

John D. Jarrell, PhD, PE

EDUCATION- **PhD, Biology, Medical Science and Engineering**, Brown University, Providence, Rhode Island, May 2008.
MSc, Materials Science and Engineering, Brown University, Providence, Rhode Island, May 1991.
Professional Engineer License (PE), Mechanical Engineering, Rhode Island, February 14, 1996.
ScB, Materials Science and Engineering, Brown University, Providence, Rhode Island, May 1988.

Dr. John D. Jarrell, PhD, PE, is an experienced multi-discipline biomedical engineer and doctor of medical science specializing in consultation and expert opinions related to product development, intellectual property, risk, failure analysis, legal cases, product liability, accidents and personal injuries. His expertise includes the analysis of complex systems, designs and failures involving materials, mechanical, medical systems and warnings. As a licensed Professional Mechanical Engineer, he is actively involved in design, product development and research. He earned three degrees from Brown University, a Bachelors and Masters of Science in Materials Science and Engineering and a Doctorate in Biology, Medical Science and Engineering and received Medical training in histology, physiology, microbiology and pathology. He has an appointment in the Department of Orthopaedics at the Alpert Medical School of Brown University and at the Weiss Center for Orthopaedic Trauma Research at Rhode Island Hospital. He has US and foreign patents covering photoactive materials, active delivery films and medical applications. He is the author of multiple peer reviewed publications and abstracts in collaboration with academic, hospital and government investigators and authored a guide book on materials selection for designers. He has been awarded contracts by the Department of Veterans Affairs, Rhode Island Hospital and the US Department of Justice. He is an ASTM member for standards Committees F04, Medical and Surgical Materials and Devices and E58 on Forensic Engineering.

SOCIETY AFFILIATIONS- ASTM Intl.; Orthopaedic Research Society (ORS); Society for Biomaterials; National Society of Professional Engineers (NSPE); American Society for Materials, International (ASM); International Metallographic Society (IMS); Heat Treating Society (HTS); Society of Carbide and Tool Engineering (SCTE); Electronic Device Failure Analysis Society (EDFAS); Society for Automotive Engineering International (SAE); Surfaces in Biomaterials Foundation; International Association for Property and Evidence (IAPE), The International Congress for Joint Reconstruction (ICJR), National Association of Corrosion Engineers (NACE, Int.)

CERTIFICATIONS- Hazardous Waste, Laboratory Safety, Blood Borne Pathogens (Brown University), Electrosurgery CE Module (Valleylab, Institute of Clinical Education) Electrosurgery; Best Practices for Electrosurgery (Pfiedler Enterprises, 4hr CE, 2016), Human Participant Protections Education for Research Teams (National Institutes of Health), CITI Course in The Protection of Human Research Subjects, NAMS Training ISO 10993 Biological Evaluation of Medical Devices

AWARDS & HONORS- 1) Best in Show, 1st, 2nd & 3rd Place Microscopy, ASM Intl., RI Chapter, 1994 2) Sigma Xi Honor Society. 3) RI Business Plan Contest winner 09' & 17' 4) RI House of Rep. Citation for developing a proprietary technology to thwart infection relating to medical device use, 5-09. 5) RI House of Rep. and Secretary of State, Certificate of Congratulations, (Res. 09-264) 6-09. 6) 2010 RI Innovation Award in Health Care & Biotechnology Innovations. 7) RI Governor Chafee Citation for 2014 RI Bioscience Award 8) PBN Fastest Growing Businesses 14', 15', Entrepreneurship 17'

EMPLOYMENT & APPOINTMENTS

Teaching Associate in Orthopaedics, February 1, 2010 through June 30, 2019, Department of Orthopaedics, Alpert Medical School, Division of Biology and Medicine, Brown University. Biomaterials, surface treatment, bacteria and biofilm researcher.

Founder, President and Managing Director January 2009 to present, BIOINTRAFACE INC., North Kingstown, RI. Coordinates R&D and intellectual property for comprehensive collaborative development of Basic Science Research into practical medical technologies and treatments for medical devices and implants. Surface treatments and coatings for implants & medical devices.

President, April 1993 to present, **MATERIALS SCIENCE ASSOCIATES, LLC**, North Kingstown, RI. Biomedical Engineering, Metallurgical, Materials Science & Mechanical Engineering consulting services for Government, Hospital, Legal, Insurance, Medical, and Manufacturing needs. Performs failure analysis, materials, process and site evaluations, biomaterial and medical implant design and testing, fabrication and surgery, professional reports, oral presentations & expert opinions.

Materials Science Engineer, March 1991 to March 1993, Thielsch Engineering Inc., Cranston, RI. Provided engineering and failure analyses for local clients, including analysis of fastener systems, pressurized vessels and piping, electrical components, bearings, medical devices & coatings, nuclear components, manufacturing processes, materials and process selection. Specialized in fractography, chemical & corrosion analysis. Received in-house training from Helmut Thielsch, Sr., PE.

Research and Teaching Assistant, September 1989 to February 1991, Brown University, Department of Advanced Materials Research, Providence, RI. Investigated a lightweight aerospace material for Martin Marietta Laboratories, with enhanced room temperature fracture toughness and the effect of high rate pressure-shear on copper foils, for the Office of Naval Research.

Engineering Investigator, March 1987 to September 1989, Avery Technical Services (ATS), Inc., Barrington, RI. Investigated, analyzed, and documented industrial, home and automotive incidents involving mechanical and material failures for legal and insurance purposes. Specialized in personal and industrial accident reconstructions.

RESEARCH PUBLICATIONS

Dioscaris R. Garcia, PhD; David Deckey, BS; Jack M. Haglin, BS; Toby Emanuel, MD; Cory Mayfield, BS; Adam E. M. Eltorai, MSc; Carole SL Spake, MSc; **John D. Jarrell, PhD**; Christopher T. Born, MD, Review: Commonly Encountered Skin Biome-Derived Pathogens Following Orthopedic Surgical Interventions, *Surgical Infections* (in Press 2019).

Jack M. Haglin, BS, Dioscaris R. Garcia, PhD; Daniel L. Roque, BS, Carole SL. Spake, MSc, **John D. Jarrell, PhD**, Christopher T. Born, MD, Assessing the Efficacy of a Silver Carboxylate Antimicrobial Coating on Prosthetic Liners, *Journal of Prosthetics and Orthotics* (JPO) (in Press 2019).

