
MMI Graduate Program Objectives and Student Learning Outcomes

The UToledo Medical Microbiology and Immunology (MMI) graduate program is focused on educating and mentoring students to become independent scientists, critical thinkers, tomorrow's biomedical research leaders. The following **Educational Program Objectives (EPOs)** highlight the scientific knowledge, skills, and professional conduct that MMI faculty expect students to learn and exhibit during their training. Individual student progress will be routinely evaluated and documented throughout the training program, with respect to competence in first-year student learning outcomes (SLOs) and mastery of MMI EPOs, to complete the degree requirements.

During the first-year core curriculum, the following **Student Learning Outcomes (SLOs)** form the foundation for subsequent training:

1. **First-year (FY) Core 1:** Identify and summarize the structure and function of cells, tissues, and organs.
2. **First-year (FY) Core 2:** Describe the molecular, biochemical, and cellular mechanisms that maintain the normal function, development, and plasticity of cells, tissues, and organs.
3. **First-year (FY) Core 3:** Summarize basic disease causes and processes that affect the structure and function of cells, tissues, and organs.
4. **First-year (FY) Core 4:** Assess and critically analyze relevant basic science and clinical literature
5. **First-year (FY) Core 5:** Design and conduct applicable biomedical sciences experiments.
6. **First-year (FY) Core 6:** Organize, interpret and summarize results of applicable biomedical sciences experiments.
7. **First-year (FY) Core 7:** Demonstrate ethical and responsible conduct in research and all other scholarly activities consistent with the University of Toledo, Health Science Campus, Standards of Conduct.

In the second year and beyond, MMI students will continue to enhance their knowledge, skills, and professional conduct. The MMI EPOs are:

I: An MMI graduate student will be knowledgeable

In the course of their educational program, MMI students are provided the opportunity to gain **knowledge (K)** through instruction by content experts and by supervised participation in research projects. Knowledge will be assessed by the student's ability to define, describe, and explain facts and concepts, as well as at higher levels of cognition that will be measured by the ability to apply, analyze, and integrate content. Before graduation, a MMI student will have demonstrated, to the satisfaction of the faculty:

M.S.B.S.:

- **K1** Compare and contrast the microorganisms (bacteria, viruses, fungi, parasites, and other agents) that cause disease in humans and animals or are related to these agents.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge
- **K2** Explain the molecular, biochemical, and cellular mechanisms that are important in maintaining the body's innate and adaptive immune systems.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge
- **K3** Explain the pathogenic mechanisms of graft rejection and graft-versus-host disease.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge
- **K4** Summarize the pathophysiology of prominent infectious and immune-based diseases.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge
- **K5** Use basic bioinformatic and statistical methods for the design and interpretation of research projects. Aligns with Institutional Student Learning Outcomes: Specialized Knowledge

- **K6** Integrate the principles and legal responsibilities that govern responsible conduct of research, the ethical care and use of animal models in research, and the accurate reporting of the results.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Civic and Global Learning

Ph.D.:

- **K1** Compare and contrast the microorganisms (bacteria, viruses, fungi, parasites, and other agents) that cause disease in humans and animals or are related to these agents, including understanding the molecules (virulence factors) and mechanisms by which pathogens cause disease.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Intellectual Skills
- **K2** Explain the molecular, biochemical, and cellular mechanisms that are important in maintaining the body's innate and adaptive immune systems, including providing detailed descriptions of the complex interactions of these immune cells and their effectors.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Intellectual Skills
- **K3** Explain the pathogenic mechanisms of graft rejection and graft-versus-host disease and recognize areas for potential therapeutic intervention.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Intellectual Skills
- **K4** Understand and be able to explain the pathophysiology of prominent infectious and immune-based diseases.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Intellectual Skills
- **K5** Correctly use basic bioinformatic and/or statistical methods for the design and interpretation of research data, including understanding when these methods are incorrectly used.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge & Intellectual Skills
- **K6** Integrate the principles and legal responsibilities that govern responsible conduct of research, the ethical care and use of animal models in research, and the accurate reporting of the results.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Civic and Global Learning, & Applied and Collaborative Learning

