

## **RAFAEL V. DAVALOS, PH.D.**

L. PRESTON WADE PROFESSOR, BIOMEDICAL ENGINEERING AND MECHANICS  
VIRGINIA TECH – WAKE FOREST UNIVERSITY  
HOME ADDRESS: 1205 REDBUD ROAD, BLACKSBURG, VA 24060  
CELL: 540-998-9197 E-MAIL: DAVALOS@VT.EDU

### **EDUCATION**

#### **Ph.D. University of California - Berkeley, CA**

Department of Mechanical Engineering - 2002  
Major: Bioengineering Minors: Dynamics and BioMEMS Advisor: Boris Rubinsky  
Dissertation Title: Real-time imaging for molecular medicine through electrical impedance tomography of electroporation

#### **M.S. University of California - Berkeley, CA**

Department of Mechanical Engineering – 1995  
Major: Design

#### **B.S. Cornell University - Ithaca, NY**

Mechanical and Aerospace Engineering - 1994

### **RESEARCH AND TEACHING INTERESTS**

Biotransport, design, cellular engineering microsystems, bioheat transfer, dielectrophoresis, medical device design for cancer detection and treatment, electroporation, microfluidic tissue mimics, bio-inspired microfluidics, scaffolds for tissue engineering, brain-on-a-chip.

### **PROFESSIONAL APPOINTMENTS**

#### **Virginia Tech – Wake Forest University - Blacksburg, VA**

Professor: School of Biomedical Engineering and Sciences, 15 – present  
Professor: Biomedical Engineering and Mechanics, 15 - present  
Associate Professor: School of Biomedical Engineering and Sciences, 11 - 15  
Adjunct Appointment: Mechanical Engineering, 13 - present  
Adjunct Appointment: Wake Forest Institute of Regenerative Medicine, 08 - present  
Affiliate Appointment: Engineering Science and Mechanics at Virginia Tech, 08 - present  
Assistant Professor: School of Biomedical Engineering and Sciences, 06 - 11

#### **Sandia National Laboratories - Livermore, CA**

Principal Member of Technical Staff: Microsystems and Advanced Concepts Engineering, 06 - 07  
Senior Member of Technical Staff: Microsystems Design and Integration, 05 - 06  
Senior Member of Technical Staff: National Security Engineering, 03 - 05  
Senior Member of Technical Staff: Exploratory Systems Technology Division, 99 - 00  
Member of Technical Staff: Advanced Weapons Systems Division, 95 - 99

### **LICENSING OF INVENTIONS**

**Protea Biosciences** (Morgantown, WV): Acquired rights to license microfluidics technology  
**Angiodynamics** (Queensbury, NY): FDA approved system, which has treated over 5500 cancer patients  
**BC Genesis** (Blacksburg, VA): Start-up company based on licensed bio-fabrication technology  
**PhenoCHIP** (Blacksburg, VA): Start-up company licensed rare cell sorting technology  
**VoltMed** (Blacksburg, VA): Start-up company licensed platform to treat brain cancer

