

# The combination of sugar with antibiotics may hold hope for treatment of persistent bacterial infections

Combining sugar with antibiotics may increase the efficacy of drug treatments for persistent bacterial infections, whilst considerably cutting healthcare costs.

Researchers at Boston University (MA, USA) have found a low-cost and effective way of improving treatment for chronic bacterial infections, including *Staphylococcus* and infections of the urinary tract, using sugar. It was discovered that the compound dramatically improves the effectiveness of first-line antibiotics.

Some subpopulations of bacteria are capable of surviving antibiotic treatment in chronic and recurrent infections and are known as 'persisters'. They enter a metabolic hibernation and essentially shut down completely, enabling them to survive antibiotic treatment. Therefore, a patient can often think they have recovered after intensive antibiotic treatment, but a few weeks or months later these persisters will reanimate, often in a more aggressive form than in the initial infection, causing the patient to relapse.

In order to effectively combat infectious diseases, this persistence of bacteria needs to be overcome to prevent infections lasting for extremely long periods of time and to eliminate the possibility of the infection spreading to the kidneys and other organs.

Lead author of the research, James Collins, and colleagues have discovered that these persisters can be stimulated into an active state using sugar combined with an antibiotic, which renders them just as vulnerable to the antibiotic treatments as the rest of the community who were unable to switch off, resulting in their death. The team applied this combination of sugar and antibiotics to the treatment of *Escherichia coli* infection in the urinary tract and found that 99.9% of the bacteria were killed in 2 h, compared with no effect when sugar was not included in the treatment. The combination treatment was also as effective in *Staphylococcus aureus* infections.

People who suffer from persistent, ongoing infections may now potentially have a hope that the combination of sugar with their antibiotic treatment may permanently cure them. In addition, speeding up and increasing the efficacy of the treatments will reduce healthcare costs substantially.

The researchers are going to investigate the potential use of combining sugar with tuberculosis treatments, to improve efficacy. When asked to comment on the work for *Future Microbiology*, Collins said, "Our work establishes an inexpensive metabolite-based method for eradicating persistent bacterial infections. We are hopeful this approach will be relevant to a wide range of troublesome infections, including persistent tuberculosis."

Sources: ScienceDaily: [www.sciencedaily.com/releases/2011/05/110511134215.htm](http://www.sciencedaily.com/releases/2011/05/110511134215.htm); Allison KR, Brynildsen MP, Collins JJ. Metabolite-enabled eradication of bacterial persisters by aminoglycosides. *Nature* 473, 216–220 (2011).

## Priority Paper Alerts

Raghwani J, Rambaut A, Holmes EC *et al.* Endemic dengue associated with the co-circulation of multiple viral lineages and localized density-dependent transmission. *PLoS Pathog.* 7(6), E1002064 (2011).

Dengue fever is an important human disease, and a major problem in tropical areas. Despite this, knowledge regarding transmission of the dengue virus and what causes this disease is limited. This study details a phylogeographic analysis of 751 genome sequences of dengue 1 virus in southern Vietnam from 2003 to 2008 in both rural and urban areas. This analysis showed that the virus exhibited strong spatial clustering in the areas examined, with multiple viral lineages circulating in the urban area. This coexistence implied similar fitness across the strains, which were believed to originate in Cambodia and then spread from urban to rural areas, with densely populated regions of Ho Chi Minh City being the major transmission foci. The slow overall dispersion of the virus (~20 km/year) was taken to suggest that mosquitoes were the main dispersal vector, and that this should be a priority for control measures in the densely populated urban environment.

Vijaykrishna D, Smith GJ, Pybus OG *et al.* Long-term evolution and transmission dynamics of swine influenza A virus. *Nature* 473(7348), 519–522 (2011).

While swine influenza is a topic that receives a great deal of attention thanks to its significant economic impact on farming, as well as recent influenza pandemics, there are relatively few long-term studies of the evolution of these viruses. This study helps to remedy this by examining the evolution and transmission of swine influenza A in a systematic, longitudinal manner. Researchers examined more than 650 viral isolates and more than 800 samples of swine sera collected over 12 years of systematic surveillance in Hong Kong, as well as additional data from the last 34 years. It was found that transmission among different continents has led to increased antigenic drift and viral diversity, changing the overall population dynamics. The data obtained in this study may well prove useful in predicting the emergence of epidemic or pandemic influenza strains.