ANDREW R. WARGO

Western Fisheries Research Center, 6505 NE 65th Street, Seattle, WA 98115-5016
Department of Biology, University of Washington, Campus Box 351800, Seattle, WA 98195
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INTERESTS

Ecology and evolution of aquatic infectious diseases, pathogen fitness traits, host-pathogen co-evolution, within-host pathogen dynamics, environmental detection, anthropogenic impacts on pathogen evolution, virulence selection, vaccination, disease in aquaculture, epidemiology, disease mathematical modeling

POSTDOCTORAL EXPERIENCE

University of Washington and Western Fisheries Research Center, Seattle, WA 2006 – present
- Research topic: *Virulence evolution and in vivo fitness of fish viruses*
- Techniques: Animal studies, qRT-PCR, plaque assays, cloning, sequencing, mathematical modeling
- Duties: Laboratory research, project management, grant writing, manuscript publication, mentoring
- Mentors: Gael Kurath, Ph.D. and Benjamin Kerr, Ph.D.

EDUCATION

Ph.D. **Biological Sciences,** University of Edinburgh 2006
Thesis: *In-host ecology and transmission dynamics of malaria parasites*
Advisor: Prof. Andrew F. Read, Ph.D.

B.A. **Biology, Chemistry Minor, *Summa Cum Laude*,** University of Vermont 2001
Semester abroad: James Cook University, Townsville, Australia

GRANTS

NSF EID Grant EFF0812603 (Co-Author), University of Washington ($986,088) 2008 – present
- Title: "*Virulence Trade-offs in a Vertebrate Virus*"

NIH NRSA Postdoctoral Training Grant, University of Washington ($100,000) 2006 – 2008
- Title: "*The Association between Virulence and Fitness in a Vertebrate Virus*"

British Society for Parasitology Ann Bishop Travel Grant, Tanzania, Africa (£1,500) 2005
- Funded international malaria field research at the Ifakara Health Institute

Wellcome Trust Ph.D. Studentship Grant, University of Edinburgh (£107,453) 2003 – 2006

Universities UK Ph.D. Studentship Grant, University of Edinburgh (£18,000) 2003 – 2006

SUGR/FAME Undergraduate Research Grant, University of Vermont ($1,500) 2001

Helix Undergraduate Summer Research Grant, University of Vermont ($5,000) 2000

PRE-DOCTORATE RESEARCH EXPERIENCE

Laboratory Technician II 2002 – 2003
Department of Medicine, University of Vermont, Burlington, VT
● *Explored kidney physiology*
● Trained laboratory personnel
● Managed laboratory inventory

Laboratory Technician II 2001 – 2002
Microbiology and Molecular Genetics Department, University of Vermont, Burlington, VT
● *Examined cancer cell biology using molecular, tissue culture, and microscopy methods*
● Advised undergraduate students
● Developed laboratory protocols

Field Research Technician 2001
USDA Forest Service, Rocky Mountain Research Station, Albuquerque, NM
● *Investigated the impact of deforestation on reptile, amphibian, and bat population ecology*
● Utilized mark-recapture and acoustical detection field research techniques

Undergraduate Researcher 1997 – 2001
Biology Department, University of Vermont, Burlington, VT
● *Researched life-history trait evolution in malaria parasites of lizards*
● Project combined molecular tools, international field ecology research, and parasitological methods
● Advisor: Prof. Jos. J. Schall, Ph.D.

