PalArch's Journal of Archaeology of Egypt / Egyptology

BACTERIOPHAGES IN HUMAN PATHOGENS

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Deepika.R, N.P. Muralidharan*, A.K. Anjali. BACTERIOPHAGES IN HUMAN PATHOGENS--Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(7), 755-765. ISSN 1567-214x

Keywords: Bacteriophages, Human Pathogens, Phage therapy, lysis, Antibiotic resistance

ABSTRACT

The Bacteriophages are viruses that infect and destroy Bacteria of human pathogens causing diseases. The Bacteriophages are considered to be acting as an alternative Antibiotics resistance to control Bacterial infections. These Bacteriophages are composed of Nucleic acids covered by encapsulated protein structure. The Bacteriophage commonly represents the term "Bacteria Eater". These are of different types which provide for different lytic phages of organisms. As a coin of two sides, it also has disadvantages, that includes at low pH they cannot survive, it also seems to be costly and a long period. As of late, we see that multidrug-safe microbes have become a worldwide danger, and phage treatment is informed as a superior source concerning the treatment and an option to antibiotics. Phage show is at present allowing the change of phages into vehicles (nanocarriers) for chemotherapeutic prescription movement by the association of drugs to the phage surface and presentation of peptides outwardly of that phage with a disposition to a ligand of intrigue. Thus Bacteriophages proving it to be also evident in genomics and biotechnology to provide efficient treatment. Thus, further researches are made by unraveling their hidden importanc

INTRODUCTION

The Bacteriophages are usually a kind of virus that infects and destroys the Bacteria. The word "Bacteriophage" itself determines the meaning was "Bacteria Eater" where the Bacteriophage eats up the Bacteria it sticks on, thus

it destroys the host cells. The Bacteriophages are first primarily composed of nucleic acids that are surrounded by a protein structure. The Bacteriophage also involves a process of lysis where it assembles and bursts out of bacteria. Bacteriophages remove a portion of host-cell bacterial DNA and transfer to the new host cell. The process is known as transduction (1). The phages were then found to be used as antibacterial agents, The use of phages was continued after the first treatment after the Second World war where the Phage therapy was introduced (2). The Bacteriophage is more effective against the species of *P. aeruginosa* for ear treatment, helpful in detecting *E.coli* in the human body and *Salmonella typhi*, etc. The Bacteriophages are most commonly present in the human gut, intestine, etc. These normally do not affect the human cells but its pathogenicity is activated towards certain infections and its virulence. Human pathogens are considered as a pathogen of microbes that cause disease. In this developing field, there are a lot of new roles invented with Bacteriophages. Bacteriophages are developed in different fields. Thus Bacteriophages play a most significant role in phage therapy thus proving it to be an alternative to antibiotics against the human pathogens (3).

The Previous study includes as persistence of viral pathogens and bacteriophage effect, This states as bacteriophages that are not fecal indicator organisms and establishes effect against human pathogens indicated (4). According to the study, Bacteriophage has these pathogenic factors which of the Bacterial viruses produce it to have diagnostic effects and therapeutic intervention (5). The further studies included Bacteriophages were also used to control *E.coli, Salmonella,* Listeria and thus providing enormous applications (6,7).

The lacunae for this study include as, this study describes more information on origin, popularity, disadvantages. Thus this study is provided to enhance more information and application-based knowledge gain on bacteriophages in human pathogens.
Thus this study aimed to uncover the hidden importance of the role of Bacteriophages in human pathogens. And also to know the application and the prevalence status of the Bacteriophages.

BACTERIOPHAGES:
The Bacterial viruses are known to be the Bacteriophages are unrecognized species of virome which are present commonly in the human gut, and intestine produces specific effects against bacterial species, causing diseases (8). Bacteriophages have their unique property of position in biology, representing an absolute majority of all organisms in the biosphere. There is also a need for isolation and comparative analysis in genomics (9). The Environmental monitoring of the bacterial species and the control based on the phage-based biosensors were currently developed (10). Bacteriophages were primarily used in curing Bacterial infections (11). These Bacterial viruses play a major role in ear infections treatment caused by *P. aeruginosa* that are isolated which is widespread from different sources (12).

ORIGIN OF BACTERIOPHAGE:

The concept of Bacteriophage started in 1915, at the infection with diarrhea. The progress of research under Bacteriophage was extended which made the lysogeny discovery after a while. Thus After which structure was invented, which include nucleic acid covered by protein structure, later on lead to the development of phage virology and its effect against the bacterial species were made to be significant. phage therapy was then introduced which then proved to be an alternative for many antibacterial antibiotics (13). Bacteroidesfragilis HSP40 phages have been identified in waters with different degrees of fecal tainting of the human birthplace. The normal quantities of *B. fragilis* phages present in sewage water arrived at 5.3 x 10 per 100 ml of water. We found a number multiple times lower in a stream sullied with household sewage just, in which the degrees of fecal coliforms and fecal streptococci were multiple times lower than those found in crude sewage. *B. fragilis* phages were not found in noteworthy numbers in slaughterhouse wastewaters. They were absent in fecal-dirtied waters containing fecal defilement from natural life as it were. Even though the quantity of *B. fragilis* phages present in polluted waters was lower than the number of coliphages, their essence demonstrated human fecal defilement. It is additionally indicated that Bacteroides phages are just ready to duplicate under anaerobic conditions within the sight of supplements, and they can't increase in normal waters and residue.

