BRIEF CURRICULUM VITAE

NAME	POSITION TITLE
Whitehead, Stephen S.	**Senior Associate Scientist**
CURRENT AFFILIATION **NIAID, NIH**	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Brigham Young University, Provo, UT	B.S.	05/1985	Microbiology
Brigham Young University, Provo, UT	M.S.	08/1989	Microbiology
Oregon State University, Corvallis, OR	Ph.D.	04/1994	Virology
M6 Pharmaceuticals / Rockefeller University, NY, NY	Postdoctoral	08/1995	Bacteriology
Laboratory of Infectious Diseases, NIAID, NIH, Bethesda, MD	Postdoctoral	08/1999	Virology

A. Personal Statement

Stephen Whitehead is currently a Senior Associate Scientist in the Laboratory of Infectious Diseases (LID), NIAID, NIH in Bethesda, MD. Dr. Whitehead received his Ph.D. in Microbiology from Oregon State University. Following postdoctoral training at Rockefeller University, NY, he joined LID as a postdoctoral fellow with a primary interest in the development of vaccines against respiratory syncytial virus. Several of the vaccine candidates he developed continue to be tested and have been licensed to a pharmaceutical partner. As a Senior Associate Scientist in the same laboratory, his current research is focused on the development and evaluation of live attenuated vaccine candidates for dengue and other vector-borne viruses, such as West Nile virus, St. Louis encephalitis virus, and Japanese encephalitis virus. The molecular virological approach involves producing candidate vaccine viruses from full-length cDNA, which allows the introduction of mutations affecting the level of viral attenuation. He is an active participant in laboratory and pre-clinical testing of candidate vaccines and coordinates production of clinical lots, including safety testing and quality control. He has extensive experience in the replication of dengue virus in non-human primates. He actively participates in the design and review of the clinical evaluation of the vaccine candidates in humans. He has directly supervised numerous postdoctoral fellows, post-bac IRTA trainees, and laboratory technicians. Over the course of the project he has developed numerous live attenuated vaccine candidates, many of which are currently undergoing clinical evaluation in humans. He is an inventor on over 10 patents and the dengue virus vaccine technology has been licensed around the world to companies interested in controlling dengue disease. He has a proven record in vaccine development and continues to research the immunological response to dengue virus infection and vaccination.

B. Positions and Honors

Positions and Employment

1995-1999 Senior Fellow, Laboratory of Infectious Diseases, NIAID, Bethesda, MD
1999-2010 Staff Scientist, Laboratory of Infectious Diseases, NIAID, Bethesda, MD
2010-present Senior Associate Scientist, Laboratory of Infectious Diseases, NIAID, Bethesda, MD

Other Experience and Professional Memberships

2002-2013 Member, NIAID Animal Care and Use Committee (ACUC)
2003 Ad-hoc reviewer, MBRS score program, Puerto Rico
2003-2009 Project Officer, Contract N01-AO-32758, “Operation of an Experimental Virus Vaccine

Production Laboratory" (Charles River Laboratories, Malvern, PA).

2004 Ad-hoc reviewer, Collaborative Research Initiative Grant, The Wellcome Trust, England.

2004-2006 US Army Military Infectious Disease Research Program (MIDRP) STEP Dengue Vaccine Workin g Group for review of research proposals seeking funding through MIDRP

2005 Review panel member, NIH/NIGMS Minority Biomedical Research Support (MBRS)

2007-2010 Project Officer, Contract HHSN272200700040I, "Manufacture and Safety Testing of Experimental Virus Vaccine Products" Meridian Life Sciences, Inc., Memphis, TN).

2007-present Intramural NIAID Research Opportunities (INRO) selection committee member

2008 Peer review committee member, National Biodefense Analysis and Countermeasures Center, National Center for Emergency Preparedness

2009 Peer review team member, CDC, Division of Vector-borne Infectious Diseases, Dengue Branch, Puerto Rico.

2011 Program committee, A Re-Emerging Challenge in the Americas: Opportunities for Dengue Research Collaboration, NIAID, San Juan, Puerto Rico.

2011-present Contract Officers Representative, Contract HHSN272201100002I, "Manufacture and Safety Test Experimental Virus Vaccines" (Charles River Laboratories, Malvern, PA).

