Vahid Serpooshan

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Postdoctoral Research Fellow 2011-PRESENT

Pediatric Cardiology, Stanford School of Medicine, US

EDUCATION

PhD in Materials Science and Engineering 2007-2010

McGill University, Canada

PhD Thesis: Optimization of collagen gel scaffold properties for bone tissue engineering

Masters in Materials Science and Engineering 2003-2005

Sharif University of Technology, Iran

Bachelors in Materials Science and Engineering 1998-2003

Sharif University of Technology, Iran

RESEARCH INTERESTS / RESEARCH TECHNIQUES

Research Interests

Cardiac regeneration, remodeling, and development processes, cardiovascular tissue engineering, physiomechanical properties of biomaterials, tissue engineering scaffolds, cell – microenvironment interactions in tissues and tumors, cellular and molecular biology, *in vivo* transgenic mouse models, drug delivery systems, nano biomaterials synthesis and characterization, MEMS, NEMS, and polymer composites.

Research Techniques

- *in vitro* and *in vivo* assessment of cell-3D matrix interactions, cell proliferation, migration, and differentiation
- Molecular biology: cloning, PCR, and immunoblotting
- Histology and immunohistochemistry of biological samples
- Microscopy and tomography techniques: optical and fluorescence microscopy, laser scanning confocal microscopy, electron microscopy (SEM and TEM), AFM, FTIR microscopy, energy dispersive spectroscopy (EDS), micro CT, and X-ray tomography
- Novel theoretical/experimental approaches to evaluate mass transfer properties (i.e. hydraulic permeability and diffusion) in hydrated scaffolds and soft tissues
- Physical-mechanical testing techniques: DMA, AFM, TMA, DSC, nano indentation, and microhardness
- Nanomaterials synthesis, processing, and biomolecular imaging techniques
- Chemical analysis techniques: XRD, FTIT-ATR spectroscopy

JOURNAL PUBLICATIONS

- **V. Serpooshan**, K. Wei, M. Zhao, S.A. Metzler, P.B. Shah, P.J. Kim, Y. Matsuura, W. Cai, A. Savtchenko, A. Wang, M. Diez-Cunado, W. Zhu, M. Mahmoudi, M.J. Butte, P.C. Yang, D. Bernstein, M. Mercola, and P. Ruiz-Lozano. *Engineered Epicardium Activates Cardiac Regeneration*. PNAS, *In Review*.

- M. Ghavami, B. AbdeEmamy, M.A. Shokrgozar, **V. Serpooshan**, and M. Mahmoudi. *Plasma Concentration Gradient Influences the Protein Corona Decoration on Nanoparticles*. RSC Advances, *DOI:* 10.1039/C2RA22093H.
- **V. Serpooshan**, T.M. Quinn, N. Muja, and S.N. Nazhat. *Hydraulic permeability of multilayered collagen gel scaffolds under plastic compression-induced unidirectional fluid flow*. Acta Biomaterialia, *DOI:* 10.1016/j.actbio.2012.08.031.
- M.J. Hajipour, K.M. Fromm, A. AkbarAshkarran, D.J. de Aberasturi, I.R. de Larramendi, T. Rojo, **V. Serpooshan**, W.J. Parak, and M. Mahmoudi. *Antibacterial Properties of Nanoparticles*. Trends in Biotechnology, 2012, *DOI: 10.1016/j.tibtech.2012.06.004*.
- M. Mahmoudi and **V. Serpooshan**. *Silver-Coated Engineered Magnetic Nanoparticles Are Promising for the Success in the Fight against Antibacterial Resistance Threat. ACS Nano 6*, 2565, 2012.
- M. Mahmoudi and **V. Serpooshan**. *Large Protein Absorption from Small Changes on the Surface of Nanoparticles*. Journal of Physical Chemistry, 2011, *DOI: 10.1021/jp2056255*.
- M. Mahmoudi, S. Laurent, and **V. Serpooshan**. *Engineered nanoparticles for biomolecular imaging*. Nanoscale 3, 3007, 2011.
- **V. Serpooshan**, T.M. Quinn, N. Muja, and S.N. Nazhat. *Characterization and modeling of a dense lamella formed during self compression of fibrillar collagen gels: implications for biomimetic scaffolds*. Soft Matter 7, 2918, 2011.
- **V. Serpooshan**, N. Muja, B. Marelli, and S.N. Nazhat. *Fibroblast contractility and growth in plastic compressed collagen gel scaffolds with microstructures correlated with hydraulic permeability*. Journal of Biomedical Materials Research Part A, DOI: 10.1002/jbm.a.33008.
- **V. Serpooshan**, M. Julien, O. Nguyen, H. Wang, A. Li, N. Muja, J.E. Henderson, and S.N. Nazhat. *Reduced hydraulic permeability of three dimensional collagen scaffolds attenuates gel contraction and promotes the growth and differentiation of mesenchymal stem cells*. Acta Biomaterialia 6, 3978, 2010.
- **V. Serpooshan**, S. Zokaei, and R. Bagheri. *Effect of rubber particle cavitation on mechanical properties and deformation behavior in high impact polystyrene*. Journal of Applied Polymer Science 104, 1110, 2007.

