



Vernon B. Carruthers, Ph.D.

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<http://sitemaker.umich.edu/carrutherslab/main>



CITIZENSHIP

Canadian; permanent resident in the USA

ACADEMIC POSITIONS

1998-2003 **Assistant Professor** (tenure track)

2004-2006 **Associate Professor** (tenure track)

W. Harry Feinstone Dept. of Molecular Microbiology and Immunology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

2006- **Associate Professor** (with tenure)

Department of Microbiology and Immunology, University of Michigan School of Medicine, Ann Arbor MI

*Structure/function and genetic analysis *Toxoplasma gondii* secretory proteins that participate in cell invasion and parasite survival during infection

*Proteomic discovery and analysis of novel parasite proteins involved in pathogenesis and virulence

*Proteolytic mechanisms in protein trafficking and surface shedding

*Mathematical modeling of parasite cell invasion

EDUCATION and TRAINING

1981-1985 **B.Sc. (with distinction) in Biochemistry**

University of Victoria, Victoria, BC, Canada

1986-1991 **Ph.D. in Microbiology**

Dept. of Microbiology and Immunology, University of Western Ontario, London, Ont., Canada

PI: Dr Michael W. Clarke, Ph.D.

*Structure/function of *T. brucei* variant surface glycoproteins

1991-1994 **Post-doctoral Fellow**

The Laboratory of Molecular Parasitology, The Rockefeller University, New York, NY

PI: Professor George A.M. Cross, Ph.D. FRS

*Genetic transformation and colony-based cloning of bloodstream-form *Trypanosoma b. brucei*

*Regulation of gene expression in *T. b. brucei*

1994-1998 **Research Associate**

Dept. of Molecular Microbiology, Washington University School of Medicine, St Louis, MO

PI: Professor L. David Sibley, Ph.D.

*Mechanisms of regulated protein secretion by *Toxoplasma gondii*

*Role of *T. gondii* adhesive proteins in cell invasion

ADDITIONAL RESEARCH EXPERIENCE

1984 **Undergraduate Research Assistant**

Dept. of Biochemistry and Microbiology, University of Victoria, Canada

*Regulation of metallothionein expression in mice and blue-green algae

1985-1986 **Research Assistant**

Dept. of Biochemistry and Microbiology, University of Victoria, Canada

*Characterization of *Leishmania* spp. cell-surface glycoproteins

1989 **Visiting Scientist**

MRC Laboratories, Fajara, The Gambia, West Africa

*Development of a latex particle agglutination test for the serodiagnosis of malaria

RESEARCH SUPPORT

Honors and Awards

1986 British Columbia Government Student Scholarship

1986 University of Western Ontario Entrance Scholarship
 1986 Natural Sciences and Engineering Research Council (NSERC) Scholarship
 1988 Canadian Public Health Association Research Grant
 1988,1989 Ontario Graduate Scholarship
 1989 University of Western Ontario Graduate Research Award
 1996 Dr. Kenneth S. Warren Award for Oral Presentation, 7th Annual Molecular Parasitology meeting, Woods Hole, MA
 1998 Alex Langmuir Fund Award in Infectious Disease Epidemiology
 1999 JHU Faculty Innovation Fund Award
 2001 Burroughs Wellcome Fund New Investigator in Molecular Parasitology
 2001 Elected member of the JHU BSPH Faculty Senate

Funding

ACTIVE

1 RO1 AI46675-06 PI-Carruthers 7/1/2005-3/31/2010 38%
 NIH \$200,000/yr
 Microneme Function in *Toxoplasma*
 This project aims to: (1) understand how parasite adhesive protein complexes are assembled and correctly targeted to invasion-related secretory organelles; (2) determine the role of such complexes in dictating cell and tissue tropisms in vivo; and (3) dissecting the role of additional novel putative invasion proteins (PIP) in infection.

2 RO1 AI063263-01 PI- Carruthers 12/1/2008-11/30/20013 25%
 NIH \$250,000/yr
 Proteolytic Modulation of *Toxoplasma* Invasion Proteins
 The goal of this project is to define the role of propeptide processing in microneme protein trafficking and identify and characterize the protease responsible for processing.

3 07R1857 PI-Carruthers 8/1/2007-7/30/2011 15%
 Stanley Medical Research Institute \$100,000/yr
 Efficacy of artemisinin derivatives for latent *Toxoplasma* infection
 Artemisinin derivatives including artemether and several novel variants are being tested for efficacy in reducing cyst burden in experimentally infected mice.

PAST

Microscopy pilot grant PI-Carruthers 8/1/2006-7/30/2007
 Univ.Michigan Center for Live Cell Imaging (CLCI) \$0 (free access time)
 Host participation in cell invasion by *Toxoplasma gondii*
 The goal of this project is to preliminarily examine the dynamics of host actin at the *Toxoplasma* invasion site.

04R796 PI-Carruthers 8/1/2004-7/30/2006 (no cost extension in effect) 5%
 Stanley Medical Research Institute \$60,870/yr
 Parasite proteases as unique targets for treating *Toxoplasma*-associated Schizophrenia
 This project is designed to test the ability of cysteine protease inhibitors to impair *Toxoplasma* invasion or replication.

RO3 AI46675 PI-Carruthers 7/1/2004-6/31/2005
 NIH \$50,000/yr
 Mediators of *Toxoplasma* Survival During Infection
 The goal of this project is to preliminarily test the functions of two novel parasite serpins (natural serine protease inhibitors) during infection.

1002830 PI-Carruthers 7/1/2001-6/31/2004
 Burroughs Wellcome Fund (New Investigator in Molecular Parasitology) \$70,000/yr
 Defining the Proteome of *Toxoplasma* Secretory Proteins
 The goals of this project are to identify new secretory proteins of *Toxoplasma gondii* and define their functions in cell invasion or parasite survival during infection.

R21 AI053797 PI-Carruthers

9/1/2002-8/31/2004

NIH

\$150,000/yr

Proteomic Analysis of Gene Knockout Phenotypes in *Toxoplasma*

The goal of this project is to systematically analyze the impact of a specific gene knockout on expression of secretory products involved in parasite cell invasion and infection.

"Characterization of an Adhesive Protein from *Toxoplasma gondii*"

Role on Project: Principal Investigator

Funding Agency: Johns Hopkins Univ. Faculty Innovation Fund.

Funding Period: **1999-2000** Annual Direct Costs: **\$23,535** Total Funding: **\$23,535****"Analysis of Two Secreted Antigens for Diagnosis of Toxoplasmosis in Cats"**

Role on Project: Principal Investigator

Funding Agency: Morris Animal Foundation 99FE-19.

Funding Period: **1999-2002** Annual Direct Costs: **\$20,000** Total Funding: **\$60,000**

The goal of this project is to develop a prototypic diagnostic test to detect H4 or P18 antigen in the serum of cats experiencing acute infection with *Toxoplasma gondii*.

"An AIDS Vaccine Based on Expression of HIV gag in *Toxoplasma gondii*"

Role on Project: Principal Investigator

Funding Agency: Center for AIDS Research.

Funding Period: **2001-2002** Annual Direct Costs: **\$53,816** Total Funding: **\$53,816**

Major goals are to express HIV gag as a cytosolic or secretory protein in an attenuated strain (ts-4) of *Toxoplasma gondii* and to demonstrate that ts-4/gag and ts-4/gag-sec produce CD8+-dependent and humoral immune responses towards HIV gag protein.

