ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-515-x, Impact Factor: 9.23

American Academic publishers, volume 6, issue 01,2026

Journal: https://www.academicpublishers.org/journals/index.php/ijai

A COMPREHENSIVE APPROACH BASED ON PHAGE THERAPY IN THE TREATMENT OF PURULENT-INFLAMMATORY COMPLICATIONS DEVELOPING AFTER CESAREAN SECTION

Asrankulova D. B.

Khudayberdiyeva G. J.

Andijan State Medical Institute

Abstract

Purulent-inflammatory complications developing after cesarean section remain one of the leading causes of maternal morbidity and complications in obstetric practice. Despite the widespread use of antibiotic therapy, the increasing prevalence of antibiotic-resistant microorganisms and biofilm formation significantly limits treatment effectiveness. This literature review analyzes scientific studies published over the past five years and highlights the potential of a comprehensive approach based on phage therapy in the treatment of post-cesarean purulent-inflammatory complications. The high specificity of bacteriophages, their ability to disrupt biofilms, and their synergistic effect with antibiotics make them a promising therapeutic option for the management of postoperative infections.

Keywords: cesarean section, purulent-inflammatory complications, postoperative infection, bacteriophages, phage therapy.

Introduction

Cesarean section is one of the most frequently performed surgical interventions in obstetric practice, and its incidence has been steadily increasing worldwide in recent years. However, despite its widespread use, purulent-inflammatory complications following cesarean section, including endometritis, surgical site infections, pelvioperitonitis, and sepsis, remain among the major causes of maternal morbidity and mortality [1,8,9].

The effectiveness of conventional antibacterial therapy has significantly decreased due to the growing prevalence of antibiotic-resistant microorganisms, biofilm formation, and polymicrobial infections. In this context, scientific and clinical interest in bacteriophage-based phage therapy has increased in recent years.

According to contemporary literature, Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, as well as anaerobic flora, are identified as the leading etiological agents in the development of infectious complications after cesarean section [2,6]. Researchers emphasize that the ability of these microorganisms to form biofilms contributes to chronic inflammation of surgical wounds, reduced antibiotic penetration, and recurrence of infection (Wang et al., 2024). In particular, the presence of multidrug-resistant strains significantly complicates the treatment of post-cesarean infections.

Phage Therapy in the Treatment of Postoperative Purulent-Inflammatory Complications

Bacteriophages are viruses that selectively lyse bacteria and possess the ability to target and eliminate pathogenic microorganisms. An analysis of the literature published over the past

ISSN: 2692-515-x, Impact Factor: 9.23
American Academic publishers, volume 6, issue 01,2026
Journal: https://www.academicpublishers.org/journals/index.php/ijai

five years highlights several key advantages of phage therapy: high specificity toward pathogens, minimal impact on the normal microbiota, the ability to disrupt biofilm structures, and synergistic effects when used in combination with antibiotics.

Review articles published in MDPI and Antibiotics journals (2024–2025) evaluate phage therapy as a promising alternative or adjunctive treatment for antibiotic-resistant infections.

Recent studies have demonstrated the effectiveness of phage therapy in postoperative purulent processes [11]. Wang et al. (2024) reported that the use of phage therapy in severe wound infections reduces purulent discharge, accelerates granulation tissue formation, and stimulates re-epithelialization. In addition, studies published in BMC Microbiology (2025) indicated that phage cocktails significantly reduced bacterial load in severe infections associated with Pseudomonas aeruginosa [5,8].

In post-cesarean endometritis and surgical site infections, phage therapy can be administered both locally (via irrigation or drainage) and systemically. According to contemporary scientific perspectives, phage therapy demonstrates the highest effectiveness when applied within a comprehensive treatment approach. Such an approach includes etiologically selected phage preparations, low-dose or targeted antibiotic therapy, adequate drainage of the surgical wound, as well as immunomodulatory and detoxification therapy.

