This is 2001-2003 School of Medicine, Duluth Catalog for the University of Minnesota.

Overview

The UMD School of Medicine curriculum originally was developed by the faculty in consultation with members of the University of Minnesota's Medical School in Minneapolis, practicing physicians in the community, and curricular consultants from many other medical schools. Over the years, the curriculum has evolved into a strong academic and clinical program with continued input from practicing physicians and faculty.

During the two years of study, students are exposed to the various basic, behavioral, and clinical sciences to prepare them for continuing their studies in Minneapolis. Transfer to the Medical School in Minneapolis is guaranteed upon successful completion of the program in Duluth.

The first-year curriculum includes presentations in applied anatomy, clinical pathology conferences, and coursework in the clinical and behavioral sciences, in addition to the following integrated courses: principles of basic medical science, histopathology, hematopoiesis and host defenses, dermatology and the musculoskeletal system, and the nervous system. This coursework is correlated with the appropriate clinical examples and incorporates the latest features of computerized and laser disk instruction.

During the second year, clinical material is again correlated with the basic science presentations in the following integrated courses: the gastrointestinal hepatobiliary system, respiratory medicine, fluids and electrolytes, the cardiovascular system, the endocrine and reproductive systems, and integrated clinical medicine. Additional courses in the behavioral sciences are offered in the second year (behavioral medicine, medical social psychology, and psycho-social-spiritual aspects of life-threatening illness) as well as ongoing clinical pathology conferences. During this year, the student spends more time in clinical settings and receives more intensive instruction in clinical medicine.

During both years of study, students participate in the Family Practice Preceptorship Program. In the first year, each student is assigned to a family practitioner within the immediate geographic area and is introduced to medicine as practiced in its actual setting. The preceptorship during the second year involves the student with physicians who practice in nonurban areas of northern Minnesota and Wisconsin.

The combination of classroom and clinical experiences throughout the two years enables students to acquire the necessary knowledge of the scientific basis for medical practice while at the same time reinforcing this knowledge by active participation in patient care. Students are assured of adequate preparation for continuing their studies.

Grades and Progress

Examinations and other forms of evaluation of student performance are administered by the various departments and, in some cases, by interdepartmental teaching teams. Grades are reported as O (outstanding), E (excellent), S (satisfactory), I (incomplete), or N (no credit), and appear as such on the official University transcript.

The Scholastic Standing Committee of the School Assembly is charged with the responsibility of monitoring each student's performance while enrolled. Academic probation is one mechanism used by the faculty to signal that a student's standing in the School of Medicine is in jeopardy. In circumstances where the development of clinical skills, the acquisition of knowledge, or personal conduct in a clinical setting is inconsistent with a student's potential capability as a physician, the Scholastic Standing Committee may recommend dismissal of the student to the School Assembly.

Courses and Symbols

Courses listed are required for first- and second-year medical students. Most required and elective medical courses are open to upper division undergraduate and graduate students through special arrangement if space is available and approval of the appropriate adviser(s) and course instructor(s) is obtained.

The following standard symbols are used throughout the course descriptions in lieu of footnotes.

QP	Quarter prerequisite.
SP	Semester prerequisite.
DGS	Director of Graduate Studies.
#	Approval of the instructor is required for registration.
Δ	Approval of the department offering the course is required for registration.

Anatomy and Cell Biology (Anat)

Professor
Arlen R. Severson, Ph.D., *head*

Associate Professor
Stephen W. Downing, Ph.D.
Donna J. Forbes, Ph.D.
Jon M. Holy, Ph.D. (joint with Biochemistry and Molecular Biology)
Lillian A. Repesh, Ph.D.

Senior Research Associate
Richard L. Leino, Ph.D.

Anatomy and cell biology deals with the structural basis of human medicine (from macrostructure to ultrastructure) and its correlation with function. Gross anatomy, embryology, histology, and neuroanatomy are taught as part of several integrated courses in the School of Medicine curriculum. Considerable emphasis is placed on basic-clinical science correlations throughout the study of the anatomical sciences. Anatomy and cell biology introduces the medical student to much of the basic language and anatomical concepts used in clinical practice.

