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Lung 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 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?](#)

Lung Cancer Risk Factors

A risk factor is anything that increases a person's chance of getting a disease such as 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 several, does not mean that you will get the disease.

And some people who get the disease may have few or no known risk factors.

Several risk factors can make you more likely to develop lung cancer. These factors are related to the risk of lung cancer in general. It's possible that some of these might not apply to small cell lung cancer (SCLC).

Risk factors you can change

Tobacco smoke

[Smoking](#)¹ is by far the leading risk factor for lung cancer. About 80% of lung cancer deaths are thought to result from smoking and this number is probably even higher for small cell lung cancer (SCLC). It's very rare for someone who has never smoked to have SCLC.

The risk of lung cancer for smokers is many times higher than for non-smokers. The longer you smoke and the more packs a day you smoke, the greater your risk.

[Cigar smoking](#)² and pipe smoking are almost as likely to cause lung cancer as cigarette smoking. Smoking low-tar or "light" cigarettes increases lung cancer risk as much as regular cigarettes. Smoking menthol cigarettes might increase the risk even more since the menthol may allow smokers to inhale more deeply.

Secondhand smoke

If you don't smoke, breathing in the smoke of others (called [secondhand smoke](#)³ or environmental tobacco smoke) can increase your risk of developing lung cancer. Secondhand smoke is thought to cause more than 7,000 deaths from lung cancer each year.

If you or someone you care about needs help quitting, see [How To Quit Smoking or Smokeless Tobacco](#)⁴ 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 this country, and is the leading cause among non-smokers.

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 radiation. This may increase a person's risk of lung cancer.

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

For more information, see [Radon and Cancer](#)⁵.

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 raise lung cancer risk.

People exposed to large amounts of asbestos also have a greater risk of developing mesothelioma, a type of cancer that starts in the pleura (the lining surrounding the lungs). For more on this type of cancer, see [Malignant Mesothelioma](#)⁶.

In recent years, government regulations have greatly reduced the use of asbestos in commercial and industrial products. It's still present in many homes and other older buildings, but it's not usually considered harmful as long as it's not released into the air by deterioration, demolition, or renovation. For more information, see [Asbestos and Cancer Risk](#)⁷.

Exposure to other cancer-causing agents in the workplace

Other carcinogens (cancer-causing agents) found in some workplaces that can increase lung cancer risk include:

- Radioactive ores such as uranium
- Inhaled chemicals such as [arsenic](#)⁸, beryllium, cadmium, silica, vinyl chloride, nickel compounds, chromium compounds, coal products, mustard gas, and chloromethyl ethers
- [Diesel exhaust](#)⁹

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, 2 large studies found that smokers who took beta carotene supplements actually had an increased risk of lung cancer. The results of these studies suggest that smokers 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](#)¹⁰ 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](#)¹¹ are at higher risk for lung cancer, particularly if they smoke. Examples include people who have been treated for [Hodgkin disease](#)¹² or women who get chest radiation after a mastectomy for [breast cancer](#)¹³. Women who have radiation therapy to the breast after a lumpectomy do not appear to have a higher than expected risk of lung cancer.

Air pollution

In cities, air pollution (especially near heavily trafficked roads) appears to raise the risk of lung cancer slightly. This risk is far less than the risk caused by smoking, but some researchers estimate that worldwide about 5% of all deaths from lung cancer may 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 tobacco smoke or radon).

Researchers have found that genetics seems to play a role in some families with a strong history of lung cancer. (See [What Causes Lung Cancer?](#)).

Factors with uncertain or unproven effects on lung cancer risk

Smoking marijuana

There are reasons to think smoking marijuana might increase lung cancer risk.

- Marijuana smoke contains tar and many of same cancer-causing substances that are in tobacco smoke. (Tar is the sticky, solid material that remains after burning, which is thought to contain most of the harmful substances in smoke.)
- Marijuana cigarettes (joints) are typically smoked all the way to the end, where tar content is the highest.
- Marijuana is inhaled very deeply and the smoke is held in the lungs for a long time, which gives any cancer-causing substances more opportunity to deposit in the lungs.
- Because marijuana is still illegal in many places, it may not be possible to control what other substances it might contain.

