

LIZBETH COURTNEY SMITH

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EDUCATION

Ph.D.	Immunology	University of California	Los Angeles, California	Mar. 1985
M.Sc.	Zoology	University of Minnesota	Minneapolis, Minnesota	Dec. 1976
B.A.	Biology	Drake University	Des Moines, Iowa	May 1974

RESEARCH INTERESTS

Sea Urchin Immunology
Evolution of the deuterostome immune system
Immunity and cellular defense mechanisms in invertebrates

Doctoral Research

Allograft Rejection Kinetics and Responses to Injury in Marine Sponges.

PROFESSIONAL POSITIONS

2001 to present	Associate Professor of Biology, George Washington University
2000 to present	Adjunct Associate Professor of Immunology, George Washington University Medical School
1996 to present	Member, Graduate Programs in Genetics and Immunology, GW Institute of Biomedical Sciences
1996 to 1998	Adjunct Associate Professor, Center of Marine Biotechnology, Univ. Maryland
1995 - 2001	Assistant Professor of Biology, George Washington University
2002 - 2003	Visiting Researcher, University of Pennsylvania School of Veterinary Medicine
1995	Member, Professional Staff, Division of Biology, California Institute of Technology
1991-1995	Associate Staff Research Biologist, Division of Biology, California Institute of Technology
1988-1991	Senior Postdoctoral Research Fellow, Division of Biology, California Institute of Technology
1985-1988	Postdoctoral Research Fellow, Division of Biology, California Institute of Technology
1980-1985	Postgraduate Researcher, Dept of Microbiology and Immunology, UCLA School of Medicine
1981-1982	Teaching Assistant, Department of Microbiology and Immunology, UCLA School of Medicine
1977-1980	Electron Microscopy Technician, Dept of Pediatrics, Univ of Minnesota School of Medicine
1976-1977	Electron Microscopy Technician, Department of Entomology, University of Minnesota
1975-1976	Teaching Assistant, Department of Zoology, University of Minnesota

PUBLICATIONS, PEER REVIEWED

- Terwilliger, D.P., L.A. Clow, P.S. Gross & L. C. Smith. 2004. Constitutive expression and alternative splicing of the SCR domains of *Sp152*, the Sea Urchin Homologue of Complement Factor B. Implications on the evolution of the C2/Bf gene family. *Immunogenetics*, *in press*
- Multerer, K.A. & L.C. Smith. 2004. Two mosaic proteins in the purple sea urchin, *Strongylocentrotus purpuratus*, with multiple domains found in factor H, factor I, and complement components C6 and C7. *Immunogenetics*, **56**:89-106.
- Clow, L.A., D.A. Raftos, P.S. Gross & L. C. Smith. 2004. The Sea Urchin Complement Homologue, SpC3, Functions as an Opsonin. *Journal of Experimental Biology*, **207**:2147-2155.
- Shah, M., K.M. Brown & L.C. Smith. 2003. The gene encoding the sea urchin complement protein, SpC3, is expressed in embryos and can be upregulated by bacteria. *Developmental and Comparative Immunology*, **27**:529-538.
- Smith, L.C. 2002. Thioester function is conserved in SpC3, the sea urchin homologue of the complement component C3. *Developmental and Comparative Immunology*, **26**:603-614.
- Clow, L.A., P.S. Gross, C.-S. Shih & L.C. Smith. 2000. Expression of SpC3, the sea urchin complement component, in response to lipopolysaccharide. *Immunogenetics*, **51**:1021-1033.

