

# ***Translational Models for Musculoskeletal Tissue Engineering and Regenerative Medicine***

Sunday, December 7, 2008  
2008 Pre-TERMIS-NA Special Interest Group Workshop  
<http://www.termis.org/na2008/>  
Sponsored by NIAMS, NIH

**Date and Location:** Sunday December 7, 2008 9:45am-5:30pm

**Participants:** Open to all TERMIS-NA registrants and speakers/session chairs

**Purpose:** To identify translation models and research and development pathways for engineered tissues and regenerative medicine therapies that target bone, cartilage, disc, ligament, meniscus, and tendon.

**Questions:** The workshop will address the following issues in order to complement the TERMIS-NA meeting that addresses emerging TE-RM therapies at various stages of research and development.

1. From the clinical perspective, what are unmet clinical needs and opportunities for injury and disease of musculoskeletal tissues and organs that may be amenable to TE-RM therapies?
2. Are there appropriate models (e.g., animal) for particular injuries and diseases in order to address efficacy, safety, and mechanism of action?
3. Are there needs to develop standardized animal models? If so, is it possible to develop such models and what would be the best ways to achieve the goal?
4. What are the translational pathways for engineered tissues and regenerative medicine therapies for these injuries and diseases that successfully lead to clinical trial and therapeutic development?

## **Draft Agenda**

### 9:45a-10:00a Welcome & Introduction

Anthony Ratcliffe, PhD (Synthasome) & Robert Sah, MD, ScD (UCSD)

### **Part 1: Moderator - Linda Sandell, PhD – Sessions I-III**

#### 10:00a-10:45a Session I. Intervertebral Disc

- Jeff Lotz, PhD (University of California, San Francisco), *Degeneration Models and Stem Cell Therapy*.
- Koichi Masuda, MD (University of California, San Diego), *Disc Degeneration Models and Advancement of IVD Therapies into Clinical Trials*.

#### 10:45a-11:30p Session II. Ligament

- Kurt Spindler, MD (Vanderbilt University), *Clinical Challenges for Ligament*
- Martha Murray, MD (Boston Children's Hospital), *Translational Research for ACL Repair*

#### 11:30a-12:00n Session III. Perspective from the FDA

- Charles Durfor (CDRH, FDA) and Richard McFarland (CBER, FDA), *Perspective from the FDA*.

#### 12:00p-1:15p Lunch

### **Part 2: Moderator - Richard Coutts, MD – Sessions IV and V**

#### 1:15p-2:15p Session IV. Articular Cartilage

- Constance Chu, MD (University of Pittsburgh), *Orthopaedic Challenges of Cartilage Injury and Degeneration and Solutions through Translational Research*
- Timothy M. Simon, PhD (Applied Biological Concepts, Inc) *Testing in a Surrogate Animal Model*
- Lori Setton, PhD (Duke University), *Strategies for Drug Delivery to Promote Cartilage Regeneration*

#### 2:15p-3:00p Session V. Muscle and Tendon

- Herman Vandenburg, PhD (Brown University), *Tissue engineering contractile tissues for clinical applications*
- Kathe Derwin, PhD (Cleveland Clinic), *Animal Models for Rotator Cuff Tendon Repair*

**3:00-3:30p Coffee Break**

**Part 3: Moderator - Christine Kelly, PhD – Sessions VI and VII**

**3:30p-4:15p Session VI. Meniscus**

- Tom Carter (Arizona State University), *Clinical Challenges for Meniscus Repair and Regeneration*
- Steve Arnoczky, PhD (Michigan State University), *Translational Models for Studying Meniscus Repair: What they Can and Can't Tell Us*

**4:15p-5:15p Session VII. Bone**

- George Muschler, MD (Cleveland Clinic), *Orthopaedic Challenges and Stem Cell Therapies for Bone Regeneration*
- Eddie Schwarz, PhD (University of Rochester), *Gene Therapies for Bone Regeneration*
- Dietmar Hutmacher, PhD (Queensland University of Technology), *Translational Therapies for Bone Regeneration*

**5:15p-5:30p Summary & Closing Remarks**

Robert Sah, MD, ScD (University of California, San Diego) & Anthony Ratcliffe, PhD (Synthasome)

