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**Mark E. Shirtliff, Ph.D.**  
**Associate Professor, Department of Microbial Pathogenesis, School of Dentistry,**  
**Associate Professor, Department of Microbiology and Immunology, School of Medicine,**  
**University of Maryland–Baltimore, Baltimore, Maryland, U.S.A.**

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## PERSONAL DATA

Name: Mark Everett Shirtliff  
Date/Place of Birth: July 1969; Canada  
Citizenship: USA/Canada

### **Business Address:**

Department of Microbial Pathogenesis,  
Dental School, University of Maryland-Baltimore  
650 W. Baltimore Street, 8<sup>th</sup> Floor South  
Office: 9209; Lab: 9414  
Baltimore, Maryland, U.S.A. 21201  
Tel. (410) 706-2263  
FAX (410) 706-0865  
Email: [mshirtliff@umaryland.edu](mailto:mshirtliff@umaryland.edu)

## EDUCATION

January 2001 - Ph.D. in Microbiology and Immunology  
University of Texas Medical Branch, Galveston, TX, USA  
Dissertation Title, “*Staphylococcus aureus*: Roles in Osteomyelitis”  
Advisor: Dr. JT Mader

May 1993 - B.S. (Cum Laude Honors)  
University of Houston - Clear Lake, Houston, TX, USA  
Junior and Senior Years  
Major: Biology; Minor: Geography  
&  
University of Alberta, Edmonton, AB, Canada  
Freshman and Sophomore Years  
Major: Biology; Minor: Geography

## RESEARCH INTERESTS

Differential gene expression and protein production using genomic and proteomic techniques, biofilms, animal models of infection (osteomyelitis, implant infection, abscess, and endophthalmitis), identification of vaccine candidates and antimicrobial targets, host-pathogen interactions.

## EXPERIENCE IN HIGHER EDUCATION

- Associate Professor (Primary Appointment)*  
Department of Microbial Pathogenesis  
Dental School, University of Maryland – Baltimore  
Baltimore, MD  
*July 2009 - present*
- Associate Professor (Secondary Appointment)*  
Department of Microbiology and Immunology  
School of Medicine, University of Maryland – Baltimore  
Baltimore, MD  
*Jan 2010 - present*
- Adjunct Professor*  
Department of Microbiology and Immunology  
Dental School, University of Maryland – Baltimore  
Baltimore, MD  
*Jan 2004 - present*
- Assistant Professor*  
Department of Biomedical Sciences  
Dental School, University of Maryland – Baltimore  
Baltimore, MD  
*Sept 2003 – June 2009*
- Assistant Research Professor*  
Department of Microbiology &  
The Center for Biofilm Engineering  
Montana State University  
Bozeman, MT  
*Oct 2002 - Aug 2003*
- Postdoctoral Fellow*  
Center for Biofilm Engineering  
Montana State University  
Advisor: Dr. AK Camper  
Bozeman, MT  
*Oct 2000 - Oct 2002*
- Graduate Student and Research Assistant*  
Dept. of Microbiology and Immunology  
U of Texas Medical Branch  
Coadvisor: Dr. DW Niesel  
Galveston, TX  
*Jan 1997 - Sept 2000*
- Graduate Student and Laboratory Director*  
Dept. of Marine Biomedical Institute  
U of Texas Medical Branch  
Advisor: Dr. JT Mader  
Galveston, TX  
*Sept 1995 - Sept 2000*
- Laboratory Director*  
Dept. of Marine Biomedical Institute  
U of Texas Medical Branch  
Advisor: Dr. JT Mader  
Galveston, TX  
*April 1995 - Sept 2000*
- Research Assistant*  
Dept. of Microbiology and Immunology  
U of Texas Medical Branch  
Supervisor: Dr. CP Davis  
Galveston, TX  
*June 1993 - April 1995*

## COURSE PRESENTATIONS

### Undergraduate:

Lecturer, Molecular Techniques - Bioprocesses in Engineering. College of Engineering, Montana State University. *Spring, 2002.*

Supervision and mentoring of >30 undergraduate students in laboratory

### Graduate:

Instructor and Coordinator, MICP 521 – General & Orofacial Infectious Diseases, University of Maryland, Baltimore. *Fall, 2009 – present.*

Instructor and Coordinator, MMIC 701 – Principles of Microbial Pathogenesis, University of Maryland, Baltimore. *Spring, 2005 – present.*

Instructor, BSCI 518C – Case Based Conferences, University of Maryland, Baltimore. *Fall, 2008 – present.*

Instructor, MSPR 520 – Host Defenses and Infectious Diseases, University of Maryland, Baltimore. *Fall, 2006 – present.*

Instructor, BSCI-511 – Cell and Molecular Biology, University of Maryland, Baltimore. *Fall 2006 – present.*

Instructor, MCB 602 – Molecular Cell Biology, University of Maryland, Baltimore. *Spring, 2006.*

Instructor, DBMS 619 – Seminars in Biomedical Sciences, University of Maryland, Baltimore. *Fall, 2005 – present.*

Instructor, DBMS 511M – Microbiology and Immunology, University of Maryland, Baltimore. *Spring 2004 - present.*

Instructor, DBMS 635 – Bacterial Genetics, University of Maryland, Baltimore. *Fall 2004 – 2008.*

Instructor, DBMS 604 – Introduction to Biomedical Sciences, University of Maryland, Baltimore. *Fall 2004 – 2007.*

Instructor, DPDM 518 – Asepsis Microbiology Assessment, University of Maryland, Baltimore. *Fall, 2004.*

Instructor, Proteomics: Methods and Applications Workshop. La Sapienza University, Rome, Italy. *March 27 – April 7, 2004.*

Instructor, Biofilms Techniques Workshop. University of Concepcion, Concepcion, Chile. *January 8 – 20, 2004.*

Lecturer, Molecular Techniques, Veterinary Molecular Biology, Montana State University, *Spring, 2003.*

Lecturer, A Course in Biocompatibility, Aalborg University, Denmark, *April 7-9, 2003.*

Laboratory Instructor, Medical Microbiology, Department of Microbiology and Immunology, University of Texas Medical Branch. *1998.*

Laboratory Instructor, Medical Microbiology, Department of Microbiology and Immunology, University of Texas Medical Branch. *1997.*

