Graduate Education in the
Department of Pathology

Molecular Oncology
and Tumor Immunology
Training Program
Molecular Oncology and Tumor Immunology (MOTI)

Molecular Oncology and Tumor Immunology (MOTI) is an integrated program focusing on Cancer Biology, Tumor Immunology, and the interface between these disciplines. The program is broadly defined, with a major emphasis on the intersection across related disciplines. It is a well-established program, with an extensive and experienced faculty.

We encourage you to review the detailed description of the MOTI graduate training program contained in this booklet and to contact the faculty and program advisors if you want to learn more about it.

Overview

Enormous advances have been made in recent years in understanding the underlying molecular, cellular, and genetic causes of human cancer. Of particular importance has been the realization of the interrelationships between oncogenesis, inflammation, and innate and adaptive immunity. The Molecular Oncology and Tumor Immunology (MOTI) Program offers unique training at the interface between cancer biology and immunology. Coursework provides students with a solid foundation in all aspects of modern cancer biology, the immune system, and the interrelationship between the two disciplines, with an emphasis on molecular, genetic, cell biological and pathophysiological aspects of cancer and immunity, as well as translational discovery and clinical cancer biology. Research projects in the Program emphasize the study of animal models and human disease as well as molecular genetic and cell biological approaches. Laboratory research opportunities run the gamut of basic studies of cancer cell biology, such as cell cycle control, the function of oncogenes and tumor suppressors, regulation of protein degradation, maintenance of genome and chromosomal integrity, analysis of the nature and function of cancer stem cells, and regulation of gene expression and signal transduction pathways; basic studies of tumor progression over a wide range of cancer models including breast, prostate, bladder, and pancreatic cancer, melanoma, neuroblastoma and leukemias; and more applied approaches to cancer and immunity, such as targeted tumor cell killing, tumor gene therapy, production of anti-tumor vaccines, and immunological and molecular approaches to cancer therapy. The Program brings together investigators from across the School of Medicine, who employ cutting edge tools of molecular biology and genetics, sophisticated imaging technologies, and genomewide genetic, chemical, and proteomic analysis of cancer and immunity.

The program is administered in the Department of Pathology, taking full advantage of being at the interface of the basic and clinical research efforts of the department, while drawing its faculty from across many departments and institutes in the School of Medicine.

LEADERSHIP

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You may also want to visit the Department of Pathology website at:
www.med.nyu.edu/pathology/education/graduate-programs/molecular-oncology-and-immunology
Students spend the first year taking Sackler Institute required courses and participating in three laboratory rotations. In addition, courses in Topics in Molecular Biology, Intro to Immunology, Molecular Oncology, Intro to Biostatistics, Cell Biology, Intro to Molecular Genetics, and Translating Cancer Discovery are required by this program and must be taken within the first two years.

In the second year, students continue to take courses to fulfill their credit requirements and begin formal research in the laboratory they have selected for their dissertation projects. At the end of the second year, students write a proposal and take an oral qualifying examination in molecular oncology and immunology, which is read by their pre-thesis committee. Students continue to meet with this committee at least once per year until their thesis research is completed. Throughout their tenure within the Program, students are expected to attend the Work-in-Progress Series, Cancer Center Seminar, Immunology Seminar, and others being offered at NYU Langone Medical Center.

In addition to the standard Sackler Curriculum, the following specific courses are required for MOTI students:

**REQUIRED COURSES FOR THE MOTI PROGRAM**
- Topics in Molecular Biology (Fall)
- Introduction to Immunology (Fall)
- Translating Cancer Discovery into Clinical Practice (Prerequisite: Molecular Oncology)
- Introduction to Biostatistics (Spring)
- Molecular Oncology (Spring)
- Introduction to Molecular Genetics (Spring)
- Cell Biology (Spring)
- Research in Pathology
- Work in Progress (Student/Postdoc seminar series)
  Only second year and beyond

**RECOMMENDED COURSES**
- Advanced Immunology (Spring)
- Molecular Pathology in the Omics Era (Spring)
- Protein Modifications in Cell Signaling (Spring)

