Valarmathi M. Thiruvanamalai, M.D., Ph.D.

Title: Research Assistant Professor

PUBMED Link: Valarmathi MT or Valarmathi TM

Research:

Dr. Thiruvanamalai is tackling one of the most fundamental problems facing cardiac therapy, creating a vascularized cardiac muscle construct. Cardiovascular disease is a leading cause of significant morbidity and mortality in the United States. Restricted myocardial regeneration after tissue injury and shortage of organs for transplantation are the principal constraints of conventional therapies. Organ tissue engineering, including cardiovascular tissues, has been an area of intense investigation and offers a potential to develop in vitro functional equivalents of native myocardium for tissue repair and to explore novel approaches to treat or prevent cardiac disease. The current major challenge to these approaches has been the inability to vascularize and perfuse the in vitro engineered tissue constructs. Attempts to provide oxygen and nutrients to the cells contained in the biomaterial constructs have had varying degrees of success. Engineering a tissue of clinically relevant magnitude requires the formation of an extensive and stable microvascular networks within the tissue. Since most in vitro engineered tissue constructs do not contain the intricate microvascular structures of native tissue, the cells contained in scaffolds heavily rely on simple diffusion for oxygenation. To this end, Dr. Thiruvanamalai is in the process of developing an in vitro vascularized cardiac myotube using autologous and/or allogenic, adult, bone marrow stromal stem cells in a three-dimensional (3-D) tubular scaffold, which can be used as a cardiac patch for repairing various types of cardiac lesions.

In addition, Dr. Thiruvanamalai has already created a novel in vitro vascularized bone tissue using autologous and/or allogenic adult stem cells in another 3-D tubular scaffold as replacement tissue for small segmental bone defects and is considered elegant in design and practice.

Dr. Thiruvanamalai's research is state-of-the-art that promises to lead to the generation of total replacement biologic products for various therapeutic purposes in regenerative medicine. This is the future of medicine where the clinical and industrial applications of these developed 3-D vascularized tissues are endless and not limited to the repair/regeneration of the heart, blood vessels and bone. Also, there is a need for such tissue for the study of basic biological mechanisms and for the use of drug discovery and screening.

Recent Publications:

- **Valarmathi MT**, Fuseler JW, Goodwin RL, Davis JM, Potts JD. The mechanical coupling of adult marrow stromal stem cells during cardiac regeneration assessed in a 2-D co-culture model. ***Biomaterials*** 2011 Apr;32(11):2834-2850.

- **Valarmathi MT**, Goodwin RL, Fuseler JW, Davis JM, Yost MJ, Potts JD. A 3-D cardiac muscle construct for exploring adult marrow stem cell based myocardial regeneration. ***Biomaterials*** 2010 Apr;31(12):3185-3200.
  http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2887929/pdf/nihms206471.pdf

- Kaur G, **Valarmathi MT**, Potts JD, Jabbari E, Sabo-Attwood S, Wang Q. Regulation of osteogenic differentiation of rat bone marrow stromal cells on 2D nanorod substrates. ***Biomaterials*** 2010 Mar;31(7):1732-41.

- **Valarmathi MT**, Davis JM, Yost MJ, Goodwin RL, Potts JD. A three-dimensional model of vasculogenesis. ***Biomaterials*** 2009 Feb;30(6):1098-112.

- Kaur G, **Valarmathi MT**, Potts JD, Wang Q. The promotion of osteoblastic differentiation of rat bone marrow stromal cells by a polyvalent plant mosaic virus. ***Biomaterials*** 2008 Oct;29(30): 4074-81.

- **Valarmathi MT**, Yost MJ, Goodwin RL, Potts JD. The influence of proepicardial cells on the osteogenic potential of marrow stromal cells in a three-dimensional tubular scaffold. ***Biomaterials*** 2008 May;29(14):2203-16. **{2008 The Year in Images}**

- Jabbari E, He X, **Valarmathi MT**, Sarvestani AS, Xu W. Material properties and bone marrow stromal cells response to in situ crosslinkable RGD-functionalized lactide-co-glycolide scaffolds. ***J Biomed Mater Res A.*** 2009 Apr;89(1):124-37.

- **Valarmathi MT**, Yost MJ, Goodwin RL, Potts JD. A three-dimensional tubular scaffold that modulates the osteogenic and vasculogenic differentiation of rat bone marrow stromal cells. ***Tissue Eng Part A.*** 2008 Apr;14(4): 491-504. **{W*ith Journal Cover Art*}**

- Sawhney M, Mathew M, **Valarmathi MT**, Das SN. Age related changes in Fas (CD95) and Fas ligand gene expression and cytokine profiles in healthy Indians. ***Asian Pac J Allergy Immunol***. 2006 Mar;24(1):47-56.

