Bio Page

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Biographical Statement:

Dr. C.C. Chu joined the Cornell faculty in 1978 after completing postdoctoral research on biomaterials for maxillofacial prostheses at the Medical Center of the University of Alabama in Birmingham. He had held visiting appointments in the Department of Dental Science at University of Liverpool in the UK, at the National Yang-Ming Medical College in Taiwan, at Hahnemann University School of Medicine in Philadelphia and in the Division of Mechanics and Materials Science, Center for Devices and Radiological Health at the U.S. Food and Drug Administration. He served on the board of directors for the Society of Plastic Engineers (medical plastics division) and was on the editorial board of the Journal of Investigative Surgery. Dr. Chu earned a B.S. in Chemistry from Tamkang University and a Ph.D. in polymer science from Florida State University. In basis research, Dr. Chus interests include the mechanisms of degradation of biomaterials, theoretical understanding of the effects of chemical structure on degradation through supercomputer molecular modeling, and exploring both intrinsic and extrinsic factors that could affect the degradation properties, such as the role of free radicals in degradation of biomaterials. In applied research, Dr. Chu focuses on the study of biomaterials, particularly the design and synthesis of novel biodegradable polymers/fibers/fabrics for tissue regeneration and repair including vascular grafts, wound closure and drug control/release purposes. This also includes the design and evaluation of novel biologic active biodegradable polymers for surgical repair of injured, diseased or aged tissues, and their impact on wound infection and healing. His research activities also include the synthesis of new biodegradable polymers for immunotherapy of cancer patients, biomaterials for reducing restenosis of vascular stents, novel substrates for cell preservation and tissue engineering, biodegradable vascular grafts, functional wound closure biomaterials for eliminating wound infection during surgery and composite bone cement for orthopaedic surgery. Dr. Chu has published over 145 research papers, a recipient of 59 US and international patents with many pending, an

author and editor of the book "Wound Closure Biomaterials and Devices". One of Chus new inventions 'Biodegradable, Bioactive, & Programable Hydrogels ' was chosen as a semifinalist for Discover Columbus Foundation Award competition. Dr. Chu has experience working with industry and medical professions to bring his new inventions in biomaterials to clinical reality. Dr. Chu teaches both undergraduate and graduate level courses. One course, "Biomaterials and Medical Devices for Human Body Repair", nicknamed "Human Spare Parts", is co-listed with the bioengineering curriculum, and has drawn students from all colleges at Cornell.

Courses Taught:

- BME 539 - Biomedical materials and devices for human body repair
- FSAD 436 - Fiber Chemistry
- FSAD 439 - Biomedical Materials and Devices for Human Body Repair
- FSAD 626 - The Chemistry of Textile Finishes and Dyeing

Related Websites:

Personal Website
http://www.chu.human.cornell.edu/

Chu's Patents Listed on the Cornell Center for Technology, Enterprise and Commercialization Website
http://www.cctec.cornell.edu/technology/patents/humec_patents.php

Current Research Activities:
Biologically active bioabsorbable polymers and fibers: The goal is to design and synthesis of amino acid based biodegradable poly(ester amide)s that could have many different types of reactive sites for chemical conjugation with biologically active agents. These new PEAs can also be fabricated via electrospinning into nanofibers or photocrosslinking into 3D microporous hydrogels. These nanofibrous membranes and hydrogels will be inherent chemical functional groups for chemical attachment or pre-loading of biological agents for treating a variety of diseases.

Durg- or biologics-impregnated hydrogels for a vareity of clinical use: The goal is to design biodegradable hydrogels that can be fabricated in an aqueous medium and can carry biologics or drugs for their sustained release to treat a variety of diseases. One particular project involves the delivery of growth factors like bFGF for improved skin regneration of burn victims, and is collaborated with Prof. M. S. Jin of Dept. of Biomedical Engineering and Profs. R. Yurt/S. Schwartz of Weill Cornell Medical College.

Therapeutic biodegradable biomaterials for wound management of burn victims: The goal is to promote wound healing of burn victims by fabricating our new pseudo-amino acids into microfiber-based medical devices as artificial skins that would have the capability to release biological agents and would also have elastomeric mechanical property. This project is collaborated with Prof. Roger Yurt and Suzanne Schwartz of Cornell Burn Center and is funded by Cornell University.

Biodegradable carriers for Gene and DNA: The goal is to design and develop new synthetic carriers that could improve gene transfection efficiency with better cellular biocompatibility. This work is collaborated with Prof. Bo Liu and Craig Kent of Division of Vascular Surgery of Dept. of Surgery of Weill Cornell Medical College and is supported by a seed grant from Cornell University.

Biodegradable polysaccharide-based biomaterials for bone engineering and as synthetic extracellular matrix: The goal is to design and develop a novel class of anionic biodegradable scaffold biomaterials that could provide bone biomineralization for engineering new bones for repair bones. This project is collaborated with the Hospital for Special Surgery, an afflilated of Weill Cornell Medical College.

Biodegradable scaffold for heart valve tissue engineering: This project is to use multidisciplinary approach to develop biodegradable and blood biocompatable scaffold via 3D bioprinting process so that heart value leaflets could be regenerated. The project involves Prof. J. Butcher of Dept. of Biomedical Engineering and Prof. Leo Girardi of Weill Cornell Medical College.

Biodegradable nanospheres for diagnostic and therpeutic of cancers: The goal is to design and develop biodegradable nanospheres that can be selectively uptaken by tumor cells for both diagnostic and therapeutic purpose. The project is collaborated with Prof. Rasa Zarengar of Weill Cornell Medical College.

