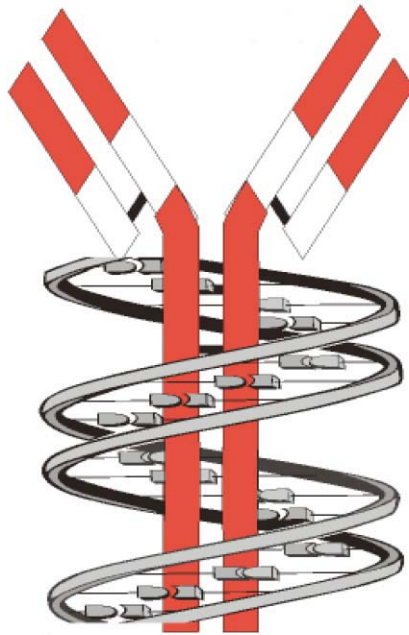


UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER

**DEPARTMENT OF MOLECULAR BIOLOGY AND
IMMUNOLOGY**



***GRADUATE PROGRAM IN MICROBIOLOGY AND
IMMUNOLOGY***

Program Handbook 2010-2011

Rance Berg, Ph.D.
Assistant Professor, Graduate Advisor

1. Description of the Program in Microbiology and Immunology

Rance Berg, Ph.D., Graduate Advisor
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Graduate Faculty: Alizadeh; Berg; Borvak; Hodge; Jones; Kim; Mathew, P.; Mathew, S.; Mummert; Simecka; Vishwanatha; Williamson

Infectious diseases have a major impact on health around the world. New infectious agents have emerged, and diseases caused by known pathogens have reestablished themselves. Many of these infections result in life-threatening diseases. To complicate matters, many of these infectious agents have developed resistance to antibiotics routinely used in treatments. Thus, prevention and treatment of these infections are of tremendous importance. The development of new antibiotics and vaccines is dependent on an in-depth understanding of the mechanisms of disease caused by these organisms and their basic biology. Also, many findings arising from the investigation of the molecular biology of microbes has significantly contributed to our understanding of the molecular basis of cancer.

Cancer continues to be a significant health problem and is associated with genetic factors, diet and exposure to environmental insults and infectious agents. Cells of the body normally are limited in their growth. In contrast, cancer cells are derived from normal cells and divide uncontrollably, forming tumors. Also, cancer cells spread (metastasize) from primary tumors to distant tissues in the body. Understanding the biology of cancer and the process of metastasis will provide important clues in prevention and treatment of cancer.

Immunology is the study of the defense mechanisms of the host against infectious diseases, cancers and other diseases. By inducing immune responses, as in the case of vaccines, infection and disease can be prevented. Enhancement of appropriate immune responses can also result in the destruction of cancer cells. Research in immunology has a tremendous potential in developing new treatments to prevent or recover from cancer and infectious disease.

Faculty maintain active and productive research programs with special emphasis on infectious disease, microbiology, cancer, and immunology. Research interests of the faculty include regulation of eukaryotic gene expression; T cell and NK cell biology; host response to respiratory infections; molecular immunology; tumor immunology; vaccine development; regulation and function of cytokines; molecular diagnostics for emerging vector borne pathogens; cancer biology and metastasis. Faculty programs are funded by extramural sources including the National Institutes of Health, the American Osteopathic Association, the Texas Higher Education Coordinating Board Advanced Research Program, and the Cancer Research Foundation of North Texas.

Students may enter the program with a variety of academic backgrounds, providing that they have fulfilled prerequisite courses. The graduate training program involves basic courses in immunology and microbiology, molecular biology, biochemistry and advanced courses in selected topics. Students participate in seminars and discussion of current research and receive extensive training in techniques of contemporary microbiology, molecular biology and immunology. Students perform original, publishable research and present their research findings at national scientific meetings. In addition, students are required to present their research at the annual UNTHSC Research Appreciation Day (RAD) and during the weekly departmental Works in Progress (WIPs). About two years are required to complete the Master of Science degree. Approximately four to five years are required to complete the Doctor of Philosophy degree.

Graduates with advanced degrees find employment in higher education, industry and government agencies.

1.2. Graduate Faculty and Specific Research Programs: Summary

Faculty and Position

Hassan Alizadeh, Ph.D.