Behavioral Sciences (BhSc)

Professor
Barbara A. Elliott, Ph.D. (joint with Family Medicine)
Frederic W. Hafferty, Ph.D.

Associate Professor
James G. Boulger, Ph.D. (joint with Family Medicine)
Gary L. Davis, Ph.D., *head*
Robert Gibson, Ph.D., *emeritus*
Richard G. Hoffman, Ph.D.

Assistant Professor
Mustafa N. al'Absi, Ph.D. (joint with Family Medicine)

Clinical Assistant Professor
Steven J. Bauer, M.D.
Lisa Capell, M.D.
Fred T. Friedman, J.D.
Peter Miller, M.D.
Robert S. Nesheim, M.D.
Margaret M. Saracino, M.D.
Steven J. Sutherland, M.D.
David X. Swenson, Ph.D.

Clinical Instructor
Benjamin Wolfe, M.A.

The offerings in this discipline provide an analysis of those facets of human behavior that bear most heavily on the practice of medicine. The courses encompass both the social science of medicine (e.g., analysis of the medical profession, the hospital as a social system, and the doctor-patient relationship) and social science in medicine (e.g., the impact of social attitudes on illness behavior, interviewing techniques, and the developmental process). In addition, the student is given a solid grounding in behavioral medicine and psychopathology.

Required Courses—First Year

BhSc 6211. Medical Sociology. (2 cr; SP–Regis med student)
Advanced aspects of sociology and its application to areas of medical science. Emphasis on doctor-patient relationship, role of medicine in society, and institutionalization of medical care through hospitals, medical schools, and medical profession.

BhSc 6230. Medical Psychology: Interviewing. (1 cr; SP–Regis med student)
Psychological aspects of interviewing in health care settings; interpersonal communicative skills and problems; techniques of rapport building and history taking.

BhSc 6652. Human Behavioral Development and Problems. (4 cr; SP–Regis med student)
Human psychological development throughout life; normal cognitive, learning, social, and personality development; problems expressed during various stages of life in the family and other settings. Assessment/treatment described as relevant to practice of family medicine.

BhSc 6701. Medical Ethics. (2 cr; SP–Regis med student; cannot apply cr to Graduate School program)
Basic concepts and skills of medical ethics, including core values, clinical issues, and case analysis.

Required Courses—Second Year

BhSc 5591. Studies in Medical Behavioral Sciences. (2 cr; SP–Regis med student, #)
Selectives on topics in general medical behavioral science, typically including social psychology of deviance, alternatives in health care delivery, family dynamics, and others.

BhSc 6200. Behavioral Medicine. (2 cr; SP–Regis med student)
Introduction to contemporary behavioral medicine. Interface of biological, psychological, and social factors in a range of health issues, including stress, substance abuse, chronic pain and illness, cardiovascular disease, obesity, and infectious diseases.

BhSc 6260. Psycho-Social-Spiritual Aspects of Life-Threatening Illness. (2 cr; SP–Regis med student)
Psychological, social, and spiritual coping of patients, families, and health care professionals as they experience life-threatening illnesses. Effective intervention strategies for health care professionals are emphasized. Post-death responses of families and care providers.

Graduate Courses

BhSc 5491. Problems in Medical Behavioral Sciences. (1-6 cr; SP–Med or upper div or grad student, #; can apply no more than 6 cr to Graduate School program)
Independent study on a tutorial, seminar, or lecture basis. Investigative work, lecture material, and/or appropriate reading and discussions designed according to interest and capabilities of individual student.

Biochemistry and Molecular Biology (MdBc)

Professor
Paul M. Anderson, Ph.D., *emeritus*
Matthew T. Andrews, Ph.D. (joint with Biology)
Lester R. Drewes, Ph.D., *head*
Joseph R. Prohaska, Ph.D.
Kendall B. Wallace, Ph.D.

Associate Professor
Subhash C. Basek, Ph.D., *adjunct*
Jon M. Holy, Ph.D. (joint with Anatomy and Cell Biology)
Thomas E. Huntley, Ph.D.

