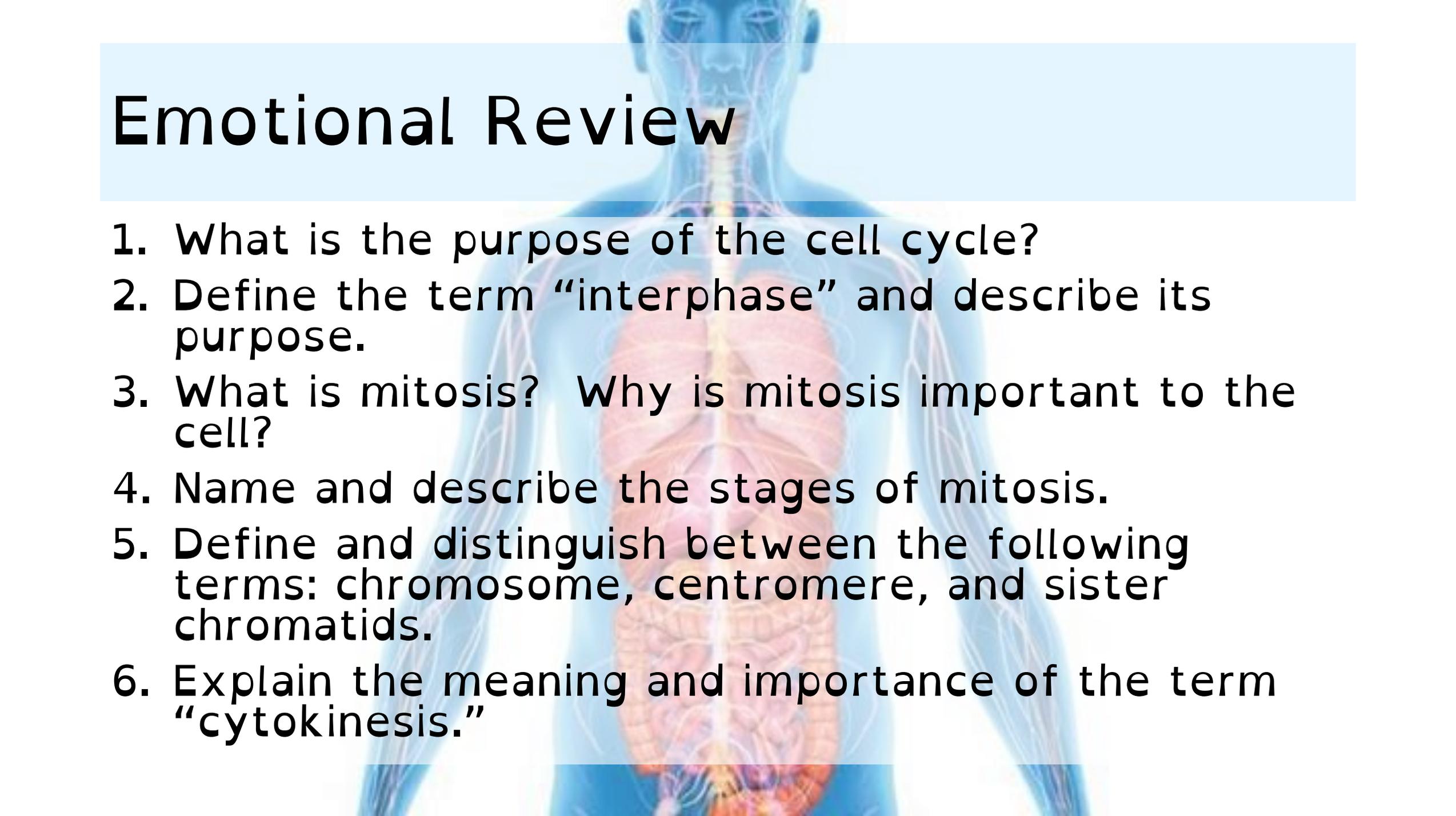
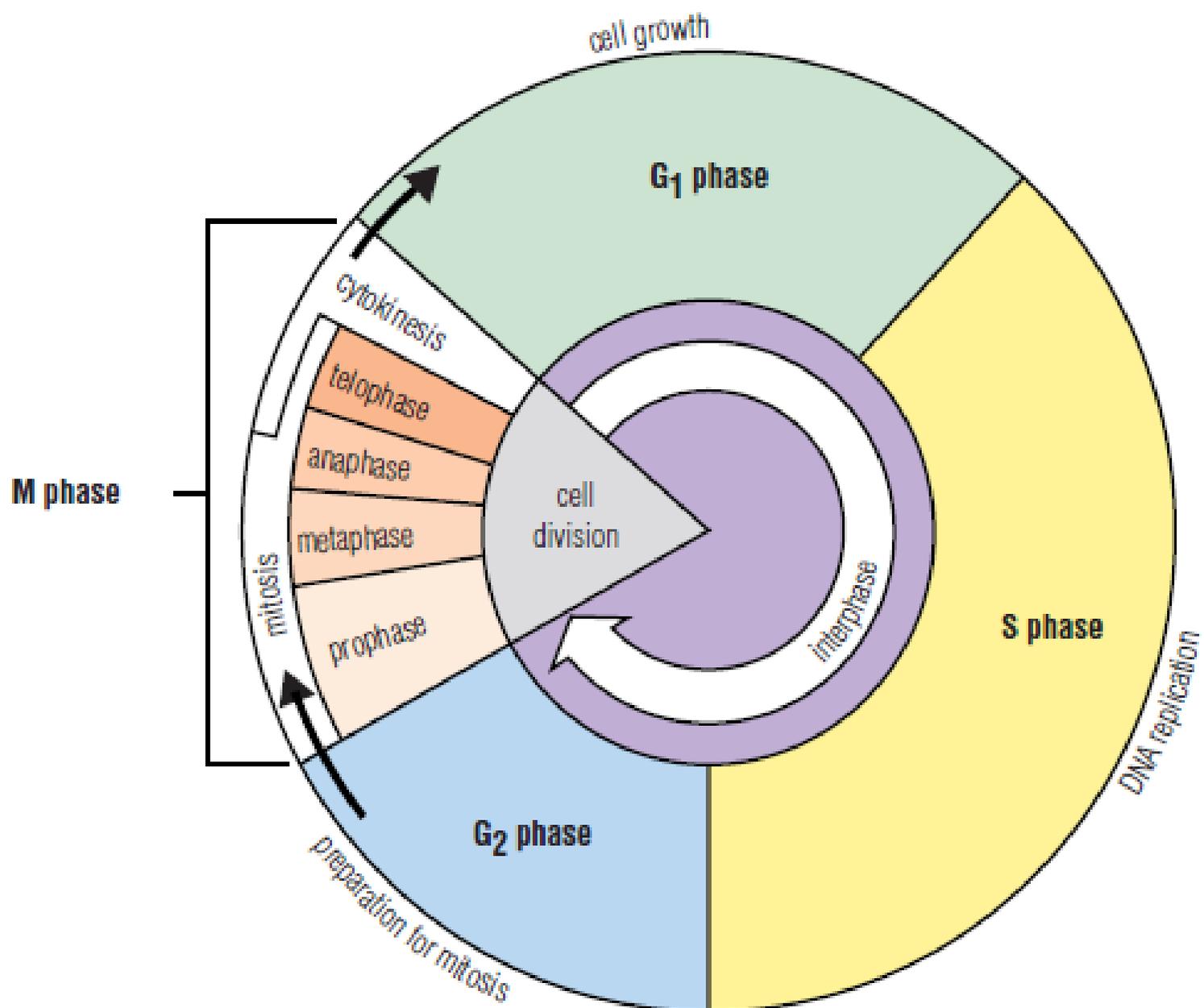
An anatomical illustration of a human torso from the neck to the waist. The skin is rendered in a light blue, semi-transparent style, revealing the underlying internal organs. The lungs are shown in a reddish-pink color, the heart is a darker red, and the digestive system, including the stomach and intestines, is depicted in various shades of red and orange. The skeletal structure, including the spine and ribs, is visible in a light yellowish-brown. A large, semi-transparent light blue rectangular box is centered over the chest and upper abdomen area, containing the text "Cell Cycle and Cancer" in a bold, black, sans-serif font.