## **COURSES TAUGHT**

**Biomedical Microdevices:** Creation and instruction of graduate course, 07 - present

**Quantitative Physiology:** Co-instruction of core graduate course in biomedical engineering, 07 - present

**Transport Processes in Biological Systems:** Undergraduate course in biological transport, 10 - present

**Senior Design Course:** Mentor students in design of platform for organ scaffolds, 10 - present

**Engineering Mathematics:** Created cross-disciplinary course for first year graduate students, 11- present

**Fundamentals of Cancer:** Course in Translational, Biology, Health and Medicine program, 15 – present

## **SELECTED HONORS AND AWARDS**

**Dean's Award:** Excellence in Research, 16

**Named Professorship:** L. Preston Wade Professorship, 16 - present

**Innovator Award:** Roanoke-Blacksburg Technology Council (RBTC) TechNite, 15

**ASME Fellow,** The American Society of Mechanical Engineers, 15

**Innovator Award:** Institute of Critical Technologies and Applied Sciences, 14

**Richard Skalak Award:** ASME Journal of Biomechanical Engineering for Best Paper, 14

**XCaliber Certificate of Excellence:** Technology-Enriched Learning, Center of Innovation, Virginia Tech, 13

**Outstanding Dissertation Advisor of the Year:** Virginia Tech, 12

**Wallace H. Coulter Fellow,** Wallace H. Coulter Foundation, 12

**College of Engineering Faculty Fellow:** College of Engineering, Virginia Tech, 11-14

**NSF CAREER Award Recipient:** National Science Foundation, 11

**Unrestricted Research Grant:** Angiodynamics, 09 - 10

**Outstanding New Assistant Professor Award:** College of Engineering, Virginia Tech, 09

**NanoKnife:** One of 20 institutions awarded \$395K unit, 08 - present

**Early Career Award:** Wallace H. Coulter Foundation, 08 - 12

**Top 7 Inventions of '07:** Irreversible Electroporation. NASA Tech Briefs, The Year in Technology, 07

**Special Issue on Irreversible Electroporation:** Technology in Cancer Research and Treatment, 07

**Featured on NPR's Pulse of the Planet:** Irreversible Electroporation Therapy, 07, 12 and 13

**National Award Recipient:** HENAAC – Nation's Most Promising Engineer or Scientist, 06

**Appointed Chair:** Sandia National Laboratories Diversity Division Council, 05 - 06

**Doctoral Studies Fellowship:** Sandia National Laboratories, 00 – 02

## **SELECTED INVITED TALKS**

**Plenary Speaker:** Bioelectrochemistry Society Annual Meeting, Lyon, France, 17

**Invited Speaker:** IEEE IMS, Honolulu, HI, 17

**Invited Speaker:** BioEM 2016, Ghent, Belgium, 16

**Invited Speaker:** Int'l Symposium on Electro & Liquid Phase-Separation Techniques, Minneapolis, MN 16

**Invited Speaker:** FACCS SciX 2016, Minneapolis, MN 16

**Plenary Speaker:** 1<sup>st</sup> World Congress on Electroporation, Portoroz, Slovenia, 15

**Invited Speaker:** SNO-SCIDOT Joint Conference on Therapeutic Delivery to the CNS, San Antonio, TX, 15

**Invited Speaker:** IEEE EMBS, Cellular BioMEMS Mini Symposium, Chicago, IL 14

**Invited Speaker:** 11<sup>th</sup> International Bioelectrics Symposium, Columbia, MO, 14

**Invited Speaker:** Microscale BioSeparations, Charlottesville, VA, 13

**Invited Speaker:** 1<sup>st</sup> Int'l Symp on Bacterial Nanocellulose, 245<sup>th</sup> ACS Ann Meeting, New Orleans, LA, 13

**Invited Speaker:** Gordon Conference, Bioelectrochemistry. Nr. Lucca, Italy, 12

**Invited Speaker:** 34<sup>th</sup> Annual IEEE EMBS Conference, San Diego, CA, 12

**Invited Speaker:** Int'l Scientific Workshop on Fundamentals and Applied Bioelectrics, Norfolk, VA, 12

**Keynote Speaker:** Int'l Symposium on Electro & Liquid Phase-Separation Techniques, Baltimore, MD, 12

**Invited Speaker:** SHPE, Thermofluids and Biomedical Optics Symposium. Anaheim, CA, 11

**Invited Speaker:** 38<sup>th</sup> FACSS Conference. Reno, NV, 11  
**Invited Speaker:** Fourth Annual Breast Cancer Symposium. Peoria IL, 11  
**Invited Speaker:** IEEE EMBS Electric Fields Effects in Tumors Workshop. Argentina, 10  
**Invited Speaker:** 7<sup>th</sup> International Bioelectrics Symposium. Norfolk, VA, 10  
**Invited Speaker:** Engineering Platforms for Exploring Cellular and Molecular Processes. U Louisville, 10  
**Invited Speaker:** Thermal Biology and Therapy Workshop. U Minnesota, 10  
**Invited Speaker:** Society for CNS Interstitial Delivery of Therapeutics. Cleveland Clinic, 09  
**Invited Speaker:** 36<sup>th</sup> FACSS Conference. Louisville, KY, 09  
**Plenary Speaker:** 45<sup>th</sup> Annual Meeting of the Society for Cryobiology. Charlotte NC, 08  
**Invited Speaker:** Commercialization of Drug Discovery, Delivery and Diagnostics. Cambridge, MA, 05

#### **APPOINTMENTS AND ACTIVITIES**

**Member:** The American Electrophoresis Society, 09 - present  
**Member:** Brain Tumor Center of Excellence at Wake Forest University, 09 - present  
**Member:** Wake Forest University Comprehensive Cancer Center, 08 - present  
**Member:** Biomedical Engineering Society, 08 - present  
**Member:** Bioelectrochemistry Society (BES), 03 - present  
**Member:** ASME Biotransport Division, 02 - present  
**Visiting Research Associate:** CNRS, Institut Gustave Roussy, France, 01 - 02

#### **OUTREACH AND PROFESSIONAL SERVICE**

**International Organizing Committee:** 2nd World Congress on Electroporation, Norfolk, Virginia, 17  
**Study Section Chair:** NIH IMST-15 SBIR/STTR Cell and Molecular Biology, 17 - present  
**Session Chair:** BioEM 16, Micro-chambers for single cell electromagnetic exposure and analysis, 16  
**Associate Editor:** IEEE Transactions on Biomedical Engineering, 15 - present  
**Guest Editor:** Biomedical Engineering Online - Special Issue, 15  
**Scientific Program Committee:** 1<sup>st</sup> World Congress on Electroporation, Portoroz, Slovenia, 15  
**Session Chair:** 1<sup>st</sup> World Congress on Electroporation, Portoroz, Slovenia, 15  
**Special Session Co-Chair:** MBEC 2014: Advanced tech for treating deep-seated tumors using ECT and IRE  
**Session Chair:** Bioelectrochemistry Gordon Research Conf, Cells and Models Under Electric Fields, 14  
**Session Chair:** Bioelectrochemistry Gordon Research Seminar, Cells and Models Under Electric Fields, 14  
**Associate Editor:** ASME Journal of Medical Devices, 13 - present  
**Program Chair:** American Electrophoresis Society Annual Meeting, 13  
**Information Chair:** ASME Summer Bioengineering Conference, 13  
**Editorial Board:** Journal of Electrophoresis, 11 - present  
**Session Chair:** BMES, Nano to Micro technologies: BioMEMS II, 14  
BMES, Implantable Devices and Implantable Electronics, 14  
BMES, Nano to Micro technologies: Microtechnologies for Cancer, 14  
BMES, Translation Biomedical Engr: Therapeutic and Diagnostic Biomedical Devices, 13  
ITP 2012, Dielectrophoresis, 12  
AIChE, Electroporation, Electrophysiology and Cell Electrokinetics, 11-13  
IEEE Engineering in Medicine and Biology Conference, Magnetic Sensors and Systems, 12  
ASME Summer Bioengineering Conference, Imaging in Biotransport, 12  
ASME Summer Bioengineering Conference, Biotransport in Device and Design, 10  
ASME Summer Bioengineering Conference, Improvements in Thermal Therapy, 09  
ASME Summer Bioengineering Conference, Characterization of Thermal Medical Applications, 08  
ASME Summer Bioengineering Conference, Biothermal Therapy, 07  
ASME Heat Transfer Conf, Experimental and Computational Methods in Medicine and Biology, 05