Assistant Professor
Annette L. Boman, Ph.D.
Cecilia Giulivi, Ph.D. (joint with Chemistry)
Arun Goyal, Ph.D. (joint with Biology)
Merry Jo Oursler, Ph.D. (joint with Biology)

Courses with components in biochemistry and molecular biology (Med 6520, Med 6541, Med 6566, Med 6573, Med 6724) introduce students to the molecular basis of cell life processes. This includes an examination of the central molecules of life—DNA, RNA, and protein; methods for exploring protein and genes and the power of genomic technology; interplay between three-dimensional structure and biological activity (function); generation and storage of metabolic energy; biosynthesis of macromolecules; and transmission and expression of genetic information. Advanced courses cover biochemical aspects of endocrinology, nutrition, neurochemistry, and other topics related to specific tissues or organ systems. Those areas of biochemistry and molecular biology most closely related to the medical sciences and clinical medicine are emphasized.

An elective course in neurobiochemistry (MdBc 5501) expands on basic aspects of brain development, metabolism function, and mechanisms of memory.

Graduate Courses

MdBc 5501. Neurobiochemistry. (2 cr; QP–Chem 3311 or Chem 5337; SP–Chem 3322 or Chem 4342 or #)
Current concepts on anatomical and compositional properties of brain; membranes and transport; neurotransmission; receptors and signal transduction mechanisms; energy, carbohydrate, protein, lipid, and nucleic acid metabolism; development and diseases of the central nervous system.

MdBc 8151. Biochemistry Seminar. (1 cr [max 4 cr]; SP–Biochem or Chem grad student or #)
Current topics in biochemistry.

MdBc 8294. Current Research Techniques. (1-3 cr [max 4 cr]; SP–Biochem or Chem grad student or #)
Research projects in biochemistry, each carried out in research lab of a faculty member.

MdBc 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and director of graduate studies consent)

MdBc 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and director of graduate studies consent)

MdBc 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

MdBc 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MdBc 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Family Medicine (FMed)

Departmental Faculty
Jeffrey Adams, M.D., *interim head*
Joy Dorscher, M.D.
Barbara Elliott, Ph.D.
Alan Johns, M.D.
Glenn Nordehn, D.O.
Tim Van Wave, Ph.D.
Ruth Westra, D.O.

Joint Faculty Members with Behavioral Sciences
Mustafa al'Absi, Ph.D.
James Boulger, Ph.D.

Duluth Family Practice Center Faculty
Sheri Boril, M.D.
Thomas Day, M.D.
Ann Doberstein, M.D.
David Hutchinson, M.D.
Roger Waage, M.D.

*Family Medicine Preceptor**
Deborah Allert, M.D.
Anthony Amon, M.D.
Mary Amon, M.D.
Vicki Anderson, M.D.
Julie Andreotti, M.D.
Ann Barry, M.D.
Niles Batdorf, M.D.
Craig Benson, M.D.
Julie Benson, M.D.
Daniel Benzie, M.D.
Sue Benzie, M.D.
James Berlin, M.D.
Dale Berry, M.D.
Marc Bettich, M.D.
Marsha Beyer, M.D.
William Beyer, M.D.
Joseph Bianco, M.D.
Mary Bianco, M.D.
Barbara Bonkoski, M.D.
Robert Bosl, M.D.
Mark Boyce, M.D.
Shelly Breyen, M.D.
Rod Brown, M.D.
Gary Carlson, M.D.
Steven Carlson, M.D.
JoAnn Chalgren, M.D.
Robert Chalgren, M.D.
H. Chris Chapman, M.D.
Lee Cohen, M.D.
Jeff Copeman, M.D.
Thomas Cunningham, M.D.
Bryan DeLage, M.D.
Jenny Delfs, M.D.
Kurt Devine, M.D.
Martin Devine, M.D.
Lynne Didrickson, M.D.
Joy Dorscher, M.D.
Peter Dunphy, M.D.
Robert Dybvig, M.D.
Thomas Edwards, M.D.
Gretchen Ehresmann, M.D.
John Eikens, M.D.
Nancy English, M.D.
Deborah Erickson, M.D.
John Fedje-Johnston, M.D.
David Freeman, M.D.
Daniel Fuglestad, M.D.
Lauren Fuller, M.D.
Scott Gerling, M.D.
Daron Gersch, M.D.
Craig Gilbertson, M.D.
David Goodwin, M.D.
Monica Goodwin, M.D.
Mark Gray, M.D.
Douglas Griffin, M.D.
Donald Grossbach, M.D.
Kathryn Halverson, M.D.
Wade Hanson, M.D.
James Harrison, M.D.
Burton Haugen, M.D.
Joel Haugen, M.D.
Thomas Haus, M.D.
Howard Hays, M.D.
Michael Heck, M.D.
Burton Helleloid, M.D.
Richard Helvig, M.D.
Barbara Hemenway, M.D.
Paul Hendrickson, M.D.
Victoria Heren, M.D.