USES OF BACTERIOPHAGES:

Bacteriophages at present are used in genomics and play a vital role where the Bacteriophages of having genome forms a bridge between the viral and bacterial genome species (14). Bacteriophages also play as a safety tool for the biocontrol against the species of Campylobacter controlling its pathogenicity (15). The Bacterial populations are subjected to constant predation Pressure by the phages transition which acts as a simple defense mechanism (16). The Bacteriophage acts as an alternative activity to the antibiotics and helps in the treatment of nosocomial infection against the pathogens (17). It also provides suppository forms of Bacteriophages in the analysis of pharmacokinetics (18). The utilization of bacteriophages (phages) to treat bacterial diseases, known as phage treatment, has a history generously longer than that of antimicrobials, yet these medications have been the treatment of decision in the West for more than 60 years attributable to viability, low harmfulness, and simplicity of creation. Microscopic organisms are getting progressively impervious to anti-toxins while endeavors to find new specialists have radically diminished. Phages have co-developed with their hosts more than billions of years and have procured systems to counter bacterial barriers, for example, extracellular biofilm creation, which seriously lessens the viability of traditional anti-infection agents. Ongoing creatures and human preliminaries demonstrate phages to be sheltered, very much endured specialists with a splendid future as an option in contrast to compound operators.

HUMAN PATHOGENS AND ACTION OF BACTERIOPHAGES:

Human pathogens are described to be the pathogens of microbes which causes infections in the growing incidence in humans in which bacteriophage pores to be a diagnostic tool (19). Human pathogens also sometimes proved to be developed resistant to temperature ambient (20). The plasmid development in Pathogens causes diseases by the enteric bacterial pathogens producing virulence activity (21). The Preliminary Incidence and infection caused by the Pathogens mainly include the bacterial food contamination that is treated with Phage therapy of bacteriophages (22).

TYPES AND EXAMPLES-BACTERIOPHAGES:

Bacteriophage T4:

Bacteriophage T4 is a member of Myoviridae which is active against and assembly of *E. coli* cells. The T type suggests being more virulent. To even phages are antigenic responses and involve phages. (23)

M 13 **BACTERIOPHAGE**:

M13 is a **filamentous** bacteriophage made as a potential candidate for transducing biochemical and bio-optical signals into electrical, optical signals. Surface properties of this bacteriophage can be manipulated in genetic engineering (23,24)

BACTERIOPHAGE P2 :

This Bacteriophage also recognized to be Escherichia P2 virus infects *E. coli.* This is a temperate **phage** of Myoviridae.

RESISTANCE:

The Bacterial biofilms produce resistance against the antimicrobials causing the host immune system to low and achieving persistence of infections which can be treated using the bacteriophages (25). The research has been extended towards the therapy of Bacteriophages which acts as a substitute for antibiotics (26). The resistance towards the antibiotics creates a problem where the phage therapy makes possible in phage resistant bacterial variants for the treatment (27,28).

BACTERIOPHAGES IN HUMAN PATHOGENS ROLE

The **Bacteriophages** kills the bacterial gene products and provides an alternative for antimicrobials (29). The Phages in different marine environments have played the role of envisaged human health (30). The Bacteriophages are Unique ways to provide phages against the microbiota of human pathogens in the human host. The Bacteriophages in the human against the pathogens even in animals are proved to be significant (31).

BACTERIOPHAGE TO BIOCONTROL ORAL BIOFILMS

It includes infections that are mainly induced by oral biofilms which include caries, PDL disease, peri-implant disease, etc. And in cases, these bacterial biofilms are highly resistant to antibacterial therapy which makes it difficult to control these infections. Thus for this condition, to control the microbes, the genetics and biology of phages are explored to determine the most effective way of controlling these groups of bacteria (32).

