

Charles Nuttelman
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PROFFESIONAL

Fall, 2007 – Current: Instructor, Department of Chemical and Biological Engineering, University of Colorado at Boulder.

Spring, 2007: Lecturer, Department of Chemical and Biological Engineering, University of Colorado at Boulder.

October 2005 – Spring 2007: Senior Research Associate, Department of Chemical and Biological Engineering, University of Colorado at Boulder.

EDUCATION

University of Colorado, Boulder, CO. Doctor of Philosophy in Chemical and Biological Engineering. Defense completed in April, 2005. GPA: 3.68/4.00.

University of Colorado, Boulder, CO. Master of Science in Chemical Engineering. December 2001. GPA: 3.68/4.00.

University of Colorado, Boulder, CO. Bachelor of Science in Chemical Engineering with High Distinction. May 1999. GPA: 3.92/4.00.

GRADUATE RESEARCH EXPERIENCE

Doctoral Thesis. Dr. Kristi Anseth, major professor. September 2002 to May, 2005. Osteogenic Poly(Ethylene Glycol)-Based Hydrogels for Human Mesenchymal Stem Cell Culture and Bone Regeneration. An experimental investigation into the photoencapsulation of human mesenchymal stem cells and their subsequent differentiation into osteoblasts. Cell viability was assessed and improved by incorporating adhesion peptide sequences and charge and osteogenic differentiation was measured using enzymatic quantification assays and gene expression of osteoblast-specific genes. Finally, the osteogenic molecule dexamethasone was covalently linked to a hydrogel network through degradable ester linkages, resulting in release of dexamethasone to encapsulated cells with degradation of those ester bonds, leading to osteogenic differentiation.

Master's Thesis. Dr. Kristi Anseth, major professor. August 1999 to August 2001. Using a polymeric scaffold based on poly(vinyl alcohol), we investigated engineering functional heart valve tissue *in vitro* that could eventually be implanted into a patient to restore function to a diseased or damaged heart valve.

UNDERGRADUATE RESEARCH EXPERIENCE

Senior Thesis Project. Department of Chemical Engineering, August 1998 to May 1999. Continued to investigate the use of bovine chondrocytes (cartilage-producing cells) in cartilage tissue engineering applications using poly(ethylene glycol) (PEG)-based hydrogel scaffolds.

Assistant to Klaus Timmerhaus, Emeritus Professor of Chemical Engineering, University of Colorado at Boulder. Fall 1998 and Spring 1999. Updating *Plant Design and Economics for Chemical Engineers*, 4th edition, (Peters and Timmerhaus, McGraw Hill, 1991)

Student Undergraduate Research Fellowship (SURF) Award Recipient. University Research Opportunities Program (UROP), CU Boulder. Summer of 1998. Worked on a project to grow chondrocytes in a polymer for eventual replacement of cartilage due to genetic defects or traumatic damage

Research Assistant. University of Colorado Chemical Engineering Department. Spring of 1997 and Fall of 1998. Developed preliminary photopolymerizable polymers to be used in tissue engineering research with chondrocytes

Summer Student Cancer Fellow. Dr. David Kroll, principal investigator. University of Colorado Health Sciences Center, Denver. Summer of 1997. Researched anticancer effects of the enzyme topoisomerase II combined with the drugs etoposide and sodium butyrate. Learned molecular biology techniques such as cell culture, polyacrylamide gel electrophoresis, Western blotting, toxicology assays, transfections, and plasmid preparations

Grant Recipient. University Research Opportunities Program, CU Boulder. Spring of 1997. Studied biodegradable, photopolymerizable polymers.

Independent Study. University of Colorado Chemical Engineering Department. Fall of 1996. Investigated the feasibility of a new method for forming photopolymerizable, three-dimensional polymers

TEACHING EXPERIENCE

Lecturer. Department of Chemical and Biological Engineering, Spring 2007. Chemical Engineering Material and Energy Balances.

Advanced Teaching Assistant. University of Colorado, Department of Chemical Engineering. Chemical Reaction Kinetics, January 2003 to May 2003. Responsible for weekly office hours and help sessions, grading, developing exam questions, weekly office hours, and presented five lectures during the semester.

Teaching Assistant. University of Colorado, Department of Chemical Engineering. Instrumentation and Process Control, January 2000 to May 2000. Responsible for teaching weekly laboratory sections, lab notebook grading, and presented four lectures during the semester. Earned the Departmental Outstanding Graduate Teaching Assistant Award, 2000.

TUTORING AND UNDERGRADUATE MENTORING EXPERIENCES

Tutor for high school Chemistry and Math, 2003, and for Material and Energy Balances, 2006.

