BIOCHEMISTRY, MICROBIOLOGY AND IMMUNOLOGY

Office: 7374 Scott Hall; 313-577-1511
Chairperson: Philip Pellett, Ph.D.
Associate Chair: Ladislau Kovari Ph.D.
Graduate Director: Jeffrey Withey Ph.D.
http://www.biochemmicroimmuno.med.wayne.edu

The Department of Biochemistry, Microbiology Immunology serves our community, state, nation, and the world by applying the tools of our disciplines to improving health and wellness for all members of our society, including historically underserved populations.

We are home to students and faculty engaged in the study of areas of modern biomedical science that are fundamental to understanding biological systems relevant to human health. The department was formed in January 2017 by a merger of the long-standing Departments of Biochemistry & Molecular Biology and Immunology & Microbiology.

We provide high quality biomedical science education and opportunities to perform pioneering research. This enables our diverse student body of college undergraduates, medical students, graduate students, and post-doctoral scholars to develop into scientific leaders in the international biomedical arena.

Our current areas of research include:

Biochemistry and Molecular Biology have played major roles in the biological revolution that has transformed our understanding of the fundamental processes of life, and have paved the way for the development of solutions to medical problems that vexed us for centuries. Our biochemical research programs involve the study of molecular mechanisms that underlie biological processes, with an emphasis on the relationship between macromolecular structure and function.

Immunology involves the study of defense systems that revolve around discrimination of self from non-self. Recognition of pathogens (non-self) triggers mechanisms that can lead to an elimination of the pathogen. Over-enthusiastic recognition of self can lead to autoimmune diseases such as rheumatoid arthritis. Research in immunology is directed at learning how immune responses are regulated, to enhance protections against pathogens, dampen autoimmunity, and direct the immune system to eliminate cancers.

Microbiology revolves around the study of bacteria and viruses, classes of microorganisms that inhabit every ecosystem on the planet and some of which cause a wide range of diseases. Microorganisms are important constituents of our environment, from our personal microbiomes to the complex array of microbial interactions that define nearly all aspects of life on earth. Our microbiology research programs involve investigation of pathogen-host interactions from the levels of populations and individuals, down to the intracellular level. Human and animal microbiomes are also under study to understand their roles in many biological processes.

Our department is home to M.S., Ph.D., and M.D/Ph.D. programs in Biochemistry & Molecular Biology (https://biochemmicroimmuno.med.wayne.edu/phd-program/) and Immunology & Microbiology (https://biochemmicroimmuno.med.wayne.edu/immunologyandmicrobiologyms/phdprograms/). Our objective is to prepare students for active and successful careers in these exciting and important areas of modern biomedical science. Our students learn how to work independently and collaboratively on complex multidisciplinary biomedical problems, in the context of high standards for research and scholarship. Our educational programs facilitate the development of critical skills such as hypothesis development, experimental design, robust application of classical and modern methods, data analysis, performing research by high ethical standards, and preparation of data for written and oral presentation in high-quality venues. For decades, our graduate programs have provided excellent foundations for many significant careers in biological research.

Biochemistry and Molecular Biology

ACKERMAN, SHARON H.: Ph.D., M.S., New York University; B.S., George Washington University; Associate Professor

AKINS, ROBERT A.: Ph.D., Ohio State University; B.A., Wittenberg University; Professor

BRUSILOW, WILLIAM S.: Ph.D., University of Wisconsin; B.A., Princeton University; Professor

EDWARDS, BRIAN F. P.: Ph.D., M.A., Harvard University; B.S., University of British Columbia; Professor

EVANS, DAVID R.: Ph.D., Wayne State University; B.S., University of Notre Dame; Professor

GATTI, DOMENICO L.: M.D., Catholic University of S. Cuore; Ph.D., University of Bari; Professor

KOVARI, LADISLAU C.: Ph.D., University of Tennessee; M.S., B.S., University of Bucharest; Professor

MITRA, BHARATI: Ph.D., Cornell University; M.S., Indian Institute of Technology; B.S., Calcutta University; Professor

WANG, JIANJUN: Ph.D., B.Sc., Nanjing University; M.S. Beijing Medicinal Chemistry Institute; Professor

YANG, ZHE: Ph.D., Chinese Academy of Sciences; Associate Professor

Immunology and Microbiology

HE , YUAN: Ph.D., University of Illinois at Urbana-Champaign; Assistant Professor

JACKSON, MATTHEW P.: Ph.D., Kansas State University; M.S., B.S., University of Missouri at Kansas City; Associate Professor