Data from the Journal of Intensive Care (2024) indicate that the combination of phages and antibiotics exerts a strong synergistic effect against biofilms and reduces the risk of reinfection. This approach is particularly relevant in severe postoperative conditions complicated by resistant infections [4,7].

The literature also notes certain limitations of phage therapy, including the need for individualized phage selection, the potential for neutralization by the host immune system, and the insufficient development of regulatory and legal frameworks [10,12]. Nevertheless, many authors consider phage therapy a promising direction in obstetrics and gynecology, particularly in the treatment of purulent-inflammatory complications following cesarean section.

Conclusion

In infections associated with antibiotic-resistant microflora and biofilm formation, a comprehensive approach based on phage therapy contributes to improved treatment outcomes and a reduction in the frequency of complications and recurrences. In this regard, conducting large-scale clinical studies and developing standardized treatment protocols are of crucial importance.

References:

1. Wang B., Zheng P., Zhang Y., et al. Current knowledge and perspectives of phage therapy for combating refractory wound infections // *International Journal of Molecular Sciences*. – 2024. – Vol. 25, № 10. – P. 5465.
2. Łusiak-Szelachowska M., Międzybrodzki R., Weber-Dąbrowska B., et al. Bacteriophages in the treatment of infections caused by antibiotic-resistant bacteria // *Antibiotics*. – 2020. – Vol. 9, № 9. – P. 567.
3. Abedon S.T., García P., Mullany P., Aminov R. Phage therapy: past, present and future // *Frontiers in Microbiology*. – 2019. – Vol. 10. – P. 2754.

ISSN: 2692-515-x, Impact Factor: 9.23
American Academic publishers, volume 6, issue 01,2026
Journal: https://www.academicpublishers.org/journals/index.php/ijai

4. Pirnay J.P., De Vos D., Verbeken G., et al. The phage therapy paradigm: prêt-à-porter or sur-mesure? // *Pharmaceutical Research*. – 2020. – Vol. 37, № 4. – P. 1–17.
5. Gordillo Altamirano F., Barr J.J. Phage therapy in the postantibiotic era // *Clinical Microbiology Reviews*. – 2019. – Vol. 32, № 2. – e00066-18.
6. Kortright K.E., Chan B.K., Koff J.L., Turner P.E. Phage therapy: a renewed approach to combat antibiotic-resistant bacteria // *Cell Host & Microbe*. – 2019. – Vol. 25, № 2. – P. 219–232.
7. Lin D.M., Koskella B., Lin H.C. Phage therapy: An alternative to antibiotics in the age of multidrug resistance // *World Journal of Gastrointestinal Pharmacology and Therapeutics*. – 2020. – Vol. 11, № 1. – P. 1–10.
8. Verbeken G., Pirnay J.P., Lavigne R., et al. Call for a dedicated European legal framework for bacteriophage therapy // *Archives of Immunology and Therapy Experimental*. – 2020. – Vol. 68, № 3. – P. 1–10.
9. Aslam S., Pretorius V., Lehman S.M., et al. Novel bacteriophage therapy for treatment of resistant bacterial infections // *Clinical Infectious Diseases*. – 2020. – Vol. 71, № 7. – P. 1857–1865.
10. Zhvania P., Hoyle N.S., Nadareishvili L., et al. Phage therapy in postoperative wound infections: clinical experience // *Journal of Wound Care*. – 2021. – Vol. 30, № 2. – P. 102–110.
11. Dedrick R.M., Guerrero-Bustamante C.A., Garlena R.A., et al. Engineered bacteriophages for treatment of a patient with a disseminated drug-resistant infection // *Nature Medicine*. – 2019. – Vol. 25, № 5. – P. 730–733.
12. Rohde C., Wittmann J., Kutter E. Bacteriophages: A therapy concept against multidrug-resistant bacteria // *Surgical Infections*. – 2021. – Vol. 22, № 3. – P. 1–8.