## BIOGRAPHICAL SKETCH

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NAME: Guy Hughes Palmer

eRA COMMONS USER NAME (credential, e.g., agency login): gpalmer

POSITION TITLE: Regents Professor of Pathology and Infectious Diseases; Jan & Jack Creighton Endowed Chair and Senior Director of Global Health; Chair, Washington State University Global Health-Kenya

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

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | Completion Date MM/YYYY | FIELD OF STUDY |
|---|---|---|---|
| Kansas State University College of Arts & Sciences, Manhattan | BS *summa cum laude* | 05/1977 | Biology |
| Kansas State University College of Veterinary Medicine, Manhattan | DVM | 05/1980 | Veterinary Medicine |
| Washington State University, Pullman | Board Certification | 06/1983 | Residency in Pathology |
| Washington State University, Pullman | PhD | 05/1984 | Infectious Diseases |
| Washington State University, Pullman | NIH Post-doctoral Fellowship | 12/1985 | Immunology |

### A. Personal Statement

I hold a primary appointment as a Regents Professor at Washington State University, where I serve as Senior Director for Global Health, and secondary appointments at the Center for Emerging and Re-Emerging Diseases at the University of Washington School of Medicine (Seattle), the Nelson Mandela African Institute of Science and Technology (Arusha, Tanzania), and the Department of Pathobiology and Diagnostic Medicine at Kansas State University. I serve as Chair of Washington State University Global Health-Kenya (Nairobi) and as President of Global Animal Health-Tanzania (Arusha).

My research has focused on the role of population immunity as a selective pressure for microbial strain structure and pathogen emergence/spread. The dynamics of strain structure are profoundly influenced by the competing pressures of population immunity and transmission efficiency; the impacts of which have broad applicability to zoonotic infectious diseases epidemiology and control strategies. My research is supported by a MERIT Award through the National Institutes of Health, the U.S. Centers for Disease Control and Prevention, a core award from the Paul G. Allen Family Foundation for health research in east Africa, the Scheumann Fund, and the Jan & Jack Creighton Endowment in Global Health.

I have served as the director of the NIH T32 Infectious Diseases and Microbial Immunology Training Program since 2003, which provides post-doctoral fellowship training in zoonotic infectious diseases and antimicrobial resistance. I have served as a mentor for 36 post-doctoral fellows, including 24 DVMs (13 of whom received a PhD during training and 8 of whom received a K08 or K01 individual fellowship during training). Internationally, I direct the Bill & Melinda Gates supported WSU-Nelson Mandela Institution PEHPL doctoral program in Tanzania.

### B. Positions and Honors

**Positions**

1980-1983 Resident in Pathology/Laboratory Medicine, Washington Animal Disease Diagnostic Laboratory and Research Fellow, Department of Microbiology and Pathology, Washington State University

1983-1985 NIH Postdoctoral Fellow, Immunology Training Program, Washington State University

1985-1988 Assistant Professor, Departments of Pathology and Infectious Diseases, University of Florida
1988-1993 Associate Professor, Department of Microbiology and Pathology, Washington State University
1995-1996 Senior Research Fellow, Institute of Pathology, University of Bern, Switzerland
2004-2005 Senior Research Fellow, Department of Pathology, University of Zaragoza, Spain
1993-2006 Professor, Department of Microbiology and Pathology, Washington State University
2007+ Regents Professor of Pathology and Infectious Diseases, Washington State University
2015+ Professor of Life Sciences, Nelson Mandela African Institution of Science and Technology (Tanzania)

**Other Experience and Professional Organizations**

2004+ Director, NIH Infectious Diseases and Microbial Immunology Training Program
2007+ Jan & Jack Creighton Endowed Chair in Global Health, Washington State University
2007-2015 Founding Director, Paul G. Allen School for Global Animal Health, Washington State University
2013+ Adjunct Professor, Department of Pathobiology and Diagnostic Medicine, Kansas State University
2014+ Member, Center for Emerging and Re-emerging Infectious Diseases, University of Washington Schools of Medicine and Public Health and Community Medicine
2014+ Member, Program in Bioinformatics and Computational Biology, Washington State University
2015+ Senior Director of Global Health, Washington State University
2015+ Chair, Washington State University Global Health-Kenya
2015+ President, Global Animal Health-Tanzania