Michael Hieb, M.D.
Steven Hietala, M.D.
Timothy Hinton, M.D.
Timothy Hogan, M.D.
Steve Honebrink, M.D.
Patricia Hook, M.D.
Jean Hoyer, M.D.
Brenda Hurtt, M.D.
Lisa Huwe, M.D.
John Ipsen, M.D.
Sarah Israelson, M.D.
Anthony Jaspers, M.D.
Jim Jessen, M.D.
Michael Johnson, M.D.
Ronald Johnson, M.D.
Terry Johnson, M.D.
Timothy Johnson, M.D.
Howard Josephs, M.D.
Phillip Kaupa, M.D.
Gary Kennedy, M.D.
David Kirby, M.D.
Terry Klemek, M.D.
Jay Knaak, M.D.
Francille Knowles, M.D.
Terence Knowles, M.D.
Bruce Knudsen, M.D.
A.A. Koeller, M.D.
Gerald Konrad, M.D.
Heidi Korstad, M.D.
Julianne Koski, M.D.
Kathryn Kramer, M.D.
Tim LaMaster, M.D.
Aaron Larson, M.D.
Barry Larson, M.D.
Richard Larson, M.D.
Lawrence Lemaster, M.D.
Michael Liebe, M.D.
Roger Lindholm, M.D.
Steve Long, M.D.
Herman Louters, M.D.
Helle Lukk, M.D.
Lori Lynner, M.D.
Lynn MacLean, M.D.
Heidi Malling, M.D.
Tim Malling, M.D.
John McCue, M.D.
Shawn McMahon, M.D.
Gregory McNamara, M.D.
John Merchlewitz, M.D.
Michael Mollen, M.D.
Lyle Munneke, M.D.
Sarah Nelson, M.D.
Michael Neudecker, M.D.
Dean Nissen, M.D.
Ingrid Nisswandt, M.D.
Margaret O'Connor, M.D.
Craig Oien, M.D.
Nancy Olsen, M.D.
Alan Olson, M.D.
Rodney Olson, M.D.
James O'Reilly, M.D.
Tom Osborne, M.D.
John Oujiri, M.D.
Daniel Palmquist, M.D.
Nancy Peltola, M.D.
Bradley Peterson, M.D.
Dennis Peterson, M.D.
Gary Peterson, M.D.
Randy Peterson, M.D.
Thomas Peterson, M.D.
Brian Pfeifer, M.D.
Steven Phillipson, M.D.
Robert Pierpont, M.D.
Diane Pittman, M.D.
Lisa Prusak, M.D.
Ricard Puumala, M.D.
Beth Riesgraf, M.D.
James Rogers, M.D.
Jerry Rogers, M.D.
Bonnie Rohr, M.D.
Edward Rosenbaum, M.D.
George Rounds, M.D.
Jon Rudberg, M.D.
Susan Rudberg, M.D.
Richard Rysavy, M.D.
Scott Rysdahl, M.D.
David Saarinen, M.D.
Mary Salter, M.D.
Michael Saunders, M.D.
Charles Schotzko, M.D.
Malcolm Scott, M.D.
Jeff Scrivener, M.D.
Robert Sellers, M.D.
Carl Sjoding, M.D.
Gary Skrien, M.D.
Harvey Smith, M.D.
Keith Stelter, M.D.
Gary Stelzer, M.D.
Jon Stephenson, M.D.
Kevin Stiles, M.D.
Lynn Stottler, M.D.
Sandra Stover, M.D.
Deborah Strand, M.D.
David Strobel, M.D.
Patrick Sura, M.D.
Christine Swensen, M.D.
Paul Terrill, M.D.
Kim Thompson, M.D.
Knute Thorsgard, M.D.
Lorraine Turner, M.D.

