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FACULTY SENATE

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MEMORANDUM

To: Julio Frenk
University President

From: Linda L. Neider
Chair, Faculty Senate

Date: March 30, 2020

Subject: Faculty Senate Legislation #2019-70(B) – Creation of an Accelerated B.S. to Ph.D. Track in the Department of Microbiology and Immunology (MIC) – Miller School of Medicine

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The Faculty Senate, at its March 25, 2020 meeting, had no objections to the approval of the Miller School of Medicine proposal to create an accelerated B.S. to Ph.D. track in the Department of Microbiology and Immunology.

The accelerated B.S.to Ph.D. track in Microbiology and Immunology (B.S. to Ph.D. MIC) is not a new degree-awarding program; instead, it is a new track within the already existing and successful programs.

The proposal is enclosed for your reference.

This legislation is now forwarded to you for your action.

LLN/ll/rh

cc: Jeffrey Duerk, Executive Vice President and Provost
Henri Ford, Dean, Miller School of Medicine
Zhibin Chen, Associate Professor, Graduate Program Director, Miller School of Medicine

C**APSULE:** Faculty Senate Legislation #2019-70(B) – Creation of an Accelerated B.S. to Ph.D. Track in the Department of Microbiology and Immunology (MIC) – Miller School of Medicine

PRESIDENT'S RESPONSE

APPROVED: _____ DATE: 4/29/20
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Dean Henri Ford, Miller School of Medicine

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY
(pending any additional approval by the Board of Trustees)

NOT APPROVED AND REFERRED TO: _____

REMARKS (IF NOT APPROVED):_____

Program Change Request

Date Submitted: 03/09/20 11:26 am

Viewing: MICM_PHD : Ph.D. in Microbiology and Immunology

Last approved: 02/10/20 4:45 pm

Last edit: 03/09/20 4:58 pm

Changes proposed by: Zhibin Chen (zchen)

Catalog Pages Using
this Program

Ph.D. in Microbiology and Immunology

In Workflow

1. **PG Assessment and Accreditation**
2. **PG FS Office for GWC**
3. PG FS GWC
4. PG Faculty Senate
5. PG FS Office for President
6. PG Registrar

Approval Path

1. 03/09/20 4:28 pm Patty Murphy (pxm491): Approved for PG Assessment and Accreditation

History

1. Feb 10, 2020 by Patty Murphy (pxm491)

Please list the authors of this proposal including name, rank/title, program/department, and school.

Proposer(s) Name

Zhibin Chen M.D., Ph.D.
Associate Professor
Director, Graduate Program in Microbiology and Immunology
Department of Microbiology and Immunology
Miller School of Medicine
University of Miami

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Change Type All Other Changes

Provide a brief summary of the change

The Department of Microbiology and Immunology (MIC) is requesting approval of an accelerated Ph.D. track. This is made possible within the long-standing frameworks of our current Undergraduate Program in Microbiology and Immunology (B.S. (MIC)) which awards B.S. degrees and our current Graduate Program in Microbiology and Immunology (Ph.D. (MIC)) which awards Ph.D. degrees.

The Accelerated B.S.to Ph.D. Track in Microbiology and Immunology (B.S. to Ph.D. MIC) is not a new degree-awarding program; instead, it is a new track within our already existing and successful programs. This educational opportunity will streamline our undergraduate and graduate trainings for some of the most talented students of the University of Miami. It is designed to be an elite track for students that are dedicated to pursuing a career in research.

The information of the new B.S.to Ph.D. (MIC) track initially will be distributed to incoming freshman in our undergraduate B.S. (MIC) program. After successful completion of their first two years in the B.S. (MIC) program, interested students may apply for the proposed B.S. to Ph.D. (MIC) track, using their third year to complete their undergraduate B.S. requirements while gaining substantial research experience in the labs of potential mentors on the Miller School of Medicine Campus. Applicants for this new track are selected by a B.S. to Ph.D. (MIC) track admission / operating committee (AOC) comprising MIC undergraduate advisors and the MIC graduate program steering committee. By the end of the third year of a student's B.S. (MIC) training, the Ph.D. (MIC) graduate program steering committee evaluates and decides on a student's application to the B.S. to Ph.D. (MIC) track based on the applicant's academic performance and recommendations of research advisors.

Evaluation and admission will follow the same process as the direct admissions of our Ph.D. (MIC) program, including the selection of mentors and identifying financial support for the student's Ph.D. training. This direct admission process is presently in effect as one of the mechanisms for our current Ph.D. student recruitment into the MIC program. The proposed B.S. to Ph.D. (MIC) track will be highly selective for only those students who are exceptionally qualified and highly motivated to pursue a career in research. We anticipate that one or two students will be recruited into this new track each year. It should be noted that a B.S. to Ph.D. track is already established in the Biochemistry and Molecular Biology (BMB) program. However, the B.S. to Ph.D. (MIC) track differs in that this track does not commence with recruiting talented students from high schools. Instead, the B.S. to Ph.D. (MIC) track will serve as a talent retention of the undergraduate students in the MIC undergraduate program, and is

offered to highly qualified and motivated undergraduate students who have already determined that they desire to pursue a scientific research career.

Career Graduate

Academic Structure

School/ College	Department
Graduate Medical	Microbiology/Immunology

Plan Type Major and/or Degree

Degree Type Doctorate

Degree Name Doctor of Philosophy

Proposed Plan Code

Plan Name Ph.D. in Microbiology and Immunology

Will there be any subcomponents within the program such as concentrations, specializations, thesis/non-thesis options, or tracks?

Yes ~~No~~

Subcomponents

Subcomponent Type	Subcomponent Name
Track	**Accelerated B.S. to Ph.D. Track**

Effective Term Fall 2020

First Term Valid Spring 2020

Program Instruction Mode In Person

Where is the program offered?

Location	Please provide the % of instruction at each location.
Medical Campus	100

Program Length (Years) 5

Total Credits 60

To Be Published in the Academic Bulletin

Program Overview

Overview

Microbiology and Immunology is a multidisciplinary program encompassing the areas of cellular and molecular immunology, virology, microbial genetics, and pathogenic bacteriology.

The goals of the department's graduate program are to provide each student with the opportunity to acquire the theoretical background and conceptual framework with the technical research skills necessary to attain a PhD. During the first year of study, a broad educational base in all disciplines together with laboratory rotations introduce students to the diverse array of research topics. Students then choose one area of concentration for their research. The varied interests of the faculty provide numerous opportunities for student participation and a broad choice in dissertation research.

Active research in immunology includes the areas of cytotoxicity, programmed cell death, cytokine receptor signaling, clinical and experimental bone marrow transplantation, stem cell biology, gene therapy for cancer treatment, antigen recognition, cell differentiation and communication, aging of the immune system, interleukins, genetic control of immunoglobulin production, gene **activation, evolution of the immune response** ~~activation,~~ and **immune therapy against cancer, infection and autoimmune diseases.** ~~evolution of the immune response.~~ Research in other areas includes molecular biology of virus-host interaction in both animal and human systems, control and regulation of bacterial pathogenesis, selective tumor chemotherapy and radiation therapy, and therapy of parasitic infections.

Contact Information

Zhibin Chen, MD, ~~Enrique Mesri,~~ PhD, Graduate Program Director
Theresa Votolato, MS, Senior Program Coordinator
Office of Graduate ~~and Postdoctoral~~ Studies
Rosenstiel Medical Sciences Building, Suite 1128-A
1600 NW 10th Avenue, M857
Miami, FL 33136
305 243 2478

Program Mission Statement

Mission

The mission and objectives of the Microbiology and Immunology Ph.D. Graduate Program are to train students who wish to attain the PhD degree by active engagement in the design and performance of basic Microbiology and Immunology research with a Biomedical Focus that is intended to provide each PhD student with:
A broad scientific reasoning ability and knowledge base in Microbiology and Immunology with a focus on its application in human health;
Creative, technical, analytical and ethical skills required for carrying out and interpreting experiments in a responsible manner in the area of Microbiology and Immunology;
The ability to successfully design, produce and publish scientific discoveries emanated from their own research in Microbiology and Immunology; and
The ability to respond to the increasing demands of collaborative and interdisciplinary research, presentation and communication skills required for presenting results in scientific talks, writing manuscripts and seeking funding through grants and proposals, teaching skills and experience, and professional preparation for a scientific career in academia, industry, health care, patent law or teaching within five years or less.

Program Goals

~~Goals~~Goals

The goals of the MIC Graduate Program include training and acquisition of:
A broad scientific reasoning ability and knowledge base in Microbiology and Immunology
Technical skills required for experiments in the area of specialization
Presentation skills required for teaching, scientific talks, manuscripts, and grants
A preparation for a scientific career in academia, industry, or teaching within 5 ½ years

Student Learning Outcomes

Student Learning Outcomes

Students in the Microbiology and Immunology graduate program will complete their training within 5 years of starting graduate school with mastery in “Knowledge of Discipline”, “Responsible Conduct of Research”, “Use of Appropriate Methodology”, “Application of Knowledge/Methodology”, Critical Thinking”, Effective Written Communication”, and “Effective Oral Communication”.
Students will demonstrate critical thinking skills and the application of the Scientific Method by showing the capability to develop hypotheses, and the ability to evaluate their hypotheses, paying attention to responsible conduct of research as appropriate.

Curriculum Requirements

Curriculum Requirements

Course List

Code	Title	Credit Hours
Biomedical Science Core		
Journal Club [1, 3]		2
PIB 700	Journal Club	
PIB 701	Introduction to Biomedical Sciences 3	5
PIB 702	Scientific Reasoning	3
PIB 705	Biostatistics for the Biosciences	3
PIB 731	Laboratory Research	3-6
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
PIB 783	Professional Development: Skills for Success II	1
PIB 785	PIBS Bioinformatics Workshop 2	1
PIB 830	Doctoral Dissertation	1
Microbiology & Immunology Required Courses		
MIC 623	Mechanisms of Microbial Virulence	2
MIC 728	Principles of Immunology	3
MIC 775	Advanced Microbiology and Immunology	3
MIC 751	Advance Topics in Microbiology and Virology	3
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
Research Credits		24
MIC 830	Doctoral Dissertation	1-12

Code	Title	Credit Hours
MIC 840	Doctoral Dissertation - Post Candidacy	1-12
MIC 850	Research in Residence	1
Total Credit Hours		60-90

1Students in this program take PIB 700 twice for a total of 2 credits. Please see Plan of Study for more information.

2Bioinformatics Requirement: All graduate students are required to complete a bioinformatics workshop or course before they graduate. This requirement can be met by taking either the PIB 706 (Bioinformatics for the Biomedical Sciences) or HGG 660 (Bioinformatics Theory and Practice), both tentatively offered every Spring. Students can also take Bioinformatics Workshops that are offered periodically.

3Students accepted as Direct Admit into the Accelerated B.S. to Ph.D. track will be eligible to waive PIB 700 and PIB 701 and to replace those courses with other courses suitable for their academic background and training goals.

