NOTES

AMCOP 63, June 23-25, 2011
Saint Mary's College
Notre Dame, Indiana

Contents

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Saint Mary's College

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NOTES

Schedule

THURSDAY, JUNE 23, 2011

4:00 pm Check-in at Regina Hall.

6:00 -9:00 pm Opening Mixer, Haggar College Center Terrace.

FRIDAY, JUNE 24, 2011
Science Center, Room 105

8:00am Continental Breakfast, Poster Setup, Silent Auction Setup

8:40 Opening Remarks and Welcome

- Dr. Thomas Platt, Program Officer
- Dr. Patricia Fleming, Vice President and Dean of Faculty, Saint Mary's College.

CONTRIBUTED PAPERS
(STUDENT PAPERS INDICATED BY *)

8:45 **1.*** Molecular and functional characterization of GDP-L-fucose synthesis and transport in miracidia and primary sporocysts of *Schistosoma mansoni*. **NATHAN A. PETERSON (GS)** and TIMOTHY P. YOSHINO (MP), Department of Pathobiological Sciences, University of Wisconsin, Madison, WI 53706

9:00 **2**.* Host Specificity of Juvenile White Grub (*Posthodiplostomum minimum*) in Spring Lake, McDonough County, IL. **BETH LANE (GS)** and SHAWN MEAGHER (MP), Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

9:10**3.*** Relative Roles of Exposure and Establishment in Creating Aggregated Intestinal Helminth Burdens in *Eptesicus fuscus* (Chiroptera: Vespertilionidae). **ELIZABETH M. WARBURTON (GS)** and MAARTEN J. VONHOF (MP), Western Michigan University, Kalamazoo, MI, 49008.

9:30 **4.*** Examination of the surface antigen (*SnSAG)* gene family in *Sarcocystis neurona.* **A.GAUTAM (GS)[a]**, S. DANGOUDOUBIYAM (PD)[a], J.P. DUBEY[b], W.J. SAVILLE[c], AND D.K. HOWE (MP)[a], [a]M.H. Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington, KY 40546, [b]United States Department of Agriculture, Agricultural Research Service, Animal and Natural Resources Institute, Parasite Biology, Epidemiology and Systematics Laboratory, Beltsville, MD 20705, [c]Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, Columbus, OH 43210.

9:45 **5**.* Parasites of native and invasive fish of the Wabash River and the potential for enemy release in invasive silver carp (*Hypopthalmichthys molitrix*). **JUSTIN WILCOX (GS)**, and JEFFRY LAURSEN (MP), department of biology Eastern Illinois University, Charleston IL, 61920.

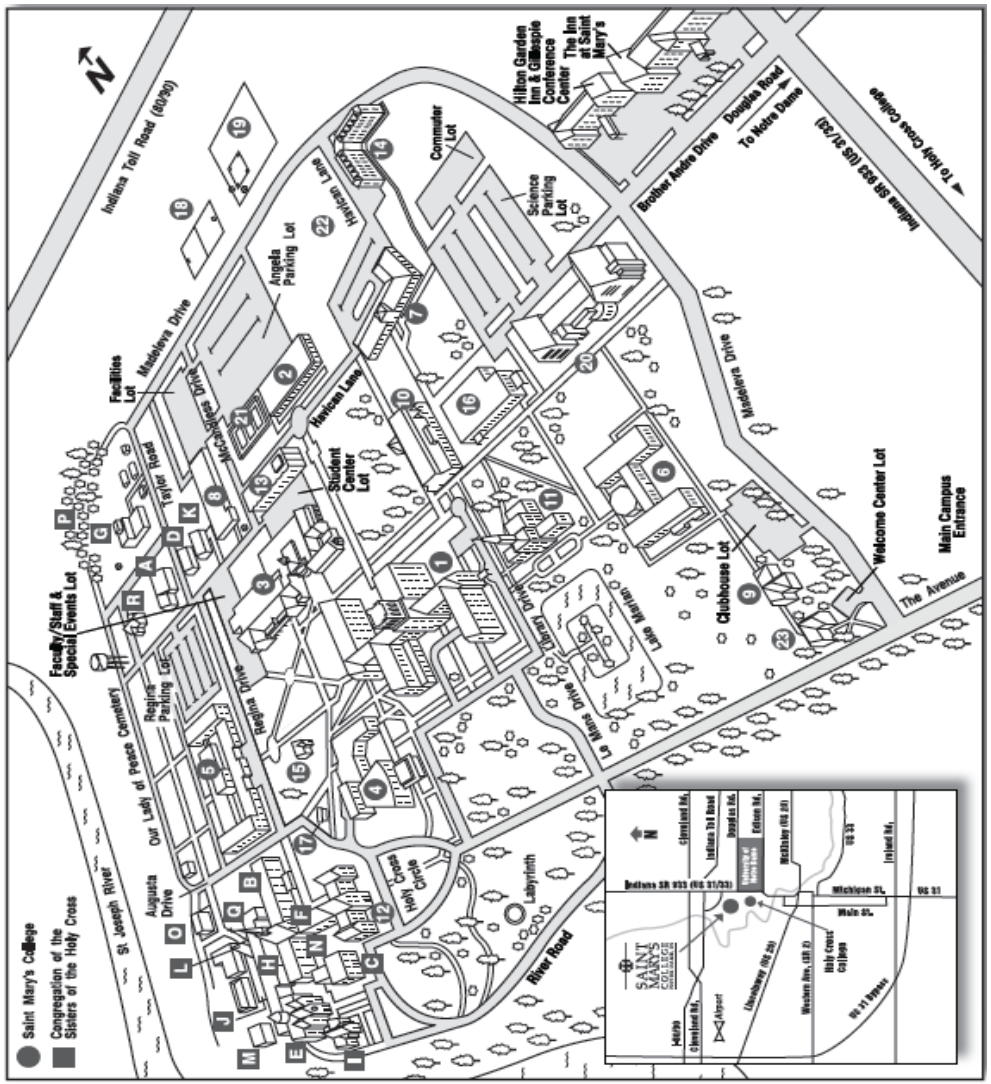
10:00 Break & Silent Auction Bidding, Poster Setup.

10:15 **6.*** Characterization of Farnesyl Pyrophosphate Synthase and Geranylgeranyl Pyrophosphate Synthase in *Schistosoma mansoni* and their role as potential drug targets. **PETER D. ZINIEL (GS)**[1,2], CYNTHIA L. CASS (PD)[1], CRAIG GATTO (P)[1], ERIC OLDFIELD (P)[3], DAVID L. WILLIAMS (MP)[1,2*] [1] School of Biological Sciences, Illinois State University, Normal, IL 61790, USA. [2] Department of Immunology /Microbiology, Rush University Medical Center, 1735 W Harrison Street, Chicago, IL 60612 USA. [3] Department of Chemistry, University of Illinois, Urbana, Illinois 61801 USA.

10:30 **7.*** Parasites of bobcats in southern Illinois. **SHELBY HIESTAND** (GS), AGUSTIN JIMENEZ (MP) and CLAYTON NIELSEN (MP), Department of Zoology, Southern Illinois University Carbondale, Carbondale, IL 62901

10:45 **8.** Toward the understanding of the function of Phytochelatin synthase in *Schistosoma mansoni.* **CORALINE RIGOUIN (PD)**, Elsye Nylin (T), Debalina Ray and David L. Williams (MP), Department of immunology and

MAP



5 Regina Hall
1 Haggar Hall
6 Science Center

Shawn Meagher Western Illinois University sa-meagher1@wiu.edu	Shelly Michalski University of Wisconsin - Oshkosh michalsk@uwosh.edu
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Tim Yoshino University of Wisconsin - Madison yoshinot@svm.vetmed.wisc.edu	

microbiology, Rush University Medical Center, Chicago, IL 60612.

11:10 **9.** The taxonomic placement of *Litomosa and Litomosoides* relative to their use of hosts. **F. AGUSTÍN JIMÉNEZ**[1], JULIANA NOTARNICOLA[2] and SCOTT L. GARDNER[2]. [1]Department of Zoology, Southern Illinois University Carbondale, Carbondale, IL 62901; [2]Harold W. Manter Laboratory of Parasitology, University of Nebraska, Lincoln NE 68588.

11:15 **DR. ERIC (SAM) LOKER**, President Elect, The American Society of Parasitologists.

11:30 Lunch

THE AMCOP SYMPOSIUM

Science Center, Room 105

"Parasitomics"

1:30pm **MICHAEL FERDIG**, University of Notre Dame

2:30 **MARY ANN MCDOWELL**, University of Notre Dame

POSTER SESSION

Science Center, Second Floor

3:45 **10.*** Effect of Host Sex and Age on White Grub (*Posthodiplostomum minimum*) Infection in Bluegill from Spring Lake, IL. **JULIA WIEDERHOLD (UG)**, SHANNON BARRY (UG), MIKALA MARENO (UG), THEODORE PAUL (UG), KEELEY VANVLEET (UG), BETH LANE (GS), SHAWN MEAGHER (MP), Department of Biological Sciences, Western Illinois University, Macomb, IL 61455

11.* Endoparasite Survey in Bobcats (*Lynx rufus rufus*) From Ohio. **MARKAH FROST (UG), SARAH JOHNSTON (UG),** SUZIE PRANGE*, and RAMON A. CARRENO (MP), Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015, *Waterloo Wildlife Research Station ODNR, Division of Wildlife, 360 East State Street Athens, OH 45701

12.* The Role of ARF1 in coatomer recruitment in *Toxoplasma gondii*. **ALLISON KRESS (UG), MONICA MCNERNEY (UG), and EMILY SIEBERT (UG)**, Department of Biology, University of Notre Dame, Notre Dame, IN 46556

13.* Hybrid praziquantel-oxadiazole oxides with activity against *Schistosoma mansoni*. **DANIELA CORTESE (UG)[1,2]**, Stefano Guglielmo (PD)[2], Roberta Fruttero (P)[2], Alberto Gasco (MP)[2], Latasha Day (T)[1] and David L. Williams (MP)[1] *[1]Department of Microbiology and Immunology, Rush University Medical Center, Chicago, IL, 60612, USA [2] Dipartimento di Scienza e Tecnologia del Farmaco, Università di Torino, Via Pietro Giuria 9, I-10125 Torino, Italy.*

14.* Parasite survey of American river otter (*Lutra canadensis*) and fisher (*Martes pennanti*) in Wisconsin**. JESSICA NERENHAUSEN (UG)**, BRANDON DEBBINK (UG) , MAURITZ STERNER (PD), REBECCA COLE (PD), and MICHELLE MICHALSKI (MP), University of Wisconsin-Oshkosh, Oshkosh, WI 54902.

15.* Characterization of miRNA Expression Profiles in *Leishmania* Infected Human Phagocytes. **NICHOLAS GERACI (GS)**, JOHN TAN (PD), ERLIANG ZENG (PD), and MARY ANN MCDOWELL (MP). University of Notre Dame, Galvin Life Science Center, Notre Dame, Indiana 46556

16.* Inhibition of Newly-Discovered GPCRs in the Fight Against Malaria: Homology Modeling, Molecular Dynamics and Virtual Screening. **KEVIN KASTNER (GS)**[1], GUILLERMINA ESTIU (PD)[2], JESUS

Membership Email Directory

(Dues Paid in Either 2010 or 2011)

Trudy Aebig University of Cincinnati aebigtj@gmail.com	Kevin Baldwin Monmouth University KBALDWIN@monm.edu
Kimberly Bates Winona State University kbates@winona.edu	Jennifer Bellaw Wilmington College jbellaw@wilmington.edu
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Eric Loker University of New Mexico esloker@unm.edu	Eugene Lyons University of Kentucky elyons1@uky.edu

		2010 AMCOP Financial Report			
		Final			
Cash on Hand 1/1/10				**$4,406.22**	
Expenses					
	AMCOP 62 Program Duplication		$84.27		
	Postage		$28.06		
	Certificates & Holders		$66.61		
	Herrick Award		$300.00		
	LaRue Award		$300.00		
	Cable Award		$100.00		
	Honorable Mention Awards		$100.00		
	Bank Fees		$0.00		
	Office Supplies		$0.00		
	Speaker Expenses		$131.00		
	2010 Student Travel Awards		$0.00		
	2009 Student Travel Awards		$200.00		
	Web Site Expense		$22.28		
	AMCOP 62 Misc. Expenses		$75.00		
	Total Expenses			**$1,407.22**	
Income					
	2010 Dues Payments		$305.00		
	2010 Member Contributions		$560.00		
	Lilly Donation		$300.00		
	ASP Support		$250.00		
	Silent Auction Revenue		$331.50		
	Interest Income		$0.00		
	AMCOP 62 Surplus		$232.05		
	Total Income			**$1,978.55**	
Cash on Hand 12/31/2010				**$4,977.55**	
Operating Surplus (Loss) for 2010					**$ 571.33**
Value of CD				**$7,152.41**	
Net Worth 12/31/2010				**$12,129.96**	
			Submitted By:		
Financial Report Approved by					
2011 Auditing Committee:					
			Douglas B. Woodmansee		
			Secretary/Treasurer		

