Teaching guide: Antibiotics and the rise of resistance

This resource supports the Level 3 Certificate and Extended Certificate in Applied Science. It will help you prepare students for Unit 3: Science in the modern world.

**Unit type:** Externally assessed (pre-release)

**Guided Learning hours:** 60

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| **Focus of the Topic** | **Suggested teaching/ delivery ideas** | **Links to AO** | **Resources** |
| Access, use and interpret media sources relating to antibiotic use.Public perception of antibiotic useEthical, moral, commercial, environmental, political and social impacts of antibiotic use and the rise of resistance.The work of scientists in the development, manufacture and use of antibiotics. | Learners can explore the scientific issues surrounding the use of antibiotics. This should develop into a consideration of the consequent rise in antibiotic resistance and the potential impact on humanity. Teachers may present (use links) textural and numerical data from a variety of sources (general,,eg newspaper articles and specialist eg scientific journals) or allow learners to carry out independent research. Through discussion teachers should encourage learners to apply and develop their evaluating and critical thinking skills, to enable learners to assess the usefulness of the sources. Teachers could present the learners with a number of specific questions in order to direct their analysis, eg* How did the discovery and commercial production of antibiotics revolutionise healthcare?
* How do antibiotics work?
* How do bacteria develop antibiotic resistance?
* What factors influence the rise in antibiotic resistance?
	+ medical over-prescription
	+ patient use
	+ farming practices
	+ legislation.
* What are the potential consequences of a rise in resistance?
* What, if anything, is being done to address this problem by the:
	+ medical profession
	+ pharmaceutical companies
	+ individuals
	+ farming community
	+ Government?

Learners could produce a summary of their findings in a variety of ways eg:* SWOT analysis

poster* leaflet.

A presentation by the teacher could be given to explain how media articles influence public perception. The presentation should include:* how the tone and language varies according to the type of audience and intended purpose of the sources
* how a peer reviewed article differs from a simplified, popular account
* how oversimplification may lead to bad science.

Using additional and/or the same sources as in AO1, teachers should explore with the learners how scientists and the media have conveyed antibiotic use and resistance and the consequent public perception. Using the previous and additional sources, learners can consider how the medical profession, pharmaceutical companies, the farming industry and Government policies and practices, together with individual behaviour impact on the issues associated with antibiotics. This could be investigated through a role play with the class divided into six groups representing the above list of stakeholders. The groups could then present arguments demonstrating their roles (both positive and negative) in the antibiotic debate using the media sources. Learners could record this information individually/collectively in the form of concept maps.Learners can research the roles and responsibilities of scientists in the pharmaceutical industry/medical services/government, which could include:* Laboratory technician
* Research scientist
* Microbiologist
* Pharmacologist
* Biotechnologists
* Medical practitioners
* Environmental scientists
* Public/community health scientists
* Government scientists.

