

## **Master of Science in Translational Biology, Medicine, and Health (TBMH) Plan of Study for VTCSOM Medical Students**

TBMH 5105 - Professional Development and Ethics (2 credits)

TBMH 5304 - Research Experience in TBMH (3 semesters, 9 credits)

TBMH 5994 - Research and Thesis (11 credits)

XXXXNNNN - Quantitative Elective (3 credits)

MED TRANSFER (13 credits\*, Replaces TBMH 5004, TBMH 5054, TBMH 5034)

*\*maximum credit transfer*

**TOTAL: 38 Credits**

### Requirements & Procedures

**Application Process:** Medical students wishing to pursue a MS with the TBMH program must begin the application process by March of their M2 year.

**Degree Requirements:** Students are eligible for graduation upon successful completion of all core, elective, and research credits, as well as successful oral defense of a written thesis. A cumulative GPA of 3.0 is required for all coursework, and no grade below a B is allowed for any core course. Courses where a grade below a B is received must be retaken.

**Thesis Advisor:** Master's students must identify a thesis advisor prior to admission to the graduate program. The thesis advisor must be a participating TBMH faculty member with an appointment in the Faculty of Health Sciences (HS) to serve as the student's thesis advisor and supervise the student's research. If appropriate and acceptable to the thesis advisor, the student may opt to take on a clinical co-mentor.

**Focus Area:** Students must also select their area of concentration from one of six Focus Areas upon entering the program: Cancer, Tissue Engineering and Reparative Medicine, Public Health and Implementation Science, Immunity and Infectious Disease, Metabolic and Cardiovascular Science, and Neuroscience. This selection should be based on their research focus area, and transferred coursework.

**Student Advisory Committee:** Prior to submitting a program of study and no later than the end of the first academic semester of study, each student must form an Advisory Committee. The Advisory Committee is composed of the thesis advisor and a minimum of three (3) other faculty members. According to the VT Graduate School guidelines, the thesis advisor must serve as the chair. The committee must include faculty from at least three (3) different departments, including one faculty member representing a different stage of the translational research spectrum relative to the student's research. It is highly encouraged for the student to have one TBMH faculty member from outside their focus area. The Advisory Committee must meet at least twice annually to assess student progress and submit a copy of their progress letter to the Academic Progress Committee.

**Plan of Study:** The Plan of Study outlines the specific courses to be taken by the student in the fulfillment of the degree, and should be completed no later than the end of the second academic semester of study. The Plan of Study must be approved by the student's Advisory Committee prior to submission to TBMH and the Graduate School.

**Research Plan:** A Research Plan should be completed no later than the end of the second academic semester of study. The written plan should outline the proposed thesis project, and should be presented orally to the student's Advisory Committee. The Advisory Committee must sign off on the Research Plan for the student's thesis project.

**Individual Development Plans:** In addition to the Program of Study, each student will develop an Individual Development Plan in their Professional Development course, which will evolve over time in consultation with their Thesis Advisor and Advisory Committee. Specifically, students will utilize a free online tool (<http://myidp.sciencecareers.org/>), endorsed by FASEM and AAS, for setting strategic goals each year, exploring career possibilities, and setting goals to prepare each student for their intended career path. Goals could include publications, fellowship submission, attendance at professional meetings, patents, clinical activities, professional activities, research project goals, or networking.

**Final Examination:** All Master's students must pass a defense of the thesis upon completing all other degree requirements. A copy of the thesis should be approved by the student's thesis advisor and provided to each of the Advisory Committee members at least two weeks prior to the examination. To complete the program, students must pass the final examination, including approval of the thesis in final form. A student is considered to have passed the examination and to have had the thesis approved if he/she received no more than one negative vote on the oral examination or thesis.

**Time to Completion:** It is expected that students will take one full year of leave from medical school\*, and complete the degree within three (3) semesters (including summer semester), depending on the student's background interest.

**Maintenance of Clinical Skills:** VTCSOM students will be required to attend periodic clinical activities (selected by the Senior Associate Dean for Medical Education) for maintenance of hands-on clinical skills while they are on leave from medical school. These activities will be a programmatic expectation, and will not be taken for a grade.

**Seminars:** Seminar attendance will not be required for a grade. However, it is a programmatic expectation that students will attend scientific seminars while enrolled in the program, particularly the Medical Scholars Lecture series in Fall (4 seminars) and Spring (4 seminars).

*\*Note – A leave of absence from the Virginia Tech Carilion School of Medicine is required to pursue a full-time Ph.D. Therefore, all VTCSOM students wishing to pursue a Ph.D. must receive approval from the VTCSOM Dean of Students prior to beginning the application process.*

TBMH Course Descriptions:

**TBMH 5105 Professional Development and Ethics (2 cr.)**

Ethical standards of science and ethical issues in translational, biomedical and health research. Responsible conduct of biomedical and health research. Collaborative research strategies. Impact of translational science on national and global issues.

**TBMH 5304 Research Experience in TBMH (3 Semesters, 9 cr.)**

Research experience in biomedical, translational, and health sciences. Experimental design and methods, techniques and procedures, lab safety, data analysis and presentation. May be repeated for up to 15 credits.

**TBMH 5994 Research and Thesis (11 cr.)**

Independent thesis research.

