

Role of metal ions in bacteriophage therapy against implant-associated *Staphylococcus aureus* infections

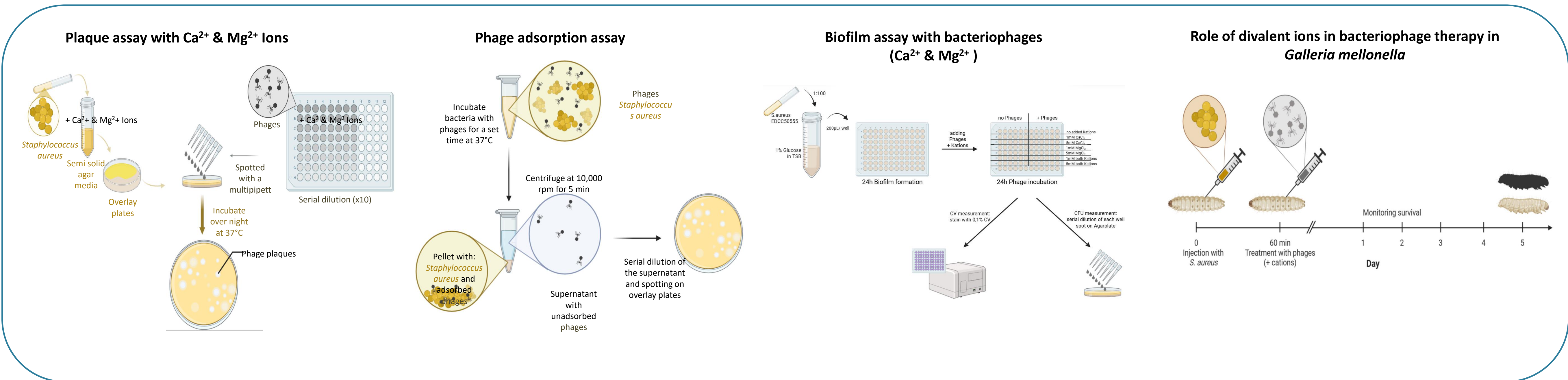
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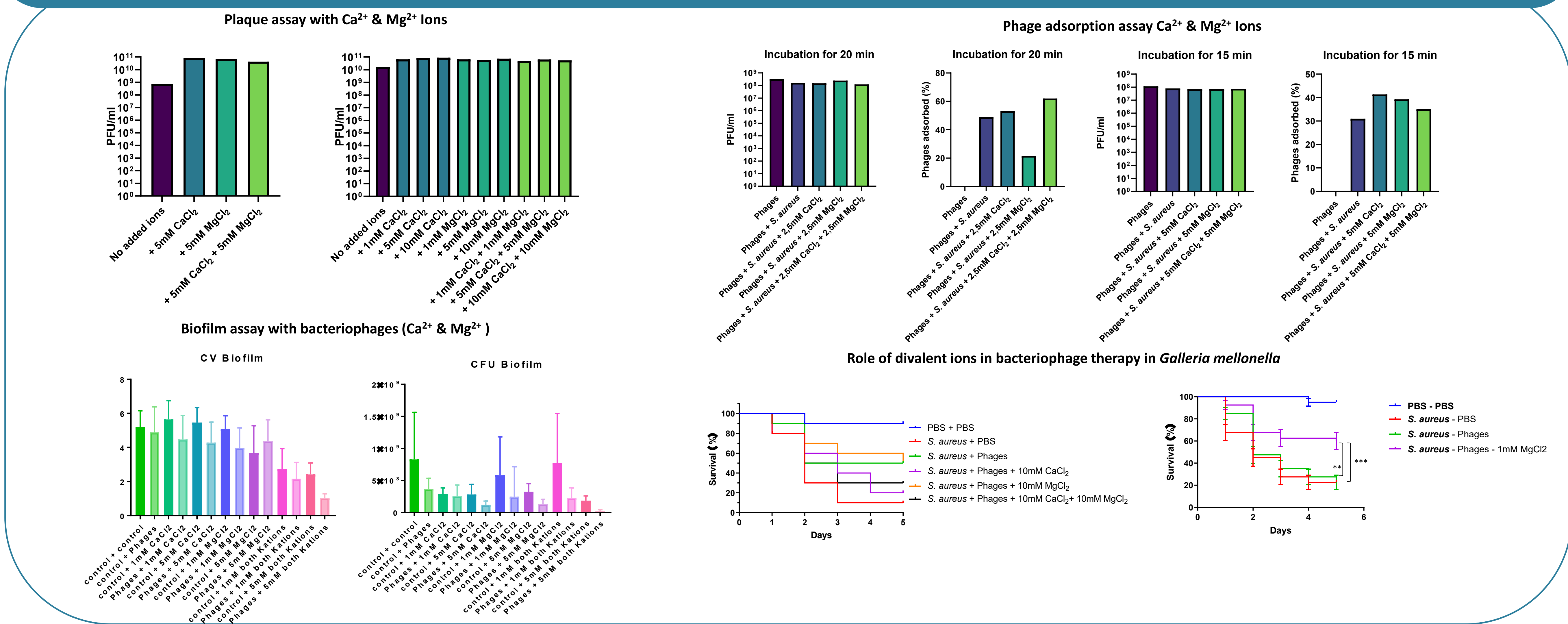
INTRODUCTION

- ❖ Orthopaedic devices are extensively used for fracture fixation and total joint arthroplasty. Despite their widespread application, these devices are susceptible to bacterial colonization and biofilm formation, which can reduce efficacy of antibiotic treatment.
- ❖ *Staphylococcus aureus* is a predominant cause of implant-associated bone infections, characterized by biofilm formation on implant surfaces and internalization into osteoblasts.
- ❖ Bacteriophages ('phages') are viruses that infect and replicate within bacteria and ultimately cause bacterial lysis. Divalent cations such as calcium (Ca^{2+}) and magnesium (Mg^{2+}) may influence phage activity by modulating phage adsorption, infectivity, and phage-bacterium interactions.
- ❖ This study investigated whether Ca^{2+} & Mg^{2+} enhance the activity of STAPH bacteriophages against *Staphylococcus aureus* isolates in planktonic and biofilm models, and whether this effect translates into improved therapeutic efficacy in a *Galleria mellonella* infection model.

MATERIALS AND METHODS



RESULTS



CONCLUSIONS AND PERSPECTIVES

- ❖ Ca^{2+} or Mg^{2+} supplementation enhanced STAPH phage activity against *S. aureus* *in vitro*, at least in part by improving phage adsorption and increasing PFU formation.
- ❖ Phages showed activity against established *S. aureus* biofilms; cations alone were not antibiofilm. The combination of Ca^{2+} and Mg^{2+} Phages showed the strongest effect. Divalent cations may optimize phage-based biofilm treatment.
- ❖ Mg^{2+} supplementation also improved survival in a *G. mellonella* model of *S. aureus* infection.
- ❖ These findings suggest that divalent cation supplementation may improve bacteriophage efficacy against *S. aureus* and support their potential application in clinical settings for implant-associated infections.

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