
BIOGRAPHICAL SKETCH

NAME Carlos J. Orihuela	POSITION TITLE		
eRA COMMONS USER NAME ORIHUELA	Associate Professor		
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Baylor University, Waco, TX	B.S.	1991-1996	Biology & Chemistry
Univ. of Texas Medical Branch at Galveston, TX	Ph.D.	1996-2001	Microbiology & Immunology
St. Jude Children's Research Hospital, Memphis, TN	Postdoctoral Fellow	2001-2005	Infectious Diseases

A. PERSONAL STATEMENT

For over 15 years my research focus has been the host-pathogen interactions responsible for the development of invasive *Streptococcus pneumoniae* disease. Most recently this includes characterizing how aging enhances susceptibility pneumococcal pneumonia, the role of Pneumococcal serine-rich repeat protein as a bacterial host-cell and intra-species adhesin, biofilm formation during nasopharyngeal colonization, and cardiomyocyte damage during invasive pneumococcal disease. We use young and aged murine models of pneumonia and bacteremia to examine serotype and strain related differences in virulence, to identify host-factors that modulate disease progression, and investigate the aged immune response to pneumococci.

B. POSITIONS AND HONORS

Employment

2001-2005	Postdoctoral Fellow, Department of Infectious Diseases, St. Jude Children's Research Hospital, Memphis, TN
2005-2011	Assistant Professor, Department of Microbiology & Immunology, University of Texas Health Science Center at San Antonio (UTHSCSA), San Antonio, TX
2011-present	Associate Professor, Department of Microbiology & Immunology, UTHSCSA

Professional Memberships

2001-present	Member, American Society for Microbiology
2001-present	Society for Advancement of Chicanos and Native Americans in Science
2006-present	Member, Barshop Institute for Longevity and Aging Studies, UTHSCSA
2008-present	Member, American Thoracic Society

Honors

1998	Texas Space Grant Consortium Winter Scholar
1998-1999	Texas Space Grant Consortium Graduate Fellow
1998-2001	National Science Foundation (NSF) Minority Graduate Fellow
1999	University of Texas Medical Branch at Galveston, McLaughlin Travel Award
1999	University of Texas Medical Branch at Galveston, Dept. Microbiology & Immunology, Christina Fleischmann Award
2000-2001	Texas Space Grant Consortium Graduate Fellow
2002-2003	University of Texas Medical Branch at Galveston, Jeane B. Kempner Scholar
2011	UTHSCSA Presidential Junior Research Scholar Award
2011	Glenn Award for Research in Biological Mechanisms of Aging
2011	UTHSCSA Distinguished Hispanic Faculty from the Graduate School of Biomedical Sciences

Review Duties

2005-present	<i>Ad hoc</i> reviewer for the journals: BMC Microbiology, Clinical Microbiology and Infection, Experimental Gerontology, FEMS Immunology & Medical Microbiology, Immunopathology,
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2006-present Infection and Immunity, Journal of Bacteriology, Journal of Clinical Microbiology, Molecular Microbiology, Medical Science Monitor, PLoS ONE, PLoS Pathogens, Veterinary Immunology
 Editorial advisor board member: Journal of Infectious Diseases (2006-present); Associate Editor: BMC Microbiology (2010-present); Guest Editor: PLoS Pathogens (2011-present).

2007-present *Ad hoc* grant reviewer for: National Institute for Health (BACP, U19 Immune Defense Mechanisms at the Mucosa Cooperative Study), The Wellcome Trust, Swiss National Science Foundation, FundScience.Org

C. PUBLICATIONS

Peer-reviewed Research Publications

* Co-first or Co-senior author.