IZAGUIRRE (MP)[1], and MARY ANN MCDOWELL (MP)[3], *[1]Department of Computer Science and Engineering, University of Notre Dame, Notre Dame, IN 46556, [2]Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN 46556, [3]Department of Biological Sciences, University of Notre Dame, Notre Dame, IN 46556*

17.* Degradation and utilization of complex carbohydrates by *Trichomonas vaginalis*. **LAUREN D. NAWROCKI (GS)**, TYLER J. NIELSEN (GS), WAYNE A. WILSON[a] (MP), and ANDREW BRITTINGHAM (MP). Department of Microbiology and Immunology, and [a]Department of Biochemistry and Nutrition, Des Moines University, Des Moines, IA 50312

18. * Testing iELISA methods for the diagnosis of *Dicrocoelium dendriticum* and *Fasciola hepatica* in red deer (*Cervus elaphus*) in northern Spain. **ANGÉLICA MARTÍNEZ (GS)[1]**., Mª SOL ARIAS[2]., ADOLFO PAZ[2]., PATROCINIO MORRONDO (MP)[2]., JESÚS GARCÍA[1]., NATIVIDAD DIEZ (MP)[1]., and Mª DEL ROSARIO HIDALGO (MP)[1]. [1]Animal Health Department, Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, León University 24071, León, Spain. [2]Animal Pathology Departament, Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, Santiago de Compostela University 27002, Lugo, Spain.

19.* An in depth analysis of the *Phlebotomus papatasi* transcriptome. **JENICA L. ABRUDAN, (GS),** Eck Institute of Global Health, Department of Biological Sciences, University of Notre Dame, IN 46556.

20.* *Toxoplasma gondii* and global blood type distribution: a link between Rh factor and *T. gondii* infections. **JUSTIN WILCOX (GS)**, Eastern Illinois University, Charleston, IL, 61920.

21. Cloning and Characterization of Phytochelatin Synthase from *Ancylostoma ceylanicum.* **ELYSE M. NYLIN[1] (T)**, CORALINE RIGOUIN[1] (PD), JON VERMEIRE[2] (P) and DAVID L. WILLIAMS[1] (MP) [1]Department of Immunology/Microbiology, Rush University Medical

Center, Chicago, IL 60612 [2]Department of Pharmacology, Yale University School of Medicine, New Haven, CT 06520

22. Sharing of glycan structures between larval *Schistosoma mansoni* and hemolymph of *Biomphalaria glabrata* snails. **XIAO JUN WU[1]**, HONGDI LIU[1], LAURA GONZALEZ[1], ANDRE M. DEELDER[2] , CORNELIS H. HOKKE[2], TIMOTHY P. YOSHINO[1] [1]Department of Pathobiological Sciences, University of Wisconsin-Madison. [2]Department of Parasitology, Leiden University Medical Center, Leiden, The Netherlands

23. A genome sequencing project for the apicomplexan parasite *Sarcocystis neurona.* **SRIVENY DANGOUDOUBIYAM (PD) [1],** DANIEL K. HOWE (MP) **[1]**, ABLESH GAUTAM (GS)[1], CHRISTOPHER L. SCHARDL[2,3], JOLANTA JAROMCZYK[3], TOMMY BULLOCK (GS)[3], JESSICA C. KISSINGER[4], JOSHUA BRIDGERS (GS)[4], SIVARANJANI NAMASIVAYAM (GS)[4].[1]Department of Veterinary Science, University of Kentucky, Lexington, KY, USA. [2]Department of Plant Pathology, University of Kentucky, Lexington, KY, USA. [3]UK-Advanced Genetic Technologies Center, University of Kentucky, Lexington, KY, USA. [4]Department of Genetics and Center for Tropical and Emerging Global Diseases, University of Georgia, Athens, GA, USA.

24. Novel oxadiazole oxide activity against adult *Schistosoma mansoni* worms *in vitro*. **VALERIE P. KOMMER (T)**, LATASHA DAY (T), ROBERTA FRUTTERO (P), ALBERTO GASCO (P), DAVID L. WILLIAMS (MP), Division of Immunology/Microbiology, Rush University Medical Center, Chicago, IL 60612 and Dipartimento di Scienza e Tecnologia del Farmaco, Università di Torino, Italy.

25. The NIH Filariasis Research Reagent Repository Center (FR3) **SHELLY MICHALSKI and KATHRYN GRIFFITHS.** University of Wisconsin-Oshkosh, Oshkosh, WI 54902.

2005 Wabash College, Crawfordsville, IN (LVII) Douglas Woodmansee
John Adams - In a changing world of malaria research, can an old dog learn new tricks? PO= Eric Wetzel, ST= Darwin Wittrock; H= Amy McHenry; L= Laura Duclos; HM= Jillian Detwiler and Julie Clennon; C= Kristin Giglietti; S= Molecular Phylogenies in Nematoda by Virginia Ferris and Microbial Community Ecology of Tick-borne Human Pathogens by Keith Clay

2006 Winona State University, Winona, MN (LVIII) Thomas McQuistion
Matthew Bolek - Amphibian parasites: The cool, the bad and the ugly. PO= Kim Bates; ST= Doug Woodmansee; H= Andrew Claxton; L= Kristin Herrmann; C= Lindsey Stillson; HM= Brenda Pracheil, Kristin Giglietti; S= Parasites of Wildlife of the Midwest by Rebecca Cole and Darwin Wittrock

2007 University of Wisconsin-Oshkosh, Oshkosh, WI (LIX) Jason Curtis
David Williams – The Genomics Revolution in Parasitology. PO= Shelly Michalski, ST= Doug Woodmansee; H= Christine Hsiao; L= Shriveny Dangoudoubiyam HM= Peter Ziniel, Nathan Peterson; C= Emily Doucette, S= Tropical Disease by Gary Weil and Peter Fischer

2008 University of Illinois at Urbana-Champaign (LX) Robert Sorensen
Dennis Minchella – P.C. (Post Cable) Parasitology at Purdue.PO= Milton McAllister, ST= Doug Woodmansee; H= Nathan Peterson; L= Erica Mize HM= Apichat Vitta, Jillian Detweiler; C= Kyle Luth, S= Parasitic Protists by Laura Knoll and Alexa Rosypal.

2009 Ohio Wesleyan University, Delaware, OH (LXI) Daniel Howe
Eugene Lyons - Hookworms (*Unicaria* spp.) in Pinnipeds with Notes on the Biology of Northern Fur Seals. PO= Ramon Carreno, ST= Doug Woodmansee; H= Sriveny Dangoudoubiyam; L= Elizabeth Thiele, HM= Matthew Brewer; C= Cailee Smith; S= Ectoparasites by Susan C. Jones and Glen R. Needam

2010 Western Illinois University, Macomb, IL (LXII) Jeffrey Laursen
Tim Yoshino - Frankenflukes: Parasitic GMO's. PO= Shawm Meagher, ST=Doug Woodmansee; H=Kathryn Coyne; L=Philip Scheibel; HM= Kathy Johnson; C= Bryan Rolfsen; S= Can Parasitic worms treat autoimmune disorders? by David Elliott and John O. Fleming.

2011 Saint Mary's College, Notre Dame IN (LXIII) Shelly Michalski
Bruce Christensen – Programmes for control of lymphatic filariasis: perspectives from a vector biologist. PO= Tom Platt, ST= Doug Woodmansee; H=?; L=? HM= ?; C= ?; S=Parasitonomics by Mary Ann McDowell and Mike Ferdig.

2012 Truman State University, Kirksville, MO (LXIV)
PO=Lin Twining , ST= ?; H=?; L=? HM= ?; C= ?; S=?

1994 Murray State Univ. Murray, KY (XLVI) Gary Uglem
E. Christiansen, Come out, come out, we know you are in there
PO=L. Duobinis-Gray, ST=D. J. Minchella, H=J. Rosinski,
L=R. Garrison, S=Parasite Ecology: Population and Community Dynamics

1995 Univ. of Wisconsin-Milwaukee (XLVII) Darwin Wittrock
E.S. Loker, Schistosomiasis in Kenya: a Copernican point of view
PO= J. Coggins, ST=D.J. Minchella; H=J. Curtis; L=M. Dwinnell
S=Water-borne Diseases

1996 Northeast MO State Univ., Kirksville, MO (XLVIII) Daniel Snyder
PO=L. C. Twining, ST=D.J. Minchella, H= V. G. Mehta, L=H. Yoder,
S=Immune Aspects of Protozoan Infections: Malaria and Amoebiasis

1997 Butler University, Indianapolis, IN, (XLIX) Joe Camp
R. Hengst, Paleoparasitology, PO=D. Daniell; ST=D.J. Minchella;
H=A. Bierberich, L=S. Kappe, S=Molecular Biology in Solving
Problems in Parasitology

1998 Indiana State University, Terre Haute, IN (L) Jim Coggins
W. Coil, J. Crites, & T. Dunagan, AMCOP 50 - Fifty Years Revisited;
PO=F. Monroy & D. Dusanic; ST=D. Wittrock; H=M. Bolek; L=K. Page
S= Cytokines and Parasitic Diseases; Visit by ASP President John Oaks

1999 Wilmington College, Wilmington OH (LI) Dennis Minchella
P. LoVerde, Molecular Biology of Schistosomes, PO= D. Woodmansee,
ST=D. Wittrock; H= J.B.Green; L=J. Curtis; S=Parasite Biochemistry by
J.D. Bangs and C.F. Fioravanti.

2000 University of Notre Dame, Notre Dame, IN (LII) Peter Pappas
J.A. Oaks – Zen and the Art of Tapeworms
PO= J. H. Adams; ST= D. Wittrock; H= A. Eppert; L= M. Bolek;
HM= C. Dresden-Osborne & K. VanBuskirk
S=Life Style Choices of Parasitic Protozoans by T. Sinai and J. Lebowitz

2001 Eastern Illinois University, Charleston, IL (LIII) Lin Twining
R.D. Smith - Environmental contamination with *Cryptosporidium*
parvum from a dairy herd. PO= J. Laursen; ST= D. Wittrock;
H= B. Foulk; L= M. Michalski ; HM= M. Gillilland III; B. Balu
and P. Blair S= Use of Molecular Data in Parasite Systematics by M. Mort
and M. Siddall

2002 Millikin University, Decatur, IL (LIV) David Williams
P. Brindley – Mobile genetic elements in the schistosome genome
PO=Tom McQuistion; ST= D. Wittrock; H= Stacy Pfluger; L= Greg
Sandland; HM= Kelly VanBuskirk and Michelle Steinauer
S= Parasite Transmission and Control in Domesticated Animals by
M. McAllister and L. McDougald

2003 Michigan State University, East Lansing (LV) Tom Platt
Robert Pennock – Darwin and the Parasitic Wasp: Teaching Evolutionary
Design; PO= Pat Muzzall; ST= Darwin Wittrock; H= Luis Gondim;
L= Michelle Steinauer; HM= Shawna Cook and Ahmed Sayed;
C= Katie Reif; S= Vector Borne Diseases of Michigan and Adjacent States
by Ned Walker and Hans Klompen

2004 Minnesota State University, Mankato, MN (LVI) Patrick Muzzall
Richard Clopton – Publishing with pain: The editor doesn't really hate you.
PO= Robert Sorensen, ST= Darwin Wittrock; H=Rebecca LaBorde;
L= Maria Castillo; HM= Angie Kuntz and Laura Duclos; C=Jenna Rodgers
S= Molecular phylogenetics of parasites by Vasyl Tkach and
Ramon Carreno

BANQUET
Haggar Parlor
Haggar College Center

Mixer 6:30 – 7:00 pm
Dinner 7:00 – 8:00 pm
After Dinner Presentation 8:00 pm

Invited speaker: **Dr. Bruce Christensen**, The University of Wisconsin.

Programmes for control of lymphatic filariasis: perspectives of a vector biologist.

SATURDAY, JUNE 25, 2011.
Science Center, Room 105

8:00am Continental Breakfast & Silent Auction Bidding

9:00 Silent Auction Bidding Closes

9:01 Business Meeting and Award Presentations, **DR. SHELLY MICHALSKI**, AMCOP Presiding Officer.

