Bladder cancer

Bladder cancer is a disease in which certain cells in the bladder become abnormal and multiply uncontrollably to form a tumor. The bladder is a muscular organ in the lower abdomen that stores urine until it can be removed (excreted) from the body.

Bladder cancer may cause blood in the urine, pain during urination, frequent urination, the feeling of needing to urinate without being able to, or lower back pain. Many of these signs and symptoms are nonspecific, which means they may occur in multiple disorders. People who have one or more of these nonspecific health problems often do not have bladder cancer, but another condition such as an infection.

The most common type of bladder cancer, called non-muscle invasive bladder cancer (NMIBC), involves cells lining the inside of the bladder. NMIBC generally does not spread to other tissues (metastasize), but it often does recur after it has been treated. The other type, called muscle-invasive bladder cancer (MIBC), involves cells of the muscle wall of the bladder. MIBC generally does metastasize and is often life-threatening.

Frequency

In the United States, bladder cancer is the fourth most common type of cancer in men. Bladder cancer occurs four times more often in men than in women, with about 60,000 men and 18,000 women diagnosed with the condition each year.

Causes

Cancers occur when genetic mutations build up in critical genes, specifically those that control cell growth and division (proliferation) or the repair of damaged DNA. These changes allow cells to grow and divide uncontrollably to form a tumor. In nearly all cases of bladder cancer, these genetic changes are acquired during a person’s lifetime and are present only in certain cells in the bladder. These changes, which are called somatic mutations, are not inherited. Somatic mutations in many different genes have been found in bladder cancer cells. It is unclear whether genetic changes that are inherited and present in all of the body’s cells (germline mutations) play a significant role in causing bladder cancer.

Somatic mutations in the \textit{FGFR3}, \textit{PIK3CA}, \textit{KDM6A}, and \textit{TP53} genes are common in bladder cancers. Each of these genes plays a critical role in regulating gene activity and cell growth, ensuring cells do not grow and divide too rapidly or uncontrollably. It is likely that variants in these genes disrupt normal gene regulation, contributing to the uncontrolled cell growth that can lead to tumor formation in bladder cancer. Mutations in many other genes have been found to be associated with bladder cancer; each of these
additional genes is associated with a small percentage of cases. Most of these genes are also involved in regulating the normal activity of genes and the growth of cells.

Additionally, deletions of part or all of chromosome 9 are commonly found in bladder cancer, particularly in NMIBC. Research shows that several genes that control cell growth and division are located on chromosome 9. It is likely that a loss of one or more of these genes plays a role in the early development and progression of bladder cancer.

Researchers have identified many lifestyle and environmental factors that expose individuals to cancer-causing compounds (carcinogens), which increase the rate at which somatic mutations occur, contributing to a person's risk of developing bladder cancer. The greatest risk factor is long-term tobacco smoking. It is estimated that half of people with bladder cancer have a history of tobacco smoking. Other environmental risk factors include chronic bladder inflammation, exposure to certain industrial chemicals, certain herbal medicines common in Asia, a parasitic infection called schistosomiasis, and long-term use of urinary catheters.

**Inheritance Pattern**

Bladder cancer is typically not inherited. It is usually associated with somatic mutations that occur in certain cells in the bladder during a person's lifetime.

In rare families, the risk of bladder cancer is inherited. In these cases, the cancer risk follows an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to increase a person's chance of developing the disease. It is important to note that people inherit an increased risk of cancer, not the disease itself. Not all people who inherit mutations in these genes will develop bladder cancer.

**Other Names for This Condition**

- bladder carcinoma urinary
- bladder tumor
- cancer of the urinary bladder
- cancer, bladder
- cancer, urinary bladder
- malignant bladder neoplasm
- malignant bladder tumor
- neoplasm of the bladder
- neoplasm of the urinary bladder
- tumor of the urinary bladder
- urinary bladder carcinoma
- urinary bladder neoplasm
Diagnosis & Management

Formal Treatment/Management Guidelines

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Genetic Testing Information

- What is genetic testing? /primer/testing/genetictesting

- Genetic Testing Registry: Bladder carcinoma https://www.ncbi.nlm.nih.gov/gtr/conditions/C0699885/

Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov https://clinicaltrials.gov/ct2/results?cond=%22bladder+cancer%22
Other Diagnosis and Management Resources

- MedlinePlus Encyclopedia: Bladder Cancer
  https://medlineplus.gov/ency/article/000486.htm
- National Cancer Institute: Bladder Cancer Treatment (PDQ®)–Patient Version
  https://www.cancer.gov/types/bladder/patient/bladder-treatment-pdq

Additional Information & Resources

Health Information from MedlinePlus

- Encyclopedia: Bladder Cancer
  https://medlineplus.gov/ency/article/000486.htm
- Health Topic: Bladder Cancer
  https://medlineplus.gov/bladdercancer.html
- Medical Tests: TP53 Genetic Test
  https://medlineplus.gov/lab-tests/tp53-genetic-test/

Genetic and Rare Diseases Information Center

- Bladder cancer
  https://rarediseases.info.nih.gov/diseases/12210/bladder-cancer

Additional NIH Resources

- National Cancer Institute: Bladder Cancer Home Page
  https://www.cancer.gov/types/bladder
- National Cancer Institute: Bladder Cancer Treatment (PDQ®)–Patient Version
  https://www.cancer.gov/types/bladder/patient/bladder-treatment-pdq
- National Cancer Institute: The Cancer Genome Atlas
  https://www.cancer.gov/about-nci/organization/ccg/research/structural-genomics/tcga/studied-cancers/bladder

Educational Resources

- MalaCards: bladder cancer
  https://www.malacards.org/card/bladder_cancer
- MD Anderson Cancer Center
  https://www.mdanderson.org/cancer-types/bladder-cancer.html
- Merck Manual Consumer Version
  https://www.merckmanuals.com/home/kidney-and-urinary-tract-disorders/cancers-of-the-kidney-and-genitourinary-tract/bladder-cancer
• Orphanet: NON RARE IN EUROPE: Bladder cancer
   https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=157980

• Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins
   https://www.hopkinsmedicine.org/kimmel_cancer_center/

Patient Support and Advocacy Resources
• American Cancer Society
   https://www.cancer.org/cancer/bladder-cancer.html

• National Coalition for Cancer Survivorship
   https://www.canceradvocacy.org/

Scientific Articles on PubMed
• PubMed
   https://www.ncbi.nlm.nih.gov/pubmed?term=%28Bladder+Neoplasms%5BMAJR%5D%29+AND+%28bladder+cancer%5BTI%5D%29+AND+review%5Bpt%5D+AND+enlightening%5Bl%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%5D

Catalog of Genes and Diseases from OMIM
• BLADDER CANCER
   http://omim.org/entry/109800

Medical Genetics Database from MedGen
• Bladder cancer, somatic
   https://www.ncbi.nlm.nih.gov/medgen/14150

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