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Data Article

Data for vancomycin elution, activity and impact on mechanical properties when incorporated into orthopedic bone cement



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ABSTRACT

In this article, we report data on the antibiotic elution and efficacy, and mechanical properties of Palacos bone cement with different amounts of added vancomycin (0.0, 0.125, 0.25, 0.5, 1.0, 2.0 g), see “*Vancomycin elution, activity and impact on mechanical properties when added to orthopedic bone cement*” (Bishop et al., 2018) [1]. Mechanical testing was performed for four-point bending, compression, and fracture toughness. The release characteristics of vancomycin was recorded for up to 60 days to estimate the elution profile. The eluted vancomycin efficacy at eliminating the four most common causative orthopedic implant pathogens is also reported.

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Specifications Table

Subject area	<i>Biomechanics, Pharmacy</i>
More specific subject area	<i>Orthopedic, Antimicrobial agent</i>
Type of data	<i>Image (X-ray, microscopy, etc.), figure, tabulated</i>
How data was acquired	<i>SEM (Zeiss-LEO, Oberkochen, Germany), MTS (Criterion C43.104, MTS Systems, Eden Prairie, MN), High performance Liquid Chromatography (HPLC)</i>
Data format	<i>Analyzed data</i>
Experimental factors	<i>Palacos bone cement different amounts of added vancomycin: 0.0, 0.125, 0.25, 0.5, 1.0, 2.0 g</i>
Experimental features	<i>Mechanical testing using MTS machine measured flexural modulus flexural strength, compressive modulus, compressive yield strength, and fracture toughness, according to ISO 5833. The drug elution test was determined using high performance liquid chromatography (HPLC) with a C₁₈ column. Three cylindrical samples (6 mm diameter × 4.5 mm height) were sterilized by ethylene oxide gas and then submerged in 3.4 mL of tryptic soy broth inoculated with bacteria for each test condition for antimicrobial activity testing. Drug elution cements were stored in –20 °C freezer and all mechanical testing cements were wet cured in a phosphate-buffer solution (PBS) for 21 days at room temperature (22 °C) before testing.</i>
Data source location	<i>Department of Mechanical Engineering and School of Pharmacy, University of Wisconsin Madison</i>
Data accessibility	<i>Data is with this article.</i>
Related research article	<i>Bishop A.R., Kim S., Squire M.W., Rose W.E., Ploeg H., Vancomycin elution, activity and impact on mechanical properties when added to orthopedic bone cement, Journal of Mechanical Behavior of Biomedical Materials S1751–6161(18)30459–4, https://doi.org/10.1016/j.jmbbm.2018.06.033 [1]</i>

Value of the data

- These data are of value in cemented joint arthroplasty using Palacos with added vancomycin as a prophylactic measure against infection.
- The mechanical test data of wet cured samples demonstrated that mechanical properties of Palacos bone cement with upto 0.5 g of vancomycin met all ISO minimum requirements.
- The release characteristic test data showed that the elution profile is suited for clinical use since the maximum elution occurs during the critical first week after surgery and would effectively eliminate *S. aureus* contamination that may inadvertently occur during the surgical procedure.
- The antimicrobial activity test data showed that the eluted concentration from samples with greater than 0.25 g vancomycin per Palacos packet was sufficient to eliminate a 10³ colony forming unit per mL (CFU/mL) initial inoculum of *S. aureus*, including methicillin-resistant *S. aureus* (MRSA).

1. Data

The data provided here are

- Mechanical test data: flexural modulus, flexural strength, compressive modulus, compressive yield strength, and fracture toughness calculated from the force-displacement curves.
- Scanning electron microscope (SEM) images from the fracture surfaces of four-point bending samples.

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