Abstracts

1 Molecular and functional characterization of GDP-L-fucose synthesis and transport in miracidia and primary sporocysts of *Schistosoma mansoni*. **NATHAN A. PETERSON (GS)** and TIMOTHY P. YOSHINO (MP), Department of Pathobiological Sciences, University of Wisconsin, Madison, WI 53706.

Fucosylated carbohydrate epitopes (glycotopes) of the parasitic flatworm *Schistosoma mansoni* are key determinants in its development and immunobiology. Importantly, studies indicate that glycotope expression is developmentally and gender-specifically regulated, although the mechanisms of differential expression have not yet been established. Ongoing research seeks to identify and functionally characterize the enzymatic machinery that contributes to their production, specifically the enzymes involved in fucoconjugation, GDP-L-fucose synthesis, and GDP-L-fucose transport. In the present study, a homology-based bioinformatics approach for gene discovery identified several schistosome genes that are putatively involved in de novo GDP-L-fucose synthesis and Golgi import, including GDP-D-mannose-4,6-dehydratase (GMD), GDP-4-keto-6-deoxy-D-mannose-3,5-epimerase-4-reductase (GMER), and GDP-L-fucose transporter (GFT). Notably, elements of a salvage pathway for GDP-L-fucose synthesis were not identified, suggesting that GDP-L-fucose in *S. mansoni* likely derives solely from de novo synthesis. Gene transcription was confirmed and full-length transcript sequences were determined via RT-PCR and 5'/3' RACE. Consistent with other fucosylation-associated genes in *S. mansoni*, these gene transcripts are alternatively spliced, yielding variants of still unknown significance. Quantitative real-time PCR and serial analysis of gene expression (SAGE) data indicate differential transcription between miracidia and primary sporocysts. Recently, full-length GMD and GMER were heterologously expressed for the production of chicken IgY polyclonal antibodies, which are currently being employed for western blot analyses and immunolocalization in miracidia and primary sporocysts. Recombinant proteins will also be used to demonstrate their enzymatic function via in vitro reconstitution of GDP-L-fucose synthesis. Additionally, RNAi-mediated gene silencing in conjunction with phenotypic screening in snail-associated larvae is being used to assess the

1981	Eastern Illinois Univ., Charleston, IL (XXXIII)	D.M. Miller
	G.D. Cain, Antigenic Variation: New Techniques Applied to Old Problems. PO=B.T. Ridgeway, ST=G. Garoian, H=J.M. Holy, L=B.N. Tuggle, S=Immunity to Protozoan Parasites	
1982	Western Illinois Univ., Macomb, IL (XXXIV)	D.G. Myer
	J.D. Briggs, Biological Control of Invertebrates in International Programs. PO=P.M. Nollen, ST=G. Garoian, H=D.E. Snyder, L=C.L. Williams, S=Biological Control of Organisms	
1983	Univ. of Illinois, Urbana, IL (XXXV)	C.M. Vaughn
	H.M. Moon, Speculations on the Pathogenesis of Cryptosporidiosis with Comparisons to Other Enteric Infections. PO=K.S. Todd, Jr, ST=G. Garoian, H=K.J. Hamann, L=K.W. Bafundo, S=Intestinal Protozoa	
1984	Univ. of Iowa, Iowa City, IA (XXXVI)	W.H. Coil
	J. Donelson, Genetic Rearrangement and the Basis of Antigenic Variation in African Trypanosomes. PO=G.D. Cain, ST=G. Garoian, H=K.F. Forton, L=D. Woodmansee, S=Helminth Immunology	
1985	Ohio State Univ., Columbus, OH (XXXVII)	B.T. Ridgeway
	K.D. Murrell, Epidemiology of Swine Trichinosis: Could Both Zenker and Leuckart be Right?, PO=P.W. Pappas, ST=G. Garoian, H=R.L. Lavy, L=H.K. Forton, S=Physiological Ecology of Parasites	
1986	Univ. of Missouri, Columbia, MO (XXXVIII)	G.D. Cain
	R.C. Tinsley, Correlation of Host Biology in Polystomatid Monogenea. H=M.C. Lewis, H=I.G. Welsford, L=D.A. Leiby, PO=L. Uhazy, ST=D.M. Miller, S=Gene Expression in Helminth Development	
1987	Southern Illinois Univ., Edwardsville, IL (XXXIX)	P.M. Nollen
	K. Kazacos, *Baylisascaris* Nematodes-Their Biology and Role in Larva Migrans Disease. PO=D. Myer, ST=D.M. Miller, H=D.A. Leiby, L=V.A. Conners, S=Modern Systematics in Parasitology	
1988	Purdue University, West Lafayette, IN (XL)	G. Garoian
	W.H. Coil, Forty Years of AMCOP, Laying a Foundation. PO=K. Kazacos & D. Minchella, ST=D.M. Miller, H=R.A. Bautz, L=R.R. Mitchler, S=Host Parasite Genetics	
1989	Miami Univ., Oxford, OH (XLI)	A.E. Duwe
	G. Castro, A Physiological View of Host-parasite Interactions. PO=R.A. Grassmick, ST=D.M. Miller, H=S.R. Morris, S=Parasites in the Immune Suppressed, Special Visit by President Kemp of ASP.	
1990	Univ. Illinois, Urbana, IL (XLII)	J. H. Hubschman
	G. Cross, Phosphatidylinositol Membrane Anchor and/or Transfection of Protozoa. PO=G. McLaughlin, ST=D.M. Miller, H=L.D. Morton, L=S.R. Morris, S=Defining the Limits of Integrated Pest and Disease Management.	
1991	University of South Dakota, Vermillion, SD, (XLIII)	K. R. Kazacos
	M. Dryden, What You Always Wanted to Know About Fleas on Fluffy and Fido but were Afraid to Ask. PO=A. D. Johnson, ST=D.M Miller, H=D. Royal, L=R. Clopton, S= Host Specificity	
1992	Univ. Wisconsin-Eau Claire, WI, (XLIV)	Omer Larson
	PO=D. Wittrock, ST=D.M.Miller, H=S. Storandt, L=D. K. Howe, S=Teaching of Parasitology-New Methods; Visit by ASP President J. Seed	
1993	St. Mary's, Notre Dame, IN, (XLV)	R. A. Grassmick
	J. Crites, AMCOP Peragrare Anni, Homines, Exitus PO=T.R Platt, ST=D.M.Miller, H=M. S. Schoen, L=B. J. Davids, S="Ain't Misbehavin'": Ethology, Phylogeny and Parasitology	

1964	Univ. of Chicago, Chicago, IL (XVI)	D.T. Clark
	R.E. Kuntz, Paragonimiasis in Formosa. ST=E. J. Hugghins	
1965	Kellogg Biological Station, Gull Lake, MI (XVII)	P.E. Thompson
	L. Jacobs, Toxoplasmosis. ST=E.J. Hugghins	
1966	Univ. of Illinois, Urbana, IL (XVIII)	M.J. Ulmer
	D.L. De Guisti, The Acanthocephala. ST=E.J. Hugghins	
1967	Iowa State Univ., Ames, IA (XVIV)	P.J. Silverman
	N.D. Levine, Parasitology, Problems and Promise. ST=E.J. Hugghins H=P.M. Nollen [FIRST HERRICK AWARD]	
1968	Univ. of Wisconsin, Madison, WI (XX)	F.G. Wallace
	D.R. Lincicome, The Goodness of Parasitism. (with APS & AIBS) ST=J.H. Greve, H=W.G. Barnes	
1969	Univ. of Cincinnati, Cincinnati, OH (XXI)	H.W. Manter
	H.W. Stunkard, Life Histories and Systematics of Parasitic Flatworms. ST=J.H. Greve, H=B. Caverny, H=T.P. Bonner	
1970	Loyola Univ., Chicago, IL (XXII)	J.L. Crites
	M.J. Ulmer, Helminths from Midwest to Mediterranean. ST=J.H. Greve, H=H. Blankespoor	
1971	Univ. of Louisville, Louisville, KY (XXIII)	F. Etges
	H. Van der Schalie, Dam Large Rivers-Then What? ST=J.H. Greve, H=R. Campbell	
1972	Southern Illinois Univ., Carbondale, IL (XXIV)	B.J. Jaskowski
	R.M. Cable, The Lighter Side of Parasitology. PO=T.T. Dunagan, ST=J.H. Greve, H=E.M. Cornford	
1973	Notre Dame Univ., Notre Dame, IN (XXV)	R. Shumard
	R.F. Rick, Babesiosis and the Development of *Babesia* in Ticks. PO=R. Thorson, ST=J.H. Greve, H=D. Danley	
1974	Univ. of Michigan, Ann Arbor, MI (XXVI)	D. Ameel
	M.J. Ulmer, Snails, Swamps and Swimmer's Itch. ST=J.H. Greve, H=P.T. LaVerde and D. Prechel	
1975	Iowa State Univ., Ames, IA (XXVII)	W. Bemrick
	P.M. Nollen, Studies on the Reproductive Systems of Parasitic Flatworms or All You Wanted to Know About Sex in Worms and Were Afraid to Ask. ST=J.H. Greve, H=D. Wittrock, L=V.M. Nelson [FIRST LARUE AWARD]	
1976	Univ. of Nebraska, Lincoln, NE (XXVIII)	J. Greve
	A.C. Todd, A Redefinition of Subclinical Parasitism and its Impact on World Politics. ST=W.H. Coil, PO=M.H. Pritchard, H=W.L. Current, L=C.A. Klu	
1977	Kansas State Univ., Manhattan, KA (XXIX)	T.T. Dunagan
	A.J. MacInnis, Snails, Dollars, DNA and Worms. PO=W.D. Lindquist, ST=W.H. Coil, H=M. Fletcher, L=L. Smurro, L=J. Ketchum	
1978	Indiana Central Univ., Indianapolis, IN (XXX)	E.J. Hugghins
	J.P. Dubey, Recent Advances in Feline and Canine Coccidia and Related Organisms. PO=M. Brandt, ST=W.H. Coil, H=D. McNair, L=G.L. Hendrickson	
1979	Loyola Univ., Chicago, IL (XXXI)	D.E. Gilbertson
	E. Foor, Basic Studies in Reproduction (in Nematodes). PO=B.J. Jaskowski, ST=W.H. Coil, H=G. Plorin, H=D. Minchella, L=M. Fletcher	
1980	Eastern Michigan Univ., Ypsilanti, MI (XXXII)	A.D. Johnson
	J.R. Williams, Tropical Parasitiology at the Junction of the White and Blue Nile Rivers. PO=E. Waffle, ST=G. Garoian, H=C.L. Williams, L=M. Goldman, L=R. Gamble, S=Functional Morphology of Acanthocephala	

role of GMD, GMER, and GFT in schistosome development and immunobiology. The identification and characterization of these genes could provide novel targets for drug discovery, which could facilitate advances in the control of schistosomiasis in snail and/or mammalian hosts.

2 Host Specificity of Juvenile White Grub (*Posthodiplostomum minimum*) in Spring Lake, McDonough County, IL. **BETH LANE (GS)** and SHAWN MEAGHER (MP), Department of Biological Sciences, Western Illinois University, Macomb, IL 61455.

Parasites cause harm to humans, domesticated animals, and wildlife. Host specificity is the measure of the number of host species a parasite can infect. White grub (*Posthodiplostomum minimum)* parasitizes many game fish species. Understanding the host specificity of *P. minimum* will help determine how many species of *P. minimum* there are. We know that different species of *P. minimum* are specific to either cyprinids (minnows) or centrarchids (sunfish), but we do not know whether there are species specific to particular centrarchid species. Two centrarchids, bluegill (*Lepomis macrochirus*; n=24), and crappie (*Pomoxis annularis*; n=44), were collected from Spring Lake in McDonough County, IL. The fish were identified to species, then general demographic data were taken: length, mass, age and sex. The organs were removed and the number of *P. minimum* in each was counted. Prevalence was significantly higher in bluegills (100%) than crappie (55%) ($X^2 = 15.5$, df = 1, $P < 0.0001$). Infection intensity was significantly higher in bluegill (1,255 ± 243.1) than crappie (6.4 ± 1.2) ($t = 5.13$, df = 21, $P < 0.0001$). Intensity increased with age class in bluegill ($t = -2.396$, df = 11.1, $P = 0.035$) but not in crappie (t = 0.166, df = 6.27, $P = 0.87$). Finally, *P. minimum* habitat differed between the two hosts. Parasite number was highest in the kidneys of bluegill and the livers of crappie, which may be due to differences in infection levels. In summary, *P. minimum* is more infective (i.e. more specific) to bluegill than crappie in Spring Lake. In the future, studies should be done to see whether host differences in infection levels are due to ecological differences that affect host exposure to *P. minimum,* or physiological differences that affect host suitability for infection.

