

# Consortium on Law and Values in Health, Environment & the Life Sciences

## 2015-16 Student Proposal Cover Page

### Applicant Information

Applicant name: Sara Sokolik

Email: soko0046@umn.edu

Project title: Understanding the zoonotic risk of echinococcosis for a northern Minnesota tribal community

Department: Veterinary Population Medicine

College: College of Veterinary Medicine

Degree program: DVM, MPH

Faculty advisor name  
& email:

Tiffany Wolf, [wolfx305@umn.edu](mailto:wolfx305@umn.edu)  
Dominic Travis,  
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NA

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How did you hear about this funding opportunity?

Consortium e-mail    The Brief    Advisor    Dept. email/newsletter    Consortium website    Other

### Funding

Total amount of funding requested:      **\$6,432**

Executive summary (maximum 200 words)

*Echinococcus granulosus* and *E. multilocularis* are multi-host parasites found definitively in wolves, foxes, and even domestic dogs. Humans can become infected when accidentally ingesting contaminated food or water, or by interaction with infected hosts. In the last few decades, prevalence of these cestodes has been markedly increasing in both natural and accidental hosts. Grand Portage Indian Reservation is located in the northeastern-most corner of Minnesota on Lake Superior, and is home to the GP band of Chippewa. A shared environment with wolves and foxes, along with subsistence lifestyle practices, puts the GP inhabitants at potential risk of contracting Echinococcosis. We are particularly interested in the transmission potential between wild canid hosts (wolves, foxes) and domestic dogs, and strive to understand the risks to human health. We aim to determine the prevalence of infection among wolves, foxes, and dogs in order to assess risk of human exposure and develop community-specific recommendations for prevention. This project will serve to foster interdisciplinary collaboration between the College of Veterinary Medicine, School of Public Health and the Grand Portage Indian Reservation, as well as provide a unique graduate training opportunity in infectious disease epidemiology at the interface of human and animal health.

### Approvals

*Check all appropriate approvals required for your proposal. Approvals must be obtained prior to receipt of funding. If you have applied for approval but have not yet received it, indicate that below.*

IRB     Yes    No    NA     Application pending

Other    Yes    No    NA     Application pending      Specify:

### Checklist—for reviewer use

- The proposal is 1000 words or less excluding budget, biographies, references and citations.

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- The proposal includes a work plan with a specific timeline using months or quarters to identify work to be done and completion dates.

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- The proposal includes a 1-2 paragraph biography of the applicant and all co-investigators.

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- The budget form is complete including the funds sought for this project, other pending applications for this project, and the amount/source of matching or other funds.

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- The applicant's faculty advisor is copied on the application email. Professional students w/o advisors check NA.

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- All necessary approvals are pending or received.

## Background

The Grand Portage Band of Lake Superior Chippewa, located in northeastern Minnesota, are one of the earliest and longest established inhabitants of northeast Minnesota (1), and uphold their culture in part by subsistence practices. Present-day realities, such as climate change, environmental contamination, loss of biodiversity, and disease emergence in wildlife, threaten the livelihood through regional resources as well as the longevity of Chippewa culture. Thus, the Ecosystem Health Division of the College of Veterinary Medicine has formed a budding partnership with Grand Portage Indian Reservation (GPIR) natural resource scientists to understand the interactions of health and the environment on the persistence of culturally important wildlife populations and human health.

In this capacity, GPIR scientists conduct annual surveys and ecological studies to understand population trends of many native species. *Echinococcus multilocularis* and *E. granulosus* are tapeworm parasites of the family Taeniidae involving wildlife hosts such as wolves and foxes; however, domestic dogs and occasionally cats also serve as hosts (2). Echinococcosis is a zoonotic disease, potentially infecting humans through ingestion of parasite eggs on contaminated food or water or by petting or handling infected dogs (3,4). Although the disease in humans is rare, in endemic areas of North America, *Echinococcus* spp. may be relatively common in animal hosts (4,5). Due to many ecological factors that are not well understood, prevalence of these parasites has been increasing in both natural and accidental hosts in the last few decades (3,6-8). Therefore, we are working toward a better understanding of *Echinococcus* spp. transmission between wildlife populations and domestic dogs, impact on subsistence species, and risks of transmission to humans in a northeastern Minnesota community with a lifestyle of high wildlife interaction.

## Hypothesis and Specific Aims

We propose a preliminary look at *Echinococcus* spp. infection among predominant definitive carnivore hosts within the Grand Portage ecosystem as an initial effort to understand the eco-epidemiology of *Echinococcus* spp. and their role in wildlife and human health in a tribal community. The epidemiology of the parasites within this region and extent to which they are transmitted in peridomestic areas (e.g. among domestic dogs) is unknown. We hypothesize that wolves, foxes, and dogs play a role in the transmission cycle within Grand Portage, although the prevalence among species varies substantially. To test this hypothesis, we will fulfill the following Specific Aims: 1) describe the prevalence of *E. multilocularis* and *E. granulosus* infection among wolves, foxes, and domestic dogs in Grand Portage, and 2) assess the risk of exposure to humans in the GPIR community based on interactions with host species.