## GRADUATE EDUCATION

- Nathaniel Archer, Ph.D., Microbiology and Immunology, University of Maryland, Baltimore – in progress (Major advisor).
- Anna Muench, Howard Hughes Fellow, Department of Microbial Pathogenesis, University of Maryland, Baltimore – in progress (Major advisor).
- Patrick Kerns, M.D., Ph.D., Microbiology and Immunology, University of Maryland, Baltimore – in progress (Major advisor).
- Salar Sanjari, M.S., Department of Microbial Pathogenesis, University of Maryland, Baltimore, – in progress (Major advisor).
- Lauren Hittle, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – in progress.
- Elizabeth Neuendorf, Ph.D., Molecular Medicine, Graduate Program in Life Sciences, University of Maryland, Baltimore – in progress.
- Daniel Powell, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – in progress.
- Leon Demasi, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – in progress.
- Khandra Sears, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – in progress.
- Elias M. Rivera, M.S., Biomedical Sciences, University of Maryland, Baltimore – in progress.
- Zhenbo Xu, Ph.D., College of Light Industry and Food Sciences, South China University of Technology, Guangzhou, China – 2011.
- Brian Peters, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2010 (Major advisor).
- Ranjani Prabhakara, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2009 (Major advisor).
- Nicole Ammerman, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2009.
- Nick Morin, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2009.
- Stephen M. Techtmann, Ph.D., Molecular Medicine, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2009.
- Chun Tan, Ph.D., Department of Biomedical Sciences, Dental School, University of Maryland, Baltimore – 2009.
- Kelsy Smith, Ph.D., Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2009.
- Gretchen Dalrymple, D.D.S., M.S., Department of Endodontics, Prosthodontics and Operative Dentistry, University of Maryland, Baltimore – 2008.
- Ajinder Kaur, Ph.D., Molecular Medicine, Graduate Program in Life Sciences, University of Maryland, Baltimore – 2008.
- Rebecca Brady, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore (Major advisor) - 2007.
- Sandra Jacobson, Ph.D., Molecular Microbiology and Immunology, Graduate Program in Life Sciences, University of Maryland, Baltimore (Major advisor) – 2007.
- Jennifer Kofonow, M.S., Biological Sciences, Arizona State University, Flagstaff, AZ – 2007.
- M. Chelsea Lane, Ph.D., Microbiology and Immunology, University of Maryland, Baltimore – 2006
- Ashley Crisp, M.S., Microbiology, St. George's University – 2005.
- Alex Bargmeyer, M.S., Civil Engineering, ENVE option, Montana State University - 2003.

## POSTDOCTORAL EDUCATION

Horst Maxeiner, M.D., Biomedical Sciences, University of Maryland, Baltimore – 2003 – 2004 (Major advisor).

Sandra Jacobsen, Ph.D., Biomedical Sciences, University of Maryland, Baltimore – 2007-2008 (Major advisor).

Graeme O'May, Ph.D., Department of Microbial Pathogenesis, University of Maryland, Baltimore – 2007 – 2011 (Major advisor).

Janette M. Harro, Ph.D., Department of Microbial Pathogenesis, University of Maryland, Baltimore – 2008 –present (Major advisor).

Lisa Marie Schlet, D.D.S., Department of Microbial Pathogenesis, University of Maryland, Baltimore – 2011 –present (Major advisor).

## STUDENTS PERFORMING INDEPENDENT STUDY

Karsten Sieber (Ph.D.), Laura Leffner (M.S), Erin O'Keefe (Ph.D.), Lindsey Newman (BS), Erin Ladwig (DDS), Khandra Sears (Ph.D.), Weiwei Lu (Ph.D.), Limei Lin (Ph.D.), Christopher Van Deven (DDS), Anna Muench (DDS), Allison Howard (DDS), Adrienne Golly (DDS), Natalia Chalmers (Ph.D.), Robin Maltzberger (BS), Tammy Tu (BS), James Dowling (BS), Michael Cripps (BS), Pooja Paranjpe (BS), Lauren Tunnel (BS), Keira Rycaj (BS), Andy Lucas (BEng), Peter Newell (BS), Kimberly White (BS), Jeremy Mitchell (BEng), Jonathan Hilmer (BS), Miriam Stewart (BS), Megan Falsetta (BS), Krista Cooperstein (BS).

## PROFESSIONAL ACTIVITIES

### Membership in Professional Organizations:

Member, Sigma Xi (elected). *1998 – present.*

American Society for Microbiology. *1998 – present.*

International Society of Microbial Ecology. *2005 – present.*

American Society for Microbiology – Maryland Branch. *2004 – present.*

### Program Participation:

#### National and International Presentations

“Taking the biofilm phenotype into consideration in the diagnosis and prevention of orthopaedic infections.” Kitakyushu International Symposium on Infectious Diseases and Chemotherapy. Secretariat of the 81st Annual Meeting of Western Branch of Japanese Association for Infectious Disease. ISC-WG: Device-related infection and Biofilm. Fukuoku, Japan. October 6, 2011

“Biofilms.” Philadelphia Academy of Stomatology Quaterly Science Meeting. Philadelphia, PA. September 21, 2011.

“Considering *Staphylococcus aureus* biofilms in vaccine development and diagnostics.” Novartis. Sienna, Italy. September 9, 2011.

“*Staphylococcus aureus* biofilm infections: Immune response, diagnostics and vaccine development” Gordon Research Conference on Staphylococcal Diseases. Barga, Italy. July 24-29, 2011.

“*Staphylococcus aureus* biofilm infection models” Eurobiofilms 2011. Copenhagen, Denmark. July 5, 2011.

**PROFESSIONAL ACTIVITIES, PROGRAM PARTICIPATION:**

National and International Presentations (continued)

- “Novel vaccine strategies and improved diagnostics for musculoskeletal infections” AO Trauma eCM XII: Implant Infection. Davos, Switzerland. June 22-24, 2011.
- “Understanding biofilms and host pathogen interactions for MRSA vaccine development” Uniformed Services University of Health Sciences. Bethesda, Maryland. January 24, 2011.
- “Who’s smarter: The bugs or us?” 2010 Orthopaedic Trauma Association. Baltimore, Maryland. October 16, 2010.
- “Biofilms and Biosafety” American Biological Safety Association 2010 Meeting. Denver, Colorado. October 2, 2010.
- “Advancements in the fight against biofilms in chronic infections” ATACCC 2010 Conference. St. Petes Beach, Florida. August 17, 2010.
- “Diagnosis and vaccine prevention of biofilm-mediated chronic orthopaedic infections.” AOTrauma CPP Bone Infection workshop. Boston, Massachusetts. July 23, 2010.
- “MRSA biofilm vaccine.” NIAID Staphylococcal Vaccine Workshop. Bethesda, Maryland. May 10, 2010.
- “Novel approaches for an antibiofilm *S. aureus* vaccine.”, 8th World Congress on Trauma, Shock, Inflammation, and Sepsis (TSIS), Munich, Germany. March 9th – 13th, 2010.
- “Biofilms in medical and dental infectious II.” Session Chair. 5th ASM Conference on Biofilms. Cancun, Mexico. November 15 - 19, 2009.
- “*Candida albicans-Staphylococcus aureus* dual-species biofilms mediate invasive staphylococcal infection.” 5th ASM Conference on Biofilms. Cancun, Mexico. November 15 - 19, 2009.
- “SYMPOSIUM 5: Infection.” Session Chair. OTA Annual Meeting - 25th Anniversary Meeting. San Diego, CA. October 8-10, 2009
- “Chronic orthopaedic infections: Are vaccines the answer?” OTA Annual Meeting - 25th Anniversary Meeting. San Diego, CA. October 8-10, 2009
- “The host immune response: How important is it?” OTA Annual Meeting - 25th Anniversary Meeting. San Diego, CA. October 8-10, 2009
- “Views from the host and the pathogen in *Staphylococcus aureus* anti-biofilm vaccine development.” National Institute of Standards and Technology, Bethesda, Maryland. September 28, 2009.
- “Host immune response to biofilm infections.” Co-Organizer and Session Chair. Eurobiofilms, Rome, Italy. September 4, 2009.
- “Vaccine development and the host immune response to *Staphylococcus aureus* biofilms. Eurobiofilms, Rome, Italy. September 4, 2009.
- “Vaccines against *Staphylococcus aureus* biofilms.” Gordon Conference of *Staphylococcus aureus*. New Hampshire. September 1, 2009.
- “Biofilms and chronic wound infections.” Symposium on Advanced Wound Care/Wound Healing Society. Dallas, TX. April 29, 2009.
- “Role of the host and the pathogen in musculoskeletal infections.” Musculoskeletal Infection Society Annual Meeting. August 7-8, 2009.
- “*Staphylococcus aureus* biofilms” Food and Drug Administration. Bethesda, Maryland. April 14, 2009.
- “Biofilm Infections: A case study of *Staphylococcus aureus* pathogenesis.” University of Ottawa, Ottawa, Canada. March 3, 2009.
- “*Staphylococcus aureus* Biofilm Infections: Host immune response and vaccine development.” National Research Council of Canada. Ottawa, Canada. March 2, 2009.
- “Animal models of *Staphylococcus aureus* chronic biofilm infections” 5th ASM Conference on Biofilms. Cancun, Mexico. November 15 - 19, 2009.

