

David T. Pride, MD PhD

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Director of Molecular Microbiology
Associate Director of Microbiology
University of California, San Diego

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Education and Honors:

1992-1996 Wake Forest University Undergraduate
1992-1996 Dean's List at Wake Forest University
1994-1996 Tri-Beta Biological Honor Society
1995 Fogarty Fellowship for International Study
1995-1996 Mortar Board Honor Society
1996 B.S. in Biology, Magna cum Laude, Wake Forest University
1996-2001 Vanderbilt University MSTP program
1998-2001 Microbes and Defense Society
2000 UNCF-Merck Graduate Research Fellowship
2000 Gates Millennium Scholarship
2001 PhD, Vanderbilt University Department of Microbiology and Immunology
2001-2003 New York University MSTP program
2003 MD, New York University School of Medicine
2006-2010 Postdoctoral Research Fellow, Stanford University School of Medicine
2007 UNCF-Merck Postdoctoral Research Fellowship
2007 Harold Amos Medical Faculty Development Fellowship
2008 Burroughs Wellcome Foundation Career Award for Medical Scientists
2009 ITI Young Investigator Innovation Award
2010-2016 Assistant Professor of Pathology and Medicine, University of California, San Diego
2010-present Director of Molecular Microbiology, UCSD Clinical Laboratories
2010-present Associate Director of Microbiology, UCSD Clinical Laboratories
2015-present Doris Duke Clinical Scientist Development Fellowship
2016-present Associate Professor of Pathology and Medicine, University of California, San Diego

Medical License History:

2006-present Board Certified Internal Medicine
2008-present Board Certified Infectious Disease
2014-present Board Certified American Board of Medical Microbiology

Clinical Experience:

Resident – Internal Medicine – Massachusetts General Hospital – 2003 to 2005
Fellow – Infectious Diseases – Stanford University Hospital – 2005 to 2007
Hospitalist – Mills Peninsula Hospital – 2007 to 2009
Hospitalist – VA Medical Center Palo Alto – 2007 to 2010

Hospitalist – Santa Clara Valley Medical Center – 2006 to 2011
Attending Physician – Infectious Disease Service – UCSD – 2010 to present

Research Experience:

- 1992-1996 Research Assistant in the laboratory of Dr. Rosanna J. Spolski in the Wake Forest University Department of Biology.
- 1993-1996 Research Assistant in the laboratory of Dr. Catherine Harris in the Wake Forest University Department of Sociology.
- 1994 Research Assistant in the laboratory of Dr. Robert J. Christy at the University of Texas San Antonio Institute of Biotechnology.
- 1995 Research Assistant in the laboratory of Dr. Luz Angela Labrada at the Center for the International Study of Epidemiology and Disease in Medicine (CIDEIM) in Cali, Colombia.
- 1998-2001 Graduate Student in the laboratory of Dr. Martin Blaser in the Department of Microbiology and Immunology at Vanderbilt University.
- 2002-2006 Independent research at New York University and Massachusetts General Hospital.
- 2006-2010 Postdoctoral Research Fellow in the laboratory of Dr. David Relman at Stanford University.

Volunteer Service

- 1995 Wake Forest University representative at the North American Conference on Minorities in Math, Science, and Engineering (NACME)
- 1995-1996 Alpha Phi Alpha Fraternity Community Service Chairman
- 1995-1996 Volunteer work at hospice in Winston-Salem, NC
- 1998-2000 Teaching assistant for medical microbiology course
- 1998-2001 Vanderbilt University representative at the Minority Access to Research Conference (MARC).
- 2006-2009 Volunteering medical services at Santa Clara Valley PACE clinic

Oral Presentations

CRISPR 10 Meeting 2009 – Session Convener and invited speaker – Comparisons of streptococcal CRISPRs and viromes in human saliva reveal bacterial adaptations specific to human oral viruses.

Infection, Immunity and Transplantation Annual Meeting 2010 – Invited Speaker – Comparisons of CRISPRs and viromes in human saliva reveal bacterial adaptations specific to salivary bacteriophage.

SD Microbiology Group – 2011 – Invited Speaker – Analysis of streptococcal CRISPRs in human saliva reveals substantial sequence diversity within and between subjects.

BCRS Seminar Series – 2011 – Invited Speaker – Insights into the role of viral communities in the human oral cavity.

CRISPR 12 Meeting 2012 – Invited Speaker – Comparisons of CRISPR content between saliva and skin: viral exposures may not be body site specific.

