**Silver Carboxylate-TiO2/Polydimethyl Siloxane is a Safe and Efficacious Antimicrobial with Significant Wound Care Potential**

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**Purpose:** In traumatic injuries, musculoskeletal infections and dehiscence can lead to longer recovery times, the need for surgical debridement, and increased costs. As the rise of drug-resistant pathogens continues to erode the efficacy of conventional antibiotic therapy, new methods and technologies are needed to fight musculoskeletal infections. Silver is a known antimicrobial that can be synthesized in different forms, each with varied pharmacokinetics and therapeutic tolerance. Silver is an attractive antimicrobial due to its multiple antimicrobial pathways, but its pharmacokinetics must be controlled. To take advantage of these capabilities, our group synthesized silver carboxylate, which is released via a titanium dioxide (TiO2) and polydimethylsiloxane (PDMS) matrix with predictable release profile. This study details the antibacterial efficacy and cellular tolerance of silver carboxylate on multidrug-resistant Pseudomonas aeruginosa, multidrug-resistant Acinetobacterium baumannii, and human-derived primary osteoblasts within the context of wound care.

**Methods:** Through an IACUC and IRB-approved protocol, silver carboxylate was applied to live Yucatan porcine skin and histologically analyzed for skin penetration via fast-red and fast-green staining. Graphite furnace atomic absorption spectroscopy (GFAAS) was used to measure elution of the coating from these products. Dose-response curves were generated for P. aeruginosa and A. baumannii at 1 x 107 CFU/mL and compared to nanosilver and last-resort antibiotics for 24 hours. Results were measured for viability via optical density 570 nm. Primary human-derived osteoblasts were subjected to silver carboxylate at 1 x 104 cells/mL colloidal and nano silver formulations, and measured for viability via the MTT assay after 24 hours of exposure. Results were subject to statistical analysis via analysis of variance and post-hoc Tukey tests.

**Results:** The silver carboxylate coating demonstrated deep penetration into the epithelium and is seen at the level of the deep pilosebaceous glands in pig skin. GFAAS testing demonstrated the extended elution profile of silver carboxylate over 96 hours, while 100% silver with no TiO2-PDMS matrix fully eluted within 48 hours. 10x silver carboxylate demonstrated superior antimicrobial activity to antibiotics and other silver formulations, and showed minimal cytotoxicity compared to other silver formulations.

**Conclusion:** Current antimicrobial therapies in wound care and surgical antisepsis, such as chlorhexidine gluconate (CHG), have pitfalls including poor skin penetration and short duration of efficacy. This study provides evidence of silver carboxylate's significant antimicrobial activity against multidrug-resistant pathogens and low cytotoxicity against osteoblasts while displaying deep penetrance into pilosebaceous glands.