Engineering Neuroscience & Health

Department of Biomedical Engineering   Division of Biokinesiology and Physical Therapy

USC UNIVERSITY OF SOUTHERN CALIFORNIA

ENH SEMINAR SERIES

Presents:

Dr. Walter Herzog

Human Performance Lab

University of Calgary

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Monday

April 26, 2010

4:00 p.m.

Refreshments served: 3:30— 4 pm

Specialty: My research is focused on the neuro-biomechanics of the musculoskeletal system. Expertise is in the area of growth, healing, and adaptation of soft (ligament, tendon, muscle, and articular cartilage) and hard (bone tissues. Within this area we work experimentally and theoretically on the molecular/cellular, in vitro, in situ, and in vivo level. It also includes cell manipulation and mechanical testing and finite element modeling, continuum mechanics, simulations and theories of growth and adaptation.

Current Work:
Our current research interests may be divided into three basic areas: (i) muscle mechanics, (ii) joint injuries and diseases; (iii) clinical rehabilitation. Muscle Mechanics: Our goals in muscle mechanics research are to understand the molecular mechanisms of contraction, and to determine the functional role of muscles working in vivo. Currently, we are doing theoretical and experimental research on all structural levels of muscles, ranging from single actin-myosin interactions and myofibrils to in vivo muscles in animal models and humans. Specifically, we are interested in the history-dependent effects of muscle force production, which we believe, may hold important (and so far unknown) information of the mechanisms of contraction. We analyze the functional, in vivo role of muscles by direct measurement of the forces, fibre length changes, and activation of muscles in freely moving animals. This research is supported by advanced approaches of musculoskeletal modeling and optimization. Joint injuries and diseases: Our goals in this area of research are to identify the mechanisms causing onset and progression of joint degeneration, and to prevent, stop, and reverse joint degeneration and osteoarthritis. In order to achieve these goals, we have developed a series of animal models (cat, rabbit) to study the mechanics of joints before and after interventions that are known to lead to osteoarthritis and joint injury. We also developed animal models to study the biological adaptive (degenerative) responses of joint tissues (articular cartilage, menisci, ligaments, tendons, joint capsules, muscles) to well-controlled, in vivo, physiological loading conditions. This research is supported by a series of theoretical approaches of musculoskeletal modeling. Most of our theoretical work to date has been in the areas of articular cartilage and contact mechanics modeling. Clinical Rehabilitation: The goals of this research are to study neuromusculoskeletal function of patients with joint injury and disease and spinal problems. Much of our research in the past few years has focused on elucidating the details of muscle atrophy and muscle inhibition in knee patients (anterior knee pain, anterior cruciate ligament deficiency and reconstruction, arthroscopic intervention, and osteoarthritis). Furthermore, we have led the effort to quantify the mechanics of conservative spinal manipulation in back patients. We have quantified the forces exerted by clinicians on patients, have measured the associated relative movements of vertebral bodies, and have quantified the neuromuscular responses through assessments of muscle inhibition, strength, and reflex responses. Finally, our current work is focused at determining the risk factors of spinal manipulation of the neck, particularly as it pertains to cerebrovascular accidents.

Locations: *Seminar is simultaneously presented*

HSC: CHP 147 – LIVE	UPC: HNB 100 — Video Conference
Center for the Health Professional	**Hedco Neurosciences Building**
HSC Campus Map/Directions: http://www.usc.edu/about/visit/hsc/	UPC Campus Map/Directions: http://www.usc.edu/about/visit/upc/

Organized by Professor Francisco Valero-Cuevas http://bme.usc.edu/valero/

Web Cast

http://capture.usc.edu/college/Catalog/pages/catalog.aspx?catalogId=946350f1-ca84-40e7-b867-e16adba01e4e

Information about all seminars can be found at
http://bme.usc.edu/valero/ENH/ENH-Schedule.html