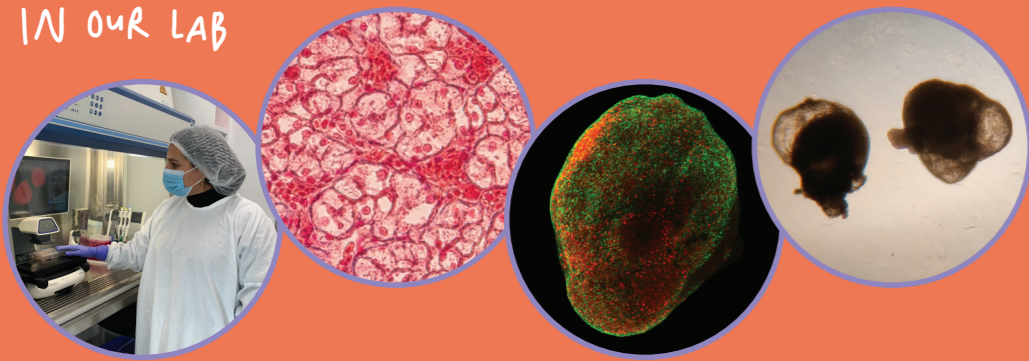
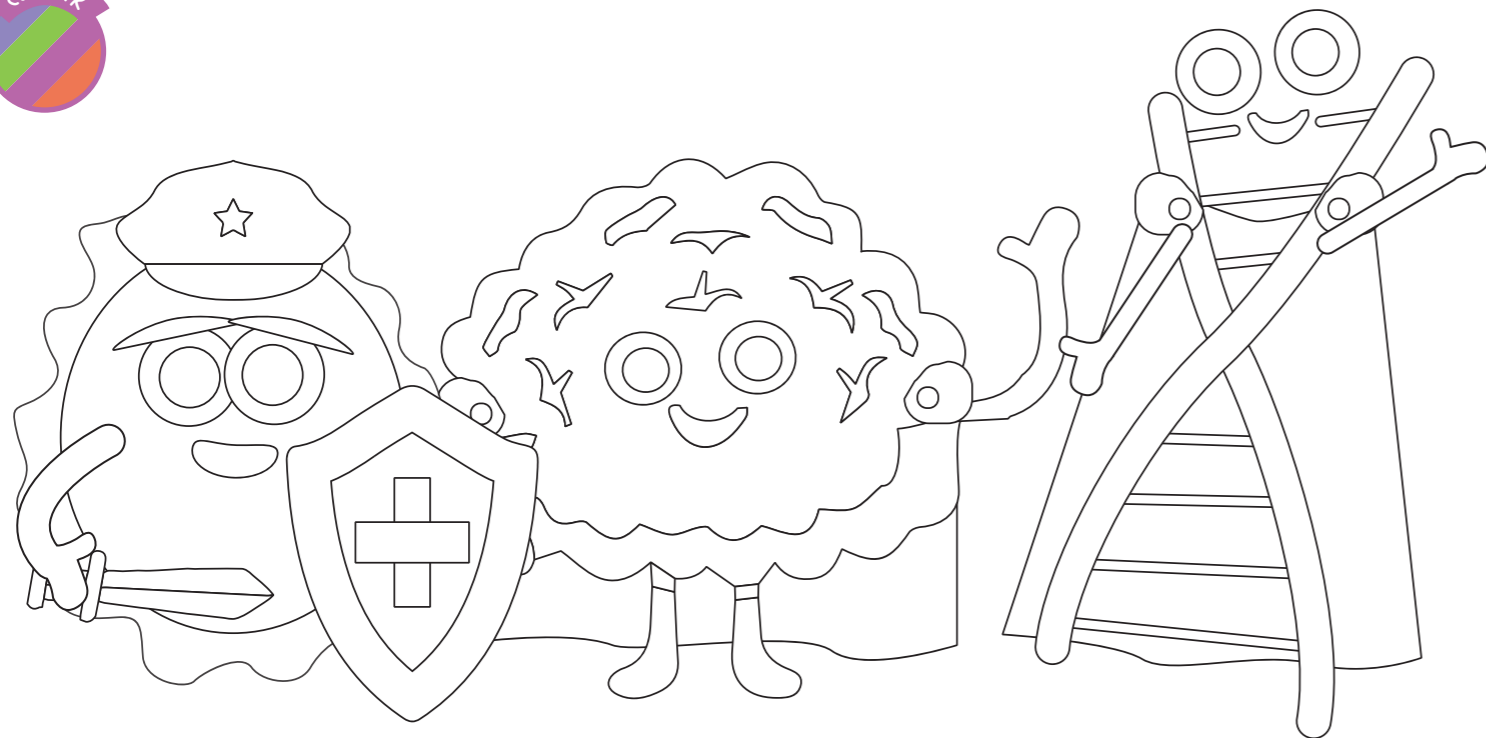