Associate Professor
Cell Biology and Anatomy
Category III

Research Interest

The major focus in my laboratory is to understand the immune response against pathogenic microorganisms that infect the eye. *Acanthamoeba* keratitis is a sight-threatening corneal disease caused by pathogenic free-living amoebae. *Acanthamoeba* keratitis is caused by *Acanthamoeba* species with a remarkable ability to kill cells in a contact-dependent and independent manner. The disease is often associated with contact lens wear, which appears to be an important risk factor in infection. The primary focus of this project is to thoroughly evaluate the molecular interactions between an ocular pathogen and corneal epithelial tissues.

Our fundamental premise is that no single therapeutic procedure is likely to be effective in the treatment of ongoing infection. However, a carefully selected and evaluated combination of procedures that collectively or synergistically interfere with each step of the pathogenic cascade is needed to produce a significant reduction in the severity of the disease.

Rance Berg, Ph.D.

Assistant Professor, Graduate Advisor
Category III

The major focus of our laboratory is to understand the immune response against pathogenic microorganisms. Specifically, the gram-positive bacterium, *Listeria monocytogenes*, is utilized to dissect the roles of T cells, NK cells, NK-T cells, dendritic cells, monocytes, neutrophils and macrophages during the innate and adaptive immune responses that occur in the spleen and liver. Elucidating the proliferative capacity, cytokine/chemokine secreting potential, localization, and ultimate fate of these and other immune effectors allows us to understand how the immune system coordinately responds to and controls pathogens.

Jozef Borvak, Ph.D.

Research Assistant Professor
Category I

Cellular multidrug resistance is a major problem in cancer therapy. There is compelling evidence that dendritic cells (DCs) require the transporter activity of multidrug resistance protein 1 (MRP1; ABCC1) for their differentiation and proper function. The immune response-eliciting capacity of DCs is, therefore, undoubtedly related to transporters of xenobiotics, particularly in cancer or other chronic diseases. My research focuses on the involvement of a non-ABC drug transporter, RLIP76, in antigen presentation by human DCs in health and disease. In a more advanced phase of our study, patients primarily with autoimmune diseases (e.g., rheumatoid arthritis, osteoarthritis, diabetes) and prostate cancer will be included. The capacity of DCs to orchestrate the innate and adaptive immunity, depending on the level of expression of RLIP76, will be assessed. The role of RLIP76 in both migratory properties of DCs and regulating the rate of antigen internalization by DCs will also be studied. We will compare the immune-stimulatory capacity of different subsets of DCs (e.g., myeloid and plasmacytoid DCs) and draw

conclusions for possible improvement of antigen presentation by altering their expression levels of RLIP76.

Lisa Hodge, Ph.D.

Assistant Professor
Category III

Our long range research goal is to evaluate the effectiveness of osteopathic manipulative techniques (OMT) at modulating the immune response against a variety of infectious and inflammatory diseases. Clinical studies support the application of OMT for the treatment of infection, edema, neuromuscular dysfunction, and pain, but experimental support for their use is sparse and the mechanisms involved are not well understood. Currently, we are examining the mechanisms by which OMT influences lymphatics, inflammation, and lymphocyte migration during pneumonia, cancer and following tissue injury. In addition, we develop animal models to study the mechanisms by which alternative medicine therapies augment the lymphatic and immune systems in both healthy and diseased states.

Harlan Jones, Ph.D.

Assistant Professor
Category III

There is increasing evidence that psychological stress is an important risk factor in the initiation and progression of chronic disease (e.g. cancer, atherosclerosis and chronic infectious disease). My research interest include the investigation of how stress affects host immune mediation of chronic disease states with the intention of facilitating comprehensive therapeutic approaches against stress-induced disease pathogenesis.

Myoung Kim, Ph.D.

Assistant Professor
Category III

Molecular mechanism of cancer metastasis and developing strategies to reduce/inhibit metastasis.

Porunelloor Mathew, Ph.D.

Associate Professor
Category III

The major objective of my research laboratory is to decipher the molecular basis of tumor cell recognition by NK cells. The information obtained in these studies will be utilized towards developing new strategies for eliminating tumor cells.

Stephen Mathew, Ph.D.

Research Assistant Professor
Category II

Dr. Stephen Mathew's research focuses on developing molecular immunological strategies against diseases like cancer with special emphasis on childhood leukemia, HIV-AIDS and lupus. Specifically, our objective is to unravel the molecular basis of tumor cell recognition by NK cells and its multiple receptor ligand interactions and their role in other diseases like lupus and HIV infection.

Mark Mummert, Ph.D.