## Work Plan

Wolves are a focus of ongoing research and/or management activities conducted by GPIR biologists. As such, there are opportunities to collect fecal samples from captured or dead animals. We anticipate the capture of 5-10 wolves over the 2016 study year. Field surveys will be conducted in summer 2016 to collect environmental fecal samples from foxes. Based on an estimated test sensitivity of 90% (9), and an estimated population size of 30 foxes in GPIR (Moore, personal communication), a sample size of 26 randomly collected fox fecal samples will allow us to estimate a minimum prevalence of 5% (10) with 95% confidence.

There are an estimated 50-100 households with domestic dogs out of an estimated 300 residences in Grand Portage (Moore, personal communication). As infection in domestic dogs would serve as the greatest risk for *Echinococcus* spp. transmission to humans, but previous work demonstrates mixed results as to the role of domestic dogs in transmission (11-13), we will sample around 30 domestic dogs, both free-roaming and house-bound pets. A freshly voided fecal sample will be collected and placed in a sterile tube, and will be frozen until sample testing can be performed. Information on age, sex, breed, and keeping (free-roaming or house-bound) of the dogs will also be collected from owners.

DNA will be extracted from fecal samples for detection of *Echinococcus* spp., as well as to determine that feces collected from field surveys are of fox origin. Samples will be tested in duplicate, and all PCR-positive samples will be confirmed by sequence analysis of amplicons at the UMN Genomics Center. Fecal samples collected from domestic dogs will also be screened for any other parasites via fecal sedimentation. Dog owners who participate in our study will be given topical flea and tick preventative (Frontline Plus) and a broad-spectrum oral de-wormer (Drontal Plus) as a free service.

In addition to sampling and molecular screening different hosts for *Echinococcus* infection, we propose to survey GPIR residents (dog owners as well as non-owners) to assess risk of *Echinococcus* spp. exposure. Surveys will be distributed as a questionnaire via postal survey to all GPIR residents, and made available at a community engagement event. The survey will aim to capture qualitative and quantitative data on pet ownership, pet keeping, pet care, presence of children in the household, and extent of wildlife interaction and contact. Data from this survey will be used to generate a health risk analysis for exposure to *Echinococcus* spp., and to give future recommendations for GPIR residents.

## Significance and Impact

Data collected will be used in ongoing monitoring studies to evaluate how parasite levels change in association with host population dynamics. One outcome of this project will be a health risk assessment for Grand Portage tribal members and others living in similar ecosystems, a product which will direct future studies into the ecology of this zoonotic parasite in northern Minnesota. The risk assessment will additionally create guidelines for preventative health measures and community-based solutions for tapeworm exposure risks to residents of GPIR. Finally, the project will foster the training and development of an interdisciplinary graduate student and future public health veterinarian, as well as tribal scientists in additional scientific methods in epidemiology and public health.

**Timeline:**

Summer, 2016: Sample Collection, Sample Testing

Fall, 2016: Sample Testing, Data Analysis

Winter, 2016-17: Data Analysis, Reporting

**Biographies**

Principal Investigator: Dr. Tiffany Wolf

Dr. Wolf graduated from Louisiana State University in 2002 with her Doctorate of Veterinary Medicine. After working in private practice, she completed a residency at The Wilds in Ohio in 2006. Dr. Wolf then worked as an Associate Veterinarian at the Minnesota Zoo 2006-2015. Most recently, Dr. Wolf earned her doctoral degree in Comparative and Molecular Biosciences from the University of Minnesota in 2015. She currently works as a Research Associate for the Ecosystem Health Division in the College of Veterinary Medicine at the University of Minnesota.

Dr. Wolf has been a research collaborator of the Grand Portage Band of Lake Superior Chippewa for several years through direct involvement in ongoing moose health research as well as in consultation on health of other monitored terrestrial wildlife species. She is particularly interested in development of new research ideas into scientific studies addressing complex health issues at the interface of humans and wildlife within the Grand Portage Indian Reservation.

Co-Investigator: Sara Sokolik

Sara is a second year Veterinary (DVM) student and concurrent Masters of Public Health student at the University of Minnesota, interested in problems involving the wildlife-human interface. She graduated in 2014 with a B.S. in Animal Science and a minor in Biology. She currently works as a Research Assistant in the Ecosystem Health Department in the College of Veterinary Medicine.

Sara gained her interest in research while completing the Undergraduate Research Opportunities Program, studying population dynamics and disease transmission in small mammals. She has continued to participate in similar work concerning population health and epidemiology throughout her graduate and professional student career. Sara has special interest in studying the human-wildlife interface in diverse cultures, which she gained through experiences working in Central America with Costa Rican, Guatemalan, and Mayan peoples, and from previous work within GPIR.

