Effects of Media on Bacterial Colonization of Spinal Biomaterials

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- **Treatments for implant-associated infections are only partially effective, and require new approaches**

- **We investigate how common orthopedic implant materials and media influence biofilm formation, as well as antibiotic efficacy**

- **Results suggest that initial conditions may markedly influence biofilm characteristics**

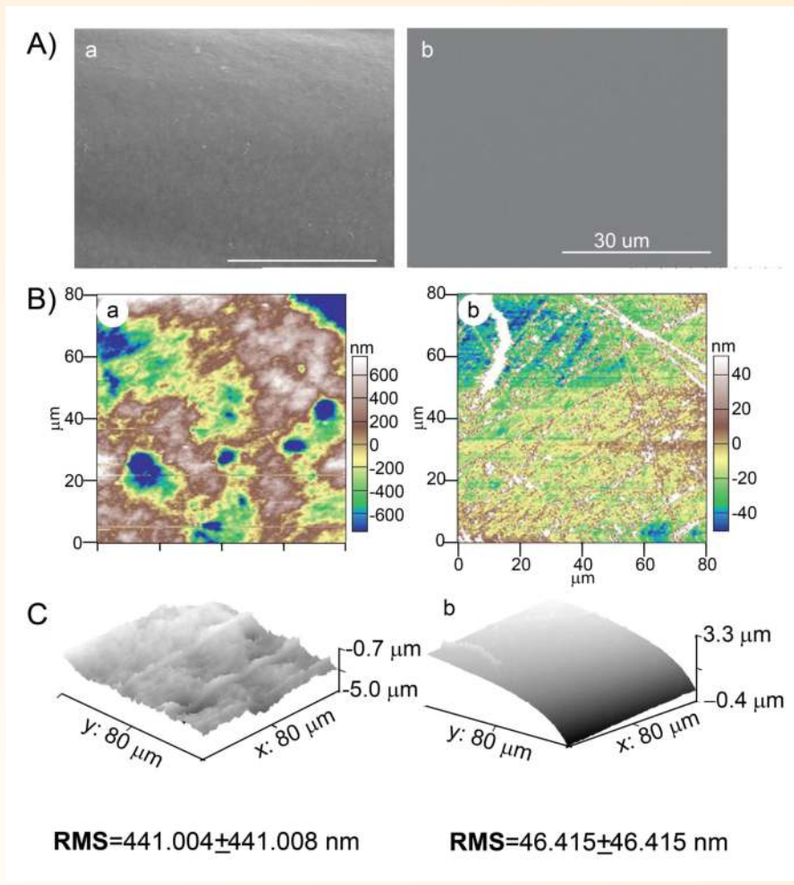

FIGURE 1: Surface assessment of PEEK and PS. A) SEM imaging of PEEK (a) and PS (b) at 3.5kX magnification. Scale bar = 30 μm. B) Topographical map of roughness, as measured by AFM, of PEEK (a) and PS (b). The roughness scale is shown to the right of each of the plots. C) Three dimensional representation of PEEK (a) and PS (b) topography. Measured root mean square (RMS) roughness is shown for each sample (RMS ± SD). While the difference in roughness is ~10-fold, neither surface appears significantly rough by SEM.