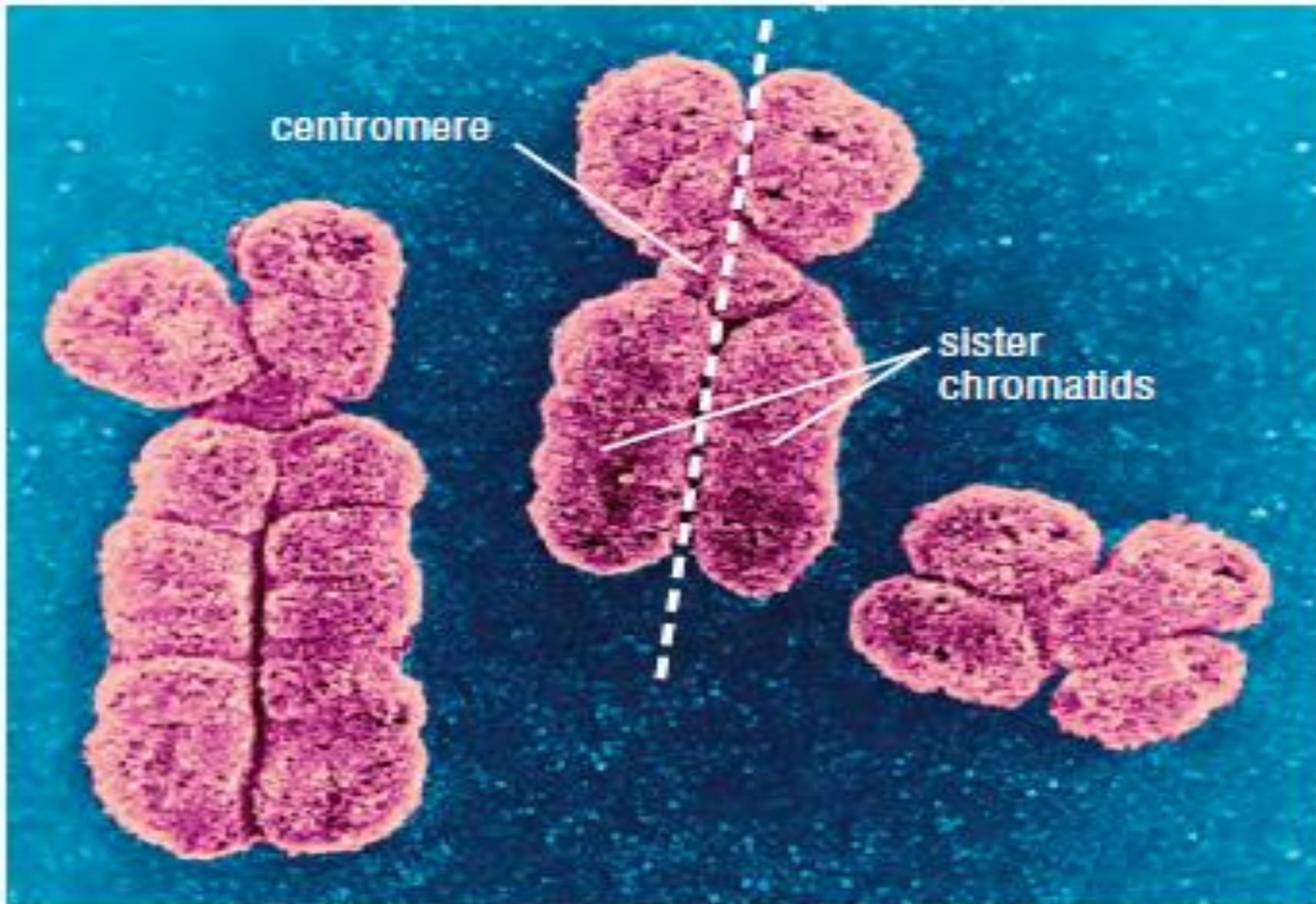
Cell Cycle and Cancer

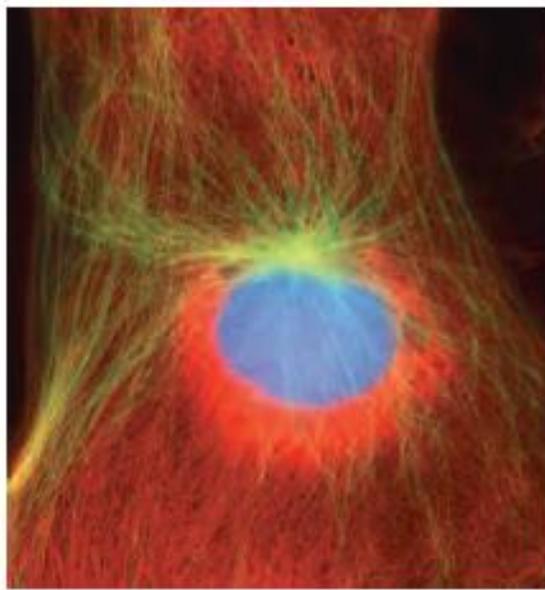
Emotional Review



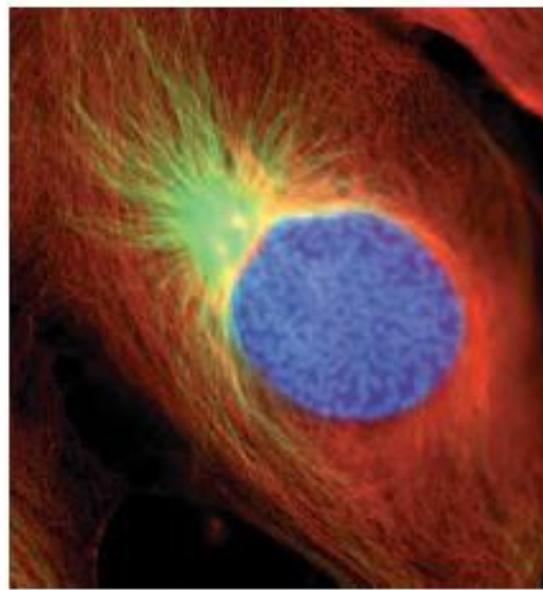
1. What is the purpose of the cell cycle?
2. Define the term “interphase” and describe its purpose.
3. What is mitosis? Why is mitosis important to the cell?
4. Name and describe the stages of mitosis.
5. Define and distinguish between the following terms: chromosome, centromere, and sister chromatids.
6. Explain the meaning and importance of the term “cytokinesis.”