NSF Research Experience for Undergraduates 1999
Michigan State University W.K. Kellogg Biological Station, Gull Lake, MI
● *Designed and conducted a committee reviewed project on flower morphology and pollinator attraction*

RESEARCH SKILLS TRAINING

Summer Institute in Modeling Infectious Diseases workshop, University of Washington 2009
Ecological Data Analysis with R workshop, USGS Western Fisheries Research Center 2009
Ecology of Infectious Disease Modeling workshop, Cornell & University of Georgia 2007 & 2009
Evolution of Infectious Disease workshop, Pennsylvania & Colorado State Universities 2006 & 2008
Small Animal Research training, University of Edinburgh & University of Washington 2003 & 2007
Chemical Safety and Radiation training, University of Vermont 2001

PROFESSIONAL SERVICE AND AFFILIATIONS

University of Washington Department of Biology Undergrad Program Committee 2011 – present

Reviewer for scientific journals 2003 – present
● *Evolution, American Naturalist, Trends in Parasitology, Journal of Virological Methods, Ecological Monographs*

University of Washington Postdoctoral Association 2009 – 2011
● Co-Chair & Public Relations Officer

Member of British Society for Parasitology 2003 – 2006

TEACHING EXPERIENCE

Lecturer 2008
Department of Biology Future Faculty Fellows Apprenticeship, University of Washington, Seattle, WA
● Designed and team taught an upper level undergraduate biology course to 20 students titled: "*The evolutionary arms race between hosts and pathogens*"
● Responsible for lecture development, curriculum content, presentation, and assessment

Teaching Assistant
University of Washington, Seattle, WA 2007
● Ran weekend field workshops on salmon ecology for undergraduates in *Introductory Biology*

University of Edinburgh, Scotland 2003 – 2006
● Tutorial Instructor: *Biometrics, Field Ecology*
● Laboratory Assistant: *Parasite Biology, Quantification in Life Sciences, Evolution in Action, Animal Biology, The Dynamic Cell*
● Computer Lab Assistant: *Evolutionary and Ecological Modeling, Population and Community Ecology*
● Grader: *Environmental and Community Biology, Origins and Diversity of Life*

Outreach Educator 2004 – 2006
Science Communication Team, University of Edinburgh, Scotland
● Traveled Scotland delivering hands on learning of science to high school students
● Conducted workshops on science for community members throughout the United Kingdom

Mentor
University of Washington, Seattle, WA 2006 – present
● Mentored two graduate students, numerous research assistants, and directly supervised a lab technician

University of Edinburgh, Scotland 2003 – 2006
● Advised two undergraduate honors project students

Tutor 1999 – 2000
Learning Cooperative, University of Vermont, Burlington, VT
● Subjects tutored: *chemistry, organic chemistry, calculus, and biology*

TEACHING SKILLS TRAINING

Howard Hughes Future Faculty Fellows Workshop, University of Washington 2007
Academic Career Skills Workshop, University of Edinburgh 2006
Teaching Assistant Workshop, University of Edinburgh 2003
Science Communication Workshop, Edinburgh 2003

ACADEMIC HONORS & AWARDS

George Perkins Marsh Award for top Undergraduate in Ecology, University of Vermont 2001
John Dewey Undergraduate Honors Program Scholar, University of Vermont 2001
Phi Beta Kappa Bogorad Award for top 3rd year Undergraduate, University of Vermont 2000
Phi Beta Kappa Honors Society, Alpha Chapter, University of Vermont 2000 – 2001
Phi Eta Sigma Honors Society, University of Vermont 1998 – 2001
Golden Key Honors Society, University of Vermont 1998 – 2001

PUBLICATIONS

14) **Wargo, A.R.** and Kurath, G. 2011. *In vivo* fitness associated with high virulence in a vertebrate virus is a complex trait regulated by host entry, replication, and shedding. *Journal of Virology*, 85, 3959 – 3967.

13) Peñaranda, M.M.D., **Wargo, A.R.**, and Kurath, G. 2011. Replication fitness correlates with host-specific virulence of *Infectious hematopoietic necrosis virus* (IHNV) in sockeye salmon and rainbow trout. *Virology*, 417, 312 – 319.

12) Park, J.W., Moon, C.H., Harmache, A., **Wargo, A.R.**, Purcell, M.K., Bremont, M., and Kurath, G. 2011. Restricted growth of U type IHNV in rainbow trout cells may be linked to casein kinase II activity. *Journal of Fish Diseases*, 34, 115 – 129.

