

New viruses to treat bacterial diseases

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Viruses found in the River Cam in Cambridge, famous as a haunt of students in their punts on long, lazy summer days, could become the next generation of antibiotics, according to scientists speaking today at the Society for General Microbiology's 161st Meeting at the University of Edinburgh, UK.

With antibiotics now over-prescribed for treatments of bacterial infections, and patients failing to complete their courses of treatment properly, many bacteria are able to pick up an entire array of antibiotic resistance genes easily by swapping genetic material with each other.

MRSA – the multiple drug resistant strain of *Staphylococcus aureus* - and newly emerging strains of the superbug *Clostridium difficile* have forced medical researchers to realise that an entirely different approach is required to combat these bacteria.

“By using a virus that only attacks bacteria, called a phage – and some phages only attack specific types of bacteria – we can treat infections by targeting the exact strain of bacteria causing the disease”, says Ana Toribio from the Wellcome Trust Sanger Institute in Hinxton, Cambridgeshire, UK. “This is much more targeted than conventional antibiotic therapy”.

The scientists used a close relative of *Escherichia coli*, the bacterium that commonly causes food poisoning and gastrointestinal infections in humans, called *Citrobacter rodentium*, which has exactly the same

gastrointestinal effects in mice. They were able to treat the infected mice with a cocktail of phages obtained from the River Cam that target *C. rodentium*. At present they are optimizing the selection of the viruses by DNA analysis to utilise phage with different profiles.

“Using phages rather than traditional broad-spectrum antibiotics, which essentially try to kill all bacteria they come across, is much better because they do not upset the normal microbial balance in the body”, says Dr Derek Pickard from the Wellcome Trust Sanger Institute. “We all need good bacteria to help us fight off infections, to digest our food and provide us with essential nutrients, and conventional antibiotics can kill these too, while they are fighting the disease-causing bacteria”

Phage based treatment has been largely ignored until recently in Western Europe and the USA. The main human clinical reports have come from Eastern Europe, particularly the Tbilisi Bacteriophage Institute in Georgia where bacteriophages are used for successful treatment of infections such as diabetic ulcers and wounds. More studies are planned along western clinical trial lines with all the standards required.

“The more we can develop the treatment and understand the obstacles encountered in using this method to treat gut infections, the more likely we are to maximise its chance of success in the long term”, says Ana Toribio. “We have found that using a variety of phages to treat one disease has many benefits over just using one phage type to attack a dangerous strain of bacteria, overcoming any potential resistance to the phage from bacterial mutations”.

“This brings us back to the problem we are trying to address in the first place. If anything, conventional antibiotic treatment has led to MRSA and other superbug infections becoming not only more prevalent but also more infectious and dangerous. Bacteriophage therapy offers an alternative that needs to be taken seriously in Western Europe”, says

Derek Pickard.

Source: Society for General Microbiology

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