Advised the following undergraduate and first-year graduate students in a variety of research projects: Rachel Niedner, Derek Mortisen, Scott Henry, Suzanne VanKreeveld, Maggie Tripodi, Sean Langelier, Sung Cho, Chelsea Collins, and April Kloxin; Spring 2000 – Fall 2004.

Tutor for Organic Chemistry, Fluids, and Material and Energy Balances, 2002-2003.

HONORS AND AWARDS

2005 American Institute of Chemists Graduate Award, Department of Chemical and Biological Engineering, University of Colorado at Boulder

2000 National Science Foundation Graduate Research Fellowship Recipient (3-year fellowship)

2000 and 2004 GAANN (Graduate Assistantships in Areas of National Need) Fellowship Recipient from Graduate Program in Macromolecular Chemistry and Engineering, U.S. Department of Education.

Beverly Sears Graduate Student Grant Recipient, Fall 2003

Outstanding Graduate Teaching Assistant, 2000

The Outstanding Senior in Chemical Engineering, 1999

Exceptional Undergraduate Research Award, 1999

Kazuko Boe Outstanding Junior Award in Chemical Engineering, 1998

Westfall Scholarship Winner, 1998-1999

Donald F. Othmer Sophomore Academic Excellence Award, American Institute of Chemical Engineers, Spring of 1997

College of Engineering Dean's List, University of Colorado, 8 Semesters

Ranald Fox Memorial Scholarship, 1997-1998

James H. Cole Scholarship Winner, 1996-1997 school year

Prager Family Scholarship Winner, 1995-1996, 1996-1997, and 1997-1998 school years

Regents Scholarship Winner, 1995-1996 school year

PUBLICATIONS (underlined co-author denotes undergraduate student)

C.R. Nuttelman, M.A. Rice, A.E. Rydholm, D.N. Shah, and K.S. Anseth. "Macromolecular Monomers for the Synthesis of Hydrogel Niches and Their Application in Cell Encapsulation and Tissue Engineering." *Progress in Polymer Science*, submitted.

C.R. Nuttelman, A.M. Kloxin, and K.S. Anseth. "Temporal changes in PEG hydrogel structure influence human mesenchymal stem cell proliferation and matrix mineralization," *Tissue Engineering Advances in Experimental Medicine and Biology*, 585: 135-149 (2006).

C.R. Nuttelman, D.S.W. Benoit, M.C. Tripodi, and K.S. Anseth. "The effect of ethylene glycol methacrylate phosphate in PEG hydrogels on mineralization and viability of encapsulated hMSCs." *Biomaterials*, 27, 1377-1386 (2006).

C.R. Nuttelman, M.C. Tripodi, and K.S. Anseth. "Dexamethasone-functionalized gels induce osteogenic differentiation of encapsulated hMSCs." *Journal of Biomedical Materials Research*, 76A (1): 183-195 (2006).

C.R. Nuttelman, M.C. Tripodi, and K.S. Anseth. "Synthetic Hydrogel Niches That Promote hMSC Viability." *Matrix Biology*. 24(3): 208-218 May 2005.

C.R. Nuttelman, M.C. Tripodi, and K.S. Anseth. "In Vitro Osteogenic Differentiation of Human Mesenchymal Stem Cells Photoencapsulated in PEG Hydrogels." *Journal of Biomedical Materials Research*. 68A (4): 773-782 MAR 15 2004.

C.R. Nuttelman, S.M. Henry, and K.S. Anseth. "Synthesis and characterization of photocrosslinkable, degradable poly(vinyl alcohol)-based tissue engineering scaffolds." *Biomaterials*, 23, 3617-3626 (2002).

C.R. Nuttelman, D.J. Mortisen, S.M. Henry, and K.S. Anseth. "Attachment of fibronectin to poly(vinyl alcohol) hydrogels promotes NIH3T3 cell adhesion, proliferation, and migration." *Journal of Biomedical Materials Research*, 57, 217-223 (2001).

Bryant, Stephanie J., Nuttelman, Charles R., and Anseth, Kristi S., "An Evaluation of the Cytocompatibility of Several Photoinitiating Systems", *Journal of Biomedical Materials Research – Polymer Edition* 11: (5) 439-457 2000.

S.J. Bryant, C.R.Nuttelman, and K.S.Anseth, "The Effects of Crosslinking Density on Cartilage Formation in Photocrosslinkable Hydrogels," in *Biomedical Sciences Instrumentation*, P.E.Patterson (ed.), 35, 309-14 (1999).