Arne Vainio, M.D.
Paul Van Pernis, M.D.
Jeri Vergeldt, M.D.
Charles Vergona, M.D.
Arden Virnig, M.D.
Douglas Watkins, M.D.
Kris Wegerson, M.D.
Robert Westin, M.D.
Chris Whiting, M.D.
Ron Wiisanen, M.D.
Terrence Witt, M.D.
John Wood, M.D.
Teresa Wrobbel, M.D.
Matthew Yelle, M.D.

The department offers coursework in basic, supportive, and applied areas. Students should be able to competently take a complete history and perform a complete physical examination by the end of their first year. Diagnostic skills are strengthened throughout the second year, primarily through didactic lectures and clinical involvement with selected patients. The family practice preceptorship enables the student to assess practice characteristics of a number of family physicians in different locations.

Required Courses—First Year

FMed 6101. Family Medicine. (2 cr; SP–Regis med student)
Lectures and seminars on disease syndromes affecting human organ systems and on disease prevention with reference to health issues in epidemiology, environment, and public health; exposure to community preventive health and alternative medicine programs; provides basic foundation in current computer technology.

FMed 6105. Physical Diagnosis. (3 cr; SP–Regis med student)
Medical history-taking and physical examination of patients emphasizing range of normal findings from the newborn to the elderly. Introduction to abnormal findings associated with major disease syndromes of human organ system.

FMed 6121. Preceptorship I. (1 cr; SP–Regis med student)
Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

FMed 6122. Preceptorship II. (2 cr; SP–Regis med student)
Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

FMed 6501. Clinical Pathology Conferences I. (1 cr; SP–Regis med student)
Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

Required Courses—Second Year

FMed 6441. Clinical Rounds and Clerkship I. (2 cr; SP–Regis med student)
Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

FMed 6442. Clinical Rounds and Clerkship II. (2 cr; SP–Regis med student)
Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

FMed 6461. Preceptorship III. (1 cr; SP–Regis med student)
Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

FMed 6462. Preceptorship IV. (2 cr; SP–Regis med student)
Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

FMed 6502. Clinical Pathology Conferences II. (1 cr; SP–Regis med student)
Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

Undergraduate and Graduate Courses

FMed 5591. Independent Study. (1-8 cr [max 12 cr]; QP–Δ; SP–Δ)
Intensive, independent study project of student's interest in medical research, interdisciplinary fellowship, preceptorship in rural health care delivery, or another medical area approved by Department of Family Medicine.

Additional Courses—Residents

FMed 7100. Clinical Family Medicine. (5-15 cr [max 90 cr]; SP–Δ; cannot apply cr to Graduate School program)
Supervised care of patients of all ages emphasizing continuous, primary, preventive, acute, and chronic care in all general diagnostic categories.

Interdisciplinary (Med)

Required Courses—First Year

Med 6301. Medical Epidemiology and Biometrics. (2 cr; SP–Regis med student; cannot apply cr to Graduate School program)
Basic elements of biostatistics, including descriptive and inferential statistics, study design, probability statistics, and ordering and interpreting diagnostic tests. Topics in clinical epidemiology and epidemiologic methods.

Med 6505. Applied Anatomy. (7 cr; SP–Regis med student)
Adult gross structure taught using regional approach with strong emphasis on functional and clinical applications. Basic-clinical science correlation conferences held frequently to emphasize applied anatomy of a region.

Med 6510. Histopathology. (6 cr; SP–Regis med student)
Integrated course correlating normal structure and function of cells, tissues, and organs of the body with examples of pathological changes that take place within these cells, tissues, and organs during disease processes.