Associate Professor, Psychiatry
and Behavioral Health
Category III

The major goal of our laboratory is to understand the biological functions of hyaluronan in innate and adaptive immune responses. Hyaluronan, a glycosaminoglycan composed of glucuronic acid and N-acetylglucosamine subunits is expressed in pericellular and extracellular matrices. We have found that hyaluronan plays an import role in the migration of epidermal dendritic cells to the lymph nodes in models of contact hypersensitivity. We have also shown that hyaluronan plays a key role in the proliferation of T cells in antigen restricted dendritic

cell presentation, allogeneic stimulation and mitogenic stimulation. Our current research is aimed at determining the hyaluronan receptors involved in these processes and the hyaluronan mediated pathways regulating cell proliferation.

Jerry Simecka, Ph.D.

Dept. Chairman and Professor
Category III

The major goal of our laboratory is to understand the immune mechanisms involved in respiratory diseases. Immune responses along the respiratory tract have both beneficial and detrimental effects. Immune responses can protect against infectious disease by preventing infection or by eliminating disease causing bacteria or viruses. However, in some cases, the immune response can contribute to the problem. This is the case for infectious diseases and asthma. We are taking advantage of a murine model of respiratory pneumonia caused by mycoplasma to study the generation of immunity that leads to either protection or more severe disease. Mycoplasmas are major causes of pneumonia in man and animals. The immune response against a mycoplasma infection has both beneficial and detrimental effects. We have shown that immune responses, through the activity of T cells, clearly promote the development of inflammatory reactions leading to severe mycoplasma lung disease. However, immune responses can also prevent disease and ensures that the infection remains localized to the lung. Our work is focusing on the role of T cell populations, antigen presenting cell populations and cytokine networks in determining the impact of immunity in mycoplasma disease.

Jamboor K. Vishwanatha, Ph.D.

Dean, Graduate School of Biomedical
Sciences and Professor
Category III

Research in Dr. Vishwanatha's laboratory is in three distinct, but interrelated areas. The goal of the first area of research is to decipher the molecular progression of prostate and breast cancers. Utilizing various molecular, immunological and imaging technologies, we are investigating the role of annexin A2, STAT-6 and C17orf37 genes in breast and prostate cancer progression. In the second area of research, we are formulating sustained release nanoparticles that can be targeted to specific disease tissues. The goal of this project is to formulate multifunctional nanoparticles for both acute and sustained therapy of diseases such as cancer, glaucoma, COPD and sickle cell anemia. In the third research area, we are studying the role of annexin A2 induced plasmin generation in retinal ganglion cell death leading to glaucoma.

Phillip Williamson, Ph.D.

Assistant Professor, Asst Dir DNA Lab
Category II

Dr. Williamson's research interests include the development of low-level DNA methodologies for microbial forensic testing and clinical diagnostic applications; rapid PCR-based diagnostic systems for pathogens such as *Borrelia*, *Babesia*, *Bartonella*, *Coxiella*, *Ehrlichia*, *Rickettsia* and *Francisella*; development of predictive risk models based on satellite remote sensing imagery and geographic information system techniques; the application of molecular-based multiplexing approaches for biodefense. These methods are being applied to study the epidemiology, genetics and associated clinical manifestations of potential emerging

pathogens and to perform environmental monitoring of vector-borne pathogen populations in Texas, the southwestern United States and South America.

2. Course Offerings & Requirement

2.1 Core Courses

Microbiology and Immunology students are required to take both Fall core courses (BMSC 6301 - Principles of Biochemistry and BMSC 6302 - Molecular Cell Biology) and 2 of 3 Spring core courses (BMSC 6305 - Microbiology & Immunology, BMSC 6304 - Pharmacology or BMSC 6303 - Physiology). Credit may be given under some instances associated with student transfer from an equivalent program, but is subject to approval from the Dean.

2.2. Advanced Courses (4-6 SCH) from the following:

- MOLB 6200 Advanced Molecular Biology: Transcriptional and Translational Regulation – offered every other fall - even years (2 SCH)
- MOLB 6201 Immune Responses Against Pathogenic Microorganisms - offered every other fall – even years (2 SCH)
- MOLB 6202 Advanced Molecular Biology: Techniques and Principles – offered every other fall - odd years (2 SCH)
- MOLB 6250 Molecular and Cell Biology of Cancer – offered each spring (2 SCH)
- MOLB 6302 Advanced Microbial Genetics – offered every other spring – odd years (3 SCH)
- MOLB 6350 Advanced Immunology – offered every spring (3 SCH)

