# Neuroblastoma Causes, Risk Factors, and Prevention

Learn about the risk factors for neuroblastoma and if there are things that might help lower risk.

**Risk Factors**

A risk factor is anything that increases your chances of getting a disease such as cancer. Learn more about the risk factors for neuroblastoma.

- Risk Factors for Neuroblastoma
- What Causes Neuroblastoma?

**Prevention**

The risk of many adult cancers can be reduced with certain lifestyle changes , but at this time there are no known ways to prevent most cancers in children.

The only known risk factors for neuroblastoma cannot be changed. There are no known lifestyle-related or environmental causes of neuroblastoma at this time.

- Can Neuroblastoma Be Prevented?

# Risk Factors for Neuroblastoma

- Age
- Heredity
- Having birth defects (congenital anomalies)

A risk factor is anything that increases the chances of getting a disease such as cancer. Different types of cancer have different risk factors.

Lifestyle-related risk factors such as body weight, physical activity, diet, and the use of tobacco and alcohol play a major role in many adult cancers. But these factors usually take many years to influence cancer risk, and they are not thought to play much of a role in childhood cancers, including neuroblastomas.

No environmental factors (such as being exposed to chemicals or radiation during the mother's pregnancy or in early childhood) are known to increase the chance of getting neuroblastoma.

## Age

Neuroblastoma is most common in infants and very young children. It is very rare in people over the age of 10 years.

## Heredity

Most neuroblastomas do not seem to run in families. But in about 1% to 2% of cases, children with neuroblastoma have a family history of it.

In children with this **familial** form of neuroblastoma (those with an inherited tendency to develop this cancer), the average age at diagnosis is younger than the age for **sporadic** (not inherited) cases. Children with familial neuroblastoma sometimes develop more than one of these cancers, often in different organs (for example, in both adrenal glands or in more than one sympathetic ganglion[1]).

It's important to distinguish neuroblastomas that start in more than one organ from neuroblastomas that start in one organ and then spread to others (metastatic neuroblastomas), because tumors that develop in several places at once are likely to be familial. This might mean that family members should consider genetic counseling and testing (see Genetic Testing: What You Need to Know[2]).

## Having birth defects (congenital anomalies)

Some studies have shown that children with certain birth defects might have an increased risk of developing neuroblastoma. Some of the link between birth defects and neuroblastoma might be related to changes in genes that happen during fetal development.

Genes are instructions in each of our body's cells that tell them what to do. The development of a fetus, which happens in a mother's womb, is controlled by genes that tell the cells how to grow and divide. If cell growth and development doesn't happen normally in the fetus, it can lead to a birth defect. Changes in genes during fetal development might also increase the risk of some kinds of childhood cancers, like neuroblastoma. For more about genes and causes of neuroblastoma, see What Causes Neuroblastoma?

## Hyperlinks

1. www.cancer.org/cancer/types/neuroblastoma/about/what-is-neuroblastoma.html
2. www.cancer.org/cancer/risk-prevention/genetics.html

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# What Causes Neuroblastoma?



While there are a few known risk factors for neuroblastoma, the cause of most neuroblastomas is not known. Still, researchers have found important differences between neuroblastoma cells and the normal **neuroblasts** (early forms of nerve cells) from which they develop.

## How normal cells become neuroblastoma cells

Nerve cells and cells in the medulla (center) of the adrenal gland start out as neuroblasts in a growing fetus. Most often, neuroblasts grow and develop into mature cells. Neuroblastomas can occur when normal fetal neuroblasts do not become mature cells, but instead continue to grow and divide.

Some neuroblasts might not have matured completely by the time a baby is born. Most of these eventually mature into normal nerve cells over time, or they simply die off and do not form neuroblastomas.

But sometimes, neuroblasts remaining in very young infants continue to grow and form a tumor. Many of these tumors will still eventually mature into nerve tissue or go away on their own. But as children get older, it becomes less likely that these cells will mature, and more likely that they will grow into a cancer.

## Why some neuroblasts don't mature

The reason some neuroblasts don't mature is because they have changes in the DNA inside the cells. DNA is the chemical in each of our cells that makes up our **genes**, which control how our cells function. The DNA in our cells is in long, string-like structures called **chromosomes**.

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

- Certain genes that help cells grow, divide, or stay alive can sometimes change to become **oncogenes**.

- Genes that help keep cell division under control, repair damaged DNA, or cause cells to die at the right time are called **tumor suppressor genes**.

Cancers can be caused by DNA changes that create oncogenes, or that turn off tumor suppressor genes. These gene changes can sometimes be inherited from a parent (which is rare with neuroblastomas), or they may happen during a person's lifetime as cells in the body divide to make new cells.

Most often, neuroblastoma cells have chromosome changes (such as having too many or too few chromosomes, or missing part of a chromosome) that are likely to affect certain genes. Scientists are still trying to determine which genes are affected by these chromosome changes, as well as how these changes affect the growth of neuroblastoma cells.

## Acquired versus inherited gene changes in neuroblastoma

Most neuroblastomas are the result of gene changes in neuroblasts that happen during the child’s development, sometimes even before birth. What causes these **acquired** gene changes is not known. They might be just be random events that sometimes happen inside cells, without having an outside cause.

These acquired gene changes are found only in the child’s cancer cells, so they will not be passed on to their children.

In rare cases, neuroblastoma occurs as a result of gene changes **inherited** from a parent. Inherited changes in certain genes account for most hereditary (familial) neuroblastomas:

- Changes in the *ALK* oncogene account for most cases of inherited neuroblastoma. Changes inhappen inside c5|.nn Tf 0 t3qHOk,f be jus05stoma

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harder to treat.
- If the *NTRK1* gene (which makes the TrkA protein) is overactive in neuroblastoma cells, the neuroblastoma might have a better outlook.
- Neuroblastoma cells in older children are more likely to have changes in the *ATRX* tumor suppressor gene. Tumors with this gene change tend to grow more slowly, but they are also harder to cure. This may help explain why younger children with neuroblastoma tend to do better long term than children who are older when they are diagnosed.

It's still not clear what causes many of the gene and chromosome changes that can lead

# Can Neuroblastoma Be Prevented?

staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent most cancers in children.

The only known

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