

## SUMMARY

Leadership and expertise in cell-based therapies for tissue engineering and regenerative medicine applications. Eighteen years post-PhD experience in academia, government, and industry, with a focus on stem cell engineering and effects of microenvironmental factors on stem fate for cardiovascular & orthopedic therapies.

## EDUCATION

Ph.D. in Bioengineering, University of California San Diego, 1998

Thesis title: *Integrative Repair and Collagen Crosslinking of Adult Articular Cartilage*

Thesis advisor: Robert L. Sah, M.D., Sc. D.

B.S.E. in Bioengineering, Minor in Mechanical Engineering, University of Pennsylvania, 1991

## ACADEMIC EXPERIENCE

**Assistant Professor: Tulane University, New Orleans, LA** **2009-present**

Department of Biomedical Engineering, Tulane University

**Burk-Kleinpeter Early Career Professor** **2014-2016**

Department of Biomedical Engineering, Tulane University

Directed an independent interdisciplinary lab for 7+ years with over 30 trainees (graduating both PhD and Masters students). The Ahsan Stem Cell Bioengineering Lab focuses on translating stem cell research into a positive clinical impact on public health.

- Lab focused on the effects of the microenvironment on stem cell fate utilizing custom engineered bioreactor systems that regulate the physical, chemical, and biological inputs to the cell.
- Studies performed in stem cell mechanobiology, bioprocessing, and tissue engineering to help develop basic experimental models, in vitro diagnostic systems, methods for drug discovery, cancer treatments, and regenerative medicine therapies.
- Novel findings include:
  - Shear stress promotes embryonic stem cells differentiation towards the endothelial lineage.
  - Knockout of the cytoskeletal vimentin gene inhibits endothelial differentiation.
  - Mesenchymal stem cell stabilization of newly formed vessels is time- and dose-dependent.
  - 3D *in vitro* culture is necessary to study epimorphic regeneration (regrowth of digit/limb after amputation).
  - Regulating mechanical parameters of pluripotent stem cell bioprocessing and biomanufacturing can enhance large-scale production of target vascular populations.
  - Stem cell populations can be purified using density during downstream bioprocessing.

## INDUSTRY EXPERIENCE

**Senior Research Scientist: Advanced Tissue Sciences, La Jolla, CA** **2001-2002**

Musculoskeletal Research Group; Reported to VP of Research: Dr. Tony Ratcliffe

**Senior Bioengineer: Advanced Tissue Sciences, La Jolla, CA** **1999-2001**

Musculoskeletal Research Group / Bioengineering Group

Led a group of researchers (up to 8 simultaneous direct reports) overseeing research and development of engineered orthopedic tissues (including cartilage, meniscus and ligament). Part of the research team that prepared an FDA IDE (Investigative Device Exemption) for tissue engineered cartilage.

- Directed a research team (including biologists and bioengineers) to develop a paradigm of cell seeding, cell expansion, tissue growth, product storage, and product delivery to the operating

room with validated predictive and reproducible quality control assessments to develop the product design of an effective cell-based therapy. Research projects also focused on designing customized bioreactors to mimic select *in vivo* parameters.

- Led the design and planning of preclinical animal studies, including focus on identifying an appropriate large animal model and clinically relevant outcome measures for cartilage repair.

### **GOVERNMENT EXPERIENCE**

**Committee Chair: Cell, Tissue, and Gene Therapies Advisory Council of the FDA 2014-2015**

**Member: Cell, Tissue, and Gene Therapies Advisory Council of the FDA 2010-2015**

Expertise: Bioengineering.

The committee addresses specific sponsor-related issues and guidance documents related to clinical products (e.g. quality control testing, mode of delivery, biocompatibility, etc.) and clinical trial design (e.g. dosing, appropriate patient populations, safety and efficacy outcomes, etc). Specific topics during my tenure included:

- As a committee member, addressed a Miltenyi cell selection system used with allografts for leukemia patients, approval of an Apligraf tissue engineering product, and a draft guidance document for early-phase clinical trials of cellular and gene therapy products.
- Under my leadership as Chair, addressed a draft guidance for shedding studies for virus or bacterial-based gene therapy products and an Amgen treatment for metastatic melanoma.

### **LEADERSHIP & HONORS**

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| Chair of the Stem Cell Engineering Track for the BMES Annual Society Meeting       | 2016         |
| Elected to the Tissue Eng & Regenerative Med Society Membership Committee          | 2014-2016    |
| Executive Committee of Tulane BME Medical School Location                          | 2013-present |
| Lead of COBRE Stem Cell Aging & Cardiovascular Applications Project                | 2012-present |
| Tulane BME Staff & Faculty Search (Hiring) Committee                               | 2009-2016    |
| Editorial Board, Frontiers in Bioengineering and Biotechnology                     | 2014–present |
| Editorial Board, Journal of Tissue Science & Engineering                           | 2010–present |
| Regular abstract reviewer and session chair for Biomedical Engineering Society     | 2009-present |
| Regular abstract reviewer for Society for Biomaterials                             | 2009-present |
| Tulane Burk-Kleinpeter Early Career Professor                                      | 2014-2016    |
| Chair of the FDA Cell, Tissue, and Gene Therapies Advisory Council                 | 2014-2015    |
| Invitee to Special NSF meeting on New Directions for Tissue Eng & Regenerative Med | 2013         |
| Executive Committee of Tulane Center for Public Service                            | 2012-2015    |
| GSSA Outstanding Faculty Award: School of Science & Engineering                    | 2009-2010    |
| NIH Ruth L. Kirschstein National Research Service Award                            | 2004-2006    |