Jay M. Vincelli, Fatih Calakli, Michael A. Stone, Graham E. Forrester, Timothy Mellon, and **John D. Jarrell**. Identification of a putative man-made object from an underwater crash site using CAD model superimposition, *Forensic Science International*, Volume 285, April 2018, Pages 129-134.

Jay M. Vincelli, Fatih Calakli, Michael A. Stone, Graham E. Forrester, Timothy Mellon, and **John D. Jarrell**. "Characterizing a Debris Field Using Digital Mosaicking and CAD Model Superimposition from Underwater Video." *Photogrammetric Engineering & Remote Sensing* 82, no. 3 (2016): 223-232.

Nhiem Tran, Michael N. Kelley, Phong A. Tran, Dioscaris R. Garcia, **John D. Jarrell**, Roman A. Hayda and Christopher T. Born. Silver Doped Titanium Oxide - PDMS Hybrid Coating Inhibits *Staphylococcus aureus* and *Staphylococcus epidermidis* Growth on PEEK, *Materials Science and Engineering: C* 49 (2015): 201-209.

Nathan P. Thomas, Nhiem Tran, Phong A. Tran, Jerry L. Walters, **John D. Jarrell**, Roman A. Hayda, Christopher T. Born, Characterization and Bioactive Properties of Zirconia based Polymeric Hybrid for Orthopedic Applications, *Journal of Materials Science: Materials in Medicine*, 25:347-354.

Matthew D. Young, Nhiem Tran, Phong A. Tran, **John D. Jarrell**, Roman A. Hayda, Christopher T. Born. Niobium oxide–polydimethylsiloxane hybrid composite coatings for tuning primary fibroblast functions, *J Biomed Mater Res A*, (Online JUNE 24, 2013), 102 (5), 1478-1485.

Nhiem Tran, Phong Tran, **John D Jarrell**, Julie Engiles, Matthew Young, Nathan Thomas, Roman Hayda and Christopher Born. In vivo Caprine Model for Osteomyelitis and Evaluation of Biofilm Resistant Intramedullary Nails, *BioMed Research International*, vol. 2013, Article ID 674378, 11 pages, 2013. doi:10.1155/2013/674378

J. Jarrell, N. Thomas, M. Young, C. Baker, J. Morgan, P. Tran, N. Tran, R. Hayda, C. Born. Bioactive Hybrid Material Surface Treatments for Infection Resistant Implants without Drugs, ASM, Medical Device Materials VI, Proceedings from the Materials and Processes for Medical Devices Conference, August 8–10, 2011, Minneapolis, Minnesota, USA, pg 143-148.

J. Jarrell, J. Walters, N. Thomas, M. Young, P. Tran, N. Tran, R. Hayda, C. Born. Improving the Bioresponse to Polymers using Zirconium and Tantalum Hybridization, ASM, Medical Device Materials VI, Proceedings from the Materials and Processes for Medical Devices Conference, August 8–10, 2011, Minneapolis, Minnesota, USA, pg 74-79.

Jarrell JD, Dolly B, Morgan JR. Rapid screening, in vitro study of metal oxide and polymer hybrids as delivery coatings for improved soft-tissue integration of implants. *J Biomed Mater Res A*, Volume 92A, Issue 3, Pages 1094-1104, 1 March 2010.

Puckett, Sabrina D., Deborah M. Ciombor, **John Jarrell**, Roy K. Aaron, and Thomas J. Webster. "In vitro and in vivo studies of electron beam evaporated titanium surfaces for orthopedic applications." In *Bioengineering Conference*, 2009 IEEE 35th Annual Northeast Bioengineering Conference, pp. 1-2. IEEE, 2009.

Jarrell JD, Dolly B, Morgan JR. Controlled release of vanadium from titanium oxide coatings for improved integration of soft tissue implants. *J Biomed Mater Res A*, Volume 90A, Issue 1, Pages 272-281, June 2009.

Jarrell JD. Active metal oxides and polymer hybrids as biomaterials. PhD Thesis, Brown University, Providence RI, USA 2008.

Jarrell JD, Eun TH, Samale M, Briant C, Sheldon BW, Morgan JR, Metal Oxide Coated (MOC) Cell Culture Arrays for Rapid Biological Screening. *Journal of Biomedical Materials Research: Part A* 2007;83A:853-860.

JD Jarrell, Dislocation Structures of OFHC Copper Deformed by High Rate Pressure-Shear, Master's Thesis: Brown University, Providence, RI, May 1991.

ABSTRACTS

Jarrell, J.D., Garcia, D.R., Born, C.T., The Efficacy of Silver Carboxylate Coatings on Prosthetic Liners, American Academy of Orthotists & Prosthetists (AAOP) 45th Academy Annual Meeting & Scientific Symposium, March 6-9, 2019.

Jarrell J.D, Garcia D.R, Born C.T., INHIBITING PSEUDOMONAS AERUGINOSA GROWTH ASSOCIATED WITH PROSTHETIC LINERS. *CANADIAN PROSTHETICS & ORTHOTICS JOURNAL (CPOJ), VOLUME 1, ISSUE 2, 2018;* ABSTRACT, POSTER PRESENTATION AT THE AOPA'S 101ST NATIONAL ASSEMBLY, SEPT. 26-29, VANCOUVER, CANADA, 2018 .

Jarrell, J.D., Garcia, D.R., Born, C.T., Cleaning-coating technology reduces bacterial by-products on liners, American Academy of Orthotists & Prosthetists (AAOP) 44th Academy Annual Meeting & Scientific Symposium, February 14 – 17, 2018.

