Tan Tock Seng HOSPITAL

Department of
MEDICAL ONCOLOGY

Genetic Counselling and Testing for Hereditary Cancer Syndrome

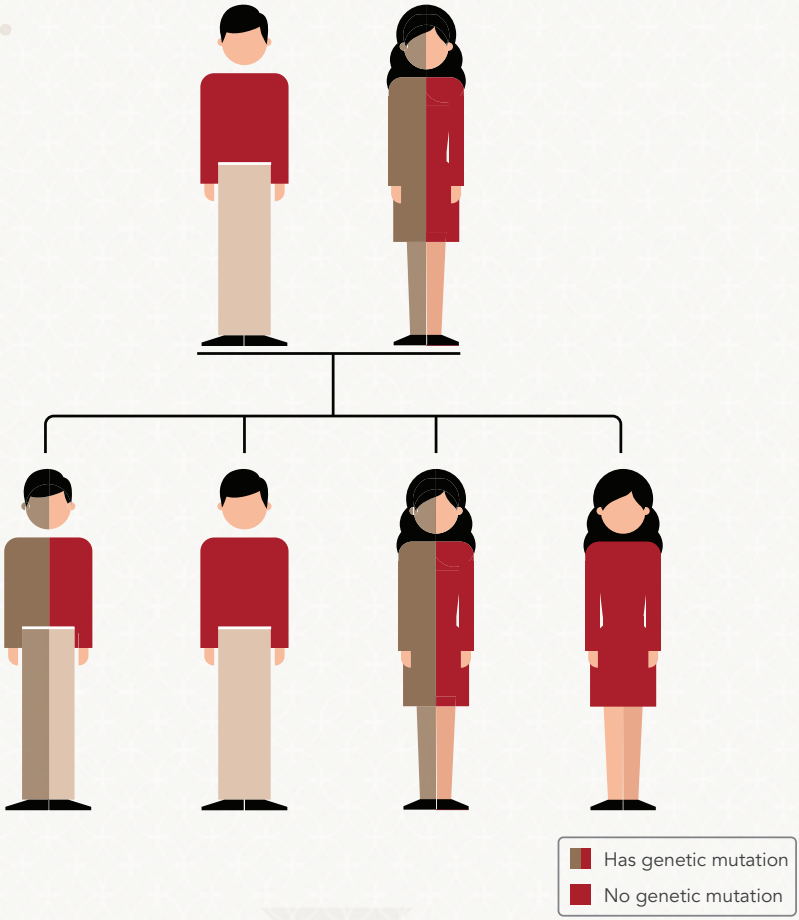
CONTENT

What Is Hereditary Cancer Syndrome?

Cancer is a common disease, and its risk will increase with age. It is a multifactorial disease resulting from the combined influence of genetic changes and environmental factors.[1]

Hereditary cancer syndrome refers to when a genetic mutation that is passed down from parent to child, resulting in an increased risk of developing certain cancers. Approximately **5% – 10% of cancer cases are the result of hereditary cancer syndrome**.[1]