Plan of Study

Suggested Plan of Study

Plan of Study Grid

First Year		
Fall		Credit Hours
PIB 701	Introduction to Biomedical Sciences	5
PIB 702	Scientific Reasoning	3
PIB 731	Laboratory Research	1-2
PIB 700	Journal Club	1
PIB 780	Research Ethics	1
PIB 782	Professional Development: Skills for Success I	1
	Credit Hours	12
Spring		
PIB 700	Journal Club	1
PIB 731	Laboratory Research	1-2
PIB 783	Professional Development: Skills for Success II	1
EPH 601	Medical Biostatistics I	4
MIC 728	Principles of Immunology	3
MIC 623	Mechanisms of Microbial Virulence	2
	Credit Hours	12
Summer		
PIB 830	Doctoral Dissertation	1
	Credit Hours	1

Second Year		
Fall		
MIC 775	Advanced Microbiology and Immunology	3
MIC 830	Doctoral Dissertation	3
	Students may elect to take additional basic science courses.	
	Credit Hours	6
Spring		
MIC 830	Doctoral Dissertation	3
	Teaching Assistant	
	Qualifying Examination	
	Credit Hours	3
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	1
Third Year		
Fall		
MIC 755	Microbiology and Immunology Research- Career Skills and Proficiencies	1-6
MIC 840	Doctoral Dissertation - Post Candidacy	3
	Students may elect to take additional basic science courses.	
	Credit Hours	4
Spring		
MIC 751	Advance Topics in Microbiology and Virology	3.00
MIC 840	Doctoral Dissertation - Post Candidacy	3
	Students may elect to take additional basic science courses.	
	Credit Hours	6
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	1
Fourth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
	Students may elect to take additional basic science courses.	
	Credit Hours	3
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
	Students may elect to take additional basic science courses.	
	Credit Hours	3
Summer		
MIC 840	Doctoral Dissertation - Post Candidacy	1
	Credit Hours	1

Fifth Year		
Fall		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	3
Spring		
MIC 840	Doctoral Dissertation - Post Candidacy	3
Students may elect to take additional basic science courses.		
	Credit Hours	3
Summer		
MIC 850	Research in Residence	1
	Credit Hours	1
	Total Credit Hours	60

Suggested Plan of Study

Accelerated B.S. to Ph.D. Track

Plan of Study Grid

First Year		
Fall		Credit Hours
PIB 701	**Introduction to Biomedical Sciences 1**	**5**
PIB 702	**Scientific Reasoning**	**3**
PIB 731	**Laboratory Research**	**2**
PIB 700	**Journal Club 1**	**1**
PIB 780	**Research Ethics**	**1**
PIB 782	**Professional Development: Skills for Success I**	**1**
	Credit Hours	13
Spring		
PIB 705	**Biostatistics for the Biosciences**	**3**
PIB 700	**Journal Club 1**	**1**
PIB 731	**Laboratory Research**	**1-2**
PIB 783	**Professional Development: Skills for Success II**	**1**
MIC 728	**Principles of Immunology**	**3**
MIC 623	**Mechanisms of Microbial Virulence**	**2**
	Credit Hours	11-12
Summer		
PIB 830	**Doctoral Dissertation**	**1**
	Credit Hours	1
Second Year		
Fall		

MIC 775	**Advanced Microbiology and Immunology**	**3**
MIC 830	**Doctoral Dissertation**	**3**
Students may elect to take additional basic science courses.		
	Credit Hours	6
Spring		
MIC 830	**Doctoral Dissertation**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
MIC 751	**Advance Topics in Microbiology and Virology**	**3.00**
Qualifying Examination		
	Credit Hours	7-12
Summer		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**1**
	Credit Hours	1
Third Year		
Fall		
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
Students may elect to take additional basic science courses.		
	Credit Hours	8
Spring		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
Students may elect to take additional basic science courses.		
	Credit Hours	4-9
Summer		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**1**
	Credit Hours	1
Fourth Year		
Fall		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
Students may elect to take additional basic science courses.		
	Credit Hours	4-9
Spring		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
Students may elect to take additional basic science courses.		
	Credit Hours	4-9
Summer		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**1**

	Credit Hours	1
Fifth Year		
Fall		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
	Students may elect to take additional basic science courses.	
	Credit Hours	4-9
Spring		
MIC 840	**Doctoral Dissertation - Post Candidacy**	**3**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
	Students may elect to take additional basic science courses.	
	Credit Hours	4-9
Summer		
MIC 850	**Research in Residence**	**1**
	Credit Hours	1
	Total Credit Hours	70-101

1Students accepted as Direct Admit into the Accelerated B.S. to Ph.D. track will be eligible to waive PIB 700 and PIB 701 and to replace those courses with other courses suitable for their academic background and training goals.

Admission Requirements

Admission Requirements

Applicants to biomedical programs should have a bachelor degree in a biological or related discipline (e.g., psychology, chemistry, engineering, physics). Although there are no prerequisite requirements, courses in general biology, cell/molecular biology, calculus, general physics, organic chemistry, physical chemistry, and biochemistry are encouraged. Applications are generally accepted from September to December for fall entry only. Select applicants will be offered an interview.

Competitive Candidates will have the following:

Excellent academic record
Competitive GRE exam scores
Research experience in a laboratory setting
Publications of abstract and / or papers
Co-authorship in a peer-reviewed journal is recommended
Strong letters of recommendation from research scientists who know the candidate well
Motivation to pursue state-of-the-art biomedical research

Applicants must submit the following:

Online Application
Application Fee
Official Academic Transcripts
GRE General Test
English Proficiency Exam (non-native speakers)
Statement of Purpose
Resume / CV
Full application instructions can be found here.

Rationale

Rationale

Our program has used a standard approach over the last few decades to help those undergraduate students that are highly motivated to pursue a research career. This path offered research to students as early as freshman year (volunteer) and for-credit experiences as early as their junior year. This resulted in a great amount of time, energy and financial support only to frequently recommend them to the very high-tier universities for their further graduate training. A student will rarely stay at UM to pursue a Ph.D. if they have offers from the very high-tier universities unless they have family in Miami or other compelling reasons. This has been frustrating because we possess a sizable graduate faculty comprised of world-class scientists and educators, and in addition to our Ph.D. (MIC) program, our program has a track record of training leaders in academia and industry in the field of microbiology and immunology.
Accordingly, we posit that an accelerated B.S.-Ph.D. (MIC) would benefit the most qualified and highly talented students who are dedicated to a research career by minimizing the time lost between their B.S. and Ph.D. trainings. Typically, those exceptional students have a substantial amount of credits from AP, IB, Cambridge, dual enrollment and other transfer coursework. These students have the academic prowess to complete their B.S. curricular requirements within 3 years, including research during the summer sessions. If a student can begin their Ph.D. trainings during their undergraduate career, they can seamlessly merge their B.S. and Ph.D. trainings in a faster, more efficient and productive fashion. As a result, they will gain an advantage in the highly competitive research career path by entering as a researcher at a much younger age. Without this new track, students will undoubtedly continue choosing other institutions for their Ph.D. training.

Market Demand

Relationship to Other Programs

Relationship to Undergraduate and Professional Programs

Library Resources Available and Needed to Support the Program

Laboratory Facilities, Equipment, and Space Available and Needed to Support the Program

Other Resources Available or Needed to Support the Program

The B.S. to Ph.D. (MIC) track will not incur additional costs, but will likely reduce the cost to recruit new and highly qualified applicants. Furthermore, these students are expected to be outstanding candidates for pre-doctoral fellowships in NIH or other agencies which may draw additional finances to the institution, wherein financial support for Ph.D. training is traditionally provided by the mentors' research grants or other resources customary for Ph.D. students in other programs.

Curriculum

Program Curriculum

Admission

For students that wish to pursue the proposed B.S.-Ph.D. (MIC) track, official admission to the Ph.D. program will depend on meeting all general guidelines of the current graduate program admission at the University of Miami, including fulfilling all academic requirements for the B.S. degree with a minimum GPA greater than 3.0. Admission to the Ph.D. phase will follow one of the two options that are currently used for admission of Ph.D. students directly into the Ph.D. (MIC) program (rather than through the umbrella program called the Program in Biological Sciences (PIBS)). Direct admission is intended for students that have already decided that they want to pursue a Ph.D. in Microbiology and Immunology and who want to expedite their progression. For all direct admit students, the Ph.D. (MIC) program adjusts the first-year curriculum requirements to accelerate their training based on the student's background and interests. The following are the two options:

Identifying a mentor ahead of time who agrees to take the student into his/her lab once admitted to the Ph.D. phase after the student complete the B.S. training. In this case, the student would not rotate through different labs and would start their Ph.D. training right away. This is the most streamlined process to accelerate the B.S.-Ph.D. training. However, this will require a well-established mentor/mentee training relationship. For this admission option to apply, the Ph.D. (MIC) program will require significant prior mentor/mentee interactions, preferably that the student has done substantial amount of research work in the mentor's lab.

Entering direct admit without an established mentor/mentee agreement. Students in the undergraduate MIC program who wish to pursue the B.S.-Ph.D. (MIC) track can select the option of direct admission to Ph.D. (MIC) program when they apply for graduate school during the last semester of B.S. training. The Ph.D. (MIC) direct admission differs from general admission by the umbrella PIBS program in that MIC program will streamline the admission process for the applicants. The Ph.D. (MIC) direct admission track can obtain support for up to two direct-admit students for their year one stipend, for the students to do rotations in the laboratories of MIC faculty members. The B.S.-Ph.D. (MIC) track students may take a PhD curriculum that differs from the typical Ph.D. curriculum. Their curriculum can be adjusted to accelerate their training toward their career goal, because of their advanced academic background and experience levels in the microbiology and immunology fields.

Cost of the proposed B.S to Ph.D. (MIC) track

The Accelerated B.S. to Ph.D. (MIC) track will not incur additional costs, but will likely reduce the cost to recruit new and highly qualified applicants. Furthermore, these students are expected to be outstanding candidates for pre-doctoral fellowships in NIH or other agencies which may draw additional finances to the institution, wherein financial support for Ph.D. training is traditionally provided by the mentors' research grants or other resources customary for Ph.D. students in other programs.

Sample Curriculum

The following sample curriculum for the B.S.-Ph.D. (MIC) track begins with an empirical outline of 3- year B.S. coursework followed by immediate transition to Ph.D. curriculum. No new coursework is proposed and a student may take more time to complete their B.S. degree requirement.

Plan of Study Grid

Freshman Year		
Fall		Credit Hours
MIC 201 or 319	**Modern Plagues and Society 2, ***	**3**
	or Innate Immunity	
MIC 304	**Introduction to Microbes and the Immune System (Lab) *** **	**2**
CHM 221	**Organic Chemistry I**	**5**
& CHM 205	**and Organic Chemistry Laboratory I**	
MTH 161	**Calculus I**	**4**
ENG 105	**English Composition I**	**3**
	Credit Hours	17
Spring		
MIC 301	**Introduction to Microbes and the Immune System ***	**3**
Arts and Humanities Cognate		**3**
CHM 222	**Organic Chemistry II**	**5**
& CHM 206	**and Organic Chemistry Laboratory II**	
MTH 162	**Calculus II**	**4**
ENG 106 or	**English Composition II**	**3**
107	**or English Composition II: Science and Technology**	
	Credit Hours	18
Sophomore Year		
Fall		
MIC 319	**Innate Immunity ***	**3**
MIC 323	**Microbial Pathogenesis and Physiology 2, ***	**3**
PHY 101	**College Physics I**	**5**
& PHY 106	**and College Physics Laboratory I**	
BMB 401	**Biochemistry for the Biomedical Sciences**	**4**
Foreign Language		**3**
	Credit Hours	18

Spring		
MIC 321	**Immunobiology 1, ***	**3**
MIC 436	**Fundamental and Medical Virology 2, ***	**3**
PHY 102	**College Physics II**	**5**
& PHY 108	**and College Physics Laboratory II**	
Arts and Humanities Cognate		**3**
PSY 110	**Introduction to Psychology (People and Society Cognate)**	**3**
	Credit Hours	17
Junior Year		
Fall		
MIC 451, 452, 453, 454, 455, or 456	**Special Projects in Immunobiology ** or Special Projects in Parasitology or Special Projects in Pathogenic Bacteriology or Special Projects in Microbial Genetics or Special Projects in Immunogenetics or Special Projects in Virology**	**3**
MIC 441	**Microbiology and Immunology Colloquium**	**1**
People and Society Cognate		**3**
Arts and Humanities Cognate		**3**
Elective		**3**
Elective		**3**
	Credit Hours	16
Spring		
MIC 451, 452, 453, 454, 455, or 456	**Special Projects in Immunobiology ** or Special Projects in Parasitology or Special Projects in Pathogenic Bacteriology or Special Projects in Microbial Genetics or Special Projects in Immunogenetics or Special Projects in Virology**	**3**
MIC 322	**Medical Parasitology 2, ***	**3**
People and Society Cognate		**3**
PSY 292	**Introduction to Biobehavioral Statistics for Non-Majors (Statistics/Computer Science)**	**3**
Elective		**3**
Elective		**3**
	Credit Hours	18
Senior Year		
Fall		
Matriculation into Fast-Track Ph.D. Program		
	Credit Hours	0

Total Credit Hours 104

*** offered only in that semester**

**** permission of undergraduate director is needed, in addition to the following: 3.0 GPA within major, 3.0 GPA overall and at least 17 credits completed in our department; also it can be taken from 2-6 credits and only 6 may count toward the major.**

*****lab can be taken before, after or with MIC 301 and only needs to be taken once.**

1 at least 1 course must be taken from MIC 321, 319.

2 at least 1 course must be taken from MIC 201,322, 323, 436.

No changes in Requirements for <u>B.S. curriculum</u> in the Accelerated B.S. to Ph.D. (MIC) track:

The table above provides a sample curriculum for a student that would qualify for admissions consideration into the B.S. to Ph.D. (MIC) track. The current B.S. (MIC) major and CHM minor to Ph.D. Fast Track, assumes that the student upon entering has received AP, IB, Cambridge, dual enrollment or other transfer credits for:

CHM 121, 113, and BIL 150, 151, 160, 161 (or equivalents)= 18 credits.

For the B.S., 24 credits of MIC are required to major.

Students must take MIC 301 and 304, 319 or 321 and MIC 201 or 322 or 323 or 436. (total 11 credits)

The remaining 13 elective credits can be fulfilled with any of the approved courses.

Majors can get MIC credit for courses outside of MIC such as: BIL 255 which is recommended for Medical School or BIL 250, GSC 309 or MSC 465/4 toward the 13 elective credits remaining to receive the major.