**Speaker Contact Information**

**Timothy M. Simon, PhD**  
Applied Biological Concepts, Inc.  
12581 Silver Fox Road  
Los Alamitos, CA 90720  
P/F: 562-430-5851  
E: [tsabc@aol.com](mailto:tsabc@aol.com)

**George F. Muschler, M.D.**  
Professor of Surgery  
Vice Chairman, Orthopaedic and Rheumatology Institute  
Depts of Orthopaedic Surgery and Biomedical Engineering  
9500 Euclid Avenue  
Cleveland, OH 44195  
P: 216-444-5338, F: 216-445-6574  
E: [muschlg@ccf.org](mailto:muschlg@ccf.org)

**Steven Arnoczky, DVM**  
College of Veterinary Medicine  
G-387 Veterinary Medical Center  
Michigan State University  
East Lansing, MI 48824  
P: 517-353-8964, F: 517-353-8980  
E: [arnoczky@cvm.msu.edu](mailto:arnoczky@cvm.msu.edu)

**Edward Schwarz, Ph.D.**  
Professor of Orthopaedics  
Associate Director, Center for Musculoskeletal Research  
University of Rochester Medical Center  
601 Elmwood Ave., Box 665  
Rochester, NY 14642  
P: 585-275-3063, F: 585-275-1121  
E: [Edward\\_Schwarz@URMC.Rochester.edu](mailto:Edward_Schwarz@URMC.Rochester.edu)

**Thomas Carter MD**  
Emeritus Head of Orthopedic Surgery  
Arizona State University, Tempe, AZ  
*Current address:* The Orthopedic Clinic  
2222 E Highland Ave #300  
Phoenix AZ 85016  
P: 602-277-6211  
E: [tcarter@tocamd.com](mailto:tcarter@tocamd.com)

**Lori A. Setton, Ph.D.**  
Mary Milius Yoh and Harold L. Yoh Jr. Bass Professor of  
Biomedical Engineering  
Associate Research Professor of Surgery  
Duke University  
Box 90281, 136 Hudson Hall  
Durham, NC 27708  
P: 919-660-5131, F: 919-681-4890  
E: [setton@duke.edu](mailto:setton@duke.edu)

**Constance R. Chu, M.D.**  
Associate Professor  
Albert Ferguson Endowed Chair  
Joint Replacement and Sports Medicine  
Orthopaedic Surgery  
University of Pittsburgh  
Pittsburgh, PA 15213  
P: 412-687-3900  
E: [chucr@upmc.edu](mailto:chucr@upmc.edu)

**Kurt Spindler, M.D.**  
Kenneth Schermerhorn Professor of Orthopaedics  
Professor of Orthopaedics & Rehabilitation  
Vice Chairman for Clinical Affairs  
Director, Vanderbilt Sports Medicine Center  
South Tower, Suite 3200  
Nashville, TN 37232-8828  
P: 615-343-1685, F: 615-343-9893  
E: [kurt.spindler@vanderbilt.edu](mailto:kurt.spindler@vanderbilt.edu)

**Kathleen Derwin, Ph.D.**  
Assistant Staff Scientist  
Dept of Biomedical Engineering, ND-20  
Cleveland Clinic  
9500 Euclid Ave  
Cleveland, OH 44195  
P: 216-445-5982, F: 216-444-9198