Courses waived through TRANSFER credit

**TBMH 5004 Fundamentals of Translational Biology Medicine, and Health (8 cr.)**

Processes underlying human health and disease and the context in which they occur. Normal v. pathological lifespan trajectory of humans and animal models at the molecular, cellular, organ system, organism, group, and social levels. Homeostatic processes throughout the life's stages and the genetic, environmental, behavioral, and social drivers and interactions that lead to pathological outcomes.

**TBMH 5054 Fundamentals of Immunity and Infectious Disease (4 cr.)**

Comprehensive survey of human immunity, infectious agents and disease across scales: genetic, molecular, cellular, tissue, organism, society. Diagnosis, treatment, and prevention of infectious and immune diseases. Social and economic aspects of infectious disease and immunity.

**TBMH 5034 Fundamentals of Public Health and Implementation Science (4 cr.)**

Analysis of research and strategies for translating major medical and health discoveries into effective treatment delivery with measurable outcomes at the individual, health systems, and population levels. Theories of health implementation, research design and methodology, health messaging, human behavior change, health care decision making, health literacy and disparities, community-based participatory research, patient-centered research, and health economics and policy. Research new approaches to improve health outcomes, health care quality, and costs related to recent therapeutic or preventative discoveries.

VTCSOM Courses that replace TBMH 5004

**MED 9061. Block I: Functional Biology of Cells and Tissues (2 cr.)**

Topics for this course include:

Molecules, Genes, Chromosomes, Proteins, Cells, Tissues, Metabolism, Transcription, Translation, Musculoskeletal System, Early Development, Pharmacodynamics, and Pharmacokinetics

**MED 9062. Block II: Human Body I (2 cr.)**

Topics for this course include:

Immunology, Cardiovascular, Respiratory, and the Autonomic Nervous System

**MED 9063. Block III: Human Body II (2 cr.)**

Topics for this course include:

GI Tract, Liver and Biliary, Renal, Endocrine, and Reproduction

**MED 9064. Block IV: Biology of the Nervous System (2 cr.)**

Topics for this course include:

Central Nervous System, Peripheral Nervous System, Special Sensory Structures

VTCSOM Courses that replace TBMH 5054

**MED 9071. Block V: Fundamentals of Pathobiology (2 cr.)**

Topics for this course include:

Cells and Tissues, Necrosis, Neoplasia, Inflammation, Genetic Disorders, Immunological Diseases, Infection, Microbiology, Virology, Skin Disorders, Pharmacology, Therapeutics

**MED 9072. Block VI: Pathobiology of the Human Body I (2 cr.)**

Topics for this course include:

Hematology, Bleeding Disorders, White Cell Disorders, Vascular Diseases, Heart, Pulmonary, ENT, Lymph Nodes and Spleen, Microbiology, Virology, Pharmacology, Therapeutics

VTCSOM Courses that replace TBMH 5034

**MED 9073. Block VII: Issues in Medicine & Culture – A Course in Medical Humanities (2 cr.)**

Topics for this course include:

Pain, Cancer Treatment, Death, Disability and Modern Life, and Empathy

**MED 9074. Block VIII: Public Health and Medicine (2 cr.)**

Topics for this course include:

Integration of Public Health and Medicine - Public Health in the 21st Century, Social Determinants of Health, Environmental Determinants of Health, Epidemiology in Action – Outbreak Investigation, The Affordable Care Act and What It Means for Practicing Physicians, and Group Presentations

## Master of Science in TBMH for MD Students – Timeline to Degree

Transfer Credits				
Course Number	Course Name	Credit Hours	Core	Graded Hours
TBMH 5004	Fundamentals of Translational Biology, Medicine, and Health	8	8	8
TBMH 5054	Fundamentals of Immunity and Infectious Disease	4	0	4
TBMH 5034	Fundamentals of Public Health and Implementation Science	4	0	4
<b>TOTALS (*can transfer up to 13)</b>		<b>16 (13*)</b>	<b>8</b>	<b>16 (13*)</b>

Year 1 - Summer				
Course Number	Course Name	Credit Hours	Core	Graded Hours
TBD	Quantitative Elective	3	3	3
TBMH 5304	Research Experience in TBMH	3	3	3
TBMH 5994	Research and Thesis	3	0	0
<b>TOTALS</b>		<b>9</b>	<b>6</b>	<b>6</b>

Year 1 - Fall				
Course Number	Course Name	Credit Hours	Core	Graded Hours
TBMH 5105	Professional Development and Ethics	2	2	2
TBMH 5304	Research Experience in TBMH	3	3	3
TBMH 5994	Research and Thesis	3	0	0
<b>TOTALS</b>		<b>8</b>	<b>5</b>	<b>5</b>

Year 1 - Spring				
Course Number	Course Name	Credit Hours	Core	Graded Hours
TBMH 5304	Research Experience in TBMH	3	3	3
TBMH 5994	Research and Thesis	5	0	0
<b>TOTALS</b>		<b>8</b>	<b>3</b>	<b>3</b>

Total Core Hours	22
Total Concentration (transferred)	8
Total Graded	27
Total Thesis Credit	11
<b>Total Program Hours</b>	<b>38</b>