- Gross, P.S., L.A. Clow & L.C. Smith. 2000. SpC3, the complement homologue from the purple sea urchin, *Strongylocentrotus purpuratus*, is expressed in two subpopulations of the phagocytic coelomocytes. *Immunogenetics*, 51:1034-1044.
- Smith, L.C., C.-S. Shih & S. Dachenhausen. 1998. Coelomocytes specifically express SpBf, a homologue of factor B, the second component in the sea urchin complement system. *Journal of Immunology*, 161:6784-6793.
- Al-Sharif, W.Z., J.O. Sunyer, J.D. Lambris & L.C. Smith. 1998. A homologue of the complement component C3 is specifically expressed in sea urchin coelomocytes. *Journal of Immunology*, 160:2983-2997.
- Smith, L.C., L. Chang, R.J. Britten & E.H. Davidson. 1996. Sea urchin genes expressed in activated coelomocytes are identified by expressed sequence tags (ESTs). Complement homologues and other putative immune response genes suggest immune system homology within the deuterostomes. *Journal of Immunology* 156:593-602.
- Smith, L.C., R.J. Britten & E.H. Davidson. 1995. Lipopolysaccharide activates the sea urchin immune system. *Developmental and Comparative Immunology* 19:217-224.
- Smith, L.C., M.G. Harrington, R.J. Britten & E.H. Davidson. 1994. The sea urchin profilin gene is expressed in mesenchyme cells during gastrulation. *Developmental Biology* 164:463-474.
- Cameron, R.A., L.C. Smith, R.J. Britten & E.H. Davidson. 1994. Ligand-dependent stimulation of introduced mammalian brain receptors alters spicule symmetry and other morphogenetic events in sea urchin embryos. *Mechanisms of Development* 45:31-47.
- Smith, L.C., R.J. Britten & E.H. Davidson. 1992. SpCoel1, a sea urchin profilin gene expressed specifically in coelomocytes in response to injury. *Molecular Biology of the Cell* 3:403-414.
- Smith, L.C. & W.H. Hildemann. 1986a. Allograft rejection, autograft fusion and inflammatory responses to injury in *Callyspongia diffusa* (Porifera, Demospongia). *Proceedings of the Royal Society of London B* 266:445-464.
- Smith, L.C. & W.H. Hildemann. 1986b. Allogeneic cell interactions during graft rejection in *Callyspongia diffusa* (Porifera, Demospongia); a study with monoclonal antibodies. *Proceedings of the Royal Society of London B* 266:465-477.
- Smith, L.C. & W.H. Hildemann. 1984. Alloimmune memory is absent in *Hymeniacidon sinapium*, a marine sponge. *Journal of Immunology* 135:2351-2355.
- Smith, L.C., R.G. Johnson & J.D. Sheridan. 1976. Gap junctions and tight junctions in early amphibian embryos: a freeze fracture study. *Journal of Cell Biology* 70:255a.

INVITED REVIEWS

- Smith, L.C. 2004. Host Responses to Bacteria; Innate Immunity in Invertebrates. In *The Influence of Bacterial Communities on Host Biology* (M. McFall-Ngai, N. Ruby, B. Henderson, eds.). *Advances in Molecular and Cellular Microbiology*. Cambridge University Press. *submitted*
- Smith, L.C., L.A. Clow & D.P. Terwilliger 2001. The ancestral complement system in sea urchins. *Immunological Reviews*, 180:16-34.
- Smith, L.C. 2001. The complement system in sea urchins. In *Phylogenetic Perspectives on the Vertebrate Immune Systems*. (G. Beck, M. Sugumaran, E. Cooper, eds.) *Advances in Experimental Medicine and Biology*, 484:363-372. Kluwer Academic/Plenum Publishing Co. New York, NY.
- Smith, L.C., K. Azumi & M. Nonaka. 1999. Complement systems in invertebrates. The ancient alternative and lectin pathways. *Immunopharmacology*, 42:107-120.
- Gross, P.S., W.Z. Al-Sharif, L.A. Clow & L.C. Smith. 1999. Echinoderm immunity and the evolution of the complement system. *Developmental and Comparative Immunology*, 23:439-453.
- Smith, L.C. & W.H. Hildemann. 1990. Cellular morphology of *Callyspongia diffusa* (Porifera: Demospongia). In: *New Perspectives in Sponge Biology*. (K. Ruetzler & W. Hartman, eds.) Smithsonian Institution Press, Washington, D.C., pp. 135-143.
- Smith, L.C. 1988. The role of mesohyl cells in sponge allograft rejection. In: *Invertebrate Historecognition*. (R.K. Grosberg, D. Hedgecock & K. Nelson, eds.) Plenum Publishing Co., pp. 15-30.

