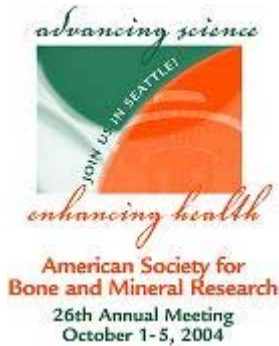


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Repeatability of the Ex-Vivo Bioreactor Bone Organ Culture Chamber and Loading System

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The purpose of this study was to determine the repeatability of the Ex-vivo bioreactor Bone organ culture chamber and Loading System (EBLS) over the period of time of at least that of a 30 to 50 day experiment. Three standards were obtained from the Dr. David Jones' Laboratory in Marburg Germany. The standards are closed hollow cylinders open at one end. The apparent elastic moduli ($E=Kh/\pi/r^2$, where E is apparent elastic modulus, K is apparent stiffness, h is cylinder height, r is cylinder radius), chosen to cover the expected range of ex-vivo trabecular bone samples, were a result of varying the material modulus and the thickness of the cylinder's end plate. The apparent elastic moduli of the three standards were 325 MPa, 495 MPa and 1590 MPa for the 500 μm thick aluminum, 800 μm thick steel, and 1200 μm thick steel standards, respectively. Thirteen sets of ten repeat measurements were made on three standards over a 90 day period. The coefficient of variation of the apparent elastic modulus was 1.4%, 1.3% and 2.3% for the three standards, in order of increasing apparent stiffness, over a period of 90 days. It is clear from this data that the reliability of the loading system is excellent and will not induce large variations into the ex-vivo bone core data set. Further testing is being carried out to determine the effects of the bone chamber, loading characteristics and specimen characteristics on the apparent elastic modulus measured using the EBLS.

Table 1. Reliability Testing Results for Three Standards (n=130 per standard)

	Force (N)	Displacement (μm)	Apparent Elastic Modulus (MPa)
Aluminum - 500 μm thick endplate			
Mean	148.9	29.62	325.0
Standard Deviation	2.375	0.04883	4.581
Coefficient of Variation	1.595%	0.1649%	1.409%
Steel - 800 μm thick endplate			

Mean	223.7	29.61	494.9
Standard Deviation	4.426	0.07139	6.540
Coefficient of Variation	1.978%	0.2411%	1.321%
Steel -1200 µm thick endplate			
Mean	719.5	29.63	1591
Standard Deviation	16.34	0.05167	0.03592
Coefficient of Variation	2.271%	0.1744%	2.257%

Reference: Jones D.B. et al., European Cells and Materials **5**:48-60, 2003.

Author Disclosure Block: H. Ploeg, None.

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