2.3. Journal Clubs

- MOLB 5120 Current Topics in Immunology – offered each fall and spring
- MOLB 5160 Current Topics in Cancer Biology – offered each fall and spring
- MOLB 5210 Signal Transduction – offered each fall and spring

2.4 Seminar in Current Topics (MOLB 5140)

Monday seminar series of Department of Molecular Biology & Immunology and discussion of seminar – offered each fall and spring

2.5. Degree Plans

M.S. Degree Plan for Microbiology and Immunology

Year 1: Fall

BMSC 6301	Integrative Biomedical Sciences I: Principles of Biochemistry	4 SCH
BMSC 6302	Integrative Biomedical Sciences II: Molecular Cell Biology	4 SCH
BMSC 5135	Introduction to Faculty Research Programs	1 SCH
BMSC 5150	Lab Rotations	2 SCH
BMSC 5160	Biomedical Ethics	1 SCH
		<hr/> 12 SCH

Year 1: Spring

	<i>At least one of the following courses:</i>	
BMSC 6303	Integrative Biomedical Sciences III: Physiology	3 SCH
BMSC 6304	Integrative Biomedical Sciences IV: Pharmacology	2 SCH
	<i>And:</i>	
BMSC 6305	Integrative Biomedical Sciences V: Immunology and Microbiology	3 SCH
BMSC 5998	Individual Research for MS Students	3-4 SCH
BMSC 5135	Introduction to Faculty Research Programs	1 SCH
MOLB 5140	Seminar in Current Topics	1 SCH
	Journal Club Course**	1 SCH
		<hr/> 12 SCH

Year 1: Summer

BMSC 5400	Biostatistics for BMSC	4 SCH
BMSC 5998	Individual Research for M.S. Students	2 SCH
		<hr/> 6 SCH

Year 2: Fall

BMSC 5310	Scientific Communications	3 SCH
BMSC 5998	Individual Research for M.S. Students	5-6 SCH
	Elective Course*	2-3 SCH
	Journal Club Courses**	1 SCH
		<hr/> 12 SCH

Year 2: Spring

BMSC 5395	Thesis	6-7 SCH
	Elective Course*	2-3 SCH
		<hr/> 9 SCH

TOTAL **51 SCH**

Ph.D. Degree Plan for Microbiology and Immunology

Year 1: Fall

BMSC 6301	Integrative Biomedical Sciences I: Principles of Biochemistry	4 SCH
BMSC 6302	Integrative Biomedical Sciences II: Molecular Cell Biology	4 SCH
BMSC 5135	Introduction to Faculty Research Programs	1 SCH
BMSC 5150	Lab Rotations	2 SCH
BMSC 5160	Biomedical Ethics	1 SCH
		<hr/> 12 SCH

Year 1: Spring

At least one of the following courses:

BMSC 6303	Integrative Biomedical Sciences III: Physiology	3 SCH
BMSC 6304	Integrative Biomedical Sciences IV: Pharmacology	2 SCH
	<i>And:</i>	
BMSC 6305	Integrative Biomedical Sciences V: Immunology and Microbiology	3 SCH
BMSC 5135	Introduction to Faculty Research Programs	1 SCH
BMSC 6998	Individual Research	3-4 SCH
MOLB 5140	Seminar in Current Topics	1 SCH
	Journal Club Course**	1 SCH
		<hr/> 12 SCH

Year 1: Summer

BMSC 5400	Biostatistics for BMSC	4 SCH
BMSC 6998	Individual Research	2 SCH
	Qualifying Exam	0 SCH
		<hr/> 6 SCH

Year 2: Fall

BMSC 5310	Scientific Communications	3 SCH
BMSC 6998	Individual Research	5-6 SCH
	Elective Course*	2-3 SCH
	Journal Club Course**	1 SCH
		<hr/> 12 SCH

Year 2: Spring

BMSC 6998	Individual Research	8-9 SCH
BMSC 6310	Grant Writing	3 SCH
	Journal Club Course**	1 SCH
		<hr/> 12 SCH

Year 2: Summer

BMSC 6998	Individual Research	6 SCH
		<hr/> 6 SCH

Year 3: Fall

MOLB 5140	Seminar in Current Topics	1 SCH
BMSC 6998	Individual Research	1-2 SCH
	Elective Course*	2-3 SCH
	Journal Club Course**	<u>1 SCH</u>
		6 SCH

