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Hereditary Genetics: Current Research

Short Communication

Approaches of Cancer Genetics and Categories of Genetic Changes and its Development

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DESCRIPTION

Cancer is a hereditary disease and it is caused by specific changes in the genes that control the work of cells, especially the growth and division of cells. Genetic changes that cause cancer can also result from errors that occur in cell division, or by substances that cause cancer that damage DNA, such as certain chemicals contained in cigarette smoke, or by exposure to radiation such as ultraviolet light. Genetic changes that occur after conception are called somatic (or acquired) mutations. Somatic mutations are often caused by environmental factors such as UV light and exposure to certain chemicals. Somatic mutations can occur in any cell division, from the initial division of a fertilized egg to the cell division that replaces the cells of a failing individual. Usually, the genetic changes in cancer can be Include three major types of genes [1]:

- Oncogenes
- Tumor suppressor's genes
- Genes that maintain the integrity of the genome.

Oncogenes

Oncogenes are genes that can cause cancer. In tumor cells, these genes are often mutated or highly expressed. Most normal cells undergo a programmed form of rapid cell death when critical functions are altered and malfunctioning. Most oncogenes began as proto-oncogenes. Normal genes involved in the inhibition of cell growth and proliferation or apoptosis. When mutations up regulate normal genes that promote cell proliferation (gain-of-function mutations), they make cells more susceptible to cancer. Therefore, they are called "oncogenes" [2].

Tumor suppressor's genes

Tumor suppressor genes represent the opposite side of cell proliferation control and usually act by inhibiting cell proliferation and tumor development. In many tumors, these genes are lost or inactivated, eliminating negative regulators of cell proliferation and contributing to the proliferation of tumor cells. These genes act as cells when to slow down replication, repair DNA, or destroy them. If these genes should be on and turned off, cancer can develop. Inactivation of TSG (Tumor Suppressor's Genes) is a common mechanism that contributes to the development of cancer. Molecular studies have shown that inactivation of TSG is associated with cytogenetic undetectable microdeletion identified by the detection of LOH, a polymorphic marker that maps to or near the tumor suppressor position. It shows that it is often present. Germline mutations in TSG are the most well-known cause of hereditary cancer, as somatic inactivation of alleles is usually consistent with normal development [3].

Genome integrity

The genome has always been vulnerable to damage from intracellular and extracellular sources such as cell metabolism, spontaneous base loss or modification, radiation, and oxidized species resulting from chemicals. Maintaining genomic integrity is essential for the survival of an organism and the inheritance of traits to offspring. Genome instability is caused by DNA damage, defective DNA replication, or uncoordinated cell division, which can lead to chromosomal abnormalities and genetic mutations. The laboratory for Genome Integrity focuses on the causes and effects of genome instability, the mechanism of DNA repair, and the destruction of DNA repair as an aging and cancer-inducing or protective event. Loss of genomic integrity can be affected by a variety of additional physiological processes such as transcription and replication, R-loop formation, and epigenome dysregulation [4].

The signs and symptoms caused by cancer depend on which part of the body is affected. Common signs and symptoms that are related to but not specific to cancer include [5]:

- Fatigue
- Lumps and thickened areas that can be felt under the skin.
- Changes in weight, including unintentional weight loss or gain.

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- Skin changes such as yellowing, darkening, redness, unhealing wounds, and changes in existing moles.
- Changes in bowel habits
- Persistent cough or dyspnea
- Dysphagia
- Hoarseness
- Persistent indigestion or discomfort after eating
- Persistent unexplained muscle or joint pain
- Persistent unexplained fever or night sweats
- Unexplained bleeding or bruising
- Cancer development is multifactorial. However, up to 10% of all cancers are associated with hereditary genetic mutations. As healthcare shifts to a greater focus on prevention, healthcare providers, including general surgeons, need to play a role in identifying patients at high risk for cancer. Genetic testing provides tools to identify patients who have a genetic mutation and can provide appropriate preventive care and treatment [6].

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