. Even if a person with kidney cancer has a risk factor, it is often very hard to know how much that risk factor contributed to the cancer.

Scientists have found several risk factors that could make you more likely to develop kidney cancer.

## Smoking

[Smoking](#)<sup>1</sup> increases the risk of developing renal cell carcinoma (RCC). The increased risk seems to be related to how much you smoke. The risk drops if you stop smoking, but it takes many years to get to the risk level of someone who never smoked.

## Obesity

People who are very [overweight](#)<sup>2</sup> have a higher risk of developing RCC. Obesity may cause changes in certain hormones that can lead to RCC.

## Workplace exposures

Many studies have suggested that workplace exposure to certain substances increases the risk for RCC. Some of these substances are cadmium (a type of metal), some herbicides, and organic solvents, particularly trichloroethylene.

## Family history of kidney cancer

People with a strong family history of renal cell cancer (without one of the known inherited conditions listed below) have a higher chance of developing this cancer. This risk is highest for people who have a brother or sister with the cancer. It's not clear whether this is due to shared genes, something that both people were exposed to in the environment, or both.

## High blood pressure

The risk of kidney cancer is higher in people with high blood pressure. Some studies have suggested that certain medicines used to treat high blood pressure may raise the risk of kidney cancer, but it is hard to tell if it's the condition or the medicine (or both) that may be the cause of the increased risk.

## Certain medicines

**Phenacetin:** This drug used to be a popular non-prescription pain reliever and has been linked to RCC in the past. But it has not been available in the United States for over 30 years, so it no longer appears to be a major risk factor.

**Diuretics:** Some studies have suggested that diuretics (water pills) may be linked to a small increase in the risk of RCC. It is not clear whether the cause is the drugs or the high blood pressure they treat. If you need to take diuretics, don't avoid them to try to reduce the risk of kidney cancer.

## Advanced kidney disease

People with advanced kidney disease, especially those needing dialysis, have a higher risk of RCC. Dialysis is a treatment used to remove toxins from your body if the kidneys do not work properly.

## Gender

RCC is about twice as common in men as in women. Men are more likely to be smokers and are more likely to be exposed to cancer-causing chemicals at work, which may account for some of the difference.

## Race

African Americans and American Indians/Alaska Natives have slightly higher rates of RCC than do whites. The reasons for this are not clear.

## Genetic and hereditary risk factors

Some people inherit a tendency to develop certain types of cancer. The DNA in each of your cells that you get from your parents may have changes that give you this tendency. Some rare inherited conditions can cause kidney cancer. It is important that people who have hereditary causes of RCC see their doctors often, especially if they have already been diagnosed with RCC. Some doctors recommend regular imaging tests (such as CT scans) to look for new kidney tumors in these people.

People who have the conditions listed here have a much higher risk for getting kidney cancer, although they account for only a small portion of cases overall.

## von Hippel-Lindau disease

People with this condition often develop several kinds of tumors and cysts (fluid-filled sacs) in different parts of the body. They have an increased risk for developing clear cell RCC, especially at a younger age. They may also have benign tumors in their eyes, brain, spinal cord, pancreas, and other organs; and a type of adrenal gland tumor called *pheochromocytoma*. This condition is caused by mutations (changes) in the *VHL* gene.

## Hereditary papillary renal cell carcinoma

People with this condition have a tendency to develop one or more papillary RCCs, but they do not have tumors in other parts of the body, as is the case with the other inherited conditions listed here. This disorder is usually linked to changes in the *MET* gene.

## Hereditary leiomyoma-renal cell carcinoma

People with this syndrome develop smooth muscle tumors called *leiomyomas* (fibroids) of the skin and uterus (in women) and have a higher risk for developing papillary RCCs. It has been linked to changes in the *FH* gene.

## Birt-Hogg-Dube (BHD) syndrome

People with this syndrome develop many small benign skin tumors and have an increased risk of different kinds of kidney tumors, including RCCs and oncocytomas. They may also have benign or malignant tumors of several other tissues. The gene linked to BHD is known as *FLCN*.

## Familial renal cancer

People with this condition develop tumors called *paragangliomas* of the head and neck region, as well as tumors known as *pheochromocytomas* of the adrenal glands and thyroid cancers. They also tend to get kidney cancer in both kidneys before age 40. It is caused by defects in the genes *SDHB* and *SDHD*.

## Cowden syndrome

People with this syndrome have a high risk of [breast](#)<sup>3</sup>, [thyroid](#)<sup>4</sup> and kidney cancers. It is linked to changes in the *PTEN* gene.

## Tuberous sclerosis

People with this syndrome develop many, usually benign (noncancerous) tumors in different parts of the body including the skin, brain, lungs, eyes, kidneys, and heart. Although the kidney tumors are most often benign, occasionally they can be clear cell RCC. It is caused by defects in the genes *TSC1* and *TSC2*.

## Hereditary renal oncocytoma

Some people inherit the tendency to develop a kidney tumor called an *oncocytoma*, which is almost always benign (not cancer).

## Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html](http://www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html)
2. [www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html](http://www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html)
3. [www.cancer.org/cancer/breast-cancer.html](http://www.cancer.org/cancer/breast-cancer.html)
4. [www.cancer.org/cancer/thyroid-cancer.html](http://www.cancer.org/cancer/thyroid-cancer.html)

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## What Causes Kidney Cancer?

