Cancer

Cell Division Gone Wrong

SNC2P Biology
Cancer - Cell Division Gone Wrong

A cell’s DNA controls everything that happens in that cell, including division. A change in the cell’s DNA can affect its cell cycle. What happens then?
Occasionally a mutation takes place in the DNA that controls the cell cycle. This can create cancer cells. **Cancer** is a group of diseases in which cell division is uncontrolled.

**Cancer**

- A disease caused by an uncontrolled division of abnormal cells in a part of the body
Uncontrolled cell division sometimes leads to the formation of a lump or tumor. Tumors are like healthy cells, they need nutrients and oxygen to survive and go through the cell cycle. Thus, they need access to the body’s blood supply.

**Tumor:**

- A swelling of a part of the body caused by an abnormal growth of tissue
Tumors
do not benefit the body and will continue to divide and increase in number.

There are two types of tumors:

- **Benign tumor**: has no serious effect on the normal cells around it. A benign tumor is not cancerous.

- **Malignant tumor**: interferes with the work of the cells around it or destroys those cells. Malignant tumors are cancerous.
Malignant Tumors

Malignant tumors are dangerous because their cells can break away and travel to other parts of the body where they start a new tumor. This process is known as **metastasis**.

Metastasis

- The development of secondary malignant growths at a distance from a primary site of cancer
Causes of Cancer

The risk of getting some types of cancers like breast cancer and colon cancer appear to be genetically inherited. Other forms of cancer are caused by carcinogens, lifestyle choices, or viruses.

Carcinogens

- Any environmental factor that causes cancer

- Carcinogens include:
  - tobacco products
  - UV radiation (sun or tanning beds)
  - chemicals (e.g. benzene)
Effects of Diet on Cancer

A University of Toronto study found a link between poor diet and colon cancer. If you do not eat your five to twelve servings of fruit and vegetables every day then you may be missing out on fibre, vitamins, and natural cancer-fighting compounds called antioxidants.

A healthy diet including eating less red meat, processed meat, saturated fat, and refined sugar may help you reduce your risk of some cancers.
UV Radiation as a Cause of Skin Cancer

If you like to lie out in the sunshine for hours or use tanning beds, you should know that ultraviolet radiation (UV), a form of invisible high-energy radiation, is a leading cause of skin cancer. UV radiation causes mutations in skin cells.

Incidence rates

- Current estimates are that one in five Americans will develop skin cancer in their lifetime
- More than 2 million people in the United States are diagnosed every year with skin cancer
Statistics

**BY THE NUMBERS**

Number of Canadians that were alive at the beginning of 2009 with a cancer diagnosed in the previous 10 years: 838,724

Number of Canadians that will be diagnosed with cancer in 2013: 187,600

Number of Canadians that will die of cancer in 2013: 75,500

- **41%** of all Canadians will develop cancer in their lifetime.
- **46%** of cancer patients will survive five years relative to the general population.
- **63%** of Canadians will develop cancer in their lifetime.

BY TYPE

Distribution of estimated new cancer cases in 2013:

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>24.5%</td>
</tr>
<tr>
<td>Breast</td>
<td>26.1%</td>
</tr>
<tr>
<td>Lung</td>
<td>13.3%</td>
</tr>
<tr>
<td>Colorectal</td>
<td>11.6%</td>
</tr>
<tr>
<td>Bladder</td>
<td>6.1%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>3.9%</td>
</tr>
<tr>
<td>Kidney</td>
<td>2.5%</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.4%</td>
</tr>
<tr>
<td>Melanoma</td>
<td>3.0%</td>
</tr>
<tr>
<td>Other</td>
<td>1.5%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2.4%</td>
</tr>
<tr>
<td>Stomach</td>
<td>2.2%</td>
</tr>
<tr>
<td>All other cancers</td>
<td>9.6%</td>
</tr>
</tbody>
</table>

*TRISH HULASTER, CARRIE COGBURN / THE GLOBE AND MAIL *
What About Treatment?
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>Effective at removing a single mass or tumor.</td>
<td>Cannot remove cancer that has spread and affected multiple areas of the body.</td>
</tr>
<tr>
<td>Radiation</td>
<td>Effective at removing a single mass or tumor while simultaneously preserving organs.</td>
<td>Damages surrounding tissues. Inability to kill tumors that cannot be seen on imaging scans.</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>Effective at removing cancer that has spread throughout the body.</td>
<td>Damages healthy cells and has numerous side effects.</td>
</tr>
</tbody>
</table>
The cell cycle regulates how long a cell lives. However, sometimes cells die because they have suffered an injury that cannot be repaired. There are two types of cell death, **necrosis** and **apoptosis**.

**Necrosis**

- A form of cell injury that results in the premature death of cells. Necrosis is caused by external factors such as infection, toxins, or trauma.

**Apoptosis**

- Apoptosis is the controlled death of cells that are no longer useful or have lost their ability to perform efficiently.
Recap

- **Cancer** is a disease caused by an uncontrolled division of abnormal cells in a part of the body which can have drastic effects on an organism.

- A **tumor** is a swelling of a part of the body caused by an abnormal growth of tissue.

- Cancer can be inherited, caused by **carcinogens**, lifestyle choices, or viruses.

- Treatment for cancer includes surgery, radiation therapy, and chemotherapy. All of which have various advantages and disadvantages.
Recap

- There are two types of cell death, **necrosis** and **apoptosis**. Apoptosis is defined as cell death from natural causes and necrosis is defined as cell death resulting from external factors.