

Rachelle Palchesko

Department of Ophthalmology
University of Pittsburgh
203 Lothrop Street
Pittsburgh, PA 15213
palchesko@gmail.com

Department of Biomedical Engineering
Carnegie Mellon University
4313 PTC
700 Technology Drive
Pittsburgh, PA 15213

Positions:

Ocular Tissue Engineering and Regenerative Ophthalmology Post-doctoral fellow (OTERO)
Louis J. Fox Center for Vision Restoration
Mentors: Adam W. Feinberg, PhD (Carnegie Mellon University) and James L. Funderburgh, PhD
(University of Pittsburgh)
March 2011-Present

Education:

Duquesne University

Surface Chemistry, PhD

Advisor: Ellen S. Gawalt, PhD

OPTIMIZATION OF CALCIUM ALUMINATE FOR USE AS A BONE SCAFFOLD MATERIAL THROUGH PHYSICAL AND CHEMICAL SURFACE MODIFICATION

August 2006-February 2011

Indiana University of Pennsylvania

Biochemistry, BS

Minors: Chemistry and Biology

May 2006

Summa cum-laude

Provost's Scholar

Graduate Research Experience:

Research Advisor: Ellen S. Gawalt, PhD

- *Chemical and physical modification of calcium aluminates for use as a bone scaffold material*
(May 2007-present)

Calcium aluminate, a biocompatible material, was physically and chemically modified to further increase its biocompatibility and potential as a bone scaffold material. The physical properties of calcium aluminate were modified during the casting process and analyzed for strength, cell adhesion, and phase composition. The mixture that balanced high performance in all areas was chosen as the optimal mixture. The calcium aluminate surface was then chemically modified using solution deposition techniques utilizing organic reactions with cell adhesion peptides,

antibiotics, and small proteins to increase the materials biocompatibility. *In vitro* testing indicated the cell adhesion peptides and antibiotics were still active on the surface and promote osteoblast adhesion while decreasing bacterial growth.

- *Biofilm formation of S. aureus on SAM-modified SS316L* (July 2009-present)
 - Collaboration with Allegheny General Hospital Singer Center for Genomic Science

The surface of SS316L was modified with self-assembled monolayers (SAMs) utilizing phosphonic acid head groups and various tail groups (OH, COOH, CH₃). These substrates and unmodified SS316L were exposed to *S. aureus* for 2, 6, 24, 48, and 72 hours. The growth of the bacteria on these substrates was evaluated using colony forming units and confocal microscopy with COMSTAT analysis.

- *Characterization of APEC polycarbonates and metal adhesion to their surface*
 - Sponsored by Bayer Material Science (January – December 2008)

Six APEC polycarbonates were modified utilizing SAMs of OH and CH₃ terminated phosphonic acids, SAMs of a CH₃ terminated silane, and plasma treatment. The unmodified and modified surfaces were then coated with aluminum to determine the modifications effect on metal adhesion strength. All surfaces were characterized using fluorescence, UV, near IR-UV and infrared spectroscopy, optical and atomic force microscopy, and contact angle goniometry. The metal-polymer adhesion was analyzed using a standard ASTM testing procedure.

Research Advisor: Charles Dameron, PhD

- *Characterization of a CXC₄₋₆CXC metal binding and dimerization motif in S. cerevisiae.* (August 2006-May 2007)

The CXC₄₋₆CXC protein metal binding domain was fused to adenylate kinase, a protein that did not contain the sequence, through genetic cloning. The new fusion protein was then purified through nickel affinity His-Tag resin chromatography. The fusion was analyzed for the ability to bind zinc and copper by exposing the protein to the metals, dialyzing to remove any unbound metal followed by Atomic Absorption spectroscopy to determine how much metal was bound to the protein.

Undergraduate Research Experience:

Research Advisor: Robert Hinrichsen, PhD

- *Isolation of genes that control the circadian rhythms in paramecium.* (August 2005-May 2006)

Paramecium DNA was extracted and analyzed for a gene sequence present in other organisms that is shown in those organisms to regulate circadian rhythms to determine if the paramecium contained homologous genes.

Publications and Presentations:

Publications:

- Palchesko, R.; McGowan, K.; Gawalt, E. S., Surface immobilization of active vancomycin on calcium aluminum oxide. *Materials Science and Engineering C* **2010**, (doi:10.1016/j.msec.2010.12.003).
- Palchesko, R; Gawalt, E; McGowan, K. *Increased osteoblast adhesion on physically optimized KRSR modified calcium aluminate* (accepted October 10, 2011 to *Journal of Biomedical Materials Research: Part A*).

Posters:

- “Chemical Modification of Calcium Aluminates for use as Bone Scaffold Material” McGowan Institute for Regenerative Medicine Retreat, Nemaquin Woodlands, March 2009, 2010.
- “Chemical and Physical Modification of Calcium Aluminates for use as Bone Scaffold Material” Metals in Biology Symposium, Duquesne University, December 2008, * won Outstanding Poster Award.
- “Characterization of the CXC₄₋₆CXC metal binding and dimerization motif in *S. cerevisiae*” Metals in Biology Symposium, Duquesne University, December 2006.

Oral Presentations:

- “Engineered Basement Membranes for Regeneration of the Corneal Endothelium” McGowan Institute for Regenerative Medicine Retreat March 2011.
- “Chemical Modification of Calcium Aluminates for use as Bone Scaffold Material” CMU Biomedical Engineering and Biotechnology Research Symposium, peer reviewed April 2010
- “Chemical and Physical Modification of Calcium Aluminates for use as Bone Scaffold Material” Materials Science and Technology Conference and Exhibition, peer reviewed, October 2008.

Mentorship Experience:

Undergraduate Research Program (URP)/CHEM 490W:

- Jared Romeo (January 2009-February 2011)
 - Duquesne University URP/490W
 - *Modification of calcium aluminates with melatonin*
 - Received the Crable award to complete an Undergraduate Honors Thesis

- Patrick Heilman (May 2010-July 2010)
 - Duquesne University URP/490W
 - *Fibroblast cell adhesion on fluorinated SAMs and polymer coatings on SS316L*
- Katie Camera (May 2010-February 2011)
 - Duquesne University URP and 490W student
 - *Fibrinogen adhesion on fluorinated SAMs and polymer coatings on SS316L*
- Katelyn Smiley (May 2009-July 2009)
 - Slippery Rock University, NSF-REU student
 - *Effect of pH on stability of self-assembled monolayers of ODPa on SS316L*
 - Presented poster at National American Chemical Society Meeting, San Francisco, March 2010
- Alexandrina Kostova (May 2008-August 2008)
 - Duquesne University, URP student
 - *Characterization of calcium aluminate aggregates antibacterial properties*

High School Students:

- Chrysten Beth Pfabe (June 2008-August 2008)
 - Project SEED Student
 - *Formation of self-assembled monolayers of sulfonic acids on SS316L*
 - Presented poster at URP Symposium, Duquesne University, July 2008
 - Presented poster at National American Chemical Society Meeting, March 2009

Awards:

- Outstanding Poster Award. Metals in Biology Symposium, Duquesne University, December 2008.
- Academic Achievement Award, Indiana University of Pennsylvania, ACS Student Affiliates 2004, 2005, 2006.
- CRC Handbook Award, Indiana University of Pennsylvania, 2003.

Organizations:

- Alpha Chi Sigma, national professional chemistry fraternity (September 2004-present)
- Women In Science, Duquesne University (August 2008-February 2011)