2011-present Member, NIAID Promotion Advisory Committee (PAC)

2012-present US Army Military Infectious Disease Research Program (MIDRP) STEP Dengue Vaccine Working Group for review of research proposals seeking funding through MIDRP

Honors

2005 NIH Merit Award for Outstanding Basic and Translational Research in Developing Vaccines for the Prevention of Respiratory Virus and Flavivirus Diseases

2005 NIAID Special Act or Service Award

2006 NIAID Special Act or Service Award

2007 NIAID Special Act or Service Award

2007 NIH Director's Award for Originality, Execution Excellence, and Multidisciplinary Collaboration across NIH to Deliver the First Intramural High Containment Laboratory Facility for Biodefense and Emerging Infectious Disease Research.

2007 NIAID Performance Award

2008 NIH Merit Award for Development of a Live Attenuated Tetravalent Dengue Vaccine and its International Licensure.

2008 NIH Merit Award for Development of a Live Attenuated West Nile Virus Vaccine Candidate.

2008 NIH Merit Award in recognition of Outstanding Preparation for the Triennial Site Visit by the Association for Assessment and Accreditation of Laboratory Animal Care, International, 2008.

2008 NIAID Special Act or Service Award

2008 NIAID Performance Award

2008 NIH Merit Award for Originality, Execution, and Multidisciplinary Collaboration across NIH to Deliver the First Intramural High Containment Laboratory Facility for Biodefense and Emerging Infectious Disease Research.

2009 NIAID Special Act or Service Award

2009 American Security Challenge Award for Licensable Research, "Vaccines for Dengue Virus", in conjunction with Federal Laboratory Consortium for Technology Transfer's Mid-Atlantic Region.

2010 NIAID Performance Award

2011 NIAID Performance Award

2011 NIH Director's Award for Outstanding Basic and Translational Research in the Development and Clinical Testing of Tetravalent Vaccines for Dengue Virus.

2012 NIAID Performance Award

2013 Recipient of the Institute Butantan Medal presented by the Governor of the State of Sao Paulo, Brazil for contribution to the enhancement of Instituto Butantan and the progress of Biomedical Sciences

2013 NIAID Performance Award

Issued U.S. patents

5,821,088 Use of Gram-positive bacteria to express recombinant proteins.

5,993,824 Production of attenuated respiratory syncytial virus vaccines from cloned nucleotide sequences.

6,689,367 Production of attenuated chimeric respiratory syncytial virus vaccines from cloned nucleotide sequences.
6,699,476 Production of recombinant respiratory syncytial viruses expressing immune modulatory molecules.
6,923,971 Respiratory syncytial virus vaccines expressing protective antigens from promoter-proximal genes.
7,226,602 Development of mutations useful for attenuating dengue viruses and chimeric dengue viruses.
7,465,794 Polynucleotides encoding recombinant respiratory syncytial viruses expressing immune modulatory molecules.
7,517,531 Dengue tetravalent vaccine containing a common 30 nucleotide deletion in the 3'UTR of dengue
7,560,118 Attenuated dengue virus comprising mutations in the NS3 gene.
7,662,397 Respiratory syncytial virus vaccines expressing protective antigens from promoter-proximal genes
7,709,007 Production of attenuated respiratory syncytial virus vaccines from cloned nucleotide sequences
7,846,455 Attenuated chimeric respiratory syncytial virus
8,039,003 Recombinant attenuated dengue viruses comprising a deletion in the 3' untranslated region and additional attenuating mutations induced by chemical mutagenesis
8,075,903 Dengue tetravalent vaccine containing a common 30 nucleotide deletion in the 3'-UTR of dengue types 1, 2, 3, and 4 or antigenic chimeric dengue viruses 1, 2, 3, and 4
8,337,860 Development of dengue virus vaccine components

Pending U.S. patent applications

2005 Construction of West Nile virus and dengue virus chimeras for use in a live virus vaccine to prevent disease caused by West Nile virus.
2010 Chimeric SLE/Dengue type 4 antigenic viruses
2011 Live attenuated virus vaccines for La Crosse virus and other Bunyaviridae.
2011 Chimeric JEV/DEN4 vaccine candidates for control of Japanese encephalitis