PENDING

None

Training grants

1999-2006 Training in the Molecular and Cellular Basis of Infectious Diseases (5T32AI007417-10, Diane Griffin, PI)
 2000-2006 Research Training in Microbial Diseases (5T32AI007291-14, Cynthia Sears, PI)
 2002-2006 Research Training in Pediatric Infectious Diseases (5T32AI052071-03, Kwang Kim, PI)
 2008- Molecular Mechanisms of Microbial Pathogenesis (Victor DiRita, PI)
 2008- Cellular and Molecular Biology (Jessica Schwartz, PI)

TRAINING ACTIVITIES**Undergraduate Students**

2003 Raymond Peroutka (Molecular Biology, Towson University)
 2005-2006 Brian Kalish (Public Health, Johns Hopkins University)
 2007-2008 Andrew Perault (Biology, University of Michigan), Ali Alshoabi (Engineering, Univ. of Michigan)
 2008-pres. Arathi Mohan (Cellular and Molecular Biology, University of Michigan)
 2009-pres. Maleena Paal (Engineering, University of Michigan)

Rotation Students

1998 Susan Cook, Gary Coleman, Susannah Brydges
 1999 Karen Rabenau, Jill Harper, Afshin Sohrabi
 2000 Caren Chancey, Michael Zilliox, Andrea Long
 2001 Andrew Walsh, Ella Hinson, Phuong Nguyen
 2002 Wen-Chih Cheng, Bjorn Kafsack
 2003 Joshua Reese
 2004 Chin Fen Teo, Mark Siracusa
 2007 MJ Wilson, Jeff Perry, Marijo Roiko, Jonathon Giebel
 2008 Tien-Huei Hsu, Sarah Strickler, Marsha Thomas
 2009 Rebecca Tarrien, Halley Flammer

Masters Students

1999-2000 Karen E. Rabenau, BSc (1993, University of Michigan)
 Thesis title: "Functional Characterization of Novel *T. gondii* Microneme Protein, TgM2AP"

Current Position: Medical Student, SUNY Buffalo, NY.

2004-2005 Chin Fen Teo, BSc (2001, National Taiwan University)
Thesis title: "Novel functions for *Toxoplasma* cysteine proteases during infection"
Current Position: Graduate Student, Biochemistry program, Univ. of Georgia

Pre-Doctoral Students

1998-2004 Susannah D. Brydges, BSc (1997, Cornell University)
Thesis title: "TgMIC5 Regulates Proteolytic Activity on the Surface of *T. gondii* Tachyzoites"
Current Position: Post-doctoral Fellow, NIAID, National Institutes of Health

1999-2005 Jill M. Harper, MSc (1999, Purdue University)
Thesis title: "Analysis of a Key Adhesive Complex in *Toxoplasma* Invasion"
Current Position: Research Assistant Professor, University of Maryland

2003-2008. Björn F.C. Kafsack, BSc, BSc, BSc (University of Washington)
**Recipient of an American Heart Association Predoctoral Fellowship (two years)
Thesis title: "Molecular Mechanisms of *Toxoplasma* Infection"
Current Position: Post-doctoral Fellow, Princeton University

2009-pres. Halley Flammer, BSc (Texas A&M)
Thesis title: TBA

Post-Doctoral Fellows

1998-2001 Eleanor F. Hoff, PhD (1998, Johns Hopkins University)
Project title: "Adhesive Characteristics of the TgMIC2 Integrin-like Domain"
Current Position: Program Analyst, NIH-NIDDK

2000-2002 Meredith T. Morris, PhD (1998, University of Georgia)
Project title: "Identification and Biochemical Analysis of Novel Serine Protease Inhibitors"
Current Position: Research Assistant Professor, Clemson Univ.

2001-2003 Arvin Shanmugam, PhD (1999, Tuberculosis Research Center, India)(co-mentored with David Schwartz)
Project title: "Development of a Potential AIDS Vaccine Based on gag Expression in *T. gondii*"
Current position: Senior Research Scientist (faculty level), University of Hyderabad, India

2001-2004 George Zhou, PhD (2000, Xiamen University, China)
Project title: "Proteomic Analysis of *T. gondii* Secretory Products"
Current position: Professor, Zhongshan School of Medicine
Sun-Yat-Sen University, Guangzhou, China

2002-2005 Mae Hyunh, PhD (2001, University of Toronto, Canada)
Project title: "Functional Characterization of the TgMIC2-M2AP Adhesive Complex"

2002-2004 Viviana Pszeny, PhD (1994, University of Buenos Aires, Argentina)
Project title: "Genetic, Enzymatic, and Structural Analysis of Natural Serine Protease Inhibitors"
Current position: Research Associate, University of Pennsylvania

2004-2006 Fabiola Parussini, PhD (2004, University of Buenos Aires, Argentina)
Project title: "Proteolytic regulation of *Toxoplasma* invasion"
Current position: Postdoctoral Fellow, University of Vermont

2006-Pres. Rajshenkar Gaji, PhD (2006, University of Kentucky)
**Recipient of an American Heart Association Postdoctoral Fellowship (three years)
Project title: "Host determinants of *Toxoplasma* infection"

2007-Pres. Julie Laliberte, PhD (2007, University of Sherbrooke, Canada)
**Recipient of a Natural Sciences and Engineering Research Council Fellowship (two years)
Project title: "Functional analysis of a *Toxoplasma* putative tissue metalloproteinase"

2008-Pres. Bjorn Kafsack, PhD (2008, Johns Hopkins University)
Project title: "Role of a pore forming protein in *Toxoplasma* egress"

2009-Pres. Zhicheng Dou, PhD (2009, University of Southern Mississippi)
Project title: "Proteolytic maturation of *Toxoplasma* invasion proteins"

Research Associate/Research Investigator

2005-pres. Mae Hyunh, PhD
Project title: "Functional Characterization of the TgMIC2/TgM2AP Adhesive Complex"

Visiting Scientist

- 04/2003 Doron Greenbaum, PhD
Project title: "Chemical probes for the identification of active *T. gondii* cysteine proteases"
Current position: Assistant Professor, University of Pennsylvania
- 01-05/2006 Janethe Pena, MD/PhD
Project title: "Preliminary analysis of a novel putative pore forming protein expressed by *T. gondii*"
Current Position: Associate Professor, University of Uberlandia, Brazil
- 07/2007 Jorge Gomez-Marin, MD/PhD
Project title: analysis of a novel inducible nitric oxide synthase gene"
Current Position: Associate Professor, Universidad del Quindio, Columbia

TEACHING: EDUCATION AND EXPERIENCE

Lecturer

- 1998-pres. Biology of Parasitism (260.634), JHU School of Public Health (1 lecture + 4 labs)
1999 Medical Parasitology (260.631), JHU School of Public Health (1 lecture + 4 labs/yr)
1999 Microbiology and Immunology (260.423), JHU School of Public Health (1 lecture)
2001-pres. Parasitology, University of Maryland School of Medicine (1 lecture + 1 discussion session/yr)
2002 Introduction to Pathobiology (ME:300.707), JHU School of Medicine (1 discussion session)
2003 Woods Hole Marine Biological Laboratory "Biology of Parasitism" course (2 lectures)
2003-pres. Molecular Biology Core Discussion (260.852), JHU School of Public Health (1 discussion session/yr)
2003-pres. Current Research Literature (120.852), JHU School of Public Health (1-2 discussion sessions/yr)
2003, 2005 NYU School of Medicine (1 lecture, graduate parasitology course)
2004 Harvard School of Public Health (1 lecture + journal discussion, graduate parasitology course)
2005 The Rockefeller University (1 lecture + journal discussion, graduate microbial pathogenesis course)
2006-pres. Mechanisms of Microbial Pathogenesis (Microbiology 405F), UMich (1 lecture, 1.5 hrs)
2007 Dartmouth College School of Medicine (1 journal discussion session)
2008 Microbiology 619 "Parasitic Diseases", U-M School of Medicine (9 lectures, 0.5 hr; 9 journal discussions, 1.0 hr)
2008-pres. Infectious Diseases Small Group Discussions (1 session, 1 hr)

Course Director

- 2002-2004 The Biological Basis of Public Health (260.603.81; online, distance education course)
2005-2006 Public Health Biology (550.630.81; online, distance education course)
2008 Microbiology 619 "Parasitic Diseases"

Invited Research Instructor

- 1992 International Laboratory for Research on Animal Diseases (ILRAD), Nairobi, Kenya
*Technology transfer: DNA-mediated transfection and growth of trypanosomes

Graduate Studies 500 ("Theory and Practice of University Teaching")

- 1990 The University of Western Ontario, London, Ont.
*Comprehensive advanced instruction on effective university teaching

Demonstrations/laboratories

- 1994 Birch-Watham-Lennox High School, NY, NY. Designed and delivered laboratory exercise on isolation of DNA from *E. coli*.
2007 Demonstration of microscopy and *T. gondii* cell egress for Ypsilanti High School students (~3 hrs prep time and four 25 min demonstrations).