SUBMITTED REVIEWS

- Smith, L.C. & E.H. Davidson. 1994. The echinoderm immune system: characters shared with vertebrate immune systems, and characters arising later in deuterostome phylogeny. In: *Primordial Immunity: Foundations for the Vertebrate Immune System*. (G. Beck, E.L. Cooper, G.S. Habicht and J.J. Marchalonis, eds.) *The New York Academy of Sciences* 712:213-226.
- Smith, L.C. & E.H. Davidson. 1992. The echinoid immune system and the phylogenetic occurrence of immune mechanisms in deuterostomes. *Immunologytoday* 13:356-362.

(The echinoid immune system revisited: reply. *Immunologytoday* 14:93-94.)

OPINION/MEETING REPORT

Warr G.W., R.C. Chapman & L.C. Smith. 2003. "Evolutionary Immunobiology: New Approaches, New Paradigms." *Developmental and Comparative Immunology*, 27:257-262.

MEETING REVIEW

Du Pasquier, L. & L.C. Smith. 2003. Workshop Report: Evolutionary Immunobiology: New Approaches, New Paradigms. *Developmental and Comparative Immunology*, 27:263-271.

Smith, L.C., C. Baier-Anderson, L.A. Clow, D.P. Terwilliger & C. Adema. 2000. Meeting Review: Mid Atlantic Society of Developmental and Comparative Immunology. *Developmental and Comparative Immunology*, 24:71-77.

BOOK and CHAPTER REVIEWS

Smith, L.C. 2001. Review of "Origin and Evolution of the Vertebrate Immune System". (L. Du Pasquier & G.W. Litman, eds.) *Quarterly Review of Biology* 76:79.

Chapter 15 (Evolution of the Immune System) in *Immunobiology*, 6th edition by C Janeway, P Travers, M Walport, M Schlomchik. Garland Science Publishing, NY, NY.

RESEARCH IN PROGRESS

Nair, S.V., H. Del Valle, P.S. Gross, E. Shepard & L.C. Smith. Transcriptome analysis of LPS-activated coelomocytes from the purple sea urchin, *Strongylocentrotus purpuratus*, reveals significant diversification of putative antimicrobial proteins. *In preparation*

Smith, L.C., M.S. Quesenberry, A. Milani, K. Saito, K. Fisher, G.R. Vasta. SpEchinoidin, a C-type lectin expressed by phagocytes from the purple sea urchin (*Strongylocentrotus purpuratus*) is a component of the innate immune response to lipopolysaccharide. *in preparation*.

Smith, L.C., M. Stevens, & C. Lee. Cloning and characterization of a receptor tyrosine kinase from sea urchin coelomocytes that is a homologue of mammalian TIE proteins.

Smith, L.C. Degradation of SpC3, the sea urchin complement component, suggests regulation through factor I-like activity.

Smith, L.C. & D.A. Raftos. Studies on the hemolytic activity in coelomic fluid from the purple sea urchin, *Strongylocentrotus purpuratus*, and the tunicate, *Styela plicata*.

INVITED SEMINARS

Conferences and Symposia

Experimental Biology 2004, Special ISDCI Symposium, "Remarkable Complexity of Immune Recognition in Invertebrates". April 19, 2004, Washington DC. "Unexpected diversity in a putative anti-microbial protein in a sea urchin."

Rockefeller Conference on "The Influence of Cooperative Bacteria on Animal Host Biology". Oct 28 - Nov 1, 2003, Bellagio Study and Conference Center, Bellagio Italy. "Immune Defenses Against Marine Microbes."