Med 6520. Principles of Basic Medical Science. (9 cr; SP–Regis med student)
Introduction to cellular homeostatic principles and mechanisms associated with normal and abnormal structure and function. Basic science principles of integrative medical sciences. Interdisciplinary sessions emphasize fundamental concepts of biochemistry, molecular biology, anatomy, microbiology, physiology, and pharmacology.

Med 6541. Hematopoiesis and Host Defenses. (9 cr; SP–Regis med student)
Introduction to principles of human immunology and hematology. Basic science principles, including pharmacology and pathology together with clinical aspects of innate and acquired immunity within context of hemato-lympho-reticular system.

Med 6573. Nervous System. (13 cr; SP–Regis med student)
Interdisciplinary study of human nervous system, including consideration of eye and ear. Basic sciences of anatomy, behavioral science, biochemistry, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

Med 6788. Dermatology and Musculoskeletal System. (4 cr; SP–Regis med student)
Interdisciplinary study of integument and musculoskeletal system. Basic sciences of anatomy, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

Required Courses—Second Year

Med 6566. Cardiovascular System. (7 cr; SP–Regis med student)
Integrated comprehensive overview of cardiovascular system. Anatomical, biochemical, physiological, pathological, and pharmacologic aspects of heart, blood vessels, and blood, including histology, embryology, anatomy, gross and microscopic pathology, as well as clinical features, diagnosis, and pharmacological therapy.

Med 6724. Gastrointestinal Hepatobiliary System. (6 cr; SP–Regis med student)
Interdisciplinary integrative course discusses fundamental concepts of anatomy, physiology, nutrition, pathology, clinical medicine, and microbiology as they relate to issues of gastrointestinal and hepatobiliary system.

Med 6728. Respiratory System. (5 cr; SP–Regis med student)
Maintenance and regulation of human internal environment by the respiratory system. Histology of upper airways and lungs; respiratory gas exchange; introduction to respiratory component of acid-base balance. Integrative lab covering cardiovascular-respiratory adjustments to exercise.

Med 6746. Fluids and Electrolytes. (4 cr; SP–Regis med student)
Introduction to principles and mechanisms associated with human renal and genitourinary function in health and disease. Integrates anatomical, physiological, pharmacological, pathological, immunological, and basic clinical aspects of renal and genitourinary systems in context of fluid and electrolyte homeostasis.

Med 6762. Endocrine and Reproductive System. (10 cr; SP–Regis med student)
Structure and function of endocrine and reproductive systems. Essential background for understanding findings of clinical medicine related to endocrine regulation of reproduction and homeostasis.

Med 6773. Integrated Clinical Medicine. (6 cr; SP–Regis med student)
Integration of basic, clinical, and behavioral science principles to understand the human body and its integrative function and psychosocial responses, especially in multisystem conditions. Emphasizing evidence-based medicine principles, health issues are explored over the life cycle from pediatrics to geriatrics.

Undergraduate and Graduate Courses

Med 3998. Human Biology and Behavior Topics. (1-10 cr [max 12 cr]; SP–#)
Advanced undergraduate or graduate students can study in depth normal human biology and behavior. During the academic year, students may elect to enroll in one or several subtopics. No basic science clinical correlation.

Med 6023. Seminars in Indian Health. (1-2 cr; SP–Regis med student)
Current issues impacting health of Indian people. Causes of morbidity and mortality, including social, cultural, and economic issues. Discussion focuses on solutions to problems in context of Indian communities.

Medical and Molecular Physiology (Phsl)

Professor
Lloyd Beck, Ph.D., *emeritus*
Lois J. Heller, Ph.D.

Associate Professor
Edwin W. Haller, Ph.D.
John Keener, Ph.D., *adjunct*
David E. Mohrman, Ph.D.
Edward K. Stauffer, Ph.D.
Lorentz E. Wittmers, Jr., M.D., Ph.D., *acting head*

Assistant Professor
Janet L Fitzakerley, Ph.D. (joint with Pharmacology)
Irina Haller, Ph.D., *adjunct*

Clinical Associate Professor
Harold Hofstrand, M.D.