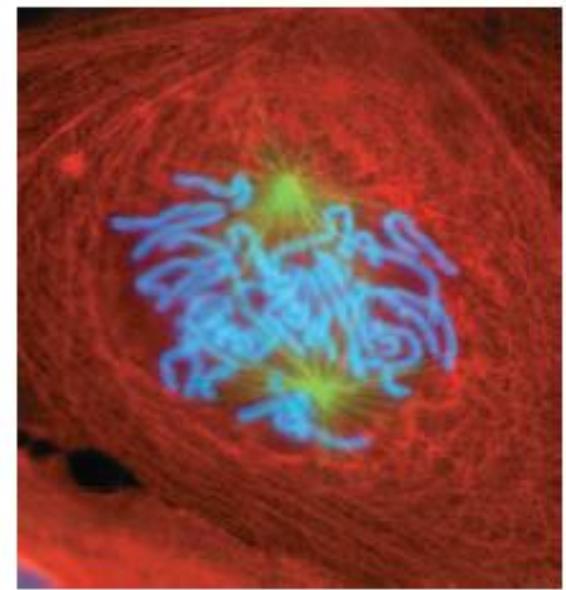




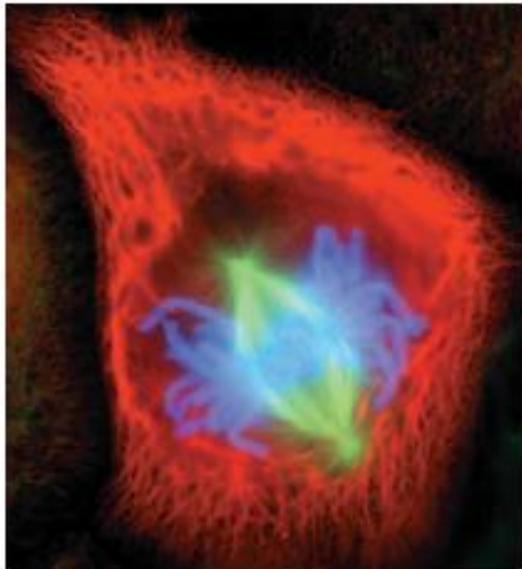
interphase



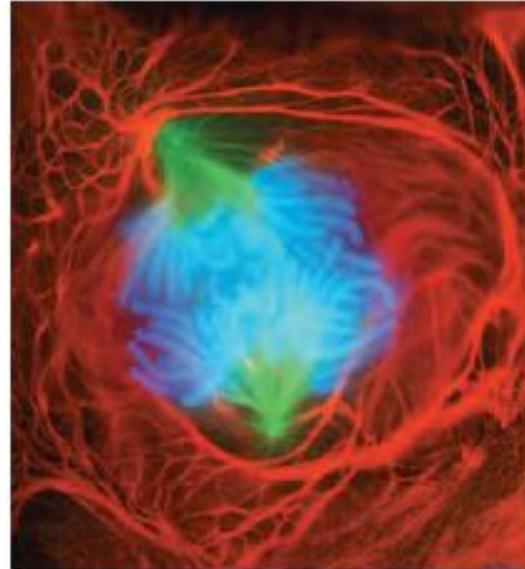
early prophase



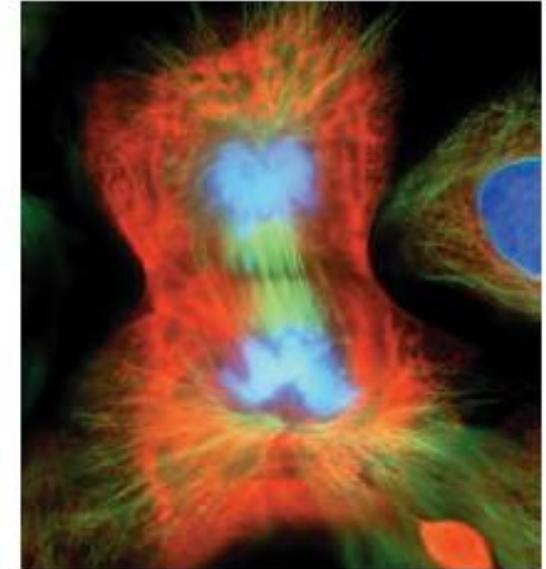
late prophase



metaphase



anaphase

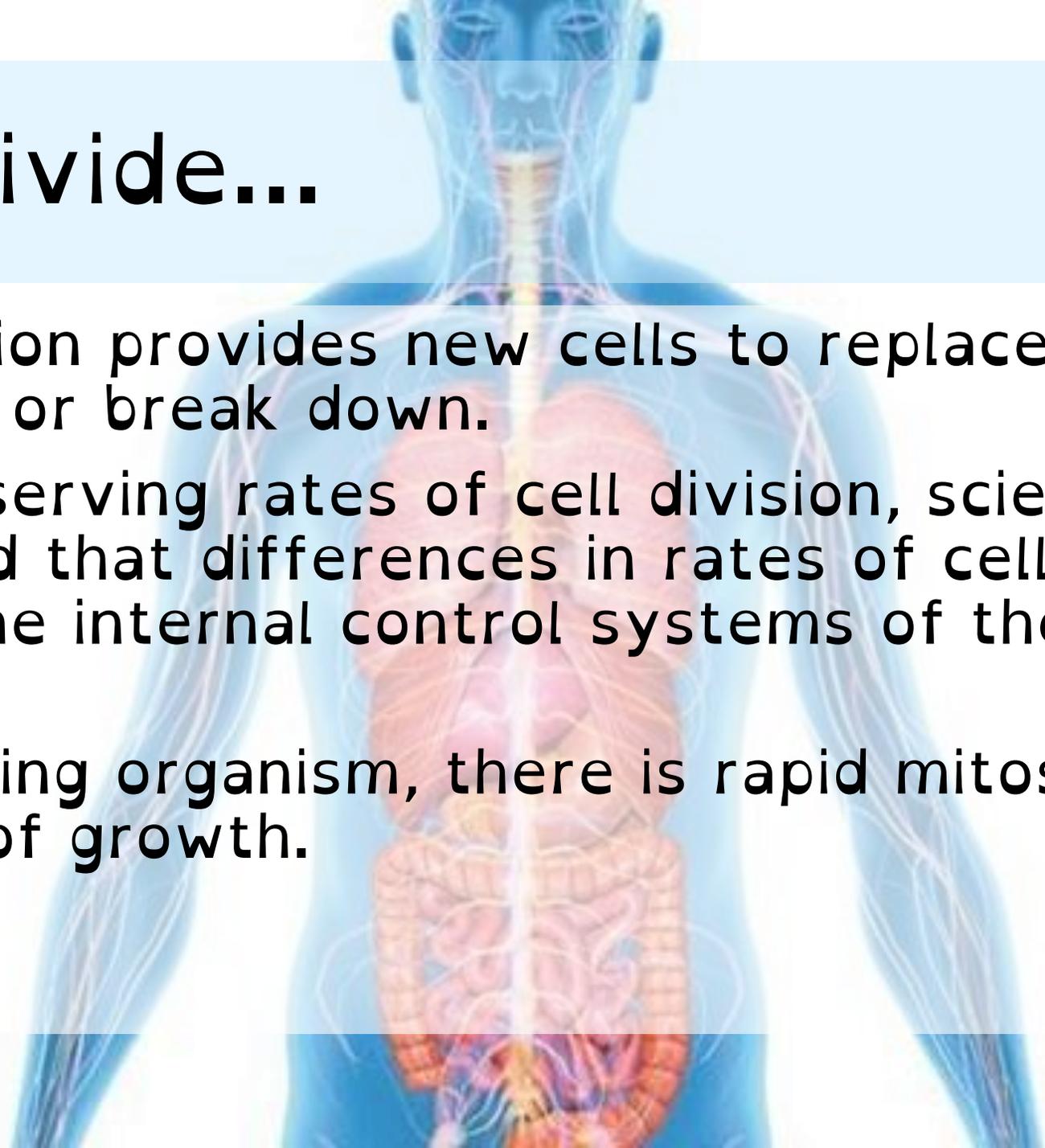


telophase and cytokinesis

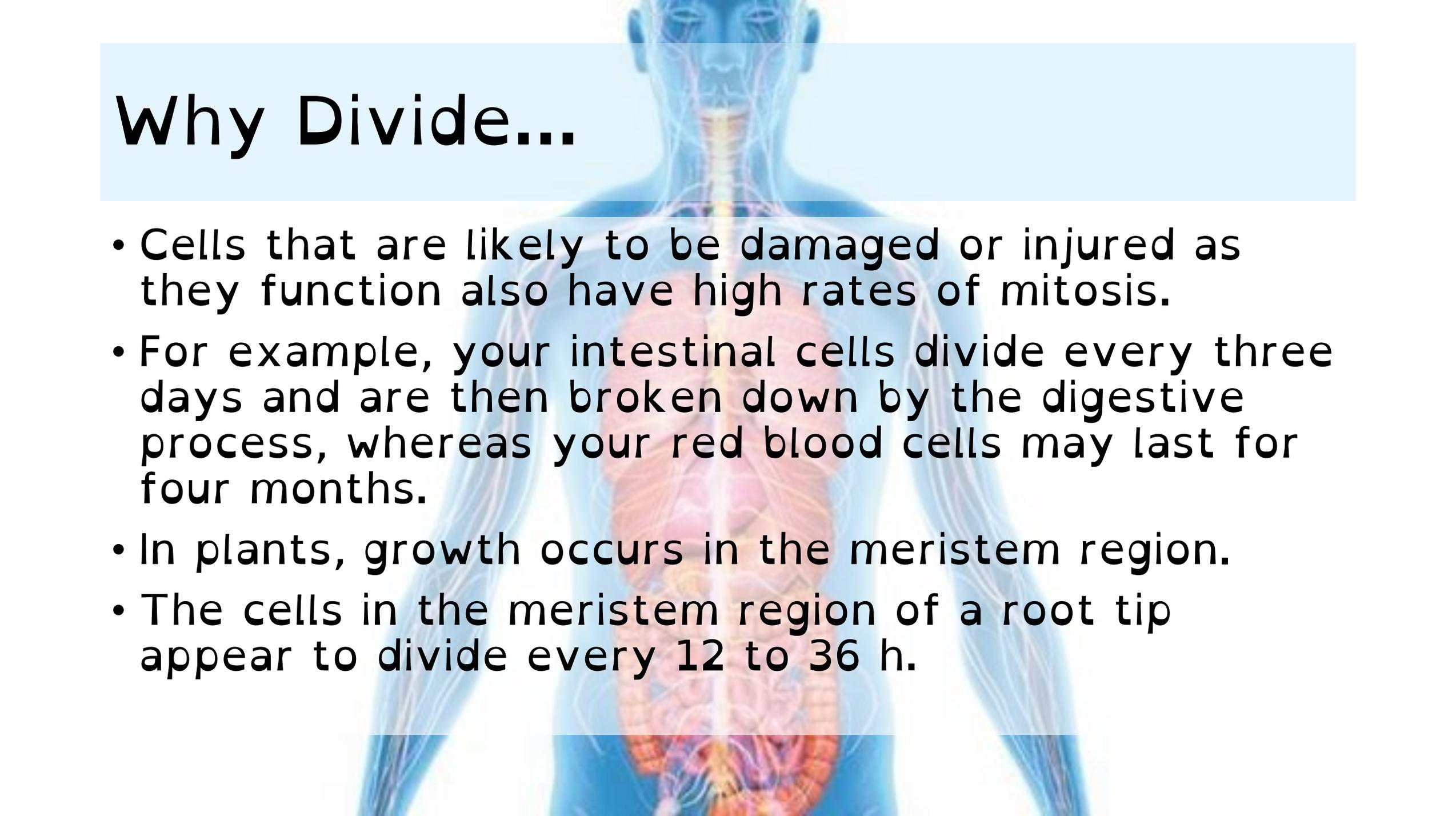
10 μm

Why Divide...

- Cell division provides new cells to replace cells that wear out or break down.
- After observing rates of cell division, scientists concluded that differences in rates of cell division reflect the internal control systems of the cell cycle.
