

JONATHAN ROBERT SANDERS

Assistant Professor of Chemical Engineering

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PROFILE

- Ph.D. level biomedical engineer/scientist/educator with six years of experience in R&D working at a lab-based start-up company on pulmonary applications of gene- and protein-based therapies.
- Five years recent administrative experience in a university research and graduate studies office.
- Extensive experience with grant writing, funding opportunity identification, and preparation of application packages for submission to external funding agencies.
- Ability to coordinate projects spanning multiple domains and including university faculty, students, research scientists, clinical doctors, engineers, and business development personnel.
- Outcomes and people-focused with excellent collaboration, organizational, and leadership skills; effective communication skills; and familiarity with laboratory and instructional technology.
- Graduate education focus on the examination of biological transport phenomena in the pulmonary microvasculature using *in vitro*, *in vivo*, and *in silico* models.

EDUCATION

VANDERBILT UNIVERSITY--Nashville, TN

Doctor of Philosophy, Biomedical Engineering, December 2001

Dissertation Title: Cationic, anionic, and neutral probes as markers of permeability in sheep pulmonary microvessels and bovine endothelial cell monolayers

VANDERBILT UNIVERSITY--Nashville, TN

Master of Science, Biomedical Engineering, May 1998

Thesis Title: Development of a universal calibration curve for a polymer-based size exclusion column to predict dextran and protein radii and molecular weight distributions

TENNESSEE TECHNOLOGICAL UNIVERSITY--Cookeville, TN

Bachelor of Science, Mechanical Engineering, May 1995, *graduated cum laude*

PROFESSIONAL EXPERIENCE

TENNESSEE TECHNOLOGICAL UNIVERSITY (TTU)--Cookeville, TN

Assistant Professor of Chemical Engineering, August 2011

Roles and Responsibilities:

Teaching (Courses Taught or Being Taught)

- CHE 3111 – Transfer Science I: Conduction, Radiation and Diffusion (Fall '11)
- CHE 6920 – Chemical Engineering Graduate Seminar (Fall '11)
- CHE 4661 – Transport in Biochemical and Biological Processes (Spring '11)

Research (Areas of Focus)

- Biomolecular medicine, including bioassay development
- Microfluidics and lab-on-a-chip applications for clinical diagnostics
- Drug delivery and gene therapy
- Engineering education

Advising

- Advisor to student chapters of AICHE and OXE

Director of Research and Graduate Studies, September 2006 - July 2011

Roles and Responsibilities:

- Support and promote university research and other scholarly activities, including those internally funded and externally funded through grants and contracts.
- Coordinate and lead proposal development workshops and educational seminars on research compliance, grants budgeting, federal regulations, etc.
- Organize and oversee annual Student Research Day activities in which undergraduate and graduate students present research results in a poster format.
- Assist faculty with proposal and associated budget development.
- Write grants and lead initiatives in areas of emerging research activity.
- Provide support services for university committees including the institutional review board (IRB) for protection of human subjects in research, patents and copyrights committee, and the animal care and use committee to ensure compliance with university policies and federal regulations.
- Coordinate meetings between university faculty and researchers at other institutions and program officers at funding agencies.
- Advise students enrolled in the on-line Master of Professional Studies-Regents Online Degree Program (MPS-RODP); serve as instructor for these students in the PRST 6998 professional project course (Credit 3) which is the culminating project required for MPS-RODP degree completion.
- Administer campus-wide electronic thesis and dissertation (eTD) program.
- Perform any and/or all administrative duties of the Office of Research and Graduate Studies in the absence of the Associate Vice President.
- Guest-lecture in chemical engineering undergraduate courses.

GENERX+, INC.--Atlanta, GA

Director of Research, March 2003 - August 2006

Research Scientist, September 2000 - March 2003

Roles and Responsibilities:

Technical

- Directed and executed set-up of biomedical research laboratory.
- Served as primary on-site person responsible for the day-to-day planning, designing, and coordinating of research activities.
- Analyzed data, prepared reports, and communicated results internally and at scientific conferences.
- Wrote small business grants, prepared budgets for applications, and prepared progress reports for submission to NIH.
- Served as liaison between company and collaborating partners.