Physiology is the science that studies the principles governing the functions of biological systems such as the nervous, cardiovascular, renal, respiratory, and endocrine systems. A number of course hours are devoted to demonstrating the applicability of physiology to various clinical disciplines through integrative sessions that emphasize basic physiologic principles.

Undergraduate and Graduate Courses

Phsl 3011. General Physiology. (5 cr; QP–Biol 1012, Chem 1101 or #; SP–Biol 1761, Chem 1102 or #)
Lab and/or lecture demonstrations illustrate key aspects of function and mechanisms of action of major organ systems. Primarily for students preparing for nursing, dental hygiene, pre-professional programs, communication disorders, life science teaching, majors in natural sciences.

Phsl 5211. Literature Seminar. (1-2 cr; QP–5927 or #)
Oral presentation of written literature review and research data reflecting student's research interests and thesis research results.

Phsl 5292. Readings in Physiology. (1-3 cr; SP–#)
Topics in physiology selected for each student; written reviews prepared and discussed.

Phsl 5294. Research in Physiology. (1-15 cr; SP–#)
Introduction and use of lab techniques and equipment used for research in various subspecialties of physiology, including neurophysiology, cardiovascular physiology, endocrinology, respiratory and transport process, electrophysiology, and renal physiology.

Phsl 5601. Physiology of Organ Systems I. (3 cr; QP–3011, [Biol 3154 or Biol 3245], [Chem 3311 or Chem 5336] or #; SP–3011, [Biol 2101 or Biol 2201], [Chem 3322 or Chem 4341] or #)
Survey of physiologic functions and interrelationships of organ systems in mammals (musculoskeletal, cardiovascular, renal, respiratory, nervous, endocrine, and reproductive). Framework for understanding physiological processes, allowing students to integrate knowledge gained at molecular level with functions of whole organism.

Phsl 5602. Physiology of Organ Systems II. (2 cr; QP–5601 or #; SP–5601 or #)
Advanced study of organ system functions in context of interaction of organism with environment.

Phsl 8401. Physiology of Aging. (2 cr; SP–5601, #)
In-depth study of several theories concerning physiological processes that appear to set the limits of maximum human life span.

Phsl 8405. Muscle Physiology. (2 cr; SP–5601, #)
In-depth review and discussion of physiological processes involved in muscle contraction from subcellular events to neural-controlled function of whole muscle (skeletal, cardiac, and smooth muscle).

Phsl 8415. Topics in Endocrinology. (2 cr; SP–5601, #)
Selected topics of current endocrine research interest examined in depth; historical background, questions posed by current research, and implications of current research for future development in the area.

Phsl 8441. Transport Processes. (2 cr; SP–5601, #)
In-depth, quantitative approach to transport processes in biological systems.

Medical Microbiology and Immunology (MicB)

Professor
Arthur G. Johnson, Ph.D., *emeritus*
Richard J. Ziegler, Ph.D.

Associate Professor
Benjamin L. Clarke, Ph.D.
Omelan A. Lukasewycz, Ph.D., *acting head*

Assistant Professor
Lucia P. Barker, Ph.D.
M. Kent Froberg, M.D. (joint with Pathology and Laboratory Medicine)
Louise B. Hawley, Ph.D.
Merry Jo Oursler, Ph.D., *adjunct*

Medical microbiology and immunology components of courses familiarize students with concepts basic to understanding infectious diseases and their management. Characteristics of important pathogenic members of the microbial world—bacteria, viruses, fungi, and parasites—are discussed, with emphasis on communicability, invasive properties, toxigenicity, and lab identification. The multifaceted immune response of the host to infectious agents is defined and characterized. In addition, the aberrant response of the immune system resulting in allergic and pathological reactions is addressed.

Graduate Courses

MicB 5545. Immunobiology. (3 cr; QP–Biol 2101 or #; SP–#)
The immune system and the cells and molecules which work in concert to keep us free from disease and aberrations resulting in immune disorders.

