**Secondary Schools:
Discovering Autophagy - Recycling Inside Cells**

Approximate timing: 30 minutes

Required resources: PowerPoint presentation, lesson plan, online access to game (link below)

This lesson will introduce students to the principles of cell recycling, termed autophagy. This resource includes an introduction to the topic, and examples of how scientists are researching it to treat diseases and understand ageing. The main activity is an online ‘whack-a-mole’ type game that allows students to test their reaction skills whilst understanding how the process of autophagy works in our cells. Learn about a process that is happening all the time in our cells to keep us alive!

**The lesson supports:**

*AQA GCSE Biology*
4.1.1 Cell structure

*EDEXCEL GCSE Biology*
1.1 Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions

*AQA A Level Biology*
3.2.1.1 Structure of eukaryotic cells

*EDEXCEL A Level Biology*
2.1 Eukaryotic and prokaryotic cell structure and function

Links to Babraham Institute research themes:

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

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

Links to Babraham Institute scientific services

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

Online activity:
<https://www.babraham.ac.uk/autophagy-game/>

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| **Learning outcomes** |
| All students will: | Be able to define and describe the process of autophagy |
| Most students will: | Explain why it is important that our cells can undergo autophagy |
| Some students will: | Explain how scientists can study autophagy, giving an example |
| Key word/s | cell, autophagy, recycling, proteins,  |

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| **Teaching notes** | **Student learning activities**  |
| **Development** (10 mins) Teach students about the principles of autophagy:* Why do our cells do it?
* Why do scientists try to understand it?
* How do scientists study it?
 | Slide(s) 2-5Answer questions and gain an appreciation on the basics of autophagy.Presentation has been designed in a question/answer format, students tend to engage better if they are asked questions before being given the information on the slide. |
| **Principal Activity** (15 mins)Autophagy game (works on pc or iPad* Read through instructions
* Visit the website for the game (<https://www.babraham.ac.uk/autophagy-game/>)
* Allow students to play the game
* Ask them to write down their scores
 | Slides 6 - 7Follow instructions on the slide and on the online game, compare your scores – did your cell survive because the autophagy was good enough? |
| Plenary (5 mins)Discuss as a group:* See who got the highest score
* Ask questions to assess learning
 | Slide 8Students answer questions to assess learning. |
| **Extension Activity**Autophagy web-quest: Students research autophagy using the Babraham Institute website. | Start at: <https://www.babraham.ac.uk/our-research/signalling> and follow links to research pages, science services and other content on our website to inform your answers. For each question, keep a record of the web-pages you have visited.1. Which group leaders within our Cell Signalling program focus on autophagy?
2. Explain ‘The Quiet Pathway’
3. What do you think is the most important discovery the Babraham Institute has made relating to autophagy? Explain your reasons.

How is autophagy important for ageing? |