ASME IMECE, Bioengineering Division, Thermal Aspects of Molecular Surgery, 04  
**Session Co-Chair:** ASME Summer Bioengineering Conference, Targeted Delivery and Electroporation, 11  
AIChE, Electrokinetic Behavior of Microparticles and Nanoparticles, 10  
AIChE, Advances in Electrokinetics and Electrophoresis - Particles and Biomolecules, 09  
**Track Chair:** IEEE EMBC (Co-Chair: M Khine), Bioinstrumentation: Microfluidics, 11-12  
IEEE EMBC (Co-chair: RC Lee), Electric Fields at the Cell and Protein Scale, 10  
IEEE EMBC (Co-chair: RC Lee), Electric Fields at the Cell and Protein Scale, 09  
**Judge:** ASME Summer Bioengineering Conference, Student Poster Competition, 10  
ASME Summer Bioengineering Conference, Student Podium Competition, 08 - 09  
**Peer reviewer:** Nature - Scientific Reports, Applied Physics Letters, JBC Online, Journal of Tissue Engineering, IEEE Transactions on Biomedical Engineering, ASME Journal of Biomechanical Engineering, Biomedical Microdevices, Lab on a Chip, Bioelectrochemistry, Annals of Biomedical Engineering, IEEE EMBC, ASME SBC, Journal of Thermal Biology, Technology in Cancer Research and Treatment, IEEE Transactions on Plasma Science, Chemical Reviews, Analytical Chemistry, Journal of Membrane Biology, IEEE Transactions on Dielectrics and Electrical Insulation, IEEE Transactions on Instrumentation and Measurement, Biomicrofluidics, Analytical and Bioanalytical Chemistry, PLoS ONE, Electrophoresis, ASME Journal of Nanotechnology in Engineering and Medicine, Biomedical Engineering Online, Nanomedicine, Cancer Research, Analyst, Biomaterials  
**Review panel:** National Science Foundation, 07 - present  
Cariplo Foundation Scientific Committee, 11-present  
National Institute of Health, 12 - present  
Air Force Office of Scientific Research, 12  
Engineering and Physical Sciences Research Council of the United Kingdom, 12

#### **INTERNAL SERVICE AND DIVERSITY INITIATIVES**

**Director:** ICTAS Center for Engineered Health, 16 - present  
**Member:** Stakeholder Committee on Innovation and Entrepreneurship, 16 - present  
**Chair:** Search Committee for Assistant/Associate Professor, 16-17  
**Member:** Advance VT/Inclusive VT Diversity Committee, 16 - present  
**Member:** VTCRI 5-year Review Committee, 16  
**Member:** Search Committee for College of Engineering Dean, 16 - present  
**Member:** Search Committee for VMCVM Associate Dean of Research and Graduate Studies, 16  
**Member:** Intellectual Property Committee, 15 - present  
**Member:** Beyond Boundaries Committee, 15 - present  
**Member:** Search Committee for Executive Vice President and Provost, 15  
**Member:** Search Committee for Associate Dean of Veterinary School, 15  
**Member:** Search Committee for WF Assistant Professor, 15  
**Chair:** Search Committee for VT Assistant Professor Position at Virginia Tech, 12  
**Steering Committee:** Center for Drug Discovery, Development, and Delivery (CD4), 12 - present  
**Member:** Search Committee for VT Assistant Professor Position at Virginia Tech, 11  
**Member:** Search Committee for WF Assistant Professor Position at Virginia Tech, 11  
**Instructor:** Interdisciplinary Training at ACC Interdisciplinary Forum for Discovery in Life Sciences, 10  
**Keynote Speaker:** Kids' Tech University: *Why can't humans walk on water and climb walls with their fingertips like spiders*, April, 10  
**Speaker:** Workshops for C-TECH<sup>2</sup> and NASA High-School Summer Programs, 10  
**Panel Member:** Virginia Tech GEM GRAD Lab, 10  
**Member:** Search Committee for SBES Department Head at Virginia Tech, 09  
**Director:** College of Engineering Diversity Summer Program, 07 - 14

**Director:** NSF/NIBIB Bioengineering and Bioinformatics Summer Institute, 07 - 12  
**Chair:** ICTAS Theme Area on Cellular Engineering Microsystems (CEMS), 07 – present  
**Co-Director:** ICTAS Multi-scale Bio-Engineered Devices & Systems (M-BEDS), 07 - present  
**Recruiter:** Represent Virginia Tech at SHPE Career Fairs, 07 - present  
**Coordinator:** SBES graduate student weekend and other recruitment efforts, 07 - present  
**Member:** Virginia Tech College of Engineering Diversity Committee, 07 - present

**EXTERNAL GRANTS (>\$16M Total, \$14.7M VT, >\$4.5M PI Share)**

Development of INSPIRE for Brain Cancer Treatment

PI: RV Davalos, Source: Virginia Biosciences Health Research Corporation (VBHRC) (2016-2017, \$380K)