IN OUR LAB



Scientists at Children's Medical Research Institute and elsewhere have learned how that one starting cell becomes all the different cells in a foetus, how a 'stem cell' or starter cell can change into a brain cell or a heart cell. These are called 'cell fate' studies. They can predict what a cell will become and even change that fate.



THE AMAZING WAY OUR BODY AND CELLS WORK!

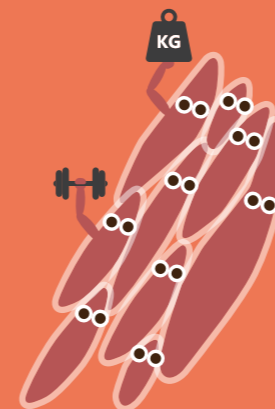
Our bodies are made of 2 trillion tiny building blocks called cells. Just like toy building blocks, cells come in many shapes and sizes depending on what they need to build. Some come together to make our bones, muscles, heart, lungs, eyes, or skin. Each cell does its part to make our body work.



Fibroblast Cells



Stem Cells



Muscle cells



Epithelia (Skin) Cells



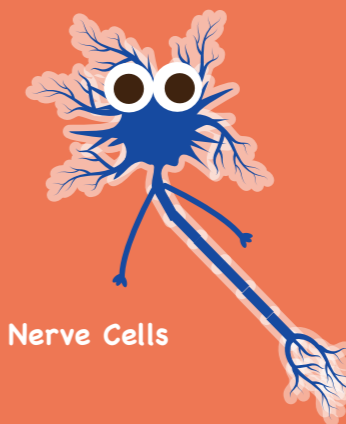
Red blood cells



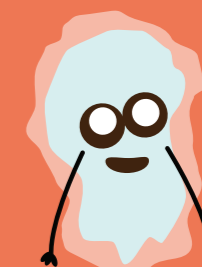
Immune cells



Cardiac muscle cells



Nerve Cells



Osteoblast Cells

Q4/2



Q1: Cells are

- a. A type of virus
- b. The building blocks of our bodies
- c. Another name for mobile phones
- d. Found in outer space

Q2: How many cells in the human body?

- a. 100
- b. Millions
- c. Billions
- d. Trillions

Q3: How does one cell become two?

- a. Specialisation
- b. Cell division
- c. Stem Cells
- d. Addition

Q4: What is the process called when stem cells specialise into heart, brain and other types of cells?

- a. Blastocyst
- b. Differentiation
- c. Foetus
- d. School



HAVE YOU BEEN PAYING ATTENTION?

Q5: Stem cells...?

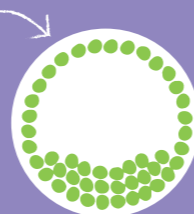
- a. Become any type of cell
- b. Are found in the embryo
- c. Can be made from adult skin cells
- d. All of the above

Q6: Birth defects are caused by?

- a. Normal development
- b. Genetic changes or environmental factors
- c. Stem cells
- d. Zygote

Q7: This image shows:

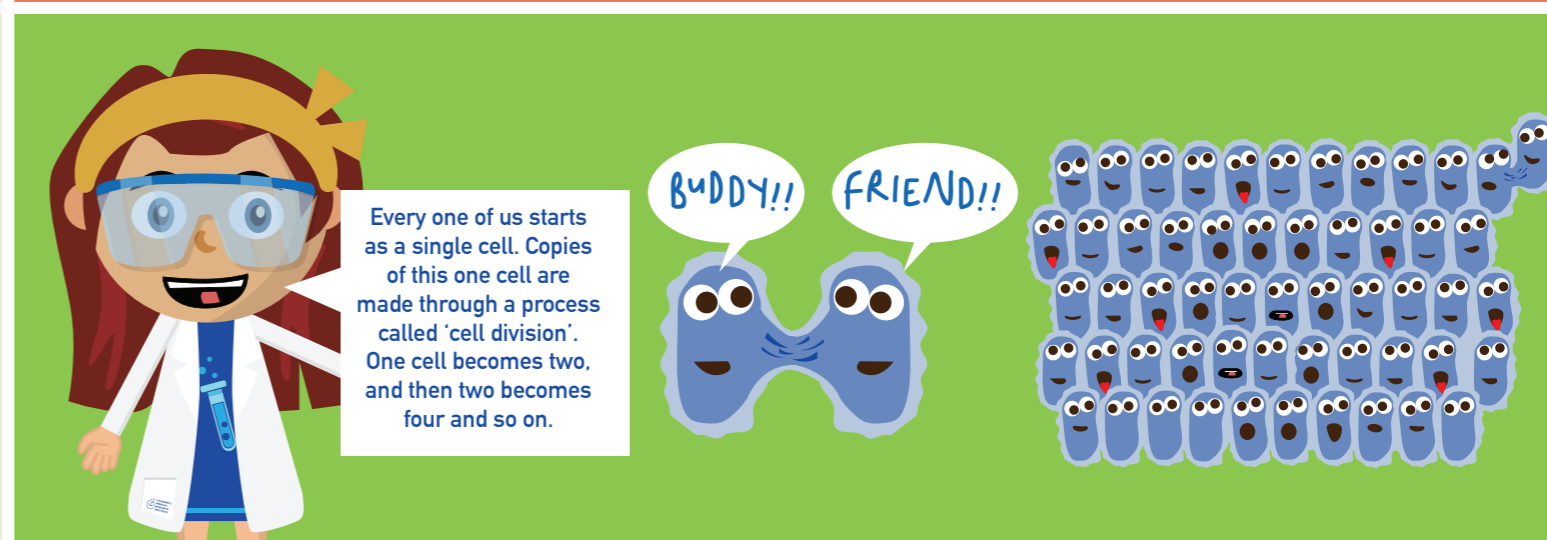
- a. a blastocyst
- b. a ball of about 100 cells
- c. an embryo 5-6 days old
- d. all of the above



FLIP FOR ANSWERS

NO PEEKING!

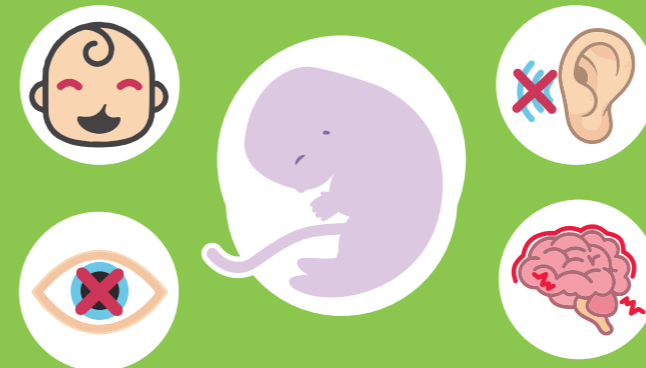
Q1: B-The building blocks of our bodies Q2: D-Trillions Q3: B-Cell division Q4: B-Differentiation Q5: D-All of the above Q6: B-Genetic changes or environmental factors Q7: D-All of the above



After five days cells begin to change, starting to 'differentiate' or specialise to become cells that will form the head and brain or the heart and other organs. Then over several weeks, the cells divide about 40 times and continue to specialise, and a baby is formed.

BIRTH DEFECTS

The developing embryo can be impacted by harmful genetic changes or toxic chemicals and other dangerous environmental factors, leading to birth defects, such as blindness, deafness, or physical abnormalities.

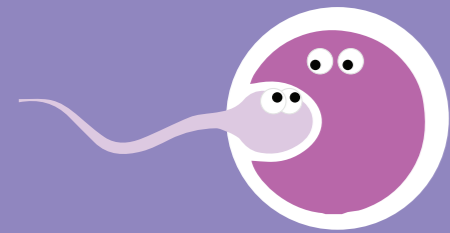


IN THE LAB

Studying what goes wrong in these early stages of development inside the womb and how to prevent it is one area of research for scientists like Professor Patrick Tam, a world-leading embryologist. He hopes that many life-threatening conditions can be prevented or treated by understanding how genes and other factors control normal development of embryos at these early stages.