Although many [risk factors](#) can increase the chance of developing renal cell cancer (RCC), it is not yet clear how some of these risk factors cause kidney cells to become cancerous.

### Changes (mutations) in genes

Cancer is caused by changes in the DNA inside our cells. DNA is the chemical in our cells that makes up our genes, which control how our cells function. DNA, which comes

from both our parents, affects more than just how we look.

Some genes help control when our cells grow, divide into new cells, and die:

- Certain genes that help cells grow, divide, and stay alive are called *oncogenes*.
- Genes that help keep cell division under control or cause cells to die at the right time are called *tumor suppressor genes*.

Cancers can be caused by DNA mutations (changes) that turn on oncogenes or turn off tumor suppressor genes, resulting in cells growing out of control. Changes in many different genes are usually needed to cause kidney cancer.

### **Inherited gene mutations**

Certain *inherited* DNA changes can lead to conditions running in some families that increase the risk of kidney cancer. These syndromes, which cause a small portion of all kidney cancers, were described in [What Are the Risk Factors for Kidney Cancer?](#)

For example, *VHL*, the gene that causes von Hippel-Lindau (VHL) disease, is a tumor suppressor gene. It normally helps keep cells from growing out of control. Mutations (changes) in this gene can be inherited from parents. When the *VHL* gene is mutated, it is no longer able to control the abnormal growth, and kidney cancer is more likely to develop. The genes linked to hereditary leiomyoma (the *FH* gene), Birt-Hogg-Dube syndrome (the *FLCN* gene), and familial renal cancer (the *SDHB* and *SDHD* genes) are also tumor suppressor genes, and inherited changes in these genes lead to an increased risk of kidney cancer.

People with hereditary papillary renal cell carcinoma have inherited changes in the *MET* oncogene that cause it to be turned on all the time. This can lead to uncontrolled cell growth and makes the person more likely to develop papillary RCC.

Special genetic tests can detect some of the gene mutations associated with these inherited syndromes. If you have a family history of kidney cancer or other cancers linked to these syndromes, you may want to ask your doctor about genetic counseling and genetic 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 [Understanding Genetic Testing for Cancer](#)<sup>1</sup> and [What Happens during Genetic Testing for Cancer?](#)<sup>2</sup>

### **Acquired gene mutations**

Some gene mutations happen during a person's lifetime and are not passed on. They affect only cells that come from the original mutated cell. These DNA changes are due to *acquired* mutations.

In most cases of kidney cancer, the DNA mutations that lead to cancer are acquired during a person's life rather than having been inherited. Certain risk factors, such as exposure to cancer-causing chemicals (like those found in tobacco smoke), probably play a role in causing these acquired mutations, but so far it's not known what causes most of them. Progress has been made in understanding how tobacco increases the risk for developing kidney cancer. Your lungs absorb many of the cancer-causing chemicals in tobacco smoke into the bloodstream. Because your kidneys filter this blood, many of these chemicals become concentrated in the kidneys. Several of these chemicals are known to damage kidney cells in ways that can cause the cells to become cancerous.

[Obesity](#)<sup>3</sup>, another risk factor for this cancer, alters the balance of some of the body's hormones. Researchers are now learning how certain hormones help control the growth (both normal and abnormal) of many different tissues in the body, including the kidneys.

Most people with sporadic (non-inherited) clear cell RCC have changes in the *VHL* gene in their tumor cells that have caused it to stop working properly. These changes are acquired during life rather than being inherited.

Other gene changes may also cause renal cell carcinomas. Researchers continue to look for these changes. For more about how genes changes can lead to cancer, see [Genes and Cancer](#)<sup>4</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/genetics/understanding-genetic-testing-for-cancer.html](http://www.cancer.org/cancer/cancer-causes/genetics/understanding-genetic-testing-for-cancer.html)
2. [www.cancer.org/cancer/cancer-causes/genetics/what-happens-during-genetic-testing-for-cancer.html](http://www.cancer.org/cancer/cancer-causes/genetics/what-happens-during-genetic-testing-for-cancer.html)
3. [www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html](http://www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html)
4. [www.cancer.org/cancer/cancer-causes/genetics/genes-and-cancer.html](http://www.cancer.org/cancer/cancer-causes/genetics/genes-and-cancer.html)

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## Can Kidney Cancer Be Prevented?

In many cases, the cause of kidney cancer is not known. In some other cases (such as with [inherited conditions](#) that raise kidney cancer risk), even when the cause is known it may not be preventable. But there are some ways you may be able to reduce your risk of this disease.

[Cigarette smoking](#)<sup>1</sup> is responsible for a large percentage of cases, so stopping smoking may lower your risk.

[Obesity](#)<sup>2</sup> and high blood pressure are also risk factors for renal cell cancer. Maintaining a healthy weight by exercising and choosing a diet high in fruits and vegetables, and getting treatment for high blood pressure may also reduce your chance of getting this disease.

Finally, avoiding workplace exposure to harmful substances such as cadmium and organic solvents may reduce your risk for renal cell cancer.

## Hyperlinks

1. [www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html](http://www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html)
2. [www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html](http://www.cancer.org/cancer/cancer-causes/diet-physical-activity/body-weight-and-cancer-risk.html)

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