## PROFESSIONAL ACTIVITIES, CONTINUED:

### National and International Presentations (continued)

- “Controversies in Infection: Diagnosing and Treating.” 22nd Annual Symposium on Advanced Wound Care and Wound Healing Society (SAWC/WHS) Meeting. Dallas, Texas. April 26-29, 2009.
- “Sensing and biofilms – biofilm effect on antimicrobial agents and effect of antibacterial agents on biofilm formation.” 48<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy/46<sup>th</sup> Infectious Disease Society of America Joint Annual Meeting, Washington, D.C. October 25-28, 2008.
- “Host-Pathogen Interactions in Biofilm Infections” Session Convener. 108<sup>th</sup> General Meeting of the American Society for Microbiology, Boston, Massachusetts, June 1-5, 2008.
- “Host Immune Response in Chronic *Staphylococcus aureus* Biofilm Infections” 108<sup>th</sup> General Meeting of the American Society for Microbiology, Boston, Massachusetts, June 1-5, 2008.
- “Biofilm-Mediated MRSA Infections: Slime by Design” Division of Infectious Diseases, Johns Hopkins University – School of Medicine, Baltimore, Maryland, April 21, 2008.
- “Biofilms and Polymicrobial Infections” Division of Infectious Diseases, Johns Hopkins Bayview Medical Center, Baltimore, Maryland, January 9, 2008.
- “Persistent Biofilm Infections” Department of Ophthalmology, Harvard Medical School, and The Schepens Eye Research Institute, Boston, Massachusetts, November 1, 2007.
- “The Role of Biofilms on Chronic Infectious Diseases, with Special Focus on Bone and Joint Infections” Mayo Clinic, Rochester, MN, September 4, 2007.
- “The Role of Biofilms in Chronic Infection” Department of Molecular Microbiology and Immunology, University of Missouri Medical School, Columbia, Missouri, August 20, 2007.
- “Biofilms in Orthopaedic Infections” Department of Orthopaedics, University of Missouri Medical School, Columbia, Missouri, May 23, 2007.
- “The Role of Biofilms in Chronic Infections” Center for Genomic Sciences, Allegheny General Hospital, Allegheny-Singer Research Institute, Pittsburgh, Pennsylvania, December 11, 2006.
- “The Role of Biofilms in Chronic Orthopaedic Infections” Annual Meeting of the Japanese Orthopaedic Society, Nagasaki, Japan, October 18-19, 2006.
- “The Use of a Denaturing HPLC Modification of the DGGE Technique for the In Situ Analysis of Complex Bacterial Populations in Health and Disease” ASM General Meeting, Orlando, Florida, May 21-25, 2006.
- “*Staphylococcus aureus* biofilms: *in vitro* and *in vivo* studies” Annual Research Symposium. Joan C. Edwards School of Medicine Marshall University, Huntington, West Virginia. March 20, 2006.
- “*Staphylococcus aureus* Infections” Northern Arizona University, Flagstaff, Arizona. March 13, 2006.
- “Role of Biofilms in Osteomyelitis” Philips Oral Healthcare Biofilm Symposium. University of Southern California, Los Angeles, California, Oct. 24-25, 2005.
- “The HPLC Modification of the DGGE Method for Population Analysis” Philips Oral Healthcare Biofilm Symposium. University of Southern California, Los Angeles, California, Oct. 24-25, 2005.
- “Molecular methods for the analysis of biofilm communities” Philips Oral Healthcare Biofilm Symposium. University of Southern California, Los Angeles, California, Oct. 24-25, 2005.
- “Studies on *Staphylococcus aureus* Biofilms.” 2005 Summer Symposium: Bugs and Biomaterials: Bacteria and the Biointerface. University of Washington · Seattle, WA August 24 - 26, 2005.
- “Detachment and Host Antibody Response to *Staphylococcus aureus* Biofilm Infections” Center for Biofilm Engineering, Montana State University, Bozeman, MT, March 3, 2005.

## PROFESSIONAL ACTIVITIES, CONTINUED:

### National and International Presentations (continued)

- “The Clinical Impact of Biofilm Infections” Winthrop University Hospital, Mineola, NY, February 3, 2005.
- “Biofilms and Device Related Infections”, Southwestern Association of Clinical Microbiology, Yearly Scientific Meeting. San Antonio, TX, September 16, 2004.
- “The Importance of Biofilms in Battlefield Injuries”, Management of Battlefield Tissue Injury, Toronto, Canada, June 28, 2004.
- “Staphylococcal biofilms” Northern Arizona University, Flagstaff, AZ, April 26, 2004.
- “Antimicrobial Resistance and Implications for Antibiotic-Impregnated Bone Cement” Stryker Howmedica Osteonics, Mahwah, NJ, April 21, 2004.
- “Workshop on Proteomics and Applications in Biofilm Research” La Sapienza University, Rome, Italy, March 29 – April 5, 2004.
- “Microbial proteomics: Workshop on sample preparation, two-dimensional gel electrophoresis, and mass spectrometric analysis” Concepcion, Chile, January 12-16, 2004.
- “*Staphylococcus aureus* and biofilms” National Institutes of Health, Washington DC, December 15, 2003.
- “Biofilms and their role in chronic infections” Columbia University, New York, NY, December 1, 2003.
- “Proteomic evaluation of *Staphylococcus aureus* biofilms” American Society for Microbiology Biofilms 2003, Victoria, Canada, November 3, 2003.
- “Proteomic and genomic evaluation of *Staphylococcus aureus* biofilms” Society of Industrial Microbiology, 2003 Annual Meeting, Minneapolis, Minnesota, August 12, 2003.
- “Evaluation of *Staphylococcus aureus* biofilms” Department of Microbiology, University of New Hampshire, May 6, 2003.
- “*Staphylococcus aureus* biofilms” Departments of Environmental Engineering and Biotechnology, Aalborg University, Denmark, April 7, 2003.
- “A search for vaccines against staphylococcal biofilm-mediated infections” Department of Microbiology, Danish Technological University, Copenhagen, Denmark, April 1, 2003.
- “Using microarrays to determine the gene expression profiles in biofilms” Danish Technological Institute, Denmark, April 3, 2003.
- “Treatment of osteomyelitis and septic arthritis: Evidences from animal models” Treatment of Bone and Joint Infections, 1<sup>st</sup> Annual Meeting of the Italian Society for Anti-infective Therapy, Vicenza, Italy, March 28, 2003.
- “Hyperbaric oxygen therapy and the treatment of musculoskeletal infections” Treatment of Bone and Joint Infections, 1<sup>st</sup> Annual Meeting of the Italian Society for Anti-infective Therapy, Vicenza, Italy, March 28, 2003.
- “Proteomic, microarray, and host-pathogen interaction studies of *Staphylococcus aureus* biofilms” University of Maryland, Departments of Oral and Craniofacial Biological Sciences, February 26, 2003.
- “*Staphylococcus aureus* biofilms” Genome Therapeutics, Waltham, Massachusetts, February 20, 2003.
- “Biofilms of staphylococci” New York Medical College. Department of Microbiology and Immunology, December 9, 2002.
- “Biofilms: Properties, significance, and current research” Department of Environmental Engineering, Washington State University, December 2, 2002.
- “Proteomics, genomics, and host-pathogen interactions in *Staphylococcus aureus* biofilms” Department of Microbiology, Montana State University, October 11, 2002.
- “*Staphylococcus aureus* biofilms” Veterinary Molecular Biology, Montana State University, September 10, 2002.