HOW BABIES GROW

When an egg from the mother is fertilized by sperm from the father, the process of development begins. The fertilized egg is also called a 'zygote'.



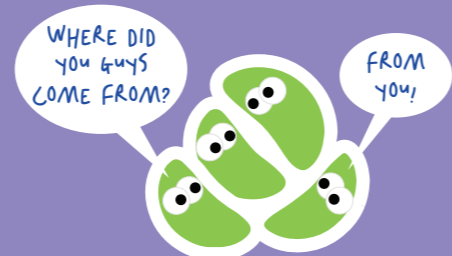
DAY 1

2 cell stage: The zygote first divides into 2 daughter cells.



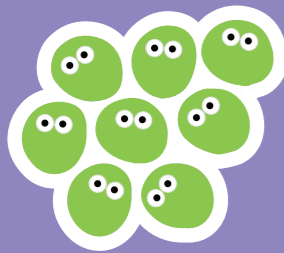
24 HOURS

4-cell stage occurs about 40 hours after fertilisation. This is when many genes become active and begin to promote the development of the embryo.



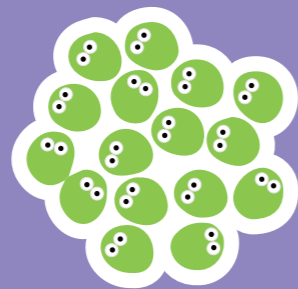
40 HOURS

8-cell stage is when cells start to stick together.



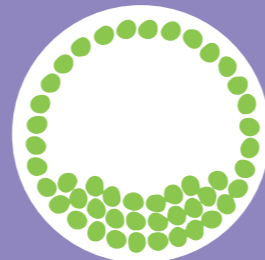
DAY 3

16 cell-stage is reached about 4 days after fertilisation and forms a morula with cells taking their place on the 'outside' and 'inside' the cluster.



DAY 4

Blastocyst is formed about 5 to 6 days after fertilisation. It's at this stage that the embryo attaches to the mother's womb. After this, the embryo begins the processes that leads to the development of a foetus in the mother's womb



DAY 6

Embryo – at about 4 weeks the embryo has formed the heart which begins to beat. Other cells will eventually form other parts of the body, such as lungs, brain, and spine.



4 WEEKS

Foetus – from about 9 weeks development, more complex structures develop such as eyes and ears.



9 WEEKS

32 weeks: the foetus has developed the brain and all the essential organs in the body.



32 WEEKS

40 weeks is considered 'full term' for a foetus, where every part of the body has fully developed already, and the baby is ready to see the world.

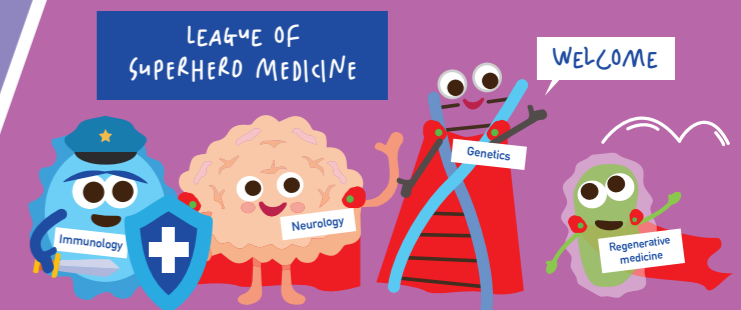


40 WEEKS

Embryos contain stem cells which eventually become all the different types of cells in our bodies. But did you know that scientists have discovered how to turn back the clock? They can take skin cells from a child or adult and turn them back into stem cells!



This has created a whole new field of research called 'regenerative medicine'. The aim is to use a person's own stem cells to cure blindness or diseases.



Stem cells can also one day be used to replace a failing organ. No longer will people need a bone marrow or kidney transplant from another person, they can grow their own replacement.



IMMUNE CONTROL

This has a lot of benefits, because it is often difficult to find an organ donor, and there are also problems with 'rejection'. This is when a person's immune system attacks the transplanted organ, seeing it as an invader. Stem cells and regenerative medicine can one day change all this, saving many lives.