Enriching Scholarship at UM

- 2007 Attended workshops on: "Sitemaker: websites made simple", "Design and delivery techniques for teaching with Powerpoint", and "Advanced Powerpoint"

External Workshops

- 2007 ApiDB database workshop, University of Georgia, Athens GA

PEER REVIEW ACTIVITIES

- 2001-pres. **Member, Board of Reviewers:**

Journal of Eukaryotic Microbiology

- 2005-pres. **Member, Advisory Board:**
Molecular Microbiology
- 2005-pres. **Member, Editorial Board:**
Eukaryotic Cell
Molecular and Cellular Proteomics
Current Chemical Biology
Journal of Biological Chemistry
- 2006-2008 **Guest Associate Editor:**
PLoS Pathogens (3)
- 2009-pres **Associate Editor:**
PLoS Pathogens (3)
- 2003 **Contributing author:**
BioMedNet's Research Update (<http://update.bmn.com/>); Opinion articles on recent significant papers; 6-10 contributions/year)
- 1998- **Journal ad hoc reviewer for (# of manuscripts, 146 total)**
Acta Tropica (2)
Anais da Academia Brasileira de Ciências (1)
Applied and Environmental (1)
BBA-Biomembranes (1)
Cell Host and Microbe (2)
Cellular Microbiology (8)
Current Chemical Biology (2)
Current Drug Targets (1)
EMBO Journal (5)
Emerging Infectious Diseases (1)
Eukaryotic Cell (16)
European Journal of Cell Biology (1)
Experimental Parasitology (5)
Expert Review of Proteomics (1)
Genome Biology (2)
Infection and Immunity (8)
Infection, Genetics, and Evolution (1)
Int'l Journal for Parasitology (4)
Int'l Journal of Biochemistry and Cell Biology (1)
Journal of Biological Chemistry (2)
Journal of Cell Biology (1)
Journal of Cell Science (2)
Journal of Clinical Microbiology (1)
Journal of Eukaryotic Microbiology (7)
Journal of Experimental Medicine (2)
Journal of Infectious Diseases (1)
Journal of Neuroinflammation (1)
Journal of Parasitology (7)
Journal of Structural Biology (1)
Molecular Biology of the Cell (1)
Molecular and Biochem. Parasitology (16)
Molecular and Cellular Proteomics (15)
Molecular Microbiology (5)
Parasite Immunology (1)
Parasitology (5)
Parasitology Research (1)
PLoS Pathogens (12)
Proteomics (1)
Protein and Peptide Letters (1)
Schizophrenia Bulletin (1)
Traffic (1)
Trends in Parasitology (4)
Vaccine (1)
- 1998-pres. **Grant/Fellowship reviewer:**
· Human Frontier Science Program (12/2000)
· American Institute of Biological Sciences (07/2001)
· JHU Center for AIDS Research (03/2002)
· Wellcome Trust (03/2002, 07/2006)
· NIH-NRSA Review Panel (02/2003, 06/2003, 10/2003, 7/2004)
· American Heart Association (03/2003)
· National Science Foundation International Science and Engineering Program (05/2003)
· NIH-NIAID Allergies, Immunology, and Transplantation Review Panel (06/2003)
· Institut National de la Sante et de la Recherche Medicale (INSERM, France)(1 grant, 07/2003)
· Johns Hopkins Malaria Research Institute Postdoc Fellowship Program (02/2004, 08/2004, 02/2006)
· NIH-DAIDS Special Emphasis Panel (ZRG1 AARRB 03), AIDS Opp. Inf. and Cancer (03/2004)
· Dept of Molecular Microbiology and Immunology fellowship training program (07/2004)

- Howard Hughes Medical Institute International Scholars grant review (10/2004)
- Canadian National Sciences and Engineering Research Council (NSERC) grant review (12/2004)
- JHU MMI departmental training grant post-doctoral fellowship program (6/2005)
- Wellcome Trust Fellowship Program (1 grant, 06/2006)
- March of Dimes Birth Defects Foundation grant review (1 grant, 2/2006)
- NIH-NIAID International Research in Infectious Diseases (ZAI1-GSM-M-M-1) review panel (03/2007)
- National Science Foundation (ad hoc reviewer, 1 grant, write-in submission, 04/2007)
- American Cancer Society Study Section (8 grants, 01/2008)
- Stanley Medical Research Institute Research Grants (4 grants, 03/2008)
- NIH-NIAID AIDS Opportunistic Infections and Cancer (AOIC)(7 grants, 07/2008)
- American Cancer Society Microbial Pathogenesis and Cancer Study Section (**Standing Member**, 7-9 grants, twice per year, 12/2008-11/2011)
- Univ. Michigan Biomedical Research Council (10/2008-11/2011, 3-4 grants per year)

ADMINISTRATION and COMMITTEE SERVICE

Departmental and School-Wide Committees

1998-1999	MMI Integrated Microbiology Course Development Committee
1999-2006	MMI Facilities Committee (Chair)
1999-2001	MMI Graduate Committee
2000-2001	MMI Strategic Planning Committee
2000-2002	MMI Seminar Committee (Chair)
2001-pres.	Malaria Institute Steering Committee
2001-2006	JHU Bloomberg School of Public Health Committee on Honors and Awards
2001-2003	Elected member, JHU Bloomberg School of Public Health Faculty Senate
2003	MMI Self Study Research Committee
2003	MMI Self Study Resources Committee
2004-2006	MMI Appointments and Promotions Committee
2004	MMI Post-doctoral Fellowship selection committee (Chair)
2004	JHMRI Fellowship review committee (Chair)
2005	Training grant planning committee "Training in Basic Mechanisms of Public Health Biology"
2005	MMI annual retreat planning committee
2005	MMI training grant post-doctoral fellow selection committee (Chair)
2005	School-wide Appointments and Promotions Ad Hoc committee
2007	M/I Appointments, Promotions, and Awards Committee
2007	M/I Science and Technology Excellence Program (STEP) committee
2008-pres.	University of Michigan School of Medicine Biomedical Research Council (BMRC)
2008-pres.	Endowment for the Biological Sciences Research Day planning committee
2009	M/I Colloquium Committee (Chair)
2009	M/I Senior Leadership Committee

Faculty Search Committees

2001-2002	MMI Molecular Parasitology Faculty Search Committee
2001-2002	MMI Structural Biology Faculty Search Committee
2001-2002	Biochemistry and Molecular Biology (BMB) Structural Biology Faculty Search Committee

Student Advisory Committees

1998-2002	David Elliott, PhD, Pathology (JHU School of Medicine)
1999-2002	Zefeng Wang, PhD, Biological Chemistry (JHU School of Medicine)
1999-2002	Catherine Huang, PhD, Biological Chemistry (JHU School of Medicine)
1999-2004	Susannah Brydges, PhD candidate, MMI (JHSPH)
2000-2005	Ronald Knight, PhD candidate, MMI (JHSPH)
2000-2005	Jill Harper, PhD candidate, MMI (JHSPH)
2001-2006	Caren Chancy, PhD candidate, MMI (JHSPH)
2002-2004	Xiaoling Zhu, PhD candidate, BMB (JHSPH)
2002-2006	Oluwatosin Gisanrin, PhD candidate, MMI (JHSPH)
2004-2006	Josh Reese, PhD candidate, MMI (JHSPH)
2004-pres.	Bjorn Kafsack, PhD candidate, MMI (JHSPH)
2004-2006	Jorge Maciel, PhD candidate, MMI (JHSPH)
2004-2006	Ulyana Vjugina, PhD candidate, BMB (JHSPH)
2004-2005	Sikha Singh, MHS candidate, MMI (JHSPH)