Role of Extracellular Space as a Modulator of the Cardiac Gap Junction-Conduction Velocity Relationship

PI: S Poelzing (Co-I: RV Davalos, R Gourdie, J Smyth) Source: NIH (2017-2021, \$2.1M) R01HL102298

High-Frequency Irreversible Electroporation for GBM

PI: RV Davalos, S Verbridge (Co-I: J Robertson, J Rossmesl) Source: NIH (2017-22, \$1.76M) R01CA213423

Repurpose the Irreversible Electroporation System for Optimal Immune Modulation Efficacy

PI: RV Davalos (Co-PI: RC Martin), Source: Cures Within Reach (2017-2018, \$50K)

Development of next generation IRE treat pancreatic cancer

PI: D Iannitti (Co-PI: RV Davalos), Source: PanCAN (2016-2018, \$300K) 16-65-IANN

STTR Phase I: An Endoscopic-Based INSPIRE Platform for Treating and Monitoring Unresectable Pancreatic Cancer

VoltMed PI: MB Sano, VT PI Davalos, Source: NSF (2014, \$225K, VT \$68K) IIP-1346343

Minimally Invasive Surgical Platform for H-FIRE and Chemotherapy Treatment

VoltMed PI: PA Garcia (VT PI: Davalos) Source: CIT CRCF (2015-16, \$50K, VT \$20K) STTR 15-002-LS

STTR Match: INSPIRE Therapy: Real-time treatment and monitoring of Pancreatic Cancer

VoltMed PI: RV Davalos, Source: CIT CRCF (2014, \$50K) STTR 14S-003-LS

High Frequency Irreversible Electroporation for Pancreatic Cancer

PI: C Clark (Co-PI: RV Davalos), Source: Golfers Against Cancer (2015-16, \$40K)

PhenoCHIP: Phenotype-based Cell Hierarchy and Isolation Platform

PI: RV Davalos, Source: Virginia Biosciences Health Research Corporation (VBHRC) (2014-2015, \$270K)

R21: Targeted Electric Field Therapy for Malignant Infiltrative Glioma

MPI: RV Davalos, S Verbridge, Source NIH (2014-2017, \$386K) 1R21 CA192041-01

SBIR Phase I: Innovative Biofabrication of 3D Nano-Biocomposites for Repair of Osteochondral Defects

BC Genesis PI: P Gatenholm, VT PI: RV Davalos, Source: NIH (2013, \$150K, \$25K VT) R43 AG044153-01A1

R21: Isolation of Tumor Initiating Cells (TICs) using Contactless Dielectrophoresis

PI: RV Davalos (Co-PI: S Cramer), Source: NIH (2013-2015, \$368K) 5R21 CA173092-01

Use of bioceramic nanoscaffolds to enhance irreversible electroporation for in situ tissue destruction

PI: I McKillop (Co-PI: RV Davalos), Source: Carolina Medical Center (2014-2015, \$47K, \$7.6K VT)

High Frequency Irreversible Electroporation for Lung Cancer and other Endoscopic Ablation Applications

PI: RV Davalos, Source: CIT CRCF (2013-2014, \$100K) MF13-034-LS

Use of Electric Fields for the Isolation of Tumor Initiating Cells and other Rare Cells

PI: RV Davalos, Source: CIT CRCF (2013-2014, \$100K) MF13-037-LS

NSF RET: Biomechanics from Molecular to Organismal Scales

PI: D Dudek (Co-PI: J Socha, SP: RV Davalos), Source: NSF (2014-2016, \$500K) RET 1301037

I-Corps: Translation of High Frequency Irreversible Electroporation for Human Clinical Applications,

PI: RV Davalos, Source: NSF (2012-2013, \$50K) IIP 1265105

EFRI-REM: Complex Microsystem Networks Inspired by Internal Insect Physiology

PI: J Socha (Co-PI: RV Davalos, I Puri), Source: NSF (2013-2014, \$114K) RET-0938047

EFRI-REM: Complex Microsystem Networks Inspired by Internal Insect Physiology

PI: J Socha (Co-PI: RV Davalos, I Puri), Source: NSF (2012-2013, \$100K) RET-0938047

CAREER: An experimental and numerical investigation of the biophysical processes of pulsed electric field induced irreversible electroporation for Glioblastoma Multiforme

PI: RV Davalos Source: NSF (2011-17, \$452K) CBET-1055913

IGERT: MultiScale Transport in Environmental and Physiological Systems (MultiSTEPS)

PI: MA Stremier (Co-PI: RV Davalos, J Kuhn, S Ross, P Vlachos) Source: NSF (2010-14, \$3M) DGE-0966125

EFRI-BSBA Complex Microsystem Networks Inspired by Internal Insect Physiology

PI: J Socha (Co-PI: RV Davalos, R DeVita, J Harrison, A Staples), Source: NSF (2010-13, \$2M) EEC-0938047

Quantification of Blood-Brain-Barrier Disruption Achieved by Intracranial N-TIRE for an Optimized Combinatorial Therapy Against GBM

PI: TL Ellis (Co-PI: RV Davalos), Source: Golfers Against Cancer (2010-11, \$28K)

Task Order 1: Calibration Curves for Cassini Oval Lesion Estimator

PI: RV Davalos, Source: Angiodynamics (2010, \$20K)

Task Order 2: Regression Analysis to Fit Numerical Models to Experimental Data

PI: RV Davalos, Source: Angiodynamics (2010, \$30K)