International Society of Developmental and Comparative Immunology, Ninth Congress. St. Andrews Scotland. June 28 - July 5, 2003. "A diverse array of genes are upregulated in sea urchin coelomocytes in response to lipopolysaccharide."

Session Co-chair, Complement System

Fifth Comparative Immunology Symposium. March 6-7, 2003, Florida International University, Miami Florida.

"Sea urchin coelomocytes respond to lipopolysaccharide with a diverse array of messages encoding a putative antimicrobial protein."

NSF Workshop on the "Evolutionary Immunobiology: New Approaches, New Paradigms", Feb, 22-25, 2002, Medical University of South Carolina, Charleston SC. "A Genomics Approach to Understanding the Sea Urchin Immune System."

International Society of Developmental and Comparative Immunology, Eighth Congress. Cairns Australia, July 2-6, 2000. "SpC3, the Sea Urchin Complement Component Homologous to Vertebrate C3, Undergoes Autolysis and may be Regulated through Controlled Degradation."

Session Co-Chair, Evolution of the Complement System.

Comparative Immunology Group Mini-Symposium. *“Immunodiversity in Defense Mechanisms”*. Florida International University, Miami, FL. April 6, 2000. “Production, Function and Degradation of SpC3, the Sea Urchin Homologue of the Vertebrate Complement Component C3.”

New England Immunology Conference. *“Innate Immunity”*. Woods Hole, MA November 6-7, 1999. “The Ancient Complement System in Sea Urchins.”

FASEB Summer Research Conference. *“Phylogenetic Perspectives on the Vertebrate Immune System”*. Copper Mountain, CO. July 11-16, 1999. “The Complement System in Sea Urchins.”

Experimental Biology ‘99. *“Early Origins of the Vertebrate Immune System”*. Washington DC. June 19-24, 1999. “The Complement System: An Evolutionary Link Between Vertebrate and Invertebrate Immunity.”

Developmental Biology of Sea Urchins, XI. Woods Hole, MA September 10-14, 1997. “Sea urchin coelomocytes express the first two components of the alternative complement cascade.”

International Society of Developmental and Comparative Immunology, Seventh Congress. College of William and Mary, Williamsburg, VA July 20-25, 1997. “Sea urchin coelomocytes specifically express a C3 complement component and a complement receptor or regulatory protein.”

Developmental Biology of Sea Urchins, X. Woods Hole, MA March, 1996. “A complement homologue is expressed in coelomocytes.”

The National Science Foundation, *“Cell Biology Forum. Research on Defense Mechanisms in a Diversity of Organisms: Assessment of Progress and Setting Goals”*. Washington, DC March 14-15, 1994. “The echinoderm immune system: future directions.”

New York Academy of Sciences: *“Primordial Immunity: Foundations for the Vertebrate Immune System”*. Woods Hole, MA May 2-5, 1993. “The echinoid immune system viewed in the context of deuterostome phylogeny.”

FASEB, American Association of Pathologists. *“Use of Aquatic Animals in Biomedical Research”*. Anaheim, CA April 5, 1992. “A sea urchin profilin gene shows increases in expression during coelomocyte responses to injury.”

University of California Marine Laboratory. *Mechanisms, Ecology & Evolution of Historecognition in Marine Invertebrates*. Bodega Bay, CA September 10-13, 1987. “Cellular morphology of *Callyspongia diffusa* (Porifera: Demospongia).”

Seminars at Institutions (invitations since 1996)

Medical University of South Carolina, Department of Biochemistry. Charleston SC May 28, 2004. “Unexpected genetic diversity in the purple sea urchin. A small gene family encoding putative antimicrobial proteins.”

University of New Mexico, Department of Biology. Albuquerque NM March 26, 2004. “Unexpected Genetic Diversity in a Putative Antimicrobial Peptide From the Sea Urchin, *Strongylocentrotus purpuratus*.”

