

Molecule to medicine

Educator notes



Learning objectives

- Learning how to explain in broad terms what a medicine is
- Describing the main factors behind the development of a medicine
- Understanding the different stages in the drug discovery and development process



Curriculum links

- Science
 - Scientific attitudes
 - Experimental skills
 - Investigations
- PSHE/PSE/Wellbeing/Careers



Time needed: 60 minutes



Resources required

- Presentation slides or student worksheet if assigning for independent learning
- Internet and/or library access for research tasks
- Access to digital design software or physical poster materials for the design task



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Introduction to medicine development (5 mins)

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What drives medicine development? (20 mins)

1

Medicine development: The seven traditional stages (15 mins)

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Activity 1: Design an infographic (20 mins+)

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Slide 1

Introduction

- Tell the class that today's lesson is all about finding out how a medicine is developed
- Explain they're going to create a poster or illustration to explain something they learn in this lesson after doing some research



Slide 2

What is medicine?

- Explain to the class that there is no single definition of a medicine
- Share that broadly speaking, a medicine is:
 - Any substance that alters normal bodily function when absorbed into the body of a living organism
 - Any chemical substance that has a medical or chemical effect on the body, which may be natural or synthetic

Discussion question: What does natural and synthetic mean in the context of medicine?

Potential answer: Synthetic drugs are chemical compounds produced in a laboratory, whereas natural medicine contain substances extracted from plants or animals.



Slides 3-5

What drives medicine development?

- Ask students to suggest what they think might motivate the development of a new medicine. Record these on a mind map or class list
- Give the class ten minutes to do some research into this process, finding out more about what creates demand for new treatments, taking notes as they go. Possible sources of information will include:
 - Pharmaceutical journals and their websites
 - News articles
 - Websites of pharmaceutical companies like [GSK](https://www.gsk.com)
 - Government research
- If helpful, you could encourage students to investigate a particular medicine and why it was needed and developed. They should also consider the different types of organisations involved; make sure they start to see that it is not just scientists in a lab working on this process. People who work in research, manufacturing and distribution, for example, are also involved
- Once they have had some time, ask for volunteers to share what they've found with the class and record them on the board
- Move to **Slide 4** and explain that there are three main drivers in the development of medicine:
 1. Patient needs
 2. Science
 3. Value
- Discuss whether the reasons recorded on the board fall into these categories
- The reasons the class found might be quite specific but discuss whether they fall broadly into these three categories. You could allocate a marker colour to each and circle the reasons you wrote on the board earlier

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Slides 3-5

What drives medicine development? Continued...

- Move on to discuss value and how this can fall into different categories, mainly:
 - Commercial value: can whoever develops the medicine make it a worthwhile investment for the organisation?
 - Societal value: does the medicine contribute to solving a societal problem such as an unmet patient need, neglected tropical disease, or something rare?
- Ask students why they think 'patient needs' is top of the list of drivers
- Move to **Slide 5** and explain that medicine development is all about understanding the unmet medical needs of people, or patients. The main goal of medicine is to improve the quality of life of the patient



Slides 6 & 7

Medicine development: The seven traditional stages

- Next, introduce the class to the process of developing a new treatment which typically goes through seven stages from laboratory to patient, as shown on **Slide 6**:
 - Research
 - Discovery
 - Pre-clinical testing
 - Clinical trials (phase 1, 2 and 3)
 - Regulatory approval
 - Supply
 - Monitoring
- Medicines get narrowed down more and more at each stage of this process. Scientists may start with up to 10,000 potential medicine candidates, ending up with just one approved medicine
- Explain that a lot of work goes into each step from a great number of people, so this process takes a long time; it could be 15 years or more
- Look at the clinical trial stage in more detail by watching [this video](#) from The Association of the British Pharmaceutical Industry, also linked on **Slide 7**
- Students should do some further research, this time looking at the development of a specific medicine, including how long it took and the people who worked on the development and their jobs
- Once they've had some time ask if any students saw, during their research, the budget or cost of developing a medicine? How much was it? Discuss how this process of developing a medicine is also very expensive, due to its length and the number of people and stages involved

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Slide 8

Design an infographic



Activity 1

Design an infographic

20+ mins

- This activity could be done in class, independently, or as homework. It can also be done digitally, using online software like Google Slides or Canva, or using card, pens, markers, and coloured paper, depending on your setting
- Explain to students they will be designing a poster in an infographic style, which is a term used for displaying data or information graphically, like the Save the Children example on **Slide 8** which you can show the class
- These are used to show a lot of information in a visually interesting, eye-catching way over a paragraph of text
- Give students time to design an infographic/ illustration/comic strip around something they learnt in this lesson, and spent time researching. Example topics for their infographic could be:
 - The story of one medicine from discovery to approval
 - An in-depth look at what drove the development of a medicine
 - A visual representation of the seven phase medicine development process
 - A visual job description of someone involved in the medicine development process



Plenary

- If you have time, students could present their infographic back to the group, discussing what they have learnt and why they chose to investigate that particular part of the medicine development process