PRESENTATIONS AND PROCEEDINGS

C.R. Nuttelman, M.A. Rice, D.N. Shah, B.D. Fairbanks, and K.S. Anseth. "Photoinitiated Polymerizations for the Synthesis of Hydrogel Niches for Cell Encapsulation and Tissue Engineering," Invited talk, 2007 Materials Research Society Spring Meeting, San Francisco, April 12th.

C.R. Nuttelman and K.S. Anseth, "Osteogenic Hydrogels for Controlled Differentiation of Human Mesenchymal Stem Cells." Australasian Society for Biomaterials 16th Annual Conference, Rotorua, New Zealand, February 9th, 2006.

C.R. Nuttelman, M.C. Tripodi, and K.S. Anseth. "Controlling Viability of Human Mesenchymal Stem Cells Photoencapsulated in Poly(Ethylene Glycol)-Based Hydrogels." Annual Fall Meeting of the Materials Research Society, Boston, MA, December 1st, 2004.

C.R. Nuttelman, M.C. Tripodi, K.S. Anseth, "Osteogenic Differentiation of Human Mesenchymal Stem Cells Photoencapsulated in PEG Hydrogels," 7th World Biomaterials Congress, Sydney, Australia, May 2004.

C.R. Nuttelman, G.A. Walker, J.E. Sheren, L.A. Leinwand and K.S. Anseth, "Tissue Engineering of the Aortic Heart Valve: A Cell Biology Approach," *Society for Biomaterials Transactions*, **24**, 417 (2001).

C.R. Nuttelman, G.A. Walker, J.E. Sheren, L.A. Leinwand and K.S. Anseth, "Tissue Engineering of the Aortic Heart Valve", Society for Heart Valve Disease Biannual Meeting, London, England, June 2001.

C.R. Nuttelman, G.A. Walker, L.A. Leinwand, and K.S. Anseth. "Characterization of valve cells and their interactions with a poly(vinyl alcohol) scaffold", 2001 American Chemical Society National Meeting, San Diego, CA, April 2001.

C.R. Nuttelman. "Tissue Engineering of the Heart Valve," a presentation to the multidisciplinary Biophysics Supergroup of the University of Colorado, January 22, 2001.

C.R. Nuttelman, S.M. Henry, K.S. Anseth, "Surface Modification of Poly(Vinyl Alcohol) Hydrogels Promotes Cell Adhesion," Biomedical Engineering Society National Meeting, Seattle, WA, October 2000.

C.R. Nuttelman and K.S. Anseth, "Attachment of Proteins to Poly(vinyl alcohol) for biomedical applications" *Polymer Preprints*, 41, 1685-6 (2000).

C.R. Nuttelman and K.S. Anseth, "Tissue Engineering of Cartilage in Poly(Vinyl Alcohol) Hydrogels," AIChE National Meeting, Miami, FL, November 1998.

PATENTS

United States Patent Application #20030144373: Bowman, Christopher; Anseth, Kristi; Hacıoglu, Bilge; Nuttelman, Charles. Summary: A thiol-ene polymeric material is disclosed. The material is produced by the photopolymerization of reactants having thiol and olefin moieties. The material

can incorporate encapsulated components, including cells. Additionally, the material can be derivatized by reacting the polymeric material with components such as proteins.

Recent Patent Disclosures: CU1319B, "Photoreactive Drug Conjugates for Controlled Delivery"; and CU1497, "Osteogenic Hydrogels for Controlled Differentiation of hMSCs."

References:

Research

- Dr. Kristi Anseth (Master's and Ph.D. Research Advisor), Professor, Department of Chemical and Biological Engineering; Associate Professor of Surgery, University of Colorado Health Sciences Center; Howard Hughes Medical Institute Assistant Investigator: (303) 492-3147, Kristi.Anseth@Colorado.EDU.
- Dr. Leslie Leinwand, Professor and Department Chair, Department of Molecular, Cellular, and Developmental Biology: (303) 492-7606, Leslie.Leinwand@Colorado.EDU.
- Mark Randolph, M.A.S., Laboratory Director, Plastic Surgery Research Laboratory, Massachusetts General Hospital; Instructor in Surgery, Harvard Medical School: (617) 726-6943, randolph.mark@mgh.harvard.edu.

Teaching

- Dr. Janet DeGrazia, Senior Instructor, Department of Chemical and Biological Engineering: (303) 735-4763, degrazia@spot.colorado.edu.
- Dr. Will Medlin, Patten Assistant Professor of Chemical and Biological Engineering: (303) 492-2418, Will.Medlin@Colorado.EDU.
- Dr. Christine Hrenya, Associate Professor of Chemical and Biological Engineering: (303) 492-7689, Hrenya@Colorado.EDU.