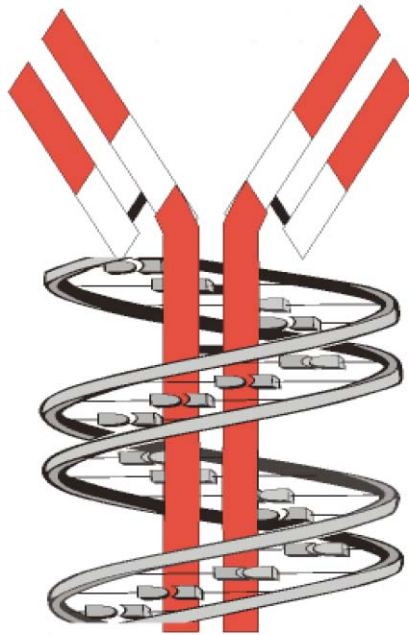


*UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER*

**DEPARTMENT OF MOLECULAR BIOLOGY AND  
IMMUNOLOGY**



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

**Program Handbook 2011-2012**

# 1. Description of the Program in Microbiology and Immunology

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**Graduate Faculty:** Alizadeh; Berg; Hodge; Jones; Mathew, P.; Mathew, S.; Mummert; Simecka; Su; 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.

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; and molecular diagnostics for emerging vector borne pathogens. 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, physiology, and pharmacology, as well as 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 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 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

#### **Rance Berg, Ph.D.**

Assistant Professor,  
Graduate Advisor  
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.

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.

**Lisa Hodge, Ph.D.**  
Associate 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.

**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 important 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.**  
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 ensure 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.

**Dong-Ming Su, Ph.D.**  
Associate Professor  
Category III

My current research interest is to understand cellular and molecular regulations in establishment and maintenance of the thymic microenvironment in the process of T-cell immune system development and aging; to delineate its deregulation caused immunodeficiency and autoimmunity diseases, as well as tumor genesis.

**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.**  
Associate Professor, Assistant  
Director DNA Lab  
Category III

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 the following core courses:

BMSC 6301 - Principles of Biochemistry  
BMSC 6302 - Molecular Cell Biology  
BMSC 6303 – Physiology  
BMSC 6304 - Pharmacology  
BMSC 6305 - Microbiology & Immunology

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

### 2.3. Journal Clubs

MOLB 5120 Current Topics in Immunology  
MOLB 5160 Current Topics in Cancer Biology  
MOLB 5210 Signal Transduction

### 2.4 Seminar in Current Topics (MOLB 5140)

Monday seminar series of Department of Molecular Biology & Immunology and discussion of seminar.

## 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

BMSC 6303	Integrative Biomedical Sciences III: Physiology	3 SCH
BMSC 6304	Integrative Biomedical Sciences IV: Pharmacology	2 SCH
BMSC 6305	Integrative Biomedical Sciences V: Immunology and Microbiology	3 SCH
BMSC 5998	Individual Research for MS Students	1 SCH
BMSC 5135	Introduction to Faculty Research Programs	1 SCH
MOLB 5140	Seminar in Current Topics 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 Course	1 SCH
	Research Proposal	0 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**

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

### **Year 1: Summer**

BMSC 5400	Biostatistics for BMSC	4 SCH
BMSC 6998	Individual Research	2 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
	Qualifying Exam	0 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	4-5 SCH

	Elective Course	2-3 SCH
	Journal Club Course	1 SCH
	Research Proposal	0 SCH
		<hr/> 9 SCH
<b><u>Year 3: Spring</u></b>		
BMSC 6998	Individual Research	5-6 SCH
	Elective Course	2-3 SCH
	Journal Club Course	1 SCH
		<hr/> 9 SCH
<b><u>Year 3: Summer</u></b>		
BMSC 6998	Individual Research	6 SCH
		<hr/> 6 SCH
<b><u>Year 4: Fall</u></b>		
BMSC 6998	Individual Research	8 SCH
	Journal Club Course	1 SCH
		<hr/> 9 SCH
<b><u>Year 4: Spring</u></b>		
BMSC 6395	Doctoral Dissertation	8 SCH
	Journal Club Course	1 SCH
		<hr/> 9 SCH
<b><u>Year 4: Summer</u></b>		
BMSC 6395	Doctoral Dissertation	6 SCH
		<hr/> 6 SCH
<b>TOTAL</b>		<b>108 SCH</b>

### 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 fields of Microbiology and Immunology. A list of key topics compiled by the Microbiology and Immunology faculty will be distributed to the student prior to the qualifying examination. The student is expected to become knowledgeable in each of these topics through their previous course work, reading of textbooks and scientific literature, and discussion with faculty members.

The qualifying examination is administered by a committee comprised of members of the Microbiology and Immunology graduate faculty and the student's university member. The qualifying examination will be administered in the fall or spring of year 2. Two attempts to successfully pass the qualifying examination are allowed. Failure of the student to pass the 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. 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.

### **3.2 Grant Writing (BMSC 6310)**

Successful completion of Grant Writing (BMSC 6310) requires the preparation and oral defense of an original NIH-style grant proposal. BMSC 6310 should be registered for during the spring or summer of the student's second year.

The graduate advisor will serve as the examination coordinator and select an examination committee consisting of five graduate faculty. One of the faculty will serve as the 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 graduate advisor will instruct the student on the regulations of the course.

The student should submit a report that 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 conducted. The student may write his/her grant on their current or proposed dissertation research. The committee must approve this summary of the research proposal.

The student must prepare a detailed written report of the research proposal in NIH R21 format after the summary has been approved. The final proposal will be prepared and presented to the committee at least two weeks prior to the oral defense. The grant proposal and presentation will be evaluated on the basis of originality, experimental design, and data interpretation as well as the ability of the student to synthesize and communicate this information, both written and orally.

If the proposal and defense are satisfactory, the committee will recommend that the student be 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  
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### **Graduate Advisor:**

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### **Graduate Secretary:**

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