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# Lung Cancer Causes, Risk Factors, and Prevention

Learn about the risk factors for lung cancer and what you might be able to do to help lower your risk.

## 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 lung cancer.

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

## Prevention

There is no way to completely prevent cancer. But there are things you can do that might lower your risk. Learn more.

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

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# Lung Cancer Risk Factors

A risk factor is anything that increases a person's chance of getting a disease such as cancer.



If you or someone you care about needs help quitting, see [How to Quit Using Tobacco](#)<sup>4</sup> or call the American Cancer Society at 1-800-227-2345

### **Exposure to radon**

Radon is a naturally occurring radioactive gas that results from the breakdown of uranium in soil and rocks. You can't see, taste, or smell it. According to the US Environmental Protection Agency (EPA), radon is the second-leading cause of lung cancer in the United States, and it's the leading cause among people who don't smoke.

Outdoors, there is so little radon that it is not likely to be dangerous. But indoors, radon can be more concentrated. Breathing it in exposes your lungs to small amounts of radon. This may increase a person's risk of lung cancer.

Homes and other buildings in nearly any part of the country can have high indoor radon levels (especially in basements).

For more information, see [Radon and Cancer](#)<sup>5</sup>.

### **Exposure to asbestos**

People who work with asbestos (such as in mines, mills, textile plants, places where insulation is used, and shipyards) are several times more likely to die of lung cancer. Lung cancer risk is much greater in workers exposed to asbestos who also smoke. It's not clear how much low-level or short-term exposure to asbestos might affect lung

- Radioactive ores, such as uranium
- Inhaled chemicals, such as arsenic, beryllium, cadmium, silica, vinyl chloride, nickel compounds, chromium compounds, coal products, mustard gas, and chloromethyl ethers
- [Diesel exhaust](#)<sup>8</sup>

The government and industry have taken steps in recent years to help protect workers from many of these exposures. But the dangers are still there, so if you work around these agents, be careful to limit your exposure whenever possible.

### **Taking certain dietary supplements**

Studies looking at the possible role of vitamin supplements in reducing lung cancer risk have had disappointing results. In fact, multiple studies found that people who smoked and took beta-carotene supplements actually had an increased risk of lung cancer. The results of these studies suggest that people should avoid taking beta-carotene supplements.

### **Arsenic in drinking water**

Studies of people in parts of Southeast Asia and South America with high levels of [arsenic](#)<sup>9</sup> in their drinking water have found a higher risk of lung cancer. In most of these studies, the levels of arsenic in the water were many times higher than those typically seen in the United States, even areas where arsenic levels are above normal. For most Americans who are on public water systems, drinking water is not a major source of arsenic.

### **Risk factors you cannot change**

#### **Previous radiation therapy to the lungs**

People who have had [radiation therapy to the chest for other cancers](#)<sup>10</sup> are at higher risk for lung cancer, particularly if they smoke. Examples include people who have been treated for [Hodgkin lymphoma](#)<sup>11</sup> or women who were treated with chest radiation for [breast cancer](#)<sup>12</sup>.

#### **Air pollution**

In cities, air pollution, such as from diesel exhaust, appears to raise the risk of lung

cancer slightly. This risk is far less than the risk caused by smoking, but about 1% to 2% of all deaths from lung cancer in the United States are thought to be due to outdoor air pollution.

### **Personal or family history of lung cancer**

If you have had lung cancer, you have a higher risk of developing another lung cancer.

Brothers, sisters, and children of people who have had lung cancer may have a slightly higher risk of lung cancer themselves, especially if the relative was diagnosed at a younger age. It's not clear how much of this risk might be due to shared genes among family members and how much might be from shared household exposures (such as



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## What Causes Lung Cancer?

We don't know what causes each case of lung cancer. But we do know many of the risk factors for these cancers (see [Lung Cancer Risk Factors](#)) and how some of them cause normal cells to become cancer cells.

- [How smoking leads to lung cancer](#)
- [Causes in people who don't smoke](#)
- [Gene changes that may lead to lung cancer](#)
- [Inherited gene changes \(germline mutations\)](#)
- [Acquired gene changes \(somatic mutations or "driver mutations"\)](#)

### How smoking leads to lung cancer

[Smoking tobacco](#)<sup>1</sup> is by far the leading cause of lung cancer. About 80% of lung cancer deaths are caused by smoking, and many others are caused by exposure to secondhand smoke.



Lung cancer in people who don't smoke can be caused by exposure to radon, [secondhand smoke](#)<sup>4</sup>, air pollution, or other factors. Workplace exposures to asbestos, [diesel exhaust](#)<sup>5</sup>, or other chemicals can also cause lung cancers in some people who don't smoke.

Some people with no known risk factors may develop lung cancer. This may be due to random events that don't have an outside cause, but it also may be due to factors that we don't yet know about.

Lung cancers in people who don't smoke are often different from those that occur in people who do. They tend to develop in younger people and often have certain gene changes that are different from those in tumors found in people who smoke. In some cases, these gene changes can be used to guide treatment.

## **Gene changes that may lead to lung cancer**

DNA is the molecule 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. It also can influence our risk for developing certain diseases, including some kinds of cancer.

