Antibiotic resistance awareness

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Antibiotic resistance awareness: spreading the word, not the worry

Antibiotic resistance and the emergence of multiple-resistant bacterial strains are a growing concern in UK clinics. Here, David Allison and Steven Hughes, from the Manchester Pharmacy School at the University of Manchester, reflect on an interactive workshop aimed to educate students on issues surrounding antibiotic misuse, the importance of hand-washing and the role of pharmacists in public health delivery.

It is both a cliché and a truism to state that antibiotic resistance has been around for as long as antibiotics have been used to treat bacterial infections. However, while early treatment failures did not represent a significant clinical problem because different types of antibiotics were available, it is the emergence of multiple resistance that is causing major problems in clinics today. Such problems are costly in terms of both patient health and expense to the National Health Service (NHS). Several factors have led to this situation, including the overuse and misuse of antibiotics, a failure to identify novel bacterial targets and an underestimation of the cunningness of bacteria to fight back.

In the absence of any new, effective antimicrobial, it is essential therefore to eliminate inappropriate antibiotic use, to limit the use of appropriate antibiotics to instances of real need and to ensure that patients comply with regimes for taking antibiotics. Pharmacists are ideally placed to engage fully with the general public in this area as they are knowledgeable about the mode of action of various antibiotics, their indications and mechanisms by which resistance arises. Moreover, pharmacists are more accessible than many general practitioners (GPs) and, as such, can use their knowledge and opportunity to raise awareness of the significance of antibiotic resistance among the general public and to discuss the rationale behind the guarded yet effective use of antibiotics.

In order to try and halt the rise of antibiotic resistance by raising awareness

of key issues, education and promoting good stewardship, the following student-led public engagement workshop was developed and delivered to Year 11 secondary school pupils in an attempt to arrest the overuse of antibiotics, as well as promote the role of the pharmacist.

TACKLING THE PROBLEM

Prior to delivering the workshop, a visit was made to the high school to distribute a questionnaire to a Year 10 (General Certificate of Secondary Education (GCSE)) class (15–16 years of age) in order to gauge their level of knowledge about antibiotics and antibiotic resistance and their preferred learning styles. From the feedback received, key issues that were identified for discussion included distinguishing between bacterial and viral infections, what antibiotic resistance is and how it can develop.

The two hour workshop, given to 25 pupils representing a cross-section of society, began with a brief introduction as to who we were and what we were going to do. This was followed by a brief PowerPoint presentation describing some of the key features of bacteria and viruses, including the almost obligatory images of various infections. A workbook was provided to supplement the key information to this and other aspects presented throughout the workshop. The aim for this part of the workshop was to get the pupils to understand the differences between bacteria and viruses and to appreciate that antibiotics are ineffective against viral infections. To reinforce this message, an interactive pub-quiz style activity was

used to gauge pupil understanding, the pupils working in teams to answer questions based on the material that had just been presented. Virtually every team scored very highly indeed.

To illustrate the concept of antibiotic resistance in bacterial terms, a visual demonstration involving different coloured balloons (red and yellow), a sewing needle and pupil volunteers was presented to the whole class. Essentially, the yellow balloons represented antibiotic-sensitive bacteria, the red balloons (which had a circle of masking tape stuck to them) represented antibiotic-resistant bacteria, while the needle represented an antibiotic. A volunteer was asked to 'pop' the yellow balloon with the needle, thereby representing killing of the bacterium. A second volunteer (it was amazing how many more pupils volunteered once they knew what was involved!) was then asked to do the same with the red balloon, but to try and stab the needle through the masking tape. This time the balloon did not burst, and it was explained that the red balloon had become resistant due to the presence of an additional factor, the masking tape, that was not present on the yellow balloons. In bacterial terms, the circle of masking tape was representative of a bacterial plasmid carrying an antibiotic-resistant gene. To further this concept, the spread of resistance was illustrated by randomly moving a mixture of red and yellow balloons and showing that when a red (resistant) balloon came into contact with a yellow (sensitive) balloon, resistance could be transferred. Never have so many 15-year-olds been so interested in playing with balloons!

