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WORLD CANCER DAY

Cancer v immune system: the hidden war

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THE human body, like a country, has a department of defence: the immune system. This system responds to injuries, protects against foreign invaders like viruses and bacteria, and destroys abnormal cells every day without us ever noticing.

An abnormal cell is one that has undergone changes that cause it to behave differently. These changes can include defects arising from mistakes in normal cellular processes or from changes in DNA, known as mutations. Mutations can be inherited or caused by exposure to carcinogens (cancer-causing agents), such as radiation, tobacco smoke, or certain chemicals.

General guards and specialist units

The immune system consists of two "departments": the innate immune system and the adaptive immune system.

The innate immune system is the body's first line of defence. Its cells patrol the body, responding to damage or anything that appears abnormal. This system responds quickly, and the response can last for several days.

The adaptive immune system is more specialised. It is activated by signals from the innate immune system and targets specific threats. The adaptive immune system responds more slowly, and these responses can last for several weeks. These systems work together to protect the body.

Immune cells communicate using

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chemical signals and through direct contact with other cells. Cells display identifying markers on their surface, known as antigens. Immune cells scan these antigens using special receptors to determine whether a cell is healthy or abnormal. Abnormal cells display unusual antigens.. This allows the immune cells to recognise when something is wrong.

Defence plan

Immune cells patrol the body. When they detect an abnormal cell, they can respond quickly or recruit cells of the adaptive immune system. Specialised immune cells that are mainly responsible for destroying abnormal cells are called T cells.

When these T cells are recruited, they investigate the target cell's antigens. When the antigen is recognised as one of the body's own antigens, it does not attack. If the antigen is recognised as being abnormal, the T cell prepares to attack.

However, the T cell first needs a confirmation signal. These signals are known as immune checkpoints. They act as safety brakes, preventing the immune system from destroying healthy cells. These immune checkpoints are important for preventing autoimmune diseases, where the immune system attacks the body's own healthy tissues.

Complex terrain

So why does cancer still develop? This is a question that many of us may ask as we mark World Cancer Day tomorrow.

Cancer is a complex disease. It can develop when mutations affect proteins that perform important functions, such as controlling cell growth or repairing damage. Also, cancer does not develop overnight. It is the result of a long battle between the immune system and abnormal cells.

It is important to point out that abnormal cells can be non-cancerous or cancerous. Non-cancerous growths are benign and remain localised. Cancerous growths are malignant and acquire the ability to spread.

Over time, cancer cells can accumulate mutations that make them more aggressive. These mutations also help them to hide from immune attack. Eventually, some cancer cells learn how to evade the immune system altogether. These cells may appear normal or actively use inhibitory immune checkpoint signals to stop T cells from attacking. This allows them to multiply and spread unchecked.

Immunotherapy

However, all is not lost. Immunotherapy is a type of treatment designed to help the immune system function better. It can then recognise and fight diseases more effectively, including cancer. In cancer, this includes helping immune cells recognise cancer cells or removing the masks cancer cells use to hide.

There are several classes of immunotherapy. The main classes are adoptive cell transfer therapy (a type of treatment that uses the cells of our immune system to destroy cancer), cancer vaccines (vaccines that target cancer antigens), cytokine (small proteins that act as chemical messengers) therapy, small molecule inhibitors (a targeted medicine that works like a "molecular off-switch" to block proteins involved in disease), and immune checkpoint inhibitors (blocks inhibitory immune checkpoints).

While immunotherapy can be very effective for some cancers with the potential for long-term remission, it does not work the same for every patient. Oncologists use tests to assess if a patient is suitable for immunotherapy, but this can be a difficult process because every cancer and patient is different.

Because the immune system and cancer are both complex, ongoing research is essential to ensure patients receive the best possible treatment.

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