PHD IN MICROBIOLOGY & INFECTIOUS DISEASES

The biological sciences have undergone a revolution of unprecedented scale. This revolution, fueled in large part by studies in microbiology, is fast reshaping the way scientists approach the myriad of biomedical and environmental issues confronting our society today. At the same time, microbiology still maintains its classical advantages – a wide variety of well-developed experimental approaches are available in the study of microbes, and many experiments can be completed in a relatively short time period. This makes microbiology especially well-suited for graduate student training. Our program faculty explore questions relevant to the following areas of modern microbiology:

Fundamental Life Processes

Many genes and their activities are conserved among bacteria, archaea, and eukaryotes. Our faculty exploit the many practical advantages of microbes to perform detailed mechanistic studies of a wide array of fundamental biological phenomena. These include gene expression, cell division, membrane biogenesis, macromolecular transport, multicellular development, and cellular differentiation.

Microbial Pathogenesis

Understanding virulence mechanisms is a major arm of medical research. Our faculty apply modern molecular genetic and biochemical technologies to understand the basis for infectious disease. Emphasis is placed on identifying and characterizing regulatory networks controlling virulence gene expression, virulence factor structure and function, mechanisms for spread of antibiotic resistance, and the host-pathogen interactions.

In addition to the general GSBS course requirements (https://gsbs.uth.edu/academics/phd-degree-requirements/), the MID Program requires the following courses

Code	Title	Hours
GS07 1741	Literature Survey in Microbiology and Infectious Diseases	1
GS07 1751	Microbiology and Molecular Genetics Seminar Series	1
GS07 1092	Topics in Microbiology and Infectious Diseases	2
GS07 1015	Microbial Genetics and Physiology	5
Total Hours		**9**

Additional courses offered by the MID Program:

Code	Title	Hours
GS04 1051	Fluorescence and Electron Microscopy: Imaging Cells and Molecules	1

Program course requirements for MS students (https://gsbs.uth.edu/academics/ms-degree-requirements/)

Microbiology and Infectious Diseases Candidacy Exam

Microbiology and Infectious Diseases (MID) Program students take an on-topic exam and the format follows the GSBS on-topic format (https://gsbs.uth.edu/academics/candidacy-exam/) except for the following features:

Step 1) Consultation with Chair of the Advisory Committee

The student submits a 1-page thesis proposal abstract and a proposed Examination Committee to the chair of their Advisory Committee. At least three members of the Examining Committee must be MID Program faculty and at least one member must be outside the Program, and the committee will be chaired by a MID Program faculty member. The Advisory Committee chair obtains approval of the Advisory Committee and informs the student and the Examination Committee. The student should be certain that all members of the proposed Examination Committee are available to participate in the exam at the expected time.

Step 2) Petition to Academic Standards Committee

The student submits abstract, Examination Committee roster (signed by all Examination Committee members) and Petition to Advance to Candidacy (signed by all Advisory Committee members) to the Program Director for approval. It is then forwarded to the Academic Standards Committee (ASC) of the GSBS for approval at their next scheduled meeting (deadline is 12:00 noon on the first Wednesday of each month). This should be done immediately after obtaining signatures to ensure that ASC has time to review the application.

Step 3) Consultation with Chair of the Examination Committee

The examination clock starts upon notification of the ASC's approval. Immediately after obtaining this approval, the student meets with their Exam Committee chair to discuss the three areas of breadth on which to be examined and to set the schedule for the exam to be held in 6-7 weeks. The Examination Committee chair approves the areas of breadth in consultation with the Examination Committee. Example breadth areas include: microbial pathogenesis, membrane biology, transcription, metabolic regulation, bioenergetics, signal transduction, protein-protein interaction. Given the varied faculty and student research, large latitude will be given in the three areas, as long as they are reasonably distinct and general. Ideally, the breadth areas will match the expertise of the committee members.

Step 4) Submission of the Proposal

The 7-page proposal (see below) is submitted to the chair of the Examination Committee after three weeks. The Examination Committee briefly reviews the proposal and decides whether it is adequate to proceed. If judged below the minimum quality required to proceed, the student has three weeks to revise it for a second, and final, attempt.

Step 5) The written component of the exam

If the proposal is acceptable, the Exam Committee Chair will provide the student with three questions within three days. The questions are prepared by the Exam Committee and will cover the student's chosen areas of breadth. The student has two weeks after receiving the three questions to prepare an up to five-page answer to one of the questions (single spaced, excluding references). The student turns in the answer to each member of the Examination Committee. *The student must research the literature and prepare the answer entirely independently, without consultation with others.* The student is also responsible for a general understanding of the other two questions, to be questioned on during the oral exam.
An example question might be: "A fundamental question in bacterial chemotaxis is the mechanism of transmembrane signaling, i.e., how chemoeffector binding in the periplasm modulates the activity of the

cytoplasmic histidine-kinase. Review current models for this process and propose an experimental strategy to distinguish them. Identify possible outcomes and pitfalls in your experimental design."

Step 6) The oral exam

In the oral exam, the student will be tested on (i) the proposal, (ii) the written answer, (iii) the other two questions, and (iv) other aspects of the areas of breadth. The student is expected to have a good command of the material taught in our curriculum, which is implicitly tested in the Proposal, the breadth answer, and the oral exam.

Ph.D. RESEARCH PROPOSAL

It is the student's responsibility to submit a Research Proposal in the form of a research grant proposal to each member of the Examining Committee. For MID program students the research proposal should be “on topic”, i.e., on the actual thesis topic the student is planning to pursue. Unlike the general GSBS policy on faculty guidance, MID Program students MAY NOT receive feedback from their advisor or members of their Examining Committee. They may, however, seek feedback on the proposal from peers and other faculty. The format of the proposal follows the research section in NRSA F31 Fellowship applications as follows:

- 1 page for Specific Aims
- 6 additional pages for research strategy (including Significance, Innovation and Approach)
- These page limits do not include the Bibliography
- Other components of the F31 are not needed
- Additional notes
  - *Margins should be 1/2" on all four sides and font size should be Arial 11 point*
  - *Smaller type may be used for figures, however, they must be clear and legible when printed at the normal size*