1. Orihuela CJ, Watson DA. Poor man's dot-blot apparatus. *Biotechniques* 23:1010, 1997.
2. Orihuela CJ, Janssen R, Robb CW, Watson DA, Niesel DW. Peritoneal culture alters *Streptococcus pneumoniae* protein profiles and virulence properties. *Infect Immun* 68:6082-6, 2000.
3. Robb CW, Orihuela CJ, Ekkelenkamp MB, Niesel DW. Identification and characterization of an *in vivo* regulated D15/Oma87 homologue in *Shigella flexneri* using differential display polymerase chain reaction. *Gene* 262:169-77, 2001.
4. Orihuela CJ, Mills J, Robb CW, Wilson CJ, Watson DA, Niesel DW. *Streptococcus pneumoniae* PstS production is phosphate responsive and enhanced during growth in the murine peritoneal cavity. *Infect Immun* 69:7565-71, 2001.
5. Xue L, Orihuela C, Tuomanen E, Morris S. Defective development and function of follicular, marginal zone, and B1 B cells in Bx110-deficient mice. *Nature Immunol* 4:855-865, 2003.
6. Orihuela CJ, Gao G, McGee M, Yu J, Francis K, Tuomanen E. Organ-specific models of *Streptococcus pneumoniae* disease. *Scand J Infect Dis* 35:647-652, 2003.
7. Orihuela CJ, Radin JN, Sublett JE, Gao G, Kaushal D, Tuomanen EI. Microarray analysis of pneumococcal gene expression during invasive disease. *Infect Immun* 72:5582-5596, 2004.
8. Orihuela CJ, Gao G, Francis KP, Yu J, Tuomanen EI. Tissue-specific contributions of pneumococcal virulence factors to pathogenesis. *J Infect Dis* 190:1661-1669, 2004.
9. Sandgren A, Albiger B, Orihuela CJ, Tuomanen E, Normark S, Henriques-Normark B. Virulence in mice of pneumococcal clonal types with known invasive disease potential in humans. *J Infect Dis* 192:791-800, 2005.
10. Kadurugamuwa JL, Modi K, Yu J, Francis KP, Orihuela C, Tuomanen E, Purchio AF, Contag PR. Noninvasive monitoring of pneumococcal meningitis and evaluation of treatment efficacy in an experimental mouse model. *Mol Imaging* 4:137-142, 2005.
11. Radin JN, Orihuela CJ, Murti G, Guglielmo C, Murray PJ, Tuomanen EI. β -Arrestin 1 Participates in Platelet-Activating Factor Receptor-Mediated Endocytosis of *Streptococcus pneumoniae*. *Infect Immun* 73:7827-7835, 2005.
12. Mann B, *Orihuela C, Antikainen J, Gao G, Sublett J, Korhonen TK, Tuomanen E. Multifunctional role of choline binding protein g in pneumococcal pathogenesis. *Infect Immun* 74:821-829, 2006.
13. Orihuela CJ, Fillon S, Hope Smith-Sielicki S, El Kasmi, KC, Gao G, Soulis K, Patil A, Murray PJ and Tuomanen EI. Cell Wall-Mediated Neuronal Damage in Early Sepsis. *Infect Immun* 74:3783-3789, 2006.
14. Obert C, Sublett J, Kaushal D, Hinojosa E, Barton T, Tuomanen EI and Orihuela CJ. Identification of a candidate *Streptococcus pneumoniae* core genome and regions of diversity correlated with invasive pneumococcal disease. *Infect Immun* 74:4766-4777, 2006.
15. Fillon S, Soulis K, Rajasekaran S, Benedict-Hamilton H, Radin JN, Orihuela CJ, El Kasmi KC, Murti G, Kaushal D, Gaber MW, Weber JR, Murray PJ, Tuomanen EI. Platelet-activating factor receptor and innate immunity: uptake of gram-positive bacterial cell wall into host cells and cell-specific pathophysiology. *J Immunol* 177(9):6182-6191, 2006.
16. Smith MW, Schmidt JE, Rehg JE, Orihuela CJ and McCullers JA. Induction of pro- and anti-inflammatory molecules in a mouse model of pneumococcal pneumonia following influenza. *Comp Med* 57(1):82-89, 2007.