Ohio University, Department of Biology. Athens OH April 9, 2001. “The ancestral innate immune system in sea urchins”

Medical University of South Carolina, Department of Microbiology. Charleston SC February 8, 2001. “The ancestral innate immune system in sea urchins”

George Washington University Medical School, Department of Immunology. Washington DC November 21, 2000. “The ancestral innate immune system in sea urchins”

American Red Cross Holland Research Laboratory. Rockville MD September 16, 1999. “Origin and Evolution of the Complement System, a Central Component of Innate Immunity.”

St. Mary’s College of Maryland, Department of Biology. St. Mary’s City, MD. March 4, 1998, “The Sea Urchin Immune System.”

Georgetown University, Department of Biology. Washington DC October 25, 1996. “The sea urchin immune system: coelomocyte activation, gene expression and the evolution of deuterostome immunity.”

University of Maryland, Center of Marine Biotechnology. Baltimore MD March 25, 1996. “Coelomocyte activation and gene expression in sea urchin immune coelomocytes and the evolution of deuterostome immunity.”

PRESENTATIONS AT CONFERENCES

Experimental Biology ‘95, Atlanta, GA April, 1995. “Sea urchin coelomocytes express a homologue of complement C3 and a putative complement receptor.”

International Society of Developmental and Comparative Immunology, Fifth Congress. Reed College, Portland, OR August 4-9, 1991. "A gene (SpCoel) expressed in sea urchin coelomocytes shows an increase in transcripts after immune challenge."

Third International Conference on the Biology of Sponges. Woods Hole, MA November 17-23, 1985. "Cellular morphology of *Callyspongia diffusa*."

American Society of Zoology, Division of Developmental and Comparative Immunology. Philadelphia, PA December 27-30, 1983. "Cellular reorganization during allograft rejection in the Hawaiian sponge *Callyspongia diffusa*."

International Society of Developmental and Comparative Immunology, Third Congress. UCLA, Los Angeles, CA August, 14-19, 1983. "Transplantation Immunity in the Hawaiian sponge *Callyspongia diffusa*."

CONFERENCES ORGANIZED

NSF Workshop "Evolutionary Immunobiology: New Approaches, New Paradigms", Co-Organized with Drs. Greg Warr and Robert Chapman, Feb 2002, Medical University of South Carolina, Charleston SC

Mid Atlantic Society of Developmental and Comparative Immunology, Aug 6-7, 1999 George Washington University, Washington DC

PROFESSIONAL MEMBERSHIPS

International Society of Developmental and Comparative Immunology. 1983 to present

Editorial Advisory Board, Developmental and Comparative Immunology. 2003-2006

American Society of Zoologists. 1983 to 1990

Sigma Xi. 1987 to 1989, 1997 to 1999

American Association for the Advancement of Science. 1992 to present

Mid Atlantic Society of Developmental and Comparative Immunology. 1999. Founding Member

Golden Key National Honor Society, Honorary Member. 1998 to present

Invitation for membership was extended by GWU undergraduates and was based on outstanding teaching

AD HOC REVIEWER

Grant Reviews

National Science Foundation

Panel Member, Signal Transduction

NIH

US-Israel Binational Science Foundation

Australian Research Council

Maryland Sea Grant

California Sea Grant

Manuscript Reviews

Editorial Advisory Board, Developmental and Comparative Immunology, 2003-2006

Nature Reviews Immunology

Biological Bulletin

Immunogenetics

Journal of Invertebrate Pathology

European Journal of Cell Biology

European Journal of Biochemistry

EMBO Journal

Gene

Quarterly Review of Biology

Comparative Biochemistry and Physiology

Biotechniques

TEACHING EXPERIENCE (at George Washington University, 1995 to present)

Cell Biology. (BISC 102) An introduction to cellular functions for the undergraduate student. Enrollment is 40-60 undergraduate students. Fall Semester

Immunology. (BISC 118) An introductory course in immunology for upper level undergraduate students in biology. Enrollment of 40 undergraduate students. Co-taught, Fall and Spring Semesters.

