



Bacteriophage Therapy: An Alternative Approach to Antibiotic Therapy

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Editorial

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Editorial

The worldwide spread of pathogenic bacteria that are resistant to a variety of antibiotics and the significant problems involved with their control threaten to reduce modern medicine to a state reminiscent of the pre-antibiotic era. Although novel antibiotics directed against such drug-resistant bacteria can be developed when extensive funds are committed for research but the pathogens will ultimately become resistant to the new drugs. Thus to break this vicious cycle, it has become necessary to adopt chemotherapy-independent remedial strategies to combat bacterial infections and this approach points at the bacteriophages.

A bacteriophage (Bacterio= bacteria; Phage= eater) is a type of virus that infects bacteria. In fact, the word "bacteriophage" literally means "bacteria eater," because bacteriophages destroy their specific host cells. All bacteriophages are composed of a nucleic acid molecule that is surrounded by a protein structure. Phages were officially discovered by French scientist Felix d'Herelle in 1917, but their anti-bacterial action (Phage therapy) was identified much earlier in 1896 in the water of rivers Ganga and Yamuna.

Phages Therapy as Alternatives to Antibiotics Therapy

The recent increase in antibiotic-resistant bacterial strains has become a serious threat to the treatment of infectious diseases. The time for antibiotic resistance to develop differs for each antibiotic. Phage therapy or viral phage therapy is defined as the therapeutic use of bacteriophages to treat pathogenic bacterial infections. Phage therapy has many potential applications in human medicine as well as dentistry, veterinary science, and agriculture. If the target host of a phage therapy treatment is not an animal,

the term "biocontrol" (as in phage-mediated biocontrol of bacteria) is usually employed, rather than "phage therapy". Phages also have several advantages over antibiotics. They are

1. Ecologically safe (i.e. harmless to humans, plants and animals).
2. Phage preparations are readily producible.
3. Easy to apply and
4. Show no apparent adverse reaction to multi-component phage preparation (sometimes called 'cocktails').

Consequently, the growing incidence of antibiotic-resistance pathogens has led scientists and physicians to examine the possibility of developing phage therapy as an alternative, but reliable, treatment. The Anatomy and infection cycle of phage T4 is as follows in figure 1 and Comparison between bacteriophage and antibiotics along with advantages of bacteriophages over antibiotics.

In comparison of bacteriophage therapy with antibiotic therapy, the bacteriophages therapy have been reported various advantages such as phages are the most abundant living entities on the planet and are natural enemies of bacteria also are considered 'ecologically pure, humans are exposed to phages specificity, their use is not likely to select for phage resistance in other (non- target) bacterial species, no side effects of phage application have been described despite decades-long use for human therapy, phages are self-regulating tools they continue to multiply and start decreasing as soon as bacterial cells are eliminated, the pharmacokinetics of bacteriophage therapy is such that the initial dose increases exponentially if susceptible bacterial host is available and thus no repeated dosages are required, phages are found in nature and thus makes it easy to find

new phages when bacteria become resistant to it and phages may be considered as good alternative for patients allergic to antibiotics. Whereas, the antibiotics are to be synthesized are not natural. Antibiotics show multiple side effects, including intestinal disorders, allergies and secondary infections (e.g. yeast infections), the concentration of an antibiotic introduced into the human organism decreases with time, repeated doses of antibiotic is required to cure the bacterial disease, developing a new antibiotic is a time consuming process and may take several years to accomplish and if patient is allergic to antibiotic, treatment is very difficult.

Phages are currently being used therapeutically to treat bacterial infections that do not respond to conventional antibiotics, particularly in Russia and Georgia. There is also a phage therapy unit in Wroclaw, Poland, established 2005, the only such centre in a European Union country.

In an endeavour to address the need to limit the emergence and spread of antimicrobial resistance (AMR), Vitalis Phage Therapy has recently been launched in India. The initiative has been developed by Pranav Johri, who underwent phage therapy himself to successfully treat his antibiotic-resistant infections. Vitalis Phage Therapy facilitates phage therapy offered by the Eliava Institute of Bacteriophages, Microbiology and Virology in Tbilisi, Georgia for patients from India.

AMR is already a health emergency in India. Every year, an estimated 58,000 newborn children die due to sepsis as antibiotics fail to treat bacterial infections. In April 2017, National Action Plan on Antimicrobial Resistance (2017-21) was announced along with the Delhi Declaration on antimicrobial resistance, a joint declaration endorsed by 12 ministries to adopt a collaborative approach on prevention and containment of antibiotic resistance in the country.

Vitalis Phage Therapy facilitates treatment in two

ways; one is an 'in-clinic treatment' at the Eliava Phage Therapy Center (EPTC) in Georgia, where comprehensive diagnostic tests, followed by phage treatment, take place under the care of experienced phage doctors. The second is a 'distance treatment', in which the patient can send samples for diagnostic testing to the institute's diagnostic lab, and based on the test result, the clinic sends sensitive phage medicines for the patient's treatment. The treatment is then administered under the care of the patient's local doctor in India. "We have facilitated both ways of treatment for Indian patients – in-clinic as well as distance", says Pranav Johri. He adds, "People suffering from urinary tract infections, kidney infections and prostatitis have taken phage therapy and have seen successful eradication of their infections."

Vitalis Phage Therapy has created systems to remove the hurdles faced by Indian patients wanting to take phage therapy at EPTC. "Pranav was our first patient from India and the interest in phage therapy from India is growing significantly since we have started a partnership with him", says Dr Naomi Hoyle, International Patient Coordinator of the Eliava Phage Therapy Center. Over 20 patients have taken phage therapy at EPTC through Vitalis in the last year.

To make the treatment more accessible for Indian patients, Vitalis Phage Therapy is working towards tying up with local diagnostic laboratories to conduct phage sensitivity tests on bacterial cultures. This will reduce the time taken for testing and make it easier for patients suffering from bacterial infections to take phage therapy (web page: <https://www.expresshealthcare.in/infection-control/indian-healthcare-space-welcomes-initiative-to-curb-antibiotic-resistance/409626/>).

The VIJ is a scientific journal with essential information for various scientists, including advance students teaches and well as research scientist in the field of microbiology especially in virology and immunology.