Deckey DG, Garcia DR, Daniels AH, Zega AM, Kondo A, **Jarrell JD,** Ebersson CP Green A, Hayda RA, Born CT. Characterization of the Adherence Patterns and Biofilm Density of Commonly Encountered Bacterial Pathogens to Spinal Instrumentation of Differing Compositions Podium Presentation AAOS Annual Meeting San Diego, CA 2017

Minnah A, Nguyen E, Garcia DR, **Jarrell JD,** Born CT. An Analysis of the Antimicrobial Effects of a Ag-doped TiO₂-PDMS coating on the adherence and proliferation of Multidrug Resistant *A. baumannii* and Vancomycin Resistant *E. faecalis* on Orthopaedic Biomaterials, Poster Presentation AAOS/OTA/SOMOS/ORS Extremity War Injuries XII: Homeland Defense as a Translation of War Lessons Learned Washington, DC. 2017

Gardezi M, Glasser J, Garcia D, Born CT, **Jarrell J.** Fluorescent-Conjugated Antibodies as Markers of Bacterial Infection on Surgical Sites. Poster Presentation Brown University UTRA Symposium and Rhode Island Hospital Research Day, Providence, RI. 2017

J. Vincelli, **J. Jarrell,** Non-polar loading in metal-on-metal hip retrievals, 2nd International Conference on BioTribology, Toronto, Canada, 11-14 May 2014.

J. Vincelli, **J. Jarrell,** Metal-on-Metal Hip Wear Patterns of Explanted Components Do Not Match Simulator Results, Society For Biomaterials 2014 Annual Meeting and Exposition: Denver, CO, USA, April 16-19, 2014.

Nhiem Tran, Michael N. Kelley, **John D. Jarrell,** Roman A. Hayda, Christopher T. Born, Silver Doped Titania – Siloxane Hybrids: Novel Coatings for Improving Antibacterial Property of Polyether Ether Ketone (PEEK), The Stevens Conference: The 2nd Conference on bacteria-Materials Interactions, Hoboken, NJ, June 2013.

J.D. Jarrell, N. Tran, P.A. Tran, J. Engiles, R.A. Hayda, C.T. Born. Bioactive hybrid materials coating for infection resistant implants and devices, Hybrid Materials 2013, Third International Conference on Multifunctional, Hybrid and Nanomaterials, Sorrento, Italy, March, 2013.

J.D. Jarrell, N. Tran, R.A. Hayda, C.T. Born, Antimicrobial silver release from titanium oxide polymer hybrid coated PEEK, Hybrid Materials 2013, Third International Conference on Multifunctional, Hybrid and Nanomaterials, Sorrento, Italy, March, 2013.

Jarrell JD; Tran N; Born CT. Improving the Bioactive properties of Polyether ether ketone (PEEK) with Antimicrobial Titanium Oxide Hybrid Coatings. 59th Annual Meeting of the Orthopaedic Research Society, San Antonio, Texas, January 2013.

Tran N, Tran PA, Baker C, **Jarrell JD**, Hayda RA, Born CT. In vitro and in vivo evaluation of bioactive hybrid materials coating for infection resistant implants. Journal of Tissue Engineering and Regenerative Medicine, Proceeding of TERMIS 2012.

Jarrell JD; Tran PA; Baker C; Morgan JR; Hayda RA; Born CT. Bioactive Hybrid Material Surface Treatments for Infection Resistant Implants without Drugs, ASM, Materials and Processes for Medical Devices 2011, Annual Meeting and Exposition: Minneapolis, MN, USA, August 8-10, 2011.

Tran PA; **Jarrell JD**; Baker C; Hayda RA; Born CT. Improving the Bioresponse to Polymers using Zirconium and Tantalum Hybridization, ASM, Materials and Processes for Medical Devices 2011, Annual Meeting and Exposition: Minneapolis, MN, USA, August 8-10, 2011.

Jarrell JD; Tran PA; Baker C; Morgan JR; Hayda RA; Born CT. Surface Treatments for Orthopaedic Implants which Prevent Bacteria Growth and Support Cell Proliferation, Society For Biomaterials 2011 Annual Meeting and Exposition: Orlando, Florida, April 13 - 16, 2011.

Tran PA; **Jarrell JD**; Baker C; Morgan JR; Hayda RA; Born CT. Effects of Addition of Transition Metal Oxides to Polymer on Growth of Human Cells, Society For Biomaterials 2011 Annual Meeting and Exposition: Orlando, Florida, April 13 - 16, 2011.

Jarrell, J D; Young M D; Walters J L; Trans P; Born, C T. Transitional Metal Oxide Hybrid Surface Treatments for Bioactive and Antimicrobial Orthopaedic Trauma Implants, 57th Annual Meeting of the Orthopaedic Research Society, Transactions Vol. 36, No. 1550, Long Beach, CA, January 2011.

Tran PA; **Jarrell J D**; Young MD; Walters JL; Hayda RA; Born CT. Hybrid Surface Treatments for Bioactive and antimicrobial Orthopaedic Trauma Implants, 18th Annual Hospital Research Celebrations, Rhode Island Hospital, October 21, 2010.

Jarrell, J D; Spenciner, D; Morgan, J R; Hayda, R A; Born, C T. Antimicrobial Hybrid Coatings for External Fixation Pins, Society For Biomaterials 2010 Annual Meeting; April 21 - 24, 2010 in Seattle, Washington, USA.

Sabrina D. Puckett, Deborah M. Ciombor, **John Jarrell**, Roy K. Aaron, and Thomas J. Webster. In Vitro and In Vivo Studies of Electron Beam Evaporated Titanium Surfaces for Orthopedic Applications, Bioengineering Conference, 2009 IEEE 35th Annual Northeast, 3-5 April 2009, Boston, MA, USA, pg1-2.

Jarrell, J D; Puckett, S; Morgan, J R; Hayda, R A; Born, C T. Durability of Bioactive, Antimicrobial Biointerface on External Fixation Pins, 56th Annual Meeting of the Orthopaedic Research Society, New Orleans, Louisiana, Transactions Vol. 35, No. 2177, New Orleans, LA, 2010.

Jarrell, J D; Werlin, E C; Weinstock, B; Puckett, S D; Morgan, J R; Ciombor, D M; Aaron, R K. Rapid Development of Photoactive Solid State Dispersions as Biointerfaces for Orthopaedic Implants, Hybrid Materials 2009, First International Conference on Multifunctional, Hybrid and Nanomaterials, Transactions, A1.3.07, Tours France, March, 2009.

Jarrell, J D; Werlin, E C; Weinstock, B; Puckett, S D; Morgan, J R; Ciombor, D M; Aaron, R K. Rapid Development of Biointerfaces for Antimicrobial Transcutaneous Osseointegrated Implant Devices (TCOIDs). 55th Annual Meeting of the Orthopaedic Research Society, Transactions Vol. 34, No. 0555, Las Vegas, NV, February, 2009.