Co-Investigator: Dr. Dominic Travis

Dr. Travis graduated Michigan State University in 1997 with his Doctorate of Veterinary Medicine. In 1997, he also completed an Internship in Disease Pathogenesis at USDA Plum Island Animal Disease Center, which he followed with a Residency in Applied Epidemiology at Virginia-Maryland Regional College of Veterinary Medicine in 2000. Dr. Travis then earned his M.S. in Epidemiology from the University of Maryland. He began working at the Linking Park Zoo in Chicago in 2000, where he rose through the ranks to Vice President of Conservation and Science through 2010. Dr. Travis currently works as an Associate Professor in the College of Veterinary Medicine at the University of Minnesota.

Dr. Travis' passion lies in building large, collaborative, trans-disciplinary research programs aimed at the characterization and management of disease risk at the interface of human, wildlife and domestic animal populations. This includes mechanisms of disease emergence, as well as the social and environmental risk factors for maintenance and spread of zoonotic diseases, as well as management and policy implications. He is focused on the scientific implementation of the One Health paradigm, leading teams of researchers working on a global, interdisciplinary scale.

## Citations

1. The Grand Portage Trust Lands Natural Resources Management Departments. Global Climate Change: Reviews, Recommendations, and Management Plans for the Grand Portage Band of Lake Superior Chippewa. Grand Portage, Minnesota; 2004.
2. Jones A, Pybus M. Taeniasis and Echinococcosis. In: Samuel WM, Pybus MJ, Kocan AA, editors. Parasitic Diseases of Wild Mammals [Internet]. 2nd ed. Ames, IA: Iowa State University Press; 2001. p. 150–92. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21912374>
3. Schweiger A, Ammann RW, Candinas D, Clavien P-A, Eckert J, Gottstein B, et al. Human alveolar echinococcosis after fox population increase, Switzerland.(RESEARCH)(Clinical report). *Emerg Infect Dis*. 2007;13(6):878.
4. Gottstein B, Saucy F, Deplazes P, Reichen J, Demierre G, Busato A, et al. Is high prevalence of *Echinococcus multilocularis* in wild and domestic animals associated with disease incidence in humans? *Emerg Infect Dis*. 2001;7(3):408.
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11. Umhang G, Comte S, Raton V, Hormaz V, Boucher J-M, Favier S, et al. *Echinococcus multilocularis* infections in dogs from urban and peri-urban areas in France. *Parasitol Res*. Berlin/Heidelberg; 2014;113(6):2219–22.
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13. Kapel CMO, Torgerson PR, Thompson RCA, Deplazes P. Reproductive potential of *Echinococcus multilocularis* in experimentally infected foxes, dogs, raccoon dogs and cats. *Int J Parasitol*. 2006;36(1):79–86.

**Budget for Student Proposals**

**Project Title: Understanding the zoonotic risk of echinococcosis for a northern Minnesota tribal community**

<b>Instructions:</b> Provide justification along with costs.			<b>Requested funding</b>	<b>Matching/other funding</b>	
	<b>Category</b>	<b>Description &amp; justification</b>	<b>Amount</b>	<b>Amount</b>	<b>Source</b>
1	Your stipend	<i>What is hourly wage &amp; fringe based on-- departmental, community or other rate?</i>			
2	Speaker honoraria				
3	Supplies & Services	Sampling supplies (sterile tubes, gloves)=~\$150; Molecular screening of samples (DNA purification, PCR testing of at \$25/sample x roughly 100 samples)= \$2,500;	\$4,008		
4	Equipment	Identify and explain use.			
5	Travel	Lodging at \$50/night x 4 weeks total= \$1,400; Per diem at \$25/day x 4 weeks= \$700; Mileage for 600 mi round trip (UMN to GPIR) at 0.54/mile= \$324	\$2,424		
<b>Subtotal research expenses (2-6)</b>			<b>\$6,432</b>	<b>\$0</b>	
<b>TOTAL BUDGET</b>			<b>\$6,432</b>	<b>\$0</b>	

**Budget Guidelines**

1. Stipend justification. You must justify the amount of stipend you are requesting by identifying the number of hours you plan to work on the project and the hourly wage used for research assistants in your department. Include fringe benefits.
2. For colloquia, identify the number of speakers and the amount of honoraria you will provide.
3. Supplies and services. List out all supplies and their estimated costs. Explain in line 7 or in the body of your proposal what the supplies will be used for.
4. Equipment costs are allowable only if the justification clearly shows that the equipment is necessary for the project. Include explanation of what will happen to equipment at completion of project.
5. Travel costs must include a description of the purpose of the travel, start and stop dates of travel, transportation costs, housing costs, and allowable per diem (use University rates found at [http:// travel/umn.edu](http://travel/umn.edu)).