Tumors in Children

- Radiation exposure
- Inherited and genetic conditions
- Factors with uncertain, controversial, or unproven effects on brain tumor risk

A risk factor is anything that affects a person's chance of getting a disease such as a brain or spinal cord tumor. Different types of cancer have different risk factors.

Lifestyle-related risk factors such as diet, body weight, physical activity, and tobacco use 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 brain tumors.

Very few risk factors have been found for brain and spinal cord tumors. There is no clear cause for most of these tumors.

Radiation exposure

The only well-established environmental risk factor for brain tumors is radiation exposure to the head, which most often comes from the treatment of other conditions.

For example, before the risks of radiation were well known (more than 50 years ago), children with ringworm of the scalp (a fungal infection) often received low-dose radiation therapy. This was later found to increase their risk of some types of brain tumors as they got older.

Today, most radiation-induced brain tumors are caused by radiation given to the head to treat other cancers, such as leukemia. These brain tumors usually develop around 10 to 15 years after getting radiation therapy.

Radiation-induced tumors are still fairly rare, but because of the increased risk (as well as the other possible side effects), radiation therapy is only given to the head after carefully weighing the possible benefits and risks. For most patients with cancer in or

likely to be very small. But to be safe, most doctors recommend that pregnant women and children not get these tests unless they are absolutely needed.

Inherited and genetic conditions

Rarely, children have inherited abnormal genes from a parent that put them at increased risk for certain types of brain tumors. In other cases, these abnormal genes are not inherited but occur as a result of changes (mutations) in the gene before birth.

People with inherited tumor syndromes often have many tumors that start when they are young. Some of the better known syndromes include:

Neurofibromatosis type 1 (von Recklinghausen disease)

This is the most common syndrome linked to brain or spinal cord tumors. It is often inherited from a parent, but it can also start in some children whose parents don't have it. Children with this syndrome may have optic **gliomas** or other gliomas of the brain or spinal cord, or **neurofibromas** (benign tumors of peripheral nerves). Changes in the *NF1* gene cause this disorder.

Neurofibromatosis type 2

This condition is less common than von Recklinghausen disease. It can also either be inherited or may start in children without a family history. It is associated with cranial or spinal nerve **schwannomas**, especially vestibular schwannomas (acoustic neuromas), which almost always occur on both sides of the head. It is also linked to an increased risk of **meningiomas**, as well as spinal cord **gliomas** or **ependymomas**. Changes in the *NF2* gene are nearly always responsible for neurofibromatosis type 2.

Tuberous sclerosis

Children with this condition may develop **subependymal giant cell astrocytomas (SEGAs)**, as well as other **benign tumors** of the brain, skin, heart, kidneys, or other organs. This condition is caused by changes in either the *TSC1* or the *TSC2* gene.

Von Hippel-Lindau disease

Children with this disease tend to develop **blood vessel tumors (hemangioblastomas)** of the cerebellum, spinal cord, or retina, as well as tumors in the kidney, pancreas, and some other parts of the body. It is caused by changes in the *VHL*

gene.

Li-Fraumeni syndrome

People with this syndrome have an increased risk of **gliomas**, as well as breast cancer, soft tissue sarcomas, leukemia, and some other types of cancer. It is caused by changes in the *TP53* gene.

Other syndromes

Other inherited conditions linked with increased risks of certain types of brain and spinal cord tumors include:

- Gorlin syndrome (basal cell nevus syndrome)

lifetime use. The same is true of any possible higher risks in children, who are increasingly using cell phones. Cell phone technology also continues to change, and it's not clear how this might affect any risk.

These risks are being studied, but it will likely be many years before firm conclusions can be made. In the meantime, for people concerned about the possible risks, there are ways to lower their (and their children's) exposure, such as using the phone's speaker or an earpiece to move the phone itself away from the head when used. For more information, see Cellular Phones[1].

Other factors

Exposure to aspartame[2] (a sugar substitute), exposure to electromagnetic fields[3] from power lines and other sources, and infection with certain viruses have been suggested as possible risk factors, but most researchers agree that there is no convincing evidence to link these factors to brain tumors. Research on these and other potential risk factors continues.

Hyperlinks

1. www.cancer.org/cancer/risk-prevention/radiation-exposure/cellular-phones.html
2. www.cancer.org/cancer/risk-prevention/chemicals/aspartame.html
3. www.cancer.org/cancer/risk-prevention/radiation-exposure/extremely-low-frequency-radiation.html

References

Dorsey JF, Hollander AB, Alonso-Basanta M, et al. Chapter 66: Cancer of the Central

What Causes Brain and Spinal Cord Tumors in Children?

- Inherited gene changes
- Acquired gene changes

The cause of most brain and spinal cord tumors is not fully understood, and there are very few known risk factors for these tumors. But researchers have found some of the changes that occur in normal brain cells that may lead them to form tumors.

Most often, it's not known why children *without* inherited syndromes develop brain or spinal cord tumors. Most exposures that cause cancer, such as tobacco smoke, somehow damage DNA. But the brain is relatively protected from most cancer-causing chemicals that we might breathe in or eat. What's more, children are less likely to have been exposed to many of these chemicals.

Several different gene changes usually occur in normal cells before they become cancerous. There are many kinds of brain tumors, each of which may have different sets of gene changes. A number of gene changes have been found in different brain tumor types, but there are probably many others that have not yet been found.

Researchers now understand some of the gene changes that occur in different types of brain tumors, but it's still not clear what causes these changes. Some gene changes might be inherited, but most brain and spinal cord tumors in children are not the result of known inherited syndromes. Most gene changes are probably just random events that sometimes happen inside a cell, without having an outside cause.

Other than radiation[1], there are no known lifestyle-related or environmental factors clearly linked to childhood brain tumors, so it's important to remember that there is nothing these children or their parents could have done to prevent these cancers.

Hyperlinks

1. www.cancer.org/cancer/risk-prevention/radiation-exposure/x-rays-gamma-rays.html

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Williams & Wilkins; 2016.

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Can Brain and Spinal Cord Tumors in Children Be Prevented?

- Limiting radiation exposure to the head

Adults can lower their risk of certain cancers with lifestyle changes (such as staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent most cancers in children.

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