Immunology of Plants and Animals: (BISC 218) Immune systems in organisms other than higher vertebrates, including cartilaginous fish, tunicates, echinoderms, insects, molluscs, cnidaria, porifera and higher plants. Emphasis is placed on understanding the innate immunity. Seminar format for the beginning graduate student;

includes critical analysis of data, oral presentations and written reviews of data. Enrollment of 4 to 8 graduate students. Spring semester

Tropical Marine Biology: (BISC 168) Investigations of the physical, chemical and biological factors that interplay in the tropical ecosystems of the Bahamian island of San Salvador. Team taught, summer, even years. Enrollment of 16-20 undergraduate students.

Advanced Problems in Genetics Seminar: (Gen301) Present a review of my research to a subset of the graduate students in the Genetics program. Interacted with two students each year for writing a paper on some topic of immunology.

Immunology: (BMSC213) Presented a 2 hour lecture on the phylogeny and evolution of immune systems in animals, or the complement system to graduate students in the GWU Biomedical Core Curriculum.

STUDENTS and RESEARCH ASSOCIATES

Post Doctoral Research Associates

Sham V. Nair, Ph.D. Post Doctoral Research Fellow in Comparative Immunology
2000 to 2002. Current position: School of Veterinary Medicine, University of Sydney, Australia
Tushini V. de Soya, Ph.D., Post Doctoral Research Fellow in Comparative Immunology
2003 to 2004.

Visiting Research Associates

Paul S. Gross, Ph.D., Assistant Professor, Medical University of South Carolina
Summer 1996, 1997, 1998, 1999, Aug. 2000
Eleanor F. Shepard, Ph.D., Post Doctoral Research Fellow, Dept of Nat. Res., Charleston, South Carolina
August 2000
David Raftos, Ph.D., Associate Professor, Macquarie University, Australia
June 1999, June 2000, September 2000, June 2003, June 2004
Margaret Stevens, Ph.D., Professor, Ripon College, Wisconsin. Sabbatical leave, June - Dec, 2001

Graduate Students (¹Co-Director)

George Washington University

Walid Al-Sharif	Genetics	1995-1999	M.Ph, 1997	
Lawrence Lantz ¹	Genetics	1997-1999	Ph.D., 1999	
Lori Clow	Genetics	1997-2000	Ph.D., 2000	current: US Patent Office
Megha Shah ¹	Biology	1999-2001	M.S., 2001	current: Phys for Responsible Med
Keri (Fisher) Multerer	Genetics	2000-2003	M.S., 2003	current: F.Hutchinson Cancer Cntr
David Terwilliger	Biology	1999-present	Doctoral candidate	
Paul Krebel ¹	Biology	2000-present	Doctoral candidate	
Katherine Shank	Biology	2003-present	Doctoral Student	
Priya Moorjani	Genomics & Bioinf	2003-present	Master's Student	

Doctoral Committee Membership

Dorothy Phuong-My Trinh	Genetics	1996-1997	Ph.D.	May 1997
Daoud Meerzamen	Genetics	1997	Ph.D.	May 1997
Di Jiang	Genetics	1998	Ph.D.	Dec. 1998
Maxine Lesniak	Genetics	1997-1999	M.S.	Dec. 1999
Cathleen Coss	Biology	1996-2000	Ph.D.	May 2000
Rachel Poltilove	Genetics	2000-2001	Ph.D.	May 2001
Masoumeh Assadi	Biology	1997-2000	Ph.D.	Dec. 2000
Ginny Emmerson	Biology	1996-2002	Ph.D.	May 2002
Miriam Darnell	Genetics	1997-2002	Ph.D.	May 2003
Tulin Olcom	Biology	1999-2002	Ph.D.	Dec. 2002
Kathi Beutler	Biology	1999-2004	Ph.D.	May 2004
Nathaniel Brittain	Genetics/NIH	2004-	PhD Program	
Jessica Shockey	Medical Univ SC	2004	PhD Program	