- 2006-pres. Tiffany Tsang, PhD candidate, M&I (PIBS, U-M)
- 2008 Margaret Kober, MD student (Summer Project, U-M)
- 2008-pres. Jeffrey Perry, PhD candidate, (U-M)

Preliminary Oral Exam Committees

- 2002 Phuong Nguyen, PhD candidate, MMI
- 2002 Oluwatosin Gisanrin, PhD candidate, MMI
- 2003 Bjorn Kafsack, PhD candidate, MMI (Chair)
- 2003 Bamini Jayabalasingham, PhD candidate, MMI
- 2004 Mark Siracusa, PhD candidate, MMI
- 2005 Anna Niewiadomska, PhD candidate, MMI
- 2007 Marcella Patrick, PhD candidate, M&I (Chair)
- 2008 Katherine Carr, PhD candidate, M&I

Graduate Board Oral Exam Committees

- 1999 Susannah Brydges, PhD candidate, MMI
- 2000 Jill Harper, PhD candidate, MMI
- 2001 Caren Chancy, PhD candidate, MMI
- 2002 Genevieve Wortzman, PhD candidate, BMB
- 2003 Wen-Chi Chen, PhD candidate, MMI
- 2004 Bjorn Kafsack, PhD candidate, MMI; Joshua Reese, PhD candidate, MMI
- 2005 Mark Siracusa, PhD candidate, MMI; Yuan Lin, PhD candidate, BMB (Chair)
- 2006 Kiwon Park, PhD candidate, MMI

Final Thesis Exam Committees

- 2000 Cynthia He, PhD candidate (Roos lab), UPenn
- 2004 Susannah Brydges, PhD candidate, MMI
- 2004 Xiaoling Zhu, PhD candidate, BMB (Chair)
- 2005 Jill Harper, PhD candidate, MMI
- 2005 Emily Binder, PhD candidate, (Kim lab), Albert Einstein College of Medicine
- 2006 Caren Chancey, PhD candidate, MMI

Thesis Reader

- 2002 Eugene Oh, ScM candidate, BMB
- 2002 David Elliott, PhD candidate, SOM
- 2005 Chin Fen Teo, ScM candidate, MMI
- 2005 Suja Joseph, MPH candidate, MMI
- 2005 Sikha Singh, MPH candidate, MMI
- 2009 Nikolas Friedrich, PhD candidate, University of Geneva, Switzerland

OTHER SERVICE ACTIVITIES

- 2000-2006 Founder and Director, MMI Departmental Light Microscopy Core Facility
- 2008 Departmental Representative, PIBS recruitment weekend open house, Sat. Mar. 7th, 2008
- 2008 Poster Judge, 28th Annual Cellular and Molecular Biology Symposium and Poster Session
- 2008 Seminar Judge, Woods Hole Molecular Parasitology Meeting, Woods Hole, MA
- 2009 Departmental Representative, PIBS recruitment weekend open house, Sat. Jan. 31st, 2009
- 2009-pres. *Toxoplasma* Genome Database External Advisory Committee

PROFESSIONAL SOCIETIES

- 2000-2004 American Society of Tropical Medicine and Hygiene (ASTMH)
- 2000-2006 American Society for Parasitology (ASP)
- 2001-pres American Society for Microbiology (ASM)
- 2001-pres. American Association for the Advancement of Science (AAAS)
- 2002 New York Academy of Sciences (NYAS)
- 2003-pres American Society of Cell Biology (ASCB)

PUBLIC RELATIONS

- 1998 IntelliHealth (Johns Hopkins Online Health Information Network) Question and Answer article "All About Toxoplasmosis".

- 2000 Morris Animal Foundation Veterinary News Program article "Acute Toxoplasmosis in Cats" Spring issue
- 2001 Morris Animal Foundation Animal News article "Feline Toxoplasmosis" Vol III
- 2002 Morris Animal Foundation Fall Appeal article "A better test for feline toxoplasmosis" Fall issue
- 2002 Johns Hopkins Public Health Magazine article "*T. gondii*: The Movie" Fall issue
- 2003 JHU BSPH "Web-based Virtual Tour" (<http://www.jhsph.edu/Admissions/VirtualTour>)
- 2008 Mich M/I website spotlight profile
- 2009 UMMS Press Release "Researchers discover protein necessary for common infection", featured on The University of Michigan main website and in Medicine at Michigan magazine.
- 2009 Providd video clips for Animal Planet TV series on parasites "Monsters inside me"

PATENT APPLICATIONS

Applicants: George Allan Martin Cross, Kelvin Paul Davies, and **Vernon Bruce Carruthers**
 Title: Expression of Glycosyl Phosphatidylinositol Anchored Heterologous Proteins in Trypanosomes
 Serial number: 08/127,972
 Filed with: U.S. Patent and Trademark Office, Sept. 27, 1993

Applicant: **Vernon Bruce Carruthers**
 Title: Use of TgMIC10 or TgM2AP for diagnosis or prevention of acute toxoplasmosis
 Serial number: 60/231,215
 Filed with: U.S. Patent and Trademark Office, Sept. 8, 2000

INVITED PRESENTATIONS (from 2002)

2002

- University of Maryland, Center for Marine Biotechnology, Feb. 20, 2002. Host: Dr. Jim Du. "Unraveling the mechanism of host cell invasion by *Toxoplasma gondii*"
- University of Virginia Bioinformatics Institute, Blacksburg, VA. "Proteomics analysis of *Toxoplasma* secretory proteins". Feb. 16, 2002
- Northwestern University, Chicago, IL, Mar. 26, 2002. Host: Dr. David Engman. "Uncovering the *modus operandi* of a professional invader"
- Johns Hopkins University, Polk Symposium, Apr. 26, 2002. "Preliminary studies on the development of an HIV vaccine based on expression of HIV gag in the protozoan parasite *Toxoplasma gondii*"
- University of Michigan, Dept of Microbiology and Immunology, May 2, 2002. Host: Dr. Michelle Swanson. "Unraveling the mechanism of host cell invasion by *Toxoplasma gondii*"
- New York Blood Center, New York, NY, May 16, 2002. Host: Dr. Sara Lustigman. "Uncovering the *modus operandi* of a professional invader"
- Gordon Research Conference on The Biology of Host-Parasite Interactions, Salve Regina University, RI, June 16-21, 2002. "*Toxoplasma gondii* MIC2-associated protein (M2AP) is required for correct targeting, stability, and secretion of MIC2" **Selected speaker**
- 10th International Congress of Parasitology, Vancouver, Canada, Aug. 4-10, 2002. **Sub-Plenary Speaker**. "*Toxoplasma* secretory proteins and host cell invasion"
- Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD. VBI/JHMRI Joint Meeting 10-3-02. "Proteomics of *Toxoplasma gondii*"
- George Washington University School of Medicine, Dept. of Microbiology and Tropical Medicine, Washington D.C., Oct 16th, 2002. Host: Dr. Julia Albright. "The function of secretory proteins in *Toxoplasma* survival during infection"
- Johns Hopkins University School of Medicine, Baltimore, Maryland, Microbial Pathogenesis Interest Group, Oct. 25th, 2002. Host: Kwang Sik Kim. "The function of secretory proteins in *Toxoplasma* survival during infection"
- Johns Hopkins University School of Medicine, Dept. of Pharmacology and Molecular Sciences, Nov. 6, 2002. Host: Dr. Theresa Shapiro. "The function of secretory proteins in parasite survival during infection"
- 51st Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH), Denver CO, Nov. 10-14, 2002. Intestinal and Other Protozoa Session, **Keynote speaker**. "Potential functions of natural serine proteinase inhibitors in *Toxoplasma* survival in the intestine and beyond"
- 42nd Annual Meeting of the American Society for Cell Biology, San Francisco CA, Dec. 14-19, 2002. "From proteomics to pathogenesis: Systematic analysis of secretory proteins reveals new insight into how *Toxoplasma gondii* establishes infection and causes disease" **Invited speaker**
- Bay Area Molecular Parasitology Club, San Francisco, CA, Dec. 16th, 2002. Host: Dr. C.C. Wang. "Defining the dynamic interface between *Toxoplasma* and its host; a tale of MudPITs and MICs"

2003

Student recruitment sessions, JHU dept of Molecular Microbiology and Immunology, Feb 7th and Mar 7th, 2003. "Survivor IV: What tools does a parasite need to persist indefinitely during infection?"