PELLETT, PHILIP. Ph.D., University of Chicago; B.S. Ohio University; Professor and Chair

SEBZDA, ERIC: Ph.D., University of Toronto; Associate Professor

THEIS, KEVIN: Ph.D., Michigan State University; B.S., State University of New York; B.A., LeMoyne College; Assistant Professor

THIPPARTHI, RAGHAVENDAR: Ph.D., University of Hyderabad; Associate Professor

TSE, HARLEY Y.: Ph.D., University of California at San Diego; M.B.A., Rutgers University; B.S., California Institute of Technology; Professor

WITHEY, JEFFREY: Ph.D., University of Michigan, B.A., Johns Hopkins University ; Professor

- Biochemistry and Molecular Biology (M.S.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/biochemistry-microbiology-immunology/biochemistry-molecular-biology-ms/)

- Biochemistry and Molecular Biology (Ph.D.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/biochemistry-microbiology-immunology/biochemistry-molecular-biology-phd/)
- Immunology and Microbiology (M.S.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/biochemistry-microbiology-immunology/immunology-microbiology-ms/)
- Immunology and Microbiology (Ph.D.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/biochemistry-microbiology-immunology/immunology-microbiology-phd/)

Biochemistry and Molecular Biology

BMB 7010 General Biochemistry Lecture Cr. 4
Introduction to biochemistry: structure of biological molecules, enzymes, bioenergetics, intermediary metabolism. Biosynthesis of DNA, RNA, and proteins. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

BMB 7015 Introduction to Metabolism Cr. 2
An introduction to intermediary metabolism of carbohydrate, lipids, amino acids and proteins. Focuses on the metabolic pathways involved in the synthesis and degradation of metabolites. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: PSL 7015

BMB 7020 Biochemistry Laboratory Rotation Cr. 1-4
Research in labs with various faculty. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students; enrollment is limited to students in the Department of Biochem,Microbio & Immunology.
Repeatable for 8 Credits

BMB 7030 Core Concepts in Technologies in Biochemistry and Molecular Biology Cr. 4
Methods-based approach to understanding core concepts in biochemistry and biotechnology. Students acquire competence enabling them to explain and implement these approaches. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

BMB 7140 Foundations of Machine Learning and Artificial Intelligence with Python, Scikit-Learn, and PyTorch Cr. 3
Introduction to basic concepts of linear algebra and their application to data analysis. MATLAB and PYTHON programs are introduced and employed as tools for practical implementation of computational methods. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: IBS 7140

BMB 7320 Protein Structure and Function Cr. 3
Structure, function, and design of proteins: architecture, function, regulation, assembly and evolution of proteins and protein complexes; theory and techniques of kinetic analysis; newer techniques of protein design and engineering. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: IBS 7320

BMB 7330 Advanced Molecular Biology Cr. 2
Modern topics in biochemistry, including nucleic acid dynamics, genomic structure, DNA replication and repair, transcription, RNA processing, translation and protein synthesis. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: IBS 7330

BMB 7360 Advanced Structural Biology Cr. 2
Determination of structure and dynamics of biological molecules by NMR and crystallography; emphasis on protein structure and function. Offered Winter.
Prerequisites: IBS 7015 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

BMB 7670 Advanced Biochemistry Laboratory Cr. 2-10
Advanced laboratory techniques as applied to investigations of biological materials. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.

BMB 7890 Journal Club Cr. 1
Student presentations of papers from recent literature or their own research. Offered Fall, Winter.
Restriction(s): Enrollment is limited to students with a major in Biochemistry&Molecular Biology or Immunology and Microbiology; enrollment is limited to Graduate level students.
Repeatable for 9 Credits

BMB 7996 Research Cr. 1-15
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 30 Credits

BMB 8999 Master's Thesis Research and Direction Cr. 1-8
Offered Every Term.
Restriction(s): Enrollment limited to students with a class of Candidate Masters; enrollment is limited to Graduate level students.
Repeatable for 8 Credits

BMB 9990 Pre-Doctoral Candidacy Research Cr. 1-8
Research in preparation for doctoral dissertation. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 12 Credits

BMB 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 3-9
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 9 Credits

BMB 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 1-18
Offered Every Term.
Prerequisite: BMB 9991 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 18 Credits

BMB 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: BMB 9992 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.

BMB 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: BMB 9993 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.

