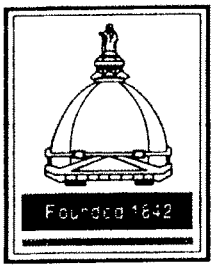
AEROSPACE & MECHANICAL ENGINEERING



2010 COLLOQUIUM 2011

SEMINARS ARE OPEN TO THE PUBLIC

INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL

UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

SPEAKER: Joel D. Boerckel
Institute for Bioengineering and Bioscience
Woodruff School of Mechanical Engineering
Georgia Institute of Technology
Atlanta, Georgia

TOPIC: **ENGINEERING BONE: ENHANCING REGENERATION THROUGH MODULATION OF BIOLOGICAL AND MECHANICAL FACTORS**

DATE: Tuesday, November 30, 2010

TIME: 3:30 p.m.

PLACE: 136 DeBartolo Hall

ABSTRACT

Treatment of large bone defects, caused by tumor removal or traumatic injury, experience less than 50% success rates, even under the best currently available treatment strategies. The gold standard of care is the autograft; however, this treatment is severely limited by low tissue availability and high donor site pain, while allografts, in which bone is transplanted from a cadaver donor, often fail to revascularize and remodel, leading to refracture. Tissue engineering has therefore emerged as a promising alternative to grafting techniques.

An extremely powerful approach to tissue engineering lies in stimulating the body's natural regenerative potential to restore tissue function. We hypothesized that both the biochemical and biomechanical environments may be manipulated to jumpstart these regenerative cascades. One of the most successful applications of tissue engineering is the delivery of osteoinductive growth factors, such as members of the bone morphogenetic protein (BMP) family. The clinical delivery method for these proteins, however, is inefficient as large doses are required, contributing to prohibitively high costs and potential complications due to protein diffusion. We are therefore exploring biomaterial delivery systems that provide sustained release profiles to enhance growth factor performance. Similarly, as a dynamically adaptive, load bearing tissue, bone is highly responsive to its mechanical environment. Normal fracture healing has been demonstrated to be very sensitive to mechanical stimuli, and this has led to a drastic change in the clinical approach to fracture fixation. However, the potential for functional loading to enhance the regeneration of large bone defects has not been evaluated. We are therefore studying the effects of in vivo mechanical loading on bone defect healing and tissue regeneration.

NOTE: *If you are interested in meeting individually with Joel Boerckel, please contact Evelyn at 631-5431*