John D Jarrell, Evan C Werlin, Sabrina Puckett, Jeffrey R Morgan. Active metal oxide and polymer hybrid coatings for antimicrobial devices. BioInterface 2008, Annual Symposium, Surfaces in Biomaterials Foundation, Min., MN, October, 2008.

Evan C. Werlin, **John D. Jarrell**, Jeffrey R. Morgan, The Effect of Precursor Selection and Coating Thickness on the Photoactivity of a Novel Metal-Polymer Hybrid. 34th Annual North East Bioengineering Conference, April 4-6, 2008.

JD Jarrell, EC Werlin, JR Morgan. Novel light-activated antimicrobial controlled delivery polymer hybrids for osseointegrated transcaneous devices. 54th Annual Meeting of the Orthopaedic Research Society, Transactions Vol. 33, No. 1729, San Francisco, CA March, 2008.

John D Jarrell and Jeffrey R Morgan. Bioactive Polymer Hybrids to Improve the Soft Tissue Seal Around Percutaneous Devices. BioInterface 2007, Annual Symposium, Surfaces in Biomaterials Foundation, San Mateo, CA, October 31, 2007.

John D. Jarrell, Jeffrey R. Morgan, Bioactive Polymers for Soft Tissue Sealing of Osseointegrated Prosthetic Attachments, 6th Combined Meeting of the Orthopaedic Research Societies, Honolulu, Hawaii, No. 0063, October 21-24, 2007

Morgan, J.R., **Jarrell, J.D.**, Holt, B., Tripathi, A., and Aaron, R.K. Optimizing the Soft Tissue Seal of a Percutaneous Osseointegration Device. No Barriers Symposium, Squaw Valley, CA. June 30, 2007.

Morgan, J.R., **Jarrell, J.D.**, Holt, B., Tripathi, A., Webster, T., Ciombor, D.M., and Aaron, R.K. Optimizing the Soft Tissue Seal of a Percutaneous Osseointegration Device. 4th International Meeting, Ten Years of the US-Russian Program in Prosthetics and Rehabilitation, New England Sinai Hospital, Stoughton, MA, June 18, 2007.

John D. Jarrell, Tai Hee Eun, Marcus Samale, Clyde Briant, Brian W. Sheldon, Jeffrey R. Morgan, Use of specialized metal oxide films for delivery of bioactive metal compounds, Orthopaedic Research Society, Transactions Vol. 32, No. 1590, San Diego, CA, 2007.

JD Jarrell, Crisco, J.J.*, Moore, D.C.*, McGovern, R.D.*, Coating of Stainless Steel Bone Cutting Devices Enhances Functional Performance, Society for Biomaterials, 23 rd Annual Meeting in conjunction with the 29th Internationals Biomaterials Symposium, New Orleans, Louisiana, April-May 1997, vol. xx, pg 416. (*Orthopedic Research Laboratories, Rhode Island Hospital)

J.D. Jarrell, A Non-Wetting, Conductive Coating Replacement for Teflon (PTFE) in Surgical Applications, Surfaces in Biomaterials '94, Scottsdale, Arizona, September 1994.

JD Jarrell, Chemical Passivation of Stainless Steels Eliminated By Using ME-92 Chromium Composition Coating, Society for Biomaterials, 20th Annual Meeting in conjunction with the 26th Internationals Biomaterials Symposium, Boston, Massachusetts, April 1994

RJ Clifton, W Tong, **JD Jarrell**, Brown University, Dislocation Structures and the High Rate Deformation of Pure Metals, Greece Symposium, 1990.

INDUSTRY PUBLICATIONS

Jarrell JD., BioIntraface®: The Next Quantum in Medical Devices. R I Med J (2013). 2013 Feb 1;96(2):26-8.

JD Jarrell and Frank Bejbl, Medical Plastics and Biomaterials: Special Section, Understanding Wear and Friction in Medical-Grade Stainless Steels, Medical Device & Diagnostic Industry, Canon Communications, August 1999, pg 50-57.

JD Jarrell, Safe, Smooth, Stable Coating Alternative to Teflon, Job Shop Technology Magazine, Prospect, CT, April 1998.

JD Jarrell, Improper Cleaning of Stainless Steels can Cause Delayed Cracking, Job Shop Technology Magazine, Prospect, CT, November 1994.

JD Jarrell and Frank Bejbl, Versatile Coating for Stainless Steel, Medical Materials Update, BBC, Inc., Publication, Norwalk, CT, USA, Volume 1, Number 5, June 1994.

JD Jarrell, Chemical Passivation of Stainless Steels Eliminated By Using ME-92 Chromium Composition Coating, Job Shop Technology Magazine, July 1994.

JD Jarrell, Chemical Passivation of Stainless Steels Eliminated By Using ME-92 Chromium Composition Coating, Medical Equipment Designer Magazine, March 1994.

BOOKS

JD Jarrell, The Medical Device Designer's Guide to Wear and Friction, ME-92 Operations, Providence, Rhode Island, USA, April 1995.

BULLETINS

JD Jarrell, Using Medical Grade Coating Technology to Address Nickel Sensitization, ME-92 Operations Bulletin Report, by Materials Science Associates, Providence, RI, May 6, 1994.

JD Jarrell, Improving the Wear, Galling and Frictional Characteristics of Medical Instruments with ME-92® Coating, ME-92 Operations, Internal Report by Materials Science Associates, Providence, RI, November 1993.

JD Jarrell, Use of ME-92 Coating to Reduce the Risk of Exposure to Bioreactive Nickel-Bearing Materials," ME-92 Operations Bulletin Report, by Thielsch Engineering Inc., Cranston RI, April 22, 1993.

SEMINAR PRESENTATIONS

2018 Academy Webinar Series: Cleaning-Coating Technology Reduces Bacterial By-Products on Liners, American Academy of Orthotists & Prosthetists (AAOP), ABC continuing education credit given.

Invited Panelist: Rhode Island Perspectives on Advancing Research, Development, and Medical Innovation- Senator Sheldon Whitehouse and the RI Tech Collective hosted roundtable discussion to hear from Rhode Island's biotech industry about opportunities and barriers to translating scientific discovery into innovative treatments and medications for patients. This discussion will inform Senator Whitehouse's work with the Senate Health, Education, Labor, and Pensions Committee to examine current policies and processes at the National Institutes of Health and Food and Drug Administration and identify reforms to foster medical innovation, support the next generation of research scientists, and get treatments to patients quickly and safely. **Tech Collective, Providence, RI, June 15, 2015**

Invited Speaker: Trends & Opportunities in the Engineering Industry
CareerBuilder.com, WebEx Conference, December 5, 2008.