JHBSPH Health Advisor Board Spring Meeting, New York, NY, April 4-5th, 2003. "An update on the Johns Hopkins Malaria Research Institute"

7th International Congress on Toxoplasmosis, Tarrytown, NY, May 23-27th, 2003 "MIC2 is released from the *T. gondii* surface by MPP1-mediated intramembrane cleavage"

7th International Congress on Toxoplasmosis, Tarrytown, NY, May 23-27th, 2003. "The *T. gondii* secretome: new insights into the complexity of parasite's interaction with its host"

7th International Congress on Toxoplasmosis, Tarrytown, NY, May 23-27th, 2003. "Synchronous invasion of host cells by buffer switching analyzed via a mathematical model of *T. gondii* invasion"

Marine Biological Laboratory Course: The Biology of Parasitism, Woods Hole, MA, July 11th, 2003 "*Toxoplasma* protein sorting and invasion"

Seattle Biomedical Institute, Seattle, WA, Aug 29th, 2003. Host: Dr. Marilyn Parsons. "Protein trafficking and targeting in *Toxoplasma*"

University of British Columbia School of Medicine, Vancouver, BC, Canada, Sept 3rd, 2003. Host: Dr. Michael Grigg. "The dynamics of *Toxoplasma* infections"

University of Calgary School of Medicine, Calgary, Canada, Sept 4th, 2003. Host: Dr. Michael Surette. "The dynamics of *Toxoplasma* invasion"

University of Maryland School of Medicine, Baltimore, MD, Oct 2nd, 2003. Host: Dr. Abdu Azad. "The dynamics of *Toxoplasma* invasion"

University of Toronto, Toronto, Canada, Oct 10th, 2003. Host: Dr. Maurice Ringuette. "The dynamics of *Toxoplasma* invasion"

Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, Oct 16th, 2003. MMI/Infectious Diseases seminar series. Host: Dr. David Sullivan. "Molecular mechanisms underlying *Toxoplasma* infections"

Johns Hopkins School of Public Health, Baltimore, MD, Oct 24th, 2003. Parasite Journal Club. "Walking a fine line: Intracellular targeting of a novel *Toxoplasma* superoxide dismutase"

New York University School of Medicine, NY, NY, Nov 14th, 2003. Host: Dr. Gerald Spaeth. "The dynamics of cell invasion by *Toxoplasma gondii*"

2004

Student recruitment sessions, JHU dept of Molecular Microbiology and Immunology, Feb 13th, 2004. "Survivor V: What tools does a parasite need to persist indefinitely during infection?"

Johns Hopkins University School of Medicine, Baltimore, Maryland, Microbial Pathogenesis Interest Group, Mar 26th, 2004. Host: Kwang Sik Kim. "A new release on life; proteolytic cascades associated with *Toxoplasma* cell invasion"

Harvard University School of Public Health, Boston, MA, Apr 14th, 2004. Host: Barbara Burleigh. "A new release on life; proteolytic cascades associated with *Toxoplasma* cell invasion"

Johns Hopkins University School of Medicine, Dept. of Cell Biology, May 6, 2004 Host: Carolyn Machamer. "The twists and turns of protein trafficking in the model intracellular parasite *Toxoplasma gondii*"

Burroughs Wellcome Summer Conference on "Coexistence and Collisions at the Host/Microbe Interface", Aug 5-7th, 2004. Poster Title: "A global view of *Toxoplasma*'s interface with its host"

FASEB Summer Conference on "Microbial Pathogenesis; Mechanisms of Disease", Aug 14-19, 2004. "Function at the junction: The adhesive roles of *Toxoplasma* microneme proteins" **Invited symposium speaker**

Molecular Parasitology Meeting, Wood's Hole, MA, Sept 19-23rd, 2004. **Session Co-Chair**, Pathogenesis and Virulence.

University of Kentucky School of Medicine, Lexington, KY, Oct 19th, 2004. "*Toxoplasma* uses a symphony of secretion and shedding to orchestrate cell invasion"

2005

Johns Hopkins School of Public Health, Dept of Molecular Microbiology and Immunology, annual faculty meeting with Dean Sommer, Jan 7, 2005. "Proteolytic targets in *Toxoplasma*'s adhesion web"

Mid-Atlantic Microbial Pathogenesis Meeting, Wintergreen Resort, Virginia. Feb. 6-8, 2005. "The dynamics of microbial invasion" **Keynote Speaker**

Seattle Biomedical Research Institute, Seattle WA, Mar 9-10, 2005. Host: Arnold Smith. "*Toxoplasma*'s Adhesion web"

Student recruitment sessions, JHU dept of Molecular Microbiology and Immunology, Mar 11th, 2005. "Pathogen survival skills: What tools does a parasite need to persist indefinitely during infection?"

University of Michigan, Ann Arbor MI, Mar 17, 2005. Host: Michelle Swanson. "Regulation of *Toxoplasma*'s Adhesion Web"

NIH Biodefense PAMPs Workshop, Bethesda MD, Mar 24th, 2005. "*Toxoplasma* surface and secretory interfaces with its host" **Invited speaker**

JHSPH Molecular Parasitology Forum, Apr 22nd, 2005. "Regulation of *Toxoplasma*'s Adhesion Web"

8th International Congress on Toxoplasmosis, Corsica, France, May 27-31st, 2005. "Identification of a premicroneme compartment associated with the trafficking and proteolytic maturation of *Toxoplasma* invasion proteins"

Symposium for the enhancement of scientific collaborations in Africa, Nairobi, Kenya, Aug 8-12, 2005. "Molecular mechanisms underlying Toxoplasmic encephalitis" **Invited speaker**

XX Annual Meeting of the Brazilian Federation of the Societies for Experimental Biology, Brazil, Aug 24-28, 2005. "*Toxoplasma* uses a symphony of secretion and shedding to orchestrate cell invasion" **Invited speaker**

IX International Coccidiosis Meeting, Foz do Iguaçu, Brazil, Sept. 19-23, 2005. "New roles for proteases in the infection biology of coccidian parasites" **Plenary Speaker**

MMI Departmental Retreat, Cumberland, MD, Oct 14-16, 2005. **Invited speaker**

New York University School of Medicine, NY, NY, Oct. 21, 2005. Host: Dr. Ana Rodriguez. "Proteolytic regulation of *Toxoplasma* invasion"

University of Wisconsin, Madison, WI. Nov. 4th, 2005. "*Toxoplasma*'s Multivalent Adhesion Web"

55st Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH), Washington DC, Dec. 11-15, 2005. "Conditional expression of *Toxoplasma* MIC2 reveals a central role in cell invasion and helical gliding" **Invited speaker**

2006

Johns Hopkins University School of Medicine, Baltimore, Maryland, Microbial Pathogenesis Interest Group, Jan 27th, 2006. Host: Kwang Sik Kim. "TgMIC2 is a rheostat for *Toxoplasma* adhesion and invasion"

Pacific Coast Protease Workshop, Palm Springs CA, Apr 21-24, 2006. "An unusual Cathepsin L-like protease occupies a novel digestive compartment in the protozoan pathogen *Toxoplasma gondii*" **Invited Expert**

The University of Michigan School of Medicine, Program in Biological Science New Faculty Luncheon, Sept 22nd, 2006. Title: "Dynamics of parasite cell invasion"

The University of Michigan School of Medicine, Nephrology Basic Science Seminar Series. Oct 3rd, 2006. Host: Benjamin Margolis. Title: "Parasite adhesion and toxoplasmosis"

The University of Georgia, Athens, GA, Department of Cellular Biology, Oct 17th, 2006. Host: Silvia Moreno. Title "Dynamics of parasite cell invasion"

The University of Pennsylvania, Philadelphia, PA, Department of Microbiology, Oct 25th, 2006. Host: Ed Pierce. Title: "Dynamics of parasite cell invasion"

The University of Michigan School of Medicine, Intracellular Trafficking Club. Nov 21st, 2006. Host: Robert Fuller. Title: "Trafficking of *Toxoplasma* invasion proteins and a novel apical digestive compartment: What's the connection?"