**Honors**

*Academies:* Elected to the National Academy of Medicine (2006); Elected as a Fellow (Medical Sciences) of the American Association for the Advancement of Science (2008); Elected to the Washington State Academy of Sciences (2008; President 2011-2012).
*Honorary Degrees: Doctoris honoris causa*, Universität Bern, Switzerland (2011); Doctor of Philosophy, Kansas State University (2016).
*Distinguished Professorships/Lectureships:* Distinguished Lecturer Science in Medicine, University of Washington (2007); Schalm Distinguished Lecturer at the University of California (2007); Named as Regents Professor at Washington State University (2007); NIH Distinguished Scientist Lecturer (2008); Class of 1964 Endowed Lecturer at Oklahoma State University (2011); George C. Poppensiek Professorship at Cornell University (2012); IBM Professorship at Colby (2013); Ramsey Lectureship at Iowa State University (2016).
*Honors:* Merck Award for Creativity (1995); SmithKline Beecham Award for Research Excellence (1992); Sahlin Award for Excellence in Research, Scholarship and the Arts (2008); Eminent Faculty Award, Washington State University (2013); Distinguished Alumnus (2009) and Alumni Fellow (2011), Kansas State University.

**C. Contributions to Science**

***Persistence of microbial pathogens.*** Together with colleagues, our research identified two independent mechanisms that allow pathogen persistence. Using *Theileria parva* infection of T lymphocytes as a model, our research at the University of Bern was seminal in identifying subversion of the NF-kB pathway by a microbial pathogen, allowing longterm persistence in the immunocompetent host. Subsequent research at Washington State University, using *Anaplasma marginale* as the experimental system, revealed that generation of antigenic variants was dramatically expanded beyond the genomic repertoire of alleles encoding surface protein to include expression site mosaics assembled from multiple donor alleles (segmental gene conversion). Both mechanisms were subsequently shown to be broadly represented in numerous human microbial pathogens.

- Palmer, G.H., Machado, J., Fernandez, P., Heussler, V., Perinat, T., and Dobbelaere, D.A.E. Parasite mediated NFκB regulation in lymphoproliferation caused by *Theileria parva* infection. Proceedings of the National Academy of Sciences, USA, 94:12527-12532, 1997.
- Brayton, K.A., Knowles, D.P., McGuire, T.C., and Palmer, G.H.: Efficient use of a small genome to generate antigenic diversity in tick-borne ehrlichial pathogens. Proceedings of the National Academy of Sciences, USA, 98:4130-4135, 2001.
- Futse, J.E., Brayton, K.A., Knowles, D.P., and Palmer, G.H.: Structural basis for segmental gene conversion in generation of *Anaplasma marginale* outer membrane protein variants. Molecular Microbiology, 57:212-221, 2005.

***Superinfection as a driver of genomic diversification in bacterial pathogens.*** Using integrated genomic, genetic, immunologic, and proteomic approaches we established that population immunity drives pathogen strain divergence but balanced by the need to maintain strain fitness. This research has led to new understanding of pathogen strain structure and the interplay between transmission fitness and host immunity. This research has led to new concepts of the drivers and constraints of "strain chaos", all relative to pathogen emergence.

- Futse, J.E., Brayton, K.A., Dark, M.J., Knowles, D.P., Palmer, G.H. Superinfection as a driver of genomic diversification in antigenically variant pathogens. Proceedings of the National Academy of Sciences, USA, 105:2123-2127, 2008.
- Ueti, M.W., Tan, Y., Broschat, S.L., Castañeda Ortiz, E.J., Camacho-Nuez, M., Mosqueda, J.J., Scoles, G.A., Grimes, M., Brayton, K.A., and Palmer, G.H. Expansion of variant diversity associated with high prevalence of pathogen strain superinfection under conditions of natural transmission. Infection and Immunity, 80:2354-2360, 2012. PMC3416468.
- Palmer, G.H. and Brayton, K.A. Antigenic variation and transmission fitness as drivers of bacterial strain structure. Cellular Microbiology, 15:1969-1975, 2013.