PHAGE THERAPY

In the last few years, the therapeutic use of bacteriophages has blossomed an interest. This field of interest is mainly due to resistance created to the antibacterial Resistance - Strains of bacteria. In which the Lytic bacteriophage can kill the antibiotic-resistant bacteriophage at the end of the phage infection cycle. Thus this kind of problem-solving treatment ensures Phage therapy. And this, in the promising field provides treatment for the bacterial infections of human pathogens Irresistible ailment specialists have cautioned that there is presently a convincing need to grow new classes of antibacterial operators, ones that can't be opposed by the same qualities that render microbes impervious to anti-infection agents. Phage treatment speaks to such "another" class. We accept that the obstructions referred to above can be survived, opening up the phages so that their properties, (for example, exponential development, and the capacity to transform against safe microorganisms) can be utilized to an extraordinary bit of leeway. There are 3 extra properties of phages that to be noted: Host explicitness. While the host explicitness is to some degree a disadvantage (requiring a matchup of phage to bacterial objective, and additionally the improvement of exceptionally multivalent phages), it likewise offers the extraordinary bit of leeway that the phages won't execute different types of microorganisms. Furthermore, phage replication is diminished; an incessant obstructive respiratory infection, where high sharpness and proteases would be expected to inactivate some level of the phages. 272 R. M. Carlton: Phage Treatment Previously and Future Accordingly, e.g., phage treatment isn't probably going to execute off the sound vegetation of the digestive organs, lungs or urogenital tract, what's more, it is along these lines improbable to incite the diseases and passings seen when anti-toxins cause abundance of pathogens, (for example, *Clostridium difficile* and *Candida albicans*).

DISADVANTAGES:

Bacteriophages were also used as a biotechnological tool, such direct application on foodborne diseases to effectively control bacterial pathogens, as two sides of a coin the phages also have certain disadvantages included as they are easy to administer orally but then for this they need to neutralize the stomach acids before ingesting so that they could minimize the damage to the Phage which cannot be able to survive at low ph. It also includes as the identification of therapeutic BP specifically is more complicated. This also puts forth the complication as the lytic capacity of Bacteriophage can vary according to the interrelation of Bacteriophage and respected Bacterium. This also leads to costly and time-consuming clinical trials that discourage pharmaceutical therapy. Moreover, Bacteriophage products are known - self-antigens which are difficult to be recognized by the human immune system and induce responses that theoretically reduce the benefit of Bacteriophage administration (33).

Application

In recent years, we observe that multidrug-resistant bacteria have become a global threat, and phage therapy is advised as a better source of treatment and an alternative to antibiotics (34). Increasing multiple drug resistant (MDR) strains of *Acinetobacterbaumannii* has aggravated curiosity in development of alternative therapy. Bacteriophages are often considered as alternative agentsfor controlling *A. baumannii* infections(35). High selectivity and specificity of bacteriophages permits targeting of specific pathogens, without affecting desirable bacterial flora which means that phages are unlikely to affect the "colonization pressure" of the patients(36,37). Thus, phage therapy could be natural, less harmful, and effective in eliminating bacterial infections. Due to the increase in the number of drug resistant pathogenic bacteria, phage therapy is considered as an alternative therapeutic method to treat bacterial infections. *Acinetobacter* species are organisms that can be easily isolated from non-clinical resources such as soil, surfaces, drinking water, wastewater and different foods (38–40). Vancomycin, a last-resort antibiotic, is used mainly in serious Gram-positive bacterial infections that do not respond to other antibiotics (41,42). different antibacterial activity based on phage concentration and resistance mechanism, coinfection of phages on single isolates, needs to be determined (43). This effective antibiotic inhibits cell wall synthesis in Gram-positive bacteria but is ineffective against VRE. The present study also showed that for the same amount of *E. faecalis* killing, less vancomycin was required in the presence of phage (44). Phage VLP vaccines have shown high efficacy in the animal models, and some have already entered clinical trials(45,46). Phage show is currently permitting the alteration of phages into vehicles (nanocarriers) for chemotherapeutic medication conveyance by the connection of medication to the phage surface and introdu ction of peptides on the outside of that phage with particularity to a ligand of intrigue(47). Such builds have even been intended to target non-have microscopic organisms, including mammalian cells.(48). Hereditarily adjusted filamentous phages have been utilized in material combination to build nanowires and films for semi-conveyor applications, piezoelectric vitality age, and photograph reaction properties(49). These provide better treatment for bacterial infections and results in the application in clinical practice for the treatment of localized infections in wounds, burns, trophic ulcers, including diabetic foot ulcers. The safety use in humans has been repeatedly demonstrated (50). It is possible that phage therapy should be personalized, which means to be individual and custom made preparations for adaptation of bacteriophage to delete those infections from the patient . It is also noted that staphylococcus phage was developed and was successfully applied intravenously for the treatment of infections in children and adults in late soviet times . Phage receptor-restricting proteins (RBPs) have likewise been utilized effectively in bacterial discovery and recognizable proof. Phage endolysin has more extensive host explicitness contrasted with lytic bacteriophages . Chimeric endolysins have as of late been created by melding enzymatic spaces to elective cell-dividers restricting determinants, therefore changing endolysin conduct and host go (51). These are used as natural preservatives, singly or in combination with other antimicrobials such as bacteriocin(52)

CONCLUSION

Thus from this study, it was observed as phage therapy of Bacteriophages had potentially used many antibiotic-resistant bacteria but the limitation if solved would prove it to be better treatment, and researchers are made through for unraveling the hidden importance and effectiveness of Bacteriophages in Human Pathogens. Thus the Bacteriophages in human pathogen roles were enlightened and importance was covered.

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