11) **Wargo, A.R.**, Garver, K.A., and Kurath, G. 2010. Virulence correlates with fitness *in vivo* for two M group genotypes of *Infectious hematopoietic necrosis virus* (IHNV). *Virology*, 404, 51 – 58.

10) Metzger, D.C., Elliott, D.G., **Wargo, A.R.**, Park, L.K., and Purcell, M.K. 2010. Pathological and immunological responses associated with differential survival of Chinook salmon following *Renibacterium salmoninarum* challenge. *Diseases of Aquatic Organisms*, 90, 31 – 41.

9) Park, J.W., Moon, C.H., **Wargo, A.R.**, Purcell, M.K., and Kurath, G. 2010. Differential growth of U and M type infectious hematopoietic necrosis virus in a rainbow trout-derived cell line, RTG-2. *Journal of Fish Diseases*, 33, 583 – 591.

8) Huijben, S., Nelson, W.A., **Wargo, A.R.**, Sim, D.G, Drew, D.R., and Read, A.F. 2010. Chemotherapy, within-host ecology and the fitness of drug-resistant malaria parasites. *Evolution*, 64, 2952 – 2968.

7) Troyer, R.M., Garver, K.A., Ranson, J.C., **Wargo, A.R.**, and Kurath, G. 2008. *In vivo* virus growth competition assays demonstrate equal fitness of fish rhabdovirus strains that co-circulate in aquaculture. *Virus Research*, 137, 179 – 188.

6) **Wargo, A.R.**, Huijben, S., De Roode, J.C., Shephard, J., and Read, A.F. 2007. Competitive release and facilitation of drug-resistant parasites following therapeutic chemotherapy in a rodent malaria model. *Proceedings of the National Academy of Sciences of the United States of America*, 104**,** 19914 – 19919.

5) **Wargo, A.R.**, De Roode, J.C., Huijben, S., Drew, D.R., and Read, A.F. 2007. Transmission stage investment of malaria parasites in response to in-host competition. *Proceedings of the Royal Society of London, Series B -Biological Sciences*, 274, 2629 – 2638.

4) **Wargo, A.R.**, Randle, N., Chan, B.H.K., Thompson, J., Read, A.F., and Babiker, H.A. 2006. *Plasmodium chabaudi*: reverse transcription PCR (RT-PCR) for the detection and quantification of transmission stage malaria parasites. *Experimental Parasitology*, 112, 13 – 20.

3) De Roode, J.C., Pansini, R., Cheesman, S.J., Helinski, M.E.H., Huijben, S., **Wargo, A.R.**, Bell, A.S., Chan, B. H. K., Walliker, D., and Read, A. F. 2005. Virulence and competitive ability in genetically diverse malaria infections. *Proceedings of the National Academy of Sciences of the United States of America*, 102, 7624 – 7628.

PUBLICATIONS (continued)

2) Vardo, A.M., **Wargo, A.R.**, and Schall, J.J. 2005. PCR detection of lizard malaria parasites: prevalence of *Plasmodium* infections with low-level parasitemia differs by site and season. *Journal of Parasitology*, 91, 1509 – 1511.

1) Osgood, S.M., Eisen, R.J., **Wargo, A.R.**, and Schall, J.J. 2003. Manipulation of the vertebrate host's testosterone does not affect gametocyte sex ratio of a malaria parasite. *Journal of Parasitology*, 89, 190 – 192.

SUBMITTED MANUSCRIPTS

Wargo, A.R., Kell, A.M., Scott, R.J., Thorgaard, G.H., Kurath, G. 2011. Analysis of host genetic diversity and viral entry as sources of between-host variation in viral load. *Virus Research.*

PUBLISHED CONFERENCE ABSTRACTS

Huijben, S., **Wargo, A.R.**, Drew, D., Sim, D. 2007. The effects of sub-curative drug treatment on the outcome of competition for drug resistant parasites in mixed-clone malaria infections. *Tropical Medicine & International Health*, 12, 69.