Having established what resistance meant, a game of antibiotic resistance skittles was used to illustrate what would happen if antibiotics were used incorrectly. Each skittle represented a different bacterial species and the ball an

antibiotic. The idea was to roll the ball (antibiotic) at the skittles. Those that were knocked down were susceptible, while those that remained standing were resistant. A discretely placed piece of Velcro helped some skittles (e.g. Methicillin-resistant *Staphylococcus aureus* (MRSA)) to remain resistant. Removing the second or third ball from the participant before they could roll it represented stopping the course of antibiotics too soon. To add in another concept, a volunteer was then asked to bowl a rugby-shaped ball at the skittles. This ball symbolised the wrong antibiotic being used to treat the bacterial infection. Due to the rugby ball's shape, when the pupil bowled it, the ball went off in a random direction and completely missed all of the skittles.

Having explained the role of the pharmacist in preventing the misuse of antibiotics, at this juncture, an alternative approach to infection control was introduced, namely that of infection prevention. Given that many infections are spread by unclean hands, an ultraviolet (UV) glow gel was used to model microbial transmission and contamination. The gel is invisible to the naked eye but glows fluorescent under a UV light. Traditionally, glow gel materials have been used by pharmacists training in aseptic techniques, so they make an excellent and safe material to mimic bacterial contamination.

The first exercise involved using the glow gel to mimic the effect of sneezing with a small amount of the gel being applied to the palm of a volunteer pupil. They shook hands with the pupil sitting to their right who then shook hands with their neighbour, until a round of handshakes had occurred among a group of five to six pupils. A small hand-held UV torch was then used to visualise UV particles ('bugs') on the pupils' hands. They were quite shocked to see that in most cases the particles were

transmitted to at least the fourth individual in the chain.

Having established how easily microorganisms can be acquired and spread, the glow gel was then used to demonstrate the correct hand-washing technique. Small amounts of the gel were applied to every pupil's hands and visualised in a UV glove box. The pupils then washed their hands in their normal manner before re-visualising under the UV lamp where fluorescent nails, wrists and occasionally areas of the palms were prominent. Results from these two activities were used to explain to pupils the difference between resident, beneficial bacteria and transient, possibly harmful microorganisms and the importance of good hygiene practice. In essence, fewer infections mean a lowered use of antibiotics.

To conclude the workshop, pupils took part in a summary quiz conducted in the style of the popular TV programme 'Countdown' where nine words connected to the workshop contents were presented, and the class given 30 seconds to individually reassemble each word into the correct form. Key aspects to infection control, prevention and antibiotic guardianship were re-emphasised in this simple but fun activity. Finally, pupils were strongly encouraged to pledge their support and even get their family and friends to sign up to the Antibiotic Guardianship website.¹

A POSITIVE WAY FORWARD

The lesson was judged an overwhelming success, with the class teachers and virtually all of the pupils thoroughly enjoying the activities. We were even asked whether we could return the following week to present the workshop to another Year 10 class, with the class teacher saving a copy of the presentation to use with future classes. In the absence of any new class of antibiotic coming onto the market, an alternative approach to tackling antibiotic resistance is required. In the United Kingdom, the emphasis on antibiotic stewardship remains fixed on health promotion and education, through improving awareness and encouraging the appropriate and proper use of antibiotics. As such, the overall aim of this trial workshop was to raise awareness of antibiotic resistance development in the hope that specific, targeted education to a young and receptive audience will eventually help arrest the global overuse of antibiotics and to halt the rise of antibiotic resistance. The main emphasis for this workshop, therefore, was to ensure that all of the pupils left knowing that all microorganisms are not created equal and that antibiotics work against bacteria, not viruses. When needed, antibiotics should be used wisely and hand-washing is the best way to stop the spread of infection, prevention being better than cure. Pharmacists have an increasing role in public health delivery, and workshops such as this, with little in the way of resource implications, provide an excellent educational vehicle to deliver key and (hopefully) lasting messages.

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Reference

1. Antibiotic Guardian. Available online at: <http://antibioticguardian.com/> (Last accessed 18th May 2015).