Active metal oxide and polymer hybrid coatings for antimicrobial devices
BioInterface, Workshop and Symposium, Antimicrobial Surfaces Session, Minneapolis, MN, October 28, 2008.

Novel light-activated antimicrobial controlled delivery polymer hybrids for osseointegrated transcutaneous devices.
54th Annual Meeting of the Orthopaedic Research Society, March, 2008.

Bioactive Polymers for Soft Tissue Sealing of Osseointegrated Prosthetic Attachments,
6th Combined Meeting of the Orthopaedic Research Societies, Honolulu, Hawaii, October, 2007

Advanced Bioactive Hybrid Materials for Percutaneous Devices,
Rhode Island Hospital, Grand Rounds, Student Research Day, May 23, 2007

Use of specialized metal oxide films for delivery of bioactive metal compounds
Orthopaedic Research Society, San Diego, CA, February, 2007.

Rapid biological screening of metal-organic coatings for percutaneous devices,
Regional Bioengineering and Biotechnology Conference U. Mass. Dartmouth, February 9, 2007

Invited Speaker: Fatigue failure of a stainless steel propeller shaft,
National Association of Marine Surveyors, New England Region, December, 2001

Invited Speaker: Metallurgical failure analysis,
National Association of Marine Surveyors, New England Region, November 5, 1999

A Non-Wetting, Conductive Coating Replacement for Teflon (PTFE) in Surgical Applications,
Surfaces in Biomaterials '94, Scottsdale, Arizona, September 1994

Chemical Passivation of Stainless Steels Eliminated By Using ME-92 Chromium Composition Coating, **Society for Biomaterials, 20th Annual Meeting in conjunction with the 26th International Biomaterials Symposium, Boston, Massachusetts, April 1994.**

INVITED REVIEWER FOR:

Journal of Biomedical Materials Research: Part A

Official Journal of the Society for Biomaterials (USA)

John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA

Medical Science Monitor

International Medical Journal for Experimental and Clinical Research

International Scientific Literature, Inc. 361 Forest Lane, Smithtown, NY 11787, USA

Tissue Engineering

Mary Ann Liebert, Inc., 140 Huguenot Street, 3rd floor, New Rochelle, NY 10801-5215

Journal of Material Science: Materials in Medicine

Springer Publishing, 15th floor, Salmon Tower Midtown Manhattan, New York City, NY

PATENTS & APPLICATIONS

U.S. Patent Application No.: 15/331,063: Inventor: John D. Jarrell
Title: **METAL OXIDE AND POLYMER CONTROLLED DELIVERY SYSTEMS, SUNSCREENS, TREATMENTS, AND TOPICAL COATING APPLICATORS**, Filing Date: October 21, 2016

U.S. Patent Application No.: 14/899,972, Inventor: Dioscaris Garcia, John Jarrell, Christopher T. Born
Based on International Application No.: PCT/US2015/066460 Filing Date: December 18, 2015
Visualization of Bacterial Colonization and Biofilm Formation on Orthopaedic Trauma Explants

U.S. Patent Application No.: 14/748,611. Inventor: John D. Jarrell, Filing Date: June 24, 2015
Dose Applicator for Point of Use Mixing

United States Patent 7868078, *Composition including metal oxide and polymer*

United States Patent 8080223, *Method of making a composite from metal oxide and polymer precursors*

US Applications: 20090104095, 12/253530 (Utility, Patent pending) Filed 10/17/2008
Method of Making a Composite from Metal Oxide and Polymer Precursors

20090105384 (12/253555), 20090104473 (12/253354) (Utility, Patent pending) Filed 10/17/2008
Novel Compositions and Related Methods, Coatings, and Articles

20110092870 (12/975,218) Filed 12/21/2010
Composition including metal oxide and polymer

US 60/981263 Filed 10/19/2007 (provisional application)
Novel Compositions and Related Methods, Coatings, and Articles

US 61/556184 Filed 12/05/2011 (provisional application)
Multi-layer metal oxide and polymer controlled delivery systems

International Application PCT/US08/80371, Filed 10/17/2008
Novel Compositions and Related Methods, Coatings, and Articles

ADDITONAL TRAINING

NAMSA Remote Training Series on ISO 10993 “Biological Evaluation of Medical Devices”

- Part 1: Evaluation and testing in the risk management process (September 17, 2014)
- Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity (October 1, 2014)
- Part 4: Selection of tests for interactions with blood (October 15, 2014)
- Part 5: Tests for in vitro cytotoxicity (October 29, 2014)
- Part 6: Tests for local effects after implantation (November 12, 2014)
- Part 7: Ethylene oxide sterilization residuals (December 3, 2014)
- Part 10: Tests for irritation and delayed-type hypersensitivity (December 17, 2014)
- Part 11: Tests for systemic toxicity (December 30, 2014)
- Part 12: Sample preparation and reference materials (January 14, 2015)
- Part 17: Establishment of allowable limits for leachable substances (January 28, 2015)
- Part 18: Chemical characterization of materials (February 11, 2015)

Certifications and Continuing Educational Credits

Adult Ventilation Management (Corexcel, CE 7.90 hr Nursing, 1-2018)

Electrosurgery; Best Practices for Electrosurgery (Pfiedler Enterprises, 4hr CE, 2016)

Electrosurgery CE Module (Valleylab, Institute of Clinical Education)

Hazardous Waste, Laboratory Safety, Blood Borne Pathogens (Brown University),
Human Participant Protections Education for Research Teams (National Institutes of Health),
CITI Course in The Protection of Human Research Subjects

RESEARCH & CONSULTING CONTRACTS

US Department of Justice
United States Attorney's Office
Thomas H. Barnard, Esq.
36 S. Charles Street, 4th Floor
Baltimore, Maryland 21201
Contract 11 W-USA37-0090

7/1 /201 1 6/29/2012

\$23,850.50

Expert Consultant on behalf of the US. Aided defense counsel in a Medical Malpractice case involving a failed electro-surgical forceps used in a laparoscopic gynecological procedure, hysterectomy.