2007

Oklahoma University Health Sciences Center, Department of Microbiology and Immunology, Feb 26th, 2007. Host: Ira Blader. Title: "Dynamics of parasite cell invasion"

University of Medicine and Dentistry of New Jersey, Department of Microbiology and Molecular Genetics Mar 6th, 2007. Host: Purnima Bhanot. Title: "Dynamics of parasite cell invasion"

University of Michigan Endowment for the Biological Sciences External Review, Mar 12th, 2007. Title: "*Toxoplasma* Invasion".

1st North American Parasitology Congress, Merida, Mexico. June 21-25, 2007. Title: "Wide-scale discovery and analysis of *Toxoplasma* invasion proteins". **Invited symposium speaker**

Chicago Area Mycology and Parasitology (CAMP) meeting, Chicago, Sept. 7th, 2007. Title: "Proteolytic maturation of *Toxoplasma* invasion proteins". **Invited colloquium speaker**

Clemson University, Department of Genetics and Biochemistry, Sept. 28th, 2007. Host: Meredith Morris. Title: "Dynamics of parasite cell invasion"

Annual Meeting of the Stanley Medical Research Institute, Chevy Chase MD, Nov 30-Dec 1st, 2007. Title: "Is the microneme secretory pathway an Achilles' heel of *Toxoplasma gondii*?"

Dartmouth College School of Medicine, Department of Microbiology and Immunology, Dec. 3rd, 2007. Host David Bzik. Title: "Orchestrated Cell Invasion"

2008

Chicago Area Mycology and Parasitology (CAMP) meeting, Chicago, Sept. Apr 4th, 2008. Title: "*Toxoplasma* egress is directed by a perforin-like protein". **Invited colloquium speaker**

Gordon Research Conference on "The Biology of Host:Parasite Interactions", Salve Regina University, RI, June 22-27, 2008. Title: "A Perforin-like Protein is Required for Rapid Egress by *Toxoplasma gondii*". **Selected speaker**

UM Cell and Molecular Biology Graduate Program New Faculty Lunch, Ann Arbor, MI, Oct. 10th, 2008. Title: "Parasite Egress and Invasion"
UM Department of Microbiology and Immunology Annual Retreat, Gull Lake, MI, Oct. 12-14th, 2008. Title: "Toxoplasma Egress and Invasion"
Annual Meeting of the Stanley Medical Research Institute, Chevy Chase MD, Dec 4th, 2008. Title: "Novel therapeutics for *Toxoplasma* infections"

2009

UM M/I Recruitment weekend Jan 30th, 2009. "Overview of *Orphan* Faculty Research Interests"
New York University School of Medicine, New York, NY, Feb. 6th, 2009. Title: "The great escape: Role of a pore-forming protein in *Toxoplasma* egress"
1st Triennial Conference on Complement, Perforins, and Bacterial CDCs: The Hole Family, Apr. 15th-18th, 2009. Title: "A novel perforin-like protein facilitates parasite egress from host cells."
10th International Congress on Toxoplasmosis, Kerkrade, The Netherlands, 2009. "Parasite egress and invasion are tied to early G1 to ensure efficient cell-to-cell transmission" **Selected Speaker.**
Washington University School of Medicine, St. Louis, MO, Oct 27th, 2009. Host: L. David Sibley. Title: "Intercellular transmission of *Toxoplasma gondii*"
Washington University School of Medicine, St. Louis, MO, Oct 28th, 2009. Host: L. David Sibley. Title: "How to load an invasion machine gun"
University of Los Angeles School of Medicine, Los Angeles, CA, Nov. 6th, 2009. Title: "TBA". **Student Invited Speaker.**
National Institutes of Health, Laboratory of Parasitic Diseases, Bethesda, MD, Dec. 1, 2009. Title: "TBA"
Annual Meeting of the Stanley Medical Research Institute, Chevy Chase MD, Dec 2-4, 2009. Title: "TBA"

2010

Indiana University, Bloomington, IN, Jan 23rd, 2010. Host: Ke Hu. Title: "TBA"
Gordon Research Conference on "The Biology of Host:Parasite Interactions", Salve Regina University, RI, June 27th-July 2, 2010. Title: "TBA". **Selected speaker**

CONFERENCE ORGANIZATION/ADMINISTRATION

7th International Congress on Toxoplasmosis, Tarrytown, NY, May 23-27th, 2003. **Session Co-Chair** – Session III Motility and Invasion
Molecular Parasitology Meeting, Wood's Hole, MA, Sept 19-23rd, 2004. **Session Co-Chair** – Pathogenesis and Virulence.
8th International Congress on Toxoplasmosis, Corsica, France, May 27-31st, 2005. **Session Co-Chair** – Host-Pathogen Interplay
IX International Coccidiosis Meeting, Foz do Iguaçu, Brazil, Sept. 19-23, 2005. **Session Chair** – Cell Biology
JHU MMI Dept'l Retreat, Rocky Gap, Cumberland, MD, Oct 24-25, 2005. **Co-organizer**
Annual Meeting of the Stanley Medical Research Institute, Annapolis MD, Nov 10-11th, 2005. **Session Chair** – Biology of *Toxoplasma*
Annual Meeting of the Stanley Medical Research Institute, Annapolis MD, Nov 10-11th, 2005. **Co-organizer**
Molecular Parasitology Meeting, Wood's Hole, MA, Sept 10-14th, 2006. **Opening Plenary Session Chair**
1st North American Parasitology Congress, Merida, Mexico. June 21-25, 2007. **Session Co-Chair** - Proteomics
9th International Congress on Toxoplasmosis, Bozeman, Montana, June 29th- July 2nd, 2007. **Session Co-Chair** – Host cell invasion
FASEB Summer Conference on "Microbial Pathogenesis; Mechanisms of Disease", Aug July 22-28, 2007. **Poster Judge and Session Chair – Host-Pathogen Interactions I.**
10th International Congress on Toxoplasmosis, Kerkrade, The Netherlands, June 19th-23rd, 2009. **Session Co-Chair** – Genomic tools

PUBLICATIONS

Peer Reviewed Articles:

74. Larson, E.T., Parussini, F., Huynh, M.-H., Giebel, J.D., Kelley, A.M., Zhang, L., Bogyo, M., Merritt, E.A., and **Carruthers, V.B. (2009)** *Toxoplasma gondii* Cathepsin L as the primary target of the invasion inhibitory compound LHVS. *J. Biol. Chem.* (in press).
73. Huynh, M.-H. and **Carruthers, V.B. (2009)** Endogenous gene tagging in a *Toxoplasma* strain deficient in non-homologous recombination. *Euk. Cell.* 8;530-539. [Cited in "Faculty of 1000"]

