

# A REVIEW ON MEDICINAL AND ANTIBACTERIAL EFFECTS OF GANGA RIVER WATER

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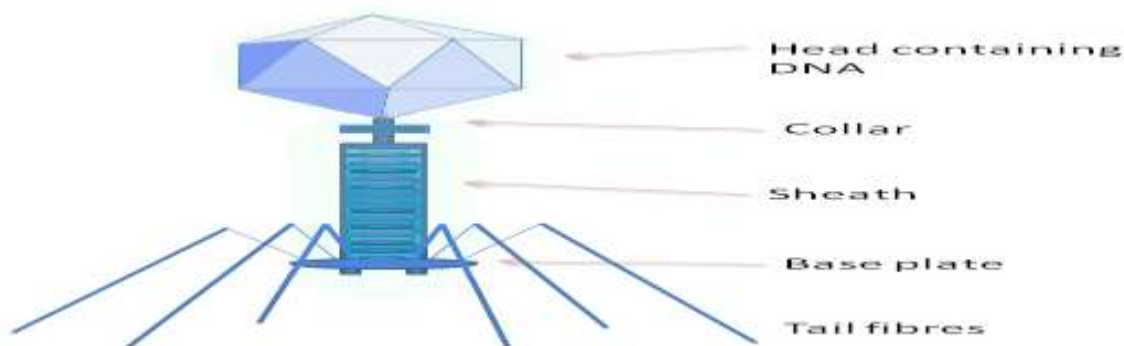
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**ABSTRACT :** *Hindus have always believed that water from India's Ganges River has extraordinary powers. The Indian emperor Akbar called it the "water of immortality" and always traveled with a supply. The British East India Co. used only Ganges water on its ships during the three-month journey back to England, because it stayed "sweet and fresh." Indians have always claimed it prevents diseases, but are the claims wives' tales or do they have scientific substance? In the fourth installment of a six-part series, independent producer Julian Crandall Hollick searched for the "mysterious X factor" that gives Ganges water its mythical reputation. He starts his investigation looking for the water's special properties at the river's source in the Himalayas. There, wild plants, radioactive rocks, and unusually cold, fast-running water combine to form the river. But since 1854, almost all of the Ganges' water has been siphoned off for irrigation as it leaves the Himalayas.*

## MANUSCRIPT :

Ganges is a lifeline to millions of people in India and the backbone of spiritual life for the country's Hindu majority. Many believe the river is self-cleansing and has healing powers. Indeed, its water has demonstrated bactericidal activity (the ability to kill bacteria). And although this mystery is still unfolding, it appears to be related to bacteriophages (or phages). And these viruses that infect and kill bacteria could provide a useful alternative to antibiotics in the form of phage therapy. Known as the national river of India, the Ganges originates in the western Himalayas and flows to Bangladesh. The river has great spiritual significance to Hindus, who worship it as the goddess Ganga. Its water, popularly called "Ganga Jal", is considered sacred and is used in many religious rituals. From a scientific perspective, the mysterious claim that the Ganges possesses self-cleansing and healing properties is particularly interesting. In fact, the river has been shown to have antibacterial properties and it can retain high amounts of dissolved oxygen, even in extremely polluted conditions. As early as 1896, the British bacteriologist Ernest Hankin studied the bactericidal properties of Ganges water. He found that colonies of cholera bacteria that thrived in tap water quickly died in Ganges water. He pursued his experiment by using boiled Ganges water and filtered Ganges water. To his surprise, while the filtered water continued to show an antibacterial effect, the boiled water did not. This clearly indicated that the factor responsible for the water's bactericidal properties was heat labile (altered by heat) but not filterable, at least not with the porcelain Pasteur filters Hankin used in his experiment. Two decades later, a Canadian microbiologist identified the factor that may explain the mystery of the Ganges. In 1916, Felix d'Herelle was working at the Institut Pasteur in Paris when he discovered phages. Phages are composed of proteins that trap genetic material. They also exhibit properties—difficult to filter and heat labile—that correspond perfectly to what Hankin had observed in Ganges water. This suggests the Ganges is heavily populated with phages. They are essentially harmless to humans because they are highly strain specific. For example, phages that infect the cholera bacterium can only infect the cholera bacterium and no other bacteria. Of course, the fact these phages often target bacteria that cause deadly diseases is an added bonus. Phages are also a potential tool for treating diseases caused by bacteria. In particular, their specificity is something antibiotics do not possess. In other words, unlike antibiotics, phages can neatly kill the pathogen without harming the natural flora also present in the body (like the lactobacilli in your gut, which aid digestion). The development of phage therapy was attempted in the United States during the early 20th century. However, it was discontinued because of a limited understanding of phages, as well as the arrival of cheaper antibiotics. [ 1 ]



(Structure of a typical bacteriophage)

