

University of Notre Dame

Journal

of

Biomaterials Applications Reviews

Volume 9

May 2015

All Contributions from the Students of AME 50571

Edited by Prof. Ryan K. Roeder

Published by the
Department of Aerospace and Mechanical Engineering,
University of Notre Dame, Notre Dame, Indiana

© Copyright 2015

Table of Contents

Section I: Cardiovascular Applications		
Uryan Isik Can	Biomaterials Solution to Complications of Cardiopulmonary Bypass	1
Kim Curtis	Investigation of Surface Coating Biomaterials to Enhance Function of Stainless Steel Coronary Stents	10
Dan Gregory	A Critical Review of the Use of Pyrolytic Carbon in the Mechanical Artificial Heart Valve	21
Jack Hanle	Vascular Grafts: Materials, Structures, and Functions	32
Hannah Juarez	The Total Artificial Heart	44
John Shapeland Kearns	Critical Review of Hemoglobin Based Blood Substitutes	53
Brennan Pinnock	Biodegradable Vascular Tissue Scaffold Engineering Critical Review	78
Seamus Quilty	A Review of Pacemaker and Implantable Cardioverter Defibrillator Leads: Structure Design, Materials, and Fixation	91
Hillary Shesterkin	Critical Review of Endovascular Embolization	100
<hr/>		
Section II: Dental Applications		
Joel G. Kolb	Orthodontic Braces: Bracket and Archwire	106
Daniel Rodriguez	Fillings and Cements: A Look Into the Future of Amalgam	116
<hr/>		
Section III: Diagnostics		
Alexander Ko	A Comprehensive Review of Glucose Biosensors	125
Anna McDermott	X-ray Contrast Agents for Vascular Imaging	137
Alejandro R. Porras	Lactate Biosensors: Past, Present, and Future	146
<hr/>		
Section IV: Neurological Applications		
Spencer Kieffer	Biomaterials Associated with the Brain-Computer Interface for the Purpose of Recording/Interpreting Neural Signals	159
Kevin O'Brien	A Review of the Pertinent Biomaterial Issues Affecting the Use of Neurostimulator Leads in Neurological Disorders	173

Section V: Ophthalmological Applications		
Laurie Breed	The Effects of Silicone, PMMA, and Soft Acrylic Intraocular Lens Biomaterials on Performance and Posterior Capsule Opacification	182
Tim Bresnahan	Biomaterials of Retinal Detachment Procedures	198
Anna Halverson	Contact Lenses: Biocompatibility for Hard and Soft Contact Lenses for Optimal Performance and Limited Corneal Damage	205
Thomas Storey	Corneal Implants: A Biomaterial Perspective	216
John-Paul Zebrowski	Non-Resorbable Implants Used in Orbital Reconstruction	228
Section VI: Orthopaedic Applications		
Katherine Iliff	Fixation in Metal Femoral Stem with Porous Surface	236
Quinn O'Rourke	Biomaterials for Reconstruction of the Anterior Cruciate Ligament	247
Ryan Williams	Cross-Linked Ultra-High Molecular Weight Polyethylene in Total Knee Arthroplasty	262
Section VII: Other Tissue Engineering Applications		
Catherine Bentzen	Structure-Property Relationships for Scaffold Used for Tissue Engineering Applications for Artificial Livers	273
Michael Hunckler	Poly(ethylene glycol) Hydrogel Microencapsulation of Islet Cells	284
Caitlin Zeiler	Comparison of Rapid Prototyping Approaches for the Construction of Tissue Engineering Scaffolds	297
Section VIII: Other Applications		
Kevin Connor	A Critical Review of Sutures Focusing on Methods and Materials Used to Decrease Post-Operative Infection	308
Tyler Curtis	Photothermal Ablative Materials: Gold Nanoshells and Single Wall Carbon Nanotubes	317
Kelsey Hutchinson	Considerations Regarding the Biomaterial Influences of Cochlear Implants	328
Alison Leddy	Copper Intrauterine Devices	340
Devon Mason	Transdermal Drug Delivery	348
Matthew Samora	Kidney Implant and the Renal Tubule Assist Device: A Critical Review	362