Brain and Other Nervous System Cancers Risk Factor Information

This document gives a general overview of risk factors. The document covers:

About Cancer and Risk Factors

Cancer is not just one disease.

Cancer is a group of over 100 different diseases. Cancer occurs when abnormal cells grow out of control and crowd out the normal cells. It can start anywhere in the body and can spread ("metastasize") to other parts of the body. Cancer types are named for the original location in the body and the type of cell or tissue. Different types of cancer have different causes and risk factors.

Cancer can take a long time to develop.

The cause of cancer is sometimes related to events that happened many years ago. Most cancer types are thought to take anywhere from 10 to over 50 years to develop. A few types, such as leukemia or lymphoma, are thought to take less than 10 years.

A risk factor is anything that increases your chance of getting cancer.

Some risk factors can be controlled while others cannot. Risk factors can include:

- Hereditary conditions (e.g. genes passed down from parents)
- Medical conditions or treatments (e.g. a previous cancer diagnosis)
- Infections (e.g. human papilloma virus)
- Lifestyle factors (e.g. smoking cigarettes)
- Environmental exposures (e.g. certain air pollutants)

Most risk factors do not directly cause cancer.

A risk factor influences the development of cancer but usually does not directly cause cancer. Instead, a combination of risk factors likely drives cancer development. For example, genetic factors can make individuals more likely to get cancer when they are exposed to a cancer-causing chemical.

Environmental risk factors depend on how, how much, and how long you are exposed.

Your risk from exposure to certain chemicals or radiation depends on the type, extent, and duration of exposure. For example, inhaling a certain chemical may increase your risk of getting cancer. However, touching the same chemical may not. In addition, some substances may increase your risk only if you are exposed to high amounts over a long time.

It is difficult to identify the exact causes of cancer.

- Many cancers can develop due to random chance.
- Multiple risk factors can act in combination.
- Risk factors can change over time.
- Cancer might not develop or get diagnosed for a long time after an initiating event (such as exposure or random cell mutation).

Knowing your risk factors can help you make more informed choices.

Discuss your risk factors with your health care provider to make more informed decisions on lifestyle and health care.

About Brain and Other Nervous System (ONS) Cancers

Brain and ONS tumors can be cancerous or non-cancerous.

Invasive (malignant) brain and ONS cancers can spread throughout brain tissue. Benign (non-cancerous) brain tumors grow locally but can press on or damage normal brain tissue. Both cancerous and non-cancerous brain tumors can be life threatening.[2]

Metastatic or secondary brain tumors start elsewhere in the body and spread (metastasize) through the lymph system or bloodstream to the brain.

In adults, metastatic (secondary) brain tumors are more common than tumors that start in the brain (primary brain tumors). Lung, breast, kidney, colon and melanoma are the most common primary cancers that metastasize to the brain. Risk factors and treatment are based on where the cancer started (primary site). For example, a breast cancer that has spread to the brain is treated as a breast cancer (not as a brain cancer). The information in this summary is about primary brain cancers and not metastatic brain tumors.[2, 4, 9]

Brain and other nervous system cancers are fairly rare in the U.S.

The American Cancer Society estimates that 23,890 people will be diagnosed with invasive (malignant) brain or other nervous system (ONS) cancers in the U.S. in 2020. [1, 2] These numbers would be much higher if benign (non-cancerous) tumors were included. Overall, the chance that a person will get an invasive brain or other nervous system cancer in their lifetime is less than 1%.[2]

While brain and ONS cancers are more common in adults, this group of cancers is the 2nd most common cancer type in children.

Brain and ONS cancers make up about 1 out of every 4 childhood cancers. Over 4,000 brain and ONS tumors are diagnosed in children and teens each year.[3] Risk of brain and ONS cancers is greatest in children under age 10. Risk then increases with age between 25 and 75 years.[3, 7, 8, 9, 11] About 80% of brain and ONS tumors are diagnosed in adults aged 40 years or older.[11]

Types of Brain and Other Nervous System Cancers

There are two main types of primary brain and ONS tumors.

- Gliomas are a general group of tumors that start in glial cells. About 81% of invasive brain and ONS tumors are gliomas.[6] There are several types of gliomas, including astrocytomas, oligodendrogliomas, and ependymomas. Glioblastoma is an aggressive, fast-growing astrocytoma that accounts for more than half of all gliomas, making it the most common malignant brain tumor in adults.[3,6]
- Meningiomas start in the meninges, which are layers of tissue that surround the outer part of the spinal cord and brain. Most meningiomas are benign, accounting for about 53% of all non-malignant brain tumors.[5, 6]

In addition to these main subtypes, there are a number of rare brain and ONS tumors.