72. Breinich, M., Ferguson, D.J.P., Foth, B., van Dooren, G., Lebrun, M, Quon, D.V., Striepen, B, Bradley, P., Frischknecht, F., **Carruthers, V.B.**, and Meissner, M. (2009) An ancestral dynamin is required for the biogenesis of specialised secretory organelles in apicomplexan parasites *Curr. Biol.* 19;277-286.
70. Kafsack, B.F.C., Pena, J.D.O., Coppens, I., Ravindran, S., Boothroyd, J.C., and **Carruthers, V.B.** (2009) Rapid membrane disruption by a perforin-like protein facilitates parasite exit from host cells. *Science* 323;530-533. [Selected for advanced release online at *Science Express* as the featured article] [commentary in *Disease Models and Mechanisms*] [Cited in "Faculty of 1000"] [Cover illustration]
69. Brydges S. D., Harper, J. M., Parussini, F. Coppens, I., **Carruthers V.B.** (2008) A transient forward targeting element for microneme regulated secretion in *Toxoplasma gondii*. *Biol. Cell* 100;253-264.
68. Kafsack, B.F.C, **Carruthers, V.B.**, Pineda F. (2007) A mathematical model for cell invasion by *Toxoplasma gondii*. *J. Theoretical Biol.* 249;817-824.
67. Teo, C.F., Zhou, X.W., Bogyo, M., **Carruthers, V.B.**, (2007) Cysteine protease inhibitors block *Toxoplasma* microneme secretion and cell invasion. *Antimicrob. Agents Chemotherapy* 51;679-688.
66. Brydges S. D., Zhou X. W., **Carruthers V.B.** (2006) Genetic ablation of *TgMIC5* enhances proteolytic processing on the surface of *Toxoplasma gondii* tachyzoites. *Euk. Cell* 5;2174-2183. [Cover illustration]
65. Starnes, G.L., Travis J. Jewett, T.J., **Carruthers, V.B.**, Sibley, L.D. (2006) Two separate, conserved acidic amino acid domains within the *Toxoplasma gondii* MIC2 cytoplasmic tail are required for parasite survival. *J. Biol. Chem.* 281;30745-30754.
64. Harper, J., Huynh, M.-H., Coppens, I., Parussini, F., Moreno, S., **Carruthers, V.B.** (2006) A cleavable propeptide influences *Toxoplasma* infection by facilitating the trafficking and secretion of the TgMIC2-M2AP invasion complex. *Mol. Biol. Cell.* 17;4551-4563.
63. Huynh, M.-H., **Carruthers, V.B.** (2006) *Toxoplasma* MIC2 is a major determinant of invasion and virulence. *PLoS Pathogens* Aug 18;2(8).
62. Zhou, X.W., Kafsack, B.F., Cole, R.N., Beckett, P., Shen, R.F., **Carruthers, V.B.** (2005) The opportunistic pathogen *Toxoplasma gondii* deploys a diverse legion of invasion and survival proteins. *J. Biol. Chem.*, 280; 34233-34244.
61. Howell, S.A., Hackett, F., Jongco, A.M., Withers-Martinez, C., Kim, K., **Carruthers, V.B.**, Blackman, M.J. (2005) Distinct mechanisms govern proteolytic shedding of a key invasion protein in apicomplexan pathogens. *Mol. Microbiol.* 57; 1342-1356.
60. Harper, J., Zhou, X.W., Pszenny, V., **Carruthers, V.B.** (2004) The novel Coccidian micronemal protein MIC11 undergoes proteolytic maturation by sequential cleavage to remove an internal propeptide. *Int. J. Parasitol.*, 34;1047-1058.
59. Kafsack, B.F.C., Beckers, C.J.M., **Carruthers, V.B.** (2004) Synchronous invasion of host cells by *Toxoplasma gondii*. *Mol. Biochem. Parasitol.*, 136;309-311.
58. Huynh, M.-H., Opitz, C., Kwok, L.Y., Tomley, F., **Carruthers, V.B.**, Soldati, D. (2004) Heterologous functional reconstitution and complementation of an adhesion complex in *Toxoplasma gondii*. *Cell. Microbiol.*, 6; 771-782.
57. Morris, M.T., Cheng, W.-C., Zhou, X.W., Brydges, S.D., **Carruthers, V.B.** (2004) *Neospora caninum* expresses an unusual single-domain Kazal protease inhibitor that is discharged into the parasitophorous vacuole. *Int. J. Parasitol.* 34;693-701.
56. Zhou, X.W., Howell, S.A., Blackman, M.J., **Carruthers, V.B.** (2004) Proteomic analysis of cleavage events reveals a dynamic two-step mechanism for proteolysis of a key parasite adhesive complex. *Mol. Cell. Proteomics*, 3;565-576. [Cover Illustration] [Cited in "Faculty of 1000"].
55. Harper, J., Hoff, E., **Carruthers, V.B.** (2004) Multimerization of the *Toxoplasma gondii* MIC2 integrin-like A-domain is required for binding to heparin and human cells. *Mol. Biochem. Parasitol.*, 134;201-212.

54. Brydges, S.D., **Carruthers, V.B.** (2003) Mutation of an unusual mitochondrial targeting sequence in SODB2 produces multiple targeting fates in *Toxoplasma gondii*. *J. Cell Sci.* 116;4675-4685.
53. Huynh, M.-H., Rabenau, K.E., Harper, J., Beatty, W., Sibley, L.D., **Carruthers, V.B.** (2003) Rapid invasion of host cells by *Toxoplasma* requires secretion of the MIC2-M2AP adhesive protein complex *EMBO J.* 22;2082-2090. ["Editors Choice" *Science* 2003 300;1204][Cited in "Faculty of 1000"]
52. Sehgal, A., Kumar, N., **Carruthers, V.**, Sharma, S. (2003) Translocation of ribosomal protein P0 onto the *Toxoplasma gondii* tachyzoite surface. *Int. J. Parasitol.* 33;1589-1594.
51. Morris, M.T., **Carruthers, V.B.** (2003) Identification and partial characterization of a second Kazal family serine proteinase inhibitor in *Toxoplasma gondii*. *Mol. Biochem. Parasitol.* 128:119-122.
50. Aliberti, J., Vanenzuela, **Carruthers, V.B.**, J.G., Hieny, S. Andersen, J., Charest, H., Reis e Sousa, C., Fairlamb, A., Ribeiro, J.M., Sher, A. (2003) Molecular mimicry of a CCR5 binding-domain in the microbial activation of dendritic cells. *Nature Immunol.* 4;485-490. [Cited in "Faculty of 1000"]
49. Hoane, J.S., **Carruthers, V.B.**, Striepen, B., Morrison, D.P., Entzeroth, R., Howe, D.K. (2003) Characterization of a *Sarcocystis neurona* microneme protein, SnMIC10. *Int. J. Parasitol.* 7;671-679.
48. Morris, M.T., Coppin, A., Tomavo, S., **Carruthers, V.B.** (2002) Functional analysis of *Toxoplasma gondii* protease inhibitor 1. *J. Biol. Chem.* 277;45259-45266. [Cited in "Faculty of 1000"]
47. Hoff, E., **Carruthers, V.B.** (2002) Is *Toxoplasma* egress the first step in invasion? *Trends Parasitol.* 18;251-255
46. Meissner, M., Reiss, M., Viebig, N., **Carruthers, V.** Trousel, C., Tomavo, S., Ajioka, J., Soldati, D. (2002) A family of transmembrane microneme proteins of *Toxoplasma gondii* contain EGF-like domains and function as escorts. *J. Cell Sci.* 115;563-574. [Cover Illustration]
45. Miller, S., Blackman, M., **Carruthers, V.B.**, Kim, K. (2001) A conserved subtilisin-like protein TgSUB1 in microneme organelles of *Toxoplasma gondii*. *J. Biol. Chem.* 276;45341-45348.
44. Rabenau, K.E., Sohrabi, A., Tripathy, A., Reitter, C., Ajioka, J.W., Tomley, F.M., **Carruthers, V.B.** (2001) TgM2AP participates in *Toxoplasma gondii* invasion of host cells and is tightly associated with the adhesive protein TgMIC2. *Mol. Microbiol.* 41;537-547
43. Hoff, E.F., Harper, J., Sherman, G.D., Coleman, G., Cook, S., Loyens, A., Dubremetz, J.-F., Ferguson, D., and **Carruthers, V.B.** (2001) *Toxoplasma gondii*: Molecular cloning and characterization of a novel 18-kDa secretory antigen, TgMIC10. *Exp. Parasitol.* 97;77-88.
42. Brecht, S., **Carruthers, V.B.**, Ferguson, D.J.P., Giddings, O.K., Wang, G., Jakle, U., Harper, J.M., Sibley, L.D., and Soldati, D. (2001) The *Toxoplasma* micronemal protein MIC4 is an adhesin composed of six conserved apple domains. *J. Biol. Chem.* 276;4119-4127.
41. Brydges, S.D., Sherman, G.D., Nockemann, S., Loyens, A., Daubener, W., Dubremetz, J.-F., and **Carruthers, V.B.** (2000) Molecular characterization of TgMIC5, a proteolytically processed antigen secreted from the micronemes of *Toxoplasma gondii*. *Mol. Biochem. Parasitol.* 111;51-66
40. Donahue, C.G. **Carruthers, V.B.**, Gilk, S.D., and Ward, G.E. (2000) The *Toxoplasma* homologue of *Plasmodium* apical membrane antigen-1 (AMA-1) is a microneme protein secreted in response to elevated intracellular calcium levels. *Mol. Biochem. Parasitol.* 111;15-30
39. **Carruthers, V.B.**, Hakansson, S., Giddings, O.K., and Sibley, L.D. (2000) *Toxoplasma gondii* uses heparin sulfate proteoglycans for substrate and host cell attachment. *Inf. Immunity* 68;4005-4011
38. **Carruthers, V.B.**, Sherman, G.D., and Sibley, L.D. (2000) The *Toxoplasma* adhesive protein MIC2 is proteolytically processed at multiple sites by two parasite-derived proteases. *J. Biol. Chem.* 275;14346-14353