Those who use marijuana tend to smoke fewer marijuana cigarettes in a day or week than the amount of tobacco consumed by cigarette smokers. The lesser amount smoked would make it harder to see an impact on lung cancer risk.

It's been hard to study whether there is a link between marijuana and lung cancer because marijuana has been illegal in many places for so long, and it's not easy to gather information about the use of illegal drugs. Also, in studies that have looked at past marijuana use in people who had lung cancer, most of the marijuana smokers also smoked cigarettes. This can make it hard to know how much any increased risk is from tobacco and how much might be from marijuana. More research is needed to know the cancer risks from smoking marijuana.

E-cigarettes

[E-cigarettes](#)¹⁴ are a type of electronic nicotine delivery system. They do not contain any tobacco but the Food and Drug Administration (FDA) classifies them as “tobacco” products. E-cigarettes are fairly new and more research is needed to know what the long-term effects might be, including the risk of developing lung cancer.

Talc and talcum powder

Talc is a mineral that in its natural form may contain asbestos. Some studies have suggested that talc miners and people who operate talc mills might have a higher risk of lung cancer and other respiratory diseases because of their exposure to industrial grade talc. But other studies have not found an increase in lung cancer rate.

[Talcum powder](#)¹⁵ is made from talc. By law since the 1970s, all home-use talcum products (baby, body, and facial powders) in the United States have been asbestos-free. The use of cosmetic talcum powder has not been found to increase lung cancer risk.

Hyperlinks

1. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html
2. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/is-any-type-of-smoking-safe.html
3. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/secondhand-smoke.html
4. www.cancer.org/healthy/stay-away-from-tobacco/guide-quitting-smoking.html
5. www.cancer.org/cancer/cancer-causes/radiation-exposure/radon.html
6. www.cancer.org/cancer/malignant-mesothelioma.html
7. www.cancer.org/cancer/cancer-causes/asbestos.html
8. www.cancer.org/cancer/cancer-causes/arsenic.html
9. www.cancer.org/cancer/cancer-causes/diesel-exhaust-and-cancer.html
10. www.cancer.org/cancer/cancer-causes/arsenic.html
11. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/second-cancers-in-adults.html
12. www.cancer.org/cancer/hodgkin-lymphoma.html
13. www.cancer.org/cancer/breast-cancer.html
14. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/e-cigarettes.html
15. www.cancer.org/cancer/cancer-causes/talcum-powder-and-cancer.html

References

The Alpha-Tocopherol, Beta Carotene Cancer Prevention Study Group. The effect of vitamin E and beta carotene on the incidence of lung cancer and other cancers in male smokers. *N Engl J Med*. 1994;330:1029-1035.

Amos CI, Pinney SM, Li Y, et al. A susceptibility locus on chromosome 6q greatly increases lung cancer risk among light and never smokers. *Cancer Res*. 2010;70:2359–2367.

Berthiller J, Straif K, Boniol M, et al. Cannabis smoking and risk of lung cancer in men: A pooled analysis of three studies in Maghreb. *J Thorac Oncol*. 2008;3:1398-1403.

Callaghan RC, Allebeck P and Sidochuk A. Marijuana use and risk of lung cancer: a 40-year cohort study. *Cancer Causes Control*. 2013 Oct;24(10):1811-20.

Cohen AJ, Ross Anderson H, Ostro B, et al. The global burden of disease due to outdoor air pollution. *J Toxicol Environ Health A*. 2005;68:1301–1307.

Dracham CB, Shankar A, Madan R. Radiation induced secondary malignancies: a review article. *Radiat Oncol J*. 2018;36(2):85–94.

Environmental Protection Agency. Health Risk of Radon. <https://www.epa.gov/radon/health-risk-radon#head>. Last updated 08/27/2018. Accessed May 20, 2019.