**RECOMMENDED SEMINARS**
- Cancer Center and/or Immunology Seminars

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### Courses

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<th>COURSE NAME</th>
<th>DIRECTOR(S)</th>
<th>SEMESTER</th>
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<tr>
<td>Introduction to Research</td>
<td>Angus Wilson, PhD</td>
<td>Fall</td>
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<tr>
<td>Topics in Molecular Biology</td>
<td>Angus Wilson, PhD</td>
<td>Fall</td>
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<td>Introduction to Immunology</td>
<td>Alan Frey, PhD</td>
<td>Fall</td>
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<tr>
<td>Translating Cancer Discovery into Clinical Practice</td>
<td>William L. Carroll, MD</td>
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<td>Topics in Bioinformatics</td>
<td>Stuart Brown, PhD</td>
<td>Fall</td>
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<td>Research in Pathology</td>
<td>Tony Huang, PhD</td>
<td>Fall</td>
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<td>Introduction to Molecular Genetics</td>
<td>James Borowiec, PhD</td>
<td>Spring</td>
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<tr>
<td>Cell Biology</td>
<td>Pamela Cowin, PhD</td>
<td>Spring</td>
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<tr>
<td>Introduction to Biostatistics</td>
<td>Itai Yanai, PhD</td>
<td>Spring</td>
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<tr>
<td>Molecular Oncology</td>
<td>David Levy, PhD</td>
<td>Spring</td>
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<tr>
<td>Advanced Immunology</td>
<td>Juan Lafaille, PhD</td>
<td>Spring</td>
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<td>Molecular Pathology in the Omics Era</td>
<td>Adriana Heguy, PhD</td>
<td>Spring</td>
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<tr>
<td>Stem Cell Biology</td>
<td>E. Jane Hubbard, PhD</td>
<td>Spring</td>
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<td>Topics in Protein Modifications in Cell Signaling</td>
<td>Stefan Huang, PhD</td>
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<td>Seminar in Immunology</td>
<td>Stefan Feske, MD</td>
<td>Fall</td>
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<td>Work in Progress</td>
<td>David Levy, PhD</td>
<td>Fall</td>
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<tr>
<td>Cancer Center Seminar</td>
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Molecular Oncology and Tumor Immunology Faculty

Iannis Aifantis, PhD
Hematopoietic stem cell differentiation, leukemia, Ubiquitin ligases

Erika Bach, PhD
Mechanisms of stem cell self-renewal, cellular growth, proliferation and pattern formation by the JAK/STAT pathway

Dafna Bar-Sagi, PhD
Oncogene function in pancreatic cancer

Tim Cardozo, MD, PhD
Drug discovery

William Carroll, MD
Treatment of childhood cancer, especially leukemias and the common solid tumor Neuroblastoma

Pamela Cowin, PhD
Breast cancer, cell adhesion, and Wnt signaling

Gregory David, PhD
Chromatin modifications in development and oncogenesis

Brian Dynlacht, PhD
Cancer, transcription, cell cycle, centrosome biology, genomics

Stefan Feske, MD
Cell-of-origin and ‘cancer stem cells’ in sarcoma and melanoma initiation and Progression

Tony Huang, PhD
Regulation of ubiquitination and deubiquitination in DNA repair and cancer susceptibility pathways

Stefan R. Hubbard, PhD
Crystallographic studies of tyrosine kinase oncoproteins

Tomas Kirchhoff, PhD
Identification of the genetic basis of cancer susceptibility

Hannah L. Klein, PhD
DNA damage, genomic instability, homologous recombination

Sergei B. Korolov, PhD
Role of Th17 driven inflammation in lymphomagenesis as well as understanding the role of non-coding RNAs in lymphocyte development

Michelle Krosggaard, PhD
T-cell recognition, cancer immunology, self-antigens, cancer immunotherapy

Peng Lee, MD, PhD
Androgen receptor function, cofactors and target genes in prostate and breast cancer

David E. Levy, PhD
Role of STAT proteins in tumorigenesis, metabolism and development

Dan R. Littman, MD, PhD
T cell development, mechanisms of inflammation, AIDS pathogenesis

Susan K. Logan, PhD
Cell Growth Regulation through the Androgen Receptor

George Miller, MD
Tumor immunology in cancers of the liver and pancreas

Daniel Meruelo, PhD
Gene Therapy, Cancer, Alzheimer’s disease

Moosa Mohammadi, PhD
Structural and functional studies of fibroblast growth factor receptors

Benjamin Neel, MD, PhD
Signal transduction pathways regulating normal and malignant cell proliferation, differentiation, and survival

Iman Osman, MB, BCh, MD
Genetic and genomic analysis of melanoma initiation, progression, and treatment

Michele Pagano, MD
Ubiquitin system; cell division cycle checkpoints, cancer

Thales Papagiannakopoulos, PhD
Elucidating the mechanisms of cancer initiation and progression using genetically engineered mouse models

Mark Philips, MD
Processing and membrane targeting of GTPases involved in growth control

Dan R. Rifkin, PhD
Extracellular control of growth factor action

Hyung Don Ryoo, PhD
Cellular stress responses and apoptosis in development and cancer

Robert Schneider, PhD
Altered regulation of gene expression and translation carcinogenesis and cell stress

Markus Schober, PhD
Role of stem cells in skin cancer initiation and dormancy

Susan R. Schwab, PhD
Role of S1P and S1P-receptor enzymes in tumor growth

Jane A. Skok, PhD
Nuclear organization of immunoglobulin genes and genomic aberrations in lymphoma

Edward Y. Skolnik, MD
Signal transduction mechanisms of cell proliferation and growth control

Susan Smith, PhD
Telomeres, tankyrase, cohesion, genome integrity in cancer

David Zagzag, MD, PhD
Angiogenesis, vasculogenesis, brain tumors, extracellular matrix