Airlift Research Foundation (Sub-award) 1/1/2010-1/1/2012 \$101,863

In Vitro Optimization and Large Animal Study of Anti-infective, Bioactive Intramedullary (IM) Nails: This project involves a two year multi-disciplinary effort, optimizing promising nano-technology hybrid surface treatments and applying them fracture fixation implants were are exposed to drug-resistant bacteria and placed in large animals. There is twelve months of *in vitro* work to measure the responses of human cells and bacteria to a series of nano-scale surface treatments, metal oxides and polymer hybrids. This is followed by *in vivo* testing of bacterial inoculated bone screws in a large animal model during the second year. Our goal is to find and test the next generation of bioactive surfaces that actively inhibits bacteria biofilm formation and maximizes bone growth and fracture repair. The animal study is a necessary part of the pre-clinical process leading to an approved human study. A favorable outcome from this pre-clinical research is intended to lead to an FDA approved follow-up clinic study.

Orthopaedic Trauma Research Fund 1/1/2009-7/1/2010 \$188,462
Rhode Island Hospital
Providence, RI/USA

A Bicortical Half Pin Mini-pig Model to Evaluate New Bio-interfaces: This project involves coordinating a multi-discipline approach to the development of large animal models for evaluation the tissue integration and antimicrobial properties of novel biomaterials developed for internal and external fixation devices and bone integration and skin attachment to transcutaneous osseointegrated devices for prosthetic attachment and the treatment of segmental bone defects. A roundtable approach is taken, involving trauma research clinicians, biologists and engineers from academics, hospitals and industry. A high throughput *in vitro* screening approach is used to validate coating compositions with optimized antimicrobial, cell proliferative and adhesive properties and applied to stainless steel, titanium alloy and composite implants.

VA24-P-0464 (Contract Consultant) 2/1/08-12/30/08 \$104,000
Department of Veterans Affairs
VMAC, Providence, RI/USA

Study: Bone and Skin Attachment for Prosthetic Attachment: This is an investigation of bone integration and skin attachment to transcutaneous osseointegrated devices for prosthetic attachment and treatment of segmental bone defects. The goal is a combine device for use in the repair of traumatic injuries. Biomaterials, device design and surgical approaches are coordinated between multiple disciplines, Biology, Medicine and Engineering nano technology, to address the need for implants which improve healing of segmental bone defects, osseointegration, soft tissue sealing, while preventing infection. A high throughput *in vitro* screening approach is used to determine coating compositions with optimized antimicrobial, cell proliferative and adhesive properties and applied to titanium alloy and composite implants. Developed small and large animal models.

John D. Jarrell, PhD, PE

TRIALS, DEPOSITIONS AND ARBITRATIONS

Trials

05/10-11/2018	Cavanaugh v Stryker, Case No. 2013CA001800 (Neptune, waste mgnt)	Cir. Court, 19 th circuit, St. Lucie, FL Firm: SEARCY DENNEY SCAROLA BARNHART
08/01/2016	Galue v. Independence 270 Madison, et al. Index: 303246/2011 (Biomechanical/workplace injury claim)	Supreme Court of NY, County of Bronx Firm: Martin Clearwater & Bell LLP
11/12/2015	Robyn Christiansen v. Wright Medical (Conserve MoM hip, MDL NO. 2329)	US District Court, Northern Dist of Georgia Firm: Pope, McGlamry, Kilpatrick, Morrison & Norwood
08/24/2006	Estate of Joseph W. Niemczura (Metal oxide formation on Cu pipe)	Hampden County Probate Court
04/07/2005	Frances Lavita v. Charles Wright, M.D. (Stainless steel surgical skin staples/nickel allergy)	Middlesex Superior Court, MA
09/16/2003	Maxner v. Cosco (Battery operated electronic device)	Seattle, WA
05/24/2000	Saied Kashani v. Mercedes (Uniblade & windshield system)	San Diego, CA
10/05/1999	Torchia v. Van Dorn Demag, (Injection molding equipment failure)	Rochester NY
07/20/1992	Hatara v. Turner Cooper Tools, Division of Cooper Industries, Inc. (propane/MAP tank explosion)	US District Court of MA

Depositions

05/17/2018	McAnney v Smith & Nephew Civil Action No. 3:17-cv-00012 (AWT) (hip)	US District Court, District of CT Firm: Law offices of Andrew J. Pianka, LLC
01/11-18/2018	Cavanaugh v Stryker, Case No. 2013CA001800 (Neptune, waste mgnt)	Cir. Court, 19 th circuit, St. Lucie, FL Firm: SEARCY DENNEY SCAROLA BARNHART
11/13/2017	Keith Cavanagh v Bio-Dynamics, Coolsystems 3:14-CV-01938-SRU (Medical cold/compression)	US District, Court, District of Connecticut Firm: Koskoff, Koskoff & Bieder, New Haven, CT
06/29/2017	Estate of Marsha Jane Snider v Wright Medical No. 15-C-464-3 (Metal on Metal hip implant)	Circuit Court of Harrison County, WV Firm: Saunders & Walker, PA, Pinellas Park, FL
09/30/2016	Estate of Beth Ann Kelly v Mylan, et al. No. 2:12-cv-11684-PDB-RSW (pain patch)	US District Court, E. Dist. of Michigan, S. Div. Firm: Angwin Law Firm
03/24/2016	ELI LILLY AND COMPANY, v PERRIGO Case. 1:13-CV-0851 SEB-MJD (Transdermal delivery of Testosterone & Applicator)	US District Court, N. Dist. of IL, E. Div Firm: RAKOCZY MOLINO MAZZOCHI SIWIK LLP
2/18/2016	BIOMEDICAL ENTERPRISES, INC. v. SOLANA SURGICAL, LLC, et al., , Civil No. 1:14-cv-00095-LY (Nitinol Bone Staples)	US District Court, Western Dist. of Texas Firm: Fish & Richardson
02/11/2016	FORSTA AP-FONDEN AND DANSKE INVEST MANAGEMENT AS v. ST. JUDE MEDICAL, et.al Civil No. 12-3070 (JNE/HB) Class Action	US District Court, District of Minnesota Firm: Motley Rice LLC, Mt. Pleasant, SC
10/15/2015	Barbara Tucker v. Wright Medical Tech., Inc Case No. BC575110 (Metal on Metal hip implant)	Superior Court, CA, La County Firm: Kiesel Law LLP
08/11/2015	Bayer HealthCare Pharmaceuticals Inc., Bayer Pharma AG, and Bayer OY (“Bayer”) MIRENA® LITIGATION, CASE NO. 297, MASTER DOCKET NO.:BER-L-4098-13	Superior Court of NJ, Bergen County Firm: Parker Waichman LLP
05/05/2015	Raymond Uribes v. BASF, Horn Co (Bondo) (Release of Asbestos from Polyester ABF)	Superior Court, CA, Santa Clara Firm: Waters Kraus & Paul, El Segundo, CA
12/30/2014	Robyn Christiansen v. Wright Medical (Conserve MoM hip, MDL NO. 2329)	US District Court, Northern Dist of Georgia Firm: Pope, McGlamry, Kilpatrick, Morrison & Norwood
11/04/2014	Teresa Hilliard v C.R. Bard (Avaulta Plus Mesh, MDL NO. 2187)	US District Court, Southern Dist.WV, Charleston Div. Firm: Harrison Davis Steakley Morrison, P.C.
11/04/2014	Cynthia Robinson v. C.R. Bard	US District Court, Southern Dist.WV, Charleston Div.