Education:

- Postdoc 1978 - University of Alabama Chemistry
- Ph.D. 1976 - Florida State University Chemistry
- B.S. 1969 - Tamkang University, Taiwan, China Chemistry

Selected Publications:

Lei Li and C. C. Chu, ?Nitroxyl Radical Incorporated Electrospun Biodegradable Poly(ester amide) Nanofibrous Membranes", J. Biomater. Sci. Polymer Ed, 20: 341-361, (2009).

D. Q. Wu and C. C. Chu, ?Cationic poly(VCL-AETA) hydrogels and ovalbumin (OVA) release in Vitro?, J.Mater. Sci. Materials in Medicine, 19: 3593-3601, (2008).

C. C. Chu and Dajun D. Sun, ?New electrospun synthetic biodegradable poly(ester amide) drug-eluting fibrous membranes for potential wound treatment?, AATCC Symposium Proceeding ?Medical, Nonwovens, and Technical Textiles?, Oct.. 6-7, 2008, Durham, NC, pp. 60-76.

Dai Yamanouchi, Jun Wu, Andrew N. Lazar, K. Craig Kent, C. C. Chu, Bo Liu, ?Biodegradable arginine-based poly(ester-amide)s as non-viral gene delivery reagents?, Biomaterials, 29(22): 3269-3277, (2008).

G. M. Sun, X. Z. Zhang and C. C. Chu, Effect of the molecular weight of polyethylene glycol (PEG) on the properties of chitosan-PEG-poly(N-isopropylacrylamide) physical hydrogels?, J. Mater. Sci. Materials in

Medicine, 19 (8):2865-2872, (2008).

Kai Guo and C. C. Chu, ?Copolymers of Unsaturated and Saturated Poly (ether ester amide)s: Synthesis, Characterization and Biodegradation?, J. Appl. Polym. Sci. 110 (3): 1858-1869, (2008).

D. Q. Wu and C. C. Chu, ?Biodegradable hydrophobic-hydrophilic hybrid hydrogels: Swelling behavior and controlled drug release?, J. Biomater. Sci. Polymer Ed 19(4): 411-429, (2008)

Kai Guo and C. C. Chu, ?Synthesis, characterization and biodegradation of novel poly(ether ester amide)s based on L-phenylalanine and oligoethylene glycol?, *Biomacromolecules*, 8(9): 2851-2861, (2007).

X. Z. Zhang and C. C. Chu, ?Influence of polyelectrolyte on the thermosensitive property of PNIPAAm-based copolymer hydrogels?, *J. Mater. Sci. Mater. in Medicine*, 18:1771-1779, (2007).

S. Namkung and C. C. Chu, ?Partially biodegradable temperature and pH-responsive poly(N-isopropylacrylamide)/dextran-maleic acid hydrogels: Formulation and controlled drug delivery of Doxorubicin?, *J. Biomater. Sci. Polym. Ed.* 18 (7): 901-924, (2007).

K. Guo and C. C. Chu, ?Biodegradation of unsaturated poly(ester-amide)s and their hydrogels?, *Biomaterials*, 28: 3284-3294, (2007).

K. Guo and C. C. Chu, ?Synthesis, Characterization and Biodegradation of Copolymers of Unsaturated and Saturated Poly(ester amide)s?, *J. Polym. Sci. Polym. Chem.* 45:1595-1606, (2007).

K. Guo and C. C. Chu, ?Controlled release of Paclitaxel from biodegradable unsaturated poly(ester amide)s/poly(ethylene glycol) diacrylate hydrogels?, *J. Biomater Sci. Polym. Ed.* 18 (5): 489-504, (2007).

G. Jokhadze, M.Machaidze, H. Panosyan, C. C. Chu and R. Katsarava, ? Synthesis and Characterization of Functional Elastomeric Poly(Ester Amide) Copolymers?, J. Biomater. Sci. Polym. Ed. 18(4): 411-438 (2007).

G. M. Sun and C. C. Chu, "Synthesis, characterization of biodegradable dextran-allyl isocyanate-ethylamine/poly (ethylene glycol) diacrylate hydrogels and its in vitro release of albumin", *Carbohydrate Polymers,* 65: 273-287, (2006).

Sunny Namkung and C. C. Chu, ?Effect of Solvent Mixture on the Property of Polysaccharide-based Hydrogels Having, Temperature and pH Sensitivity ?, *J. Biomater. Sci., Polymer Ed.,* 17(5): 519 ? 546, (2006).

D. Q Wu, X. Z. Zhang, C. C. Chu, Functionalized 3-arm poly(e-caparolactone) maleic acid microspheres for controlled protein release?, *Am. J. Drug Delivery*, 3(4): 253-267, (2005).

X. Z. Zhang and C. C. Chu, ?Temperature sensitive poly(N-isopropylacrylamide)/poly(ethylene glycol) diacrylate hydrogel microspheres: formulation and controlled drug release?, *Am. J. Drug*

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Xian-Zheng Zhang, P. J. Lewis and C. C. Chu, ?Fabrication and characterization of a smart drug delivery system: Microsphere in hydrogel?, *Biomaterials*, 26(16): 3299-3309, (2005)

C. C. Chu, ?Surface degradation and microenvironmental outcomes?, IN: Surfaces and Interfaces for Biomaterials, Pankaj Vadgama, ed. Woodhead Publishing LTD, Oxford, England (2005)

X. Z. Zhang, G. M. Sun and C. C. Chu, ?Temperature sensitive dendrite-shaped PNIPAAm/Dex-AI hybrid hydrogel particles: Formulation and properties?, *European Polymer Journal*, 40: 2251-2257, (2004)

X. Z. Zhang, D. Q. Wu, C. C. Chu, ?Synthesis and Characterization of Partially Biodegradable, Temperature and pH Sensitive Dex-MA/PNIPAAm Hydrogels?, *Biomaterials*, 25:4719-4730, (2004)

The information on this bio page is taken from the CHE Annual Report.