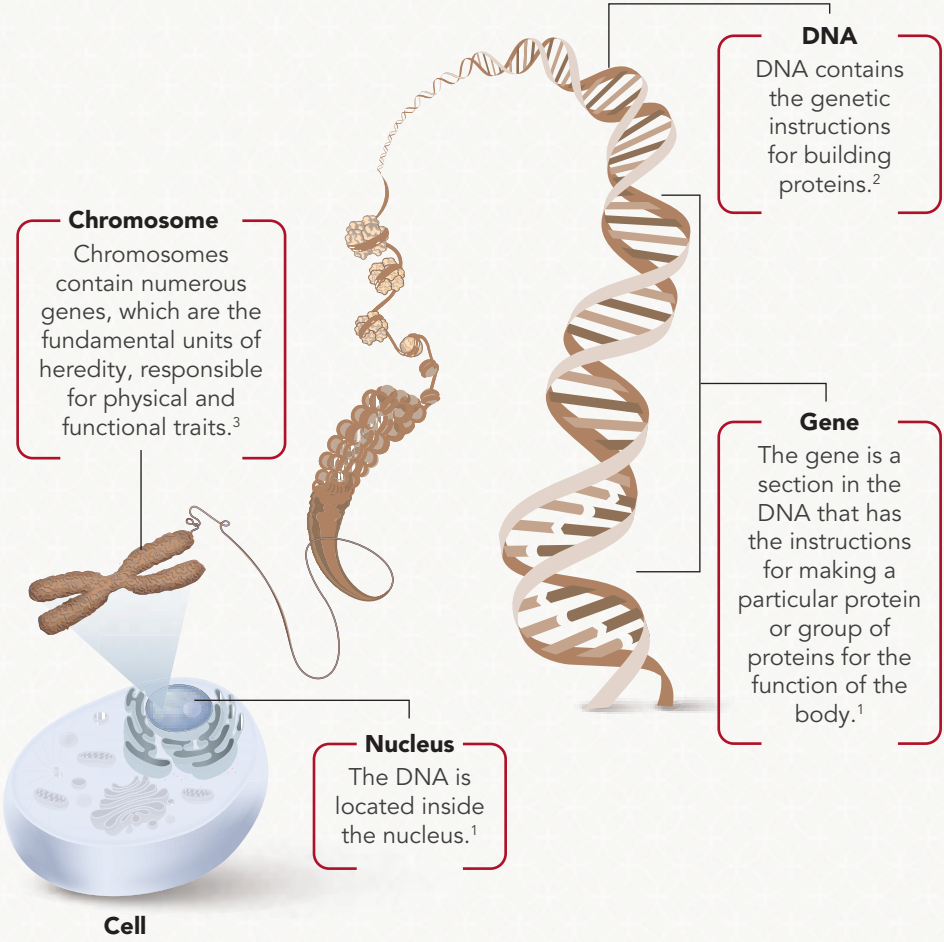
What Is Hereditary Cancer Syndrome?



Both men and women can pass down inherited genetic mutations to their children.[1]

What Are Genes?

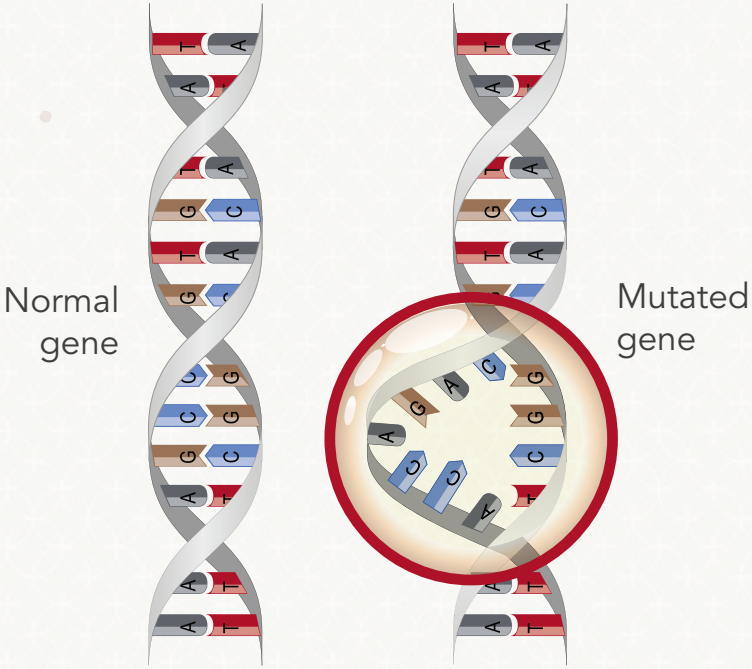
Genes are the instructions encoded in our DNA that dictate the way the body functions. We have over **25,000 genes** in our body.[2]



> All genes, except those on sex chromosomes, come in pairs **as we inherit one copy from our mother and the other copy from our father**.[4]

DNA: Deoxyribonucleic acid.

What Are Genetic Mutations?



Genetic mutations are changes in DNA similar to typographical errors that can provide wrong instructions, leading to abnormal functions in our bodies.[1]

DNA changes that cause diseases are called 'genetic mutations'.[1]

DNA: Deoxyribonucleic acid.

Types of Genetic Mutations

Genetic mutations can either be acquired (referred to as 'somatic') or inherited (referred to as 'germline').[4]

Somatic DNA changes

Acquired over a person's lifetime in single cells

Can lead to cancer

Cannot be inherited

Germline DNA changes

Present in every cell of the body, including eggs and sperm

Can be inherited

Can increase risk of developing cancer

Examples: Hereditary breast and ovarian cancer syndrome and Lynch syndrome[3,5]

DNA: Deoxyribonucleic acid.