Pathology Research Lecture Series – 2012 – Invited Speaker – Association between living environment, ecological niche, and human viral ecology.

American Society for Microbiology – Annual Meeting 2013 – Invited Speaker – Association between living environment and human oral viral ecology.

Exploring Host Microbiome Interactions – 2014 – Invited Speaker – Effects of bacteria on oral viruses and implications for spread.

International Society for Microbial Ecology – Annual Meeting 2014 – Human oral viruses are personal, persistent, and gender consistent.

Infectious Diseases Grand Rounds UCSD 2014 – Invited Speaker– Mass spectrometry for the identification of bacteria and fungi

Microbiome Connections to the environment, health and disease – Invited Speaker 2014 – The oral Virome.

International Human Microbiome Congress – Annual Meeting 2015 – Invited Speaker - Roles of viruses in the human microbiome.

Pathology Lecture Series, UC Irvine 2015 - Invited Speaker - Roles of viruses in the human microbiome.

Gastroenterology Grand Rounds, UCSD 2015 - Invited Speaker - Role of viruses in the human microbiome.

ICAAC 2015 - Invited Speaker - Roles of viruses in the human microbiome.

University of Southern California Microbiome Matters Symposium 2015 - Invited Speaker - Role of viruses in the human microbiome.

ASM Microbe 2016 - Invited Speaker - Role and spread of viruses in the human microbiome

Living with our Viromes 2016 - Invited Speaker - Role of viruses in the human microbiome

Irvine Center for Virus Research 2016 - Invited Speaker - Sharing our microbiomes with our close contacts.

Penn State University Summer Research Symposium 2017 - Invited Speaker - Role of viruses in the human microbiome.

Microbiome Matters Symposium 2016 - Invited Speaker - Role of viruses in the human microbiome

ASM Microbe 2017 - Invited Speaker - Transmission of viruses via our microbiomes.

UC Berkeley Biology Seminar Series 2017 - Invited Speaker - Transmission of viruses via our microbiomes.

ECCMID 2017 – Invited Speaker – Role of viruses in the respiratory microbiome

North American Microbiome Congress 2017 - Sharing viruses in the human microbiome with our close contacts

UCSD Center for Microbiome Innovation 2017 - Invited Speaker - Transmission of viruses via our microbiome

Festival of Genomics 2017 - Invited Speaker - Role of viruses in the human microbiome

North American Microbiome Congress 2018 - Invited Speaker - Role of viruses in the human microbiome

Publications

Pride, D.T., R.J. Meinersmann, and M.J. Blaser. 2001. Allelic variation within *Helicobacter pylori* *babA* and *babB*. *Infect. Immun.* 69: 1160-1171. PMID 11160014.

Ando, T., R.M. Peek, **D. Pride**, S.M. Levine, T. Takata, Y.C. Lee, K. Kusugami, A. van der Ende, E.J. Kuipers, J.G. Kusters, and M.J. Blaser. 2002. Polymorphisms of *Helicobacter pylori* HP0638 reflect geographic origin and correlate with *cagA* status. *J Clin Microbiol.* 40: 239-46. PMID 11773122.

Pride, D.T., and M. J. Blaser. 2002. Concerted evolution between duplicated genetic elements in *Helicobacter pylori*. *J. Mol. Biol.* 316: 627-640. PMID 11866522.

Ghose, C., G. Perez-Perez, M.C. Dominguez, **D.T. Pride**, and M.J. Blaser. 2002. Amerindians harbor *Helicobacter pylori* strains with East Asian genotypes: evidence for ancient *Helicobacter pylori* origin in humans. *Proc Nat Acad Sci.* 99: 15107-15111. PMID 12417749.

Drake, W.P., Z. Pei, **D.T. Pride**, R.D. Collins, T.L. Cover, and M.J. Blaser. 2002. Molecular analysis of sarcoidosis and control tissues for *Mycobacteria* DNA. *Emerging Infectious Diseases.* 8: 1334-1341. PMID 12453366.

Pride, D.T., and M.J. Blaser. 2002. Identification of recently acquired genetic elements in *Helicobacter pylori* using oligonucleotide difference analysis. *Genome Letters.* 1: 2-15.

Pride, D.T., R.J. Meinersmann, T. Wassenaar, and M.J. Blaser. 2003.

Evolutionary implications of tetranucleotide frequencies in prokaryotes. *Genome Research*. 13: 145-158. PMID 12566393.

