



4.1 Treatment of Infection

Antibiotics and Medicine

Advance Preparation

The following preparation is for 1 group of 5 students

For a visual of workbench set up visit www.e-bug.eu

Materials Required

- | | | |
|---------------------------------------|--|--|
| <input type="checkbox"/> Petri dishes | <input type="checkbox"/> Hydrochloric acid | <input type="checkbox"/> Wax Crayon/marker |
| <input type="checkbox"/> Base Agar | <input type="checkbox"/> 20 Test tubes | <input type="checkbox"/> Disposable droppers |
| <input type="checkbox"/> Hot plate | <input type="checkbox"/> 5 Test tube racks | <input type="checkbox"/> Cork borer |
| <input type="checkbox"/> Phenol Red | | |

Agar Plate Preparation

1. Make up 100ml of base agar following the manufacturer's instructions.
2. When cooled slightly, but not solid, pour 1 agar plate (to demonstrate no growth). When complete add enough (~10 drops) 2 – 4% Phenol Red to turn the agar a deep red/dark orange and mix well.
3. Pour approx 20ml into each petri dish and leave to cool.
4. When solidified, make 5 evenly spaced bore holes in each agar plate.
5. Label each petri dish with one the following 4 names:
 - a. Jean Smith
 - b. Tom Harris
 - c. Anne Jones
 - d. Raj Nedoma

Antibiotic (test-tube) Preparation

1. Set up a test tube rack of 5 test tubes for each patient. Label each test tube with one of the following labels
 - a. Penicillin
 - b. Meticillin
 - c. Oxacillin
 - d. Vancomycin
 - e. Amoxicillin
2. Transfer 5ml of the following solutions into the appropriately labelled test tube

	Penicillin	Meticillin	Erythromycin	Vancomycin	Amoxicillin
Jean Smith	Water	Water	Water	Water	Water
Tom Harris	10% HCl	5% HCl	1% HCl	0.05% HCl	5% HCl
Anne Jones	Water	Water	1% HCl	0.05% HCl	Water
Raj Nedoma	Water	0.05% HCl	0.05% HCl	0.05% HCl	Water

NB: It is extremely important to have the correct concentrations of HCl (antibiotics) for each patient.

3. Set up a work bench for the group as follows:
 - a. Place the appropriate patient's agar plate next to each corresponding rack of test tubes at 4 stations across the bench
 - b. A dropper for each test tube
 - c. A ruler with mm markings
 - d. It may be easier for students if they place each patient's agar plate on a piece of white paper and label the paper next to each bore hole with the antibiotic name.





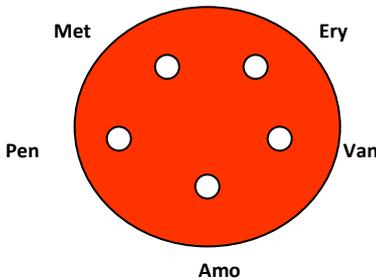
4.1 Treatment of Infection Antibiotics and Medicine

Teacher Answer Sheet

Plate Results

Patient	Organism sensitivity to antibiotics					Diagnosis
	Penicillin	Meticillin	Erythromycin	Vancomycin	Amoxocillin	
Jean Smith	✗	✗	✗	✗	✗	Influenza
Tom Harris	✓	✓	✓	✓	✓	Strep throat
Anne Jones	✗	✗	✗	✓	✗	MRSA
Raj Nedoma	✗	✓	✓	✓	✗	Staphylococcus infection

Plate Results Explained

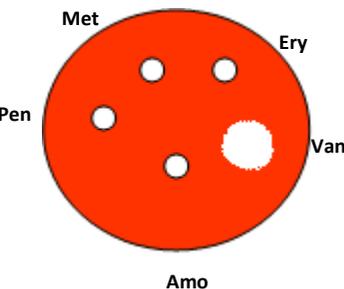
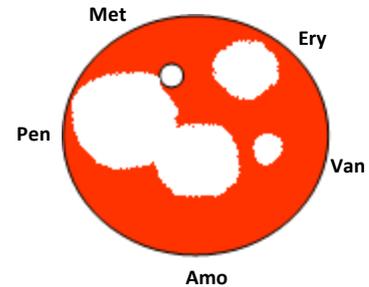


Jean Smith:

Influenza is caused by a virus and as such none of the antibiotics will have an effect as antibiotics can only be used on bacterial infections.

Tom Harris:

Sore throat infections are quite common and generally get better on their own. In severe cases, most antibiotics will treat this infection. Penicillin is the antibiotic of choice for this infection as the group of bacteria responsible (*Streptococcus*) have yet to develop a mechanism of resistance. Antibiotics should not be given unnecessarily for mild sore throats as 80% of sore throats are due to viruses and other bacteria can develop resistance during treatment.

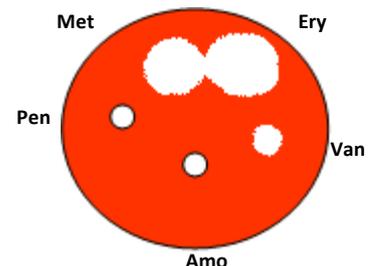


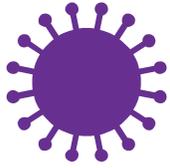
Anne Jones:

Meticillin Resistant *Staphylococcus aureus* (MRSA) infections are becoming increasingly difficult to treat. These *S. aureus* bacteria have developed resistance to Meticillin, the previous antibiotic of choice. Vancomycin is one of the last lines of defence against these potentially fatal bacteria however some organisms have been detected which also show resistance to this antibiotic!