**Moderator Contact Information**

<p>E: <a href="mailto:derwink@ccf.org">derwink@ccf.org</a></p> <p><b>Charles N. Durfor, Ph.D.</b>  Senior Scientific Reviewer  Plastics and Reconstructive Surgery Devices Branch  Division of General, Restorative and Neurological Devices  ODE/CDRH/FDA  9200 Corporate Blvd, HFZ-410  Rockville, MD 20850  P: 240-276-3555  E: <a href="mailto:Charles.durfor@fda.hhs.gov">Charles.durfor@fda.hhs.gov</a></p>	<p><b>Richard D Coutts, MD</b>  Professor of Orthopaedic Surgery  University of California, San Diego  Orthopaedic Medical Director  Sharp Healthcare  7910 Frost Street, Suite 200  San Diego, CA 92116  P: 858-278-8300, F: 858-278-1708  E: <a href="mailto:rdcoutts@aol.com">rdcoutts@aol.com</a></p>
<p><b>Dietmar W. Hutmacher Ph.D., MBA</b>  QUT Chair in Regenerative Medicine  Institute of Health and Biomedical Innovation  Queensland University of Technology  60 Musk Avenue  Kelvin Grove QLD 4059, Australia  P: 07 3138 6077, F: 07 3138 6030  E: <a href="mailto:dietmar.hutmacher@qut.edu.au">dietmar.hutmacher@qut.edu.au</a></p>	<p><b>Christine A Kelley, PhD</b>  Director, Division of Discovery Science and Technology  National Institute of Biomedical Imaging and Bioengineering, NIH,  DHHS  6707 Democracy Blvd., Suite 200  Bethesda, MD 20892-5649  P: 301-451-4778  E: <a href="mailto:kelleyc@mail.nih.gov">kelleyc@mail.nih.gov</a></p>
<p><b>Jeffrey C. Lotz, Ph.D.</b>  UCSF Orthopaedic Bioengineering Laboratory  533 Parnassus Ave  4th Floor, U454  San Francisco, CA 94143-0514  P: 415-476-7881, F: 415-476-1128  E: <a href="mailto:lotzj@orthosurg.ucsf.edu">lotzj@orthosurg.ucsf.edu</a></p>	<p><b>Linda Sandell, PhD</b>  Director of research, Department of Orthopaedic Surgery  Professor of Orthopaedic Surgery and of Cell Biology and  Physiology  Washington University School of Medicine  Yarem Research Building, Room 704  216 South Kings Highway  St Louis, Missouri 63110  P: (314) 454-7800  E: <a href="mailto:sandell@msnotes.wustl.edu">sandell@msnotes.wustl.edu</a></p>
<p><b>Koichi Masuda, M.D.</b>  Professor in Residence  Department of Orthopaedic Surgery  Medical Teaching Facility # 153  University of California, San Diego  9500 Gilman Dr. La Jolla CA 92093-0630  P: 858-246-0426  E: <a href="mailto:koichimasuda@ucsd.edu">koichimasuda@ucsd.edu</a></p>	<p style="text-align: center;"><b>Organizer Contact Information</b></p>
<p><b>Richard D. McFarland, M.D., Ph.D.</b>  Associate Director for Policy  Office of Cellular, Tissue and Gene Therapies  Center for Biologics Evaluation and Research  United States Food and Drug Administration  1401 Rockville Pike, HFM-700  Rockville, MD 20852  P: 301-827-5102, F: 301-8279796  E: <a href="mailto:richard.mcfarland@fda.hhs.gov">richard.mcfarland@fda.hhs.gov</a></p>	<p><b>Anthony Ratcliffe, Ph.D.</b>  President and CEO  Synthasome, Inc  3030 Bunker Hill Street, Suite 308  San Diego, CA 92109  P: 858-490 9401, F: 858-490 9404  E: <a href="mailto:anthonyratcliffe@synthasome.com">anthonyratcliffe@synthasome.com</a></p>
<p><b>Herman Vandenburg, PhD</b>  Professor, Department of Pathology  RISE Research Building, Miriam Hospital  Four Third Street  Providence, RI 02906  P: 401-793-4273  E: <a href="mailto:herman_vandenburg@brown.edu">herman_vandenburg@brown.edu</a></p>	<p><b>Robert Sah, M.D., Sc.D.</b>  Professor, Howard Hughes Medical Institute  Professor, Department of Bioengineering, UCSD  9500 Gilman Drive  La Jolla, CA 92093-0412  P: 858-534-0821, F: 858-822-1614  E: <a href="mailto:rsah@ucsd.edu">rsah@ucsd.edu</a></p>
<p><b>Martha M Murray, MD</b>  Dept of Orthopaedic Surgery  Hunnewell 2  300 Longwood Ave  Boston, MA 02115  P: 617-355-7132  E: <a href="mailto:martha.murray@childrens.harvard.edu">martha.murray@childrens.harvard.edu</a></p>	<p><b>Fei Wang, PhD</b>  Program Director, Musculoskeletal Development, Tissue  Engineering, and Regenerative Medicine Program  Division of Musculoskeletal Diseases  National Institute of Arthritis and Musculoskeletal and Skin  Diseases, NIH, DHHS  6701 Democracy Boulevard, Suite 800  Bethesda, MD 20892-4872  P: 301-594-5055; F: 301-480-4543  E: <a href="mailto:wangf@mail.nih.gov">wangf@mail.nih.gov</a></p>