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A novel approach to improving antibiotic elution from PMMA: How the addition of lipid affects Gentamicin elution from bone cement

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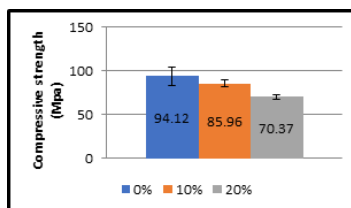
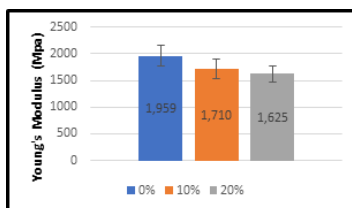
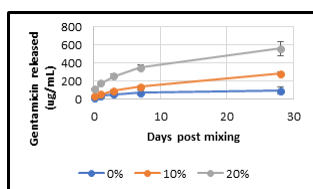
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Antibiotic Poly methyl-methacrylate bone cement (ABC) has a variety of surgical uses including primary and revision arthroplasty, dead space management in infection and structural support in bone tumours. All of these indications rely on antibiotic elution to augment systemic antibiotic use. However, in spite of years of research, ABC elutes only a small percentage of the total antibiotic incorporated. Several techniques and additives have been incorporated into ABC that improve elution, however this is accompanied by a considerable decrease in mechanical properties. The present study investigates the additional of a lipid to ABC containing a hydrophilic and moderately lipophilic antibiotic, Gentamicin.

Olive oil was added by weight to Palacos MV + G bone cement (LL-ABC) which is known for its superior elution properties in 0, 10 and 20% w/w. Cement was vacuum mixed and placed onto sterilized stainless-steel plates to create small cement dowels. Antibiotic elution was determined at 4 hours, 1, 3, 7 and 28 days for each concentration. Mechanical properties of the cement dowels were determined by compressive testing using MTS- bionix 858 with resultant determination of Young's modulus and creation of load-deformation curves.

The cumulative antibiotic released (ug/mL) was proportionate to the % w/w of olive added. The cumulative antibiotic release from the 20% w/w LL-ABC was greater than the control at all time points. At 28 days, 10% and 20% w/w LL-ABC had released 295% and 585 % more gentamicin than the control sample. Compressive strength and young's modulus were inversely related to the concentration of olive oil in the LL-ABC samples.

The addition of olive oil to Gentamicin Palacos MV cement significantly increased the elution potential of the cement with minor compromise in the mechanical properties. The recommended next step is evaluating whether the locally eluted antibiotic maintains therapeutic values above the minimal inhibitory concentration and extending this in vitro study to an in vivo model.



Biography

Dr. Daniel Cohen is a final year orthopaedic surgical registrar (resident) in Sydney, Australia. He was awarded his medical degree from the University of Sydney in 2010. He also has a Bachelor of Science in Anatomy and a Master of Science in Physiology from McGill University in Montreal, Canada. He has been actively involved in medical teaching and research with a focus on primary knee arthroplasty as well as management of complex orthopaedic infections. He has a keen interest in primary and revision hip and knee arthroplasty and will be undertaking sub-specialty fellowship training in 2020.

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