### **PROFESSIONAL SERVICE**

Regular reviewer of manuscript submission to journals, including:

Acta Biomaterialia, Annals of Biomedical Engineering, Biotechnology and Bioengineering, Bone, BMC Biotechnology, Cell & Molecular Bioengineering, Cell Proliferation, Cells Tissues Organs, Cytotherapy, Integrative Biology, Journal of Biomed Materials Res Part A, Journal of Biomechanical Engineering, Stem Cell Research & Therapy, Stem Cell Reviews and Reports, Stem Cells, Stem Cells International, Tissue Engineering Parts A, B, C, and Trends in Cardiovascular Medicine.

Grant reviewer for the American Heart Assoc., NY Stem Cell Foundation, and the NIH (ad hoc).

**PUBLICATIONS** (*a selection of 5 representative publications of 22 as of 8/5/16; additional 6 in prep*)

- Lack of vimentin impairs endothelial differentiation of embryonic stem cells. Boraas LC, Ahsan T: *Nature Scientific Reports* 2016.
- Cytoskeletal expression and remodeling in pluripotent stem cells. Boraas LC, Guidry JB, Pineda ET, Ahsan T: *PLOS One* 2016.
- Looking ahead to engineering epimorphic regeneration of a human digit or limb. Quijano LM, Lynch KM, Allan CH, Badylak S, Ahsan T: *Tissue Eng Part B* 2016.
- Shear stress during early embryonic stem cell differentiation promotes hematopoietic and endothelial phenotypes. Wolfe RP, Ahsan T: *Biotechnol Bioeng* 2013.
- Mesenchymal Stem Cells Overexpressing Ephrin-B2 Rapidly Adopt an Early Endothelial Phenotype with Simultaneous Reduction of Osteogenic Potential. Duffy GP, D'Arcy S, Ahsan T, Nerem RM, O'Brien T, Barry F. *Tissue Eng Part A* 2010.

A full listing of publications is listed on the National Library of Medicine PubMed website:

<http://www.ncbi.nlm.nih.gov/myncbi/browse/collection/40257895/?sort=date&direction=descending>

**PRESENTATIONS**

5 International Invitations, 14 National Invitations, 50+ International & National Conference Presentations

**GRANT FUNDING**

Funding has been received at the State level (Louisiana Board of Regents), Federal level (NIH >\$1.2 million), and from Industry (Millipore). >\$2 million dollars in procured funding.

**SOCIETY MEMBERSHIPS**

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| American Association for the Advancement of Science (AAAS)                | 2010-present |
| American Institute of Chemical Engineers (AIChE)                          | 2010-present |
| American Society of Cell Biology (ASCB)                                   | 2005-present |
| American Society of Matrix Biology (ASMB)                                 | 2001-2008    |
| American Society of Mechanical Engineers (ASME)                           | 1997-present |
| Biomedical Engineering Society (BMES)                                     | 2001-present |
| International Society for Stem Cell Research (ISSCR)                      | 2005-present |
| Tissue Engineering & Regenerative Medicine International Society (TERMIS) | 2003-present |

**ACADEMIC TRAINING**

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| <b>Research Engineer: Georgia Institute of Technology</b>  | <b>2007-2009</b> |
| Cardiovascular Tissue Engineering Laboratory<br>PI of Lab: Dr. Robert M. Nerem   |                  |
| <b>Visiting Scholar: Imperial College London, UK</b>   | <b>2007</b>      |
| Department of Chemical Engineering & Institute of Biomedical Engineering<br>Mentors: Drs. Athanasios Mantalaris and Judit Nagy |                  |
| <b>Postdoctoral Research Fellow: Georgia Institute of Technology</b>   | <b>2003-2007</b> |
| Cardiovascular Tissue Engineering Laboratory<br>PI of Lab: Dr. Robert M. Nerem   |                  |
| <b>Postdoctoral Fellow: M.E. Müller Inst. for Biomechanics, Bern, Switzerland</b>  | <b>1998-1999</b> |
| Cartilage Tissue Biomechanics and Structural Biology<br>Institute Director: Prof Ernst B. Hunziker                             |                  |
| <b>Research Assistant: University of California San Diego, La Jolla, California</b>  | <b>1994-1998</b> |
| Cartilage Tissue Engineering Laboratory<br>Advisor: Dr. Robert L. Sah  |                  |

A full CV is available at: [ahsanlab.org](http://ahsanlab.org)