Hashibe M, Morgenstern H, Cui Y, et al. Marijuana use and the risk of lung and upper aerodigestive tract cancers: Results of a population-based case-control study. *Cancer Epidemiol Biomarkers Prev*. 2006;15:1829-1834.

Kaufman EL, Jacobson JS, Hershman DL, et al. Effect of breast cancer radiotherapy and cigarette smoking on risk of second primary lung cancer. *J Clin Oncol*. 2008;26:392–398.

Malhotra J, Malyezzi M, Negri E, La Vecchia C, and Boffetta P. Risk factors for lung cancer worldwide. *European Respiratory Journal*. 2016; 48: 889-902.

Moir D, Rickert WS, Levasseur G, et al. A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions. *Chem Res Toxicol*. 2008; 21: 494-502.

Obedian E, Fischer DB, Haffty BG. Second malignancies after treatment of early-stage

breast cancer: Lumpectomy and radiation therapy versus mastectomy. *J Clin Oncol*. 2000;18:2406–2412.

Omenn GS, Goodman GE, Thornquist et al. Risk factors for lung cancer and for intervention effects in CARET, the Beta-Carotene and Retinol Efficacy Trial. *J Natl Cancer Inst*. 1996;88:1550-1559.

U.S. Department of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General, 2014*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014.

Zhang LR, Morgenstern H, Greenland S, et al. Cannabis smoking and lung cancer risk: Pooled analysis in the International Lung Cancer Consortium. *Int J Cancer*. 2015;136(4):894–903.

Last Medical Review: October 1, 2019 Last Revised: October 1, 2019

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 cells to become cancer.

Smoking

[Smoking tobacco](#)¹ 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.

Smoking is clearly the strongest risk factor for lung cancer, but it often interacts with other factors. Smokers exposed to other known risk factors such as [radon](#)² and [asbestos](#)³ are at an even higher risk. Not everyone who smokes gets lung cancer, so other factors like genetics probably play a role as well (see below).

Causes in non-smokers

Not all people who get lung cancer are smokers. Many people with lung cancer are former smokers, but many others never smoked at all. And it is rare for someone who has never smoked to be diagnosed with small cell lung cancer (SCLC), but it can happen.

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

A small portion of lung cancers occur in people with no known risk factors for the disease. Some of these might just be random events that don't have an outside cause, but others might be due to factors that we don't yet know about.

Lung cancers in non-smokers are often different from those that occur in smokers. They tend to occur in younger people and often have certain gene changes that are different from those in tumors found in smokers. In some cases, these gene changes can be used to guide treatment.

Gene changes that may lead to lung cancer

Scientists know how some of the risk factors for lung cancer can cause certain changes in the DNA of lung cells. These changes can lead to abnormal cell growth and, sometimes, cancer. 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. 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:

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

Cancers can be caused by DNA changes that turn on oncogenes or turn off tumor suppressor genes. Changes in many different genes are usually needed to cause lung cancer.

Inherited gene changes

Some people inherit DNA mutations (changes) from their parents that greatly increase their risk for developing certain cancers. But inherited mutations alone are not thought to cause very many lung cancers.

Still, genes do seem to play a role in some families with a history of lung cancer. For example, people who inherit certain DNA changes in a particular chromosome (chromosome 6) are more likely to develop lung cancer, even if they don't smoke or only smoke a little.

Some people seem to inherit a reduced ability to break down or get rid of certain types of cancer-causing chemicals in the body, such as those found in tobacco smoke. This could put them at higher risk for lung cancer.

Other people inherit faulty DNA repair mechanisms that make it more likely they will end up with DNA changes. People with DNA repair enzymes that don't work normally might be especially vulnerable to cancer-causing chemicals and radiation.

Some non-small cell lung cancers (NSCLCs) make too much of the EGFR protein (which comes from an abnormal *EGFR* gene). This specific gene change is seen more often with adenocarcinoma of the lung in young, non-smoking, Asian women, but the excess EGFR protein has also been seen in more than 60% of metastatic NSCLCs.

Researchers are developing tests that may help identify such people, but these tests are not yet used routinely. For now, doctors recommend that all people avoid tobacco smoke and other exposures that might increase their cancer risk.

