**How Research Works – The Epigenetics Escape Room**

**Lesson Plan**

**Approximate timing:** 100 minutes (120 minutes with live Q&A)

**Required resources:** Lesson plan (this document), escape room link (in this document), PowerPoint presentation, scientist profile cards.

**Additional information:** contained in the “introduction to epigenetics” information sheet, Clues document, and Answers document.

If students are completing the activity individually or in groups, they will need access to computers or laptops with internet access. Alternatively, the teacher can display the puzzles on a screen, students complete the puzzles then a vote is taken on which answer to input.

**Link to activity:** <https://www.escape.babraham.ac.uk/>

**Summary:** This lesson introduces students to the topic of epigenetics. Literally meaning “on top of genetics”, epigenetic marks are chemical tags added to DNA, or to histones (the proteins around which DNA is organised). These tags control whether DNA is activated or silenced.

The main activity is an online “escape room”, in which players take on the role of a researcher visiting the Babraham Institute. Individual students, groups or the whole class together have to solve epigenetic themed puzzles to complete their research and publish their paper.

The lesson also acts as an introduction to lots of different science roles and careers.

**Key words:** DNA, epigenetics, gene, genome, histone, protein, RNA, stem cell.

**Curriculum links:**

Working scientifically – development of scientific thinking; analysis and evaluation; scientific vocabulary.

Cell biology – growth and development of cells.

Inheritance, variation and evolution – the genome and gene expression; inheritance; selective breeding and gene technology.

**Learning outcomes:**

All students will: Explain that epigenetics marks are tags placed onto DNA to control whether genes are ‘switched on’ or ‘switched off’.

Most students will: State some factors which affect epigenetics. Describe some of the research techniques used by bioscience research Institutes (e.g. bioinformatics, sequencing, flow cytometry).

Some students will: Describe the central dogma in molecular biology (DNA makes RNA, and RNA makes protein) and the links between epigenetics and ageing. Explain how different techniques and roles contribute to producing scientific research.

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| **Section of lesson** | **Timing** | **Student learning activities** |
| Starter | 5 mins | Students asked (in PPT):   * How many different types of cell can you name? * How do different cell types develop? |
| Development | 20 mins | Students introduced to the concept of epigenetics through PPT and [animated video](https://www.youtube.com/watch?v=9JAd07bwG6g) |
| Principal activity | 60 mins | Students complete the [escape room](https://www.escape.babraham.ac.uk/) activity in groups. This can be set up as a competition to see which group can finish quickest. Groups must show their working in their “lab notebooks” - a printout of the questions with space for notes. |
| Extension | - | For students who finish early:  Choose one of the scientific facilities featured in the puzzles. Using the information on [our website](https://www.babraham.ac.uk/science-facilities) and any other relevant websites, create a poster answering the following questions:   * What does the facility do? * What equipment do they use? * What is one discovery that has been made at the Babraham Institute involving that facility? |
| Review | 15 mins | Review answers to puzzles (explanations given in answer sheet) |
| Careers Development | 15 mins | Students given scientist profile cards.  Think: students write down 5 skills they think are required for each role.  Pair: students discuss in pairs and reflect on similarities and differences (between their answers, and between the different job roles)  Share: whole class discussion  *Alternatively, use this as an extension activity for those who finish the escape room quickly instead if you have less time.* |
| Plenary | 5 mins | Short quiz on epigenetics and science careers (in PPT) |

**Further information about Babraham research and facilities:**

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

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

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

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

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

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

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