Concern over the prevalence of active pharmaceutical agents and subsequent occurrence of antimicrobial resistance in the environment is increasing. Incorruptible ability of Ganga water was evaluated using fresh, 8-year-old, and 16-year-old Ganga water samples spiked with pathogenic *Escherichia coli* serotype O157:H7. Survival of *E. coli* O157:H7 over the course of the experiment was 3, 7, and 15 days for fresh, 8-year-old, and 16-year-old Ganga waters, respectively. On the contrary, in Milli Q water the decline in viable count of *E. coli* O157:H7 up to 30 days was only 2 log units. Survival of *E. coli* O157:H7 was greater in boiled water compared with water after passage through a 0.2-microm-pore-size membrane filter, indicating involvement of heat-labile agents influencing survival of *E. coli* O157:H7 in Ganga water, which seems to indicate the role of antimicrobial peptides. Functional diversity of Ganga water's native microbial community structure as assessed with Biolog Eco plates was not affected even in the presence of a 5-fold log units higher pathogenic load of *E. coli* O157:H7. These findings suggest that Ganga water has certain novel antimicrobial attributes, besides its remarkable fluidity, which may provide a much-needed basis for the development of new antimicrobial compounds.[2] There are two major factors which give Ganges its unique ability.

1. The presence of Bacteriophages which gives it the anti-bacterial nature.

Bacteriophage are those viruses which kill bacteria. The waters of Ganga when added to other water resources in adequate amount, causes the bacteriophage in it to quickly multiply cleaning the new water resource of any bacteria present in it. Which is why the ancient Indians used to take Ganga jal back home to clean their local water resources! Also, the water of river Ganga can be an alternative for using antibiotics to treat bacterial diseases! Ancient Indians who used the water of rivers like Ganga never required any antibiotics, for the very water they used was anti-bacterial in nature!

2. An unknown factor called the Mystery Factor, which gives this river an unusual ability to retain dissolved oxygen from the atmosphere! The Ganges' self-purifying quality leads to oxygen levels 25 times higher than any other river in the world. The high levels of oxygen in the waters of Ganga gives it the unique ability to remain fresh over a prolonged period of time. [3]

3. Its fast flowing nature combined with low temperature ( $\approx 5$  degree Celsius) gives it many unique qualities like mosquitoes can't breed in it, things can be refrigerated ( Seen in Rishkesh where Milkman used dip Milkcans in it to reduce temperature hence preserving food items).

### Water of Ganges has Anti-putrefaction properties

C.E. Nelson, another British physician noticed that, the waters of Ganga when taken even from one of its dirtiest mouths at Hooghly, by the ships returning to England, remained fresh throughout the long journey!! Normally river water begins to putrefy over a period of time due to lack of oxygen which promotes the growth of anaerobic bacteria, which in turn gives rise to the smell of stale water.

### How River Ganga cleans the dead bodies

In 1927, Flix dHerelle, a French microbiologist, was amazed when he saw that only a few feet below the bodies of persons floating in the Ganga who had died of dysentery and cholera, where one would expect millions of germs, there were no germs at all! In other words, Hindus had for thousands of years rightly believed that Ganga purifies the dead bodies, which is why probably the bodies of even those who died of infectious diseases were offered to this river for purification![4] In other words, the water of river Ganga can be an alternative for using antibiotics to treat bacterial diseases! Ancient Indians who used the water of rivers like Ganga never required any antibiotics, for the very water they used was anti-bacterial in nature! This type of Bacteriophage Therapy has been suggested by many researchers, but rarely tried/tested or practised in the health industry. In fact it was in the former Soviet Union that the most active research about using bacteriophages to treat bacterial diseases was done at the George Eliava Institute! This research institute was co-founded by George Eliava and Felix DHerelle after DHerelle introduced Eliava to the wonderful world of Bacteriophages.



A man gathers water from the Ganges River at Har-ki-pairi ghat in Haridwar.



**Clear spots on the petri dish mark where phages have destroyed bacteria in a sample of water taken from the Ganges River.**  
[5]

significant number of founding studies on Ganges were carried out mainly by British and French microbiologists. Such studies on Ganges led to the introduction of bacteriophages to the world. Bacteriophages are the prokaryotic viruses that solely infect and/or destroy the bacteria. Bacteriophages were associated with the special property of river Ganges [6,7].

Interestingly, our study for the first time has shown the presence of bacteriophages against putrefying and pathogenic bacteria in the waters of Ganges even at its origin. The origin of river Ganges is known as Gomukh. Gomukh is also unique, as observed during the sampling, loads of sediment gushes out in force along with water at this origin site which is due to the melting permafrost. Typically the Himalayan permafrost [8] melts and forms the origin of Ganges. We believe the bacteriophage trapped at a much earlier time scale in the Himalayan permafrost as abiotic particles are being released gradually with the melting permafrost, thereby making a seed source of bacteriophage at Gomukh. To the best of our knowledge this is the first ground breaking finding of its kind. [9] Back when the Ganga was unpolluted, it was rich in sulphur and natural germicides. This meant that taking a dip in the river would rid the people of common and preventable skin diseases and elongate life.

#### **Conclusion:**

Today, phage therapy is once again being researched at a time when antibiotic resistance is becoming a major concern, Many strains of bacteria have become resistant to antibiotics because of the misuse or overuse of the antibiotics themselves. Therefore, the potential of phage therapy as a replacement for antibiotics is very promising. From the Ganges' longstanding reputation for self-cleansing to a potential solution for antibiotic resistance, phages and phage therapy bridge the gap between an ancient belief and modern medicine.

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