**Other:**

Consulting

Stryker Inc. 2002 – Present.  
Affinergy 2008.  
Shook, Hardy, and Bacon 2007 – 2009.  
Microbiotix 2006 – 2008.  
Targanta 2006.  
Synthes 2005 – 2007.  
Howmedica 2002 – 2004.  
Genome Therapeutics. 2002.

Grant Reviewer

National Institutes of Health, National Institute of Dental and Craniofacial Research. Special Emphasis Panel/Scientific Review Group 2010/08 ZDE1 JH (19). 2010.  
National Institutes of Health, National Institute of Allergy and Infectious Disease, BACP – Bacterial Pathogenesis Study Section. 2008.  
National Institutes of Health, National Institute of Allergy and Infectious Disease, 2008/10 ZRG1 BACP-H (02) S - Bacterial Pathogenesis. 2008.  
National Science Foundation. 2003 – 2006.  
Technology Foundation, Government of the Netherlands. 2002 – 2003.  
Katholieke Universiteit Leuven, Belgium. 2002 – 2003.

Journal Reviewer

Molecular Microbiology. 2002 – present.  
Annals of Clinical Microbiology and Antimicrobials. 2003 – present.  
Journal of Bacteriology. 2003 – present.  
FEMS Immunology and Medical Microbiology. 2003 – present.  
JAMA. 2005 – present.  
Infection and Immunity. 2006 – present.  
Microbes and Infection. 2006 – present.  
Applied and Environmental Microbiology. 2007 – present.  
Antimicrobial Agents and Chemotherapy.  
Yonsei Medical Journal. 2006 – present.  
Mayo Clinic Reviews. 2002 – present.  
Journal of Bacteriology. 2007 – present.

**HONORS**

Outstanding Researcher of the Year, Center Biofilm Engineering (2002)  
Christina Fleischmann Award, U of TX Medical Branch (2000)  
Curtis W. Lambert Academic Scholarship Award, U of TX Medical Branch (2000)  
Arthur V. Simmang Academic Scholarship, U of TX Medical Branch (1999)  
Elected to Sigma Xi scientific honors society (1998)  
Cum Laude Honors, University of Houston (1994)  
Information Sciences Academic Scholarship, University of Houston (1993)

## SERVICE AND COMMITTEE ASSIGNMENTS

Search Committee. Chair of Orthodontics, School of Dentistry, University of Maryland, Baltimore, 2011 – *present*.

Institutional Animal Care and Use Committee, Dental School. University of Maryland, Baltimore. 2010 – *present*.

Space Committee. Dental School. University of Maryland, Baltimore. 2010 – *present*.

Curriculum Development Committee. Dental School, University of Maryland, Baltimore. 2008 – *present*.

Oral Exam Committee, Graduate Program in Life Science, Molecular Microbiology and Immunology, University of Maryland, Baltimore. 2007 – *present*.

Class Advisor, Dental School. University of Maryland, Baltimore. 2006 – *present*.

Admissions Committee, Graduate Program in Life Science, Molecular Microbiology and Immunology, University of Maryland, Baltimore. 2005 – *present*.

Chair, Graduate Program in Life Sciences Awards Committee, Graduate School, University of Maryland, Baltimore. 2009.

Presenter, University of Maryland Dental School, 20<sup>th</sup> Annual High School Biomedical Research Program. University of Maryland, Baltimore. 2008.

President, American Society for Microbiology, Maryland Division. 2007 – 2008.

Graduate Council, University of Maryland, Baltimore and University of Maryland, Baltimore County. 2007 – 2008.

Preclinical Progression Committee. University of Maryland, Baltimore and University of Maryland, Baltimore County. 2007 – 2008.

Advanced Dental and Graduate Education Committee. University of Maryland, Baltimore and University of Maryland, Baltimore County. 2007 – 2008.

Faculty Search Committee, Department of Biomedical Sciences. Dental School. University of Maryland, Baltimore. 2006 – 2008.

Faculty Council, Dental School. U of Maryland, Baltimore. 2005 – 2008.

Seminar Coordinator, Department of Biomedical Sciences. Dental School. University of Maryland, Baltimore. 2005 – 2008.

Graduate Comprehensive Exam Committee, Department of Biomedical Sciences. Dental School. University of Maryland, Baltimore. 2004 – 2008.

Summer Undergraduate Research Program Admissions Committee, Department of Biomedical Sciences, Dental School, University of Maryland, Baltimore. 2007.

Center for Biofilm Engineering Seminar Coordinator. 2000 – 2003.

President, Forest Bend Fire Department. 1997 - 1998, 1999 - 2000.

President, Theta Chi Fraternity. 1989 - 1990.

## PUBLICATIONS

### Textbooks and Thematic Issues

1. Donelli G, Bayston R, Costerton JW, and **Shirtliff ME**. Eurobiofilms. *FEMS Immunol. Med. Micro.* 2010.
2. **Shirtliff ME** and Leid JG, **Editors**. Biofilms and Device-Related Infections. Springer, New York, NY. 2009.