Managerial

- Managed a research team consisting of as many as three research technicians.
- Coordinated experiments across multiple domains with subcontractors and company employees/affiliates having different areas of expertise.
- Led weekly lab meetings.
- Oriented and trained new employees regarding company goals, reporting procedures, and standard operating procedures.

Business Development

- Assisted with business plan writing.
- Experienced with fund raising initiatives through work with CEO and COO.

- Worked on market analysis project of company lead products.

OTHER APPOINTMENTS AND PROFESSIONAL AFFILIATIONS

2009--2011	Adjunct Faculty, School of Interdisciplinary Studies, TTU
2008--Present	Associate, TTU Millard Oakley STEM Center
2007--2010	Member, Sigma Xi Scientific Research Society President-Elect/President (2007/2008) TTU Chapter
2003--Present	Member, Biomedical Engineering Society
2002--2006	Research Scientist, TransTk Co. (wholly-owned subsidiary of geneRx+)
2003--2006	Adjunct Instructor, Department of Medicine, Emory University

ADDITIONAL AREAS OF STRENGTH/INDUSTRY EXPERTISE

Project Management/External Funding

- Principal investigator on four NIH-sponsored Small Business Innovation Research (SBIR) grants and an investigator on two Small Business Technology Transfer (STTR) grants:

Principal Investigator on the following four funded small business grants

2005-2007: Development of Alpha-1 Antitrypsin Gene Therapeutic as Treatment for COPD (Phase I SBIR)--\$97,549.

2002-2004: Improved Plasmid/Liposome Administration to the Lungs (Phase II SBIR)--\$785,508.

2000-2001: Improved Plasmid/Liposome Administration to the Lungs (Phase I SBIR)--\$100,000.

2000-2001: Gene Delivery Systems for Bronchoalveolar Diseases (Phase II SBIR).

Investigator on the following two funded small business grants

2002-2004: AuContraAer: Ventilator Compatible Aerosol Delivery Device (Phase I STTR).

2003-2006: p20, Molecular Shortstop for Inflammatory Lung Diseases (Phase II STTR).

- Principal investigator on a pending Academic Research Enhancement Award (AREA) grant application submitted to the NIH National Institute of Biomedical Imaging and Bioengineering:

2011-2014: Dendrimer-Mediated Gene Delivery: A Blueprint for Building Biomedical Research (with Dr. Pedro Arce, Dr. Holly Stretz, and Dr. Don Visco)--\$408,935
Impact Score: 23; Council Review: January 2011

Product Development

- Applied engineering methods to optimize gene- and protein-based formulations and to identify and implement solutions to problems encountered during product development.
- Assisted in the development of murine-based, elastase-induced models of emphysema.
- Refined *in vitro* assays to enhance assessment of effects of formulation modifications on product potency and stability.
- Developed techniques for improving liposome/plasmid complex and protein-based aerosol administration to the lungs.
- Tested nebulizers and identified optimal system for aerosol delivery of plasmid/liposome complexes to the lungs.

Laboratory and Computer Skills

- Extensive experience with plasmid construction, liposome-mediated transfections, and other

molecular biology techniques. Also experienced with electrophoresis, Western blot analysis, RNA isolation and RT-PCR.

- Proficient with a number of chromatographic techniques including HPLC, SEC, and IEC for separation and purification of plasmids, recombinant proteins, dextrans, and other polymers.
- Other skills: mathematical modeling and compartmental analysis, large animal experience, fluorescence and uv-vis spectroscopy, radioisotope handling and detection, labeling techniques, liposome production, characterization of nebulizer output and aerosol particle size using cascade impactors, experience with particle sizers, endotoxin testing.
- Ability to program in MATLAB and experience with FORTRAN.
- Extensive experience with Microsoft Word, Excel, and PowerPoint applications.

PUBLICATIONS

Peer Reviewed

Stashenko, G. J., A. Robichaux, Y. C. (Gary) Lee, **J. R. Sanders**, R. J. Roselli, and R. W. Light. Pleural fluid exchange in rabbits. Respirology. 12(4): 495-499, July 2007.

