

## Molecular Microbiology & Immunology Program

### Overview and Curriculum

#### Research

#### Concentrations

- Bacteriology
- Immunology
- Virology
- Parasitology
- Cell Biology
- Microbial Genomics
- Fungal Pathogenesis

Access our Faculty at:



Molecular Microbiology and Immunology (MMI) is an interdisciplinary graduate program leading to the Ph.D. degree that is designed to provide training in seven concentrations. The goal of the program is to prepare students for professional careers in basic, translational and applied aspects of microbiology and immunology in academic, industry, government and global health settings. This goal is achieved through a strong educational curriculum, dedicated faculty mentors, state-of-the-art facilities, cutting-edge thesis research and integrated professional development components.

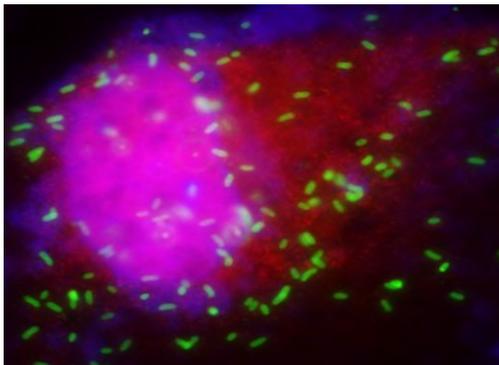
The MMI curriculum includes a comprehensive first semester 'core' course that is taken by all GPILS students and specialty courses in immunology, microbial pathogenesis, virology and an advanced elective subject. The 'core' course, *Mechanisms in Biomedical Sciences: From Genes to Disease*,



2016 MMI Students

provides a broad perspective of the cellular, molecular and genetic mechanisms underlying key physiologic processes to provide the foundation for advanced courses in specialized areas of research. A series of laboratory rotations familiarizes students with faculty research interests and sharpens their independent benchtop laboratory skills. Following completion of the core curriculum, students must pass a comprehensive examination prior to admission to candidacy for the Ph.D. degree. Upon the successful completion of this

qualifying examination, students are accepted into the laboratory of a faculty advisor and begin dissertation research. At the end of the third year, students present and defend their research proposal to a thesis committee. Completion of the Ph.D. program, including the final thesis defense and publication of at least one first author paper, typically requires five years. Throughout the program, seminar series and journal clubs, an annual student symposium and professional development workshops provide opportunities for students to hone presentation skills and keep abreast of current



*Rickettsia typhi* (green) infecting HeLa cell (red) by MMI student S. Lehman



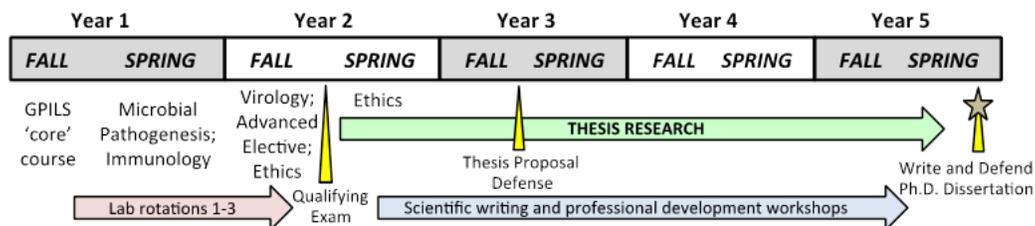
Actin pedestals formed on an *E. coli*-infected cell provide a striking example of host-pathogen interactions. MMI faculty study diverse aspects of microbial pathogenesis and host defense

## Dedicated faculty, state-of-the-art facilities and a vibrant MMI student body provide a rich learning environment

Laboratory research is a central component of the MMI training program and graduate students work with a faculty of over 80 investigators who are leaders in their respective fields. Research is conducted in a stimulating training environment comprised of state-of-the-art facilities and core services including sequencing, flow cytometry, confocal microscopy, peptide and oligonucleotide synthesis and transgenic and knockout mouse generation. MMI faculty laboratories are modern, spacious and well equipped for technically advanced molecular and cellular research. An important feature that distinguishes the MMI program is its close affiliations with internationally recognized centers of excellence that include the Center for Vaccine Development, Institute for Human Virology, Institute for Genome Science, Greenebaum Comprehensive Cancer Center, Center for Vascular and Inflammatory Diseases and Institute for Marine and Environmental Technology. Extensive interdisciplinary interactions between the many MMI faculty in the different centers and institutes provide graduate students with a large pool of prospective thesis mentors and a spectrum of research opportunities that explore diverse aspects of host defense, microbial pathogens and their interactions in the context of human diseases.

MMI students receive a competitive stipend, tuition remission, health coverage, and the possibility for additional awards. GPILS programs have active NIH training grants in multiple areas of research including those in *Immunity and Infection* and *Signaling Pathways in Innate Immunity* that involve the majority of MMI faculty. MMI students with outstanding academic and research records who are working in the training grant-funded areas are selected for inclusion on the grant. Trainees receive stipend support and expenses for training activities and travel to present their research at scientific meetings.

Research and academic activities are balanced by the broad extracurricular interests of our 40+ MMI students and enriched by the diversity of backgrounds in the group. Student-initiated activities include UMB and local sporting functions such as intramural soccer and the Baltimore Run Festival. Events that embrace city culture (e.g. ArtScape) and service (e.g. mentoring West Baltimore youth through the UMB CURE Scholars Program), and explore the broader mid-atlantic region, provide further opportunities for personal growth outside the lab.

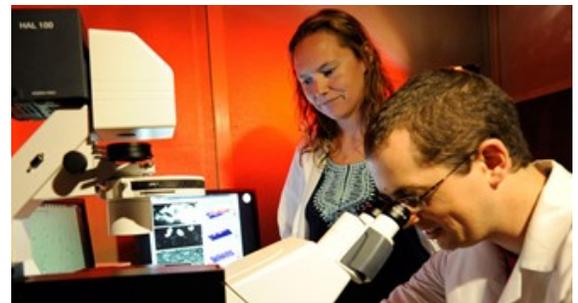


**Timeline of MMI curriculum and milestones.** Seminars, journal clubs and student research presentations occur throughout the program and are not shown. The time for thesis research is not fixed but most students complete the program in five years.

## MMI training prepares students for success in diverse professional paths

The UMSOM is part of the University of Maryland Baltimore (UMB) campus that is home to seven professional schools and the UM Medical Center. UMB is part of the Baltimore-Washington biomedical research corridor that includes major government, industry and academic centers. With this concentration of research institutions, the area serves as host to major professional scientific meetings each year, providing students with enhanced opportunities

to attend and directly participate in this important component of professional development. The collaborative opportunities and direct exposure to career paths facilitated through these experiences are promoted through the GPILS Office of Career Development. These networking opportunities significantly enhance post-graduate success as evidenced by the many MMI alumni who have taken leadership roles in these sectors.



MMI student B. French uses Bioflux to model *in vivo* neutrophil and platelet adhesion

Visit our website: <http://lifesciences.umaryland.edu/microbiology/>

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