Task Order 3: Three-Dimensional Irreversible Electroporation Modeling and Field Characterization

PI: RV Davalos, Source: Angiodynamics (2010, \$30K)

Task Order 4: FEA Modeling of Ablation Variables

PI: RV Davalos, Source: Angiodynamics (2012, \$104K)

Task Order 5: Hydrogel Modeling of IRE

PI: RV Davalos, Source: Angiodynamics (2013, \$40K)

Task Order 6: Brain Paper

PI: RV Davalos, Source: Angiodynamics (2013, \$38K)

Task Order 9: Bipolar probe modeling

PI: RV Davalos, Source: Angiodynamics (2013-2014, \$32K)

Task Order 10: Characterization of Lesion Volumes using ex vivo samples

PI: RV Davalos, Source: Angiodynamics (2015, \$12K)

Task Order 11: Modeling of Field Distributions in Tissue

PI: RV Davalos, Source: Angiodynamics (2015, \$10K)

Task Order 12: Experimental evaluation using perfused organ models

PI: RV Davalos, Source: Angiodynamics (2015-2016, \$65K)

Task Order 13: Advanced Experimental Ablation Protocols

PI: RV Davalos, Source: Angiodynamics (2016-2017, \$65K)

SBIR: Customizable Meniscus Implant Prepared by Dielectrophoretic Biofabrication - Phase I and Phase II  
BC Genesis PI: P Gatenholm, VT PI: RV Davalos, Source: NSF (2009-12, \$1,141K, \$180K VT) IIP-1026421

Combinatorial Brain Cancer Therapy through Irreversible Electroporation and Carbon Nanotubes  
PI: RV Davalos (Co-PI: MN Rylander), Source: NSF CBET (2009-11, \$300K) CBET-0933335

Unrestricted Research Grant: Modeling of Irreversible Electroporation  
PI: RV Davalos, Source: Angiodynamics (2009-10, \$15K)

Unrestricted Research Grant  
PI: RV Davalos, Source: Protea Biosciences (2011-12, \$10K)

Unrestricted Research Grant  
PI: RV Davalos, Source: Protea Biosciences (2014-15, \$25K)

Irreversible Electroporation Devices to Treat Cancer - Phase I and Phase II  
PI: RV Davalos (Co-PI: TL Ellis), Source: Coulter Foundation - Early Career Award (2008-12, \$500K)

Isolation and Enrichment of Tumor Stem Cells using Insulator-Based Dielectrophoresis  
PI: S Cramer (Co-PI: RV Davalos), Source: Golfers Against Cancer (2008-10, \$35K)

Quantitative Evaluation of Micro-Electroporation  
PI: RV Davalos, Source: Jeffress Memorial Trust (2008, \$20K)

NSF-NIBIB BBSI: Summer Institute for Quantitative and Integrative Bioengineering  
PI: RV Davalos (Initial PI: E Scott, Co-PI: RC Laubenbacher), Source: NSF (2006-10, \$649K) EEC-0609225

#### **INTERNAL SUPPORT**

Microfluidic Model of Cancer  
PI: RV Davalos (Co-PI: C Finkelstein), Source: Fralin Biotechnology Center (2010, \$10K)

Dielectrophoretic Microweaving  
PI: RV Davalos (Co-PI: P Gatenholm), Source: ICTAS (2009-11, \$99K)

Cancer Therapy through Irreversible Electroporation Enhanced with Carbon Nanotubes  
PI: RV Davalos, Source: Comprehensive Cancer Center - Wake Forest University (2008-09, \$25K)

Implantable Micro-Oncologists  
PI: RV Davalos (Co-PI: M Agah, I Puri, G Wang, P Gatenholm), Source: ICTAS (2007-09, \$104K)

#### **PEER-REVIEWED JOURNAL ARTICLES (cited >4800 times with h-index 36)**

1. I Goswami, S Coutermarsh-Ott, RG Morrison, IC Allen, **RV Davalos**, S Verbridge, LR Bickford. Irreversible electroporation inhibits pro-cancer inflammatory signaling in triple negative breast cancer cells, *Bioelectrochemistry*, vol 113, pp 42-50, 2017. **(IF 3.903)**
2. IA Siddiqui, EL Latouche, MR DeWitt, JH Swet, RC Kirks, EH Baker, DA Iannitti, D Vrochides, **RV Davalos**, IH McKillop. Induction of rapid, reproducible hepatic ablations using next-generation, high frequency irreversible electroporation (H-FIRE) in vivo. *HPB*, vol 18(9), pp 726-734, 2016. **(IF 2.918)**
3. T Murovec, DC Sweeney, E Latouche, **RV Davalos**, C Brosseau. Modeling of transmembrane potential in realistic multicellular structures before electroporation, *Biophysical Journal*, vol 111, pp 2286-2295, 2016. **(IF 3.972) (cover)**