- In a growing organism, there is rapid mitosis of cells in areas of growth.

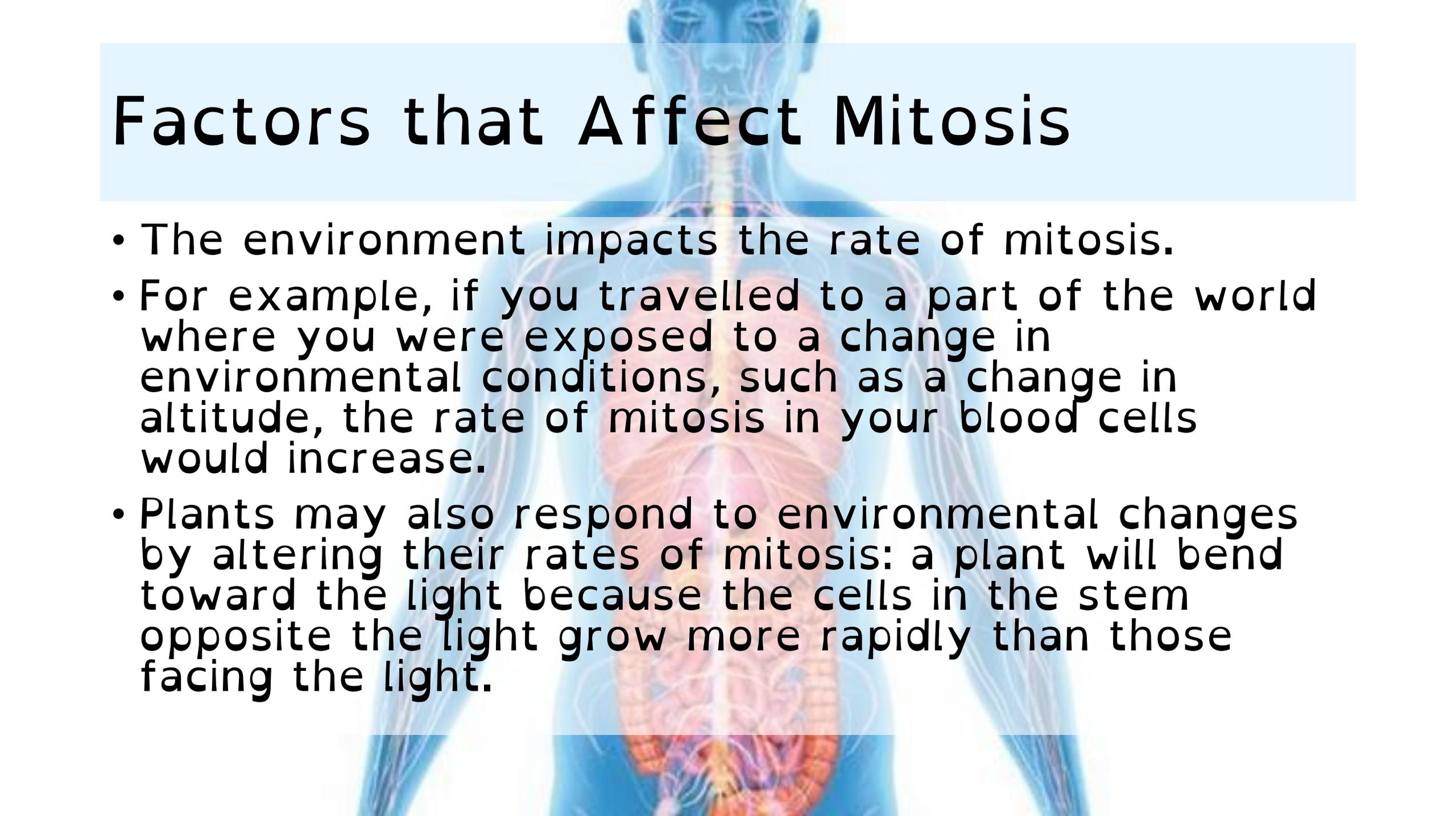


Why Divide...



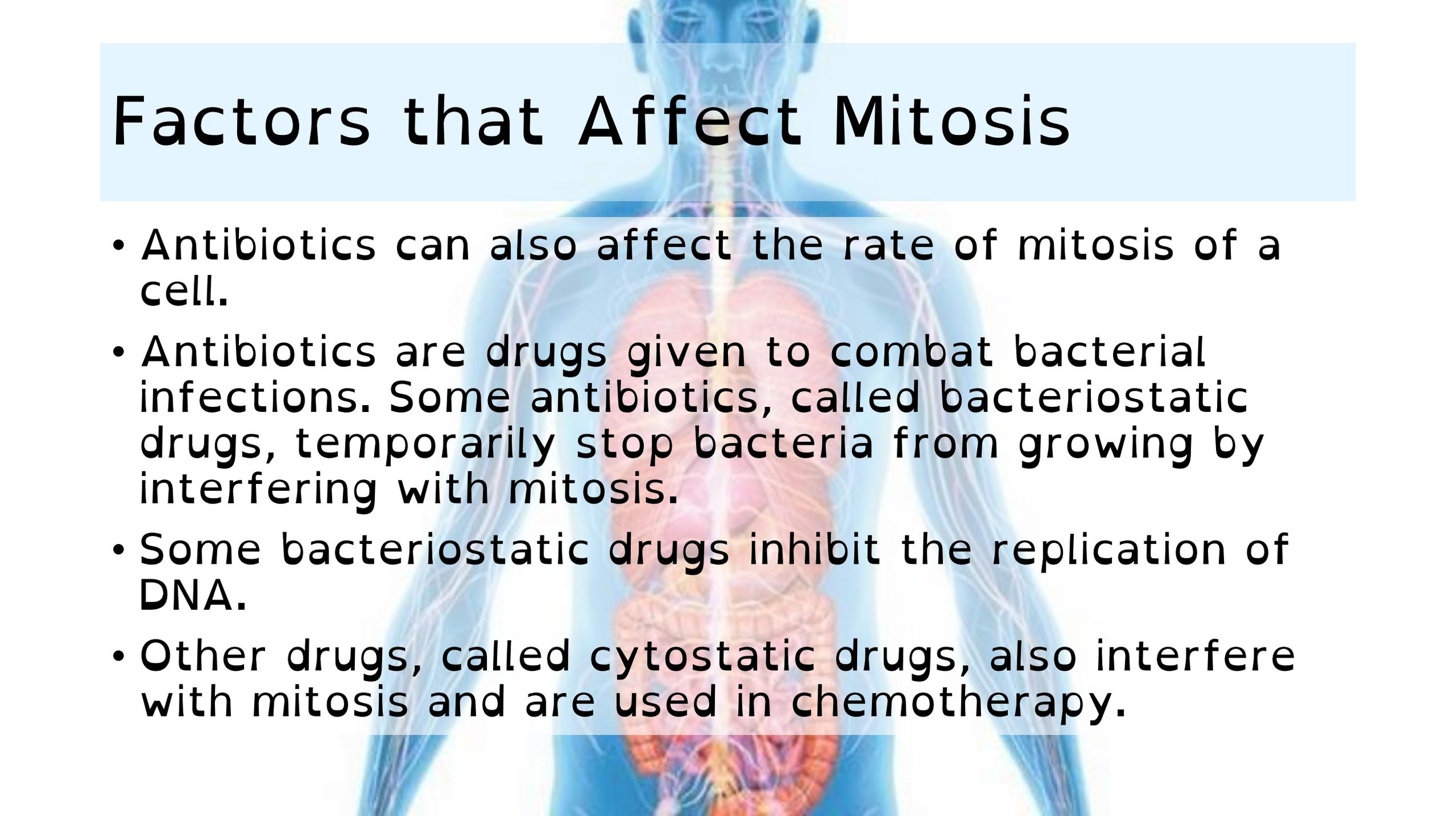
- Cells that are likely to be damaged or injured as they function also have high rates of mitosis.
- For example, your intestinal cells divide every three days and are then broken down by the digestive process, whereas your red blood cells may last for four months.
- In plants, growth occurs in the meristem region.
- The cells in the meristem region of a root tip appear to divide every 12 to 36 h.

