

Genetic disorders and cancer are caused by mutations

Hereditary mutations cause genetic disorders and some cancers

Genetic disorders are inherited disorders caused by abnormal genes or chromosomes

Some mutations can increase the likelihood of developing certain cancers

If a gamete containing the mutation for a genetic disorder is fertilised, the mutation will be present in the new fetus formed

Acquired mutations are mutations that occur in individual cells after fertilisation

If these mutations occur in the genes that control the rate of cell division, it can cause uncontrolled cell division

A **tumor** is a mass of abnormal cells

They are caused by uncontrolled cell division

Cancers are tumors that invade and destroy surrounding tissue

There are two types of gene that control cell division

Tumour-suppressor genes can be inactivated if a mutation occurs in the DNA sequence

When functioning normally, these genes slow cell division

They produce proteins that stop cells dividing

They can cause them to self-destruct

If a mutation occurs in this gene, the protein is not produced

This stimulates the cells to divide uncontrollably

This results in a tumour

Proto-oncogenes can be increased if a mutation occurs in the DNA sequence

A oncogene is a proto-oncogene which is mutated

When functioning normally, these genes stimulate cell division

They produce proteins that make cells divide

If a mutation occurs in this gene, it may become overactive

This stimulates the cells to divide uncontrollably

This results in a tumour

Diagnosing & Treating Cancer and Genetic Disorders

Cancer and most genetic disorders are caused by mutations

Knowing whether a disorder is caused by an acquired or inherited mutation affects the prevention and diagnosis of the disorder

Identifying the specific mutation that causes a disorder in an individual affects the prevention, diagnosis and treatment

Acquired Mutations

Prevention

Cancer can be caused by acquired mutations

Acquired mutations can occur spontaneously

They can be caused by exposure to mutagenic agents

If you know that acquired mutations are caused by mutagenic agents, you can try to prevent cancer by avoiding them

Protective clothing - people who work with mutagenic agents should wear protective clothing

Sunscreen - people should be warned that the skin is exposed to the sun

Vaccination - some acquired cancers are caused by viruses

A vaccine available should protect women, reducing the risk of developing certain types of cancer

Diagnosis

Normally, cancer is diagnosed after symptoms appear

High-risk individuals can be screened for cancers that the general population are not screened for

They can be screened earlier and more frequently

This can lead to earlier diagnosis of cancer

This increases the chances of recovery

Some types of cancer are caused by a particular mutation

All stem cells in plants are totipotent

They can mature into any cell type

They can be used to grow plant organs

They can be used to grow whole new plants in vitro

Stem cells become specialised because different genes are expressed

Stem cells all contain the same genes

During development not all of them are transcribed and translated

Under the right conditions some genes are expressed

Others are switched off

mRNA is only transcribed from specific genes

The mRNA from these genes is then translated into proteins

These proteins modify the cell

They determine the cell structure and control cell processes

Changes to the cell cause the cell to become specialised

These changes are difficult to reverse

Therefore when a cell becomes specialised, it remains specialised

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