BMB 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Fees: $434.8
Repeatable for 0 Credits

Immunology and Microbiology

IM 7010 Fundamentals of Immunology Cr. 2
Cellular-molecular and systemic functions, and diseases of the immune system. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy degree; enrollment limited to students in the School of Medicine.
Equivalent: IBS 7090

IM 7020 Fundamentals of Microbiology Cr. 2
Molecular Mechanisms of Bacterial Pathogenesis uses bacterial pathogens as paradigms to illustrate the disease process. Molecular mechanisms of bacterial colonization, evasion of the host immune response, inflammation, invasion and tissue damage by exotoxin secretion are key learning objectives. Host and pathogen interaction and the role of the microbiome in human health are taught. Antimicrobial resistance is covered at the level of development and transmission. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

IM 7030 Molecular Biology of Viruses Cr. 2
Basic principles of virology including virus host interactions and the molecular biology of virus multiplication and genetics. Offered Winter.
Prerequisite: BMB 7010 with a minimum grade of B or MGG 7010 with a minimum grade of B
Restriction(s): Enrollment is limited to Graduate level students.

IM 7040 Fundamentals of Research Cr. 2
Lecture/discussion of practical aspects of professional scientific research. Offered Fall.
Restriction(s): Enrollment is limited to Graduate or Medical level students; enrollment limited to students in the School of Medicine.

IM 7060 Laboratory Rotation Cr. 1-4
Students complete 3-4 week rotations in three different research laboratories prior to choosing a thesis research lab. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students; enrollment is limited to students in the Department of Biochem,Microbio & Immunology.
Repeatable for 4 Credits

IM 7140 Critical Thinking in Science Cr. 1
The objective of the course is to provide students with opportunities to practice explicit application of critical thinking skills for the analysis of scientific literature through the deliberate practice of reading, writing, and small group discussion. Strong inference and the principles of logic will be used to illustrate how doubt-driven motivation can be applied to a research project without a priori thinking that can result in confirmation bias. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.

IM 7450 Current Trends in Immunology Cr. 2
Lectures and discussions on current literature and research problems. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.

IM 7520 Molecular Mechanisms of Bacterial Pathogenesis Cr. 2
Molecular Mechanisms of Bacterial Pathogenesis uses bacterial pathogens as paradigms to illustrate the disease process. Molecular mechanisms of bacterial colonization, evasion of the host immune response, inflammation, invasion and tissue damage by exotoxin secretion are key learning objectives. Host and pathogen interaction and the role of the microbiome in human health are taught. Antimicrobial resistance is covered at the level of development and transmission. Offered Winter.
Restriction(s): Enrollment is limited to students with a major in Immunology and Microbiology; enrollment is limited to Graduate level students.

IM 7530 Advanced Microbiology Research Cr. 1-4
Independent study between a BMI student and an advisor. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students; enrollment is limited to students in the Department of Biochem,Microbio & Immunology.
Repeatable for 4 Credits

IM 7650 Current Trends in Host-Microbiome Interactions Cr. 2
We are each populated by diverse microbial communities that affect our physiological and immunological profiles and ultimately our likelihood of experiencing health or disease. This course will explore the literature related to all aspects of host-microbiome interactions, and will do so from mechanistic, ontogenetic, functional, and phylogentic perspectives. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.

IM 7890 Seminar Cr. 1
Weekly BMI seminar series. Offered Fall, Winter.
Restriction(s): Enrollment is limited to students with a major in Immunology and Microbiology; enrollment is limited to Graduate level students.

IM 7996 Research Cr. 1-9
Lab research. Offered Every Term.
Restriction(s): Enrollment is limited to students with a major in Immunology and Microbiology; enrollment is limited to Graduate level students.
Repeatable for 30 Credits

IM 8999 Master's Thesis Research and Direction Cr. 1-8
Offered Every Term.
Restriction(s): Enrollment limited to students with a class of Candidate Masters; enrollment is limited to Graduate level students.
Repeatable for 8 Credits

IM 9990 Pre-Doctoral Candidacy Research Cr. 1-8
Research in preparation for doctoral dissertation. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 12 Credits

IM 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 3-9
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 9 Credits

IM 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 1-18
Offered Every Term.
Prerequisite: IM 9991 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 18 Credits

IM 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: IM 9992 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.

IM 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5
Offered Every Term.
Prerequisite: IM 9993 with a minimum grade of S
Restriction(s): Enrollment is limited to Graduate level students.

IM 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0
Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Fees: $434.8
Repeatable for 0 Credits