Factors that Affect Mitosis



- The environment impacts the rate of mitosis.
- For example, if you travelled to a part of the world where you were exposed to a change in environmental conditions, such as a change in altitude, the rate of mitosis in your blood cells would increase.
- Plants may also respond to environmental changes by altering their rates of mitosis: a plant will bend toward the light because the cells in the stem opposite the light grow more rapidly than those facing the light.

Factors that Affect Mitosis

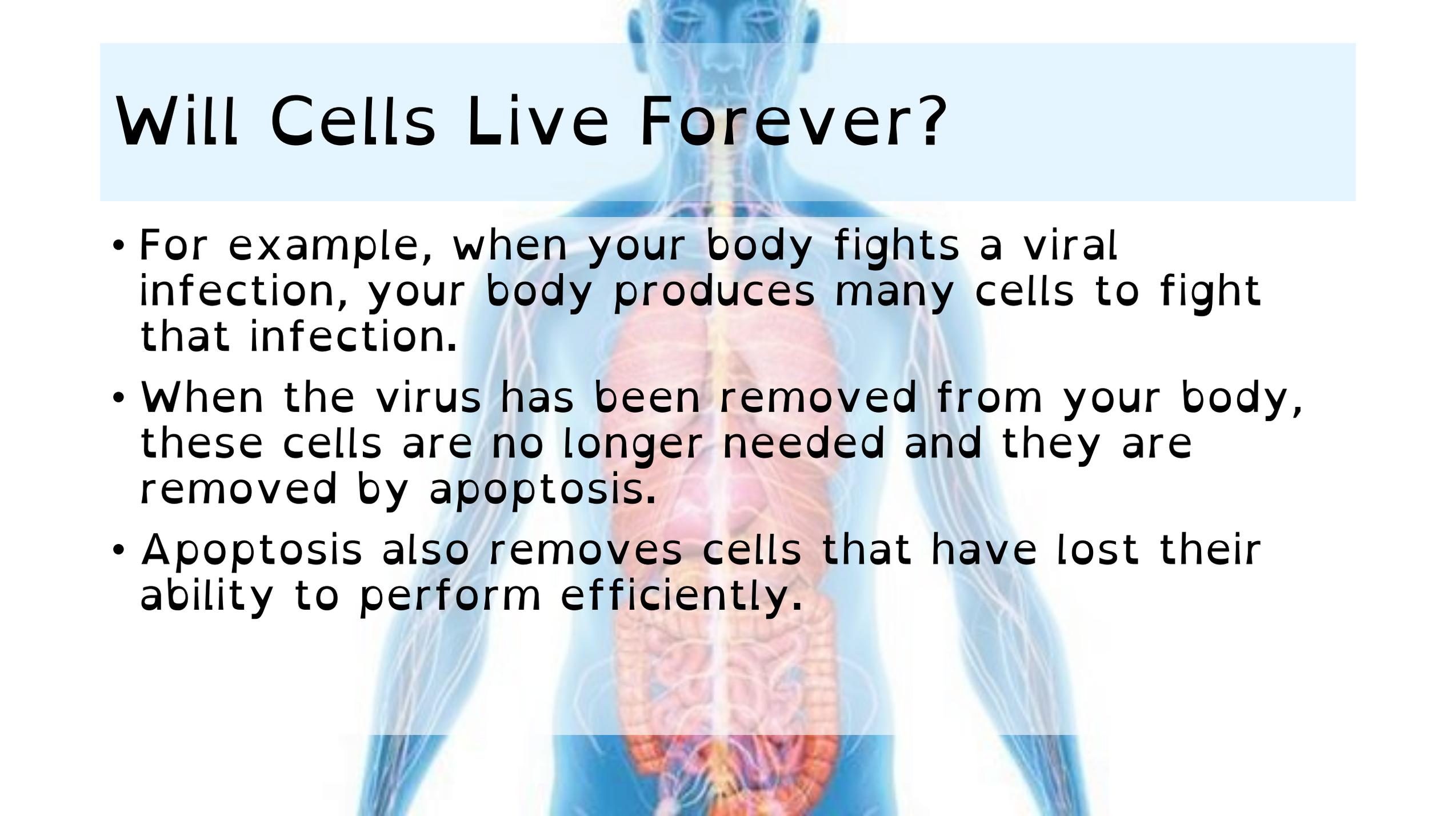


- Antibiotics can also affect the rate of mitosis of a cell.
- Antibiotics are drugs given to combat bacterial infections. Some antibiotics, called bacteriostatic drugs, temporarily stop bacteria from growing by interfering with mitosis.
- Some bacteriostatic drugs inhibit the replication of DNA.
- Other drugs, called cytostatic drugs, also interfere with mitosis and are used in chemotherapy.

Will Cells Live Forever?

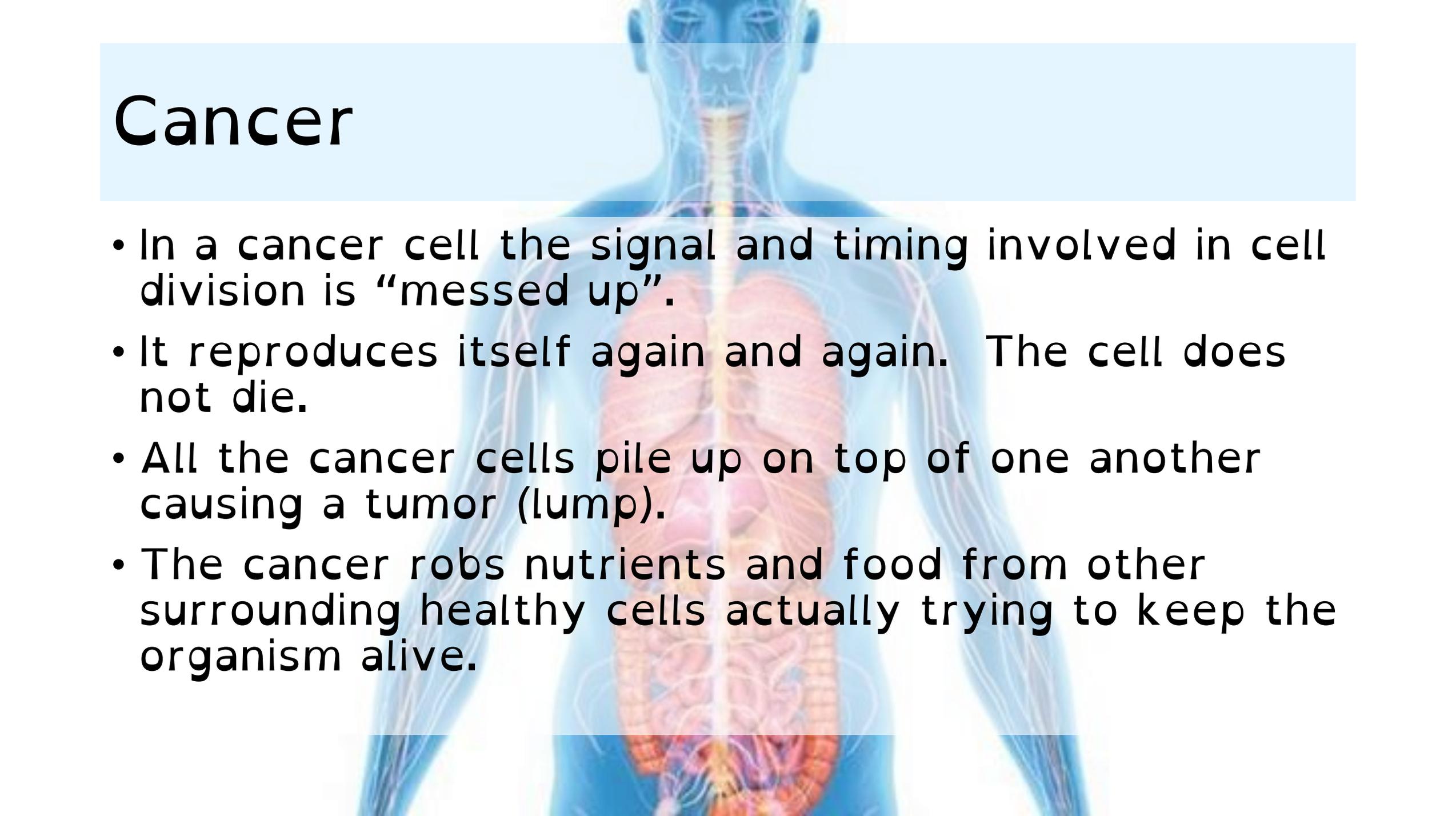
- The cell cycle regulates how long a cell lives.
- Sometimes, cells die because they have suffered injury or damage that cannot be repaired (cells that are exposed to a poison may absorb the poison and die). This type of death is known as **cell necrosis**.
- A cell also dies as a normal part of the functioning of healthy multicellular organisms. This regulated, or controlled, cell death is known as **apoptosis**.
- Apoptosis is the death of cells that are no longer useful.