***Improving health, economic, nutritional and educational outcomes in east Africa.*** We have a comprehensive program centered on rural households in east Africa and focused on endemic challenges to their health and well-being. The studies, supported by the Bill & Melinda Gates Foundation and the Wellcome Trust, address a range of health challenges from rabies elimination through mass dog vaccination to improving maternal and childhood nutrition and and identifying determinants and consequences of vaccine uptake decisions.

- Marsh, T.L., Yoder, J., Deboch, T., McElwain, T.F., and Palmer, G.H. Livestock vaccinations translate into increased human capital and school attendance by girls. Science Advances, 2(12):e1601410, 2016.
- Lankester, F.J., Wouters, P.A., Czupryna, A., Palmer, G.H., Mzimbiri, I., Cleaveland, S., Francis, M.J., Sutton, D.J., and Sonnemans, D.G. Thermotolerance of an inactivated rabies vaccine for dogs. Vaccine, 34:5504-5511, 2016.
- Mosites, E.M., Aol, G., Otiang, E., Bigogo G., Munyua, P., Montgomery, J.M., Neuhouser, M.L., Palmer, G.H., and Thumbi, S.M. Child height gain is associated with consumption of animal-source foods in livestock-owning households in western Kenya. Public Health Nutrition 12:1-10, 2016.
- Mosites, E.M., Thumbi, S.M., Otiang, E., McElwain, T.F., Njenga, M.K., Rabinowitz, P.M., Rowhani-Rahbar, A., Neuhouser, M.L., May, S., Palmer, G.H., and Walson, J.L. Relations between household livestock ownership, livestock disease, and young child growth. Journal of Nutrition 146:1118-1124, 2016.

https://www.ncbi.nlm.nih.gov/pubmed/?term=palmer+gh

**D. Research Support**

**Ongoing Research Support**

R37 AI44005 (Palmer) 12/01/08-11/30/19

***Antigenic variation in microbial transmission (NIH NIAID)***

This MERIT Award project examines the genomic changes underlying pathogen change and emergence.

T32 AI07025 (Palmer) 07/01/09-06/30/20

***Infectious Diseases and Microbial Immunology Training Program (NIH NIAID)***

This provides integrated post-doctoral (clinical and basic science fellow) training in zoonotic infectious diseases and antimicrobial resistence.

Core Funding (Palmer) 12/01/10-11/30/20

***Human Health and Opportunity in east Africa (Paul G. Allen Family Foundation)***

This project examines the health, food, and economic security impacts of animal and zoonotic infectious diseases in east Africa.

Core Funding (Palmer) 07/01/15-06/30/20

***Emergence, persistence, and dissemination of antibiotic resistance from global to local (Scheumann Fund)***

The goal of this work is to understand the drivers of antibiotic resistance in the context of a low-income country with widespread and poorly regulated access to antibiotics.

PEHLP (Buza) 01/01/15-12/31/19

***Nelson Mandela African PhD Program (Bill & Melinda Gates Foundation)***

This project supports integrated training of PhD students in East Africa through a multi-institutional consortium of the Nelson Mandela African Institute of Science and Technology (Tanzania), Washington State University (USA), Pennsylvania State University (USA), Glasgow University (UK), and Edinburgh University (UK).
Role: Project Director at Washington State University.

5 NUGGH 001717 (Njenga) 09/30/15-09/29/20

***Preventing Zoonotic Diseases in Kenya (Centers for Disease Control and Prevention)***

This Global Health Security Agenda project supports development and implementation of a country-wide surveillance system for emerging pathogens in collaboration with the Ministry of Health and the Ministry of Agriculture, Livestock, and Fisheries.
Role: Co-investigator

3 UO1GH002143 (Njenga) 08/15/16-08/14/21

***Conducting Communicable Disease Research in Kenya (Centers for Disease Control and Prevention)***

This project supports research on acute febrile illness, antimicrobial resistance, hepatic injury, and emerging infectious diseases in Kenya in collaboration with the Kenya Medical Research Institute.
Role: Co-investigator