Year 3: Spring

BMSC 6998	Individual Research	2-3 SCH
	Elective Course*	2-3 SCH
	Journal Club Course**	<u>1 SCH</u>
		6 SCH

Year 3: Summer

BMSC 6998	Individual Research	<u>6 SCH</u>
		6 SCH

Year 4: Fall

BMSC 6998	Individual Research	5 SCH
	Journal Club Course**	<u>1 SCH</u>
		6 SCH

Year 4: Spring

BMSC 6395	Doctoral Dissertation	5 SCH
	Journal Club Course**	<u>1 SCH</u>
		6 SCH

Year 4: Summer

BMSC 6395	Doctoral Dissertation	<u>6 SCH</u>
		6 SCH

TOTAL **96 SCH**

3. Advancement to Doctoral Candidacy

3.1 Qualifying Examination

The qualifying examination ensures that the doctoral student has mastered information needed to succeed as a Ph.D. in the field of Microbiology and Immunology. A list of key topics compiled by the Microbiology and Immunology faculty will be distributed to the student after completion of the first year of course work. The student is expected to become knowledgeable in each of these topics through their course work, reading of textbooks and scientific literature, and discussion with faculty members.

The oral qualifying examination is administered by a committee comprised of Members of the Microbiology and Immunology graduate faculty and the student's university member. The oral examination consists of questions from a selected list of topics provided to the student.

The qualifying examination will be administered during the summer after completion of the core course work. Two attempts to successfully pass the qualifying

examination are allowed. It is the responsibility of the student to obtain signatures from the examination committee chair, graduate advisor, university member, and department chairman upon completion of the exam. The appropriate form may be obtained from the Graduate School website. Failure of the student to pass the oral qualifying examination results in dismissal of the student from the doctoral program. A doctoral student who does not pass may be allowed to complete the requirements for a Master of Science degree.

3.2 Grant Writing (BMSC 6310)

Success completion of Grant Writing (BMSC 6310) requires the preparation and oral defense of an original NIH grant proposal. Two attempts to successfully accomplish this are allowed. BMSC 6310 should be registered for during the Spring semester of the student's second year.

The graduate advisor will serve as the examination coordinator and select an examination committee consisting of four graduate faculty, including a committee chair. The student's major professor may not serve as a committee member. The student's university member will oversee the entire examination process.

The faculty coordinator instructs the student on the regulations of the course and assists in initiating and preparing the proposal. The student should submit a report which presents the hypothesis, experimental strategy and specific aims for the proposal to the examination committee by mid-semester. The proposal must consist of the student's original ideas and is expected to significantly extend scientific knowledge in the chosen research area if the proposed experiments were actually conducted. The proposal should be unrelated to any previous research performed by the student and unrelated to any research currently being pursued in the major professor's laboratory. The committee must approve this summary of the research proposal.

The student must prepare a detailed written report of the research proposal in NIH format after the summary has been approved. The final proposal will be typed and presented to the committee at least two weeks prior to the oral defense. The grant proposal and presentations will be evaluated on the basis of originality and ability to synthesize and communicate this information.

If the proposal and defense are satisfactory, the committee will recommend that the student be advanced to candidacy. This recommendation is presented to the discipline's graduate faculty for approval by the faculty coordinator. Upon successful completion of this course, the student is advanced to candidacy. Two attempts to successfully complete Grant Writing (BMSC 6310) will be allowed. Failure to pass Grant Writing (BMSC 6310) will result in dismissal from the doctoral program. In this case, a student may be allowed to complete the requirements for a Master of Science degree.

4. Contacts in Situations of Uncertainty or Emergency

Graduate Program in Microbiology and Immunology
Department of Molecular Biology & Immunology
Main Office Phone: 817-735-2109 ▪ Office: RES-416

Graduate Advisor:

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Faculty Interview Schedule
Fall 2010
 (To be completed by August 31, 2010)

Name of Faculty Member	Date of Interview	Signature
Rance Berg, Ph.D. RES-416D		
Lisa Hodge, Ph.D. RES-402E		
Harlan Jones, Ph.D. RES-416F		
Myoung Kim, Ph.D. CBH-328		
Porunelloor Mathew, Ph.D. RES-402D		
Stephen Mathew, Ph.D. RES-416J		
Mark Mummert, Ph.D. RES-110		
Jerry Simecka, Ph.D. RES-402A		
Jamboor K. Vishwanatha, Ph.D. EAD-822		
Phillip Williamson, Ph.D. ENX2-134		