Biomaterials Applications of Memphis (BAM) Laboratories

The multidisciplinary **BAM Laboratories at the University of Memphis-University of Tennessee Health Science Center (UTHSC) - Memphis** are led by Dr. Joel D. Bumgardner and Dr. J. Amber Jennings. The labs involve UoM faculty in chemistry, physics, biology and UTHSC faculty in the Colleges of Dentistry and Medicine. The focus of the BAM laboratories are in developing, characterizing and evaluating biomaterials for biomedical implants, coatings, tissue engineering and drug delivery. Our labs have established a world recognized expertise in chitosan-based materials.

-Bumgardner Research Focus -

Dr. Bumgardner and team are currently focused on developing chitosan-based materials for a wide range of biomedical implant and tissue engineering/regenerative medicine applications in the orthopedic and dental/craniofacial areas. The lab is focused on design and development of chitosan-based materials for; dental and orthopedic implant coatings, composites for bone grafts, injectable micro- and nano- particles for graft and drug delivery, and wet-spinning and electrospinning of fibers/membranes. Dr. Bumgardner has established world-wide reputation for characterizing chitosan properties and characteristics including molecular weight, degree of de-acetylation, and crystallinity. He has expertise *in vitro* and *in vivo* biocompatibility testing using wide range of cells including macrophage cultures and rodent soft and hard tissue models as well as electrochemical corrosion testing and electron microscope surface analysis.

-Jennings Research Focus -

Dr. Jennings and team have directed research efforts toward the overarching goal of improving therapies for musculoskeletal trauma. For design of new therapeutic biomaterials, two primary foci are preventing infection and promoting tissue regeneration. Dr. Jennings has established a program of research in the use of natural materials for drug delivery, regeneration, and infection prevention. Her expertise in biofilm-associated infection has led to novel therapeutic strategies in local delivery of antibiotics, bacterial signaling molecules, and small molecule therapeutics. In ongoing collaborative research, her team has developed stimuli-responsive biomaterials to enable "smart" delivery of drugs through non-invasive magnetic or electric stimuli. She is experienced in both *in vitro* and *in vivo* models of biocompatibility, wound healing, and infection

For more information

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-Infrastructure-

- VCA Optima Contact Angle Machine
- Thermofisher Ultimate 3000 HPLC
- Charged Aerosol Detector
- Shimadzu Prominence Gel Permeation Chromatography; aqueous-based
- Netzsch 200 Phox Differential Scanning Calorimeter
- Custom Electrospinning and micro/nano-bead manufacturing system
- Instron Mechanical Test System (50-500N)
- Gamry Potentiostat

Cell/Tissue/Bacterial Culture Facilities

- Complete Mammalian Cell Culture Facilities
- Eppendorf Thermocycler
- SDS-PAGE and PCR Gel Electrophoresis
- Fluorescent and Light Microscopy
- Bioquant Osteo II Image Analysis System
- Spectrophotometry
- Biosafety Level II microbiological laboratory

-Recent Publications-

- Mechanically stable surface-hydrophobilized chitosan nanofibrous barrier membranes for guided bone regeneration, Biomedical Materials, 2018.
- Chitosan coatings to control release and target tissues for therapeutic delivery. Therapeutic Delivery. 2015
- Balancing mechanical strength with bioactivity in chitosan-calcium phosphate 3D microsphere scaffolds for bone tissue engineering: air- vs. freeze-drying processes. Journal of Biomaterials Science Polymer Edition, 2013
- Magnetic stimulus responsive vancomycin drug delivery system based on chitosan microbeads embedded with magnetic nanoparticles. J Biomed Mater Res B Appl Biomater, 2017.