4. M Bonakdar, EW Wasson, YW Lee, **RV Davalos**. Electroporation of brain endothelial cells on chip toward permeabilizing the blood-brain-barrier, *Biophysical Journal*, vol 110, pp 505-512, 2016. **(IF 3.972) (cover)**
5. SP Bhonsle, M Bonakdar, RE Neal, C Aardema, JL Robertson, J Howarth, H Kavnoudias, KR Thomson, SN Goldberg, **RV Davalos**. Characterization of irreversible electroporation ablation with a validated perfused organ model. *Journal of Vascular and Interventional Radiology*, vol 27, pp 1913-1926, 2016. **(IF 2.570)**
6. DC Sweeney, M Reberšek, J Dermol, L Rems, D Miklavčič, **RV Davalos**. Quantification of cell membrane permeability induced by monopolar and high-frequency bipolar bursts of electrical pulses. *BBA-Biomembranes*, 1858(11), pp 2689-2698, 2016. **(IF 3.687)**
7. J Cemazar, TA Douglas, EM Schmelz, **RV Davalos**. Enhanced contactless dielectrophoresis enrichment and isolation platform via cell-scale microstructures. *Biomicrofluidics*, vol 10 pp 014109:1-14, 2016. **2016 Editor's Pick (IF 3.357)**
8. SA George, M Bonakdar, M Zeitz, **RV Davalos**, J Smyth, S Poelzing. Extracellular sodium dependence of the conduction velocity relationship: evidence on ephaptic self attenuation. *American Journal of Physiology-Heart and Circulatory Physiology*, vol 310(9), pp H1129-H1139, 2016. **(IF 3.838)**
9. JW Ivey, EL Latouche, MB Sano, JH Rossmeisl, **RV Davalos**, SS Verbridge. Targeted cellular ablation based on the morphology of malignant cells, *Nature Scientific Reports*, vol 5:17157, 2015. **(IF 5.078)**
10. MB Sano, CB Arena, KR Bittleman, MR DeWitt, PA Garcia, HJ Cho, CC Szot, D Saul, JM Cissell, J Robertson, YW Lee, **RV Davalos**. Bursts of bipolar microsecond pulses inhibit tumor growth, *Nature Scientific Reports*, vol 5:14999, 2015. **(IF 5.078)**
11. JH Rossmeisl, PA Garcia, TE Pancotto, JL Robertson, N Henao-Guerrero, RE Neal, TL Ellis, **RV Davalos**. Safety and feasibility of the nanoKnife system for irreversible electroporation ablative treatment of canine spontaneous intracranial gliomas. *J Neurosurgery*, 2015 vol 123(4), pp 1008-1025. **(IF 3.227)**
12. SP Bhonsle, CB Arena, DC Sweeney, **RV Davalos**. Mitigation of impedance changes due to electroporation therapy using bursts of high-frequency bipolar pulses. *Biomedical Engineering Online*, vol 14(S3), 2015. **(IF 1.430)**
13. M Bonakdar, E Latouche, R Mahajan, **RV Davalos**. The feasibility of a smart surgical probe for verification of IRE treatments using Electrical Impedance Spectroscopy (EIS), *IEEE Transactions on Biomedical Engineering*, vol 62(11), pp 2674-2684, 2015. **(IF 2.347)**
14. A Baah-Dwomoh, A Rolong, P Gatenholm, **RV Davalos**. The feasibility of using irreversible electroporation to introduce pores in bacterial cellulose scaffolds for tissue engineering. *Applied Microbiology and Biotechnology*, vol 99(11), pp 4785-4794, 2015. **(IF 3.811)**
15. RE Neal, PA Garcia, H Kavnoudias, F Rosenfeldt, CA Mclean, EV Victoria, J Bergman, **RV Davalos**, KR Thomson. In vivo irreversible electroporation kidney ablation: Experimentally correlated numerical models. *IEEE Transactions on Biomedical Engineering*, vol 62(2), pp 561-569, 2015. **(IF 2.233)**



16. KR Colacino, CB Arena, S Dong, M Roman, **RV Davalos**, YW Lee. Folate conjugated cellulose nanocrystals potentiate irreversible electroporation-induced cytotoxicity for the selective treatment of cancer cells, *Technology in Cancer Research and Treatment*, vol 14(6), pp 757-766, 2015. **(IF 1.943)**
17. CB Arena, PA Garcia, MB Sano, JD Olson, T Rogers-Cotrone, JH Rossmeisl, **RV Davalos**. Focal blood-brain-barrier disruption with high-frequency pulsed electric fields. *Technology*, vol 9(8), pp 1-8, 2014. **(IF N/A)**
18. PA Garcia, **RV Davalos**, D Miklavcic. A numerical investigation of the electric and thermal cell kill distributions in electroporation-based therapies in tissue. *PLoS ONE*, vol 9(8), pp e103083:1-12, 2014. **(IF 4.537)**
19. MB Sano, CB Arena, MR DeWitt, D Saur, **RV Davalos**. *In-vitro* bipolar nano- and microsecond electro pulse bursts for irreversible electroporation therapies. *Bioelectrochemistry*, vol 100, pp 69-79, 2014. **(IF 3.774)**
20. RC Gallo-Villanueva, MB Sano, BH Lapizco-Encinas, **RV Davalos**. Joule heating effects on particle immobilization in insulator-based dielectrophoretic devices. *Electrophoresis*, vol 35(2-3), pp 352-361, 2014. **(IF 3.261)**
21. RE Neal, JL Millar, H Kavnoudias, P Royce, F Rosenfeldt, A Pham, R Smith, **RV Davalos**, KR Thomson. In vivo characterization and numerical simulation of prostate properties for non-thermal irreversible electroporation ablation. *The Prostate*, vol 74(5), pp 458-468, 2014. **(IF 3.843)**
22. RE Neal, JH Rossmeisl, V D'Alfonso, JL Robertson, PA Garcia, S Elankumaran, **RV Davalos**. In vitro and numerical support for combinatorial irreversible electroporation and electrochemotherapy glioma treatment, *Annals of Biomedical Engineering*, vol 42(3) pp 475-487, 2014. **(IF 2.575)**
23. A Salmanzadeh, ES Savage, PC Roberts, EM Schmelz, **RV Davalos**. Sphingolipid metabolites modulate cells dielectric characteristics in a mouse ovarian cancer progression model. *Integrative Biology (cover)*, vol 5(6), pp 843-852, 2013. **(IF 4.509)**
24. RE Neal, JH Rossmeisl, JL Robertson, CB Arena, EM Davis, RN Singh, J Stallings, **RV Davalos**. Improved local and systemic anti-tumor efficacy for irreversible electroporation in immunocompetent versus immunodeficient mice, *PLoS ONE*, vol 8(5), e64559:1-10, 2013. **(IF 4.537)**
25. CB Arena, RL Mahajan, MN Rylander, **RV Davalos**. An experimental and numerical investigation of phase change electrodes for therapeutic irreversible electroporation, *ASME Journal of Biomechanical Engineering*, vol 135(11), pp 111009:1-9, 2013. **Editor's Choice Paper, Richard Skalak Award (IF 1.519)**
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4. **RV Davalos**, B Rubinsky. Tissue ablation with irreversible electroporation. US Application 10/571,162. Filed: 12/24/04 Issued 4/14/15 Patent No 9,005,189.
5. **RV Davalos**, CB Arena, JL Caldwell. Integration of very short electric pulses for minimally to noninvasive electroporation. US Application 12/757,901. Filed: 4/9/10, Issued 1/6/15 Patent No 8,926,606.
6. CB Arena, **RV Davalos**, MB Sano. High frequency electroporation for cancer therapy. US Application 13/332,133 PCT/US2011/066239. Filed: 12/20/11 Pending.