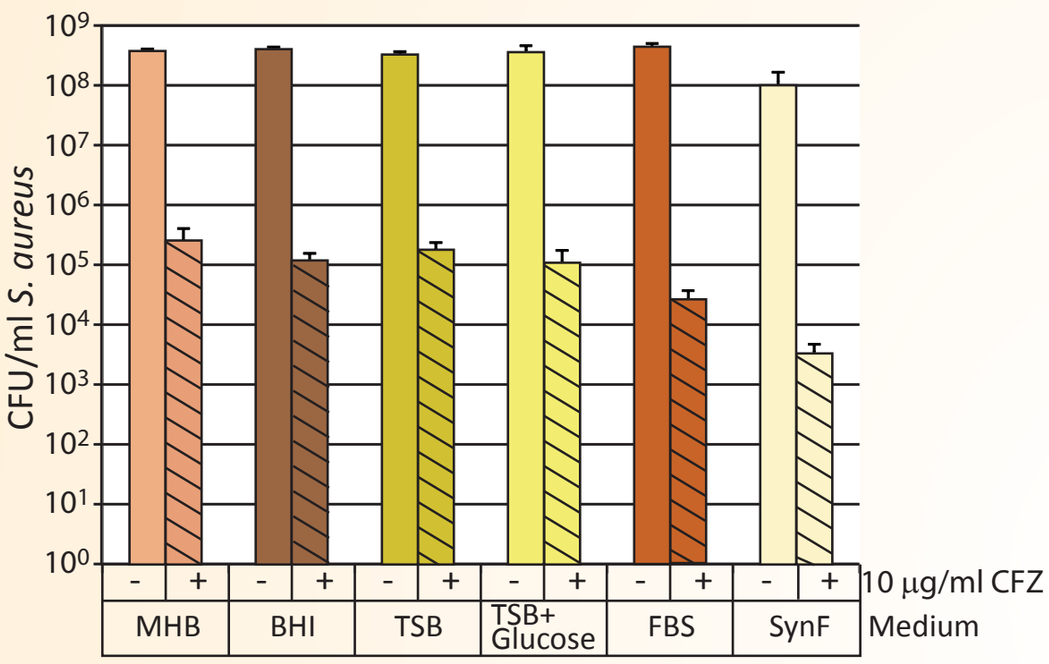

FIGURE 2: Antibiotic activity when 10^5 CFU of methcillin-sensitive *Stahylococcus aureus* (MSSA) + cefazolin (CFZ) are added simultaneously. Sensitivity appears similar in all media except for human SynF where both the initial counts and those after CFZ addition are lower. It is worth noting that FBS shows an intermediate effect.

- **Orthopedic material choice has only a minor effect on bacterial adhesion and antibiotic sensitivity**

- **Incubation media has a much greater effect on antibiotic sensitivity, at a 100-1000 fold change**

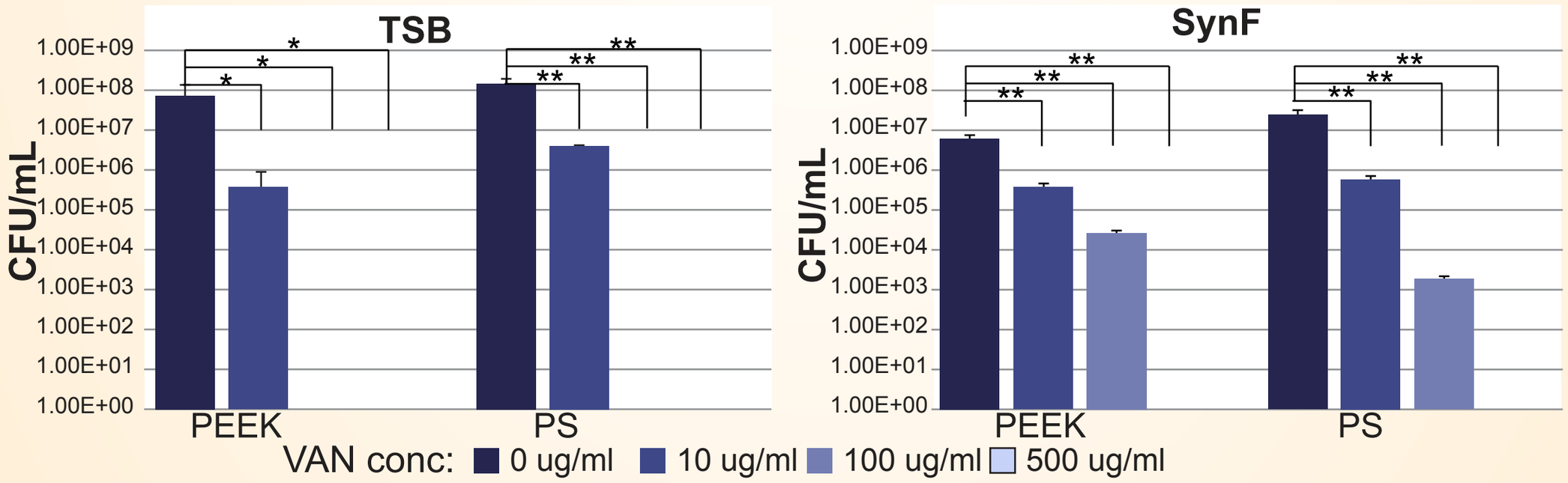

FIGURE 3: Dose responsiveness to vancomycin (VAN) when 10^5 CFU of MSSA are added simultaneously. VAN is at least 10-fold more effective against adherent MSSA in TSB than in human SynF. Values shown are average ± SD (n = 6, with at least 3 independent repeats). For TSB on PEEK, 0 vs. 10 μg/ml VAN was p = 0.0241, 0 vs. 100 μg/ml VAN and 0 vs. 500 μg/ml VAN were both p = 0.0077. For TSB on PS, all comparisons except 100 vs. 500 μg/ml VAN were p < 0.0001. For TSB on PEEK and PS, 100 vs. 500 μg/ml VAN was p > 0.9999. For SF on PEEK and PS, all comparisons were p < 0.0001.

- **Biofilms formed in physiological media have additional components not present in "ideal" biofilms, which may explain infection recalcitrance**

- **Regardless of material or media, antibiotic sensitivity is severely mitigated once a biofilm is formed**

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