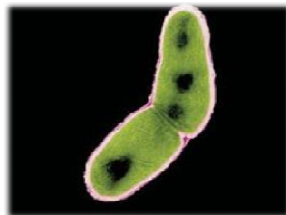


SNC2D BIOLOGY

TISSUES, ORGANS & SYSTEMS OF ...
The Importance of Cell Division
(P.26-27)

The Importance of Cell Division

You began life as a single fertilized cell. Now your body is made up of trillions of cells. How does a single cell become a full-grown multicellular plant or animal? Cell division is what allows organisms to grow, repair damage, and reproduce.



March 17, 2013

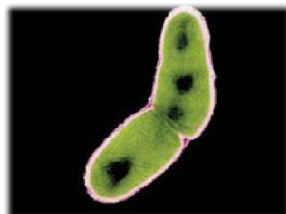
2DBIOL - The Importance of Cell Division

1

The Importance of Cell Division

NOTE!

*The bacteria shown to the right (18000 X) produces new individuals simply by dividing in two. This is known as **mitosis**. Under ideal conditions, bacteria can double their numbers every 20 minutes.*



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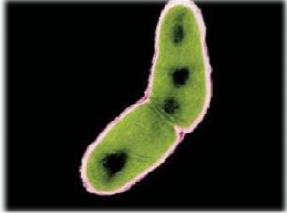
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2

The Importance of Cell Division

FUNCTIONS OF CELL DIVISION

- ① growth
- ② healing & tissue repair
- ③ reproduction



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The Importance of Cell Division

NOTE!
The rate and timing of cell division are very precisely regulated. Chemical signals pass between neighbouring cells to help keep the rate of cell division equal to the rate of cell death. Sometimes, a cell does not respond to the chemical signals or has damaged DNA. This can cause it to follow its own pattern of cell division.

CELL DIVISION

- ❖ in an adult the rate of cell division = rate of cell death
- ❖ regulated by chemical signals between cells

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Cell Division for Growth

*An organism that is made up of more than one cell is called a **multicellular organism**. Multicellular organisms grow by increasing their number of cells through cell division.*

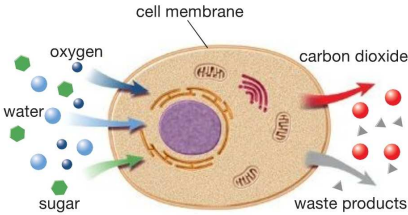
MULTICELLULAR ORGANISM

- ❖ organism that is made up of more than one cell
- ❖ grow by increasing their number of cells

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Limits on Cell Size

As a multicellular organism grows, the number of cells increases. Why does the original single cell not simply grow larger? This has to do with how cells obtain nutrients and get rid of wastes. Nutrients and wastes move through the cell in a process called **diffusion**.

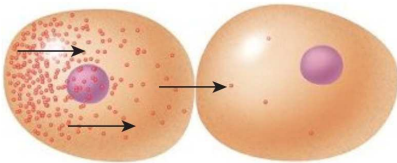


The diagram shows a cell with a cell membrane. On the left, arrows point into the cell for oxygen (blue spheres), water (green spheres), and sugar (green spheres). On the right, arrows point out of the cell for carbon dioxide (red spheres) and waste products (grey spheres).

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Diffusion

In diffusion, substances move across the cell membrane from an area of high concentration (i.e. more particles) to an area of low concentration (i.e. fewer particles).



The diagram shows two cells. The left cell is labeled 'high concentration' and contains many red particles. The right cell is labeled 'low concentration' and contains fewer red particles. Arrows point from the high concentration cell towards the low concentration cell, indicating the direction of diffusion.

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Diffusion

NOTE!
Diffusion is the process that also spreads the smell of food throughout your house!



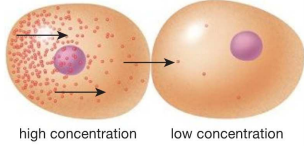
The image shows a bowl of popcorn on the left and a cup of coffee on the right. The coffee cup is surrounded by coffee beans, and the coffee is spreading its aroma.

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Diffusion

DIFFUSION

- ❖ dissolved substances move from an area where there are more particles (high concentration) to an area where there are fewer particles (low concentration)
- ❖ method that cells use to:
 - obtain oxygen, water, and nutrients
 - get rid of carbon dioxide and wastes

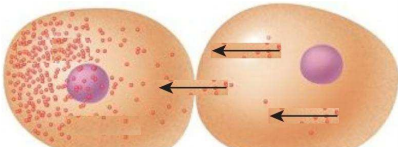


high concentration low concentration

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Osmosis

*A similar process moves water through a cell. Water enters and leaves through the cell membrane by a process called **osmosis**. In osmosis, water moves across a cell membrane toward an area where dissolved substances are at a higher concentration.*



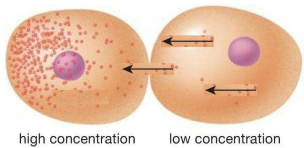
high concentration low concentration

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Osmosis

OSMOSIS

- ❖ movement of water from an area where there are fewer particles to an area where there are more particles
- ❖ the reverse of diffusion



high concentration low concentration

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Diffusion & Osmosis

NOTE!
 It is important that cells contain lots of water since many of the chemicals that our cells need to function need to be dissolved in water so they can be used.