Some genes help control when cells grow, divide to make new cells, and die:

germline mutations. If germline mutations are found, it would not only show that you were at an increased hereditary risk for developing lung cancer, but it could also help guide discussions about the best way to treat your lung cancer. If you have lung cancer and are also found to have a certain germline mutation, you may respond well to that mutation's targeted therapy.

Examples of possible germline mutations for patients with lung cancer include: CHEK2, ATM, TP53, *BRCA1*, EGFR, APC, and PALB2. Studies are ongoing to better understand the role of germline mutations in lung cancer. Regardless of whether you carry a higher hereditary risk for lung cancer, doctors recommend that all people avoid tobacco smoke and other exposures that will increase cancer risk.

### **Acquired gene changes (somatic mutations or “driver mutations”)**

Acquired gene changes, or somatic mutations, may occur in any individual cell and cannot be inherited. Somatic mutations refer to DNA changes within cells that were not passed from your parents, but rather were acquired during your lifetime. Certain somatic mutations can affect the cell's ability to control its own growth, and will eventually transform a non-cancer cell to become a cancer cell. These somatic mutations are also known as “driver mutations.” If your tumor is found to have a driver mutation, you will likely respond well to targeted therapy.

For patients with advanced non-small cell lung cancer, it is recommended that the lung mass or a metastatic mass be tested for driver mutations. It is standard practice to test for the following driver mutations: EGFR, ALK, ROS1, MET, RET, BRAF, and NTRK. If any of these driver mutations are found, initial treatment with a targeted therapy (rather than chemotherapy) would be recommended. Although these mutations can be found in any patient with lung cancer, nonsmokers with lung cancer are more likely to have a driver mutation.

### **Hyperlinks**

1. [www.cancer.org/cancer/risk-prevention/tobacco.html](http://www.cancer.org/cancer/risk-prevention/tobacco.html)
2. [www.cancer.org/cancer/risk-prevention/radiation-exposure/radon.html](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/radon.html)
3. [www.cancer.org/cancer/risk-prevention/chemicals/asbestos.html](http://www.cancer.org/cancer/risk-prevention/chemicals/asbestos.html)
4. [www.cancer.org/cancer/risk-prevention/tobacco/health-risks-of-tobacco/secondhand-smoke.html](http://www.cancer.org/cancer/risk-prevention/tobacco/health-risks-of-tobacco/secondhand-smoke.html)
5. [www.cancer.org/cancer/risk-prevention/chemicals/diesel-exhaust-and-cancer.html](http://www.cancer.org/cancer/risk-prevention/chemicals/diesel-exhaust-and-cancer.html)

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# Can Lung Cancer Be Prevented?

Not all lung cancers can be prevented, but you may be able to lower your risk for lung cancer by changing the [risk factors](#) that you can control.

- [Stay away from tobacco](#)
- [Avoid radon exposure](#)
- [Avoid or limit exposure to cancer-causing agents](#)
- [Eat a healthy diet](#)

## Stay away from tobacco

The best way to reduce your risk of lung cancer is not to smoke and to avoid breathing in other people's smoke.

If you stop smoking before a cancer develops, your damaged lung tissue gradually starts to repair itself. No matter what your age or how long you've smoked, quitting will lower your risk of lung cancer and help you live longer. If you would like help quitting smoking, see [How to Quit Using Tobacco](#)<sup>1</sup> or call the American Cancer Society at 1-800-227-2345.

## Avoid radon exposure

Radon is an important cause of lung cancer. You can reduce your exposure to radon by having your home tested and treated, if needed. For more information, see [Radon and Cancer](#)<sup>2</sup>.

## Avoid or limit exposure to cancer-causing agents

Avoiding exposure to known cancer-causing agents, in the workplace and elsewhere, may also be helpful (see [Lung Cancer Risk Factors](#)). When people work where these exposures are common, they should be kept to a minimum.

## Eat a healthy diet

A [healthy diet](#)<sup>3</sup> with lots of fruits and vegetables may also help reduce your risk of lung cancer. Some evidence suggests that a diet high in fruits and vegetables may help protect people who smoke and those who don't against lung cancer. But any positive

effect of fruits and vegetables on lung cancer risk would be much less than the increased risk from smoking.

Trying to reduce the risk of lung cancer in people who currently smoke or those who formerly smoked by giving them high doses of vitamins or vitamin-like drugs has not been successful so far. In fact, some studies have found that supplements of beta-carotene, a nutrient related to vitamin A, appear to increase the rate of lung cancer in these people.

Some people who get lung cancer do not have any clear risk factors. Although we know how to prevent most lung cancers, at this time we don't know how to prevent all of them.

## Hyperlinks

1. [www.cancer.org/cancer/risk-prevention/tobacco/guide-quitting-smoking.html](http://www.cancer.org/cancer/risk-prevention/tobacco/guide-quitting-smoking.html)
2. [www.cancer.org/cancer/risk-prevention/radiation-exposure/radon.html](http://www.cancer.org/cancer/risk-prevention/radiation-exposure/radon.html)
3. [www.cancer.org/cancer/risk-prevention/diet-physical-activity/acs-guidelines-nutrition-physical-activity-cancer-prevention.html](http://www.cancer.org/cancer/risk-prevention/diet-physical-activity/acs-guidelines-nutrition-physical-activity-cancer-prevention.html)

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**Written by**

The American Cancer Society medical and editorial content team  
(<https://www.cancer.org/cancer/acs-medical-content-and-news-staff.html>)

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