Types of Hereditary Cancer

The two most commonly diagnosed hereditary cancer syndromes are **hereditary breast and ovarian cancer (HBOC) syndrome** and **Lynch syndrome** (also known as hereditary nonpolyposis colorectal cancer, HNPCC).[6,7]

Individuals with **HBOC syndrome** are more likely to develop cancers such as:

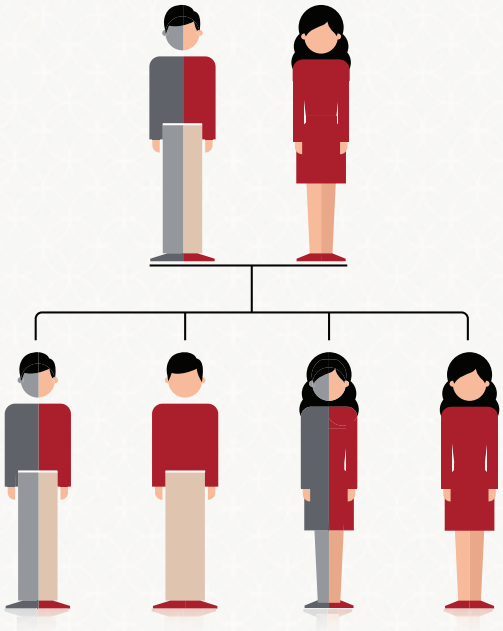
- **Female breast** 45% – 72%[8]
- **Male breast** 1% – 8%[9]
- **Ovaries** 16% – 63%[9]
- **Pancreas** 1% – 7%[9]
- **Prostate** 8% – 15%[9]
- **Melanoma** (elevated)[8]

Individuals with **Lynch syndrome** are more likely to develop cancers such as:

- **Colorectal** 12% – 53%[10]
- **Endometrium/uterus** 13% – 46%[10]
- **Ovaries** 3% – 17%[10]
- **Stomach** 2% – 16%[10]
- **Brain** 1% – 4%[10]

How Is Hereditary Cancer Syndrome Inherited?

Hereditary cancer syndrome is caused by a germline genetic mutation, which is present in all cells of an individual throughout the life and is passed down from parent to child.[1,11]



Individuals with a genetic mutation have a 50% chance to pass on the mutation to their children