C. Selected Publications (Most relevant selected from 90 peer-reviewed publications)

1. Durbin, A.P., **Whitehead, S.S.**, McArthur, J., Perreault, J.R., Blaney, J.E. Jr., Thumar, B., Murphy, B.R., Karron, R.A. 2005. rDEN4Δ30, a live attenuated dengue virus type 4 vaccine candidate, is safe, immunogenic, and highly infectious in healthy adult volunteers. *J Infect Dis*, 191(5):710-718.
2. Durbin, A.P., McArthur, J., Marron, J.A., Blaney, J.E. Jr., Thumar, B., Wanionek, K., Murphy, B.R., **Whitehead, S.S**. 2006. The live attenuated dengue serotype 1 vaccine rDEN1Delta30 is safe and highly immunogenic in healthy adult volunteers. *Hum Vaccin.* 2(4):167-73.
3. Durbin, A.P., McArthur, J., Marron, J.A., Blaney, J.E. Jr., Thumar, B., Wanionek, K., Murphy, B.R., **Whitehead, S.S**. 2006. rDEN2/4Delta30(ME), a live attenuated chimeric dengue serotype 2 vaccine is safe and highly immunogenic in healthy dengue-naive adults. *Hum Vaccin.* 2(6):255-60.
4. Simmons, C.P., Chau, T.N., Thuy, T.T., Tuan, N.M., Hoang, D.M., Thien, N.T., Lien le, B, Quy, N.T., Hieu, N.T., Hien, T.T., McElnea, C., Young, P., **Whitehead, S.**, Hung, N.T., Farrar, J. 2007. Maternal antibody and viral factors in the pathogenesis of dengue virus in infants. *J Infect Dis.* 196:416-24.
5. **Whitehead, S.S.**, Blaney, J.E., Durbin, A.P., and Murphy, B.R. 2007. Prospects for a dengue virus vaccine. *Nat Rev Microbiol.* 5:518-28.
6. McArthur J.H., Durbin A.P., Marron J.A., Wanionek K.A., Thumar B., Pierro D. J., Schmidt A.C., Blaney J.E. Jr., Murphy B.R., **Whitehead S.S.** 2008. Phase I clinical evaluation of rDEN4Δ30-200,201: a live attenuated dengue 4 vaccine candidate designed for decreased hepatotoxicity. *Am J Trop Med Hyg.* 79(5):678-84.
7. Wright P.F., Durbin, A.P., **Whitehead, S.S.**, Ikizler, M.R., Henderson, S., Blaney, J.E., Thumar, B., Ankrah, S., Rock, M.T., McKinney, B.A., Murphy, B.R., Schmidt, A.C. 2009. Phase 1 trial of the dengue virus type 4 vaccine candidate rDEN4Δ30-4995 in healthy adult volunteers. *Am J Trop Med Hyg.* 81(5):834-41.
8. Tran, N.B.C., Nguyen, T.H., Anders, K.L., Wolbers, M., Le, B.L., Lu, T.M.H., Tran, T.H., Nguyen, T.H., Farrar, J., **Whitehead, S.**, Simmons, C.P. 2009. Dengue Virus Infections and Maternal Antibody Decay in a Prospective Birth Cohort Study of Vietnamese Infants. *J Infect Dis.* 200(12): 1893-1900.