Tu, Z., D.W. Ussery, **D.T. Pride**, and M.J. Blaser. 2003. Genomic characteristics of the *C. fetus* sap Island. *Genome Letters*. 2: 34-40.

Pei, Z., L. Yang, R.M. Peek, S.M. Levine, **D.T. Pride**, and M.J. Blaser. 2005. Bacterial biota in reflux esophagitis and Barrett's Esophagus. *World Journal of Gastroenterology*. 11: 7277-7283. PMID 16437628.

Pride, D.T., T. Wassenaar, C. Ghose, and M. J. Blaser. 2006. Evidence of host-virus co-evolution in tetranucleotide usage patterns of bacteriophages and eukaryotic viruses. *BMC Genomics*. 7: 8. PMID 16417644.

Allen, S.S., W. Evans, J. Carlisle, R. Hajizadeh, M. Nadaf, B.E. Shepherd, **D.T. Pride**, J.E. Johnson, and W.P. Drake. 2008. Superoxide dismutase A antigens derived from molecular analysis of sarcoidosis granulomas elicit systemic Th-1 immune responses. *Respiratory Research*. 9:36. PMID 18439270.

Pride, D.T., and T. Schoenfeld. 2008. Genome signature analysis of thermal virus metagenomes reveals Archaea and thermophilic signatures. *BMC Genomics*. 9: 420. PMID 18798991.

Willner, D., M. Furlan, R. Schmeider, J. Grasis, **D.T. Pride**, D.A. Relman, F.E. Angly, T. McDole, R.P. Mariella, F. Rohwer, and M. Haynes. 2010. Metagenomic detection of phage-encoded platelet binding factors in the human oral cavity. *Proc Nat Acad Sci*. 20547834.

Pride, D.T., Sun C.L., Salzman J., Rao N., Loomer P., Armitage G.C., Banfield J.F., Relman D.A. 2011. Analysis of streptococcal CRISPRs from human saliva reveals substantial sequence diversity within and between subjects over time. *Genome Res*. 21: 126-136. PMID 21149389

Pride, D.T., Salzman J., Haynes M., Rohwer F., Davis-Long C., White R.A. III, Loomer P., Armitage G.C., Relman D.A. 2012. Evidence of a robust resident bacteriophage population revealed through analysis of the human salivary virome. *ISME J*. 6: 915-926. PMID 22158393

Pride, D.T., Salzman J., and Relman D.A. 2012. Comparisons of clustered regularly interspaced short palindromic repeats and viromes in human saliva reveal bacterial adaptations to salivary viruses. *Environ Microbiol*. 14: 2564-2576. PMID 22583485

Robles-Sikisaka, R., Ly M., Boehm T., Naidu M., Salzman J., and **Pride D.T.** 2013. Association between living environment and human oral viral ecology. *ISME J*. PMID 23598790.

Abeles, S.R., Robles-Sikisaka, R., Ly, M., Lum, A.G., Salzman, J., Boehm, T.K., and **Pride, D.T.** 2014. Human oral viruses are personal, persistent, and gender consistent. *ISME J*. PMID 24646696.

Ly, M., Abeles, S.R., Boehm, T.K., Robles-Sikisaka, R., Naidu, M., Santiago-Rodriguez, T., and **Pride, D.T.** 2014. Altered oral viral ecology in association with periodontal disease. *mBio*. 5(3): e01133-14. PMID 24846382.

Robles-Sikisaka, R., Naidu, M., Ly, M., Salzman, J., Abeles, S.R., Boehm, T.K., and **Pride, D.T.** 2014. Conservation of streptococcal CRISPRs on human skin and saliva. *BMC Microbiology*. 14: 146. PMID 24903519.

Naidu, M., Robles-Sikisaka, R., Abeles S.R., Boehm T.K., and **Pride D.T.** 2014. Characterization of bacteriophage communities and CRISPR profiles from dental plaque. *BMC Microbiol*. 14:175. PMID 24981669. [Highly Accessed](#).

Abeles, S.R, and **Pride D.T.** 2014. Molecular bases and role of viruses in the human microbiome. *J. Mol. Biol.* PMID 25020228.

Santiago-Rodriguez, T.M., Ly M., Bonilla N., and **Pride D.T.** 2015. The human urine virome in association with urinary tract infections. *Front Microbiol*. 6:14. PMID 25667584.