Different types of brain and ONS tumors are more common in certain groups.

- Men are generally more likely to develop gliomas than women, while women are more likely to develop meningiomas. [3, 6, 9]
- The incidence of gliomas is higher in white individuals compared to black individuals. On the other hand, the incidence of meningiomas is higher in black individuals compared to whites.[6]
- In adults aged 40 years or older, most brain and ONS tumors are meningiomas (43%) or gliomas (27%).[11]
- About half of all childhood brain and ONS cancers are gliomas. Another 10% to 20% of childhood brain tumors are embryonal tumors, of which medulloblastoma is the most common.[3]

Known Risk Factors

Most brain and ONS cancers develop for no apparent reason and are not associated with specific risk factors.

Medical Conditions

Allergies and atopic conditions:

People with allergies and atopic conditions (e.g., asthma, eczema) have a lower risk for gliomas. The reason is not known, but it may be that people with these conditions have more active immune systems which discourage abnormal cell growth.[11, 12]

Hereditary Conditions

Family history (rare):

In rare cases, brain and ONS cancer run in some families. These tumors may be associated with hereditary syndromes such as neurofibromatosis types I and II, Li-Fraumeni syndrome, tuberous sclerosis, and Von Hippel-Lindau disease. Neurofibromatosis type I is the most common inherited cause of brain or spinal cord tumors.[2, 3] Overall, less than 5% of brain tumors may be linked to inherited syndromes.[5, 9]

Environmental Exposures

Ionizing radiation:

The most established risk factor for brain and ONS tumors (either benign or invasive) is high-dose exposure to ionizing radiation (i.e., x-rays and gamma rays). Most radiation-induced brain and ONS tumors are caused by radiation to the head from the treatment of other cancers (e.g. for leukemia in childhood). These brain tumors usually develop around 10 to 15 years after the radiation.[2]

Possible Risk Factors

Medical Conditions

Head injury:

Head injury has long been suspected to be a possible risk factor for later development of brain and ONS tumors and continues to be studied by scientists. Some studies have found a positive association between head trauma and meningioma. Overall, additional research is necessary before a definitive link can be established.[5, 9, 12]

Lifestyle Factors

Dietary N-nitroso compounds:

Dietary N-nitroso compounds are formed in the body from nitrates or nitrites found in cured meats, tobacco smoke, and cosmetics. Some studies found an increased risk of childhood brain tumors associated with high levels of nitrite intake from cured meat consumption by the mother during pregnancy. However, these studies have been criticized, and additional research is needed.[5, 9, 12]

Environmental Exposures

Workplace hazards:

Occupational exposure to radiation or certain chemicals may be associated with increased risk of brain cancer. Workers in the nuclear industry exposed to ionizing radiation may have an increased risk. Some studies indicate that workers in plastics manufacturing exposed to chemicals like vinyl chloride or acrylonitrile may also be at higher risk. However, no definitive link has been made.[2, 5, 9, 12]

Other Risk Factors That Have Been Investigated

Lifestyle Factors

Cell phone use?

With cellular phones becoming increasingly common, there is growing concern over a link between their use and brain and ONS tumors. Cell phones emit radiofrequency radiation, a form of energy on the electromagnetic spectrum between FM radio waves and those used in microwave ovens. They do not emit ionizing radiation, which has been shown to damage DNA and has the ability to cause cancer. Some studies have suggested a possible increased risk of brain tumors in adults with cell phone use, but most larger studies have not found an increased risk.[2, 3, 12] However, there are very few studies on long-term use (10 years or more).[2,3]

Environmental Exposures

Other exposures?

Many studies have been conducted to investigate links between brain and ONS cancers and environmental factors, including residential power line exposure; viruses and infections; aspartame (a sugar substitute), and pesticides. To date, there is no strong evidence to link these factors to brain tumors.[2, 3, 12]

References / More Information

This information sheet should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the resources below. Much of the information contained in this summary has been taken directly from these sources. This material is provided for informational purposes only and should not be considered as medical advice. Consult your physician if you have questions regarding a specific medical problem or condition.

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