MIC 441 may be taken up to two times.

BMB 401 does not count toward the 24 credits of MIC required but must be taken.

12 credits of MIC are required for the minor; students must take MIC 301 and 304, 319 or 321 and MIC 201 or 322 or 323 or 436 and MIC 441 (total 12 credits).

120 credits are required for graduation. Your last 45 credits must be taken at the University of Miami.

Courses may be taken during the summer sessions to lighten the load in any given semester.

For any additional requirements that are not included please consult with Diana M. Lopez, Ph. D. or Roger Williams, M.S. Ed.

<u>Ph.D. curriculum</u> in the proposed B.S. to Ph.D. (MIC) track

The next sample curriculum for the B.S. to Ph.D. (MIC) track outlines a sample Ph.D. curriculum.

Students who wish to pursue the B.S. to Ph.D. (MIC) track must meet all general requirements for graduate admission to the University of Miami. Graduate admission will follow one of the two direct admission options previously mentioned. These options are currently used to admit Ph.D. students directly into the Ph.D. (MIC) program (rather than through the umbrella PIBS program).

Course requirements for Ph.D. students are established by the Graduate Program. To fulfill the course credit hour requirements for the Ph.D. degree, students will need **a minimum of sixty credit hours of which at least twenty-four credits must have been taken in residency at the University of Miami with a minimum of twelve dissertation credits. Students must obtain at least four advanced credits from course(s) offered by other programs to satisfy general electives.**

<u>Curriculum for Direct Admit Option 1:</u> Identifying a mentor ahead of time who agrees to take the student into his/her lab once admitted to the Ph.D. phase after the student complete the BS training. In this case, the student would not rotate through different labs and would start PhD training right away.

Curriculum for Direct Admit Option 2: Entering directly into MIC without an established mentor / mentee agreement. MIC program will streamline the admission process for the applicants whose interest closely matches the interest of available mentors who have immediate openings to accept new students. Students who pursue this 2nd MIC-track option may also be considered in PIBS general admission and may take a first-year curriculum that differs from the standard PIBS curriculum.

The following is the current PIBS first-year curriculum. **Students accepted as Direct Admit will be eligible to waive PIB 700 and PIB 701**, and to replace those courses with other courses suitable for their academic background and training goals. They will also fulfill their Teaching Assistant (TA) requirement as MIC students beyond the second year, with proper approval.

Plan of Study Grid

Year One		
Fall		Credit Hours
PIB 701	**Introduction to Biomedical Sciences**	**5**
PIB 702	**Scientific Reasoning**	**3**
PIB 731	**Laboratory Research (1 credit per rotation)**	**1**
PIB 700	**Journal Club**	**1**
PIB 780	**Research Ethics**	**1**
PIB 782	**Professional Development: Skills for Success I**	**1**
	Credit Hours	12
Spring		
PIB 705	**Biostatistics for the Biosciences**	**3**
PIB 700	**Journal Club**	**1**
PIB 731	**Laboratory Research**	**1-6**
PIB 783	**Professional Development: Skills for Success II**	**1**
MIC 728	**Principles of Immunology**	**3**
MIC 623	**Mechanisms of Microbial Virulence**	**2**
	Credit Hours	11-16
Summer		
PIB 830	**Doctoral Dissertation**	**1**
	Credit Hours	1
Year Two		
Fall		
MIC 775	**Advanced Microbiology and Immunology**	**3**
MIC 830	**Doctoral Dissertation**	**1-12**
Students may elect to take additional courses		
	Credit Hours	4-15
Spring		
MIC 830	**Doctoral Dissertation**	**1-12**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
MIC 751	**Advance Topics in Microbiology and Virology**	**3.00**

Qualifying exam

Credit Hours 5-21

Summer

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

Credit Hours 1-12

Year Three

Fall

MIC 755 Microbiology and Immunology Research- Career Skills and Proficiencies 1-6

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

Students may elect to take additional courses

Credit Hours 2-18

Spring

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

MIC 755 Microbiology and Immunology Research- Career Skills and Proficiencies 1-6

Students may elect to take additional courses

Credit Hours 2-18

Summer

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

Credit Hours 1-12

Year Four

Fall

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

MIC 755 Microbiology and Immunology Research- Career Skills and Proficiencies 1-6

Students may elect to take additional courses

Credit Hours 2-18

Spring

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

MIC 755 Microbiology and Immunology Research- Career Skills and Proficiencies 1-6

Students may elect to take additional courses

Credit Hours 2-18

Summer

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

Credit Hours 1-12

Year Five

Fall

MIC 840 Doctoral Dissertation - Post Candidacy 1-12

MIC 755 Microbiology and Immunology Research- Career Skills and Proficiencies 1-6

Students may elect to take additional courses

Credit Hours 2-18

Spring

MIC 840	**Doctoral Dissertation - Post Candidacy**	**1-12**
MIC 755	**Microbiology and Immunology Research- Career Skills and Proficiencies**	**1-6**
Students may elect to take additional courses		
	Credit Hours	2-18
Summer		
MIC 850	**Research in Residence**	**1**
	Credit Hours	1
	Total Credit Hours	49-210

Bioinformatics Requirement: All graduate students are required to complete a bioinformatics workshop or course before they graduate. This requirement can be met by taking either the PIB 706 (Bioinformatics for the Biomedical Sciences) or HGG 660 (Bioinformatics Theory and Practice), both tentatively offered every Spring. Students can also take Bioinformatics Workshops that are offered periodically.

Upload Syllabi for Any New Courses

Proposed Schedule of Course Offerings for the First Three Years

CIP Code

Proposed CIP Code

Faculty

Program Directors

Upload CV(s)

Program Faculty

Upload CV(s) Grad

Students

Applicant Pool

Enrollment Projections

Teaching or Research Assistants

Administration

Program Administration

Comparison

Peer Comparisons

Documents

Attach Supporting Documentation MIC Attachments_update 03092020.pdf

Reviewer
Comments

Patty Murphy (pxm491) (03/09/20 12:13 pm): This proposal for a new accelerated track is simply a new pathway for the currently approved Ph.D. in Microbiology and Immunology program. Consequently notification to or approval from SACSCOC is not required.

Key: 388

UHealth
UNIVERSITY OF MIAMI HEALTH SYSTEM

UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

March 5, 2020

Linda Neider, Ph.D., M. A., M. B. A.
Chair, Faculty Senate
University of Miami
Ashe Building. Suite #325
252 Memorial Drive
Coral Gables, FL 33146

Re: Accelerated B.S. - Ph.D. (MIC) Track.

Dear Dr. Neider,

I would like to express my enthusiastic support for the Accelerated B.S. - Ph.D. (MIC) Track proposal from the Department of Microbiology and Immunology. This is designed as an elite track for efficient transition between BS and PhD. It serves as a tool for talent retention in the University of Miami education system to strength our education efforts. My understanding is that this proposal has already been reviewed and approved by the Medical Faculty Council and the Graduate School Council.

Thank you for your consideration of this proposal.

Sincerely,

Henri R. Ford, M.D., M.H.A.

Henri R. Ford, M.D., MHA
Dean and Chief Academic Officer
Don Soffer Clinical Research Center (DSCRC) | 1120 NW 14th Street | Suite 360S (R-97)
Miami, FL 33136 | Tel: (305) 243-9678 | Fax: (305) 243-8535

UHealth
UNIVERSITY OF MIAMI HEALTH SYSTEM

UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

November 20, 2019

Linda Neider, Ph.D., M. A., M. B. A.
Chair, Faculty Senate
University of Miami
Ashe Building. Suite #325
252 Memorial Drive
Coral Gables, FL 33146

Re: Council Approved a Proposal for creation of Accelerated B.S. - Ph.D. (MIC) Track.

Dear Dr. Neider,

This is to inform the Faculty Senate that the Medical School Faculty Council met on November 12, 2019 to review the Proposal for creation of Accelerated B.S. - Ph.D. (MIC) Track within the Graduate Program(s) in Microbiology and Immunology at the University of Miami Miller School of Medicine (UMMSM).

The council members voted to *approve* the proposal.

Respectfully submitted,

Sanjoy K. Bhattacharya, M. Tech, Ph.D.
Speaker, Medical Faculty Council

Medical School Faculty Council
1600 NW 10th Avenue, RMSB Suite 1124| Miami, Florida 33136
Phone: 305-243-6551 | Fax: 305-243-5574

UNIVERSITY OF MIAMI
MILLER SCHOOL
of MEDICINE

Department of Microbiology
and Immunology

P.O. Box 016960 (R-138)
Miami, Florida 33131

Rosenstiel Medical Science Building
1600 NW 10th Avenue
Suite 3045
Miami, Florida 33136-1015

Phone: 305-243-6655
Fax: 305-243-5522
http://biomed.miami.edu/micro

September 27, 2019

The Graduate School and the Faculty Senate

University of Miami

Dear Dean Prado and the Faculty Senate:

We are requesting your approval of the Accelerated B.S. - Ph.D. (MIC) Track. The proposed educational track is based on the enthusiastic support from the faculty of the Department of Microbiology and Immunology and the endorsement by the Steering Committee of the Graduate Program in Microbiology and Immunology.

The Accelerated B.S. - Ph.D. (MIC) is not a new degree-awarding program; instead, it is a new track within our already existing and successful programs. This educational opportunity will streamline our undergraduate and graduate trainings for some of the most talented students of the University of Miami. It is designed to be an elite track and serves as a talent retention of our undergraduate students. We believe that this track will benefit the most qualified and highly talented students who are dedicated to a research career by minimizing the time lost between their B.S. and Ph.D. trainings.

Thank you for your time and efforts.

Sincerely,

Thomas Malek, Ph.D.
Professor and Chairman
Department of Microbiology and Immunology
University of Miami Miller School of Medicine
Phone: 305-243-6655; Fax: 305-243-5522; E-mail: tmalek@med.miami.edu

Diana Lopez, Ph.D.
Director, Undergraduate Program in Microbiology and Immunology
Professor, Department of Microbiology and Immunology
University of Miami Miller School of Medicine
Phone: 305-243-6655; Fax: 305-243-5522; E-mail: d.lopez1@med.miami.edu

Zhibin Chen, M.D, Ph.D
Director, Graduate Program in Microbiology and Immunology
Associate Professor, Department of Microbiology and Immunology
University of Miami Miller School of Medicine
Phone: 305-243-8348; Fax: 305-243-5522; E-mail: zchen@med.miami.edu

UNIVERSITY
OF MIAMI

Assessment and Accreditation
Gables One Tower 1320 S. Dixie Hwy.
Coral Gables, Florida 33146

Phone: 305-284-5120
Fax: 305-284-4929
oaa.miami.edu

MEMORANDUM

DATE: October 7, 2019

TO: Zhibin Chen, Director, Graduate Program in Microbiology and Immunology
Miller School of Medicine

FROM: Patty Murphy, Associate Provost for University Accreditation
Office of Assessment and Accreditation

RE: **New Accelerated Track in the PhD in Microbiology and Immunology Program**

On October 1, 2019, the Miller School of Medicine notified my office of its intent to offer a new Accelerated Track within its current PhD in Microbiology and Immunology program [MICM_PHD] effective Fall 2020. The proposed Accelerated Track will be open only to selected students who have completed the College of Arts and Science's BS program in Microbiology and Immunology.

No changes are being proposed to the curriculum or degree requirements of either program (BS or PhD), nor is this a proposal for a joint/dual degree program. Rather, the proposed track will allow the graduate program to fast track students who graduate from the UM undergraduate Microbiology and Immunology program into the research component of the doctoral program because they will already have an established research experience within the department. This will help expedite completion of the doctorate.

The proposed new track does not "represent a significant departure, either in content or method of delivery" from what we are currently approved by SACSCOC to offer because no changes are being made to the curriculum or degree requirements of either program. SACSCOC only requires notification of program changes that represent a significant departure from our current programs. Therefore, no notification or approval is required for this change.

Please contact me if you have any questions at pattymurphy@miami.edu or (305) 284-3276.

CC: Faculty Senate
Guillermo Prado, Dean of the Graduate School
Henri Ford, Dean of the Miller School of Medicine
Thomas Malek, Chair, Department of Microbiology and Immunology
Diana Lopez, Director, Undergraduate Program in Microbiology and Immunology
Karen Beckett, University Registrar
Carrie Glass, Executive Director of Student Financial Assistance and Employment

UNIVERSITY OF MIAMI
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of MEDICINE

Department of Microbiology
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Fax: 305-243-5522
http://biomed.miami.edu/micro

Jan 30, 2020

Linda Neider, Ph.D., M. A., M. B. A.
Chair, Faculty Senate
University of Miami
Ashe Building. Suite #325
252 Memorial Drive
Coral Gables, FL 33146

Re: Accelerated B.S. - Ph.D. (MIC) Track.