17. Embry A, Hinojosa E, **Orihuela CJ**. Regions of diversity 8, 9 and 13 contribute to *Streptococcus pneumoniae* virulence. *BMC Microbiol* 7(1):80, 2007.
18. Obert CA, Gao G, Sublett J, Tuomanen EI, **Orihuela CJ**. Assessment of molecular typing methods to determine invasiveness and to differentiate clones of *Streptococcus pneumoniae*. *Infect Genet Evol.* 7(6):708-16, 2007.
19. Rose L, Shivshankar P, Hinojosa E, Rodriguez A, **Orihuela CJ**. Antibodies against PsrP, a novel *Streptococcus pneumoniae* adhesin, block adhesion and protect mice against pneumococcal challenge. *J Infect Dis.* 198(3):375-83, 2008.
20. **Orihuela CJ**, Mahdavi J, Thorton J, Mann B, Wooldridge KE, Abousedada N, Oldfield NJ, Self T, Ala'Aldeen DAA, Tuomanen EI. Laminin receptor initiates contact of bacteria with the blood brain barrier. *J Clin Invest.* 119(6): 1638-1646, 2009. *Highlighted in *Nature* 459(1):487, 2009.
21. Hinojosa E, Boyd AR, **Orihuela CJ**. Age-associated inflammation and Toll-like receptor dysfunction primes the lungs for pneumococcal pneumonia, *J Infect Dis.* 200:546–554, 2009.
22. Shivshankar P, Sanchez C, Rose, LF, **Orihuela CJ**. The *Streptococcus pneumoniae* adhesin PsrP binds to Keratin 10 on lung cells. *Mol Micro.* 73(4):663-679, 2009.
23. Li Z, Wang H, Xue L, Shin LM, Roopenian J, Xu W, Qi CF, Sangster MY, **Orihuela CJ**, Tuomanen EI, Rehg JE, Cui X, Zhang Q, Morse HC, Morris SW. Eμ-BCL10 mice exhibit constitutive activation of both canonical and non-canonical NF-κB pathways generating marginal zone (MZ) B cell expansion as a precursor to splenic MZ lymphoma. *Blood.* Nov 5;114(19):4158-68, 2009.
24. **Orihuela CJ**. Role of *psrP-secY2A2* (Accessory Region 34) in the invasive disease potential of *Streptococcus pneumoniae*. *J Infect Dis.* 200(1):1180, 2009.
25. Rosch JW, Hinojosa E, Pestina T, Hu Y, Boyd AR, Persons DA, ***Orihuela CJ**, Tuomanen EI. Statins protect against lethal pneumococcal infection and cytolysin toxicity in experimental sickle cell disease. *J Clin Invest.* 120(2):627-35, 2010.
26. Lizcano A, Chin T, Sauer K, Tuomanen EI, **Orihuela CJ**. Early biofilm formation on microtiter plates is not correlated with the invasive disease potential of *Streptococcus pneumoniae*. *Microb Pathog.* 48(3-4):124-30, 2010.
27. Sanchez CJ, Shivshankar P, Stol K, Trakhtenbroit S, Sullam PM, Sauer K, Hermans, PWM, **Orihuela CJ**. The Pneumococcal serine-rich repeat protein is an intra-bacterial adhesin that promotes bacterial aggregation *in vivo* and in biofilms. *PLoS Pathog.* 6(8). pii: e1001044, 2010.
28. Munoz-Almagro C, Selva L, Sanchez CJ, Esteva C, Pallares R, **Orihuela CJ**. PsrP, a novel *Streptococcus pneumoniae* adhesin, is highly prevalent in children with pneumonia and is strongly associated with clonal type. *Clin Vaccine Immunol* 17(11):1672-8, 2010.
29. Miller RA, Harrison D, Astle CM, Baur JA, Rodriguez Boyd A, de Cabo R, Fernandez F, Flurkey K, Javors MA, Nelson JF, **Orihuela CJ**, Pletcher S, Sharp ZD, Sinclair D, Starnes JW, Wilkinson EW, Nadon N, Strong R. Rapamycin, but not Resveratrol or Simvastatin, extends lifespan of genetically heterogeneous mice. *J Gerontology* 66(2):191-201, 2011.
30. Perry TW, Pugh MJV, Waterer GW, Nakashima B, **Orihuela CJ**, Copeland LA, Restrepo MI, Anzueto A, Mortensen EM. Incidence of Cardiovascular Events Following Hospital Admission for Pneumonia. *Am J Med.* 124(3):244-51. 2011
31. Shivshankar P, Boyd AR, Le Saux CJ, Yeh IT, **Orihuela CJ**. Cellular senescence increases expression of bacterial ligands in the lungs and is positively correlated with increased susceptibility to pneumococcal pneumonia. *Aging Cell.* 10(5):798-806, 2011.
32. Sanchez CJ, Hurtgen BJ, Lizcano A, Shivshankar P, Cole GT, **Orihuela CJ**. Biofilm and planktonic pneumococci demonstrate disparate immunoreactivity to convalescent sera. *BMC Microbiol.* 11:245, 2011.
33. Sanchez CJ, Hinojosa C, Shivshankar P, Hyams C, Camberlein E, Brown JS, **Orihuela CJ**. Changes in capsular serotype alter the surface exposure of pneumococcal adhesins and impact virulence. *PLoS ONE.* 6(10):e26587, 2011.
34. Sanchez CJ, Khumar, K, Lizcano A, Shivshankar P, Dunning-Hotopp J, Jorgensen J, Tettelin H, **Orihuela CJ**. *Streptococcus pneumoniae* in biofilms are unable to cause invasive disease due to altered virulence determinant production. *PLoS ONE.* 6(12):e28738, 2011.

