

Overview

MRSA (methicillin-resistant *Staphylococcus aureus*) is a highly contagious strain of the *Staphylococcus aureus* family of bacteria. MRSA can exist harmlessly on people's skins without their even knowing it, but if it infects someone who is already ill or weak, it can kill. Infections occur where there is opportunity for MRSA to get into the body, such as at surgical wounds or where a catheter or needle is inserted. The reason that MRSA is such a problem for hospitals and care homes – and why it has become known as a 'superbug' – is that it has developed resistance to methicillin and other antibiotics, so infections are much more difficult to treat.

The National Audit Office (for England and Wales) estimates that hospital-acquired infections contribute to some 5000 deaths annually. Of those caused by the *Staphylococcus aureus* family, most are known to be due to the MRSA strain. Between 2003 and 2006, mentions of MRSA on death certificates increased from 955 to 1556.

A study carried out at Selly Oak Hospital in Birmingham has shown that surfaces made with materials containing copper kill a wide range of potentially harmful micro-organisms – significantly reducing the number of these organisms that can come into contact with patients, visitors and staff.

The activities

This unit contains four possible activities. Each activity can be carried out independently of the others, using the same introduction to set a context. The first activity, 'MRSA in the news', and the timeline exercise in 'Comparing the antibacterial properties of metals' could be set as homework prior to the lesson.

MRSA in the news

Students analyse how outbreaks of MRSA are reported in different news stories and try to identify and correct any misconceptions.

What is MRSA?

Students convert information from several sources into revision notes about MRSA.

Comparing the antibacterial properties of metals

Students prepare a timeline of the history of copper in medicine (optional) and then carry out a practical investigation.

Copper and MRSA – How scientists work

Students analyse real data, from *in vitro* investigations at the University of Southampton and clinical trials at Selly Oak Hospital in Birmingham, on the effectiveness of copper as an antibacterial agent (specifically against MRSA).

Curriculum links (for students aged 14–16)

How Science Works (from POS KS4 for England)

Data, evidence, theories and explanations

1a how scientific data can be collected and analysed

Practical and enquiry skills

2c work accurately and safely, individually and with others, when collecting first-hand data

Communication skills

3a recall, analyse, interpret, apply and question scientific information or ideas

3b use both qualitative and quantitative approaches

3c present information, develop an argument and draw a conclusion, using scientific, technical and mathematical language, conventions and symbols and ICT tools

Applications and implications of science

4a about the use of contemporary scientific and technological developments and their benefits, drawbacks and risks

4c how uncertainties in scientific knowledge and scientific ideas change over time and about the role of the scientific community in validating these changes

GCSE or equivalent 14–16 specifications

England (GCSE)

AQA Science A 4461

Biology Unit 1a: Human biology 11.4 What causes infectious diseases and how can our bodies defend themselves against them?

AQA Science B 4462

Biology Unit 1: 11.4 What causes infectious diseases and how can our bodies defend themselves against them?

AQA Biology 4411

Biology Unit 1: 11.4 What causes infectious diseases and how can our bodies defend themselves against them?

Biology Unit 3: 13.7 How can we be sure we are using micro-organisms safely?

AQA Additional Applied Science (Single Award) 4863

Unit 2: Science at work, 11.2: Food Science – Micro-organisms and food safety

AQA Applied Science (Double Award) 4861

Science for the needs of society Unit 2: 11.2 Health and medicine – illnesses, diseases, and their diagnosis and treatment

Developing Scientific skills Unit 3: 12.3 How microbiologists investigate living organisms

Edexcel 360 Science 2101

Biology B1a: Topic 1 – Environment; Topic 4 – Use, misuse and abuse

OCR Science A (21C science) J630

Module B2 – Keeping healthy: B2.3 What are antibiotics, and why can they become less effective?
How are new drugs developed and tested?

OCR Biology A (21C) J633

Module B2 – Keeping Healthy: B2.3 What are antibiotics, and why can they become less effective?
How are new drugs developed and tested?