Dear Dr. Neider,

The Department of Microbiology and Immunology would like to submit the Accelerated B.S. – Ph.D. (MIC) track proposal to the Faculty Senate for approval.

Since October 2019, the Accelerated B.S. – Ph.D. (MIC) track proposal has gone through the evaluation by the Office of Assessment and Accreditation (please attached OAA memo from Dr. Murphy), the approval of Medical School Faculty Council (please see the attached memo from Dr. Bhattacharya, the Speaker of Medical Faculty Council), and the approval of the Graduate Council (please see the attached memo from Dean Prado).

The Accelerated B.S. – Ph.D. (MIC) track is proposed to begin in Fall 2020.

Please let me know if there is any question.

Thank you very much.

Best,

zchen

Zhibin Chen M.D., Ph.D.
Associate Professor
Director, Graduate Program in Microbiology and Immunology
Department of Microbiology and Immunology
Miller School of Medicine
University of Miami

Phone: 305-243-8348 / 305-243-4651 Fax: 305-243-5522
Email: zchen@med.miami.edu

UNIVERSITY OF MIAMI
GRADUATE SCHOOL

Graduate School
P.O. Box 248125
Coral Gables, FL 33124-3220

Phone: 305-284-4154
Fax: 305-284-5441
graduateschool@miami.edu

MEMORANDUM

DATE: January 29, 2020

TO: Linda Neider
Chair, Faculty Senate

FROM: Guillermo (Willy) Prado
Dean, Graduate School

SUBJECT: Proposal – New Accelerated Track in the PhD in Microbiology and Immunology Program

The Department of Microbiology and Immunology submitted a proposal to offer a new Accelerated Track within its current PhD in Microbiology and Immunology program, effective Fall 2020. The proposal was discussed at the meeting of the Graduate Council on Tuesday, Januarey 21, 2020. There were no concerns expressed by Council members present.

CC: Thomas Malek, Chair, Department of Microbiology and Immunology
Zhibin Chen, Director, Graduate Program in Microbiology and Immunology
Diana Lopez, Director, Undergraduate Program in Microbiology and Immunology
Tiffany Plantan, Director of Education, Graduate School
Patty Murphy, Associate Provost for University Accreditation, Office of Assessment and Accreditation

PIBS Course Descriptions:

PIBS 700: Journal Club/Seminar
All PIBS students are required to attend one journal club or seminar each week for the entire academic year.

PIBS 701: Introduction to Biomedical Sciences
This course surveys fundamentals of molecular and cellular biology that underlie all modern biomedical research. Lectures are organized into modules that cover Proteins and DNA, Gene Expression, Signaling and Membranes, Cells, and Development. A final module covers immunology, organ systems, and genetics. Experimental techniques are emphasized throughout, with the first week of the course devoted to a bootcamp on common biomedical methods.

PIBS 702: Scientific Reasoning
This course teaches scientific reasoning by critical reading of primary research papers in a small-group setting. Multiple small groups are offered every week and students can choose from different topics related to lectures in the companion PIBS 701 course. Research papers are discussed in two 1-hour sessions each week.

PIBS 705: Biostatistics for Biosciences
This is an introductory course that covers the basics of applied statistics. The course emphasizes a practical understanding of statistical concepts: the goal is to prepare you to be able to properly analyze and interpret data from your own research, not to turn you into a statistician. As such, the structure of the course is designed to provide hands-on experience with data and statistical software, and to teach you how to proceed when you encounter novel problems in the future (e.g., data that you're not quite sure how to analyze). An overall goal of the course is to prepare you to be able to intelligently assess the statistics commonly encountered in journal articles in your field, to and provide you with the foundational skills required for more advanced statistical methods when you later encounter the need.

PIBS 731: Laboratory Research
Laboratory rotations familiarize students with a variety of modern techniques in biomedicine and potential mentors for their dissertation projects.

PIBS 780: Research Ethics
The NIH Guide for Grants and Contracts stipulates that Institutions receiving support for National Research Service Award Training Grants are required to develop a program in the principles of scientific integrity. This program should be an integral part of the proposed training effort.

PIBS 782: Professional Development: Skills for Success I

This workshop will teach students the basics on how to: manage your career, choose a rotation lab / mentor, read a scientific paper, write a lab report and present in the journal club and lab meetings.

PIBS 783: Professional Development: Skills for Success II
This workshop will teach students the basics on how to: write a fellowship and scientific paper as well as the proper and ethical handling of research data.

PIBS 830: Doctoral Dissertation
Required for all PhD candidates. First-year students generally take one credit of doctoral dissertation in their first summer semester then continue in program specific dissertation credit through graduation.

List of Graduate Courses offered by the MIC department:

Yearly Course Schedule:			
Course	**Year**	**Term** (Fall, Spring, Summer)	**Credit**
MIC 623	1	Spring B	2
MIC 728	1	Spring A	3
MIC 751	2 & beyond	Spring	1 to 3
MIC 755	2 & beyond	Spring	1 to 6
MIC 775	2 & beyond	Fall	1 to 3
MIC 711	2 & beyond	By announcement only	-
MIC 780	2 & beyond	Fall	0
MIC 799	2 & beyond	By announcement only	1 to 3
MIC 810	2 & beyond	By announcement only	1 to 6
MIC 820	2 & beyond	By announcement only	0
MIC 830	2 & beyond	Fall, Spring, Summer	1 to 12
MIC 840	3	Fall, Spring, Summer	1 to 12
MIC 850	3 & beyond	Fall, Spring, Summer	1 - Doctoral Defense

MIC Course Descriptions:

MIC 623: Mechanisms of Microbial Virulence
This course will focus on the mechanisms employed by bacterial and viral pathogens to produce disease in animals and humans. The course is divided into two, three-week modules. The first module will cover bacterial pathogens with an emphasis on the bacteria-host cell interaction. Specific topics will include: bacterial attachment and invasion of eukaryotic cells, virulence gene regulation, secretion of virulence factors, bacterial toxins and obligate intracellular bacterial pathogens. The second module will cover viruses and human viral diseases with an emphasis on viral replication, gene expression, virus-host cell interactions and viral oncology. Classes will

consist of a mixture of lectures and discussions of recent or classic papers. There will be two exams.

MIC 728: Principles of Immunology
This team-taught course will present immunological concepts and reasoning in immunological research. The course is divided into 7 weekly modules. Each module has a common theme and consists of 3 lectures on immunological concepts and one session where students present and discuss a research paper related to the theme of each module. The paper discussion session will include use of disease models as a portal to understand the function of immune system in health and disease. The module topics are: (1) lymphoid cell development, (2) antigen recognition, (3) initiation of immune responses, (4) T lymphocyte effector development t and function, (5) T cell immunity versus tolerance, (6) B cell immunity, and (7) innate immunity. There will be one exam following the first four modules and the second exam after the remaining three modules.

MIC 751: Advanced Topics in Microbiology & Virology
This advanced level course is intended to explore complex interactions of microbial pathogens and hosts at the systemic, cellular, subcellular and molecular levels. This course consists of three modules focusing on the following topics: (1) Ubiquitin molecules at the host/pathogen interface and inflammasomes (1 credit); (2) Microbes, emergency hematopoiesis and autoimmunity (1 credit); and (3) The role of microbes in cancer initiation, progression and therapy (1 credit).

MIC 755: Microbiology & Immunology Research - Career Skills & Proficiencies
This is a longitudinal training course delivered throughout all years of training. Students start taking it upon joining the Microbiology and Immunology Program to perform research under the mentorship of participating faculty. Up to six credits may be awarded commensurate with attendance and participation in the four modules. The four modules include: Teaching assistance (TA) experience (3 credits); Attendance and participation in the weekly departmental seminars and completing written assignments on the seminars topics (1 credit); Attendance, participation and presentation in Journal Clubs (1 credit); Research Forums on Responsible Conduct of Research (RCR) and career skills (1 credit).

MIC 775: Advanced Topics in Immunology
This course will explore in depth the current and advanced concepts and topics in selected areas of Immunology. We will cover recent advances and cutting-edge experimental approaches in cellular and molecular immunology and also expose students to concepts and themes that link the various cell types into an effective immune system. The classes will consist of a mixture of lectures and discussions of recent papers and be divided into three modules: (1) Cellular and molecular networks of Immune System (1 credit); (2) Molecular regulation of Adaptive Immunity (1 credit); (3) Immunopathologies and Immunotherapies (1 credit).

MIC 711: Accelerated Basic Science Medical Curriculum
Transfer for graduate credit of basic science medical course work for individuals enrolled in combined degree (i.e. M.D. /Ph.D.) programs.
*Note that future of these credits is under discussion in light of the PIBS 701 waiver for combined degree students.

MIC Dissertation Research Credits (upon completion of other required coursework)

MIC 780: Research Ethics

The NIH Guide for Grants and Contracts stipulates that Institutions receiving support for National Research Service Award Training Grants are required to develop a program in the principles of Scientific Integrity. This program should be an integral part of the proposed training effort. The University of Miami, School of Medicine has chosen to respond to this requirement with this course. This course must be taken during the first semester in the Department or Program. This is a six-hour course and is given in two sessions of three hours each. *Permission of the Graduate Advisor required.*

MIC 799: Advanced Topics

Subject matter offerings based upon student demand and availability of faculty.
Subtitles describing the topics to be offered will be shown in parentheses in the printed class schedule, following the title “Advanced Topics." *Permission from instructor required.*

MIC 810: Master’s Thesis

The student working on his/her master’s thesis enrolls for credit, in most departments not to exceed six, as determined by his/her advisor. Credit is not awarded until the thesis has been accepted.

MIC 820: Research in Residence

Used to establish research in residence for the thesis for the master’s degree after the student has enrolled for the permissible cumulative total in MIC 710 (usually six credits). Credit not granted. May be regarded as full-time residence.

MIC 830: Doctoral Dissertation

Required of all candidates for the Ph.D. The student will enroll for credits as determined by the Graduate Office, but not for less than a total of twenty-four. No more than twelve hours of MIC 830 may be taken in a regular semester and no more than six in the summer.

MIC 840: Post-Candidacy

Required of all candidates for the Ph.D. The student will enroll for credits as determined by the Graduate Office, but not for less than a total of twenty-four. No more than twelve hours of MIC 840 may be taken in a regular semester and no more than six in the summer.

MIC 850 Research in Residence

Used to establish research for the Ph.D. candidate after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. May be regarded as full-time residence as determined by the Dean of the Graduate School.

Qualifying Examination

The Qualifying Examination for prospective Ph.D. candidates is administered February 1 – May 31 of year two of the Microbiology & Immunology program.

The Qualifying Exam in the Microbiology and Immunology Graduate Program is an integral part of the overall evaluation of a student’s academic performance to date and requires a current combined GPA of > 3.0. The evaluation will entail examination of a student’s ability to conceive, efficiently organize and evaluate ideas as well as to verbally communicate them to the faculty.

Importantly, students are expected to exhibit the capacity to think about the significance of the research described by relating the specific aims of your project to broad long-term objectives. The Qualifying Examination also evaluates problem solving capability and utilization of basic knowledge, as well as ability to critically evaluate scientific literature. Thus, a successful defense must indicate to the M&I Graduate Program that the student has a high ability to grow into a successful scientist.

The Qualifying Examination must be the first formal encounter between the student and the Dissertation Committee as a whole. The Dissertation Committee members evaluate the student's written proposal and the oral examination. A member of the Dissertation Committee is selected by the Committee to be the 'recorder.' This individual must be a member of the M&I Graduate Faculty and take responsibility for reporting throughout the tenure of the Dissertation Committee. The recorder summarizes and prepares a consensus statement concerning the opinions and recommendations of the Committee as a whole. See MIC Graduate Student Handbook for more details regarding the QE and committee selection.

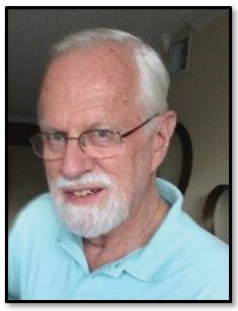
MIC Research Program Overview

Microbiology and Immunology is particularly productive in pre-clinical research and discovery. We are focused on pathogenic bacteria, viruses, and immunology. Our main research themes also focus on developing more effective cancer immunotherapy, an HIV vaccine, creating antigen-specific immune tolerance and overcoming the antibiotic resistance of bacteria.

Active research in immunology includes the areas of cytotoxicity, programmed cell death, cytokine receptor signaling, clinical and experimental bone marrow transplantation, stem cell biology, gene therapy for cancer treatment, antigen recognition, cell differentiation and communication, aging of the immune system, interleukins, genetic control of immunoglobulin production, gene activation and evolution of the immune response. Research in other areas includes molecular biology of virus-host interaction in both animal and human systems, control and regulation of bacterial pathogenesis, selective tumor chemotherapy and radiation therapy and therapy of parasitic infections.