Has genetic mutation

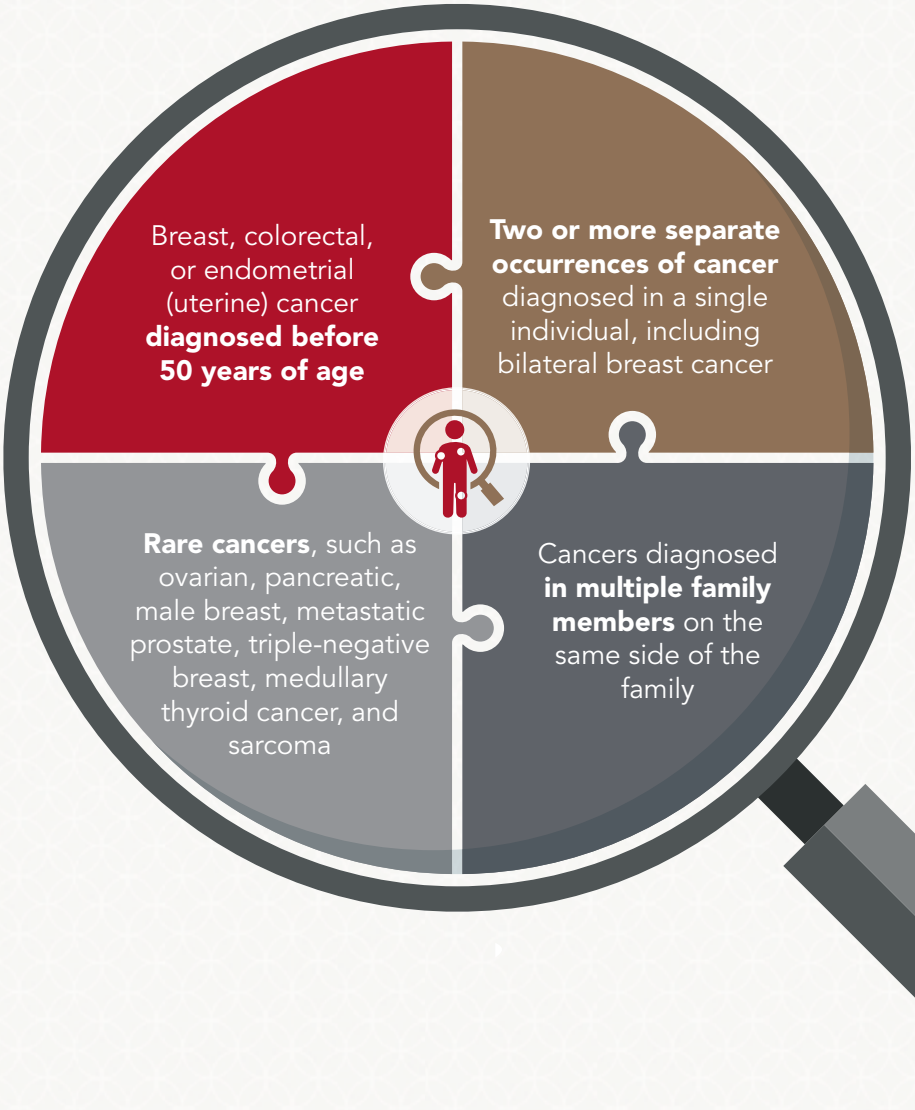
No genetic mutation

Inheriting a genetic mutation does not mean a person will develop cancer, but it **increases their risk of certain cancers**.[2]

To identify hereditary cancer syndromes that run in a family, **a germline genetic test can be performed**.[1,11]

Who Should Consider Genetic Testing?

Individuals with a personal or family history of:[11,12]



What Is Genetic Testing?

Genetic testing is conducted to help individuals **make informed decisions about cancer treatment or prevention.** It also **provides information about potential implications that may affect their family.**[13]

Two types of genetic testing can be performed:[14]

Tumour Test

For individuals who have been diagnosed with cancer and to guide their treatment options[14]

Tumour test sample taken via:[14]

- Tumour biopsy
- Liquid biopsy

Germline Test

To identify specific inherited genetic mutations that have been linked to an increased risk of certain cancers[14]

Germline test sample taken via:[14]

- Blood
- Saliva
- Skin

What Is the Process of Genetic Counselling?

Genetic counselling is **conducted before an individual undergoes germline genetic testing**. This process provides patients and/or their family members with information to help them make informed decisions about cancer risk, treatment of cancer, and potential implications for their family.[12,15]

Topics that will be covered during a genetic counselling session include:[12,15]

Personal and family **history** of cancer

Risk assessment of the likelihood that an inherited genetic mutation is the cause of cancer(s) in the family

Genetic testing procedures, including specimen type, test costs, number of genes tested, and expected timing for results

Potential **outcomes** of genetic testing

Benefits and limitations of genetic testing

Implications of the genetic test results on insurance, legal, and confidentiality issues

What Is the Procedure for Genetic Testing?

Genetic testing is a personal choice. If an individual agrees to undertake germline genetic testing, written informed consent is required. Blood or saliva samples will be collected for testing, and results will usually be ready in a few weeks.[16]

01 Genetic counselling

Consent taking 02

03 Sample collection

Genetic testing 04

05 Review of results

What Are the Potential Genetic Test Results?

Genetic testing for an inherited mutation can have **three possible results**:[12,16]

Positive

- A genetic mutation known to cause hereditary cancer is identified.
- Medical management, such as increased surveillance or risk-reducing surgery, may be recommended.
- Predictive testing is recommended for immediate family members.

Negative

- No genetic mutation known to cause hereditary cancer found.
- This does not rule out a genetic cause for cancer.

Variant of uncertain significance

- An uncertain gene change(s) is identified. However, it is unclear if the change(s) increases your risk of cancer.
- In some instances, this result may be clarified by testing other family members and could be reclassified over time as 'positive' or 'negative'.
- Medical management should be based on personal and/or family history.

What Are the Benefits of Germline Genetic Testing?

Determines your risk of cancer to help you make informed medical decisions, such as regular screening to detect cancer as early as possible and/or risk-reducing surgery[12]

Provides an explanation for your personal or family history of cancer[12]

Identifies other family members who may be at risk of developing cancer[12]

Guides treatment options for current cancer diagnosis[12]

If you have a personal or family history of cancer or are interested in learning about your inherited cancer risk, **talk to your doctor about whether germline genetic testing is right for you**.

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Notes

Clinic 1C
Clinical Genetics and Genomics Clinic
TTSH Medical Centre, Level 1

Contact
6357 7000 (Central Hotline)
6889 4664 (Clinic 1C Hotline)

Scan the QR code with your smartphone to access the information online or visit http://for.sg/ttsh-health-library

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