**Secondary Schools/Sixth Form:  
Discovering Epigenetics – Reprogramming Adult Cells**

Approximate timing: 15 minutes

Required resources: Printouts of the stem cell quiz sheets, answer sheet, lesson plan

Summary: This lesson will introduce students to stem cells and how adult cells can be reprogrammed to create induced pluripotent stem cells.

**The lesson supports:**

*AQA GCSE Biology*

4.1.2.3 Stem cells  
4.6 Inheritance, variation and evolution

4.6.1.4 DNA and the genome

4.6.1.5 DNA structure (biology only)

4.6.2 Variation and evolution

4.6.2.4 Genetic engineering

*EDEXCEL GCSE Biology*

2.6 Explain the importance of cell differentiation in the development of specialised cells

3.4 Describe DNA as a polymer

3.5 Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein

3.13 Explain the term: chromosome

*OCR GCSE Biology*

B1.1 What is the genome and what does it do?

B1.2 How is genetic information inherited?  
B1.3 How can and should gene technology be used?

*AQA A Level Biology*

3.4.1 DNA, genes and chromosomes

3.4.2 DNA and protein synthesis

*EDEXCEL A Level Biology*

7.2iv Understand that gene expression can be changed by epigenetic modification, including non-coding RNA, histone modification and DNA methylation.

7.2v Know that epigenetic modification is important in ensuring cell differentiation.

*OCR A Level Biology*

5.1.1 Patterns of inheritance

5.1.3 Gene technologies

Links to Babraham Institute research themes:

<https://www.babraham.ac.uk/our-research/healthy-ageing>

<https://www.babraham.ac.uk/our-research/epigenetics>

Links to Babraham Institute scientific services

<https://www.babraham.ac.uk/science-services/bioinformatics>

<https://www.babraham.ac.uk/science-services/sequencing-facility>

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| **Learning outcomes** | |
| All students will: | Explain what makes stem cells special |
| Most students will: | Describe the process of reprogramming adult cells into induced pluripotent stem cells |
| Some students will: | Describe the epigenetics changes that occur during reprogramming, such as the decreased biological age of adult cells. |
| Key word/s | Stem cells, reprogramming, epigenetics, laboratory methods, research |

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| **Teaching notes** | **Student learning activities** |
| **Principal Activity** (5 mins)  Hand out the quiz sheets and ask students to complete them on their own or in pairs. | Student actions  Read the quiz sheet and answer the questions |
| Plenary (10 mins)  Discuss the answers to the quiz plenary. Use the answer sheet to provide more insights into why the answer to a question is correct | Student actions  Engage with the plenary discussion on the answers of the quiz |
| **Extension activies** | Discovering Epigenetics   * The Epigenetic Clock * Ageing in *C. elegans*   Making your mark  Epigenetics model |