**Drawing the genome in body cells**

The diagrams show several different types of cells from a human.

(The cells are not drawn to the same scale.)

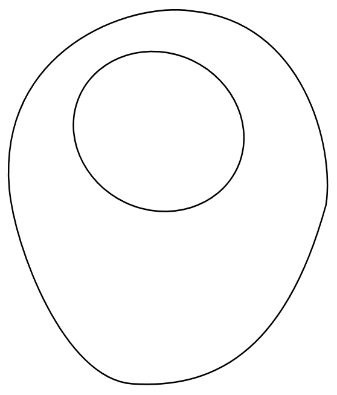
**To discuss**

The diagrams do not show the genome of each cell.

* What do you think the genomes would look like?
* What would you draw to add the genomes to the cell diagrams?

**To do**

Complete the diagrams by drawing the genome inside each cell.



cytoplasm

cell membrane

nucleus

**Cheek cell**



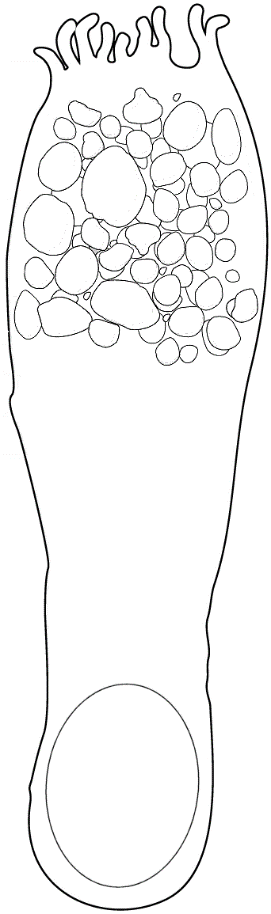
cell membrane

cytoplasm

fatty insulation

nucleus

**Nerve cell**



mucus vesicles

cell membrane

cytoplasm

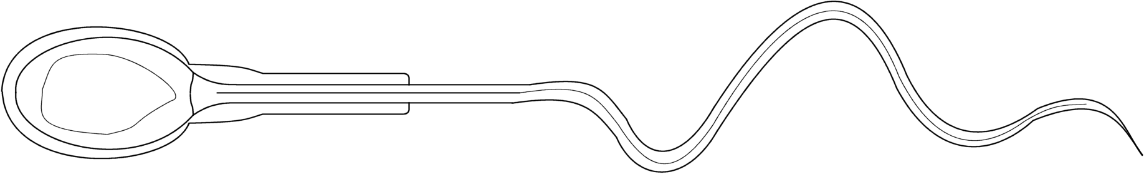
nucleus

**Gut lining cell**

cell

membrane

cytoplasm



nucleus

**Sperm cell**

*Biology> Big idea BHL: Heredity and life cycles > Topic BHL1: Inheritance and the genome > Key concept BHL1.2: The structure and function of the genome*

|  |
| --- |
| **Response activity** |
| **Drawing the genome in body cells** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The structure and function of organisms depends on proteins made by cells using instructions stored in the DNA of the genome. |
| Observable learning outcome: | Recall that all organisms store heritable genetic information in their genome inside cells. |
| Activity type: | Discussion, modelling |
| Key words: | genome, cell |

This activity can help develop students’ understanding of which types of human body cells store a copy of the genome through a drawing and discussion-based task. It can be used in response to the following diagnostic questions:

* Diagnostic question: Locating the genome

**What does the research say?**

Various researchers (e.g. Lewis, Leach and Wood-Robinson, 2000; Wood-Robinson, Lewis and Leach, 2000; Lewis and Kattmann, 2004; Donovan and Venville, 2012) have reported common misunderstandings about DNA, genes and chromosomes in school children, including that:

* DNA is only found in blood;
* DNA is only found in specific cell types (e.g. in the reproductive system);
* DNA exists only to help solve crimes, and is therefore only found in skin and hair that can be shed at crime scenes.

Teaching and learning about inheritance and genetics at school must aim to prepare students to live and work in the genomic era (Stern and Kampourakis, 2017). Up to the age of 14, a useful approach may be to embed ‘pro-genomics’ and ‘pre-genomics’ practices – for example, use of language and concepts that dispose students to thinking about whole genomes rather than just genes (Airey, Moore and Bennett, 2018).

Researchers have used constructivist approaches that enable students to build their own explanations of the structure and function of the genome, which may help to develop students’ understanding and overcome misconceptions, including the use of drawing and group discussions (e.g. Lewis and Kattmann, 2004; Rotbain, Marbach-Ad and Stavy, 2005; Saka et al., 2006)

**Ways to use this activity**

Students should complete this activity in pairs or small groups. The focus of the activity should be on group discussion to reach a consensus on what the drawings of the genomes should look like. It is through the discussions that students can check their understanding and develop their explanations. Listening in to the conversations of each group will often give you insights into how your students are thinking.

Alternatively, students could be asked, individually, to draw the genome in the nucleus of each cell. In groups, the students’ diagrams could be ‘peer assessed’, with an emphasis on small group discussion to provide constructive feedback rather than simply criticising or assigning a score.

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

After their discussions, each group should be prepared to report the key points of their discussion to another group, or to the class.

*Differentiation*

The sperm cell could be omitted to simplify the activity for some students.

**Equipment**

For each pair/group:

* coloured pencils/pens/crayons
* paper (if not drawing on the worksheet)

**Expected answers**

The genome should be drawn inside the nucleus of each cell. Students may draw the genome using representations of DNA, chromosomes, or just squiggles. They should use the same shape and colour to indicate that the genomes are identical copies in all cell types except the sperm cell. In the sperm cell, they should indicate that it is roughly half the amount of genetic material of the other cell types.

**Acknowledgments**

Developed by Alistair Moore (UYSEG), from an idea suggested by Lewis and Kattmann (2004).

Images: UYSEG

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