**NB** The teacher/learner may use their own classification as the above categories are not mutually exclusive.Alternatively, they could listen to guest speakers or visit pharmaceutical companies or hospitals.The roles, responsibilities and skills of these scientists and their interaction in the manufacture and use could then be summarised in a comparison table, leaflet(s), or poster(s). | AO1 Use information about topical scientific issues obtained from a variety of media sources.AO2 Understand the public perception of science and the influence the media have (General and specialist media).AO3 Understand the ethical, moral, commercial, environmental, political and social issues involved in scientific advances, and how these are represented in the media.AO4 Understand the roles and responsibilities that science personnel carry out in the science industry. | Antibiotic Resistance – case study[bigpictureeducation.com/antibiotic-resistance-case-study](http://bigpictureeducation.com/antibiotic-resistance-case-study)Gov UK Antibiotic Awareness Resources[dobugsneeddrugs.org/educational-resources/](http://www.dobugsneeddrugs.org/educational-resources/)Microbiology Society: The History of Antibiotics[microbiologysociety.org/.../history-of-antibiotics.cfm](http://www.microbiologysociety.org/.../history-of-antibiotics.cfm)WHO Antimicrobial Resistance[who.int/mediacentre/factsheets/fs194/en/](http://www.who.int/mediacentre/factsheets/fs194/en/)Public Health England Antibiotics e-bug[e-bug.eu/lang\_eng/.../Young\_Adult\_Antibiotic\_Full\_Pack.pdf](http://www.e-bug.eu/lang_eng/.../Young_Adult_Antibiotic_Full_Pack.pdf)“How to read articles about health” Dr. Alicia White Bad Science[badscience.net/2009/09/how-to-read-articles-about-health-by-dr-alicia-white/](http://www.badscience.net/2009/09/how-to-read-articles-about-health-by-dr-alicia-white/) Antibiotic - How Products are Made[madehow.com/Volume-4/Antibiotic.html](http://www.madehow.com/Volume-4/Antibiotic.html)Use the following two sources and answer questions on how the two sources approach antibiotic resistance issues:[Source A: The AMR crisis: is there a global solution? OUP blog by Laura Bowater November 19 2015](https://blog.oup.com/2015/11/amr-crisis-global-solution-fems/)  [Source B: Antibiotic Resistance “a greater threat than cancer”](https://www.theguardian.com/society/2016/apr/14/antimicrobial-resistance-greater-threat-cancer-2050-george-osborne)[By 2050 The Guardian 14 April 2016 by Nicholas Watt](https://www.theguardian.com/society/2016/apr/14/antimicrobial-resistance-greater-threat-cancer-2050-george-osborne)Best, J. Damned Lies and Statistics: Untangling Numbers from the Media, Politicians and Activists (University of California Press,2001) ISBN 9780520219786See further guidance in the resources section of the specification (pages 72-73)Lymberry, P. and Oakshott I.Farmageddon: The True Cost of Cheap Meat (Bloomsbury Publishing, 2014) ISBN 9781408846445Antimicrobial Resistance (AMR) – Gov.uk[gov.uk/government/collections/antimicrobial-resistance-amr-information-and-resources](https://www.gov.uk/government/collections/antimicrobial-resistance-amr-information-and-resources)Antibiotic use-Guidance and guideline topic-NICE[nice.org.uk/guidance/conditions-and-diseases/infections/antibiotic-use](http://www.nice.org.uk/guidance/conditions-and-diseases/infections/antibiotic-use)Factsheet for general public – ECDC[ecdc.europa.eu/en/eaad/antibiotics-get-informed/factsheets/Pages/general](http://ecdc.europa.eu/en/eaad/antibiotics-get-informed/factsheets/Pages/general)Journal of Antimicrobial Chemotherapy- The public’s attitude to and compliance with antibiotics.[m.jac.oxfordjournals.org/content/60/suppl\_1/i63.full](http://m.jac.oxfordjournals.org/content/60/suppl_1/i63.full)Antibiotic Resistance in the Environment – Elsevier[journals.elsevier.com/science-of-the-total-environment/virtual-special-issues/antibiotic-resistance-in-the-environment/](http://www.journals.elsevier.com/science-of-the-total-environment/virtual-special-issues/antibiotic-resistance-in-the-environment/)Bacteria that resist “last antibiotic” found in UK – BBC News 21 December 2015[bbc.co.uk/news/health-35153795](http://www.bbc.co.uk/news/health-35153795)Why a cut knee could kill a child – The Sun[thesun.co.uk/sol/homepage/woman/health/health/4454626/Why-a-cut-knee-could-kill-a-child-as-normal-antibiotics-are-about-to-stop-working.html](http://www.thesun.co.uk/sol/homepage/woman/health/health/4454626/Why-a-cut-knee-could-kill-a-child-as-normal-antibiotics-are-about-to-stop-working.html)Antibiotic use in farm animals “threatens human health” – NHS choices [nhs.uk/news/2015/12December/Pages/Antibiotic-use-in-farm-animals-threatens-human-health.aspx](http://www.nhs.uk/news/2015/12December/Pages/Antibiotic-use-in-farm-animals-threatens-human-health.aspx)Antibiotic-resistant disease pose “apocalyptic” threat, top expert says. The Guardian[theguardian.com/society/2013/jan/23/antibiotic-resistant-diseases-apocalyptic-threat](http://www.theguardian.com/society/2013/jan/23/antibiotic-resistant-diseases-apocalyptic-threat)See further guidance in the resources section of the specification (pages 72-73).Abpi Careers in the pharmaceutical industry[apbi.org.uk/our-work/careers/Pages/default.asp](http://www.apbi.org.uk/our-work/careers/Pages/default.asp) 10 types of scientist- Science Council Official Website[sciencecouncil.org/about-us/10-types-of-scientist/](http://www.sciencecouncil.org/about-us/10-types-of-scientist/)AstraZeneca career opportunities[astrazenecacareers.com/career-areas/](http://www.astrazenecacareers.com/career-areas/)Glaxo Smith Kline (GSK) Careers[gsk.com/en-gb/careers](http://www.gsk.com/en-gb/careers)Johnson & Johnson Careers[careers.jnj.com/home](http://www.careers.jnj.com/home)Careers in Pharmacology British Pharmacological Society (BPS)[bps.ac.uk/education-careers/careers-in-pharmacology](https://www.bps.ac.uk/education-careers/careers-in-pharmacology)NHS Careers[healthcareers.nhs.uk](https://www.healthcareers.nhs.uk/)Science Career Pathways – Career Resources[sciencecareerpathways.com/career-resources/](http://www.sciencecareerpathways.com/career-resources/)See further guidance in the resources section of the specification (pages 72-73). |