### Papers

1. McLean JS, Fansler SJ, Majors PD, McAteer K, Ziegler L, Lux R, **Shirtliff ME**, Costerton JW, and Shi W. Revealing species identity and their functional contribution in the development of cariogenic conditions within oral plaque by combining in-vivo metabolomics with stable isotope probing. *NMR*. 2011. – submitted.
2. Peters BM, Ovchinnikova E., Jabra-Rizk MA, Hoyer L, van der Mei HC, Busscher HJ, Krom BP, and **Shirtliff ME**. *Candida albicans* hyphal adhesin Als3p mediates interspecies interactions with *Staphylococcus aureus* during polymicrobial biofilm growth. 2011. – submitted to *PLoS One*.
3. Cope E, Goldstein-Daruech N, Kofonow J, Christensen L, Gilliland M, McDermott B, Monroy F, Nunamaker J, Palmer J, Chiu A, Cohen N, **Shirtliff ME**, and Leid JG. Characterization of virulence gene expression resulting from *Streptococcus pneumoniae* and nontypeable *Haemophilus influenzae* polymicrobial interactions in a chronic disease. 2011. – submitted to *PLoS One*.
4. Zhu J, Krom B, Peters B, **Shirtliff ME**, Scheper M, Intapa C, Jabra-Rizk MA. Farnesol-induced apoptosis in *Candida albicans* is mediated by Cdr1-p extrusion and depletion of intracellular glutathione. *J Euk Cell*. 2011. – accepted with revisions.
5. Conti S, Sotereanos N, Altman G, Altman D, Post JC, Ehrlich GD, Gorur A, Schaudinn C, Sedghizadeh P, **Shirtliff ME**, Costerton JW, Stoodley P, Kathju S, and DeMeo P. Significance of the biofilm mode-of-growth in orthopaedic infections. *JBJS*. 2011. – in press.
6. Cope E, Cohen N, Dowd SE, Palmer J, Chiu A, Wolcott R, Neeling L, Gmerek A, Smith A, **Shirtliff ME**, and Leid JG. Primary exposure to cigarette smoke influences microbial community composition in chronic rhinosinusitis determined by next generation pyrosequencing. *FEMS Med Micro Immun.* 2011. – in press.
7. O'May GA, Macfarlane S, Macfarlane GT, and **Shirtliff ME**. Biofilms in the human gastrointestinal tract. 2011 – in press.
8. Stoodley P, Hall-Stoodley L, Costerton JW, DeMeo P, **Shirtliff ME**, Gawalt E, and Kathju S. Biofilms, Biomaterials, and Device-Related Infections. In Biomaterials. 2011. – in press.
9. Han A, Zenilman JM, Melendez JH, **Shirtliff ME**, Agostinho A, James G, Stewart PS, Mongodin EF, Rao DL, Rickard AH, Lazarus GS. A systematic, multi-faceted approach using novel molecular methods to characterize the microbial flora in chronic wounds. 2011. *Wound Rep. Regen.* – in press.
10. Peters BM, O'May GA, Jabra-Rizk MA, Costerton JW, and **Shirtliff ME**. Polymicrobial interactions in biofilms: impact on pathogenesis and human disease. *Clin Micro Rev*. 2011. – in press.

**PUBLICATIONS, Papers...continued**

11. Xu Z, Lin L, Chu J, Peters BP, Harris ML, Li B, Shi L, and **Shirtliff ME**. Development and application of loop-mediated isothermal amplification assays on rapid detection of various types of staphylococcal strains. *Food Res Int.* – in press.
12. Leid JG, Cope EK, Parmenter S, **Shirtliff ME**, Dowd S, Wolcott R, Basaraba R, Hunsaker H, Palmer J, and Cohen N. The importance of biofilms in chronic rhinosinusitis. *Biofilm Infections*. Springer Inc. New York, New York. 2011. 139-160.
13. O'May GA, Brady RA, Leid JG, Calhoun JH, and **Shirtliff ME**. Osteomyelitis. *Biofilm Infections*. Springer Inc. New York, New York. 2011. 111-138.
14. Prabhakara R, Harro JM, Leid JG, Harris ML, and **Shirtliff ME**. Murine immune response to a chronic *Staphylococcus aureus* biofilm infection. *Infect Immun.* 79(4): 1789-1796, 2011.
15. Brady RA, O'May G, Leid JG, and **Shirtliff ME**. Resolution of *Staphylococcus aureus* biofilm infection using vaccination and antibiotic treatment. *Infect Immun.* 79(4): 1797-1803, 2011.
16. Xu Z, Lin Li L, **Shirtliff ME**, Peters BM, Li B, Peng Y, Alam MJ, Yamasaki S, Shi L. Resistance Class 1 Integron in clinical methicillin-resistant *Staphylococcus aureus* strains in Southern China, 2001-2006. *Clin Microbiol Infect.* 17(5):714-8, 2011.
17. Xu Z, Li L, Shi L, and **Shirtliff ME**. Class 1 integron in staphylococci. *Mol Biol Rep.* Published online: Jan 22, 2011.
18. Prabhakara R, Harro J, Harris M, Leid JG, and **Shirtliff ME**. Prevention and resolution of *Staphylococcus aureus* biofilm infections via host immune response modulation. *Infect Immun.* Epub: Sept 26, 2011.
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- Jabra-Rizk M, **Shirtliff ME**, and Meiller TF. Farnesol effect on *Candida dubliniensis* biofilms. 106<sup>th</sup> General Meeting of the American Society for Microbiology, Orlando, Florida, May 21-25, 2006.
- Kjellerup B, **Shirtliff M**, Ghosh U, May, H, Fagervold, S, and Sowers K. Distribution and diversity of PCB dechlorinating *Chloroflexi* in marine and fresh water sediments by Competitive PCR (cPCR) and Denaturing High-Performance Liquid Chromatography (DHPLC). SETAC North American 26<sup>th</sup> Annual Meeting, Baltimore, MD, November 13-17, 2005.
- Shirtliff ME**, Leid JG, Stoodley P, Costerton JW, Brady R, Camper AK. Studies on *Staphylococcus aureus* biofilms. 2005 Summer Symposium: Bugs and Biomaterials: Bacteria and the Biointerface. University of Washington · Seattle, WA August 24 - 26, 2005.
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- Jabra-Rizk M, **Shirtliff ME**, Johnson JK, Silva A, and Meiller TF. Effect of farnesol on mixed species biofilm. 105<sup>th</sup> General Meeting of the American Society for Microbiology, Atlanta, June 1-5, 2005.
- Jacobsen S, Harro J, **Shirtliff M**, and Mobley H. Mutants in the Pst phosphate transport system of uropathogenic *Proteus mirabilis* are attenuated in an experimental murine model of UTI. 105<sup>th</sup> General Meeting of the American Society for Microbiology, Atlanta, June 1-5, 2005.
- Jabra-Rizk M, Johnson JK, Oliveira KM, Haverkos K, **Shirtliff ME**, and Meiller TF. PNA FISH analysis of microbial biofilms. 105<sup>th</sup> General Meeting of the American Society for Microbiology, Atlanta, June 1-5, 2005.
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- Shirtliff ME**, Leid JG, Costerton JW, and Camper AK. Gene expression and protein production in *Staphylococcus aureus* biofilms. 104<sup>th</sup> General Meeting of the American Society for Microbiology, New Orleans, May 23-27, 2004.
- Shoemaker RC, Hudnell HK, House D, **Shirtliff M**, and Domenico P. Melanocyte stimulating hormone (MSH) deficiency in chronic fatigue syndrome associated with nasal carriage of coagulase negative staphylococci (CoNS). 104<sup>th</sup> General Meeting of the American Society for Microbiology, New Orleans, May 23-27, 2004.
- Jeffers AK, Willson CJ, **Shirtliff ME**, Parsek MR, and Leid JG. Human leukocytes kill *Pseudomonas aeruginosa* biofilms through an interferon gamma dependent process. 104<sup>th</sup> General Meeting of the American Society for Microbiology, New Orleans, May 23-27, 2004.
- Block AP, Borham C, **Shirtliff ME**, and Leid JG. Selective human leukocyte killing of *Pseudomonas aeruginosa* and *Staphylococcus aureus* polymicrobial biofilms is dependent upon quorum sensing in *P. aeruginosa*. 104<sup>th</sup> General Meeting of the American Society for Microbiology, New Orleans, May 23-27, 2004.
- Lee K, **Shirtliff ME**, Fry SE, and Leid JG. Inhibition of methicillin-resistant *Staphylococcus aureus* biofilm formation with bismuth-thiol compounds. 104<sup>th</sup> General Meeting of the American Society for Microbiology, New Orleans, May 23-27, 2004.