Edlund, A., Santiago-Rodriguez T.M., Boehm T.K., and **Pride D.T.** 2015. Bacteriophage and their potential roles in the human oral cavity. *J Oral Microbiol*. 7: 27423. PMID 25861745.

Santiago-Rodriguez, T.M. Naidu M., Jones M.B., Ly M., and **Pride D.T.** 2015. Identification of staphylococcal phage with reduced transcription in human blood through transcriptome sequencing. *Front Microbiol*. PMID 26074882.

Lum, A.G., Santiago-Rodriguez T.M., Naidu M., Boehm T.K., and **Pride D.T.** 2015. Global transcription of CRISPR loci in the human oral cavity. *BMC Genomics*. 16: 401. PMID 25994215.

Santiago-Rodriguez, T.M., Naidu M., Abeles S.R., Boehm T.K., Ly M., and **Pride D.T.** 2015. Transcriptome analysis of bacteriophage communities in periodontal health and disease. *BMC Genomics*. 16: 549. PMID 26215258.

Abeles, S.R., Ly M., Santiago-Rodriguez T.M., and **Pride D.T.** 2015. Effects of long term antibiotic therapy on human oral and fecal viromes. *PLOS One*. 10: e0134941. PMID 26309137.

Jones, M.B, Highlander S.K., Anderson E.L., Li W., Dayrit M., Klitgord N., Fabani M.M., Seguritan V., Green J., **Pride D.T.**, Yooseph S., Biggs W. Nelson K.E., and Venter J.C. 2015. Library preparation methodology can influence genomic and functional predictions in human microbiome research. *Proc Natl Acad Sci USA*. 112: 14024. PMID 26512100.

Santiago-Rodriguez, T.M., Ly M., Daigneault M.C., Brown I.H., McDonald J.A., Bonilla N., Allen-Vercoe E., and **Pride D.T.** 2015. Chemostat culture systems support diverse bacteriophage communities from human feces. *Microbiome*. 3: 58. PMID 26512100.

Hwang, J.H., Lyes M., Sladewski K., Enany S., McEachern E., Mathew D.P., Das

S., Moshensky A., Bapat S., **Pride D.T.**, Ongkeko W.M., Crotty-Alexander L.E. 2016. Electronic cigarette inhalation alters innate immunity and airway cytokines while increasing the virulence of colonizing bacteria. *J Mol Med*. PMID 26804311.

Ghose C., Eugenis I., Sun X., Edwards A.N. McBride S.M., **Pride D.T.**, Kelly C.P. Ho D.D. 2016. Immunogenicity and protective efficacy of recombinant *Clostridium difficile* flagellar protein FliC. *Emerg Microbes Infect*. 5: e8. PMID 26839147.

Abeles, S.A., Jones M.B., Santiago-Rodriguez T.M., Ly M., Klitgord N., Yooseph S., Nelson K.E., and **Pride D.T.** 2016. Microbial diversity in individuals and their household contacts following typical antibiotic courses. *Microbiome*. 4: 39. PMID 27473422.

Ly, M., Jones M.B., Abeles S.R., Santiago-Rodriguez T.M., Gao J., Chan I.C., Ghose C., and **Pride D.T.** 2016. Transmission of viruses via our microbiomes. *Microbiome*. 4: 64. PMID 27912785.

Santiago-Rodriguez, T.M., Ly M., **Pride D.T.**, and Toranzos G.A. 2017. Draft genome sequence of an *Enterococcus faecalis* ATCC 19433 siphovirus isolated from raw domestic sewage. *Genome Announc*. 5: 3. PMID 28104647.

Software

Pride DT. 2001. Swaap 1.0.3: A tool for analyzing substitutions and similarity in multiple alignments. Distributed by the author, Department of Microbiology and Immunology, Vanderbilt University School of Medicine in Nashville, TN.

Pride DT. 2001. Swaap PH 1.0.2: A tool for analyzing nucleotide usage patterns in coding and noncoding portions of microbial genomes. Distributed by the author, Department of Microbiology and Immunology, Vanderbilt University School of Medicine in Nashville, TN.

Pride DT. 2008. Swaap Genome Search: A tool for phylogenetic classification of metagenome fragments from prokaryotes and bacteriophages. Distributed by the author, Department of Medicine, Division of Infectious Diseases, Stanford University School of Medicine, Stanford, CA.