Relative Roles of Exposure and Establishment in Creating Aggregated Intestinal Helminth Burdens in *Eptesicus fuscus*
3 (Chiroptera: Vespertilionidae). **ELIZABETH M. WARBURTON (GS)** and MAARTEN J. VONHOF (MP), Western Michigan University, Kalamazoo, MI, 49008. Parasite aggregation within a host population is a defining characteristic of parasitism. Relatively few individuals bear the bulk of the parasitic burden, producing heterogeneous distributions of parasites within host populations. Therefore, not all hosts have equal probability of transmitting infection to another individual. In most host-parasite systems, the key feature of transmission dynamics is this variation in parasite burden among hosts. More heavily infected individuals introduce disproportionate numbers of infective propagules into the environment, leading to sharp increases in the frequency of infection within a population. Factors influencing host exposure, such as location and season, and factors influencing parasite establishment, such as genetic diversity, immunocompetence, sex, and age of an organism, have been linked to enteric helminthiasis in mammals. However, findings on worm burden in relation to these correlates vary widely. Moreover, factors influencing helminthiasis have not been well studied in many wild populations of mammals, especially bats. This investigation uses exposure variables of capture location, capture date, and water contact along with establishment variables such as sex, age, body condition, and immune function to reveal which of these correlates influence differential intestinal helminth burdens in *E. fuscus*. To accomplish these goals, *E. fuscus* were captured from colonies in Michigan and Indiana in 2008 and 2009. Each individual's sex, age class, body condition, and intestinal helminth burden was assessed. Blood was also collected in order to measure functional immunocompetence via hemolysis-hemagglutination assays. Data were analyzed via structural equation modeling in AMOS. Both Akaike's Information Criterion (AIC=27.229) and x^2 (p=0.156) values indicate that the model with the best fit included year of capture, sex of host, and distance of colony to nearest body of water. Of these three predictors, distance to nearest water was the only one to significantly correlate with helminth burden (p<0.001). Thus, differential exposure to parasites appears to play a more significant role than differential parasite establishment in creating heterogeneous helminth burdens. However, this investigation will be broadened to include host genetic

shall traditionally be $100. Awards may vary according to funds available from contributors.

(c) No person may win the same award more than one time while in student status. Likewise, no student may win both awards at the same meeting. However, one person may win both awards while a student in different years.

SUMMARY OF AMCOP MEETINGS 1949-PRESENT

Year | Meeting Site (Conference No.) | Presiding Officer
Banquet Speaker & Title, PO=Program Officer, ST=Secy/Treas, H=Herrick Award, L=LaRue Award, HM=Honorable Mention, C=Cable Undergraduate Award; S=Symposium Title and Speakers

1949	Univ. Wisconsin, Madison, WI (AMCOP I)	Harley J. VanCleave
	J.C. Baer, ST=J. R. Lincicome	
1950	Univ. Michigan, Ann Arbor, MI (II)	R.V. Bangham
	W.W. Cort, Trends in Helminthological Research. PO/ST=R. J. Porter	
1951	Purdue University, Lafayete, IN (III)	L.O. Nolf
	J.E. Ackert, Some Observations on Hookworm Disease. ST=W. Balamuth	
1952	Univ. Illinois, Urbana, IL (IV)	R.J. Porter
	A.C. Walton, ST=W. Balamuth	
1953	Iowa State College, Ames IA (V)	C.A. Herrick
	R.M. Cable, Parasitological Experiences in Puerto Rico. ST=W.D. Lindquist	
1954	Michigan State Univ., East Lansing, MI (VI)	A.C. Walton
	G.F Otto, Mosquitos, Worms, Somoans and the Parasitologist in Somoa. ST=W.D. Lindquist	
1955	Notre Dame Univ., IN (VII)	R.M. Cable
	G.R. LaRue, Relationships in the Development of Digenetic Trematodes. ST=W.D. Lindquist	
1956	Iowa State University, Ames, IA (VIII)	W.D. Lindquist
	W.H. Headlee, ST=F.J. Krudenier	
1957	Univ. of Michigan, Ann Arbor, MI (IX)	J.E. Ackert
	A.C. Chandler, ST=F.J. Krudenier	
1958	Kansas St. Univ., Manhattan, KS (X)	G.R. LaRue
	H.W. Manter, Trematodes of Many Waters. ST=F.J. Krudenier	
1959	Northwestern Univ., Evanston, IL (XI)	G.F. Otto
	H. Van der Schalie, Contrasting Problems in Conrol of Schistosomiasis in Egypt and the Sudan. ST=D.T. Clark	
1960	Purdue Univ., Lafayette, IN (XII)	F.J. Krudenier
	P.P. Weinstein, Aspects of Growth and Differentiation of Parasitic Helminths *in vitro* and *in vivo*. ST=D.T. Clark	
1961	Ohio State Univ., Columbus, OH (XIII)	N.D. Levine
	B. Schwartz, Parasitology Old and New. ST=D.T. Clark	
1962	Univ. of Nebraska, Lincoln, NE (XIV)	G.W. Kelley, Jr
	O.W. Olsen, The Life History of the Hookworm of Fur Seals. ST=D.T. Clark	
1963	Univ. of Minnesota, St. Paul, MN (XV)	M.F. Hansen
	F.G. Wallace, Observations on the Louisiana State University Inter-American Program in Tropical Medicine. ST=D.T. Clark	

5. The Secretary/Treasurer shall issue annual dues notices and about four months prior to each Conference a call for participants in the program for each Conference; inform the new Presiding and Program Officers concerning their duties and the members of the Policy Committee of their tenure and the Secretary of the American Society of Parasitology within three weeks after the annual election; serve as member without vote and the Secretary of the Policy Committee: and supervise all funds of the Conference.

6. The Program Officer shall be responsible for the general format of the Conference and for arranging suitable facilities and funding. It shall also be this person's responsibility to chair the special committee to determine and collect the registration fee for the Conference. The format of the Conference may vary, but should include both a demonstration session and a session of contributed papers, both open to all members. A symposium may also be included or may replace a session of contributed papers.

7. The Policy Committee shall determine by majority vote all matters of procedure and policy pertaining to the Conference upon which decision must be reached between consecutive Conferences, as well as all matters referred specifically to it by the membership. Such a vote may be requested by any member of the Conference but must be directed through the Secretary/Treasurer. The Chairperson of the Policy Committee shall request approval by the membership for all decisions of the Committee at the earliest subsequent business meeting of the Conference.

8. The Conference confers three major awards during its annual meeting to student participants. These are the Chester A. Herrick Award, sponsored by the Eli Lilly Co., for the best poster/demonstration of parasitological research, the George A. LaRue Award for the best oral presentation of parasitological research, and the Raymond M. Cable Award for best presentation given by an undergraduate student. Honorable mention awards will be given to the second place poster/demonstration and second place oral presentation at the discretion of the awards committee. All awards except for the Herrick Award are supported by donations from the AMCOP membership.

9. (a) The winner of each award will be selected by a 3-person committee appointed at each annual meeting by the Presiding Officer. The criteria for judgment will be established each year by the committee.

   (b) The size of the Herrick and LaRue awards shall traditionally be $300.00. The Cable undergraduate award and honorable mention awards

makeup, particularly major histocompatibility genes, because although functional immunological responses may not correlate to helminth burden, fine-scale molecular differences between hosts may exist.

4 Examination of the surface antigen (*SnSAG)* gene family in *Sarcocystis neurona.* **A.GAUTAM (GS)[a]**, S. DANGOUDOUBIYAM (PD)[a], J.P. DUBEY[b], W.J. SAVILLE[c], AND D.K. HOWE (MP)[a], [a]M.H. Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington, KY 40546, [b]United States Department of Agriculture, Agricultural Research Service, Animal and Natural Resources Institute, Parasite Biology, Epidemiology and Systematics Laboratory, Beltsville, MD 20705, [c]Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, Columbus, OH 43210.

Sarcocystis neurona is a protozoan parasite whose complex life cycle progresses through multiple developmental stages that differ morphologically and molecularly. The *S. neurona* merozoite surface is covered by multiple related proteins, which are orthologous to the surface antigen (*SAG*) gene family of *Toxoplasma gondii*. Expression of the SAG surface antigens in *T. gondii* and another related parasite *Neospora caninum* is life cycle stage-specific and seems necessary for parasite transmission and persistence of infection. In the present study, expression of the *S. neurona* merozoite surface antigens (SnSAGs) was evaluated in the sporozoite and bradyzoite stages. Western blot was used to compare SnSAG expression in merozoites versus sporozoites, while immunocytochemistry was performed to examine expression of the SnSAGs in merozoites versus bradyzoites. These analyses revealed that SnSAG2, SnSAG3 and SnSAG4 are expressed by sporozoites, while SnSAG5 appeared to be downregulated in this life cycle stage. In *S. neurona* bradyzoites, SnSAG2, SnSAG3, SnSAG4 and SnSAG5 were either absent or expression was greatly reduced. Additionally, an effort was made to identify new SnSAGs in the draft sequence of the *S. neurona* genome. Multiple searches revealed several potential new *SnSAG* genes, and bioinformatic analyses of the sequences revealed characteristics consistent with the *SAG* gene family. Studies are underway to characterize the proteins encoded by these putative *SnSAG* genes in detail. The information acquired

about the stage-specific expression of the SnSAGs together with identification of new SnSAG paralogues should provide a better understanding of the parasite, its complex life cycle, and its pathogenesis during infection of host animals.

5 Parasites of native and invasive fish of the Wabash River and the potential for enemy release in invasive silver carp (*Hypopthalmichthys molitrix*). **JUSTIN WILCOX (GS)**, and JEFFRY LAURSEN (MP), department of biology Eastern Illinois University, Charleston IL, 61920.
Invasive species represent a serious threat to biodiversity and have the potential to cause significant economic damage. Although the majority of non-native species introduced into most habitats do not seem to establish, proliferate and spread to the point of causing observable damage, there are a significant minority that achieve biological successes far beyond what they do in their native ranges. As such a proper understanding of factors leading to invasion success is essential for proper prevention and management of invasive species. Parasites and pathogens are theorized to play an important role in invasions, both as potential mediators of the population growth of invasive species and as invasive species themselves. This study examines and compares the abundance and species richness of digestive tract helminths in native and invasive fish of the lower Wabash River, a single waterpool over 600 kilometers in length. Two species of invasive carp, the silver carp (*Hypopthalmichthys molitix*) and the common carp (*Cyprinus carpio*), as well as four species of ecologically or taxonomically similar native fish, gizzard shad (*Dorosoma cepedianum*), freshwater drum (*Aplodinotus grunniens*), quillback carpsucker (*Carpiodes cyprinus*), and river shiner (*Notropis blennius*) were dissected to evaluate the potential for the invasive carp to be experiencing an enemy release, search for invasive parasites, assess the impact of these invasive fish on the population dynamics of the overall community of fish parasites, and survey the parasites of common fish of the Wabash River. An additional 29 silver carp were also dissected from the Illinois River. No parasites whatsoever were found in the 82 silver carp that were dissected. The probability of obtaining these results if silver carp had double digit prevalences of gut helminths as is observed in comparable natives and their home range, is less than 0.001 indicating that they are experiencing a release from parasites at both the community and geographic levels. A logistic

2. The officers are a Presiding Officer, whose term of office is one year or until a successor is elected (normally the term expires with adjournment of the annual Conference over which the person presides); a Secretary/Treasurer, whose term of office is two years or until a successor is elected; a Program Officer whose term of office is one year; and a Policy Committee composed of the last five available retired Presiding Officers plus, *ex officio* and without vote, the current Presiding Officer and Secretary/Treasurer. All terms of office of each full member of the Policy Committee is five years, or so long as the person is one of the five most recent, available Presiding Officers. The most recent past Presiding Officer available chairs the Policy Committee and is the Vice-President of the current Conference.

3. The Presiding Officer, the Secretary/Treasurer, and the Program Officer are elected by a majority vote of those members attending a regularly scheduled business meeting of the Conference or by a majority vote of those replying to a mail ballot of the membership.