37. **Carruthers, V.B.**, Giddings, O.K., and Sibley, L.D. (1999) Secretion of micronemal proteins is associated with *Toxoplasma* invasion of host cells. *Cell. Microbiol.* 1;225-235
36. **Carruthers, V.B.**, Moreno, S.N.J., and Sibley L.D. (1999) Ethanol and acetaldehyde elevate intracellular calcium and stimulate microneme discharge in *Toxoplasma gondii*. *Biochem. J.* 342; 379-386
35. **Carruthers, V.B.**, and Sibley, L.D. (1999) Mobilization of intracellular calcium stimulates microneme discharge in *Toxoplasma gondii*. *Mol. Microbiol.* 31; 421-428
34. Dobrowolski, J.M., **Carruthers, V.B.** and Sibley, L.D., (1997) Myosin participates in gliding motility and host cell invasion by *Toxoplasma gondii*. *Mol. Microbiol.* 76; 163-173
33. **Carruthers, V.B.**, and Sibley, L.D. (1997) Sequential protein secretion from three distinct organelles of *Toxoplasma gondii* accompanies invasion of human fibroblasts. *Eur. J. Cell Biol.* 73; 114-123
32. Wan, K.L., **Carruthers, V.B.**, Sibley, L.D., and Ajioka, J.W. (1997) Molecular characterization of an expressed sequence tag locus of *Toxoplasma gondii* encoding the micronemal protein MIC2. *Mol. Biochem. Parasitol.* 84; 203-214
31. Davies, K., **Carruthers, V.B.**, and Cross, G.A.M. (1997) Manipulation of the *vsg* co-transposed region increases expression-site switching in *Trypanosoma brucei*. *Mol. Biochem. Parasitol.* 86; 163-177
30. **Carruthers, V.B.**, Navarro, M., and Cross, G.A.M. (1996) Targeted disruption of expression-site-associated gene-1 in bloodstream-form *Trypanosoma brucei*. *Mol. Biochem. Parasitol.* 81; 65-79
29. Hug, M., **Carruthers, V.**, Cross, G., and Clayton, C. (1993) A role for the 3'-untranslated region in developmental gene regulation in trypanosomes. *Mol. Biochem. Parasitol.* 61; 87-95
28. **Carruthers, V.B.** and Cross, G.A.M. (1993) DNA-mediated transformation of bloodstream-form *Trypanosoma brucei*. *Nucleic Acids Res.* 21; 2537-2538.
27. **Carruthers, V.B.**, and Cross, G.A.M. (1992) High efficiency clonal growth of bloodstream- and insect-form *Trypanosoma brucei* on agarose plates. *Proc. Natl. Acad. Sci. USA* 89; 8818-8821.
26. **Carruthers, V.B.**, and Clarke, M.W. (1988) Mapping of segmental antigenic determinants on structurally related variant surface glycoproteins of *Trypanosoma brucei*. *Biochem. Cell Biol.* 66; 1231-1237.

Invited Articles:

24. Roiko, M.S. and **Carruthers, V.B.** (2009) New roles for perforins and proteases in apicomplexan egress. *Cell. Microbiol.* (in press).
23. Laliberté, J. and **Carruthers, V.B.** (2008) Host cell manipulation by the human pathogen *Toxoplasma gondii*. *Cell. Mol. Life Sci.* 65:1900-1915.
22. **Carruthers, V.B.**, Tomley, F.M. (2008) Microneme proteins in apicomplexans. *Subcell. Biochem.* 47;33-45.
21. Hager, K.M. and **Carruthers, V.B.** (2008) MARveling at parasite invasion. *Trends Parasitol.* 24;51-54.
20. **Carruthers, V.B.**, Cotter, P.A., and Kumamoto, C.A. (2007) Microbial Pathogenesis: Mechanisms of Infectious Disease. *Cell Host and Microbe.* 2;214-219.
19. **Carruthers, V.B.** and Suzuki, Y. (2007) Effects of *Toxoplasma gondii* infection on the brain. *Schizophrenia Bulletin* 33;745-751.
18. Huynh, M.-H., **Carruthers, V.B.** (2007) Microneme protein repertoire and function. in The Biology of *Toxoplasma gondii*, J. Ajioka and D. Soldati, ed. (Wyomndham, UK: Horizon Scientific Press) pp. 437-454.

17. Lebrun, M., **Carruthers, V.B.**, Cesbron-Delauw, M.-F. (2007) *Toxoplasma* Secretory Proteins and their roles in Cell Invasion and Intracellular Survival. in *Toxoplasma gondii: The Model Apicomplexan – Perspectives and Methods*, Weiss and Kim (Eds). 265-315.
16. **Carruthers, V.B.**, Boothroyd, J.C. (2006) Pulling together: An integrated model of *Toxoplasma* cell invasion. *Curr. Opin. Microbiol.* 9:1-7.
15. **Carruthers, V.B.**, Proteolysis and *Toxoplasma* invasion. (2006) *Int. J. Parasitol.* 36:494-500.
14. Huynh, M.-H., Harper, J.M., **Carruthers, V.B.** (2006) Preparing for an invasion: Charting the pathway of adhesion proteins to *Toxoplasma* micronemes. *Parasite Res.* 98:389-395.
13. **Carruthers, V.B.**, Blackman, M.J. (2005) A new release on life: Emerging concepts in proteolysis and parasite invasion. *Mol. Microbiol.* 55; 1617-1630. [Cover Illustration].
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Manuscripts in Preparation or Submitted for Review:

- Lagal, V., Binder, E., Diez, R., Chen, D., Cole, R.N., **Carruthers, V.B.**, and Kim, K. *Toxoplasma gondii* protease TgSUB1 is required for surface processing of micronemal adhesive complexes that mediate host cell attachment and invasion. (received favourable reviews; under revision to *PLoS Pathog.*)
- Starnes, G.L., Huynh, M.-H., **Carruthers, V.B.**, and Sibley, L.D. Microneme protein 2 (MIC2) is required for coupling attachment to motility during host cell invasion by *Toxoplasma gondii*. (under revision for resubmission to *Cell. Microbiol.*).
- Parussini, F., Coppens, I., Shah, P., Diamond, S.L., and **Carruthers, V.B.** Cathepsin protease L functions as a maturase for secretory proteins within endosome-like organelles of *Toxoplasma gondii*. (in preparation)
- Pszenny, V., Zhou, X.W., Davis, P.H., Hunter, C., Roos, D.S., and **Carruthers, V.B.** Targeted disruption of *Toxoplasma gondii* Serine Protease Inhibitor-1 increases *in vitro* cyst formation and acute virulence in mice. (in preparation)
- Kafsack, B.F.C. and **Carruthers, V.B.** Apicomplexan perforin-like proteins. Invited review for *Commun. Integr. Biol.* (in preparation)