OCR Science B (Gateway Science) J640

Module B1: Understanding ourselves; Item B1c: Keeping healthy

OCR Biology B (Gateway Science) J643

Module B1: Understanding ourselves; Item B1c: Keeping healthy
Module B6: Beyond the microscope; Item B6b: Harmful micro-organisms

OCR Applied Science (Double Award) J649

Section 2.2.3 Diseases caused by micro-organisms

Scotland (SCE standard grade)

Biology

Topic 7 Biotechnology: Sub-topic c – Reprogramming microbes

Wales (WJEC GCSE)

Biology B3

Microbes and mankind

4. Nature of microbes 5. Microbes and disease

Applied Science (Double Award)

Unit 1: Developing scientific skills 3. Investigating living organisms 3.2 micro-organisms

Unit 2: Science and society (a) The human body and health

NI (CEA GCSE)

Science (Single Award)

Module 2 Human activity and health: Disease and body defences

Biology

Section 3.4 Microbiology

Applied Science (Double Award)

Unit 1: Developing scientific skills: Micro-organisms

Unit 2: Science for the needs of society – Living organisms

Learning objectives

By working through the unit, students come to understand that:

- MRSA is resistant to some antibiotics, such as methicillin
- MRSA resistance is due to naturally occurring genetic mutations
- MRSA causes infections by entering the body through wounds
- some MRSA infections are fatal
- MRSA transmission can be reduced by various hygiene measures
- copper has antibacterial properties
- the use of copper-containing surfaces in hospitals may be another measure in the fight to reduce the transmission of MRSA.

Teaching and learning approaches

Learning Skills, learning by/from:

- lab or fieldwork
- practical investigations
- interpreting and evaluating data
- reflective reading
- gathering information from a variety of sources
- devising 'visual' ways of expressing and communicating ideas (including maps, diagrams, charts)
- handling ideas and information: using computers (ICT)
- interacting with a variety of audio-visual media
- 'case-studies' in a variety of contexts

[For further information about Learning Skills for Science \(LSS\) click here](#)

Downloads

MRSA in the news

- Activity sheet A – MRSA: What the papers say
- Activity sheet B – MRSA: What the papers say (simplified)
- Newspaper articles – see the weblinks to articles about MRSA and Michael Winner (celebrity), William Osborne (baby), Sandy Davidson (farm worker), Ben McBean (soldier), Edwyn Collins (singer), Anita Osbourne (OAP), Tina Hobley (actor) and Leyla Sanai (doctor).

What is MRSA?

- Presentation:
 - slide 1 – starter stimulus
 - slide 2 – MRSA infection reports in England, 1990–2007
 - slide 3 – age and sex distributions of MRSA infections, 2006–2008
 - slide 4 – hospital deaths involving MRSA
 - slide 5 – timing of detection of MRSA infection from patient’s arrival in hospital, 2006–2008
- Data sheet – MRSA facts and figures
- Information sheet A – What is MRSA?
- Information sheet B – What is MRSA? (simplified version)
- Activity sheet – All about MRSA

Comparing the antibacterial properties of metals

- Presentation
 - slide 6 – metals and MRSA
- Information sheet – History of copper in medicine
- Activity sheet – Copper in medicine timeline (optional)
- Practical sheet 1 – Investigating the antibacterial properties of metals
- Practical sheet 2 – Investigating the antibacterial properties of metals

Copper and MRSA – How scientists work

- Presentation
 - slide 1 – starter stimulus
 - slide 7 – statements on MRSA in hospitals
- Investigation report – *In vitro* evaluation of copper: University of Southampton
- Investigation report – Clinical evaluation of copper: Selly Oak Hospital, Birmingham
- Activity sheet A – Copper and MRSA
- Activity sheet B – Copper and MRSA (simplified version)
- Information sheet A – What is MRSA? (if you have not already carried out the activity ‘What is MRSA?’)
- Information sheet B – What is MRSA? (simplified version) (if you have not already carried out the activity ‘What is MRSA?’)

MRSA



Acknowledgements

This unit was written by Kath Twin and Silvia Newton. The practical activities were suggested by John Tranter of ASE Safeguards Committee.