We actively collaborate with the Sylvester Comprehensive Cancer Center and the Diabetes Research Institute. These interactions help to foster translating our discoveries in the laboratory to directly benefitting patients with cancer and type 1 diabetes. Our efforts to translate our discoveries to the clinic are also shown in our large portfolio of licensing agreements and start-up companies.

Microbiology & Immunology Graduate Faculty



Dr. Arba Ager, Professor
(305) 243-3142, aager@med.miami.edu

Research Focus: Chemotherapy of Malaria and Leishmaniasis
(Testing new chemicals for activity against these 2 diseases and evaluating drug combinations for synergistic activity) Evaluating the influence of Perforin 2 on 4 intracellular parasites (Cutaneous and Visceral Leishmania, Toxoplasma and Trypanosoma cruzi)

Dr. Allison Bayer, Research Assistant Professor
305-243-6743, abayer@med.miami.edu

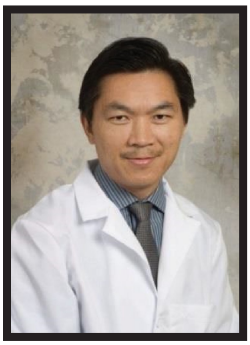
Keywords: T regulatory cell, Autoimmunity, Type 1 diabetes, transplantation, Tolerance

Research Focus: The research Program that I direct in the Cell Transplant Center of the Diabetes Research Institute at the University of Miami aims at identifying a preventative and/or cure for type 1 diabetes (T1D). Key to achieving this goal is centered on understanding the basic immunobiology of Treg cells in experimental models of transplantation and autoimmune diabetes. I seek to answer fundamental questions about adoptive Treg therapy and the mechanisms regulating Treg engraftment and long-term persistence by investigating novel information about the in vivo biological environment necessary to support the Treg compartment. These studies will lay the framework for future development of novel strategies for the restoration of self-tolerance for the treatment of autoimmune diseases like T1D, and for tolerance induction to transplanted tissues or cells.

Dr. Bonnie Blomberg, Professor
305-243-6040, BBlomber@med.maimi.edu

Research Focus: A major focus of our current research is to better define the mechanisms by which the aged immune system is suboptimal and how to improve it. We have discovered molecular and cellular biomarkers in mice and humans which predict the quality of the humoral (antibody) response. These include IgG memory B cells, the enzyme, activation- induced cytidine deaminase, AID, and inflammatory cytokines such as TNF-a. Utilizing a mouse model we are currently testing mechanisms for effects of inflammatory fat tissue on B cell subsets, function and repertoire (autoimmunity).

Another major focus of research in this lab, in collaboration with Dr. Michael Antoni in Psychology, is to understand the positive role of cognitive behavioral stress management (CBSM) on reducing inflammation and improving the immune response in breast cancer patients, e.g. as measured by the influenza vaccine response. A key new finding is that the CBSM intervention not only improves the immune system and gives less inflammation but also that overall survival in the breast cancer patients is improved.



Dr. Zhibin Chen, Associate Professor
305-243-8348, ZChen@med.maimi.edu

Research Focus: Bridging genetic and genomic discoveries to biology and pathophysiology in autoimmune diseases and cancer Interface of immunology, cancer biology, neuroscience.

Current research interests:

- Mechanisms of autoimmunity as a double agent in tumor killing and cancer promotion.
- Microbiota in cross-differentiation of T cell lineages, immune memory and immune tolerance.
- Mechanisms of tissue repairing and regeneration, wound healing.
- Tumor epigenome and transcriptome diversification.
- Origin of cancer: tumorigenic cell differentiation driven by inflammatory cytokines.

Recent publications by PhD students:

1) **Jason Miska, Jen Bon Lui,** Kevin Toomer, Priyadharshini Devarajan.Zhibin Chen. Initiation of Inflammatory Tumorigenesis by CTLA4 Insufficiency Due to Type 2 Cytokines. *Journal of Experimental Medicine.* 215: 841-858. **2018**. (News: http://med.miami.edu/news/sylvester-researchers-discover-new-pathway-linking-inflammation-and-cancer/)
2) **Jen Bon Lui**, Priyadharshini Devarajan, Sarah A. Teplicki, and Zhibin Chen. Cross-differentiation from the CD8 lineage to CD4 T cells with or without microbiota. *Cell Reports.* 10: 574-585. PMID: 25640181. **2015**. (News: http://med.miami.edu/news/students-led-by-dr.-zhibin-chen-make-immunology-discovery)
3) **Priyadharshini Devarajan**, Jason Miska, Jen Bon Lui, Dominika Swieboda, Zhibin Chen. Opposing Effects of CTLA4 Insufficiency on Regulatory versus Conventional T Cells in Autoimmunity Converge on Effector Memory in Target Tissue. *Journal of Immunology.* 193: 4368-4380. PMID: 25246499. **2014**. (Cover story: http://www.jimmunol.org/content/193/9.toc).
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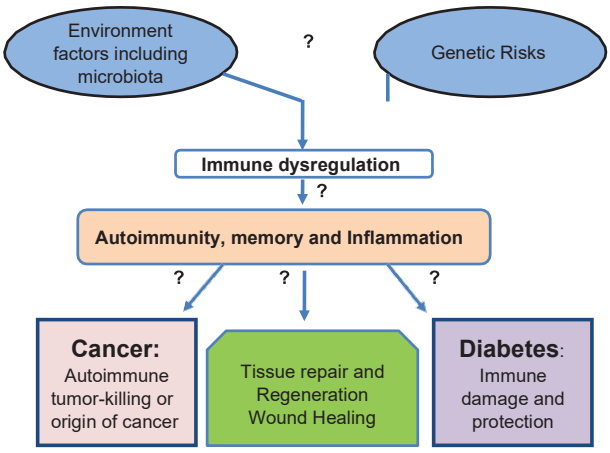
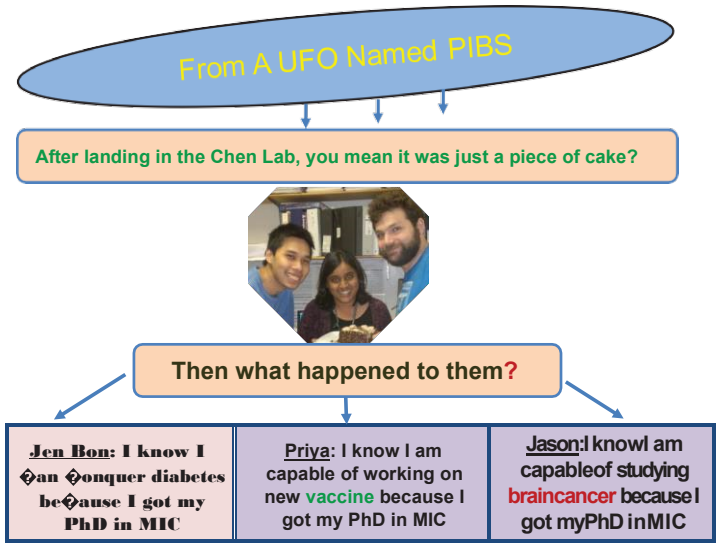
Autoimmunity and Inflammation in Immune Tolerance, Cancer and Immune Therapies: An Overview of Chen Lab



Key words: Autoimmunity, Inflammation, Cancer, Diabetes

Did you hear any rumor what happened to the former PIBS students?



Dr. Daniela Frasca, Research Assistant Professor
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Research Focus: One major aspect of our current research is the characterization of the molecular defects in mouse and human B cells at least in part responsible for the reduced response of elderly individuals to infections and vaccines. The defects identified in our lab include the impairment in the ability of B cells to undergo Ig class switch recombination and somatic hypermutation, which is due to reduced expression of activation-induced cytidine deaminase and of its transcriptional activator E47. The results of these studies, which have bridged together the areas of basic immunology and translational medicine in the elderly, have shed light on basic mechanistic pathways of the humoral immune response, which are critical for protective responses against infections. Importantly, these studies have offered strategies for the improvement of B cell responses in aged individuals which may be applicable to other chronic inflammatory states.

We have recently started to identify and characterize the effects of obesity on antibody responses. Obesity, similar to aging, accelerates age defects in B cells and antibody production, and induces systemic and B cell intrinsic inflammation, leading to reduced B cell responses. We have shown that some B cell subsets are more inflammatory than others, that they are pre-activated and that they signal through metabolic pathways, demonstrating for the first time in human B cells the link between aging, inflammation and metabolism. More recently, we have shown that the human adipose tissue which increases in size with aging, contributes to the secretion of autoimmune antibodies many of which are also present in the plasma of elderly individuals. We have identified several molecules and mechanisms responsible for the local release of "self" antigens, induction of class switch and production of autoimmune antibodies, the specificity of which is under characterization in our laboratory.

A major goal of our research program in the near future will be to obtain creative insights to advance the knowledge in the field of immunometabolism and understand how the consequences of aberrant interaction between the adipose tissue and the immune system drive age-related chronic diseases and may be fundamental contributors to the elevated risk of chronic disease, disability, and adverse health outcomes with advancing age.

Dr. Eli Gilboa, Professor
305-243-1767, EGilboa@med.miami.edu

Research Focus: Cancer immunotherapy. Immune modulation using oligonucleotide aptamer-targeted delivery of therapeutic agents, aptamers, siRNAs, cytotoxic drugs, to tumor cells or immune cells.

Dr. Roland Jurecic, Associate Professor
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Keywords: Cancer, Chemotherapy, Cancer Hematopoiesis, Hematopoietic and immune systems, Hematopoietic stem cells, Emergency hematopoiesis and infection, Cancer therapy-induced malignancies

Research Focus: The research in the lab focuses on: (1) Characterization and attenuation of long-lasting adverse effects of cancer and chemotherapy on hematopoietic and immune system function in cancer survivors; (2) Responses of the Hematopoietic and Immune Systems to cancer (Cancer Hematopoiesis) in treatment-na1ve hosts; (3) Development of new therapeutic approaches to improve hematologic and immune competence of cancer patients and cancer survivors, (4) Cancer therapy-induced malignancies in survivors, and (5) Molecular and cellular pathways regulating Emergency Hematopoiesis in response to acute and chronic infections and tissue damage.

Research Projects:

1) Characterization and attenuation/prevention of acute adverse effects of cancer on the function of hematopoietic and immune systems (Cancer Hematopoiesis) in treatment-na1ve breast cancer-bearing mice and cancer patients.
2) Characterization and attenuation/prevention of acute and long-lasting adverse effects of cancer and chemotherapy on the function of hematopoietic and immune systems in breast cancer survivor mice, cancer patients and cancer survivors.
3) Cellular and molecular characterization of cancer therapy-induced hematologic malignancies in survivors.
4) Generation of personalized breast cancer patient-specific humanized PDX models with the syngeneic hematopoietic system and cancer, originating from the same patient.
5) Testing the safety and efficacy of novel bioactive compounds to: a) Destabilize tumor microenvironment, attenuate cancer progression, and attenuate Cancer Hematopoiesis, and b) Improve the efficacy of chemotherapy and/or immunotherapy.

Dr. Wasif Khan, Professor
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<u>Research Focus:</u> Innate and adaptive functions of B lymphocytes in immune protection, autoimmunity and lymphoma

Our goal is to understand cellular and molecular mechanisms that govern immune defense, autoimmunity and lymphomagenesis, with a focus on newly emerging innate immune and regulatory functions of B cells. These are integral to the overall immune response to pathogens as well as affect the pathological outcomes including immunodeficiency, autoimmunity and lymphoma. Identifying and defining functional significance of critical molecules in immunity, autoimmunity and lymphoid malignancies will facilitate the development of next generation of biological and more precise therapeutics for these maladies.

A major focus is on understanding how dysregulated signaling in B cells leads to autoimmune diseases such as Lupus and Sjogren's Syndrome and analyze therapeutic approaches to treat them. Another focus is on the functional specialization of B cell populations into distinct types of immune responders based on the nature of challenging pathogen and location of encounter.

<u>Rotation projects:</u>

1- Define the effects of dysregulated apoptosis in B-cells alone by altering T cells and innate cells using proapoptotic Bim mutant mice.
2- Determine the extent to which inhibiting BCR signaling ameliorates Lupus and Sjogren's Syndrome pathologies in our novel model of Lupus (B cell specific Bim mutant mice) crossed on to mice that lack BCR signal transducer Btk kinase in B cells.
3- Determine the role of perforin-2 (P2), named by Dr. Eckhard Podack, in MZ, B1 and transitional B cell development and anti-bacterial function.