4. The Presiding Officer shall preside at all meetings of the Conference and shall arrange for a banquet speaker. On the first day of a Conference the Presiding Officer shall appoint the following committees, which shall serve until they have reported on the last day of the annual Conference:

   (a) Nominating Committee,

   (b) Committee to Recommend Future Meeting Places,

   (c) Committee to Suggest Program Possibilities for Future Meetings,

   (d) Resolutions Committee,

   (e) Judging Committee,

   (f) Audit Committee,

   (g) such other *ad hoc* committees as may be required.

   The Presiding Officer shall appoint the Conference Representative to the Council of the American Society of Parasitologists for the year, who must be a member of that society. The current Presiding Officer serves as a member without vote of the Policy Committee.

THE ANNUAL MIDWESTERN CONFERENCE OF PARASITOLOGISTS (AMCOP)

OBJECTIVES AND ORGANIZATION

A restatement to incorporate changes approved in 1989. Earlier statements have been approved in 1948, 1953, 1971, 1972, 1973, 1974, 1986, 2003 and 2004.

NAME

The organization shall be known as the ANNUAL MIDWESTERN CONFERENCE OF PARASITOLOGISTS (AMCOP), hereinafter referred to as the Conference.

AFFILIATION

The Conference is an affiliate of the American Society of Parasitologists.

OBJECTIVES

The Conference is a gathering of parasitologists and students of parasitology for the purpose of informal discussion of research and teaching in parasitology and the furthering of the best interests of the discipline of parasitology.

MEMBERS

The Conference is open to all interested persons regardless of place of work, residence, or affiliation in other recognized societies. There are three categories of membership: Emeritus, Regular, and Student. When a member retires from industry, university or other professional occupation, that person shall be eligible for emeritus membership.

DUES

Annual dues are required for emeritus, regular and student membership. A registration fee is charged during registration at annual conferences. The amount of this fee will be decided for each Conference by a committee composed of the Presiding Officer, the Secretary/Treasurer, and the Program Officer, who is to serve as its chair. Dues are established by the Policy Committee and collected by the Secretary/Treasurer.

MEETINGS

The Conference is held in the general midwestern area during early to mid-June, unless otherwise specified by a majority vote of the previous Conference or a majority vote of those listed members replying by mail.

BYLAWS

1. Simple majority vote of members in attendance at regularly scheduled meetings of the Conference shall determine the policies of the Conference.

regression indicates a significant difference in the probability of a fish being infected with any parasite based on species.

6 Characterization of Farnesyl Pyrophosphate Synthase and Geranylgeranyl Pyrophosphate Synthase in *Schistosoma mansoni* and their role as potential drug targets. **PETER D. ZINIEL (GS)**[1,2], CYNTHIA L. CASS (PD)[1], CRAIG GATTO (P)[1], ERIC OLDFIELD (P)[3], DAVID L. WILLIAMS (MP)[1,2*]
[1] School of Biological Sciences, Illinois State University, Normal, IL 61790, USA. [2] Department of Immunology /Microbiology, Rush University Medical Center, 1735 W Harrison Street, Chicago, IL 60612 USA. [3] Department of Chemistry, University of Illinois, Urbana, Illinois 61801 USA.
Schistosomiasis affects over 260 million people worldwide with over 200,000 deaths annually. There is currently only one drug available for disease treatment, praziquantel. We report here that *Schistosoma mansoni* farnesyl pyrophosphate (PP) synthase (*Sm*FPPS) and geranylgeranyl PP synthase (*Sm*GGPPS), which are essential enzymes in many eukaryotes involved in protein prenylation and the generation of sterols and non-sterol products of mevalonate, could serve as drug targets for the treatment of schistosomiasis. In humans, FPPS is a target for bisphosphonate drugs widely used in bone resorption therapy. Validation of FPPS and GGPPS as drug targets may allow the repositioning of bisphosphonates for schistosomiasis treatment. *Sm*FPPS and *Sm*GGPPS have 35% identity to human FPPS and 53% identity to human GGPPS, respectively. We successfully expressed active, recombinant *Sm*FPPS and *Sm*GGPPS. Recombinant *Sm*FPPS was found to be a soluble 44.2 kDa protein while *Sm*GGPPS was a 38.3 kDa soluble protein. Characterization of the substrate utilization of the two enzymes showed that, unlike human enzymes, which display strict substrate specificity, both worm enzymes we able to couple isopentenyl PP with three allylic acceptors (dimethylallyl PP, generanyl PP, and farnesyl PP). This indicates that the schistosome enzymes have overlapping substrate specificities, making their actions appear to be redundant. Against *Sm*FPPS, several bisphosphonates had IC_{50}s in the low nanomolar range; these inhibitors had significantly less activity against *Sm*GGPPS. While hydrophilic bisphosphonates had no activity against cultured adult parasites, a lipophilic bisphosphonate at 50 µM was active against *ex vivo* adult worms with worm death occurring over 4-7 days. These results indicate that FPPS and GGPPS

could be important targets for drug development in the search for new drugs for the treatment for schistosomiasis.

7 Parasites of bobcats in southern Illinois. **SHELBY HIESTAND** (GS), AGUSTIN JIMENEZ (MP) and CLAYTON NIELSEN (MP), Department of Zoology, Southern Illinois University Carbondale, Carbondale, IL 62901.

Bobcats (*Lynx rufus*) are the most abundant and widely-distributed wild felid species in North America. Bobcat populations have grown throughout their distributional range since reaching historical lows during the mid-20th century. Increasing population densities of bobcats raises concerns about how they influence the wildlife community as a host for parasites. Although many parasites found in bobcats also infect other wild and domestic animals, knowledge of bobcat parasites and potential impacts on other species has received relatively little study . Our objectives are to determine endoparasite presence and intensity within bobcats in southern Illinois and identify possible relationships between parasite communities and age, sex, and occupancy of bobcats and sympatric mammalian species. We are examining road-killed bobcats and scat for parasites in southern Illinois, where bobcat populations are thriving in the absence of human harvest. Necropsies will be performed on road-killed bobcats examining the body cavity and internal organs for parasites. Bobcat scat will be collected along roads and trails according to a probability gradient of bobcat occupancy. Preliminary examinations of bobcats have shown infections by *Alaria americana, Ancylostoma sp., Teania rileyi, Teania sp., Toxocara leonia, Toxocara cati* and *Capillaria sp*. Following collection and identification, multiple regression will be used to examine trends between parasites and bobcat sex, age, and occupancy. These results will be used to develop a parasite risk map for bobcats and sympatric carnivore species in the region. Our study will provide information to wildlife biologists regarding the potential impacts of growing bobcat populations as a health risk for both wild and domestic animals.

8. All AMCOP members, especially the students, who presented papers and posters making the meeting an educational experience for all,
9. The members of AMCOP who gleefully and without hesitation agreed to serve as Committee Members for this meeting,
10. The staff of the Western Illinois University Union for providing excellent service for our opening reception, continental breakfasts, refreshment breaks and banquet,
11. Western Illinois University and the staff of the University Union for providing excellent facilities for paper presentations, poster displays and the silent auction,
12. The membership of AMCOP for support of the G.R. LaRue Award for outstanding platform presentation, the Honorable Mention Awards, the Raymond Cable Award for outstanding undergraduate presentation, and travel awards for student winners,
13. Members of AMCOP who contributed books, journals, and esoterica for the silent auction, and finally,
14. Dr. Doug Woodmansee for continuing his fine job as our Secretary/Treasurer - as certified by the Auditing Committee!

AMCOP 62
REPORT OF THE RESOLUTIONS COMMITTEE
Tom Platt and Darwin Wittrock

Whereas the 62nd Annual Midwestern Conference of Parasitologists met at Western Illinois University, home of the Leathernecks, at Macomb, Illinois on 3-5 June 2010, and

Whereas the meeting was of the highest quality, promoting the field of parasitology as well as fellowship among those in attendance, and

Whereas, the membership of AMCOP wishes to acknowledge the contributions of the following individuals to the success of the 62nd annual conference,

Therefore be it resolved that we acknowledge with UTMOST THANKS the following:

1. Dr. Shawn Meagher, Program Officer, for his meticulous planning that made for a VERY successful conference,
2. Dr. Jeffrey Laursen, Presiding Officer, for his efficiency in conducting the meeting,
3. Our symposium speakers, Dr. David Elliot of the University of Iowa, for his presentation entitled, "Helminths: Do they belong in our Immune Ecosystem" and Dr. John O. Fleming of the University of Wisconsin, for his talk on "Parasites as Old Friends: Multiple Sclerosis,"
4. Richard Anderson, Associate Dean of the College of Arts and Sciences, and Paul Nollen, Professor Emeritus in Biological Sciences, for their welcoming remarks and comparison of the previous AMCOP held at Western Illinois in 1982 with the current meeting,
5. The American Society of Parasitologists for providing travel funds for our speakers,
6. ELANCO Animal Health, a division of Eli Lilly Company, for its continued support of the C.A. Herrick Award for the outstanding poster session,
7. Dr. Timothy Yoshino of the University of Wisconsin for his banquet address "Frankenflukes: Parasitic GMO's,"

8

Toward the understanding of the function of Phytochelatin synthase in *Schistosoma mansoni.* **CORALINE RIGOUIN (PD)**, Elsye Nylin (T), Debalina Ray and David L. Williams (MP), Department of immunology and microbiology, Rush University Medical Center, Chicago, IL 60612.
Schistosomiasis is a parasitic disease caused by blood flukes of the genus *Schistosoma*, responsible for more than 280,000 deaths annually. The treatment of the disease relies on a single drug, praziquantel. Because it is a cost-effective drug, it has been disseminated through control programs; hence, it is likely that resistance of the parasite to the drug emerge. Therefore, there is an urgent need to identify new targets and drugs for schistosomiasis treatment. We are currently investigating the potential of phytochelatin synthase (PCS) as a drug target in *S. mansoni*. This enzyme is of particular interest since humans do not have a PCS gene in their genome. PCS is a cysteine protease-like enzyme that catalyzes the production of glutathione-derived peptides, the phytochelatins (PCs), with a structure $(\gamma Glu\text{-}Cys)_nGly$ (n=2-11). These peptides are known to be involved in heavy metal detoxification and accumulation (Pal and Rai 2009). To assess the function of this protein in *S. mansoni*, studies on the recombinant enzyme have been carried out. Recent work with the purified recombinant *S. mansoni* enzyme showed evidence for the production *in vitro* of PCs $(\gamma Glu\text{-}Cys)_nGly$, with n=2-7) from glutathione. Interestingly, using glutathione-S-bimane as a substrate, *S. mansoni* PCS was found to be capable of cleaving the glycine residue yielding the corresponding γGlu-Cys-S-conjugate. To investigate the role of the enzyme in vivo, cultured worms were submitted to different stress conditions that could potentially trigger an increase in PCS expression. We found that mRNA levels of PCS increase in response to stress (heavy metals and drugs) and shows the same upregulation as other proteins involved in stress responses. These data attest to the role of PCS in potential detoxification pathways, for both heavy metal scavenging and xenobiotic-glutathione conjugate degradation, making this enzyme likely to be necessary for parasite survival, particularly in stress conditions. We are currently developing a biochemical assay that could be used in a high throughput manner that would allow us to screen for inhibitors. Identification of PCS inhibitors will help us to understand the function of the protein in the parasite and will

be used to assess its potential as a drug target in a mouse model of infection.

9 The taxonomic placement of *Litomosa and Litomosoides* relative to their use of hosts. **F. Agustín Jiménez**[1], Juliana Notarnicola[2] and Scott L. Gardner[2]. [1]Department of Zoology, Southern Illinois University Carbondale, Carbondale, IL 62901; [2]Harold W. Manter Laboratory of Parasitology, University of Nebraska, Lincoln NE 68588.
Litomosoides includes 35 species that infect marsupials, bats, hystricognath and sigmodontine rodents. Monophyly of this group is supported by the structure of the buccal capsule. Two morphological types "*carinii"* and "*sigmodontis"*- are currently recognized based on characters of the males. Species in this group have a subtropical distribution ranging from northern Patagonia, Argentina to the southern United States; with their geographical distribution apparently correlated with the range of their mite vectors (Macronyssidae). *Litomosoides thomomydis* and *Litomosoides westi* are two filaroid nematodes that occur in pocket gophers from the central Rockies and central great plains of North America. These two species were excluded from *Litomosoides* on the basis of morphological characters (Brant and Gardner, 2000). An analysis of a set of 13 species belonging to these two genera was performed using partial sequences of two mitochondrial markers, cytochrome oxidase I (COI) and ribosomal small subunit (12S). Data-sets were analyzed independently using maximum likelihood and Bayesian algorithms as optimality criteria. Both analyses are incongruent relative to the position of *L. westi.* This taxon is included in *Litomosoides* using COI, yet it is not part of the in-group using 12S. Characters that define the two taxonomic types as well as known vectors and geographic distribution were mapped into the phylogeny. The analysis reveals events of host switching for definitive hosts but not for the vectors. A more extensive taxon sample is necessary to draw general conclusions on the patterns of host-switching occurring at this level.