- **Valarmathi MT**, Sawhney M, Deo SS, Shukla NK, Das SN. Novel germline mutations in the BRCA1 and BRCA2 genes in Indian breast and breast-ovarian cancer families. ***Hum Mutat***. 2004 Feb;23(2):205.
  Online Citation: **Human Mutation**, Mutation in Brief #684 (2004)
  Onlinehttp://www3.interscience.wiley.com/homepages/38515/pdf/mutation/684.pdf
  http://onlinelibrary.wiley.com/doi/10.1002/humu.9213/pdf

- Agarwal A, Rani M, Saha GK, **Valarmathi TM**, Bahadur S, Mohanti BK, Das SN. Disregulated expression of the Th2 cytokine gene in patients with intraoral squamous cell carcinoma. ***Immunol Invest.*** 2003 Feb;32(1-2):17-30.

- **Valarmathi MT**, AA, Deo SS, Shukla NK, Das SN. BRCA1 germline mutations in Indian familial breast cancer. ***Hum Mutat***. 2003 Jan;21(1):98-9.
  Online Citation: **Human Mutation**, Mutation in Brief #570 (2002)
  Onlinehttp://www.interscience.wiley.com/humanmutation/pdf/mutation/570.pdf
  http://onlinelibrary.wiley.com/doi/10.1002/humu.9099/pdf

- Shanthi P, **Valarmathi TM**, Chithra R, Madhavan M, Pushpa V, Sethuraman S. AgNORs in the study of different types of acute leukaemias. ***Indian J Pathol Microbiol***. 1995 37(Sup): S82.

Invited Books and/or Chapters:

- **Valarmathi MT**, Fuseler JW. A novel adult marrow stromal stem cell based 3-D postnatal de novo vasculogenesis for vascular tissue engineering. Book chapter in "Vasculogenesis", Dan T. Simionescu, Editor. InTech Web 2011.

Education:

1981-1984	**B.Sc., Chemistry,** University of Madras (Dowaraka Doss Goverdhan Doss Vaishnav College), Madras, INDIA
1984-1989	**M.B.B.S., Medicine & Surgery,** University of Madras (Kilpauk Medical College), Madras, INDIA
1991-1994	**M.D., Pathology,** University of Madras (Postgraduate Institute of Basic Medical Sciences), Madras, INDIA
1998-2003	**Ph.D., Biotechnology**, All-India Institute of Medical Sciences (A.I.I.M.S.), New Delhi, INDIA
1989-1990	**Compulsory Rotary Residential Internships,** University of Madras (Kilpauk Medical College), Madras, INDIA
1997-1998	**Post M.D./M.S. Training in Medical Biotechnology**, All-India Institute of Medical Sciences (A.I.I.M.S.), New Delhi, INDIA
2004-2006	**Visiting Scientist (Postdoctoral Fellowship Training),** Laboratory of Molecular Biology (LMB), Centre for Cancer Research (CCR)**,** National Cancer Institute (NCI), National Institutes of Health (NIH), Maryland, USA
2006- 2008	**Postdoctoral Research Associate,** Department of Chemical Engineering & Department of Cell and Developmental Biology & Anatomy, University of South Carolina, South Carolina, USA

Additional Training:

2005	**hESC -** Short-term Course in Human Embryonic Stem Cell Culture Techniques, Johns Hopkins University, Baltimore, Maryland, USA
2007	**FrHESC -** Frontiers in Human Embryonic Stem Cells Advance Training Course, Pittsburg Development Center, Woods Hole, Massachusetts, USA

Professional Affiliations:

2007-Present	Member, International Society for Stem Cell Research – **ISSCR**
2007-Present	Member, Tissue Engineering and Regenerative Medicine International Society – **TERMIS**
2007-Present	Member, American Association for Cancer Research – **AACR**
2007-Present	Member, American Society for Investigative Pathology – **ASIP**
2011-Present	Member, American Heart Association – **AHA**

Invited Editorial Board Activities:

2010-Present	Editorial Board, Journal of Microbial & Biochemical Technology
2011-Present	Editorial Board, Anatomy & Physiology

Funded Research Support:

2010-2012	**Viscofan Bioengineering Project,** "The Development of 3-D Tissue Models for Toxicity Testing – Cardiovascular Tissue Model." Development of Cardio-Toxicity Cell-Based Assays. Collaborative Research Project University of South Carolina and Viscofan Bioengineering
2011-2014	**American Heart Association, Scientist Development Grant,** "Development of a 3-D vascularized cardiac muscle construct."

Contact Information:

Address: Building No. 1, Room No. B-31
6439 Garners Ferry Road
Cell Biology and Anatomy
School of Medicine
University of South Carolina
Columbia
SC 29209
Phone: (803)-216-3821
Fax: (803)-216-3846
E-mail: valarmathi.thiruvanamalai@uscmed.sc.edu