7. MB Sano, **RV Davalos**, P Gatenholm. Advanced nanomaterials and a technology platform for biofabricating them. US Application 61/166,508. Provisional Filed: 4/3/09 Pending.
8. MB Sano, **RV Davalos**, JL Robertson, RE Neal, PA Garcia. Irreversible electroporation using tissue vasculature to treat aberrant cell masses or create tissue scaffolds. US Application PCT/US2011/062067. Filed: 11/23/11 Pending.
9. MB Sano, JL Caldwell, **RV Davalos**. Devices and methods for contactless dielectrophoresis for cell or particle manipulation, PCT Application No.: PCT/US2011/055381, Filed: 10/7/11 Pending.
10. P Gatenholm, H Backdahl, TJ Tzavaras, **RV Davalos**, MB Sano. Three dimensional bioprinting of biosynthetic cellulose (BC) implants and scaffolds for tissue engineering. US Application 61/246,210. PCT/US2010/050460. Provisional Filed: 9/28/09, Filed: 9/28/10 US Application 13/498,657 Filed 3/28/12 Issued 4/8/14 Patent No 8,691,974.
11. **RV Davalos**, H Shafiee, MB Sano, JL Caldwell. Devices and methods for contactless dielectrophoresis for cell or particle manipulation. US Application 61/158,553. Provisional Filed: 3/9/09, Issued 3/3/15 Patent No 8,968,542.
12. **RV Davalos**, MN Rylander, CB Arena. Irreversible electroporation using nanoparticles. US Application 12/609,779. PCT/US2009/062806. Provisional Filed: 3/5/09, Filed: 10/30/09, Issued 6/18/13 Patent No 8,465,484.
13. **RV Davalos**, MN Rylander, CB Arena, YW Lee. Irreversible electroporation using nanoparticles. US Application 12/609,779. PCT/US2009/062806. Provisional Filed: 3/5/09, Filed: 10/30/09, Issued 8/26/14 Patent No 8,814,860.
14. **RV Davalos**, PA Garcia, JL Robertson, JH Rossmeisl, RE Neal. Irreversible electroporation to treat aberrant cell masses. US Application 12/491,151. Provisional Filed: 6/24/08, Filed: 6/24/09, Issued 3/28/15 Patent No 8,992,517.
15. P Gatenholm, **RV Davalos**. Electromagnetic controlled bio-fabrication for manufacturing biocompatible materials. US Application 61/131,017. Provisional Filed: 6/4/08 Pending.
16. **RV Davalos**. A method for producing a scaffold for tissue engineering an organ. US Application 61/125,840. Provisional Filed: 4/29/08 Pending.
17. **RV Davalos**, CRB Ellis. Vesicle-based method and apparatus for collecting, manipulating and chemically processing trace macromolecular species. US Application 10/914,991. Filed: 8/9/04 Issued 8/17/10 Patent No 7,776,357.
18. **RV Davalos**, BA Simmons, RW Crocker, EB Cummings. Insulator-based DEP with impedance measurements for analyte detection. US Application 11/556,685. Filed: 11/3/06 Issued 3/16/10 Patent No 7,678,256.
19. **RV Davalos**, B Rubinsky. Tissue ablation with irreversible electroporation. US Application 13/237,199. Filed: 9/20/11, Issued 10/9/12 Patent No 8,282,631.

20. **RV Davalos**, B Rubinsky. Tissue ablation with irreversible electroporation. US Application 10/571,162. Filed: 12/24/04 Issued 11/1/11 Patent No 8,048,067.
21. **RV Davalos**, CRB Ellis. Vesicle-based method and apparatus for collecting, manipulating and chemically processing trace macromolecular species. US Application 10/914,991. Filed: 8/9/04 Issued 3/4/08 Patent No 7,338,796.