SELECTED CONFERENCE PRESENTATIONS / PUBLICATIONS

- **V. Serpooshan**, K. Wei, M. Zhao, S.A. Metzler, P.B. Shah, P.J. Kim, Y. Matsuura, W. Cai, A. Savtchenko, A. Wang, M. Diez-Cunado, W. Zhu, M.J. Butte, P.C. Yang, D. Bernstein, M. Mercola, and P. Ruiz-Lozano. *Engineered Epicardium Activates Cardiac Regeneration*. Stanford School of Medicine, Department of Pediatrics Division of Cardiology, Annual Cardiovascular Institute (CVI) Retreat, September 2012 (**Yong Investigator Award in Basic Sciences**).
- **V. Serpooshan**, M. Zhao, S. Metzler, Y. Tachie-Baffour, C. Breen, P. Shah, D. Bernstein, and P. Ruiz-Lozano. *Novel cardiovascular patches to promote cardiac regeneration post myocardial infarction*. Stanford School of Medicine, Department of Pediatrics Division of Cardiology, Annual Cardiovascular Institute (CVI) Retreat, September 2011 (**Most Popular and Best Presentation Awards**).
- S. Metzler, **V. Serpooshan**, M. Diez, S. Ray, K. Wei, and P. Ruiz-Lozano. *Developmental mechanobiology of the epicardium*. Stanford School of Medicine, Department of Pediatrics Division of Cardiology, Annual Pediatric Research Retreat, April 2011 (**Best Presentation Award**).

- **V. Serpooshan**, N. Muja, and S.N. Nazhat. *Study of the role of hydraulic permeability of three dimensional collagen scaffolds on fibroblastic cell contractile behaviour, viability, and proliferation.* Canadian Biomaterials Society (CBS) 2010, Kingston, Canada, June 2-4 2010.
- C. Gao, O. Nguyen, **V. Serpooshan**, B. El Chaarani, S.N. Nazhat, E.J. Harvey, and J.E. Henderson. *Rodent model for adult stem cell transplantation for bone repair.* Canadian Orthopaedic Association (COA) Annual Meeting, Edmonton, Canada, June 17-20 2010.
- C. Gao, O. Nguyen, B. ElChaarani, **V. Serpooshan**, L.Z. Lim, H. Wang, A. Li, M. Khayyat-Kholghi, S.N. Nazhat, E.J. Harvey, and J.E. Henderson. *Mesenchymal stem cells (MSC) in dense collagen scaffold for bone repair*. Canadian Society for Life Science Research 4th Annual Conference. Ottawa, Ontario, Canada, November 13-14 2009.
- **V. Serpooshan**, T.M. Quinn, and S.N. Nazhat. *Self compression of collagen gel scaffolds: a novel route of measuring hydraulic permeability.* Canadian Biomaterials Society (CBS) 2009, Quebec City, Canada, May 20-23 2009.
- O. Nguyen, M. Julien, **V. Serpooshan**, A. Li, E.J. Harvey, S.N. Nazhat, and J.E. Henderson. *Osteogenic differentiation of marrow stem cells (MSC) for bone tissue engineering.* Canadian Biomaterials Society (CBS) 2009, Quebec City, Canada, May 20-23 2009.
- C. Gao, O. Nguyen, **V. Serpooshan**, L.Z. Lim, H. Wang, A. Li, M. Khayyat-Kholghi, S.N. Nazhat, E.J. Harvey, and J.E. Henderson. *Bone tissue engineering with mesenchymal stem cell (MSC)-seeded dense collagen scaffolds.* 15th Annual Canadian Connective Tissue Conference, Calgary, Canada, July 17-18 2009.

LANGUAGES

- English, French, and Farsi

COMPUTER SKILLS

- *Mastery in graphic skills applied to demonstrate scientific phenomena related to research*: Adobe Photoshop, Macromedia Flash, AutoCAD, LightWave 3D, CoolEditPro, and Movie Maker Pro
- *Programming*: Visual Basic, Maple, HTML, Java, SQL, web design and programming

AWARDS, INVENTIONS AND HONORS

- Cardiovascular Institute (CVI) Seed Grant 2012-13, Stanford School of Medicine, December 2012.
- Cardiovascular Institute (CVI) Young Investigator Award in Basic Sciences 2012, Stanford School of Medicine, Sep 2012.
- V. Serpooshan and P. Ruiz-Lozano, *Peptide coated collagen matrices for myocardial infarction therapy*, Report of Invention, Stanford University, docket number S11-458, Dec 2011.
- Oak Foundation Cardiovascular Award, March 2011-2013, Stanford School of Medicine.
- McGill Engineering Doctoral Award (MEDA), 2007-2010, McGill University
- Graduate Research Enhancement and Travel (GREAT) Award, August 2010, McGill University
- McGill Provost's Graduate Fellowship, 2009, McGill University
- Dr. Gerald Hatch Doctoral Fellowship Award, 2008, McGill University
- S. N. Nazhat, V. Serpooshan, T. M. Quinn, *A method and a device for measuring hydraulic permeability of gel-like structures and for making biomaterials, and novel biomaterials produced thereof*, Report of Invention to OTT #09080, February 2009.