Dr. Robert Levy, Professor
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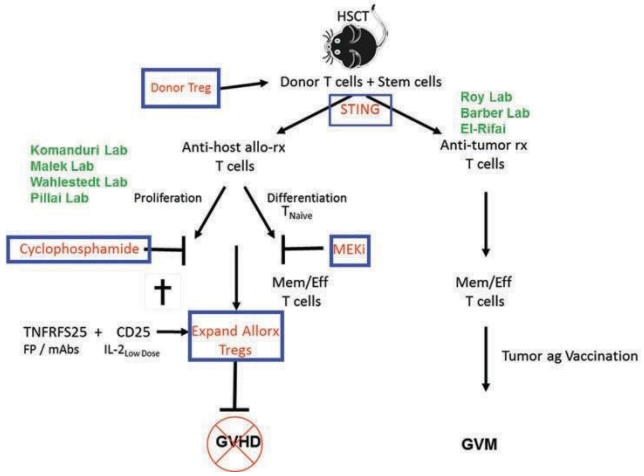
Research Focus: My laboratory's overall objective is to discover strategies which can facilitate the success of hematopoietic stem cell ("Bone Marrow") transplants (**HSCT**) as well as solid tissue transplants. As immunologists, we consider several issues which are separate - but intimately related - during the HSCT process involving hematopoietic cell engraftment, immune reconstitution, graft-versus-host disease (**GVHD**) and anti-tumor immunity (**GVT**) in the recipient. Success requires solving several conundrums including: a) how can we rapidly cure hematopoietic cancers (leukemia, lymphoma, etc.) in recipients whose immune systems have been ablated and are in need of reconstitution and b) how can T lymphocytes be included in the transplanted cells from a healthy donor such that they eradicate disease after infusion but do not damage the patient's healthy tissue? Using well-defined pre-clinical HSCT models our laboratory has developed, we generate questions, design and perform experiments with the overall objective of translating our strategies into the clinic. We are a highly collaborative laboratory with interactions across multiple disciplines in academia and industry - addressing several key areas of T cell biology in transplantation including:

Utilize pre-clinical HSCT models to develop translational strategies for application to transplant patients with hematologic malignancies



- Generating translational regulatory T cell based strategies to limit GVHD and promote GVL and engraftment
- Understanding the role of Stimulator of Interferon Genes (STING) in acute and chronic GVHD
- Defining how epigenetic regulation can be applied to control transplant related inflammatory responses
- Using tumor vaccines during early immune reconstitution in HSCT recipients to eradicate disease
- Elucidating the underlying mechanisms of - and generating topical therapy for - ocular GVHD
- Applying tolerance strategies to prevent cornea tissue transplants

1. Very Low Numbers of $CD4^+$ $FoxP3^+$ Tregs Expanded in Donors via TL1A-Ig and Low-Dose IL-2 Exhibit a Distinct Activation/Functional Profile and Suppress GVHD in a Preclinical Model. Copsel S, Wolf D, Kale B, Barreras H, Light- bourn CO, Bader CS, Alperstein W, Altman NH, Komanduri KV, Levy RB. Biol Blood Marrow Transplant. 2018 PMID: 29751114

2. Marked in Vivo Donor Regulatory T Cell Expansion via Interleukin-2 and TL1A-Ig Stimulation Ameliorates Graft-versus-Host Disease but Preserves Graft-versus-Leukemia in Recipients after Hematopoietic Stem Cell Transplantation. Wolf D, Barreras H, Bader CS, Copsel S, Lightbourn CO, Pfeiffer BJ, Altman NH, Podack ER, Komanduri KV, Levy RB. Biol Blood Marrow Transplant. 2017; 23(5):757-766. PMID: 28219835

3. Novel Scoring Criteria for the Evaluation of Ocular Graft Versus Host Disease in a Pre-Clinical Allo-HSCT Animal Model. Perez VL, Barsam A, Duffort S, Urbieta M, Barreras H, Lightbourn C, and Levy RB. *Biol Blood Marrow Transplant*. 2016 Aug 1. pii: S1083-8791(16)30248-8. PMID: 27492793

4. Superior immune reconstitution using Treg-expanded donor cells versus PTCy treatment in preclinical HSCT models. Wolf D, Bader CS, Barreras H, Copsel S, Pfeiffer BJ, Lightbourn CO, Altman NH, Komanduri KV, Levy RB. JCI Insight. 2018 Oct 18;3(20). PMID: 30333311

5. Donor $CD4^+Foxp3^+$ regulatory T cells are necessary for post-transplantation cyclophosphamide- mediated protection against GVHD in mice. Ganguly S, Ross DR, Panoskaltsis-Mortari A, Blazar BR, Levy RB and Luznik L *Blood.* 2014 Sep 25. PMID 25139358

6. Combining Early Heat Shock Protein Vaccination with Directed IL-2 Leads to Effective and persistent anti-tumor immunity in recipients of experimental autologous hematopoietic cell transplantation Newman RG, Podack ER and Levy RB. *Blood*. 2014 123(19):3045-55, 2014. PMID:24687086

7. Antigen and Lymphopenia-driven Donor T Cells are Differentially Diminished by Post-Transplantation Administration of Cyclophosphamide after Hematopoietic Cell Transplantation. Ross D, Jones M, Komanduri K, Levy RB. Biol Blood Marrow Transplant. 2013. PMID: 23819914

8. The promise of CD4+FoxP3+ regulatory T-cell manipulation in vivo: applications for allogeneic hematopoietic stem cell transplantation. Copsel S, Wolf D, Komanduri KV, Levy RB. Haematologica. 2019 Jul;104(7):1309-1321. PMID: 31221786

Dr. Mathias Lichtenheld, Associate Professor
305-243-3301, mlichten@med.miami.edu

Keywords: Killing of pathogens and pathogen-infected cells effector molecules and transcription with applications to cancer and HIV.

Research Focus: Research by our laboratory and its collaborators has evolved from understanding how CD8+ T-cells and NK cells can kill to how chromatin structures and transcription factors control their expression of the killer proteins. Because of the critical role of these cells in antiviral and antitumor immunity, we expanded our interests to HIV/AIDS and how CD8+ T- cells should be programmed to function optimally in anti-tumor therapy. Our new line of research characterizes mechanism by which perforin-2, a pore forming molecule with significant homology to perforin-1, the essential killer protein of CD8+ T-cells and NK cells, can take a "first shot" at various enemies.

Dr. Diana Lopez, Professor
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Professor of Microbiology and Immunology, Director of Undergraduate Program

Dr. Thomas Malek, Professor and Chair
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Keywords: Regulatory T cells; immune memory; IL-2; autoimmunity, tumor immunotherapy; type 1 diabetes

Regulation of tolerance and immunity by IL-2

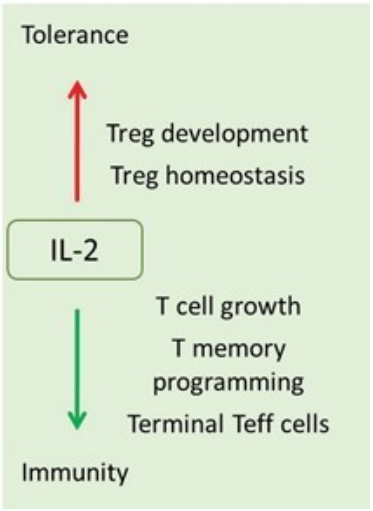
IL-2 is a critical regulator of T cell responses where the level of IL-2 receptor signaling distinctively controls tolerance and immunity. One major objective of the laboratory is to define the underlying mechanisms by which IL-2 controls immunosuppressive regulatory T cells versus the development $CD8^+$ T memory responses. We also seek to translate this information to develop new approaches to suppress autoimmune diseases and to augment anti-tumor immunity.

Ongoing Projects

1. IL-2 Treg development and homeostasis
2. IL-2-gene program in Tregs
3. Low dose IL-2 therapy to selectively boost Tregs in T1D patients

Pharmacology of new IL-2-based drugs

1. Mechanisms of memory programming
2. Enhancing T cell memory and tumor vaccine efficacy by transient high dose IL-2
3. T cell immunity to cancer neoantigens



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3. Ward, N.C., Yu, A., Moro, A., Ban, Y., Chen, X., Hsiung, S., Keegan, J., Arbanas, J.M., Loubeau, M., Thankappan, A., Yamniuk, A.P., Davis, J.H., Struthers, M., Malek, T.R. IL-2/CD25: A long-acting IL-2-based biologic that targets the high affinity IL-2R on regulatory T cells. J Immunol. 201:2579-2592, 2018.
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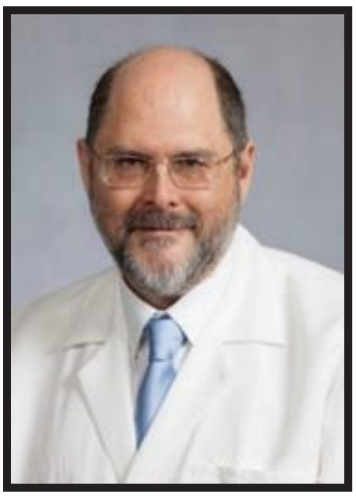
5. Toomer, K.H., Yuan, X., Yang,J., Dee, M.J., Yu, A. and Malek, T.R. Developmental progression and inter-relationship of central and effector regulatory T cell subsets. J. Immunol. 196: 3665-3676, 2016.
6. Yu, A., Snowhite, I., Vendrame, F., Rosenzwajg, M., Klatzmann, D., Pugliese, A., Malek, T. R. Selective IL-2 responsiveness of regulatory T cells through multiple intrinsic mechanisms support the use of low-dose IL-2 therapy in Type-1 diabetes. Diabetes 64:2172-2183, 2015.
7. Castro, I., Dee, M.J. and Malek, T.R. Transient enhanced IL-2R signaling early during priming rapidly and preferentially amplifies development of CD8+ T effector-memory cells J. Immunol. 189:4321-4330, 2012.
8. Yu, A., Zhu, L., Altman, N.H., and Malek, T.R. A low IL-2R signaling threshold supports the development and homeostasis of T regulatory cells. Immunity 30: 204-217, 2009.



Dr. Enrique Mesri, Professor
305-243-5659, EMesri@med.miami.edu

Research Focus: Dr. Mesri's laboratory focuses on the mechanisms of viral carcinogenesis by the Kaposi's sarcoma herpes virus (KSHV) or human herpes virus-8. KSHV is the etiological agent of Kaposi's sarcoma, the main type of cancer associated with AIDS (1,2). AIDS-KS tumors are characterized by proliferation of spindle cells and blood microvessels (angiogenesis) (1,2). Elucidation of the mechanisms of viral carcinogenesis and activation of angiogenesis by KSHV is key for the identification of viral and host molecular therapeutic targets and could lead to the development of novel cures for KS (1,2). Dr. Mesri's laboratory has identified the major angiogenic activating viral oncogene of KSHV-the G protein coupled receptor (vGPCR). vGPCR is a viral gene capable of turning normal cells into cancer cells and activating the secretion of growth factors that promote blood vessel growth (1,2,3). Dr. Mesri's laboratory also recently developed several cell and animal models of virally induced KS — an important step in better understanding the mechanisms of KSHV-mediated viral carcinogenesis and the validation of viral therapeutic targets (3,4). Dr. Mesri is working on using drugs and genetic approaches to block vGPCR and identifying host signaling cascades involved in viral carcinogenesis that can be targeted by FDA-approved drugs to treat KS. His lab recently identified and defined Rac1 induced ROS and PDGF signaling as novel anti-KS target for KS that could be treated with tyrosine kinase and antibody inhibitors (5). In addition, he is using his novel animal model to understand how KSHV and host genes mediate the paracrine mechanisms of oncogenesis induced by KSHV vGPCR. Dr. Mesri's laboratory is currently working on: 1) Identifying the cell progenitor of KS. 2) Novel anti-viral interventions in KS 3) Novel use of a mouse infectious model for a KSHV like virus (MHV-68) to understand in vivo biology 4) Identifying normal genetic polymorphisms that predispose to KS 5) Using next generation sequencing to study KS pathogenesis and response to therapy 6) Study KSHV and HIV oncogenic interactions.