Published Abstracts and Symposia...continued:

- Falsetta M, Hilmer J, Leid JG, Camper AK, and **Shirtliff ME**. Gene expression profiles in *Staphylococcus aureus* biofilms through microarray analysis. American Society for Microbiology Biofilms 2003, Victoria, British Columbia, Canada, November 1-6, 2003.
- Leid JG, Li Y, Silverstein S, Costerton JW, and **Shirtliff M**. Human leukocyte attack and killing of medically important biofilms: Mimicking physiological situations improves biofilm killing. American Society for Microbiology Biofilms 2003, Victoria, British Columbia, Canada, November 1-6, 2003.
- Borriello G, Pitts B, **Shirtliff ME**, and Stewart PS. Proteomic patterns in antibiotic treated *Pseudomonas aeruginosa* PA14 biofilms. American Society for Microbiology Biofilms 2003, Victoria, British Columbia, Canada, November 1-6, 2003.
- Shirtliff ME**, Leid JG, Costerton JW, and Camper AK. Proteomic evaluation of *Staphylococcus aureus* biofilms. American Society for Microbiology Biofilms 2003, Victoria, British Columbia, Canada, November 1-6, 2003.
- Jeffers AK, Wilson CJ, **Shirtliff ME**, Parsek MR, and Leid JG. IFN- $\alpha$  mediated human leukocyte killing of *Pseudomonas aeruginosa* biofilms lacking the ability to produce the exopolysaccharide alginate. American Society for Microbiology Biofilms 2003, Victoria, British Columbia, Canada, November 1-6, 2003.
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- Shirtliff ME**. Proteomic and genomic evaluation of *Staphylococcus aureus* biofilms. Society of Industrial Microbiology, 2003 Annual Meeting, Minneapolis, Minnesota, August 10-14, 2003.
- Ehrlich GD, Weedn V, Kathju S, Peterson J, Balaban N, **Shirtliff M**, Post C, Lin Q, Leduc P, Hu FZ, Kaiser T, Becker J, Sotereanos N, Costerton W. Development of intelligent implants for biofilm prevention in orthopedic prostheses. Bio-, Micro-, and Nanosystem. New York, NY, July 7-10, 2003.
- Shirtliff ME**, Camper AK, Stoodley P, Leid J. Interaction of leukocytes and *Staphylococcus aureus* biofilms. 102<sup>nd</sup> General Meeting of the American Society for Microbiology, Salt Lake City, May 19-23, 2002.
- Leid JG, Stoodley P, Costerton B, and **Shirtliff ME**. Leukocyte responses to maturing and fully mature *Staphylococcus aureus* biofilms. Experimental Biology – Annual Meeting of the American Association of Immunologists, New Orleans, April 20-24, 2002.
- Shirtliff ME**, Mader JT, Camper AK, Robb CW, and Niesel DW. Comparison of *in vivo* versus *in vitro* Methicillin Resistant *Staphylococcus aureus* (MRSA) Gene Expression Using Differential Gene Expression by Replica Plate Hybridization (dGERPH). 101<sup>st</sup> General Meeting of the American Society for Microbiology, Orlando, May 20-24, 2001.
- Thomas SJ, Hegggers JP, **Shirtliff ME**, McCoy L, Carino E, Washington J, and Herndn DN. Evaluation of predictive criteria for the diagnosis of *Clostridium difficile* in the pediatric burn patient. 33<sup>rd</sup> Annual Meeting of the American Burn Association. Boston, MA, 2001.

Published Abstracts and Symposia...continued:

**Shirliff ME**, Mader JT, and Niesel DW. Differential gene expression by replica plate hybridization (dGERPH). 100<sup>th</sup> General Meeting of the American Society for Microbiology, Los Angeles, CA, May 21-25, 2000.

**Shirliff ME**, Galbraith JW, Niesel DW, and Mader JT. Comparative evaluation of oral gatifloxacin and parenteral nafcillin in the treatment of experimental methicillin sensitive *Staphylococcus aureus* (MSSA) osteomyelitis in rabbits. 100<sup>th</sup> General Meeting of the American Society for Microbiology, Los Angeles, May 21-25, 2000.

**Shirliff ME**, Cripps MW, Robb CW, Niesel DW, and Mader JT. Retrospective review of 728 patients suffering from long bone osteomyelitis observed at the University of Texas Medical Branch in Galveston, Texas, from 1985 to 1996. 99<sup>th</sup> General Meeting of the American Society for Microbiology, Chicago, May 30-June 3, 1999.

Robb CW, Orihuela C, **Shirliff ME**, and Niesel DW. Characterization and sequencing of Oma90, a D15/Oma87 homologue in *Shigella flexneri*. 99<sup>th</sup> General Meeting of the American Society for Microbiology, Chicago, 1999.

**Shirliff ME**, Cripps MW, Mader JT, and Niesel DW. A clinical review of the pathology and treatment of long bone osteomyelitis. Society for Experimental Biology and Medicine, Galveston, TX, 1999.

**Shirliff ME**, Calhoun JH, and Mader JT. The treatment of experimental methicillin sensitive *Staphylococcus aureus* osteomyelitis in rabbits with levofloxacin and nafcillin. Musculoskeletal Infection Society Annual Meeting, St. Louis, 1998.

Cripps M, **Shirliff ME**, and Mader JT. The treatment of osteomyelitis with a hydroxyapatite antibiotic implant: studies with a rabbit model. Musculoskeletal Infection Society Annual Meeting, St. Louis, 1998.

Cripps M, **Shirliff ME**, Calhoun JH, and Mader JT. Comparative evaluation of oral L-ofloxacin and parenteral nafcillin in the treatment of experimental methicillin sensitive *Staphylococcus aureus* (MSSA) osteomyelitis in rabbits. 38<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy, San Diego, 1998.

Cripps M, **Shirliff ME**, and Mader JT. The treatment of osteomyelitis with a hydroxyapatite antibiotic implant in a rabbit model. 38<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy, San Diego, 1998.

Ali SA, Cesani F, Nusynowitz ML, **Shirliff ME**, Briscoe EG, and Mader J. Skeletal scintigraphy with technetium-99m tetrphenyl porphyrin sulfonate (TC-99mTPPS<sub>4</sub>) for the detection and determination of osteomyelitis. 84<sup>th</sup> Radiological Society of North America, 1998.

Mader JT, Cripps MW, and **Shirliff ME**. Treatment of bone and soft tissue infection with antibiotic-impregnated beads. Trauma, Infection, and Repair (Wound Healing). Galveston, 1998.

