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Abstract

# Phage Therapy against Orthopedic Implant Infections: Non-Antibiotic Intervention Worth Exploring

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**Abstract:**

Orthopaedic implants have revolutionized the treatment of bone fractures and non-infectious joint arthritis by giving immense relief from pain, helping in bone healing and restoring normal mobility of the injured limb or body part. Although the risk for acquiring an orthopaedic implant infection after clean orthopaedic surgical procedures is low but infections of orthopaedic implants post-surgery (fracture fixation or knee or hip arthroplasty) are considered as one of the most devastating complications associated with high morbidity, high treatment cost and high rates of treatment failure.

The poor clinical outcome of orthopaedic implant infections is due to the biofilm based nature of such infections. Biofilm once formed on a medical device is difficult to eradicate due to the inbuilt ability of biofilm bacteria to resist immune attack and attack of various antimicrobial agents employed. To worsen the scenario, emergence of resistant strains associated with implant infection is on rise within the orthopaedic settings resulting in further complicating the treatment process. The long term antibiotic suppression therapy given to patients is always associated with considerable drug toxicity, side effects and potential antibiotic resistance. Even with aggressive treatment and various management strategies, many of these infections are never fully eradicated especially often leading to removal of prosthesis, prolonged periods of immobility, soft tissue and bone loss, and even limb loss. In this scenario, there is an essential need to exploit new non-antibiotic anti-biofilm approaches for improved management and treatment of orthopaedic implant infections.

Phage therapy represents one such ideal approach that is worth exploring in the battle against orthopaedic implant infections. Although phage therapy has shown promising results in treating various bacterial infections, its application in treating and preventing bone and joint infections has not been exploited to its full potential. The reasons advocating its use are : 1) ability to self-replicate at the expense of host bacteria (auto-dosing) 2) safe approach with no reported adverse effects on normal flora unlike antibiotics 3) easy to isolate and can be used as cocktails for broader spectrum of activity and 4) Phage enzymes have ability to disrupt biofilm matrix and attack the biofilm bacterial cells even the resistant strains.

The presentation hereby highlights the various phage therapy based anti-biofilm approaches that work by both preventing the formation of biofilm at the initial stage of implantation itself or act by adopting biofilm disruption technology with special focus on their effect on resistant pathogens associated with orthopaedic infections. Such article will enable future researchers in providing new solutions to fight orthopaedic implant infections in the present scenario of rising antimicrobial resistance for better treatment outcomes.

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