10 Effect of Host Sex and Age on White Grub (*Posthodiplostomum minimum*) Infection in Bluegill from Spring Lake, IL. **JULIA WIEDERHOLD (UG)**, SHANNON BARRY (UG), MIKALA MARENO (UG), THEODORE PAUL (UG), KEELEY VANVLEET (UG), BETH LANE

AMCOP 65 – 2013: Purdue University, West Lafayette, IN
AMCOP 66 – 2014: The University of Kentucky, Lexington KY
AMCOP 67 – 2015: Lawrence University, Appleton, WI

Secretary-Treasurer Woodmansee presented the treasurer's report for 2009 and the interim financial report for 2010. These were approved upon the recommendation of the Auditing Committee.

At the business meeting a correction was made to the minutes of the previous meeting. The value of the travel grants should have been stated as $200. The conference approved, by unanimous vote, raising the value of the Cable Award to $200. There was discussion of AMCOP paying dues to the World Federation of Parasitologists. Payment of dues would allow AMCOP to vote on Federation issues including the location of future International Congresses. No decision was reached. It was suggested that the benefits of dues payment be investigated more thoroughly and the issue brought back to the group in 2011. There was discussion of the ongoing surplus in AMCOP's bank accounts. The travel grant program has not lowered those surpluses. Various alternatives were discussed and an ad hoc committee was named to investigate the issue further and generate a proposal. Persons named to the committee were Kim Bates, Matt Bolek, Agustin Jimenez, Shawn Meagher, and Tim Yoshino.

The following committee reports were received and approved: Auditing (Dennis Minchella), Symposium Suggestions (Matt Bolek, Agustin Jimenez), Meeting Sites (Judith Humphries, Jason Curtis), Nominating (Shelly Michalski, Joe Camp), and Resolutions (Tom Platt, Darwin Wittrock).

Officers elected for 2011 were: Dr. Shelly Michalski, University of Wisconsin - Oshkosh: Presiding Officer; Dr. Tom Platt, St. Mary's College: Program Officer. Dr. Douglas Woodmansee, Wilmington College will serve the second year of his 2 year term.

Submitted June 10, 2010.
Douglas B. Woodmansee
AMCOP Secretary-Treasurer

Summary of the 62st Annual Midwestern Conference of Parasitologists.

The 62nd Annual Midwestern Conference of Parasitologists was held on June 3-5, 2010, at Western Illinois University in Macomb, Illinois. Dr. Jeffrey Laursen of Eastern Illinois University served as Presiding Officer, and Dr.Shawn Meagher of Western Illinois University made local arrangements and served as Program Officer. Ten platform presentations and 6 posters were presented by members. The C. A. Herrick Award and $300 for outstanding poster was awarded to Kathryn Coyne for her poster "Investigation of Biomphalaria galbrata plasma factor(s) possessing in vitro toxicity to Fascioloides magna miracidia" The G. R. LaRue Award and $300 for outstanding platform presentation was awarded to Philip Scheibel of Southern Illinois University for his presentation "Evaluation of synlophe and bursa as taxonomic characters for Viannaiinae (Nematoda: Trichostrongyloidea)." Bryan Rolfsen of Eastern Illinois University received the R. M. Cable undergraduate award and $100 for his oral presentation on "A parasitological survey of pen-raised Bobwhite Quail (Colinus virginianus) in Illinois." An Honorable Mention award and $100 was given to Kathy Johnson of Purdue University for her presentation entitled "Investigation of the seasonal prevalence of gastrointestinal nematodes and protozoal parasites of naturally infected alpacas (Lama pacos) in the Midwest." Kathryn Coyne was chosen as the AMCOP nominee for the American Society of Parasitologists' student travel grant award for 2011.

The AMCOP symposium was presented by Dr. David Elliott of the University of Iowa who spoke on "Helminths: Do they belong in our Immune Ecosystem?" and Dr. John Fleming of the University of Wisconsin who spoke on "Parasites as old friends: Multiple Sclerosis." The banquet speaker was Dr. Tim Yoshino of the University of Wisconsin who spoke on "Frankenflukes: Parasitic GMOs." A silent auction of a large selection of books, photographs and journals was held.

AMCOP 63 will be held in 2011 at St. Mary's College in Notre Dame Indiana. Additional future meeting sites as determined by the meeting sites committee are:

AMCOP 64 – 2012: Truman State University, Kirksville, MO

(GS), SHAWN MEAGHER (MP), Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. Parasites affect all forms of life including wildlife, domesticated companion animals, livestock, and humans. White grub (*Posthodiplostomum minimum*) is a parasite that commonly infects game fishes. Although it is well known that *P. minimum* infects bluegill (*Lepomis macrochirus*), little is known about whether *P. minimum* prefers a specific sex or age class of host. Two standard measures of parasite infection are "prevalence", the percentage of the host population that is infected, and "intensity", the total number of parasites found in an infected host. For this study 24 bluegill individuals were collected from Spring Lake in McDonough County, Illinois. These fish were then weighed, and total length was measured as an index of relative age. Fish were dissected to determine the intensity of their infection. Fish were sexed by gonad identification, which yielded 13 males and 9 females. The fish were also aged by counting the number of annuli on their otoliths (small ear bones), then broken down into two age classes: one-to-two year olds (n = 13) and three-to-four year olds (n = 11). Sex had no effect on prevalence ($X^2 = 0$, df = 1, $P = 1$), nor intensity ($t = 0.96$, df = 11.56, $P = 0.355$). There was no effect of age class on prevalence ($X^2 = 0$, df = 1, $P = 1$). However, there was a significant effect of fish length on intensity ($F = 8.92$, df = 1, $P = 0.008$). Since older age class fish are longer ($t = 4.07$, df = 17.2, $P = 0.0008$), this means that intensity increases with age. In conclusion, bluegill sex has no effect on white grub infection in this lake. Larger fish have higher infection intensities, and this may be due to longer time of exposure, or a greater surface area for parasite penetration.

11 Endoparasite Survey in Bobcats (*Lynx rufus rufus*) From Ohio. **MARKAH FROST (UG), SARAH JOHNSTON (UG),** SUZIE PRANGE*, and RAMON A. CARRENO (MP), Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015, *Waterloo Wildlife Research Station ODNR, Division of Wildlife, 360 East State Street Athens, OH 45701. After having been extirpated from the state, bobcats (*Lynx rufus rufus*) have been returning to a currently suitable ecosystem in southern Ohio. The ecological impact of the return of this carnivore is unclear as are the factors determining the corresponding re-establishment of its parasite community. The recent return of this host coupled with

vehicular mortality provided an opportunity to document the likely re-establishment of bobcat parasites in Ohio. A total of 90 bobcats from 21 southern Ohio counties were examined for parasites, including 44 entire carcasses and 46 gastrointestinal tracts. Seventy (77.8%) of the 90 bobcats harbored one or more species of parasite. Parasites identified included *Taenia rileyi*, *Taenia macrocystis*, *Toxocara cati*, *Toxascaris leonina*, *Ancylostoma* sp., and *Molineus barbatus*. In addition, parasites resembling *Filaroides rostratus* were found in bobcat lungs from 3 Ohio counties. These findings provide baseline data for the early re-establishment of bobcats in Ohio and a template for future documentation of parasites for the expected population increase in this state.

12 The Role of ARF1 in coatomer recruitment in *Toxoplasma gondii*. **ALLISON KRESS (UG), MONICA MCNERNEY (UG), and EMILY SIEBERT (UG)**, Department of Biology, University of Notre Dame, Notre Dame, IN 46556.
Toxoplasma gondii is an obligate intracellular parasite that must produce, package, target, and ultimately secrete proteins in order to invade host cells. Rules regulating protein packaging and targeting throughout the secretory pathway are well understood in mammalian cells. Coatomer binding regulates protein targeting in mammalian cells. When activated by GTP, ARF1 binds coatomer to vesicles. Our research focuses on determining whether this process holds true in *Toxoplasma gondii,* specifically studying ARF1's role in recruiting the coatomer component, ßCOP. We hypothesize that ARF1 is responsible for the recruitment of coatomer TgßCOP. To test this, we treated *T. gondii* with the drug brefeldin A (BFA). In most cells, BFA delocalizes ßCOP by targeting the SEC7 region of the ARF-GEF complex and thus deactivating ARF1 (Zeghouf, *et. al*, 2005). In our treatment of *T. gondii*, ßCOP did not delocalize as expected but instead localized in the Golgi region in a less distinct and more rounded shape than it localized in untreated cells. These results suggest that the protein trafficking rules of *T. gondii* differ from those of mammalian cells. Because BFA targets a region of the ARF/GEF complex, we hypothesize that either the ARF1 or GEF of *T. gondii* is different from that in most other cells. To determine if the ARF1 or GEF of *T. gondii* is unique, we are utilizing a three pronged approach: mutational studies, chemical treatments, and bioinformatics. The effects of dominant negative and positive ARF mutants, T31N and

most effective and well-studied oxadiazole oxide (Rai *et al.*, 2009). The Gasco laboratory recently synthesized 49 novel oxadiazole oxides. These compounds were screened for activity at a concentration of 50 µM against adult *S. mansoni* worms *in vitro* for 48 hours. Activity was determined by percent survival. Of these 49 compounds, 7 were found to possess significant activity against *S. mansoni*, with 0% survival occurring between 4 and 48 hours. The activity of these compounds against *S. mansoni* was further studied at concentrations of 50µM, 10µM, 5µM for 168 hours (7 days). Of these compounds, only 2 compounds showed significant activity (0% survival) at 10µM, and no compounds killed worms completely at 5µM. Of the two compounds that were active at lower concentrations, one exhibited an unusual structure, with the electron-withdrawing group in position 4 of the oxadiazole ring rather than in position 3. This compound can spontaneously release NO, suggesting that it has a different mechanism of action than furoxan. Future studies on the mechanism of action of this compound will include series expansion and TGR modification assays.

25 The NIH Filariasis Research Reagent Repository Center (FR3) **SHELLY MICHALSKI and KATHRYN GRIFFITHS** University of Wisconsin-Oshkosh, Oshkosh, WI 54902.
The NIH Filariasis Research Reagent Repository Center (FR3) serves as a free source of filarial parasite and molecular materials, as well as technical protocols and advice, to facilitate and stimulate research in filarial diseases. The FR3 is also a great free-of-charge source of materials for instructional purposes. Filarial species available include: *Brugia malayi*, *Brugia pahangi*, *Dirofilaria immitis*. cDNA and gDNA libraries are also available for: *Onchocerca volvulus*, *Onchocerca ochengi*, *Brugia malayi* and *Wuchereria bancrofti*. Additionally, we provide filarial infected and uninfected adults and eggs of filarial susceptible *Aedes aegypti*. Visit the booth to learn about all of our materials and services and our FREE hands-on workshop!

sequence tags along with 454 transcriptome data from the extracellular merozoite stage are being used to aid genome annotation, particularly to determine transcription start sites, splice junctions and alternatively-spliced transcripts. Limited 454 transcriptome datasets for the intracellular schizont stages at early and late endopolygeny were also generated. Preliminary analysis of the parasite's transcriptome from different developmental stages showed evidence for the presence of stage-specific gene expression. The transcriptome information will be mapped to the genome and deposited at SarcoDB for use by other researchers. The availability of annotated genome sequences for *S. neurona* and other apicomplexans at EuPathDB will help to understand the evolutionary and phylogenetic relations between the parasites belonging to this important phylum. The genome and transcriptome information will provide insight into the complex biology of *S. neurona*, and will be a valuable resource for mining potential diagnostic and vaccine candidates and targets of chemotherapeutic agents. The *S. neurona* genome and transcriptome sequences will also serve as a reference for comparative genomics to reveal molecular diversity among different strains of *S. neurona* and other *Sarcocystis* species.