Rotation Graduate Students

Jennifer Solomon	GWIBS Oncology	1998
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Undergraduate Students

¹REU Award, ²SURF: Summer Undergraduate Research Fellow at Caltech, ³Served as Co-Director for a student who worked in a different laboratory, *Co-authorship on a publication)

Caltech:

Mike Graham	1985	
Ali Lashgari	1986	
John Bowers	1987-1988	² SURF: 1988
Aaron Petty	1990-1993	SURF: 1992
Lily Chang*	1993-1994	SURF: 1994
Charles Lee ¹	1994-1995	SURF: 1995

George Washington University:

Chie-Schin Shih*	1995-1997	B.S., Biology with Special Honors, May 1997
Sebastian Dachenhausen*	1996-1997	B.S., Biology with Special Honors, May 1997
David Lima	1996-1997	B.S., Biology, May 1997
Lee Heiman	1997	B.S., Biology, May 1997
Maximillian Soong ³	1997-1998	B.S., Biology, May 1998
Mary Ann McYat ¹	1997-1999	B.S., Biology, May 1999
Brian Gier ³	1998	
Susan Pesci ¹	1998-2000	B.S., Biology, with Special Honors, May 2000
Nikolas Marko ³	1999-2000	B.S., Biology with Special Honors, May 2000
Sabina Siddiqui ¹	1999	B.S., Biology, May 2000
Caroline Sanchez ³	1999-2000	B.S., Biology with Special Honors, May 2000
Anna Krueger ³	2000-2001	B.S., Biology with Special Honors, May 2001
Heather Del Valle*	2002-2003	B.S., Biology, May 2003
Megan Dixon	2002-2004	
Jonathan Mendelson	2004-present	HHMI summer fellowship, 2004

Medical Students

Chie-Schin Shih	summer 1998. George Washington University Medical School Recipient of a Gill Award for summer research by a medical student.
Dhruti Mehta	summer 2002. Howard University Medical School

High School Student

Nicole Ritter, Plainfield Indiana, summer 2003, 2004.

PRESENTATIONS at MEETINGS by STUDENTS & RESEARCH ASSOCIATES

Al-Sharif, W.Z., J.O. Sunyer, J.D. Lambris & L.C. Smith. "Characterization of the cDNA encoding a protein homologous to the mammalian complement component C3 which is expressed in sea urchin coelomocytes." Poster. International Society of Developmental and Comparative Immunology, Seventh Congress. College of William and Mary, Williamsburg, VA, July 20-25, 1997.

de Soyza, T. V., S. V. Nair, L. C. Smith. "Chromatin immunoprecipitation of DNA from sea urchin coelomocytes identifies a promoter with a kB site." Poster. Experimental Biology 2004, April 20, 2004, Washington DC.

Gross, P.S., J.O. Sunyer, J.D. Lambris & L.C. Smith. "The Sea Urchin Complement C3 Protein: Expression And Function." International Society of Developmental and Comparative Immunology, Seventh Congress. Poster. College of William and Mary, Williamsburg, VA, July 20-25, 1997.

Gross, P.S., L.A. Clow, C.-S. Shih & L.C. Smith. "Complement protein C3 (SpC3) from the purple sea urchin, *Strongylocentrotus purpuratus*, is expressed specifically in a subpopulation of the phagocytic coelomocytes." Poster. Experimental Biology '99, Washington DC, June 19-24, 1999.