II: An MMI graduate student will be skilled

The MMI curriculum provides a training environment in which research **skills (S)** are learned in concert with the correlated knowledge. Students have the opportunity to gain these skills under the supervision of a faculty mentor, with the advice and guidance of the student advisory committee, through direct contact with content and/or technical experts, and through direct participation in research projects. Before graduation, a student will have demonstrated, to the satisfaction of the faculty:

M.S.B.S.:

- **S1** The ability to perform laboratory procedures necessary for the completion of the student's thesis research project(s).
Aligns with Institutional Student Learning Outcomes: Applied and Collaborative Learning
- **S2** The ability to design and execute an independent research project.
Aligns with Institutional Student Learning Outcomes: Applied and Collaborative Learning
- **S3** The ability to perform research productively as an individual or member of a research team.
Aligns with Institutional Student Learning Outcomes: Intellectual Skills, Civic and Global Learning & Applied and Collaborative Learning
- **S4** The ability to compile, compose, explain, compare/contrast, and discuss research findings effectively, both orally and in writing.
Aligns with Institutional Student Learning Outcomes: Intellectual Skills, Civic and Global Learning & Applied and Collaborative Learning
- **S5** The ability to collect (from electronic databases and other sources), prioritize, organize, integrate, and utilize biomedical information for solving problems that are relevant to the appropriate completion of a research project, and accurate reporting of the results
Aligns with Institutional Student Learning Outcomes: Intellectual Skills & Applied and Collaborative Learning

Ph.D.:

- **S1** The ability to design and perform laboratory procedures necessary for the completion of the student's dissertation research project(s).
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Intellectual Skills, & Applied and Collaborative Learning
- **S2** The ability to independently identify a research question/problem, design experiments to answer that question/problem, and interpret/explain the data to others, including those who are not experts in the field.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Intellectual Skills, & Applied and Collaborative Learning
- **S3** The ability to perform research productively as an individual or member of a research team.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Intellectual Skills, Civic and Global Learning, & Applied and Collaborative Learning
- **S4** The ability to compile, compose, explain, compare/contrast, and discuss research findings effectively, both orally and in writing.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Intellectual Skills, Civic and Global Learning, & Applied and Collaborative Learning
- **S5** The ability to collect (from electronic databases and other sources), prioritize, organize, integrate, and utilize biomedical information for solving problems that are relevant to the appropriate completion of a research project, and accurate reporting of the results.
Aligns with Institutional Student Learning Outcomes: Specialized Knowledge, Intellectual Skills, & Applied and Collaborative Learning

III. An MMI graduate will be professional

The University of Toledo College of Medicine and the MMI Graduate Program recognize the importance of role-modeling and directly training the **professional (P)** conduct and character of its students. The institution and the MMI Track devote curricular and extracurricular time to the development of ethical standards and humanistic as well as professional behaviors by its students. Before graduation, students will have met the following institutional standards:

M.S.B.S. and Ph.D.:

- **P1** Demonstrate ethical, responsible and professional behavior in all aspects of their scientific lives.
Aligns with Institutional Student Learning Outcomes: Civic and Global Learning & Applied and Collaborative Learning
- **P2** Demonstrate honesty and integrity in all interactions with colleagues, research subjects, and others with whom students may interact in their professional lives.
Aligns with Institutional Student Learning Outcomes: Civic and Global Learning & Applied and Collaborative Learning
- **P3** Demonstrate professionalism in dress and grooming in compliance with health and safety rules applicable to the research laboratories and to other institutional and public sites.
Aligns with Institutional Student Learning Outcomes: Civic and Global Learning & Applied and Collaborative Learning
- **P4** Demonstrate respect for all laws and regulations governing biomedical research, the use of animals, patient materials, and for all patient privacy issues.
Aligns with Institutional Student Learning Outcomes: Civic and Global Learning & Applied and Collaborative Learning