24 Novel oxadiazole oxide activity against adult *Schistosoma mansoni* worms *in vitro*. **VALERIE P. KOMMER (T)**, LATASHA DAY (T), ROBERTA FRUTTERO (P), ALBERTO GASCO (P), DAVID L. WILLIAMS (MP), Division of Immunology/Microbiology, Rush University Medical Center, Chicago, IL 60612 and Dipartimento di Scienza e Tecnologia del Farmaco, Università di Torino, Italy

Schistosomiasis is a chronic infectious disease caused by trematode flatworms of the genus *Schistosoma.* This neglected disease is prevalent in tropical and sub-tropical areas and affects over 200 million people worldwide, causing more than 200,000 deaths each year. Praziquantel is currently the only treatment available for this disease. Recent studies have shown that oxadiazole oxides show promise in developing a novel antischistosomal agent due to their ability to inhibit thioredoxin glutathione reductase (TGR), a redox enzyme biochemically unique to *S. mansoni*. These compounds also serve as nitric oxide (NO) donors, adding to their antischistosomal properties. Furoxan is currently the

Q71L respectively, will be tested in *T. gondii*. If ARF1 is responsible for TgßCOP recruitment, we expect to see delocalized TgßCOP parasites that contain T31N and localized TgßCOP in those that contain Q71L. We will also test the effect of GTPγS , a nonhydrolyzable GTP, on *T. gondii.* If ARF1 is responsible for ßCOP recruitment, we expect to see localized TgßCOP in cells treated with GTPγS . If our results confirm ARF1's role in TgßCOP recruitment, we hypothesize that *T. gondii*'s resistance to BFA arises due to novel ARF-GEF factors. Should this be the case, we will carry out an intensive data-mining effort directed at identifying all ARF-GEFs in the *T. gondii* genome. We will compare the sequence of the SEC7 region of *T. gondii* to known ARF-GEF factors in other systems. By analyzing the GEF of T. gondii, we will determine what mutation causes its BFA resistance. If we observe that TgßCOP is not ARF1 specific, then we conclude that a factor besides ARF1 recruits TgßCOP. Should this be the case, we will carry out an intensive data-mining effort directed at identifying all ARFs in the T. gondii genome. We will characterize them by sequence and determine if a mutation in the sequence of ARF1 causes the change in TgßCOP recruitment or if a different ARF altogether recruits ßCOP. These studies provide a baseline of comparison to determine the extent of *T. gondii*-specific differences and allow for the development of novel therapeutic approaches for treatment of infection.

13 Hybrid praziquantel-oxadiazole oxides with activity against *Schistosoma mansoni*. **DANIELA CORTESE (UG)[1,2]**, Stefano Guglielmo (PD)[2], Roberta Fruttero (P)[2], Alberto Gasco (MP)[2], Latasha Day (T)[1] and David L. Williams (MP)[1]
[1]Department of Microbiology and Immunology, Rush University Medical Center, Chicago, IL, 60612, USA [2] Dipartimento di Scienza e Tecnologia del Farmaco, Università di Torino, Via Pietro Giuria 9, I-10125 Torino, Italy.
Today around 200 million people world-wide are infected with schistosomiasis and more than 200 000 people die every year for this neglected disease. Praziquantel is the only drug currently administrated, but as praziquantel-resistant worms have been found, the development of new anti-schistosomiasis drugs is urgently needed. Recently, several oxadiazole oxides have been shown to have good activity against *Schistosoma mansoni*. However, the shortcomings of these compounds are

limited aqueous solubility and rapid metabolic degradation. For this reason we thought that the incorporation of the praziquantel structure may increase the efficiency of drug delivery and stability. Six novel oxadiazole oxides hybrids with praziquantel were synthesized: three of them with furoxan and three with furazan moieties replacing the hexane ring of praziquantel. Only the praziquantel hybrid with the furoxan-3-carbonitrile moiety and the praziquantel hybrid with the furoxan-3-carboxamide had significant activity against adult, *ex vivo* worms. The *in vitro* approach consisted of overnight exposure of parasite cultures to five different concentrations of each compound, followed by eight-day culture in drug-free medium. After exposure to the compounds it was observed in some treatments that contraction and worm phenotype changed. The contraction in the presence of hybrid compounds was similar to that seen in the presence of authentic praziquantel. Interestingly, upon removal of drugs, the parasites regained their normal morphology and some were able to survive for eight days, except for the furoxan-3-carbonitrile hybrid which killed all worms at 50 μM. The oxadiazole oxides are good inhibitors targeting thioredoxin glutathione reductase (TGR), which is considered to be an essential protein to schistosomes and a potential drug target. Therefore, we tested the inhibition of TGR activity by these compounds. The three furoxan hybrids were able to inhibit TGR at 50 μM. In the inhibitory mechanism of the furoxan moiety it is proposed that nitric oxide from furoxan produced on reaction with TGR reacts with cysteine and/or selenocysteine residues in the active site of TGR, leading to inactivation of the enzyme. Our data support this hypothesis. In future we will determine nitric oxide production from these compounds, the IC_{50} values of these compounds against TGR, and evaluate whether the most potent compounds can decrease worm burdens in infected mice.

14 Parasite survey of American river otter (*Lutra canadensis*) and fisher (*Martes pennanti*) in Wisconsin**. JESSICA NERENHAUSEN (UG)**, BRANDON DEBBINK (UG) , MAURITZ STERNER (PD), REBECCA COLE (PD), and MICHELLE MICHALSKI (MP), University of Wisconsin-Oshkosh, Oshkosh, WI 54902.
A parasite survey was done on two Wisconsin mustelid species in 2010-2011. American river otter (*Lutra canadensis*) and fisher (*Martes pennanti*) specimens were

evaluated by Western blot and ICC analyses in inbred susceptible (NMRI) and resistant (BS-90) *B. glabrata* strains. Results revealed both qualitative and quantitative differences in glycan expression on plasma and hemocyte proteins, with NMRI snails exhibiting higher levels of plasma protein-associated shared glycans than those of the BS-90 strain. Conversely, quantification of glycan-expressing hemocyte subpopulations revealed an overall greater level of shared glycotope expression in BS-90 cells than NMRI. Moreover, treatment of blotted hemolymph components or fixed hemocyte populations with larval transformation proteins (LTPs) released by in vitro cultured miracidia/sporocysts significantly modulated anti-glycan reactivity indicating a complex interaction between host hemolymph proteins, shared glycans and LTPs released during initial larval infections.

23 A genome sequencing project for the apicomplexan parasite *Sarcocystis neurona.* **SRIVENY DANGOUDOUBIYAM (PD)** [1]**,** DANIEL K. HOWE (MP) [1], ABLESH GAUTAM (GS)[1], CHRISTOPHER L. SCHARDL[2,3], JOLANTA JAROMCZYK[3], TOMMY BULLOCK (GS)[3], JESSICA C. KISSINGER[4], JOSHUA BRIDGERS (GS)[4], SIVARANJANI NAMASIVAYAM (GS)[4].[1]Department of Veterinary Science, University of Kentucky, Lexington, KY, USA. [2]Department of Plant Pathology, University of Kentucky, Lexington, KY, USA. [3]UK-Advanced Genetic Technologies Center, University of Kentucky, Lexington, KY, USA. [4]Department of Genetics and Center for Tropical and Emerging Global Diseases, University of Georgia, Athens, GA, USA.
The apicomplexan parasite *Sarcocystis neurona* is the primary cause of the neurologic disease equine protozoal myeloencephalitis and an emerging pathogen of marine mammals. To enhance gene discovery and to better utilize current technologies and experimental approaches (i.e., "omics"), a genome sequencing project for *S. neurona* was initiated. The genome project is using 454 pyrosequencing (shotgun and paired end) combined with Sanger paired-sequencing of fosmids, which has achieved 25x coverage of the parasite's genome. The genome sequence assembled into 167 scaffolds with an estimated genome size of 123.8 Mb. Preliminary BLAT (Blast-like Alignment Tool) analysis of the genome indicates the presence of a majority of genes shared by members of Apicomplexa. Annotation of the *S. neurona* genome is underway, and approximately 16,000 expressed

applications in the control of multiple neglected diseases (Ray and Williams, 2011). PCS catalyzes the synthesis of phytochelatins, glutathione-derived peptides that sequester toxic heavy metals in many organisms. In this study we have cloned and characterized the PCS of *A. ceylanicum* (AcePCS). The conserved catalytic triad of cysteine-histidine-aspartate found in PCS proteins and cysteine proteases is also found in AcePCS, as are several cysteine residues thought to be involved in heavy metal binding and enzyme activation. Studies on the recombinant enzyme showed evidence for the production *in vitro* of PCs [$(\gamma$Glu-Cys$)_n$Gly, with n=2-8] from glutathione. Quantitative PCR to evaluate AcePCS mRNA level from eggs, L1, L3, female and male worms showed that AcePCS is expressed in all of these stages, with the highest levels being found in male cDNA. These results give evidence of the presence and the activity of PCS in *A. ceylanicum* and establish the basis for further investigations that would lead to the elucidation of the function of PCS in the parasite and confirmation of this enzyme as a potential drug target.

Sharing of glycan structures between larval *Schistosoma mansoni* and hemolymph of *Biomphalaria glabrata* snails.

22 **XIAO JUN WU**[1], HONGDI LIU[1], LAURA GONZALEZ[1], ANDRE M. DEELDER[2] , CORNELIS H. HOKKE[2], TIMOTHY P. YOSHINO[1] [1]Department of Pathobiological Sciences, University of Wisconsin-Madison. [2]Department of Parasitology, Leiden University Medical Center, Leiden, The Netherlands

Molecular mimicry (Damian, 1964; 1979), the sharing of common molecular structures at the parasite-host interface, has been hypothesized as a possible mechanism by which the parasite may avoid or escape detection by the host's immune system. Since lectins (nonenzymatic carbohydrate-binding proteins) have been shown to function as pattern recognition receptors in innate immunity in mollusks, including B. *glabrata*, it also has been suggested that glycans presented by invading larvae may represent important ligands mediating host immune recognition/reactivity. Given this scenario, as protection against a lectin-based internal defense system, selection may have favored schistosome larvae that selectively exhibited similar glycan structures as the snail host, thereby reducing host immunoreactivity. In the present study, using a panel of schistosome glycan-specific monoclonal antibodies, crossreactivity with plasma and hemocyte glycoproteins was

obtained through the Wisconsin Department of Natural Resources. A survey of the hearts and lungs was performed on both species. Blood was collected from the heart and lungs, and then filtered to potentially find filarial parasites. Gross examination of the heart and lungs under a dissection scope was performed to look for heartworm and *Paragonimus*. In the river otters, 53 samples were surveyed. The prevalence of microfilariae in the blood was 1.89% (one positive out of 53). The prevalence of eggs in the blood was 1.89% (one positive out of 53). No parasites were found in river otter lungs upon gross examination. Six fisher samples were surveyed. The prevalence of nematodes in blood pooled from heart and lungs was 33% (2 positive out of 6). Lung washes revealed the presence of a nematode, possibly in the genus *Crenosoma*, with a prevalence of 50% (3 positive out of 6) and a mean intensity of 3.3 nematodes per fisher. Nematode larvae were found in the lung wash, with a prevalence of 100% (6 positive out of 6). A total of 6 fisher stomachs and intestines were also surveyed. A gut scrape was performed and a survey of the contents was conducted. 50% of the fishers surveyed were positive for intestinal parasites (7 positive out of 14). Two species of trematodes were found. One as of yet unidentified trematode species had a prevalence of 43% (6 positive out of 14) with a mean intensity of 62 worms per otter. The second trematode species had a prevalence of 29% (4 positive out of 14) with a mean intensity of 19.5 worms per otter. Nematodes were also present in the guts with a prevalence of 29% (4 positive out of 14) with a mean intensity of 6 worms per otter. In one case acanthacephalans were found with a prevalence of 7.1% (1 positive out of 14) and a mean intensity of 4 per individual. We will report identification of trematode and nematode species in our poster.

Characterization of miRNA Expression Profiles in *Leishmania* Infected Human Phagocytes.

15 **NICHOLAS GERACI (GS)**, JOHN TAN (PD), ERLIANG ZENG (PD), and MARY ANN MCDOWELL (MP). University of Notre Dame, Galvin Life Science Center, Notre Dame, Indiana 46556.

