Title

Combination Prophylactic Therapy with Rifampin Increases Efficacy against an Experimental Staphylococcus epidermidis Subcutaneous Implant-Related Infection

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Combination prophylactic therapy with rifampin increases efficacy against an experimental Staphylococcus epidermidis subcutaneous implant-related infection

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Abstract

The incidence of infections related to cardiac devices (such as permanent pacemakers) has been increasing out of proportion to implantation rates. As management of device infections typically requires explanation of the device, optimal prophylactic strategies are needed. Cefazolin and vancomycin are widely used as single agents for surgical prophylaxis against cardiac device-related infections. However, combination antibiotic prophylaxis may further reduce infectious complications. To model a localized subcutaneous implant-related infection, a bioluminescent strain of Staphylococcus epidermidis was inoculated onto a medical-procedure-grade titanium disc, which was placed into a subcutaneous pocket in the backs of mice. In vivo bioluminescence imaging, quantification of ex vivo CFU from the capsules and implants, variable-pressure scanning electron microscopy (VP-SEM), and neutrophil enhanced green fluorescent protein (EGFP) fluorescence in LysEGFP mice were employed to monitor the infection. This model was used to evaluate the efficacies of low- and high-dose cefazolin (50 and 200 mg/kg of body weight) and vancomycin (10 and 110 mg/kg) intravenous prophylaxis with or without rifampin (25 mg/kg). High-dose cefazolin and high-dose vancomycin treatment resulted in almost complete bacterial clearance, whereas both low-dose cefazolin and low-dose vancomycin reduced the in vivo and ex vivo bacterial burden only moderately. The addition of rifampin to low-dose cefazolin and vancomycin was highly effective in further reducing the CFU harvested from the implants. However, vancomycin-rifampin was more effective than cefazolin-rifampin in further reducing the CFU harvested from the surrounding tissue capsules. Future studies in humans will be required to determine whether the addition of rifampin has improved efficacy in preventing device-related infections in clinical practice.

Figures

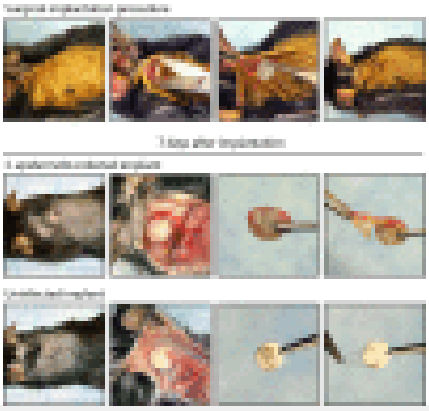

FIG 1

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Mouse model of a subcutaneous-implant-related…

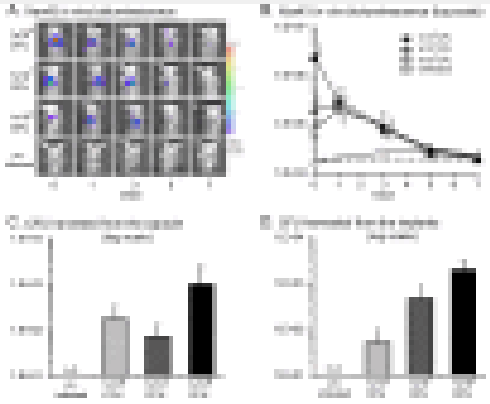

FIG 2

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In vivo S. epidermidis bacterial…

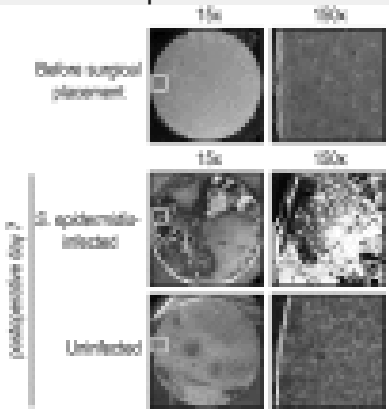

FIG 3

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Biofilm formation on the implants....

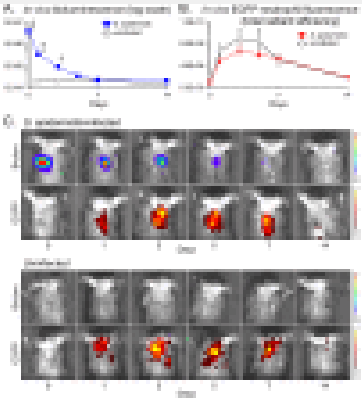

FIG 4

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Measurement of bacterial burden and...

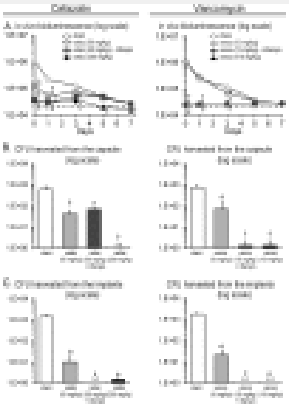

FIG 5

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Efficacy of prophylactic antibiotic therapy....