**Shirliff ME**, Cripps M, and Mader JT. Comparison of hyperbaric oxygen therapy and ampicillin in the treatment of *Escherichia coli* soft tissue infection in guinea pigs. Undersea and Hyperbaric Medical Society Annual Meeting, Cancun, 1997.

Published Abstracts and Symposia...continued:

**Shirliff ME**, Mohan D, Calhoun JH, and Mader JT. Four week intravenous antibiotic therapy versus two week intravenous plus four week oral antibiotic therapy in the treatment of long bone osteomyelitis. Musculoskeletal Infection Society Annual Meeting, Snowmass, 1997.

Ali SA, Cesani F, **Shirliff M**, Briscoe EG, Mader J, and Chaljub G. Imaging of experimental osteomyelitis in an animal model. 42<sup>nd</sup> Annual Meeting of the Southwestern Chapter Society of Nuclear Medicine, New Orleans, 1997.

Ali SA, Cesani F, Nusynowitz ML, **Shirliff M**, Briscoe EG, and Mader J. Skeletal scintigraphy with technetium-99m tetrphenyl porphyrin sulfonate (Tc-99m TPPS<sub>4</sub>) for the detection and determination of osteomyelitis. 42<sup>nd</sup> Annual Meeting of the Southwestern Chapter Society of Nuclear Medicine, New Orleans, 1997.

Cesani F, Ali SA, **Shirliff M**, Briscoe EG, and Mader J. F-18 FDG Spect imaging for osteomyelitis. 42<sup>nd</sup> Annual Meeting of the Southwestern Chapter Society of Nuclear Medicine, New Orleans, 1997.

Cesani F, Chaljub G, Ali SA, **Shirliff M**, Briscoe EG, Mader J, and Nusynowitz ML. Assessment of vertebral osteomyelitis by dual head spect and magnetic resonance imaging. 44<sup>th</sup> Annual Meeting of the Society of Nuclear Medicine, San Antonio, 1997.

Ali SA, Cesani F, Chaljub G, **Shirliff M**, Briscoe EG, Mader J, and Nusynowitz ML. 18-FDG single photon scintigraphy in acute and chronic osteomyelitis. 44<sup>th</sup> Annual Meeting of the Society of Nuclear Medicine, San Antonio, 1997.

**Shirliff ME**, Dowling J, Calhoun JH, and Mader JT. Comparative evaluation of oral rifampin with oral azithromycin, oral clarithromycin, or parenteral nafcillin in the treatment of experimental methicillin sensitive *Staphylococcus aureus* osteomyelitis in rabbits. 37<sup>th</sup> Interscience Conference on Antimicrobial Agents and Chemotherapy, Toronto, 1997.

**Shirliff ME**, Mader JT, Tu T, and Calhoun JH. Comparative evaluation of oral rifampin with oral azithromycin, oral clarithromycin, or parenteral nafcillin in the treatment of experimental methicillin sensitive *Staphylococcus aureus* osteomyelitis in rabbits. Musculoskeletal Infection Society Annual Meeting, Snowmass, 1996.

**Shirliff ME**, Mader JT, Tu T, and Calhoun JH. Skeletal scintigraphy with technetium-99m tetrphenyl porphyrin sulfonate (Tc-99m TPPS<sub>4</sub>) for the detection and determination of osteomyelitis in an animal model. Musculoskeletal Infection Society Annual Meeting, Snowmass, 1996.

Ali SA, Cesani F, Chaljub G, Briscoe EG, **Shirliff ME**, and Mader JT. MR Imaging of osteomyelitis: comparison with In-111 white blood cells and In-111 Cl<sub>3</sub> scintigraphy. 82<sup>nd</sup> Annual Scientific Assembly of the Radiological Society of North America, Chicago, 1996.

**Shirliff ME**, Davis CP, Trieff NM, Hoskins SL, and Warren MM. *In vivo* reduction of bacterial populations in catheterized sheep by iontophoresis and characterization of antimicrobial chlorine-based substances produced by iontophoresis. BioInternational '94 Conference and Exhibition Annual Meeting, Houston, 1994.

Hoskins SL, Davis CP, Trieff NM, **Shirliff ME**, and Warren MM. Iontophoresis reduction of *Escherichia coli*. American Society for Microbiology General Meeting, 1994.

Grants (given in direct costs):

**Current:**

“*Staphylococcus aureus* biofilms: *in vitro* and *in vivo* studies” National Institutes of Health – R01-AI069568-02. PI – Mark E. Shirtliff. \$1,250,000 (+ \$606,250 Indirects). *June 1, 2007–May 31, 2012.*

*Staphylococcus aureus* biofilms: *in vitro* and *in vivo* studies. National Institutes of Health (Agency NIAID) – R01-ARRA Supplement. PI – ME Shirtliff. 2010 – present. \$321,000

“Vaccine development for recurrent musculoskeletal infections” Department of Defense. – W81XWH-07-1-0210. PI – ME Shirtliff. \$280,000 (+ \$70,000 Indirects). *Sept 1, 2008 –Aug 31, 2011.*

“*Candida albicans* and *Staphylococcus aureus* dual species biofilms’ National Institutes of Health – R01-DE020939-01A2. PI – Mary Ann Jabra-Rizk. \$1,250,000 (+ \$625,000 Indirects). To Shirtliff Lab \$625,000 (+ \$312,500 Indirects). *June 1, 2010 –May 31, 2015.*

“*Candida albicans* and *Staphylococcus aureus* dual species biofilms’ National Institutes of Health – T32. PI – N. Capra. Brian Peters Trainee \$46,000/yr for 3 years (\$138,000). *June 1, 2009 –May 31, 2011.*

“Determination of differential gene expression in *Streptococcus mutans* biofilms through microarray analysis.” National Institutes of Health. PI – ME Shirtliff. \$200,000 in material costs only – no indirects provided. *June 1, 2006 – present.*

“Determination of differential gene expression in *Staphylococcus aureus* biofilms through microarray analysis.” National Institutes of Health. PI – ME Shirtliff. \$200,000 in material costs only – no indirects provided. *June 1, 2006 – present.*

“Determination of differential gene expression in *Candida albicans* biofilms through microarray analysis.” National Institutes of Health. PI – ME Shirtliff. \$200,000 in material costs only – no indirects provided. *June 1, 2006 – present.*

**Submitted**

“A vaccine to protect against both biofilm and planktonic *S. aureus* infections.” National Institutes of Health – STTR. PI – Charlie Rodie, Sorrento Pharmaceuticals. Co-I – Mark E. Shirtliff. \$400,000 (+ \$200,000 Indirects). To Shirtliff Lab \$240,000 (+ \$120,000 Indirects). Submitted December 15, 2010.

“Passive immunization for the prevention of *S. aureus* infections.” National Institutes of Health – STTR. PI – Charlie Rodie, Sorrento Pharmaceuticals. Co-I – Mark E. Shirtliff. \$400,000 (+ \$200,000 Indirects). To Shirtliff Lab \$160,000 (+ \$80,000 Indirects). Submitted December 15, 2010.

“*Staphylococcus aureus*: *in vivo* nasal colonization studies” National Institutes of Health – F31 Kirschstein-NRSA Individual Fellowship. PI – Mark E. Shirtliff. \$92,000 (Indirects not provided). Submitted Jan 15, 2011.