Pride DT. 2008. Swaap Gene: A tool for one step phylogenetic reproduction. Distributed by the author, Department of Medicine, Division of Infectious Diseases, Stanford University School of Medicine, Stanford, CA.

Pride DT. 2016. Ion Assist: A tool for one step phylogenetic reproduction. Distributed by the author, Department of Pathology, University of California, San Diego, Stanford, CA. www.thepridelaboratory.org.

Ongoing Research Support

Doris Duke Foundation CDSA Award

Pride (PI)

07/01/15-06/30/18

Doris Duke Foundation \$450,000
Title: Human viral communities as vehicles for the spread of antibiotic resistance in the community.
The objective of this proposal is to develop techniques to decipher the role of human bacteriophage communities in the transmission of antibiotic resistance among human subjects in close contact.
Role: PI

PLUS Pilot Grant Pride (PI) 07/01/17-06/30/19
NIH/NIDDK \$100,000
Title: Establishment of guidelines for storage, processing, and microbiome analysis of voided urine specimens in women and girls.
The objective of this proposal is to develop methods for characterizing the urine microbiome and deciphering whether there are associations with lower urinary tract symptoms.
Role: PI

1R21AI33189-01A1 Pride (PI) 02/15/18-1/13/20
NIH/NIAID \$275,000
Title: Model systems to assess the role of viruses in the microbiome
The objective of this proposal is to define the role communities of viruses may play in shaping the gut microbiome.

Lab Service Agreement Pride (PI) 01/01/18-05/31/18
Hologic Inc \$91,034
Title: Evaluation of Group B Streptococcus and MRSA detection on the Panther
The objective of this proposal is to determine the sensitivity and specificity of the GBS assay on the Panther compared to the Luminex Aries and the Cepheid Gene Xpert.

Pending Research Support

Lab Service Agreement (Amendment) Pride (PI) 01/01/18-05/31/18
Hologic Inc \$52,953
Title: Evaluation of Group B Streptococcus and MRSA detection on the Panther
The objective of this proposal is to determine the sensitivity and specificity of the GBS assay on the Panther compared to the Luminex Aries and the Cepheid Gene Xpert.

Lab Service Agreement Pride (PI) 03/01/18-05/31/18
Genmark, Inc \$31,800
The objective of this proposal is to help Genmark develop a gastrointestinal pathogens detection test for stool.

1R01DE028161 Pride (PI) 09/01/18 – 08/31/23
NIH/NIAID
Title: Electronic cigarette effects on the oral microbiome, host defense, and periodontal health
The objective of this proposal is identify the effects of electronic cigarettes on the oral microbiota and their role in accelerating periodontal disease
Role: PI

Tobacco-Related Disease Research Program Pride (PI) 09/01/18 – 08/31/21
TRDRP
Title: Electronic cigarette effects on the oral microbiome, host defense, and periodontal health

The objective of this proposal is identify the effects of electronic cigarettes on the oral microbiota and their role in accelerating periodontal disease

Role: PI

U54

Brubaker (PI)

NIH/NIDDK

Title: O'Brien Urobiome Center

The objective of this proposal is to develop a center for microbiome analysis of urine specimens and to develop techniques to predict susceptibility to UTIs in postmenopausal women.

Prior Research Support

UNCF-Merck Postdoctoral Research Fellowship Pride (PI) 08/01/07-09/01/09

Title: None

The objective of this proposal is to provide support for the creation of new algorithms for improving the phylogenetics of prokaryotes based on patterns of oligonucleotide usage.

Role: PI

ITI Young Investigator Innovation Award Pride (PI) 01/01/09-8/31/09

Title: Pyrosequencing analysis of human bacteriophage communities in health and disease

The objective of this proposal is to develop Roche/454 Pyrosequencing techniques to evaluate bacteriophage communities in the human oral cavity.

Role: PI

Harold Amos Medical Faculty Development Award Pride (PI) 01/01/08-04/31/12

Title: The phylogenetics of nucleotide usage patterns: origin of metagenome DNA fragments and unknown bacteriophages revealed.

The objective of this proposal is to generate new methodology for understanding the origin and host prokaryotes of bacteriophages isolated from metagenome data.

Role: PI

Burroughs Wellcome Fund CAMS Award Pride (PI) 03/01/09-08/01/16

Title: Bacteriophage communities in oral health and disease

The objective of this proposal is to develop techniques to evaluate the members of double stranded DNA bacteriophage communities from the oral cavity of human subjects with oral health and disease.

Role: PI