Acquired gene changes

Gene changes related to lung cancer are usually acquired during life rather than inherited. Acquired mutations in lung cells often result from exposure to factors in the environment, such as cancer-causing chemicals in tobacco smoke. But some gene changes may just be random events that sometimes happen inside a cell, without having an outside cause.

Acquired changes in certain genes, such as the *RB1* tumor suppressor gene, are thought to be important in the development of SCLC. Acquired changes in genes such as the *p16* tumor suppressor gene and the *K-RAS* oncogene, are thought to be important in the development of NSCLC. Changes in the *TP53* tumor suppression gene and to chromosome 3 can be seen in both NSCLC and SCLC. Not all lung cancers share the same gene changes, so there are undoubtedly changes in other genes that have not yet been found.

Hyperlinks

1. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer.html
2. www.cancer.org/cancer/cancer-causes/radiation-exposure/radon.html
3. www.cancer.org/cancer/cancer-causes/asbestos.html
4. www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/secondhand-smoke.html
5. www.cancer.org/cancer/cancer-causes/diesel-exhaust-and-cancer.html

References

Amos CI, Pinney SM, Li Y, et al. A susceptibility locus on chromosome 6q greatly increases lung cancer risk among light and never smokers. *Cancer Res.* 2010;70:2359–2367.

Araujo LH, Horn L, Merritt RE, Shilo K, Xu-Welliver M, Carbone DP. Ch. 69 - Cancer of the Lung: Non-small cell lung cancer and small cell lung cancer. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020.

Chiang A, Detterbeck FC, Stewart T, Decker RH, Tanoue L. Chapter 48: Non-small cell lung cancer. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019.

Gazdar AF. Activating and resistance mutations of EGFR in non-small-cell lung cancer: role in clinical response to EGFR tyrosine kinase inhibitors. *Oncogene*. 2009;28 Suppl 1(Suppl 1):S24–S31.

Hann CL, Wu A, Rekhtman N, Rudin CM. Chapter 49: Small cell and Neuroendocrine Tumors of the Lung. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 11th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2019.

National Cancer Institute. Physician Data Query (PDQ). Patient Version. Non-Small Cell Lung Cancer Treatment. 2019. Accessed at <https://www.cancer.gov/types/lung/patient/non-small-cell-lung-treatment-pdq> on May 22, 2019.

Varella-Garcia M. Chromosomal and genomic changes in lung cancer. *Cell Adh Migr.*

2010;4(1):100–106.

Last Medical Review: October 1, 2019 Last Revised: October 1, 2019

Can Lung Cancer Be Prevented?

Not all lung cancers can be prevented. But there are things you can do that might lower your risk, such as changing the [risk factors](#) that you can control.

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 may lower your risk of lung cancer and help you live longer. If you would like help quitting smoking, see [How to Quit¹ Smoking or Smokeless Tobacco²](#) 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 Cancer³](#).

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](#)⁴ 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 both smokers and non-smokers 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 current or former smokers 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/healthy/stay-away-from-tobacco/guide-quitting-smoking.html
2. www.cancer.org/healthy/stay-away-from-tobacco/guide-quitting-smoking.html
3. www.cancer.org/cancer/cancer-causes/radiation-exposure/radon.html
4. www.cancer.org/healthy/eat-healthy-get-active/acs-guidelines-nutrition-physical-activity-cancer-prevention.html

References

The Alpha-Tocopherol, Beta Carotene Cancer Prevention Study Group. The effect of vitamin E and beta carotene on the incidence of lung cancer and other cancers in male smokers. *N Engl J Med*. 1994;330:1029-1035.

Kushi LH, Doyle C, McCullough M, et al. American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: Reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin*. 2012;62:30-67.

Omenn GS, Goodman GE, Thornquist et al. Risk factors for lung cancer and for intervention effects in CARET, the Beta-Carotene and Retinol Efficacy Trial. *J Natl Cancer Inst*. 1996;88:1550-1559.

Last Medical Review: October 1, 2019 Last Revised: October 1, 2019

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