Antibiotics legitimately available in over-counter throat medications could contribute to increased resistance

April 12 2019

Credit: CC0 Public Domain

New research presented at this year's European Congress of Clinical Microbiology & Infectious Diseases (ECCMID) in Amsterdam, Netherlands (13-16 April) shows that the inappropriate of use of

antibiotics legitimately available in over-the-counter (OTC) throat medications could be contributing to antibiotic resistance, thereby going against World Health Organisation (WHO) goals.

Certain OTC products aimed at treating sore throats contain topical antibiotics, and medications of this type are widely available around the world, including in the UK and many other European countries. This study, commissioned by Adrian Shephard of Reckitt Benckiser Healthcare Ltd, was conducted by researchers from the School of Pharmacy and Pharmaceutical Sciences at Cardiff University, UK and aimed to understand the development of bacterial resistance to four different topical antibiotics (gramicidin, neomycin, bacitracin and tyrothricin) commonly used in some OTC sore throat medicines.

The team examined four species of bacteria in which antibiotic resistance is a widespread and significant problem; *Staphylococcus aureus*, *Acinetobacter baumannii*, *Streptococcus pyogenes* and *Haemophilus influenza*. Cultures of each species were exposed to decreasing concentrations of antibiotic for 24 hours at human body temperature (37°C), and surviving bacteria were sub-cultured and tested for antibiotic susceptibility. The researchers also looked into cross-resistance, where bacteria exposed to one antibiotic can become less susceptible to a different antibiotic to which they may not have previously been exposed.

The researchers wanted to check whether the in-use concentrations of antibiotics in OTC medicines was above the minimum inhibitory concentration (MIC); the lowest concentration of a drug that is still able to prevent bacterial growth. They found that for *S. aureus* and *A. baumannii* the in-use concentrations of neomycin, bacitracin and tyrothricin were all above the MIC, confirming that these products were effective at preventing bacterial growth. No MIC could be determined for gramicidin, indicating that none of the concentrations tested were

able to prevent growth of those two species of bacteria. For *S. pyogenes* and *H. influenza* MIC values for all the tested antibiotics were below in-use concentrations in OTC throat medicines, with *H. influenza* being unable to grow in any of the antibiotics and concentrations tested, and *S. pyogenes* only exhibiting growth in very weak concentrations (5% and 1% of those found in medicines) of neomycin.

When *S. aureus* was exposed to bacitracin, it eventually showed growth after 144 hours at higher concentrations, and a culture grown in a lower concentration of the drug was discovered to have decreased susceptibility to gentamicin, fusidic acid, and ciprofloxacin, indicating that it had developed cross-resistance.

"We were concerned to find that some of the OTC antibiotics used in sore throat preparations were not sufficiently concentrated to prevent growth of common human pathogens and are enabling these pathogens to develop resistance. In addition, exposure to both standard and diluted concentrations of bacitracin was associated with clinical cross-resistance to other antibiotics," says Shephard. "Our work raises doubt about the continued OTC availability of these antibiotics for the treatment of sore throats, especially considering the primarily viral nature of the condition."

"This was an interesting study that showed once again the potential of bacteria to adapt to chemotherapeutic antibiotics highlighting the need for a prudent and perhaps controlled use of antibiotics in practice,"adds co-author Jean-Yves Maillard, Professor of Pharmaceutical Microbiology, School of Pharmacy and Pharmaceutical Sciences, Cardiff University, UK.

To date, the authors say that only products containing the antibiotic fusafungine have been removed. A wide range of other OTC products containing antimicrobials remain available across Europe (see notes to

editor below).

Provided by European Society of Clinical Microbiology and Infectious Diseases