- V. Serpooshan, *Patent*: "New Revealing Technique for Optical/Electron Microscopy of Polymer Blends", Registered in National Organization of Documents Registration, Iran, Reg. Number: 32783, Sep 1 2005.
- Top-student in Masters program, 2003-2005, Mater. Sci. and Eng. Dept., Sharif University of Tech., Iran.

PROFESSIONAL EXPERIENCE

Postdoctoral Research Scholar — Mar 2011 – PRESENT

Stanford School of Medicine, Palo Alto, CA

- Conducting research in the field of cardiac diseases, development, and regeneration. Investigating new therapeutic approaches to interfere with cardiac remodeling processes following acute heart injuries, particularly myocardial infarction, via employing biomimetic engineered cardiac patches seeded with various cells, growth factors, and nanobiotherapeutics.
- Supervising several undergraduate students from Stanford and other universities within the US.

Graduate Research Assistant — Sep 2007 – Dec 2010

McGill University, Montreal, QC

- Developed new physical-mechanical models to measure hydraulic permeability of hydrated collagen scaffolds (submitted to Office of Technology Transfer at McGill University as a report of invention).
- Participated in multidisciplinary collaborations with research groups in the fields of cell biology and medicine. Gained experience on the application of collagen scaffolds for bone tissue engineering.
- Independently supervised a number of research projects for the undergraduate students, conducted at McGill University. These included the supervision of the experiments conducted in the Biomaterials Laboratory in Materials Engineering Department, and also cell culture assays conducted in Centre for Bone and Periodontal Research.
- Obtained hands-on experience over a range of cell culture and analysis techniques. In-depth knowledge on application of various microscopy techniques: SEM and TEM, AFM, and FTIR microscopy.

Research Engineer — Dec 2005 – June 2007

Delta Consultant Engineering Co., Tehran, Iran

- Conducted several materials characterization and materials selection projects for polymeric parts to be used in automotive industries.

Graduate Research Associate — Sep 2006 – Aug 2007

Institute for Nano Science and Technology (INST)
Sharif University of Technology, Tehran, Iran

- Conducted comprehensive literature review on nanomaterials, MEMS, and NEMS, with a focus on polymeric nanocomposites. Obtained in-depth knowledge over a range of nanomaterials synthesis and characterization techniques.

Graduate Research Assistant — Sep 2003 – Sep 2005

Sharif University of Technology, Tehran, Iran

- **Masters Thesis**: *Study of relationship between mechanical properties and microstructure in high impact polystyrene (HIPS)*. Advisor: Prof. R. Bagheri, Sharif University of Technology, 2003-2005.

- Independently supervised a research project on: *Application of recycled tire powder in development of new epoxy-based compounds for surface coating purposes*. The results of this project were introduced directly to public coating industries in Tehran for commercial uses.
- Designed and developed various home-made soft wares to investigate mechanical properties of polymeric materials, including: *Scratch Resistance Measurement Software* which incorporated a new visual criterion to quantify scratch resistance of materials.

TEACHING EXPERIENCE

- Certificate from "*Learning to Teach"* professional development workshop for graduate students, held in Graduate and Postdoctoral Studies (GPS) Center at McGill University, Nov 2008.
- Analytical and Characterization Techniques (MIME317) June 2009 – July 2009
  Dept. of Mining and Materials Engineering, McGill University, Canada
- Materials Properties for Electrical Engineering (MIME262) January 2009 – April 2009
  Dept. of Mining and Materials Engineering, McGill University, Canada
- Applications of Polymers (MIME345) January 2008 – April 2008
  Dept. of Mining and Materials Engineering, McGill University, Canada
- Structure of Materials (MIME261) September 2007 – December 2007
  Dept. of Mining and Materials Engineering, McGill University, Canada

EXPERIENCE AS A REVIEWER FOR JOURNALS

- Chemical Reviews
- Chemical Neuroscience
- Acta Biomaterialia
- Journal of Applied Polymer Science
- Nanomedicine
- Biomedical Materials

PROFESSIONAL AFFILIATIONS

- American Heart Association (AHA)
- Canadian Biomaterials Society (CBS)
- Society for Biomaterials (Secretary/Treasurer Officer)
- Tissue Engineering and Regenerative Medicine International Society (TERMIS)

REFERENCES

- Dr. Pilar Ruiz-Lozano prlozano@stanford.edu (650) 736-8758
  Department of Pediatrics Cardiology, Stanford University, Palo Alto, CA 94304
- Dr. Daniel Bernstein danb@stanford.edu (650) 721-2121
  Department of Pediatrics Cardiology, Stanford University, Palo Alto, CA 94304
- Dr. Showan N. Nazhat showan.nazhat@mcgill.ca (514) 398-5524
  Department of Mining and Materials Engineering, McGill University, Montreal, Canada H3A 0C5