9. Tran, N.B.C., Anders, K.L., Le, B.L., Nguyen, T.H., Lu, T.M.H., Nguyen, M.T., Tran, T.T., Le, T.P., Nguyen, T.H.T., Mai, N.L., Farrar, J., **Whitehead, S.S.**, Simmons, C.P. 2010. Clinical and virological features of Dengue in Vietnamese infants. *PLoS Negl Trop Dis*; 4:e657.
10. Beltramello M., Williams K.L., Simmons C.P., Macagno A., Simonelli L., Quyen N.T., Sukupolvi-Petty S., Navarro-Sanchez E., Young P.R., de Silva A.M., Rey F.A., Varani L., **Whitehead S.S.**, Diamond M.S., Harris E., Lanzavecchia A., Sallusto F. The human immune response to Dengue virus is dominated by highly cross-reactive antibodies endowed with neutralizing and enhancing activity. Cell Host Microbe. 2010. 8(3):271-83.
11. Durbin A.P., Schmidt A., Elwood D., Wanionek K.A., Lovchik J., Thumar B., Murphy B.R., **Whitehead S.S.** Heterotypic dengue infection with live attenuated monotypic dengue virus vaccines: implications for vaccination of populations in areas where dengue is endemic. J Infect Dis. 2011. 203(3):327-34.
12. Murphy B.R, **Whitehead S.S.** Immune Response to Dengue Virus and Prospects for a Vaccine. Annu Rev Immunol. 2011. 29:587-619.
13. Dowd, K.A., Jost, C.A., Durbin, A.P., **Whitehead, S.S.**, Pierson, T.C. A dynamic landscape for antibody binding modulates antibody-mediated neutralization of West Nile virus. PLoS Pathogens. 2011. 7(6):e1002111.
14. Durbin, A.P., Kirkpatrick, B.D., Pierce, K.K., Schmidt, A.C., **Whitehead, S.S.** Development and clinical evaluation of multiple investigational monovalent DENV vaccines to identify components for inclusion in a live attenuated tetravalent DENV vaccine. 2011. 29(42):7242-50.
15. Durbin, A.P., **Whitehead, S.S.**, Shaffer, D., Elwood, D., Wanionek, K., Thumar, B., Blaney, J.E., Murphy, B.R., Schmidt, A.C. A Single Dose of the DENV-1 Candidate Vaccine rDEN1Δ30 Is Strongly Immunogenic and Induces Resistance to a Second Dose in a Randomized Trial. PLoS Negl Trop Dis. 2011. 5(8):e1267.
16. Mahoney R.T., Francis D.P., Frazatti-Gallina N.M., Precioso A.R., Raw I., Watler P., Whitehead P., **Whitehead S.S.** Cost of production of live attenuated dengue vaccines: a case study of the Instituto Butantan, Sao Paulo, Brazil. Vaccine. 2012. 30(32):4892-6.
17. Lindow J.C., Borochoff-Porte N., Durbin A.P., **Whitehead S.S**., Fimlaid K.A., Bunn J.Y., Kirkpatrick B.D. Primary vaccination with low dose live dengue 1 virus generates a proinflammatory, multifunctional T cell response in humans. PLoS Negl Trop Dis. 2012. 6(7):e1742.
18. Durbin, A.P., Kirkpatrick, B.D., Pierce, K.K., Elwood, D., Larson. J.J., Lindow, J.C., Tibery, C., Sabundayo, B.P., Shaffer, D., Talaat, K.R., Hynes, N.A., Wanionek, K., Carmolli, M.P., Luke, C.J., Murphy, B.R., Subbarao, K., **Whitehead, S.S.** A single dose of any of four different live attenuated tetravalent dengue vaccines is safe and highly immunogenic in flavivirus-naïve adults: a randomized, double blind clinical trial. J Infect Dis. 2013. J Infect Dis. 2013. 207(6):957-65.
19. Smith, S.A., de Alwis, R., Kose, N., Durbin, A.P., **Whitehead, S.S.**, de Silva, A.M., Crowe, J.E. Jr. Human monoclonal antibodies derived from memory B cells following live attenuated dengue virus vaccination or natural infection exhibit similar characteristics. *J Infect Dis.* 2013. **207***:*1898-1908.
20. Fox, A., **Whitehead, S.**, Anders. K.L., Le, N.M.H., Le, Q.M., Pham, Q.T., Nguyen, T.Y., Tran, N.D., Dang, D.T., Farrar, J., Wertheim, H., Simmons, C., Nguyen, T.H., Horby, P. Investigation of Dengue and Japanese Encephalitis Virus Transmission in Hanam, Viet Nam. *Am J Trop Med Hyg.* 2014. **90**:892-896.
21. Gromowski, G.D., Firestone, C.Y., Hanson, C.T., **Whitehead, S.S.** Japanese encephalitis virus vaccine candidates generated by chimerization with dengue virus type 4. *Vaccine.* 2014. **32**(25):3010-8*.*
22. Weiskopf, D., Angelo, M., Bangs, D., Sidney, J., Paul, S., Peters, B., de Silva, A., J., Diehl, S., Whitehead, S., Durbin, A., Kirkpatrick, B., and Sette, A. The human CD8+ T cell responses induced by a live attenuated tetravalent dengue vaccine are directed against highly conserved epitopes. *J Virol.* 2015. **89**(1):120-128.
23. Gromowski, G.D., Firestone, C.Y., Bustos-Arriaga, J., **Whitehead, S.S.** Genetic and phenotypic properties of vero cell-adapted Japanese encephalitis virus SA14-14-2 vaccine strain variants and a recombinant clone, which demonstrates attenuation and immunogenicity in mice*. Am J Trop Med Hyg.* 2015. **92**:98-107.

D. Research Support

<u>Ongoing Research Support</u>

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