1. Kaposi's sarcoma and its associated herpesvirus.
Mesri EA, Cesarman E, Boshoff C. Nature Reviews Cancer. 2010 Oct 10(10):707-19. doi: 10.1038/nrc2888. Review. PMID: 20865011

2. Molecular and cellular mechanisms of KSHV oncogenesis of Kaposi's sarcoma associated with HIV/AIDS.
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3. In vivo-restricted and reversible malignancy induced by human herpesvirus-8 KSHV: a cell and animal model of virally induced Kaposi's sarcoma. Mutlu AD, Cavallin LE, Vincent L, Chiozzini C, Eroles P, Duran EM, Asgari Z, Hooper AT, La Perle KM, Hilsher C, Gao SJ, Dittmer DP, Rafii S, Mesri EA.
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5. A role for virally induced reactive oxygen species in Kaposi's sarcoma herpesvirus tumorigenesis.
Ma Q, Cavallin LE, Leung HJ, Chiozzini C, Goldschmidt-Clermont PJ, Mesri EA. Antioxid Redox Signal. 2013 Jan 1 18(1):80-90. doi: 10.108249/ars.2012.4584. Epub 2012 Aug 20. PMID: 22746102

Dr. George Munson, Associate Professor
305-243-5317, GMunson@miami.edu

Keywords: Peforin-2 (MPEG1), innate immunity, bacterial pathogenesis

Characterization of Perforin-2, an effector of innate immunity, and bacterial anti-Perforin-2 effectors

- Post-translational modification(s) and intracellular trafficking of Perforin-2 in response to LPS and other PAMPs
- Structure/function of Perforin-2 and mechanism of pore formation
- Identification and characterization of bacterial toxins and effectors that inhibit Perforin-2's bactericidal activity
- Activation and proteolytic cleavage of Perforin-2 in the phagosome

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2. McCormack RM, Lyapichev K, Olsson ML, Podack ER, Munson GP. Enteric pathogens deploy cell cycle inhibiting factors to block the bactericidal activity of Perforin-2. Elife. 2015 Sep 29 4. PMCID: PMC4626573.

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Savita Pahwa, MD; Professor, M & I,
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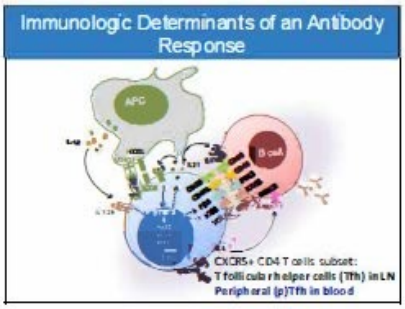

Keywords: HIV, B cells, T follicular helper cells, virus persistence, inflammation, immune activation.

Research Focus: **Active projects (Funding sources: PI has 4 NIH R01 grants, a P30 center grant, EPIICAL grant through Penta network from ViiV health care and collaborates with investigators in other networks in UM.,**

T follicular helper cells, B cells and antibody responses

- In HIV infected and exposed infants following administration of childhood vaccines, effect of antiretroviral treatment on developmental immunity of virally controlled infants and therapeutic intervention strategies for achieving functional HIV cure (R01, Epiical)
- In aging and HIV infection to examine their impact on influenza vaccine induced Ab responses (R01)
- In aging SIV infected monkeys to determine lymph node and peripheral blood immune responses to different vaccines given to young and old animals(R01)
- In pregnant women with active or latent TB for maternal to infant passage of anti-TB antibodies (R01)

HIV Reservoirs, Persistence and "Cure"

- In HIV infected children to examine role of immune system in HIV persistence (R01, same as above)
- Establishment of Latency in primary CD4 T cells using reporter HIV (pilot grant, Lesley DeArmas)

Inflammation and immune activation, cytokine imbalance and gut microbial translocation-effect on HIV progression/ reservoirs

- In different clinical projects

Other basic research by lab members in aging and in infants:
Pilot grants: Epigenetics of T cells in HIV (Pallikkuth); Memory B cells in HIV, (Rinaldi)

Pahwa Laboratory

Missing: Graduate students Dan, Vinh, Christina and Kimberly

Suresh Pallikkuth, Research Assistant Professor
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Research Focus: I am currently investigating the immunologic mechanisms that are involved in protective immune response to Influenza vaccines in aging and HIV infection. Furthermore, we are studying the mechanisms of immune dysfunction in aging and HIV infection using non- human primate models of HIV infection in collaboration with Emory University and Vaccine Research Center at NIH. In a related study, I am performing transcriptomic analysis using RNA- seq and Fluidigm Biomark based approaches in collaboration with Case Western University for identifying gene signatures that are predictive of the vaccination outcome and that could provide insight into approaches to improve the immunologic outcomes in HIV and aging. My research interests also include IL-21 based immunomodulatory approaches in SIV infection to improve the immune function and vaccine responses by modulating T follicular helper (Tfh) and B cell function. I am also involved in the HIV remission research strategies in which I am investigating the role of T follicular helper cells in the peripheral blood and lymph nodes from HIV infected virologically suppressed patients on cART in contributing to HIV persistence and viral reservoirs. In another related study, I am also involved in identifying the cellular reservoirs of HIV infection in the circulation that contribute to viral rebound at post-treatment interruption using phylogenetic analysis of HIV in collaboration with Dr. Stevenson. Furthermore, I am also collaborating with investigators from SCCC to study the role of inflammation and immune dysfunction in HIV infected patients diagnosed with anal dysplasia and polyps. These studies will further understand the role of epigenetic mechanisms in regulating inflammation at the gut mucosal sites.

Dr. Gregory Plano, Professor
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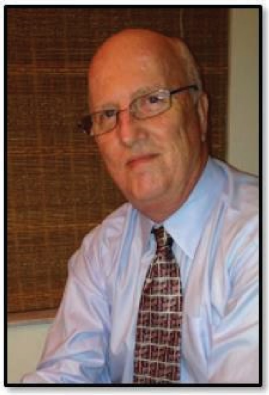
Keywords: Bacterial pathogenesis, Type three secretion, host-pathogen interaction, protein secretion, bacterial attachment, plague

Research Focus: The research in my laboratory is focused on mechanisms of bacterial pathogenesis. In general, these studies have been focused on a virulence mechanism termed type III secretion (T3S). Gram-negative bacterial pathogens use the T3S process to directly inject anti-host proteins termed effector proteins into targeted eukaryotic cells. Ongoing research projects include the characterization of three novel T3S effector proteins encoded in the genome of *Yersinia pestis*, the agent of plague. A second active project is characterizing the role of the *Y. pestis* Ail outer membrane protein in the injection of T3S effector proteins, attachment to host cells and in resistance to complement. We are also characterizing the mechanism by which bacterial pathogens suppress the expression of Perforin-2.



Dr. Richard Riley, Professor
305-243-2644, RRiley@med.miami.edu

Keywords: Old age, B lymphocytes, inflammation, B lymphopoiesis, Pre-B cell receptor

Research Focus: Dr. Riley's laboratory focuses on understanding the cellular and molecular basis of reduced B lymphocyte function in old age. In particular, his laboratory studies the mechanisms of poor B lymphopoiesis and ramifications for altered "read-out" of the antibody repertoire. More recently, the role of a novel B cell subset, the Age-associated B Cells (ABC) and of inflammation in modulating immune system development and function in old age are being investigated. Dr. Riley is also engaged in collaborative research with Dr. Bonnie Blomberg and Dr. Daniela Frasca (Department of Microbiology & Immunology) studying B lymphocyte dysfunction in old age and with Dr. Roland Jurecic (Department of Microbiology & Immunology) studying effects of cancer chemotherapy and inflammation on immune system development and functions.

Dr. Kurt Schesser, Associate Professor
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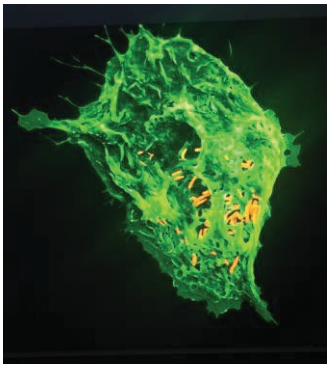


Dr. Schesser's laboratory is focused on host factors that impact infection. Current studies are on host-encoded Heme Regulated Inhibitor (HRI) and Perforin-2 (P2), whose infection-specific activities were discovered in the Schesser and Podack labs, respectively. HRI and P2 are required to restrict the replication of bacterial pathogens in the liver and the placenta. At the cellular level, HRI regulates endosomal trafficking such that the pathogen is confined within the infected cell thus enhancing immune activation (Bahnan et al. 2018). P2, on the other hand, was unexpectedly found to be a regulator of endosomal pH and when absent allows for a much more favorable environment for the expression and activity of pathogen-encoded virulence factors (McCormack et al. 2016). Current studies include deciphering how HRI (an eIF2a kinase) impacts post- transcriptional gene expression and intracellular pathogen trafficking and identifying what cells in the placenta P2 activity is critical to inhibit pathogens from infecting the fetus. Additionally, Dr. Schesser directs, with departmental colleagues Drs. Arba Ager and Natasa Strbo, the Tropical Disease Research Unit.

Representative Publications (Graduate and undergraduate student authors are ***bolded in italics***)

1. ***Gayle P,*** *Freitag NE, Strbo N, Schesser K. Using a Bacterial Pathogen to Probe for Cellular and Organismic-level Host Responses. Journal of Visual Experiments. 2019 Feb 22;(144).*

2. *Schesser Bartra S, Lorica C, Qian L, Gong X,* ***Bahnan W,*** *Barreras H Jr,* ***Hernandez R,*** *Li Z, Plano GV, Schesser K. Chromosomally-Encoded Yersinia pestis Type III Secretion Effector Proteins Promote Infection in Cells and in Mice. Frontiers Cell and Infection Microbiology. 2019 Feb 22;9:23.*

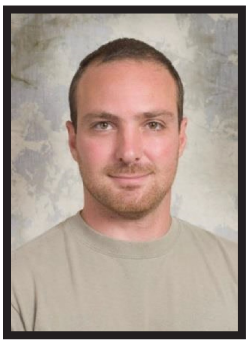
3. ***Bahnan W, Boucher JC, Gayle P, Shrestha N,*** Rosen M, Aktas B, Adkins B, Ager A, Khan WN, Schesser K. The eIF2a Kinase Heme-Regulated Inhibitor Protects the Host from Infection by Regulating Intracellular Pathogen Trafficking. Infection and Immunity. 2018 Feb 20 86(3).

4. ***McCormack R, Bahnan W, Shrestha N, Boucher J, Barreto M, Barrera CM,*** Dauer EA, Freitag NE, Khan WN, Podack ER, Schesser K. Perforin-2 Protects Host Cells and Mice by Restricting the Vacuole to Cytosol Transitioning of a Bacterial Pathogen. Infection and Immunity. 2016 Mar 24 84(4):1083-1091

5. ***Bahnan W,*** Boettner DR, Westermark L, Fallman M, Schesser K. Pathogenic Yersinia Promotes Its Survival by Creating an Acidic Fluid-Accessible Compartment on the Macrophage Surface. PLoS One. 2015 Aug 14 10(8):e0133298.

6. ***Shrestha N, Boucher J, Bahnan W,*** Clark ES, Rosqvist R, Fields KA, Khan WN, Schesser K. The host-encoded Heme Regulated Inhibitor (HRI) facilitates virulence-associated activities of bacterial pathogens. PLoS One. 2013 Jul 10 8(7):e68754

7. ***Shrestha N, Bahnan W,*** Wiley DJ, Barber G, Fields KA, Schesser K. Eukaryotic initiation factor 2 (eIF2) signaling regulates proinflammatory cytokine expression and bacterial invasion. Journal of Biological Chemistry. 2012 Aug 17 287(34):28738-44.



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Research Focus: Our laboratory is focused in understanding the role of myeloid cells, and in particular myeloid derived suppressor cells, in promoting immune tolerance. In cancer setting, we showed that these cells are the tolerogenic antigen presenting cells that allows the tumor to escape immune recognition. Furthermore, these cells promote tumor growth, invasion, and metastases. We undisclosed some of the molecular mechanisms that these cells employed to suppress the antitumor response and we designed some important therapeutic strategies that allows to recently complete a phase I-II clinical Trial in HNSCC. In preclinical setting, we have developed functionalized nanoparticles and RNA aptamers that allow us to further dissect the biology of these cells in vivo. The main directions of our laboratory is thus the understanding MDSC biology and their relationship with other leukocyte subsets (i.e. Treg, CTL, B cell etc) in order to develop new therapeutic strategy in cancer and autoimmunity.

Another growing field in our laboratory is the development of targeting moieties that allow the delivery of therapeutic cargos (i.e. gene modulating RNAs, chemotherapeutic agents, immune modulators) to specific cells or tissues in vivo. For examples, we develop functionalized dendrimer targeting myeloid cells, aptamers able to vehicle chemotherapeutic agents or siRNA specifically to the myeloid cells in tumor stroma, or gene altering RNA (i.e. siRNA or saRNA) to human, insulin producing ◆ cells in mice transplanted with human islets.

Finally we are using in vivo imaging systems that allow to evaluate at cellular level the interaction between immune system and graft (i.e. islets or patient derived tumor xenograft) that will allow us to follow and better understand the dynamics of the immune response as well as the effect of treatment on tumor or allograft rejection.