”Development of alternative, novel therapies to combat Gram-negative bacterial wound infections” USAMRMC. Broad Agency Announcement. PI – Luis Actis. Co-I – Mark E. Shirtliff. \$700,000 (+ \$300,000 Indirects). To Shirtliff Lab \$200,000 (+ \$100,000 Indirects). Submitted Jan 15, 2011.

**Submitted (continued).**

“Human antibodies for prevention of *S. aureus* infections.” National Institutes of Health – STTR. PI – Charlie Rodie, Sorrento Pharmaceuticals. Co-I – Mark E. Shirtliff. \$400,000 (+ \$200,000 Indirects). To Shirtliff Lab \$240,000 (+ \$120,000 Indirects). Submitted December 15, 2010.

”Impact of Microbiome on chronic wound healing in diabetics and non-diabetics” National Institutes of Health – R01. PI – Jonathan Zenilman. Co-I – Mark E. Shirtliff. \$213,748 (+ \$106,873 Indirects). Submitted June 6, 2009.

“Rapid and Early Detection of *Staphylococcus aureus* Orthopaedic Infection by Lateral Flow Immunoassay” PI – Mark E. Shirtliff. \$720,000 (+ \$180,000 Indirects). Department of Defense, Peer Reviewed Orthopaedic Research Program (PRORP) – CDMRP Submitted August 4, 2010.

“Vaccine prevention of post-traumatic chronic orthopaedic war wound infections.” PI – Mark E. Shirtliff. \$400,000. Department of Defense, Peer Reviewed Orthopaedic Research Program (PRORP) – CDMRP Submitted August 4, 2009.

“Reduction of carriage and prevention of systemic infections due to *Staphylococcus aureus*.” PI – Mark E. Shirtliff. \$700,000. Variations Biotechnologies. Submitted October 4, 2009.

**Previous Support:**

“Identification of determinants essential for biofilm formation and virulence in methicillin-resistant *Staphylococcus aureus* (MRSA) using a global genetic approach” PI – ME Shirtliff and KS McIver. University of Maryland, College Park. \$70,000. Sept 1 2008 – Aug 31, 2009.

“Host Immune Response to Bacterial Cyclic Diguanylic Acid” PI – J. Nataro. Department of Defense. \$11,345 – no indirects provided to Shirtliff. Mar 2007 – Apr 2008.

“Detection and evaluation of antimicrobial agent targets and vaccine candidates against *Staphylococcus epidermidis* in models of biofilm infection.” National Institutes of Health – SBIR. PI – Tim Opperman. Co-Investigator – ME Shirtliff, Co-Investigator – JG Leid. \$500,000. - \$39,000 + \$19,000 Indirects to Shirtliff – Sept. 1, 2005 – August 30, 2006.

“Modern Molecular Methods for the Analysis of Supragingival and Subgingival Biofilm Populations: Location of the Aerobic/Anaerobic Boundary.” Philips. PI – Mark E. Shirtliff. \$99,000 + \$48,000 Indirects. Oct. 1, 2005 – Sept. 30, 2007.

“Determination of the phenotypic effect of mutation in genes shown to be up-regulated in *Staphylococcus aureus* biofilms. Fellowship for A. Muench. Howard Hughes Fellowship Program. PI – Mark E. Shirtliff. \$35,000 – No indirects provided. June. 1, 2006 – May 31, 2007.

“Daily Antimicrobial Tablet for Dental Unit Water” Maryland Industrial Partnerships. PI – Mark E. Shirtliff. \$65,000. Sept. 1, 2005 – August 30, 2006.

“Combinatorial Method to Combat Antimicrobial Resistance” Tedco. PI – Mark E. Shirtliff. \$20,000. Sept. 1, 2005 – August 30, 2006.

**Previous Support (continued):**

- “Transcriptomic and proteomic evaluation of *Streptococcus mutans* biofilms.” National Institutes of Health. PI – ME Shirtliff. \$200,000. *Apr 1, 2004 - present.*
- “Proteomic evaluation of *Staphylococcus aureus* biofilms.” Undergraduate Scholars Program, Montana State University. PI – ME Shirtliff, Students - AT Lucas, J. Mitchell. \$3000. *Sept 1, 2001 – Aug 30, 2003.*
- “Analysis of *Staphylococcus aureus* biofilms through DNA microarrays and 2D gel electrophoresis.” Montana Network for Biomedical Research Opportunities. PI – ME Shirtliff, CoPI – JG Leid. \$10,000. *Dec 1, 2002 – Nov 31, 2003.*
- “Identification of vaccine candidates and potential antimicrobial targets from *Staphylococcus aureus* biofilms.” Culpepper Foundation. PI – ME Shirtliff, CoPIs – JG Leid, AK Camper \$25,000. *Dec 1, 2002 – Oct 31, 2003.*
- “Differential gene expression in bacterial biofilms.” Jeane B. Kempner Award. PI – ME Shirtliff. \$28,800/yr. *June 1, 2001 – May 2003.*
- “Comparative evaluation of oral L-ofloxacin and parenteral nafcillin in the treatment of experimental methicillin sensitive *Staphylococcus aureus* (MSSA) osteomyelitis in rabbits.” Schering Plough. PI - JT Mader, CoPI – ME Shirtliff. \$24,000/yr. *1997 - 1999.*
- “Comparative evaluation of vancomycin and linezolid in the treatment of methicillin resistant *Staphylococcus aureus* osteomyelitis: Studies with a rabbit model.” Pharmacia & Upjohn. PI – JT Mader, CoPI – ME Shirtliff. \$25,000/yr. *1999 - 2000.*
- “*in vivo* gene expression and regulation in methicillin resistant *Staphylococcus aureus*.” National Institutes of Health T32 Trainee Grant. PI – ME Shirtliff. \$16,784/yr. *1998 - 2000.*

**Patents:**

“Smart Implant” Debora Armellini, Alexander Pazoki, **Mark E. Shirliff**, Liene Molly, and Mark A. Reynolds. – September 14, 2006. International Patent Publication Number WO 2006/096720 A1

“Anti-biofilm vaccine” **Mark E. Shirliff**, Graeme O’May, Jeff G. Leid – International Patent Publication Number WO 2010/039563 A2.

“Method for Stimulating Human Leukocytes to Kill Bacteria, Yeast, and Fungi and Biofilms That Have Formed In/On Prosthetic Devices, Catheters, Tissues, and Organs In Vivo” Samuel C. Silverstein, Jeff Leid, Yongmei Li, John D. Loike, J. William Costerton and **Mark E. Shirliff** – 2005 - Patent # 20050214279.

“Methods and devices for the detection of biofilm.” Jeff G. Leid, Timothy L. Vail, Jennifer M. Kofonow, **Mark E. Shirliff** and Rebecca A. Brady - International Patent Publication Number WO 2010/028013 A2

**Animal Care and Use Committee Protocols:**

“Identification of vaccine candidates for the prevention of biofilm-mediated *Staphylococcus aureus* and *Staphylococcus epidermidis* infections.” Rabbit models of osteomyelitis, implant infection, and artificial abscess - #1003007. PI - ME Shirliff.

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**STATEMENT**

To Whom It May Concern:

I certify that this curriculum vitae is a current and accurate statement of my professional record.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_