#### **GRADUATE STUDENTS AND SELECTED AWARDS**

1. **Paulo Garcia** (PhD BME, Fall 2010)  
 Post-doc, Harvard-MIT, Prof. Cullen Buie, 13 - present  
 Virginia Tech KnowledgeWorks awards Tech Transfer Challenge prize, 12  
 Paul E. Torgersen Student Research Excellence Award: Best PhD Presentation, 10  
 26th Annual Research Symposium and Exposition Oral Competition: Second Place, 10  
 SBES 9th Annual Graduate Student Research Symposium: Best Presentation, 10  
 IEEE EMBS Student Paper Competition: **North American Finalist**, 09
2. **Hadi Shafiee** (PhD ESM, Fall 2010)  
 Assistant Professor, Harvard Medical School  
 Post-doctoral, Harvard-MIT, Prof. Utkan Demirci, 11 - 14  
 F32 NIH Postdoctoral Fellowship, 12  
 Paul E. Torgersen Student Research Excellence Award: PhD Finalist, 10  
 26th Annual Research Symposium and Exposition Poster Competition: First Place, 10  
 Liviu Librescu Memorial Scholarship, 09  
 GEM<sup>4</sup> - Cellular and Molecular Mechanics: U Illinois – Urbana Champaign: Best Poster, 09
3. **John Caldwell** (MS EECS, Spring 2010)  
 Texas Instruments National Design Competition: First Place, 09  
 Engineer, Leadership Development Program, Texas Instruments, 10-present
4. **Erin Henslee** (MS BME, Spring 2010)  
 Whitaker International Foundation Fellowship, 10-11  
 University of Surrey, Biomedical Engineering  
 Advisor: Prof. Michael P. Hughes
5. **Mike Sano** (MS ESM, Spring 2009, PhD SBES, Summer 2012)  
 Post-doc, Stanford University, 14 – present  
 DoD post-doctoral Fellowship, 15  
 Virginia Tech KnowledgeWorks awards Tech Transfer Challenge prize, 12  
 CEO, VoltMed LLC, Blacksburg, VA, 12-present  
 Paul E. Torgersen Graduate Student Research Excellence Award, 09
6. **Andrea Rojas** (MS MSE, Spring 2012)  
 Initiative for Maximizing Student Diversity (IMSD) NIH Fellowship, 10-11  
 Product Development, Terumo Medical Corporation, Elkton, MD, 16-present  
 Engineer, W.L. Gore & Associates, Elkton, MD, 12-15  
 Initiative for Maximizing Student Diversity (IMSD) NIH Fellowship, 10-11
7. **Robert Neal II** (PhD SBES, Fall 2011)  
 Virginia Tech Outstanding Dissertation Award, 12  
 Whitaker International Foundation Fellowship, 11  
 Paul E. Torgersen Student Research Excellence Award: Best Poster, 11  
 Post-doctoral, The Alfred Hospital, Melbourne Australia, Dr. Ken Thomson
8. **Elizabeth Savage** (MS BME, Spring 2013)  
 MultiSTEPS IGEP Fellowship, 11-12

- Interdisciplinary Research Symposium Poster Award, 12  
Spotlight Speaker Chair, Interdisciplinary Research Honors Society, 12-13  
Consultant, Poly-Med, Inc. in Anderson, SC 13-present
9. **Chris Arena** (PhD SBES, Spring 2013)  
Assistant Professor, Elon University, 15 – present  
Post-doctoral Fellow, Biomedical Engineering, University of North Carolina, 13 – 15  
Richard Skalak Award, ASME Journal of Biomechanical Engineering, 14  
College of Engineering Graduate Student of the Year, 13  
1st Place Podium Ph.D. Student Paper Competition, *ASME Summer Bioengineering Conference*, 12.  
1st Place Virginia Tech KnowledgeWorks Tech Transfer Challenge, 12  
Virginia Tech Graduate Student Assembly Travel Fund Program Award, 12  
NSF John Chato Memorial Symposium Travel Award, 11  
3rd Place Podium Ph.D. Student Paper Competition, *ASME Summer Bioengineering Conference*, 11
10. **Alireza Salmanzadeh** (PhD ESM, Spring 2013)  
Senior Engineer, BD Biosciences, San Jose, 16-present  
Post-doc, University of California, Berkeley (Luke Lee), 14-15  
Paul E. Torgersen Student Research Excellence Award: Best PhD Presentation, 13  
Amir Chand and Dewki Bai Batra Scholarship, 13  
Virginia Tech Graduate Man of the Year, 12  
Outstanding Graduate Student Leader Award, 12  
American Electrophoresis Society: Poster Award, 12  
American Electrophoresis Society: Poster Award, 11  
Virginia Tech Cancer Symposium: Co-Chair, 11  
Manual Stein Scholarship, 10
11. **Eduardo Latouche** (MS ESM, Spring 2016)  
Paul E. Torgersen Student Research Excellence Award: Best MS Presentation, 15  
BMES-FDA Frontiers in Medical Devices Conference: First runner up podium, 16  
Senior Engineer, VoltMed, Blacksburg, VA 16 – present
12. **Matt DeWitt** (PhD SBES (Co-advisor), Summer 2016)  
Matthew DeWitt (PhD SBES (Co-advisor), Summer 2016)  
Cunningham Doctoral Fellowship: 11-16  
ASME Heat Transfer Conference: Invited Panelist on Thermal Medicine, 14  
National Science Foundation (NSF) Graduate Research Fellowship (GRFP), 12-15  
Senior R&D Engineer, Boston Scientific, MN 16-Present