35. Ojedes S, Mares C, Alvarez A, Li I, **Orihuela CJ**, Teal JM. Virulence factors involved in passage of *Francisella tularensis* subsp. *novicida* through an air blood barrier. Environ Sci Tech. accepted 2011 (In press).

Book Chapters and Review Articles

36. **Orihuela CJ**, Fogg G, DiRita V and Tuomanen E. Bacterial Interactions with Mucosal Epithelial Cells. In: Mucosal Immunology, 3rd Edition. Mestecky J, Strober W, et al. (eds.). Academic Press, NY; 2005.
37. **Orihuela CJ**, Tuomanen EI. Models of pneumococcal disease. Drug Discov Today: Disease Models 3:69-75, 2006.
38. **Orihuela CJ**, Tuomanen EI. *Streptococcus pneumoniae*: Invasion and Inflammation. In: Gram-Positive Pathogens, 2nd Edition. Fischetti V, Novick R, et al. (eds.). ASM Press, Washington, DC; 2006, pp. 253-267.
39. Rodriguez A, **Orihuela CJ**. Aging, Inflammation, and Pneumococcal Disease. In: Sepsis: New Strategies for Management, 2nd Edition. Rello J, Restrepo RI (eds.). Springer, Washington, DC; 2008, pp. 53-68.
40. Paterson GK, **Orihuela CJ**. Pneumococcal microbial surface components recognizing adhesive matrix molecules targeting of the extracellular matrix. Mol Microbiol. 77(1):1-5, 2010.
41. Paterson GK, **Orihuela CJ**. Pneumococci: immunology of the innate host response. Respirology. 15(7):1057-63, 2010
42. Boyd AR, and **Orihuela CJ**. Dysregulated inflammation as a risk factor for pneumonia in the elderly. Aging Dis. 2(6):487-500, 2011

Patents

43. El Kasmi KC, Jordan B, Kriwacki R, Mann B, **Orihuela CJ**, Tuomanen E. Synthetic *Streptococcus pneumoniae* vaccine. Publication No. WO/2008/039838; Application No.: PCT/US2007/079527.
44. **Orihuela CJ**. PsrP is a protective antigen against pneumococcal infection. U.S. Serial No.: 61/055,378. International Patent Application No. PCT/US2009/045071

D. RESEARCH SUPPORT

Active Research Support

- 1R01AI078972 [Orihuela (PI)] 1/23/2009-12/31/2013
NIAID
Title: Mechanism of PsrP mediated adhesion.
Description: Determine the molecular mechanisms by which Pneumococcal serine rich-repeat protein (PsrP) mediates adhesion of *S. pneumoniae* to lung cells.
- 1R21AG033274 [Orihuela (PI)] 4/01/2009-3/31/2012
NIA
Title: Age-associated Toll-like receptor dysfunction in the lungs.
Description: Identify the cell types in the lungs that experiencing age-dependent Toll-like receptor dysfunction.
- 1R21HL108054 [Orihuela (PI)] 4/01/2011-12/31/2012
NHLBI
Title: Statins protect against adverse cardiac events during pneumonia.
Description: Determine whether statins protect cardiomyocytes from pneumolysin and cell wall mediated damage during pneumococcal pneumonia
- Orihuela (PI) 08/01/2011-07/31/2013
Glenn Foundation through American Federation for Aging Research
Title: Impact of cellular senescence on lung cell immune function.
Description: To determine the molecular mechanisms responsible for age-dependent Toll-like receptor dysfunction on alveolar macrophages.