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Myelodysplastic Syndrome Causes, Risk Factors, and Prevention

Learn about the risk factors for myelodysplastic syndromes 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 myelodysplastic syndromes.

- [Risk Factors for Myelodysplastic Syndromes \(MDS\)](#)
- [What Causes Myelodysplastic Syndromes \(MDS\)?](#)

Prevention

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

- [Can Myelodysplastic Syndromes \(MDS\) Be Prevented?](#)

Risk Factors for Myelodysplastic Syndromes (MDS)

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

But having a risk factor, or even several, does not always mean that a person will get the disease, and many people with cancer have few or no known risk factors.

There are several known risk factors for myelodysplastic syndromes (MDS).

- [Older age](#)
- [Male sex](#)
- [Cancer treatment](#)
- [Smoking](#)
- [Environmental exposures](#)
- [Genetic syndromes](#)
- [Familial MDS](#)

Older age

MDS can occur at any age, even in children. But it is uncommon in people younger than 50, and it's most often diagnosed in people in their 70s or 80s.

Male sex

MDS is more common in men than in women. The reason for this is not clear, although it might have to do with men having been more likely to smoke or to have been exposed to certain chemicals in the workplace in the past.

Cancer treatment

People who have been treated with certain chemotherapy (chemo) drugs or with radiation therapy for cancer are more likely to develop MDS later. When MDS is caused by cancer treatment, it is called **secondary MDS** or **treatment-related MDS**.

People who have had [stem cell transplants](#)¹ (bone marrow transplants) can also develop MDS because of the very high doses of chemo (and possibly radiation) they received.

Still, only a small percentage of people who get chemo and radiation will eventually

develop MDS.

Smoking

Familial MDS

In some families without these syndromes, MDS occurs more often than would be expected. Sometimes this is because of a known [gene mutation](#) that runs in the family, but in other cases the cause isn't clear.

Hyperlinks

1. www.cancer.org/cancer/types/myelodysplastic-syndrome/treating/stem-cell-transplant.html
2. www.cancer.org/cancer/risk-prevention/tobacco.html
3. www.cancer.org/cancer/risk-prevention/tobacco/carcinogens-found-in-tobacco-products.html
4. www.cancer.org/cancer/risk-prevention/radiation-exposure/x-rays-gamma-rays.html
5. www.cancer.org/cancer/risk-prevention/chemicals/benzene.html
6. www.cancer.org/cancer/risk-prevention/genetics/family-cancer-syndromes/ataxia.html

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What Causes Myelodysplastic Syndromes (MDS)?

Some myelodysplastic syndromes (MDS) are linked to known [risk factors](#), but most often, the cause of MDS is unknown.

A lot of progress has been made in understanding how certain changes in the DNA in bone marrow cells may cause MDS to develop.

- [Changes \(mutations\) in genes](#)
- [Inherited gene changes](#)
- [Gene changes acquired during a person's lifetime](#)

Changes (mutations) in genes

- Changes in genes that normally help cells grow, divide, or stay alive can lead to these genes being more active than they should be, causing them to become **oncogenes**. These genes can result in cells growing out of control.
- Genes that normally help keep cell division under control or cause cells to die at the right time are known as **tumor suppressor genes**. Changes that turn off these genes can result in cells growing out of control.
- Some genes normally help repair mistakes in a cell's DNA. Changes that turn off these **DNA repair genes** can result in the buildup of DNA changes within a cell, which might lead to them growing out of control.

Any of these types of DNA changes might lead to cells growing out of control, which might lead to cancer. To learn more, see [Oncogenes, Tumor Suppressor Genes, and DNA Repair Genes](#)¹.

Usually, mutations in several different genes inside bone marrow cells are needed before a person develops MDS. Some of the mutations most often seen in MDS cells include those in the *DNMT3A*, *TET2*, *ASXL1*, *TP53*, *RUNX1*, *SRSF2*, and *SF3B1* genes.

Some of these gene changes can be **inherited** from a parent, but more often they are **acquired** during a person's lifetime.

Inherited gene changes

Researchers have found the gene changes that cause some rare [inherited syndromes](#) that are linked to an increased risk of developing MDS.

For example, in a condition called *RUNX1* familial platelet disorder with associated myeloid malignancies, the cells have an inherited change in the *RUNX1* gene. Normally, this gene helps control the development of blood cells. Changes in this gene can lead to blood cells not maturing like they normally would, which can increase a person's risk of MDS.

Gene changes acquired during a person's lifetime

Often, it's not known why people without inherited syndromes develop MDS.

Some [outside exposures](#) can lead to MDS by damaging the DNA inside bone marrow cells. For example, tobacco smoke contains chemicals that can damage genes.

Exposure to radiation or certain chemicals such as benzene or some chemotherapy drugs can also cause mutations that lead to MDS.

But sometimes the gene changes that lead to MDS seem to occur for no apparent reason. Many of these changes are probably just random events that sometimes happen inside a cell, without having an outside cause.

Gene changes inside cells can build up over a person's lifetime, which might help explain why MDS largely affects older people.

Hyperlinks

www.cancer.org/cancer/understanding-cancer/genes-and-cancer/oncogenes-tumor-suppressor-genes.html

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