10/13/2014	(Align Mesh, MDL NO. 2187) Glenny. Pichardo v. CR Bard (IVCF Recovery fracture)	Firm: The Lanier Law Firm, PLLC US District Court, Southern Dist of NY
08/15/2013	Tim Courson v. Wright Medical (Failed Ti modular hip neck)	Firm: Burns & Harris, Esqs US District Court, Middle Dis Georgia, Macon Div.
07/23-24/2013	Kilgore v. Synthes (failed titanium spinal implants)	Firm: Fortson, Bentley and Griffin, P.A. US District Court, Southern Georgia, Augusta Div
06/24/2013	Steven Brown v. Snook, et. al. (Duraform Bovine collagen in spinal surgery)	Firm: Blasingame, Burch, Garrard & Ashley 5th Dist Court, Washington County, Utah
05/08/2013	Penn Chiro. v. BCBSBA (Spinal traction, roller table, massage chair)	Firm: Aaron J. Prisbrey, PC US District Court, N. District of IL, E. Div.
02/07/2013	Chad Boatman v. Synthes, et. al. (Orthopaedic wrist screws)	Firm: McDermott Will & Emery LLP District Court, Orange County, TX
11/13/2012	Carpenter v American Medical Systems (AMS monarch transvaginal mesh)	Firm: Provost Umphrey Law Firm Superior Court, CA, County of San Bernardino
05/08/2010	Cole v. LDR Holdings, et. al. (New design spinal fusion implant)	Firm: Albertson & Davidson, LLP District Court, Smith County, TX
04/16/2010	Jennings v. Alsager, et al. (Duragesic, fentanyl reservoir pain patch)	Firm: Martin Walker, PC Superior Court, WA, King County
04/02/2010	Auburn v. Johnson & Johnson, Alza, et al. (Fentanyl reservoir pain patch)	Firm: Heygood, Orr, Pearson Superior Court, CA, County of Sacramento
02/05/2009	D.A. West v. Alza Corp (Fentanyl laminated reservoir pain patch)	Firm: Heygood, Orr, Pearson Distr. Court, Trinity County, TX
11/23/2004	Delbrook v. Aescualp, Inc. (Stainless steel surgical ronguer)	Firm: Heygood, Orr, Pearson Superior Court of WA, King County
04/01/2004	FV Western Hunter-Casco Bay Diesel (Marine transmission & converter)	Providence, RI
02/05/2004	Dixie Smith (Class Action) v. AllState (Automotive sheet metal parts, fabrication and safety)	
08/19/2003	Maxner v. Cosco (Battery operated toy)	Seattle, WA
05/22/2003	Cecil E. Dodson v. Ford Motor Company (Electrical switch/auto fire)	RI Superior Court
05/16/2001	Serdin v. USSC, Kaiser Foundation Hospitals (Attorney: Patrick Emery, medical stapler)	Superior Court, CA County of Sonoma
05/23/2000	Saied Kashani v. Mercedes (Uniblade & windshield system)	San Diego, CA
05/1999	ME-92 v. Smith Nephew (Medical grade surface coating for stainless steels)	Memphis, TN
10/21/1998	Turchiano v. Howmedica (Spinal implant failure)	US District Court of NY
05/1992	Hatara v. Turner Cooper Tools, Division of Cooper Industries, Inc. (Propane/MAP tank explosion)	US District Court of MA

Arbitrations

02/22/2011	Eric Grabowski v Kaiser Foundation; Shaieb, MD (PEEK Shoulder Anchor)	Hawaii
07/2005	Travel leather, Peabody Mass v. Hartford Steam Boiler (Stainless hot water tank, BINGHAM MCCUTCHEN LLP)	Boston, MA

REFERENCES

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TERMS AND CONDITIONS OF AGREEMENT

CHARGES: Work performed under a fixed-price arrangement will be billed at the agreed fixed amount. Work performed on a time-and-expenses basis will be charged in accordance with the most current Schedule of Rates & Charges of Materials Science Associates, LLC ("MSA"). Any unusual work not specifically covered by that schedule will be charged at a rate mutually determined to be reasonable in relation to the type of work to be performed.

At the discretion of MSA, a suitable retainer shall be required from the client in advance of starting a case or project. At the discretion of MSA, additional suitable retainers shall be required from the client in advance of scheduling or continuing additional work on a project, such as the retaining and use of additional consultants, travel, inspections, preparation and testimony at depositions and trials. All retainer fees and prepayment fees paid are non-refundable.

Evidence storage and disposal of cases file will be the responsibility of the client. Upon the client's request, MSA may agree to provide temporary storage space for a reasonable fee, which the client agrees to pay monthly fees upon presentation of an invoice from MSA.

Taxes will be charged where applicable.

PAYMENT: Invoices are typically rendered weekly or in accordance with the agreed upon payment schedule, and are due upon receipt. Outstanding balances past due over 30 days are subject to a 1.5% delinquency charge until paid. MSA, without liability, may withhold delivery of reports and other data, and may suspend performance of its obligations to the client, pending full payment of all charges. MSA reserves the right to decline further work with any client delinquent in payment of charges due to MSA for previous work, until such balances are paid in full.