DIFFUSION

high concentration low concentration

OSMOSIS

high concentration low concentration

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Limits on Cell Size

If a single cell were too large, diffusion and osmosis would not work efficiently. Nutrients and water would not reach all the organelles quickly. Wastes might poison the cell if they were not transported out of the cell fast enough. In smaller cells, diffusion and osmosis are more efficient.

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Limits on Cell Size

LIMITS ON CELL SIZE

- ❖ in smaller cells, diffusion and osmosis are more efficient
- ❖ if a single cell were too large:
 - diffusion and osmosis would not work efficiently
 - nutrients and water would not reach all the organelles quickly
 - wastes would poison the cell if they were not transported out of the cell fast enough

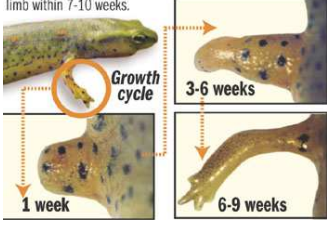
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Cell Division for Repair & Replacement

Cell division allows organisms to repair injuries. A newt can regenerate (regrow) a limb within 7-10 weeks. More complex animals, such as humans, cannot regenerate whole parts such as fingers or toes. However, they can repair themselves by replacing old or damaged cells.

Regenerating a limb

A newt can regenerate an entire limb within 7-10 weeks.

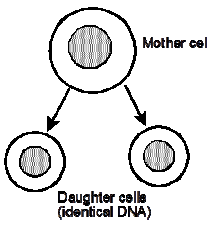


The diagram illustrates the 'Growth cycle' of a newt's limb regeneration. It shows three stages: at 1 week, a small growth starts at the site of amputation; between 3-6 weeks, the limb grows significantly larger; and by 6-9 weeks, a fully formed limb is regenerated.

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Cell Division for Reproduction

All organisms use cell division to reproduce. When a single-celled organism divides, it produces two new organisms that have the exact same DNA as the original cell. This kind of reproduction is called asexual reproduction. In **asexual reproduction**, only one parent is involved. Some multicellular organisms such as aphids, hydras and strawberry plants can also reproduce asexually.

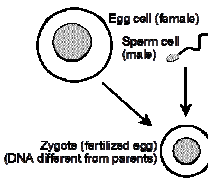


The diagram shows a single 'Mother cell' at the top, which then divides into two 'Daughter cells (identical DNA)' at the bottom.

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Cell Division for Reproduction

However, many multicellular organisms require two parents to reproduce. This form of reproduction, called **sexual reproduction**, takes place when a sex cell from one parent joins a sex cell from another parent. Animals' sex cells are called sperm and egg cells. The offspring produced by sexual reproduction have DNA from both parents.



The diagram illustrates the process of sexual reproduction. An 'Egg cell (female)' and a 'Sperm cell (male)' are shown combining to form a 'Zygote (fertilized egg) (DNA different from parents)'.

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Cell Division for Reproduction

ASEXUAL REPRODUCTION <ul style="list-style-type: none">❖ only one parent❖ offspring are genetically identical to the parent❖ no genetic advantage	SEXUAL REPRODUCTION <ul style="list-style-type: none">❖ requires two parents (sperm & egg)❖ offspring has DNA from both parents❖ evolution?
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Mother cell

Daughter cells (identical DNA)

Egg cell (female)

Sperm cell (male)

Zygote (fertilized egg) (DNA different from parents)

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Check Your Learning

1. List three reasons for cell division.

- ① growth
- ② healing & tissue repair
- ③ reproduction


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Check Your Learning

2. What is the role of cell division in helping the body stay healthy?

healing & tissue repair


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 **Check Your Learning**

3. When an organism grows, why do its cells divide instead of just getting larger? Explain.

in smaller cells, diffusion and osmosis are more efficient – if a cell were too large then nutrients and water would not reach all the organelles quickly and wastes would poison the cell

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 **Check Your Learning**

4. With the aid of a diagram(s) explain the difference between diffusion and osmosis?

diffusion: dissolved substances move from an area with a high concentration to an area with a low concentration

osmosis: water moves from an area with a low concentration of substances to an area with a high concentration

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 **Check Your Learning**

5. What is the difference between asexual reproduction and sexual reproduction?


asexual: - only one parent is involved
- offspring is genetically identical to the parent
- offspring has no genetic advantage over parent

sexual: - two parents (egg & sperm) are involved
- offspring has different DNA compared to parent
- leads to evolution (offspring weaker or stronger?)

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 ✓ Check Your Learning

WIKI (BIOLOGY)

 2DBIOL - QUIZ#1 (Microscopes & Cells)

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