Will Cells Live Forever?



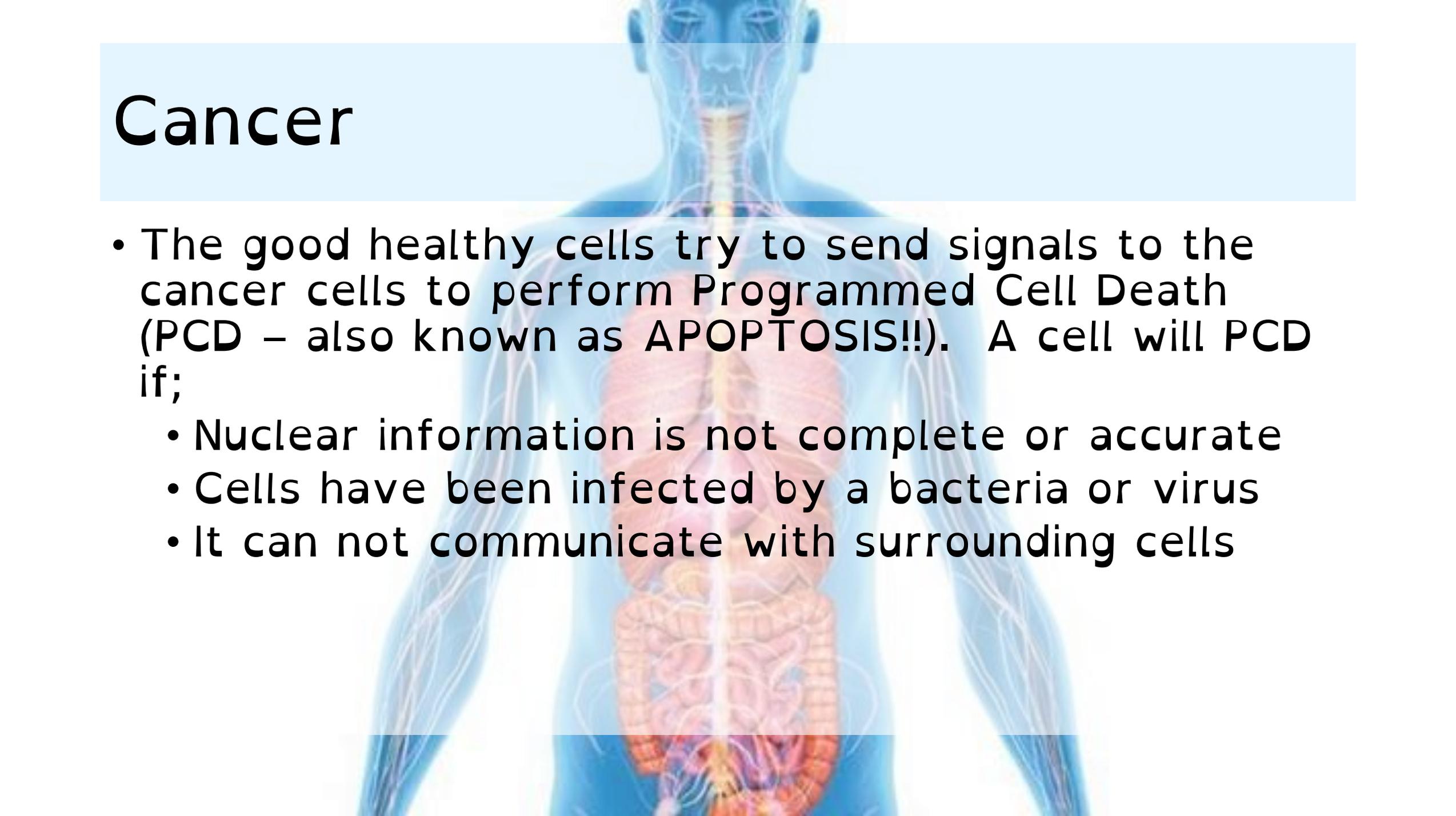
- For example, when your body fights a viral infection, your body produces many cells to fight that infection.
- When the virus has been removed from your body, these cells are no longer needed and they are removed by apoptosis.
- Apoptosis also removes cells that have lost their ability to perform efficiently.

Cancer



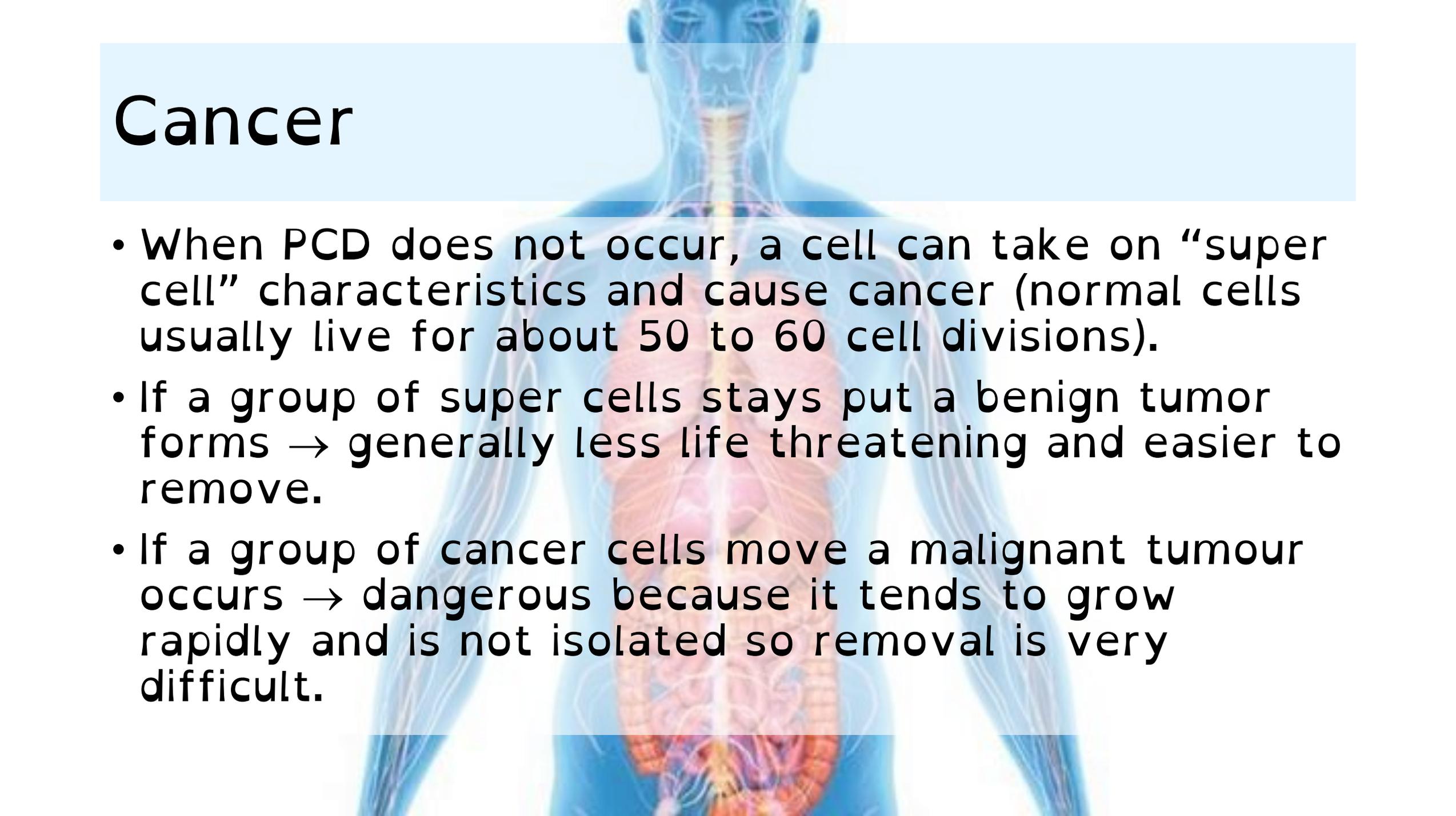
- In a cancer cell the signal and timing involved in cell division is “messed up”.
- It reproduces itself again and again. The cell does not die.
- All the cancer cells pile up on top of one another causing a tumor (lump).
- The cancer robs nutrients and food from other surrounding healthy cells actually trying to keep the organism alive.