EXECUTION OF SCOPE OF SERVICES: MSA will work in accordance with generally accepted professional engineering and medical analysis practice. No other warranty, express or implied, is made concerning work performed under the agreement, including MSA's findings, recommendations, specifications, or professional advice.

MSA will diligently proceed with the contracted work and report to the client in a timely manner, except for delays occasioned by factors beyond MSA's control, by factors that were not reasonably foreseeable, or by factors initiated by the client.

Work under the agreement will be terminated upon receipt by MSA of written notice from the client, except that MSA may complete such analyses, records, and reports as are reasonably necessary to adequately document the work performed through termination. Charges for such work will be kept to a reasonable minimum not exceeding 10% of total charges incurred through the date of termination. Work under a fixed-price agreement is non-refundable. Work under the agreement may be terminated by MSA only for just cause. This includes, but is not limited to: development of a material conflict of interest, judicially required participation in onerous discovery or other legal process outside the intended scope of the work, or the presence of circumstances beyond MSA's control, such as natural disasters or government intervention.

MSA, unless other specific arrangements are made, will maintain its technical files for 30 days after the final payment is received and the case file is closed. Financial records will be retained according to I.R.S. requirements, but not less than one year after the case file is closed.

HOLD HARMLESS AND INDEMNIFICATION: The client assumes full and complete responsibility for all uses and applications of MSA's recommendations, or work under this agreement, or failure to use recommendations or work, and agrees to indemnify and hold harmless MSA, its affiliates, officers, directors, employees, agents, and stockholders against any and all liability, damages, losses, claims, demands, actions, causes of action, and costs including attorney's fees and expenses resulting from the death or injury to any person or damage to any property or any other alleged or actual damages resulting from the aforementioned use, application, or nonuse of MSA's recommendations or work under this agreement.

The client agrees that in no event shall MSA, its affiliates, officers, directors, employees, agents, or stockholders be liable for any incidental or consequential damages, direct or indirect, arising from MSA's services under this agreement.

MSA will hold in strictest confidence all proprietary information and trade secrets of the client to which it may be given access. Unless otherwise expressly agreed in writing, all reports, recommendations, procedures, and other information provided to the client under this agreement shall be joint property of the client and MSA, and may be used without restriction by either. However, unless otherwise expressly agreed in writing, MSA shall retain exclusive rights to all proprietary information, technologies, trade secrets, inventions, or patentable ideas developed during the performance of this agreement.

In any litigation involving the client in which MSA is compelled by subpoena or court order to testify at a deposition or judicial proceeding, or to produce documents regarding work performed by MSA, the client agrees to compensate MSA, at its prevailing hourly rate, for all time spent by MSA in responding to such legal process, including all time spent in preparing for such testimony. The client also agrees to pay MSA's reasonable attorney's fees and expenses included in connection with the foregoing. In the event of any such subpoena or court order, MSA will promptly notify the client to enable the client to object to any such testimony or production of documents.

In the event of a lawsuit between the client and MSA under this agreement, such lawsuit shall be filed and tried only in a court of competent jurisdiction within the State of Rhode Island. Rhode Island law shall apply to any such proceeding.

SCHEDULE OF RATES & CHARGES

PROFESSIONAL FEES

The staff of Materials Science Associates, LLC comprises highly qualified professionals: both employees and consultants. MSA charges its clients for services provided according to the skill level of the individual assigned to the client's project. For billing purposes, MSA provides the following staff classifications that designate relative experience, training, and accomplishment within a technical field together with the range of standard hourly fees charged for their services.

PROFESSIONAL SUPPORT:

Engineering & Medical Analysis, Site Inspections, Travel and Expense

Dr. John D. Jarrell, PhD, PE

Travel	\$475/hr
Inspections & Analysis	\$595/hr
Depositions (prepayment, Min. 6 hours paid in advance)	\$775/hr
Trials (prepayment, Min. 8 hours paid in advance)	\$775/hr

***Non-refundable initial retainer fee to retain promise of availability for analysis: \$9950**

Jay M. Vincelli, MSc, PE; Lise H. Moloney

Travel	\$295/hr
Inspections & Analysis	\$450/hr
Depositions (prepayment, Min. 6 hours paid in advance)	\$595/hr
Trials (prepayment, Min. 8 hours paid in advance)	\$595/hr

***Non-refundable initial retainer fee to retain promise of availability for analysis: \$8100**

Associates

Travel	\$295/hr
Inspections & analysis	\$395/hr
Depositions (prepayment, Min. 6 hours paid in advance)	\$550/hr
Trials (prepayment, Min. 8 hours paid in advance)	\$550/hr

Surgeons & Specialists

Travel (limited availability)	quote
Analysis & Review	quote
Depositions (prepayment, Min. 6 hours paid in advance)	quote
Trials (prepayment, Min. 8 hours paid in advance)	quote

***Non-refundable initial retainer fee to retain promise of availability for analysis, quoted per case and expert.**

Lab Technicians	\$150-250/hr
Case Managers, Case Management and Evidence Management	\$250/hr
Support Staff, Administrative Services and case support	\$95-125/hr

***Initial retainer fees are non-refundable, as well as advance prepayments required for depositions & trials and scheduled preparation and travel.** Retainer fees are to secure the experts promise of "availability" to work on a case independent of services performed. Refunds are not given under any circumstances, including cases that settle before work is performed, settlements before an inspection or settlements before issuance of a report, deposition or trial. Our work, inspections and analysis time and expenses, however, are billed against the prepayments until it is depleted.

Cancellations made less than 10 days prior to travel for inspection, deposition or trial engagement are billed at 50%, and 100% for cancellations 72 hours or less in advance, with 8 hour minimum per day for cancelled air travel. Additional expenses, travel, supplies and rush services are billed separately from our rates.

We review records before invoices are sent out, and sometimes make adjustments to avoid a disparity between the time charges and the services rendered or the results achieved. We expect to write a report prior to deposition or trial testimony scheduling unless otherwise agreed upon in writing. Full payment of all retainers and invoices for services are required before the performance or scheduling of any travel, inspection, reporting, depositions or trials. The client agrees to inform expert when the case or matter is closed or settles. Storage fees for evidence and documents are charged separately. Expert shall have no

