



THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING

Biomedical Engineering

DEPARTMENT OF BIOMEDICAL ENGINEERING SEMINAR SERIES
PRESENTS

Mark Van Dyke, PhD

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“Biomimetic coatings for medical device applications”

ABSTRACT:

Percutaneous osseointegrated skeletal docking (POSD) of artificial limbs has a three-decades-long history of clinical use in Europe. The many advantages of this technology, which avoids the complications of the centuries old socket suspension method of attaching prosthetic limbs, have become obvious, proven in clinical practice, and are now well described in the literature. The introduction of European devices into the US system has been delayed largely because of the unresolved and continued clinical problem of superficial and deep infection at the percutaneous stoma as well as the inability to design a device configuration that remains permanently attached to the residual stump bone and avoids dehiscence at the skin-implant interface. To address this issue, we have developed a biomimetic coating made from keratin proteins. The system seeks to mimic the human skin-fingernail interface by providing a substrate that anchors epithelial cells through biologically-meaningful adhesions that promote outside-in signaling cues leading to interface stability. Experiments in a porcine model using percutaneous titanium implants have demonstrated the feasibility of this approach. More recently, we have developed methods to produce the keratin building blocks using recombinant DNA technology. Recombinant protein synthesis allows us to access a broad design space, wherein the substrate can be tailored to elicit specific biological responses, while also improving the physical characteristics of the coating system.

BIO:

Mark Van Dyke was born and raised in Michigan and graduated from Central Michigan University with a Bachelor of Science degree (chemistry, biology) in 1988. He began his professional career as an analytical chemist at the Dow Chemical Company in Midland, MI. As part of the Environmental Sciences Department, he served as a study director for research programs supporting US Environmental Protection Agency approval of new herbicides. In 1991, he moved to the Dow Corning Corporation and began work in toxicology, silicone biomaterials, and medical devices. After receiving the Dow Corning Fellowship, he attended graduate school at the University of Cincinnati in the Department of Chemical and Materials Engineering, earning his

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PhD in 1998. That same year, Dr. Van Dyke joined Southwest Research Institute (SwRI) in San Antonio, TX, the largest independent non-profit research and development lab in the US. During his tenure with SwRI, Dr. Van Dyke was a principal investigator and study director for several large biomaterial development programs. His primary area of interest was in the development of naturally-derived biomaterials and their application to wound healing and tissue engineering. In 2004, Dr. Van Dyke joined the faculty of the Wake Forest University School of Medicine where he expanded his investigations into the use of keratin biomaterials for regenerative medicine applications. In 2012 he joined the faculty of Virginia Tech in the Department of Biomedical Engineering and Mechanics where his research included investigation of the solution behavior and self-assembly of keratin nanomaterials and their development into products for medical devices, tissue engineering, drug and cell delivery, and trauma applications. In 2020, Dr. Van Dyke joined the University of Arizona as the Associate Dean of Research in the College of Engineering, and a Tenured Professor in the Department of Biomedical Engineering. Dr. Van Dyke has published more than 80 papers and book chapters, is an inventor or co-inventor on 34 issued US patents and more than 80 US and international patents pending, many related to keratin biomaterials and their application to tissue engineering and trauma, and a co-founder of three startup companies. His teaching interests include regenerative medicine, biomaterials and healthcare entrepreneurship.

Please join us on

Monday, October 26th, 2020

12:00-12:50 pm, <https://arizona.zoom.us/j/94765815841>

Hosts: Dr. DK Kang and Dr. Russ Witte
dkkang@arizona.edu and rwitte@arizona.edu

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