Mudumba, S., D. Deshpande, **R. Sanders**, R. Parker, C. Carter, S. Webb, M. Tan, E. Gabatan, J. A. Schuster, D. C. Cipolla, S. J. Farr, and K. Brigham. Non-viral delivery of Cox-1 gene by the AERx® Pulmonary Delivery System. Respiratory Drug Delivery IX. 2: 353-356, 2004.

Sanders, J. R., N. A. Pou, and R. J. Roselli. Neutral and DEAE dextrans as tracers for assessing lung microvascular barrier permeability and integrity. J. Appl. Physiol. 93(1): 251-262, July 2002.

Patent Filings

Parker, R. E. and **J. R. Sanders**. System and Method for Optimized Delivery of an Aerosol to the Respiratory Tract. United States Patent Application. Publication #: US 2007/0157931 A1. Publication Date: July 12, 2007.

Conference Proceedings and Presentations

Mbachu, C. P., **R. Sanders**, and P. E. Arce. Role of Collaboration in Enhancing Creativity and Innovation in Engineering Education: Examples from Fluid Mechanics and Biotransport Courses. October 2011 (Free Forum on Chemical Engineering Education during the AIChE Annual Meeting).

Golbayani, P., K. T. Seale, **R. Sanders**, and P. E. Arce. Morphological Effects on the Electrostatic Potential in a Divergent and Convergent Channel for Microfluidic Applications. October 2011 (Poster Session for the American Electrophoresis Society during the AIChE Annual Meeting).

Golbayani, P., K. T. Seale, **R. Sanders**, and P. Arce. Role of Channel Morphology in Microfluidic Applications: Impact on the Behavior of the Electrostatic Potential for an Idealized Case. November 2010 (Poster Session for the American Electrophoresis Society during the AIChE Annual Meeting).

Sanders, R., C. Carter, S. Webb, N. Farsinejad, L. Sealy, K. Brigham, and A. Stecenko. Tag-team genes for preferential generation of prostacyclin. Am. J. Respir. Crit. Care Med.

169(7):A289, May 2004 (Poster Presentation at ATS International Conference-Orlando, FL)

Sanders, J. R. and R. J. Roselli. Dextrans as Model Probes of Permeability in the Lung Microvasculature. October 2003 (Oral Presentation at BMES Annual Fall Meeting-Nashville, TN).

Sanders, J. R. and R. J. Roselli. Assessment of Blood-Lung Lymph Barrier Properties with Neutral and Anionic Dextrans. Ann. Biomed. Engin. 29:S1, October 2001 (Poster Presentation at BMES Annual Fall Meeting-Durham, NC).

Sanders, J. R., N. A. Pou, and R. J. Roselli. Charge modification of the endothelial cell glycocalyx affects transmembrane solute and fluid flux. The FASEB Journal. 14(4): Part I, March 2000 (Poster Presentation at Experimental Biology meeting-San Diego, CA).

Sanders, J. R., N. A. Pou, F. R. Haselton, and R. J. Roselli. Electrostatic Attraction of DEAE dextran alters cell surface charge density. The FASEB Journal. 13(5): Part II, March 1999 (Poster Presentation at Experimental Biology meeting-Washington, DC).

Roselli, R. J. and **J. R. Sanders.** Different mechanisms are responsible for lung microvascular transport of proteins and dextrans. Ann. Biomed. Engin. 26:S7, 1998 (Poster Presentation at BMES Annual Fall Meeting-Cleveland, OH).

Sanders, J. R., N. A. Pou, and R. J. Roselli. The use of DEAE dextrans and neutral dextrans as tracers for detecting changes in sheep lung capillary permeability. The FASEB Journal. 12(4): Part I, March 1998 (Poster Presentation at Experimental Biology meeting-San Francisco, CA).

Roselli, R. J., N. A. Pou, R. E. Parker, C. Finney, and **J. R. Sanders.** A multiple optical tracer method for simultaneous measurement of lung filtration coefficient and solute reflection coefficients. The FASEB Journal. 12(4): Part I, March 1998 (Poster Presentation at Experimental Biology meeting-San Francisco, CA).