INTRODUCTION: Platelet-rich plasma (PRP) therapy has been shown to speed tissue growth and healing in surgically created lesions in lab animals due to its concentrated growth factors. PRP thereby is becoming an increasingly, although still experimental, popular procedure for helping patients to achieve tissue or bone healing in a short time period. Although very little is known, PRP may have antimicrobial properties due to its concentrated leukocytes and antibacterial peptides. We hypothesized that PRP has antimicrobial properties and its combined antimicrobial and tissue healing properties will help inhibit bone infections. The objective of this study was to determine the antimicrobial effects of PRP in vitro and to determine whether PRP could be used alone as a prophylactic therapy to inhibit bone infection in vivo.

MATERIALS AND METHODS: For in vitro studies, six clinically isolated bacterial strains (i.e. methicillin-sensitive Staphylococcus aureus or MSSA, methicillin resistant Staphylococcus aureus or MRSA, E. coli, Group A Streptococcus, Pseudomonas, and Neisseria gonorrhoeae) related to bone infections were examined. PRP was isolated by the twice centrifugation technique (so-called “buffy coat” method) from peripheral whole blood which was obtained from New Zealand white rabbits. The concentration of platelets in PRP was adjusted to 2,000,000 platelets/μl, which is 10-fold above the baseline concentration. Three different concentrations of thrombin (50 IU/ml, 100 IU/ml, and 200 IU/ml) in 10% CaCl2 were used to form PRP-gel. In vitro antimicrobial susceptibility of PRP-gel was determined using a bacterial kill curve assay for up to 24 h.

For in vivo studies, an implanted-associated spine infection was first established in a rabbit model. A concentration of 10^5 colony forming units/0.1 ml of MSSA was found to reproducibly induce infection. Fifteen rabbits (30 surgical sites, L3 and L6) were investigated: surgical sites were randomly treated with PRP-gel or phosphate buffered saline (Control). Bacterial growth was assessed post-operatively at 1, 2, and 3 weeks.

RESULTS AND DISCUSSION: Bacterial kill curve: The cultures that contained PRP-gel showed a distinct decrease in the numbers of MSSA, MRSA, Group A Streptococcus, and Neisseria gonorrhoeae in the first 2 h compared to the controls; data on MSSA and MRSA are shown in Fig. 2. The higher the concentration of thrombin, the lower the bacterial numbers (Fig. 2). No obvious decrease in bacterial numbers was observed in cultures of E. coli and Pseudomonas (data not shown). For all bacterial strains, the numbers of bacteria started to increase substantially at the 4 h time point and reached a plateau at approximately 12 h to 24 h (Fig. 2).