Gross, P.S., L.A. Clow & L.C. Smith. "SpC3, a homologue of the complement component, C3, from the purple sea urchin, *Strongylocentrotus purpuratus*, is expressed specifically in a subpopulation of the phagocytic

- coelomocytes.” Oral Presentation. Mid Atlantic Society of Developmental and Comparative Immunology, George Washington University, Aug 5-6, 1999.
- Clow, L.A., P.S. Gross, C.-S. Shih & L.C. Smith. “Lipopolysaccharide induces the complement homologue, SpC3, in the purple sea urchin *Strongylocentrotus purpuratus*.” Poster. Experimental Biology '99, Washington DC June 19-24, 1999.
- Clow, L.A., P.S. Gross, C.-S. Shih & L.C. Smith. “Expression of SpC3, A complement homologue in the purple sea urchin, *Strongylocentrotus purpuratus*.” Poster. FASEB Summer Research Conference. *Phylogenetic Perspectives on the Vertebrate Immune System*. Copper Mountain, CO. July 11-16, 1999.
- Clow, L.A., P.S. Gross & L.C. Smith. “SpC3, A Complement Homologue in the Purple Sea Urchin, *Strongylocentrotus purpuratus*: Expression and Opsonization.” Oral Presentation. Mid Atlantic Society of Developmental and Comparative Immunology, George Washington University, Aug 5-6, 1999.
- Clow, L.A., P.S. Gross, D.A. Raftos & L.C. Smith. “Sea Urchin SPC3, a Homologue of the Complement Component C3, is Expressed in Two Subsets of Phagocytes and Functions as an Opsonin.” Poster. International Society of Developmental and Comparative Immunology, Eighth Congress, Cairns Australia, July 2-6, 2000.
- Nair, S.V., P.S. Gross, E. Shephard, R.Chapman, G. Warr & L.C. Smith. Macroarray analysis of sea urchin defensive responses to lipopolysaccharide. 4th Annual Comparative Immunology Symposium “Immunodiversity in Defense Mechanisms; Recognition & Communication Systems.” Oral Presentation. Florida International University. March 2-3, 2002
- Terwilliger D.P., L.A. Clow, P.S. Gross, K.A. Fisher, L.C. Smith. The expression and alternative splicing of *Sp152*, homologue of complement factor B in *Strongylocentrotus purpuratus*. Oral presentation. International Society of Developmental and Comparative Immunology, Ninth Congress, St Andrews Scotland, June 29-July 5, 2003
- Terwilliger, D.P., L.A. Clow, P.S. Gross, L.C. Smith. “Expression of SpBf, the Homologue of Complement Factor B, and Evidence for Alternative Splicing in the Purple Sea Urchin, *Strongylocentrotus purpuratus*.” Poster. International Society of Developmental and Comparative Immunology, Eighth Congress, Cairns Australia, July 2-6, 2000.
- Terwilliger, D.P., L.A. Clow, P.S. Gross, L.C. Smith. “Gene Expression of a Homologue of Complement Factor B (SpBf) in Phagocytes from the Purple Sea Urchin, *Strongylocentrotus purpuratus*, in Response to Lipopolysaccharide and Injury.” Poster. Mid Atlantic Society of Developmental and Comparative Immunology, George Washington University, Aug 5-6, 1999.
- Terwilliger, D.P, S. V. Nair, D. Mehta, N. J. Ritter, L. C. Smith. “Unexpected genetic diversity in a putative antimicrobial peptide from a sea urchin.” Poster. Experimental Biology 2004, April 21, 2004, Washington DC.
- Shah, M., L. C. Smith, K. M Brown. “The gene encoding the sea urchin complement protein, SpC3, is expressed in embryos and can be upregulated by bacteria.” Poster. Experimental Biology 2004, April 21, 2004, Washington DC.
- Shih, C.-S., L.A. Clow, P.S. Gross & L.C. Smith. “SpC3 Protein Expression in Lipopolysaccharide-activated Coelomocytes from the sea urchin, *Strongylocentrotus purpuratus*.” Poster. GWU/Beaumont Research Day, GWU School of Medicine. January, 1999.