Cancer

An anatomical illustration of a human torso, showing the internal organs and the skeletal structure. The illustration is semi-transparent, allowing the underlying organs to be seen. The color palette is primarily blue and red, with the organs rendered in shades of pink, red, and orange. The background is a light blue gradient.

- The good healthy cells try to send signals to the cancer cells to perform Programmed Cell Death (PCD – also known as APOPTOSIS!!). A cell will PCD if;
 - Nuclear information is not complete or accurate
 - Cells have been infected by a bacteria or virus
 - It can not communicate with surrounding cells

Cancer



- When PCD does not occur, a cell can take on “super cell” characteristics and cause cancer (normal cells usually live for about 50 to 60 cell divisions).
- If a group of super cells stays put a benign tumor forms → generally less life threatening and easier to remove.
- If a group of cancer cells move a malignant tumour occurs → dangerous because it tends to grow rapidly and is not isolated so removal is very difficult.

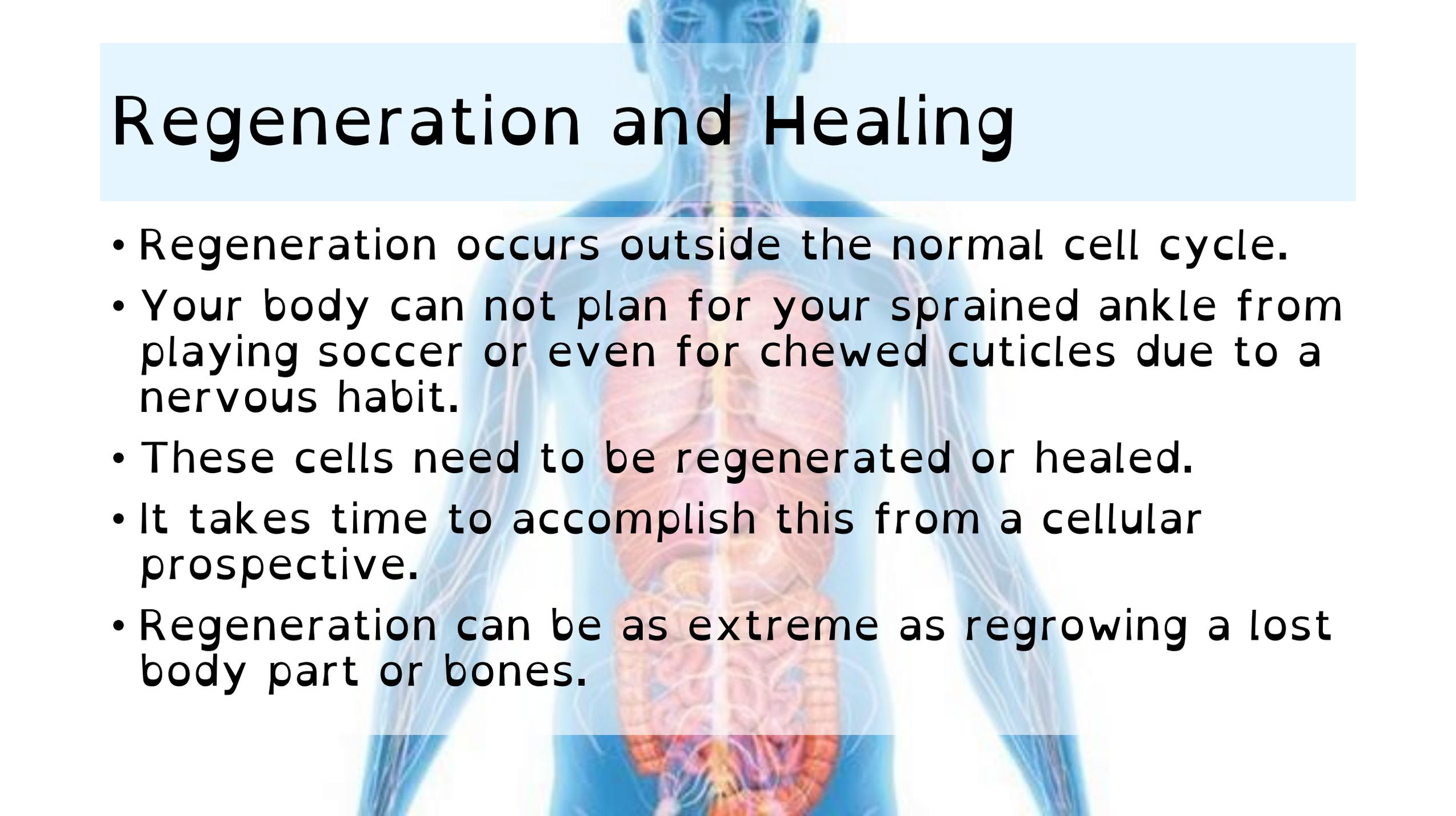


Table 1.4 Comparing Normal Cells with Cancer Cells

Normal Cells	Cancer Cells
<ul style="list-style-type: none">• make exact copies of themselves through mitosis	<ul style="list-style-type: none">• make exact copies of themselves through mitosis
<ul style="list-style-type: none">• reproduce for about 50–60 cell divisions	<ul style="list-style-type: none">• do not stop reproducing
<ul style="list-style-type: none">• stick together to form masses of cells as appropriate	<ul style="list-style-type: none">• do not stick to other cells• behave independently
<ul style="list-style-type: none">• self-destruct when too old or too damaged	<ul style="list-style-type: none">• may move to another location of the body