Nicole, J., **Wargo, A.R.**, Bishop-Rimmer, E., Segal, A.S. 2004. Membrane cholesterol content regulates the mechanosensitivity of a nonselective cation channel in renal proximal tubule. *Journal of General Physiology*, 124, 14A.

ORAL PRESENTATIONS

Invited: "How an understanding of the ecological principles governing infectious disease severity can assist in the management of fish pathogens" 2011
USDA ARS Dairy Forage, Milwaukee, WI

Invited: "Anthropogenic impacts on animal infectious disease severity" 2011
Oregon State University, Corvallis, OR

Invited: "Ecological drivers of animal infectious disease severity" 2011
University of California, Davis, CA

"Drivers of pathogen burden variation" 2011
Department of Biology Retreat, University of Washington, Friday Harbor, WA

Invited: "Shedding dynamics of two *Infectious hematopoietic necrosis virus* (IHNV) genotypes which differ in virulence in rainbow trout" 2010
Virus Evolution Meeting, Noble Foundation, Ardmore, OK

"Is there an advantage to being a deadly virus" 2010
Department of Biology Retreat, University of Washington, Friday Harbor, WA

"Virulence-fitness trait associations in a vertebrate virus" 2010
Department of Biology Seminar Series, University of Washington, Seattle, WA

ORAL PRESENTATIONS (continued)

"Does IHNV virulence have a fitness tradeoff?" 2009
WFRC Research Seminar Series, USGS WFRC, Seattle, WA

"Virulence trade-offs in a vertebrate virus" 2009
Ecology and Evolution of Infectious Disease Meeting, University of Georgia, Athens, GA

Invited: "Investigating the virulence and fitness trait relationship in a vertebrate virus" 2009
NSF Ecology of Infectious Disease Grant Holders Meeting, Park City, UT

Invited: "Virulence and fitness in IHNV" 2008
Marrowstone Research Conference, USGS WFRC, Marrowstone, WA

"Are pathogens evolving towards becoming super-killers?" 2007
Postdoctoral Mini-Symposium, University of Washington, Seattle, WA

"Low drug treatment dosage to curtail drug resistance evolution in malaria" 2006
Ecology and Evolution of Infectious Disease Meeting, Pennsylvania State University, State College, PA

Invited: "Does curative drug treatment accelerate the evolution of drug resistance in malaria?" 2006
Co-infection Workshop, University of Edinburgh, Scotland

"Experimental evidence of accelerated drug resistance evolution in malaria" 2005
American Society of Tropical Medicine and Hygiene Meeting, Washington, D.C.

Invited: "Competition, transmission, and drug resistance evolution in mixed malaria infections" 2005
Protozoan Parasite Seminar Series, University of Edinburgh, Scotland

Invited: "Ecology and evolution of malaria parasite transmission" 2004
Protozoan Parasite Seminar Series, University of Edinburgh, Scotland

"Quantification and detection of transmission stage malarial parasites" 2004
European Evolution PhD Student Meeting, Shrewsbury, England

POSTER PRESENTATIONS

"Is there a trade-off between transmission potential and virulence in an aquatic vertebrate virus?" 2011
Ecology and Evolution of Infectious Disease Meeting, University of California, Santa Barbara, CA

"Transmission stage dynamics of vertebrate virus genotypes that differ in virulence" 2010
Ecology and Evolution of Infectious Disease Meeting, Cornell University, Ithaca, NY

"Virulence trade-offs in an acute vertebrate virus" 2008
Ecology and Evolution of Infectious Disease Meeting, Colorado State University, Ft. Collins, CO

"Intra-specific competition and transmission dynamics of malaria" 2005
European Society for Evolutionary Biology Meeting, Krakow, Poland