Background: Rare and neglected tropical diseases remain a continuing hindrance to the abilities of third world nations to compete in a global marketplace. *Leishmania major* (*Lm*) and *Leishmania donovani* (*Ld*) are intracellular protozoan parasites that cause approximately 1.5 million new cases of cutaneous

and 500,000 of visceral leishmaniasis respectively, per annum. These parasites avoid immune destruction when parasitizing host cells, eliciting unique cell type-specific gene expression profiles by their hosts and systems-wide clinical manifestations. Sand flies are the insect vectors of *Leishmania* parasites in tropical and subtropical regions, but global climate change has the potential to expand vector ranges into non-endemic areas, allowing for potential exposure and spread of the diseases to immunologically naive populations. With treatment, leishmaniasis is not typically fatal, but does cause severe states of morbidity and loss of labor potential for individuals. Purpose: A deeper understanding of the disease pathobiologies for more effective clinical interventions is a necessity. One far-reaching immunity attenuating mechanism may entail a parasite-specific influence upon expression of host cell micro(mi)RNAs, natural gene expression inhibitors. Methods: We developed a processing pipeline to isolate and sequence the full expression profile of small RNAs from human cells infected with *Ld* or *Lm*. Bioinformatics tools, including mirTools and the miRanda algorithm, aided in miRNA identification among the sequence data and gene transcript target predictions, validated through qPCR, elucidating infection correlations with immunologically relevant miRNA gene transcript target inhibition. Results: Preliminary data revealed a trend toward strong upregulation of miR-155 during *Lm* infections, which attenuates STAT molecular pathways during normal immune responses, but marginal concurrent upregulation of STAT1, validating this experimental methodology. Conclusion: This study serves as a pilot for further investigations into the roles of host miRNAs during *Ld* and *Lm* infections that will translate to new targets of therapeutic intervention, ultimately improving the health of nations striving to engage a global marketplace.

16 Inhibition of Newly-Discovered GPCRs in the Fight Against Malaria: Homology Modeling, Molecular Dynamics and Virtual Screening. **KEVIN KASTNER (GS)**[1], GUILLERMINA ESTIU (PD)[2], JESUS IZAGUIRRE (MP)[1], and MARY ANN MCDOWELL (MP)[3], *[1]Department of Computer Science and Engineering, University of Notre Dame, Notre Dame, IN 46556, [2]Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN 46556, [3]Department of Biological Sciences, University of Notre Dame, Notre Dame, IN 46556.*

associated with toxoplasmosis. While the mechanism behind this trend is not understood at this time, it is possible that *Toxoplasma gondii* infections have exerted and continue to exert a selection pressure on RhD blood type. This study examines the potential for this by analyzing blood type frequencies and the proportion of the population infected with *T. gondii* in 30 countries around the globe. There was a significant relationship between the level of *Toxoplasma gondii* prevalence (low, medium, or high) and blood type, although this relationship was not linear. Countries with medium levels (22-43% prevalence) of *T. gondii* infection had a significantly larger proportion of Rh negative individuals compared to countries with low (9.8-21.5% prevalence) and high (48-73.5% prevalence) levels of *T. gondii* infection. These results support the hypothesis that heterozygosity for the RhD gene may confer some protection against the effects of toxoplasmosis, and that *Toxoplasma gondii* may have played a role in determining global distributions of Rh blood type.

21 Cloning and Characterization of Phytochelatin Synthase from *Ancylostoma ceylanicum.* **ELYSE M. NYLIN**[1] **(T)**, Coraline Rigouin[1] (PD), Jon Vermeire[2] (P) and David L. Williams[1] (MP) [1]Department of Immunology/Microbiology, Rush University Medical Center, Chicago, IL 60612 [2]Department of Pharmacology, Yale University School of Medicine, New Haven, CT 06520

More than 600 million people worldwide are infected with hookworms, parasitic nematodes that attach to the intestinal mucosa and feed on blood. Hookworm infections cause growth delays and anemia, which is especially problematic for children and pregnant women. Transmission occurs mainly through physical contact with soil contaminated with infectious larvae. Because of its well-established impact on global health and clinical observations suggesting the evolution of drug-resistant parasites, there has recently been renewed interest in developing effective control measures for hookworm. We are investigating phytochelatin synthase (PCS) as a potential drug target in the human hookworm, *Ancylostoma ceylanicum*. This enzyme is of particular interest because humans do not have a PCS gene in their genome. The characterization of PCS has recently been described in the parasite *S. mansoni* and the authors have suggested that drug development targeting this enzyme may have widespread

diseases, including leishmaniasis, sand fly fever and bartonellosis. The most devastating of these diseases is leishmaniasis with 350 million people at risk and approximately two million new cases each year. We performed a global gene discovery analysis of two sand fly vectors, *Phlebotomus papatasi* and *Lutzomyia longipalpis*. Expressed Sequence Tags (ESTs) from normalized cDNA libraries from each species were compared. The resulting high quality reads (*Ph. papatasi* - 37,487; *Lu. Longipalpis* – 27,928) were assembled into unique sequences (6,187 contigs and 10,993 singlets for *Ph. papatasi* and 6,049 contigs and 11,101 singlets for *Lu. longipalpis*) using CAP3. Of these sequences 25% for each species had no similarity to proteins available in NR or in UniProt databases, when searched for using BLAST (blastx, e-value: 10^{-5}). Functional annotation was performed using the blast2GO algorithm: 8,837 (50%) *Ph. papatasi* sequences were annotated in one of the 3 GO categories (Biological process, Molecular function or Cellular component). The highest subcategories were catabolic process (Biological Process; 15%), nucleotide binding (Molecular Function; 16%) and protein complex (Cellular Component; 21%). *Lu. longipalpis* exhibited a similar distribution of GO subcategories (catabolic process, 13%; nucleotide binding, 16%; protein complex 19%). An in depth analysis of *Ph. papatasi* genes of interest was performed resulting in identification of 1 novel trypsin, 11 chymotrypsin, 2 aminopeptidases, 5 carboxypeptidases, 4 chitinases, 2 galectins, 4 C-type lectins, genes implicated in digestion and immune response. This project is the initial step in the sand fly genome sequencing effort to generate full genome sequences of both *Ph. papatasi* and *Lu. longipalpis.*

Toxoplasma gondii and global blood type distribution: a link between Rh factor and *T. gondii* infections. **JUSTIN WILCOX (GS)**, Eastern Illinois University, Charleston, IL, 61920.

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Toxoplasma gondii is a prolific protozoan parasites with a wide host specificity and wide geographic range. It infects over a third of the human population and is linked to a number of mental and psychiatric conditions such as schizophrenia, personality changes, and slowed reaction times. Multiple studies have shown that individuals with Rhesus factor positive blood types or individuals heterozygous for Rh factor seem to be protected against the slowed reaction times

Malaria is the most prevalent vector-borne disease in the world, threatening about 40% of the world's population. Mosquitoes transmit this deadly disease and thus the use of insecticides has been very beneficial in controlling the spread of malaria throughout the world. However, insecticide resistance is increasing, requiring the development of new, effective insecticides with novel modes of action. G-Protein Coupled Receptors, or GPCRs, comprise a highly important class of drug targets that has been underexploited for insect control. Due to the complexity of GPCR proteins, as well as being located in lipid membranes, few GPCR crystal structures have been elucidated. Yet, high homology has been discovered in the 3D structures of GPCRs, thus invoking the hypothesis that 3D molecular modeling utilizing an existing GPCR model template, coupled with simulations to fix any variation, creates a protein model amenable for virtual screening. As virtual screening has been found to successfully identify new active compounds, even finding antagonists for GPCRs, it is a good method of initially discovering new compounds that can then be verified experimentally. It should be possible to improve on the existing virtual screening methodology concerning GPCRs by creating a library of compounds made specifically for GPCR testing. To further improve on the virtual screening methodology, I will ask an interesting Molecular Dynamics (MD) question: "Is it possible to use MD simulations to determine if a compound is an agonist, antagonist, or inverse agonist of the GPCR?" The rationale is that the main difference between agonist-bound and antagonist-bound GPCR is entropic rather than enthalpic. This could be high impact since there is currently no methodology to predict the type of compound in-silico. The main goal of my research will be to use the results of the virtual screens against GPCR models to aid in insecticide development. The data concerning ligands found to bind to these receptors can be used to make inhibitors for the receptors and hopefully lead to the production of an insecticide that will be more effective than conventional means at countering the spread of malaria. I will focus on GPCRs that are unique to insects, therefore toxicity to humans will also be reduced. In addition to insecticide development, as some of these libraries contain ligands known to be naturally occurring, this research may also be used to better understand the mechanism of these proteins and potentially aid in future research.

Degradation and utilization of complex carbohydrates by *Trichomonas vaginalis*. **LAUREN D. NAWROCKI (GS)**, TYLER J. NIELSEN (GS), WAYNE A. WILSON[a] (MP), and ANDREW BRITTINGHAM (MP). Department of Microbiology and Immunology, and [a]Department of Biochemistry and Nutrition, Des Moines University, Des Moines, IA 50312.

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Trichomonas vaginalis is a protozoan parasite that is the causative agent of trichomoniasis, a widespread sexually transmitted disease that affects millions worldwide. Several reports suggest that infection with this protozoan correlates with a decrease in the glycogen content of the vaginal epithelium. Most studies of *Trichomonas vaginalis* include the maintenance of parasites in media containing either glucose or maltose as carbohydrate sources. Here, we demonstrate that *T. vaginalis* grows equally well in media containing the glucose polymers amylopectin or glycogen as the principal carbon source. Having demonstrated the ability of *Trichomonas* to grow and utilize these polymers to support growth, we sought to analyze cell pellets and culture supernatant for hydrolytic activity towards amylopectin. We hypothesized that *Trichomonas* utilizes glucose polymers by first degrading the polymers into smaller subunits. Our data indicate that *T. vaginalis* possess both cell-associated and secreted hydrolytic activity towards glucose polymers and that activity accumulates in the medium during growth. The presence of such robust activity suggests a role for degradation of glucose polymers during infection.

Testing iELISA methods for the diagnosis of *Dicrocoelium dendriticum* and *Fasciola hepatica* in red deer (*Cervus elaphus*) in northern Spain. **ANGÉLICA MARTÍNEZ (GS)** [1]., Mª SOL ARIAS[2]., ADOLFO PAZ[2]., PATROCINIO MORRONDO (MP)[2]., JESÚS GARCÍA[1]., NATIVIDAD DIEZ (MP)[1]., and Mª DEL ROSARIO HIDALGO (MP)[1]. [1]Animal Health Department, Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, León University 24071, León, Spain. [2]Animal Pathology Departament, Parasitology and Parasitic Diseases, Faculty of Veterinary Medicine, Santiago de Compostela University 27002, Lugo, Spain.

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The red deer (*Cervus elaphus*) occupies at the present all of the main ecosystems in Spain. Hunting is a traditional activity

that becomes a sustainable and profitable resource for many mountain areas in northern Spain. In this context it is necessary to investigate which agents may reduce their populations and, on the other hand, to control which of these could be shared with other species. Previous studies have demonstrated that *Fasciola hepatica* and *Dicrocoelium dendriticum* are present in wild ruminants in northern Spain. The red deer, because of its biology and trophic behaviour, can serve as an important alternative host for these parasites. The objective of the current research was to refine various immunodiagnostic techniques in *C. elaphus* and to establish which of the methods employed were the most sensitive and most practical in the management of these animals. To accomplish this, the prevalence of the parasites was determined by fecal techniques (sedimentation), necropsies, and various indirect ELISA methods (iELISA). For *D. dendriticum*, an iELISA with an excretory-secretory antigen (E/S) was used. In contrast, for *F. hepatica*, 3 types of iELISA (E/S, recombinant protein for early and current diagnosis of ovine fasciolosis (APS) and a commercial ELISA, BIO K 211) were tested. The prevalence of *D. dendriticum* was 50% by necropsy, 4.55% by fecal methods and 34 % by iELISA. The sensitivity was 5.45 % for fecal techniques and 34% by iELISA (E/S), corresponding to the same efficiency as if both techniques were combined. With respect to *F. hepatica*, the prevalence of infection was 12.7 % by necropsy, 5.5% by fecal methods, 6% by iELISA (BIO K 211), 13 % by iELISA (APS), and 32 % by iELISA (E/S). The highest sensitivity (58.33 %) was found to occur using the iELISA (E/S), a level that was more sensitive than the use of fecal analysis (21.42 %). The combined fecal-iELISA (E/S) had the most sensitivity (66.67 %). Our results indicate that the use of fecal methods in the diagnosis of hepatic trematodes in deer show very little efficiency. It is necessary to complement fecal techniques with immunodiagnostic methods that, in turn, represent a suitable alternative as rapid techniques and as a practical approach for analysing samples coming from hunters.

An in depth analysis of the *Phlebotomus papatasi* transcriptome. **JENICA L. ABRUDAN (GS),** Eck Institute of Global Health, Department of Biological Sciences, University of Notre Dame, IN 46556.

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Phlebotomine sand flies are important vectors for disease in both the Old and the New World, transmitting a variety of