Publications since 2014:

1. Zilio S, Vella JL, De la Fuente AC, Daftarian PM, Weed DT, Kaifer A, Marigo I, Leone K, Bronte V, **Serafini P. "***4PD Functionalized Dendrimers: A Flexible Tool for In Vivo Gene Silencing of Tumor-Educated Myeloid Cells." J Immunol. 2017 Apr 10. pii: 1600833. doi: 10.4049/jimmunol.1600833. Journal of immunology highlighted*
2. Zilio S, **Serafini P. "***Neutrophils and granulocytic MDSC: the Janus god of Cancer immunotherapy."* **Vaccines.** 2016 4, (3), 31
3. Zoso A*, **Serafini P***, Lanzoni G, Peixoto E, Messinger S, Mantero A, Padilla-Tellez ND, Baidal DA, Alejandro R, Ricordi C, Inverardi L. *G-CSF and Exenatide might be associated with increased Long-term Survival of Allogeneic pancreatic islets graft.* ***PLOS one*** 11 (6), e0157245. Epub 2016/06/10 *co-first authors
4. Caroli J, Taccioli C, De La Fuente A, **Serafini P**, Bicciato S. *APTANI: a computational tool to select aptamers through sequence-structure motif analysis of HT-SELEX data.* ***Bioinformatics****.* 2016. 32 (2), 161-164
5. Weed DT, Vella JL, Reis IM, De la Fuente AC, Gomez C, Sargi Z, Nazarian R, Califano J, Borrello I, **Serafini P**. *"Tadalafil reduces myeloid-derived suppressor cells and regulatory T cells and promotes tumor immunity in patients with head and neck squamous cell carcinoma".* ***Clin Cancer Res***. 2015 21(1):39-48. **F1000 recommended.** T*his is the first demonstration that PDE5 inhibitors are effective immunomodulators in patients with HNSCC*
6. Califano JA, Khan Z, Noonan KA, Rudraraju L, Zhang Z, Wang H, Goodman S, Gourin CG, Ha PK, Fakhry C, Saunders J, Levine M, Tang M, Neuner G, Richmon JD, Blanco R, Agrawal N, Koch WM, Marur S, Weed DT, **Serafini P**, Borrello I. *"Tadalafil augments tumor specific immunity in patients with head and neck squamous cell carcinoma*". ***Clin Cancer Res.*** 2015 21(1):30-8.
7. Mazza, E, Zoso A, Mandruzzato M, Bronte V., **Serafini P**., Inverardi I, Bicciato, S.*"Gene expression profiling of human fibrocytic myeloid-derived suppressor cells (f-MDSC)"* ***Genomics Data*** 2014 Dec (2) 389-392
8. *Zoso A, Mazza EM, Bicciato S, Mandruzzato S, Bronte V.,* ***Serafini P.*,*** *Inverardi L.* "Human fibrocytic myeloid-derived suppressor cells express IDO and promote tolerance via Treg-cell expansion".* ***Eur J Immunol***. 2014 44(11):3307-19. Cover, **Co*-senior authors. *This is the first cellular, molecular and functional characterization of a new subsets of human MDSCs.*

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Keywords: NF-KB, A20, Ubiquitination, Inflammation, and leukemia and lymphoma

Project I: Uncontrolled activation of innate immune receptors by pathogens can cause chronic inflammation and autoimmune disease. My laboratory focuses on understanding the mechanisms of negative regulation of the transcription factor NF-KB activated by the innate immune receptors. Activation of NF-KB is critical to eliminate pathogens and to maintain tissue homeostasis. NF-KB activation needs to be tightly regulated after the danger is eliminated. The ubiquitin-editing enzyme A20 complex tightly regulates NF-KB activation. The mechanisms of the ubiquitin-editing enzyme A20 complex activation are not known. Thus, we wish to understand the mechanisms that activate the A20 complex and lead to termination of NF-KB activation and maintenance of tissue homeostasis.

Project II: Chronic activation of NF-KB is essential for the survival of leukemia and lymphoma caused by oncogenic viruses, such as EBV, KSHV, and HTLV-1 infected cells. Viral oncogenes, LMP-1 of EBV, vFLIP and vGPCR of KSHV and Tax of HTLV-1, are hijacking and post-translationally modifying host factors to maintain chronic NF-KB activation in leukemias and lymphomas. However, the host factors that are post-translationally modified are not fully known. Thus another focus of my laboratory is to identify the mechanisms and host factors that post-translationally modified by the viral oncogenes to maintain chronic NF-KB activation in leukemias and lymphomas.

Project III: Type I interferons (IFN-a and IFN-&#65533;) and type II interferon (IFN-y) are induced in response to infections with viruses or bacteria. IFNs bind to their cognate receptor, which play important roles in host defense against invading pathogens. Type I interferons provide protection against many viral infections, whereas type II interferon is essential for host defense against some bacterial and parasitic pathogens. Interestingly, numerous studies have also found that functional dysregulation of either interferon response can leads to chronic pathological conditions associated with numerous human diseases, including tissue damage and autoimmunity. Type I and II IFN signaling pathways are dysregulated in oncogenic virus-infected cells to maintain chronic inflammation and initiate and develop tumors. However, the molecular mechanisms and the host factors that are involved in regulating interferon receptors are poorly understood. The overall objective of this proposal is to determine the molecular mechanisms of action of a host protein, P-2 (also known as MPEG-1), on Type I and II IFN signaling pathways and oncogenic virus-infected cells.

1. Pujari R, Hunte R, Thomas R, van der Weyden L, Rauch D, Ratner L, Nyborg JK, Ramos JC, Takai Y, **Shembade N**. **PLoS Pathog.** 2015 Mar 16 11(3):e1004721.

2. Shembade N, Pujari R, Harhaj NS, Abbott DW, Harhaj EW. The kinase IKKa inhibits activation of the transcription factor NF-KB by phosphorylating the regulatory molecule TAX1BP1. **Nature Immunology.** 2011 Jul 17 12(9):834-43

3. Shembade N, Ma A, Harhaj EW. Inhibition of NF-kappaB signaling by A20 through disruption of ubiquitin enzyme complexes. ***Science.*** 2010 Feb 26 327(5969):1135-9

4. Shembade N, Harhaj NS, Parvatiyar K, Copeland NG, Jenkins NA, Matesic LE, Harhaj EW. The E3 ligase Itch negatively regulates inflammatory signaling pathways by controlling the function of the ubiquitin-editing enzyme A20. **Nature Immunology.** 2008 Mar 9(3):254-62

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Keywords: (1.) Cellular and molecular mechanism of secreted heat shock fusion protein, gp96-Ig and development of secreted gp96-Ig vaccine against infectious diseases. (2.) The role of Perforin-2 at mucosal barriers: skin, reproductive tract and gut. (3.) Development of humanized-mouse model. (4.) Mucosal Immune system in female reproductive tract.

The main goal of my current research is to devise a novel strategy for achieving as complete a protection as possible, the ultimate goal being the future development of an efficacious vaccine against HIV and malaria. In addition, we want to understanding the dynamic interaction of innate immune responses and pathogens at mucosal barriers such as: skin, reproductive tract and gut. These studies may provide major insights into the ultimate development of highly effective mucosal vaccines.

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Keywords: virology, cell biology, innate immunity, HIV, cancer, viral hepatitis, liver

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Research Focus: Hepatocellular Carcinoma (HCC) is one of the few cancers whose incidence is on the rise and this cancer is predicted to continue to increase in incidence. The biggest driver of this unfortunate trend is that fact that chronic liver disease resulting from Hepatitis B and C virus infection, 500 million infected globally, causes a large percentage of all cases of HCC. There are over 4 million individuals in the United States with HCV infection making it the most common chronic blood-borne infection. Viruses that cause hepatitis are particularly difficult to study in-vitro however, research focused on these viruses are yielding tremendous insight into how viruses cause cancer and in host defense mechanisms found in the liver. My lab has developed cellular models to study these viruses and their role in cancer development. In addition, we have established new exciting models to study the role that HIV coinfection plays in accelerating liver disease progression and in the development of HCC.

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2. Experimental models of hepatitis B and C - new insights and progress.Thomas E, Liang TJ.Nat Rev Gastroenterol Hepatol. 2016 Jun 13(6):362-74. doi: 10.1038/nrgastro.2016.37. Epub 2016 Apr 14. Review.

3. Viral hepatitis: past and future of HBV and HDV.Thomas E, Yoneda M, Schiff ER.Cold Spring Harb Perspect Med. 2015 Feb 2 5(2):a021345. doi: 10.1101/cshperspect.a021345. Review.PMID:25646383Similar articles

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5. Integrative functional genomics of hepatitis C virus infection identifies host dependencies in complete viral replication cycle. Li Q, Zhang YY, Chiu S, Hu Z, Lan KH, Cha H, Sodroski C, Zhang F, Hsu CS, Thomas E, Liang TJ. PLoS Pathog. 2014 May 22 10(5):e1004163. doi: 10.1371/journal.ppat.1004163. eCollection 2014 May. PMID: 24852294

6. HCV infection induces a unique hepatic innate immune response associated with robust production of type III interferons. Thomas E, Gonzalez VD, Li Q, Modi AA, Chen W, Noureddin M, Rotman Y, Liang TJ. Gastroenterology. 2012 Apr 142(4):978-88. doi: 10.1053/j.gastro.2011.12.055. Epub 2012 Jan 13. PMID:22248663

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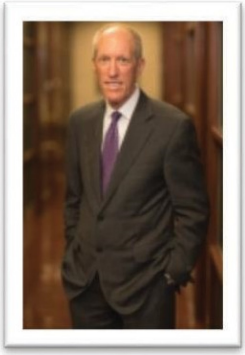

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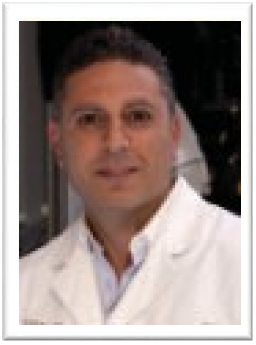

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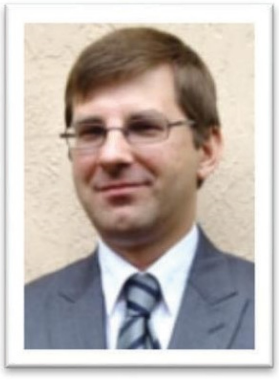

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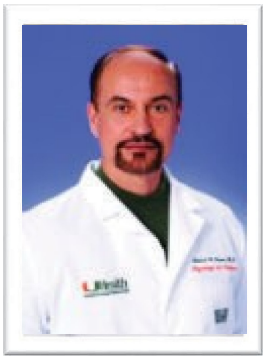

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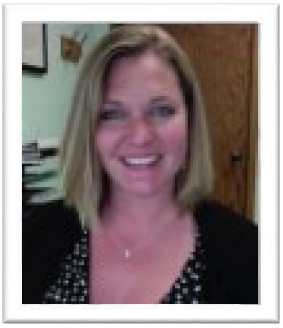

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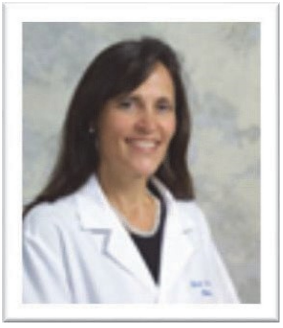

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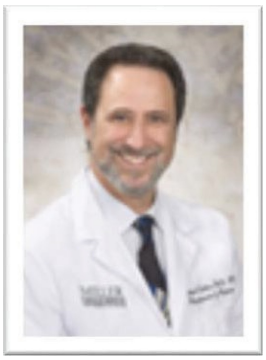

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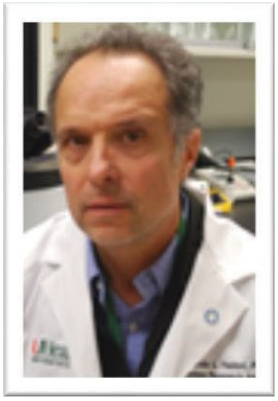

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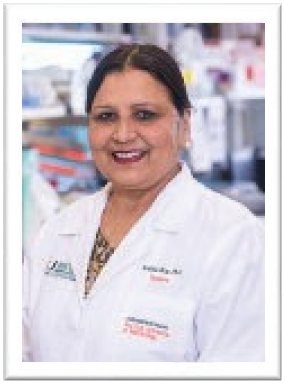

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Keywords: "HIV/AIDS, viral persistence, antiviral restrictions"

Chief Division of Infection Diseases.

Research Focus: Research in the Stevenson lab is aimed at understanding how HIV-1 persists in the face of antiretroviral suppression. While antivirals can control viral replication, they don't eliminate the virus and identifying how the virus persists is key to developing strategies to cure the infection. The lab is also trying to harness the antiviral activity of cellular factors known as antiviral restrictions. Several host proteins have been identified that potently suppress HIV-1 replication. However, the virus has evolved counter defenses that neutralize these antiviral restrictions. We are developing small molecules that neutralize viral defenses so as to allow the antiviral restrictions to neutralize the virus. We have recently begun to develop diagnostic platforms to detect emerging and resistant organisms (HIV, Zika, TB) in resource limited settings.