Regeneration and Healing



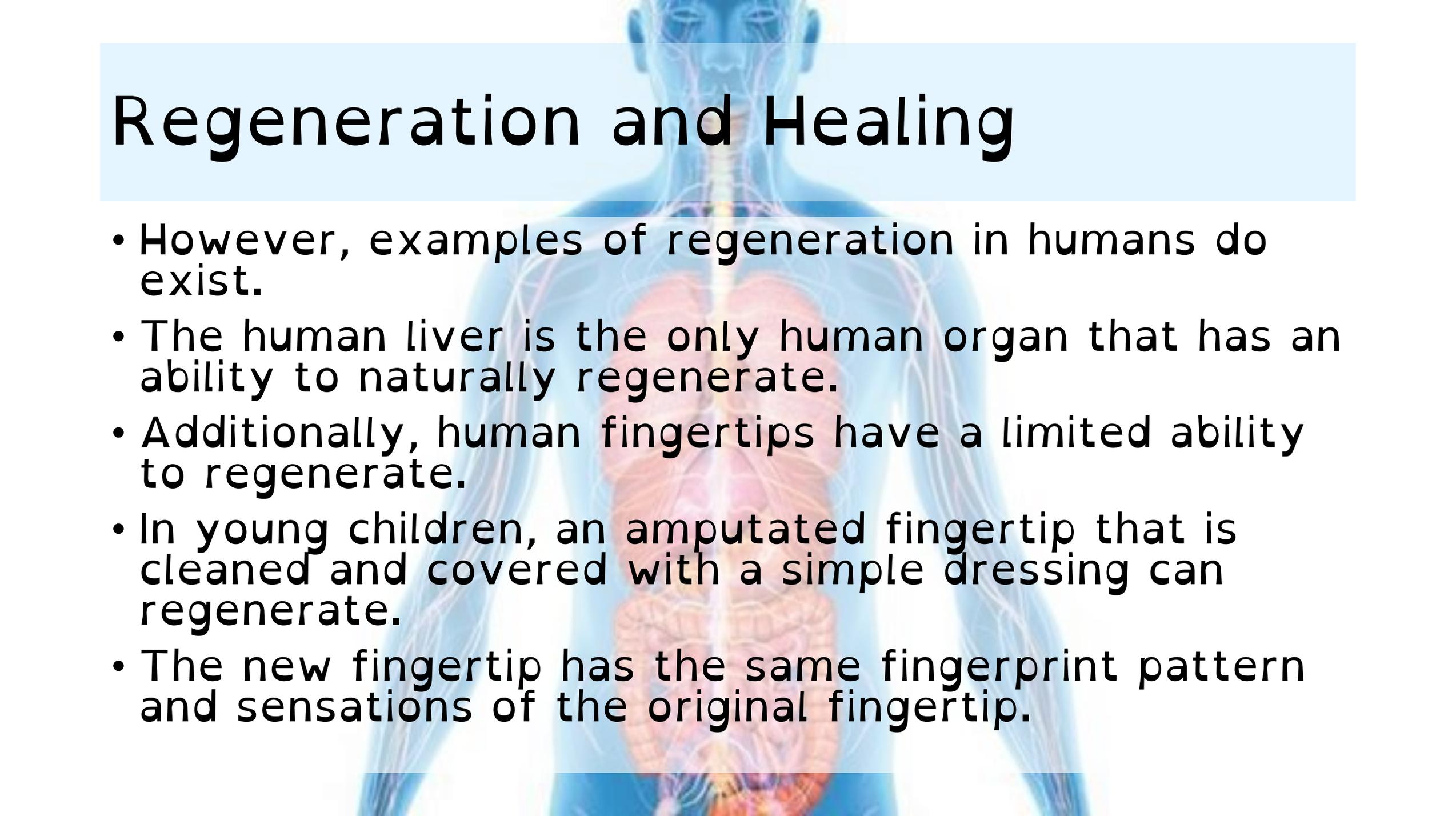
- Regeneration occurs outside the normal cell cycle.
- Your body can not plan for your sprained ankle from playing soccer or even for chewed cuticles due to a nervous habit.
- These cells need to be regenerated or healed.
- It takes time to accomplish this from a cellular prospective.
- Regeneration can be as extreme as regrowing a lost body part or bones.

Regeneration and Healing

- Although regeneration has been studied in organisms such as the salamander, it is not often thought to occur in humans.

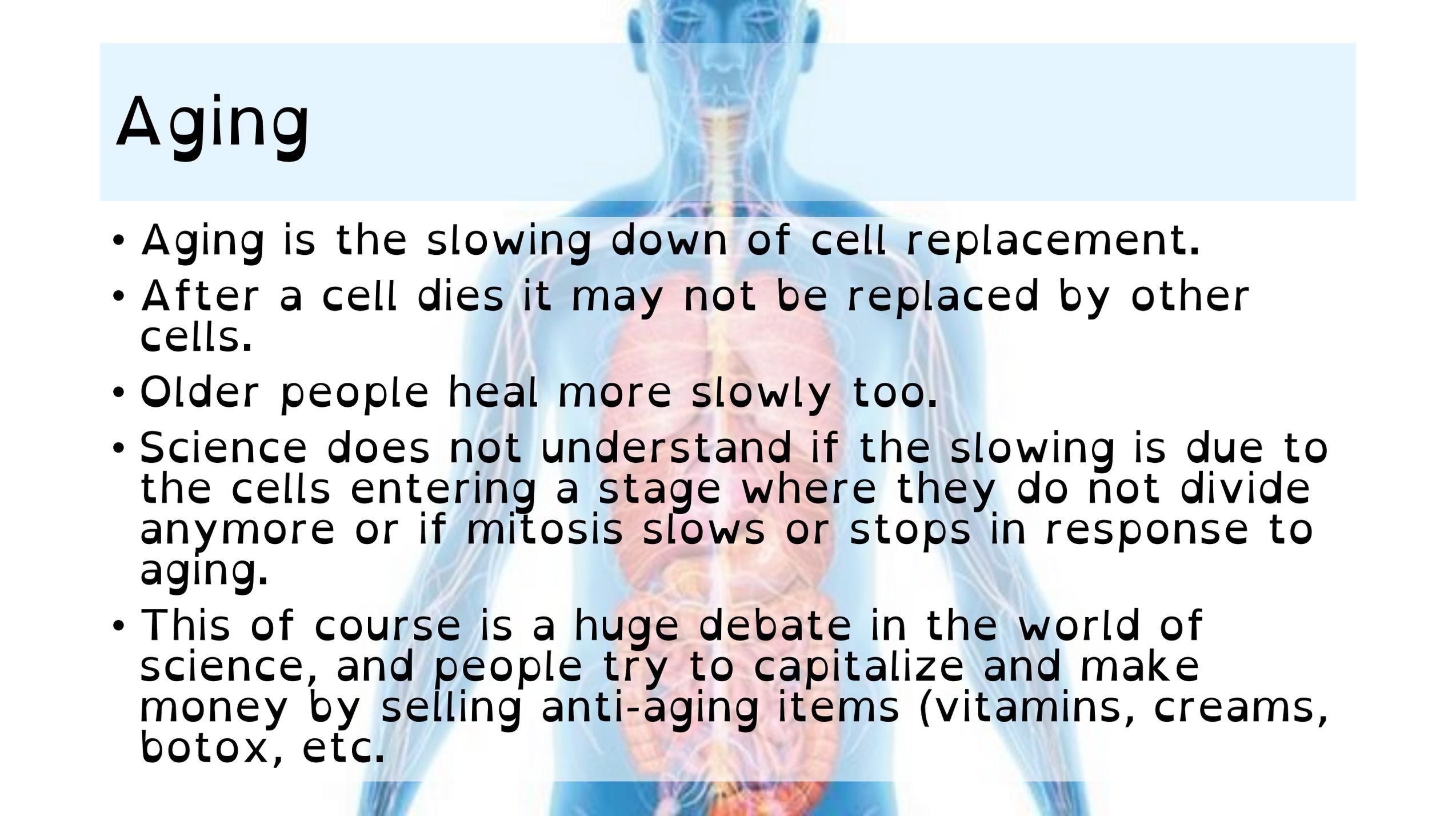


Regeneration and Healing

An anatomical illustration of a human torso, showing internal organs like the liver, lungs, and stomach, along with a network of nerves and blood vessels. The illustration is semi-transparent, allowing the text to be overlaid on it.

- However, examples of regeneration in humans do exist.
- The human liver is the only human organ that has an ability to naturally regenerate.
- Additionally, human fingertips have a limited ability to regenerate.
- In young children, an amputated fingertip that is cleaned and covered with a simple dressing can regenerate.
- The new fingertip has the same fingerprint pattern and sensations of the original fingertip.

Aging



- Aging is the slowing down of cell replacement.
- After a cell dies it may not be replaced by other cells.
- Older people heal more slowly too.
- Science does not understand if the slowing is due to the cells entering a stage where they do not divide anymore or if mitosis slows or stops in response to aging.
- This of course is a huge debate in the world of science, and people try to capitalize and make money by selling anti-aging items (vitamins, creams, botox, etc).

Task: Historical Thinking on Cancer

- Download the worksheet and watch the videos on cancer in the news as well as the animations. Submit your worksheet to Teams.
- Your reflection should be organized and should cover the following items... Submit to Flipgrid in Teams!
- The most interesting thing I learned about cancer today was.... because... (give at least 2 reasons why it was interesting).
- Cancer touches all of our lives in some way, how have you or will you try to lessen the chances of cancer impacting your life?