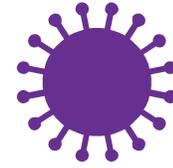
Raj Nedoma:

Penicillin was the first antibiotic discovered and produced, unfortunately many people viewed it as a 'wonder drug' and used it to treat many common infections. This resulted in the majority of *Staphylococcal* bacteria quickly developing resistance to this antibiotic. As Ampicillin is a derivative of penicillin *Staphylococcus* bacteria are resistant to it as well. Meticillin is the drug of choice for this sensitive *Staphylococcus* infection.





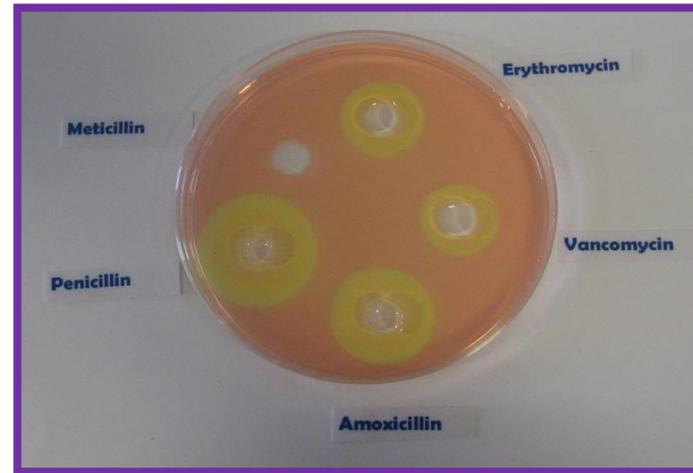
ANTIBIOTICS



Antibiotic Sensitivity Test Results



JEAN SMITH



TOM HARRIS

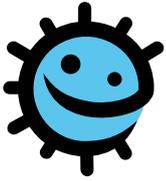


ANNE JONES

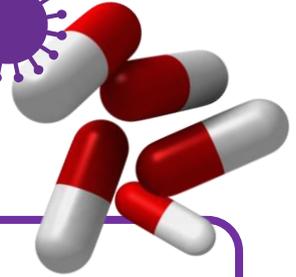


RAJ NEDOMA

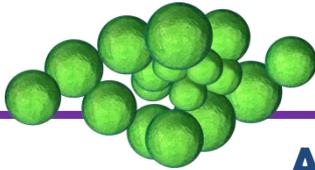




ANTIBIOTICS



e-Bug



Amy's Problem

Amy is on a summer work placement at the local hospital laboratory. It is her job to read the test results and fill in the paperwork for the doctor. Unfortunately Amy has mixed up some of the test results. Her results sheet shows the following:

Patient Name	Organism sensitivity to antibiotics					Diagnosis
	Penicillin	Meticillin	Erythromycin	Vancomycin	Amoxicillin	
Anne Jones						
Tom Harris						
Jean Smith						
Raj Nedoma						

(✓ sensitive – zone visible, ✗ not sensitive – no zone visible)

She has grown up the infectious organism isolated from each of the patients on agar plates. Can you repeat the antibiotic sensitivity test and identify which diagnosis is for which patient? In the results section below fill in the name of the patient that matches each diagnosis and which antibiotic you would recommend the doctor to prescribe.

Results

Patient A: _____

Patient B: _____

Flu (Influenza virus)	Zone of Inhibition Size (mm)
Penicillin	
Meticillin	
Erythromycin	
Vancomycin	
Amoxicillin	

Recommended antibiotic:

Strep Throat (Streptococcus)	Zone of Inhibition Size (mm)
Penicillin	
Meticillin	
Erythromycin	
Vancomycin	
Amoxicillin	

Recommended antibiotic:

Patient C: _____

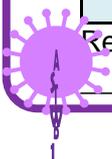
Patient D: _____

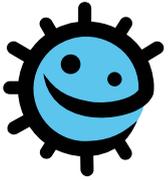
MRSA (Methicillin Resistant Staphylococcus aureus)	Zone of Inhibition Size (mm)
Penicillin	
Meticillin	
Erythromycin	
Vancomycin	
Amoxicillin	

Recommended antibiotic:

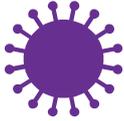
Staph Wound Infection (Staphylococcus aureus)	Zone of Inhibition Size (mm)
Penicillin	
Meticillin	
Erythromycin	
Vancomycin	
Amoxicillin	

Recommended antibiotic:

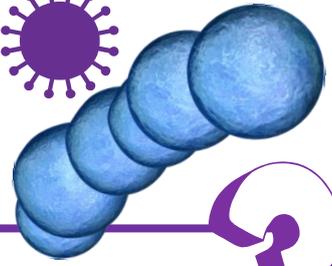




e-Bug



ANTIBIOTICS



Conclusions

1. Antibiotics don't cure the cold or flu, what should the doctor recommend or prescribe to patient A to get better?

2. Meticillin is normally the drug of choice for treating a Staphylococcal infection, what would happen to Patient C's infection if they had been prescribed Meticillin?

3. If you had some Penicillin left over in your cupboard from a previous sore throat, would you take them later to treat a cut on your leg that got infected? Explain your answer.

4. Patient D doesn't want to take the prescribed Meticillin for their wound infection.

*'I took more than half of those pills the doc gave me before
and it went away for a while but came back worse!'*

Can you explain why this happened?