MicB 5591. Problems in Medical Microbiology and Immunology. (1-4 cr [max 8 cr]; SP–Open to med students or qualified upper div and grad students with #)
Independent study on tutorial basis. Emphasis on basic and clinical microbiology problems under study at UMD School of Medicine, including immunology. Investigative work and appropriate reading arranged with tutorials consistent with interests and capabilities of individual students.

MicB 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and director of graduate studies consent)

MicB 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and director of graduate studies consent)

MicB 8554. Advanced Immunology and Immunobiology. (2 cr; SP–5545 or #)
Detailed study of mechanisms involved in immunologic defense. Emphasis on concepts and current literature.

MicB 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

MicB 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

MicB 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Pathology and Laboratory Medicine (Path)

Professor
Arthur C. Aufderheide, M.D.
Patrick C. J. Ward, M.D., *head*

Assistant Professor
M. Kent Froberg, M.D. (joint with Medical Microbiology and Immunology)

Clinical Assistant Professor
Thomas C. Nelson, M.D.
Sarah T. B. Seidelmann, M.D.
Patrick A. Twomey, M.D.
Daniel P. Vandersteen, M.D.
Geoffrey A. Witrak, M.D.

Human pathology is the study of anatomic changes in body tissues occurring in disease states. Correlation between anatomic changes and clinical signs and symptoms under disease conditions is emphasized. Special effort is made to integrate subject matter with the content of courses taught in other disciplines.

Pharmacology (Phcl)

Professor
Richard M. Eisenberg, Ph.D., *head*
Jean F. Regal, Ph.D.
George J. Trachte, Ph.D.

Associate Professor
Edward T. Knych, Jr., Ph.D.

Assistant Professor
Janet L. Fitzakerley, Ph.D. (joint with Medical and Molecular Physiology)

Pharmacology is the science concerned with the actions of drugs, chemicals, and other biologically active agents on biological processes. The sequence of courses in pharmacology deals with principles of drug action; prototype drugs and their congeners and how each of these drugs affects biochemical and physiological processes; the manner and mechanism whereby drugs can ameliorate or correct pathological processes; clinical toxicology; and drugs used in emergency situations. Because drugs only alter existing biochemical, physiological, or pathological processes rather than produce de novo effects, an extensive knowledge of these related disciplines will normally be required as preparation for the study of pharmacology.

Undergraduate and Graduate Courses

Phcl 4001. Introduction to Pharmacology. (2 cr; QP–Biol 1111, Chem 1110-1111-1112, Chem 3512-3513 or #; SP–Biol 1011, Chem 1151-1152, Chem 2521-2522 or #)
Elementary course in pharmacology. Actions and use of drugs in selected health conditions.

Phcl 4094. Directed Research in Pharmacology I. (1-10 cr [max 10 cr]; QP–Upper div sci major, #; SP–Upper div sci major, #)

Phcl 5094. Directed Research in Pharmacology II. (1-10 cr [max 10 cr]; QP–Grad student, #; SP–Grad student, #)

Phcl 5201. Pharmacology I. (6 cr; QP–Chem 5336, Chem 5337, Phsl 5601 or #; SP–Chem 4341-4342 or Phsl 5601 or #)
Analysis of effects of pharmacologic agents on living systems; major classes of drugs; concepts of chemotherapy; characteristic pharmacologic agents, their reactions and therapeutic applications.

Phcl 5202. Pharmacology II. (5 cr; QP–5101 or #; SP–5201 or #)
Analysis of effects of pharmacologic agents on living systems; major classes of drugs; concepts of chemotherapy; characteristic pharmacologic agents, their reactions and therapeutic applications.

Phcl 5204. Pharmacology Seminar. (1 cr [max 4 cr]; QP–Grad student, #; SP–Grad student, #)
Presentation of selected research problems and current journal articles.

Phcl 5410. Advanced Pharmacology. (1 cr; QP–Phcl grad student or #; SP–Phcl grad student or #)
Comprehensive lectures and discussion of principles of drug disposition; drug receptor interactions; mechanism of action of selected drugs emphasizing current advances and methodologies.

Phcl 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and director of graduate studies consent)

Phcl 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and director of graduate studies consent)

Phcl 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Phcl 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Phcl 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

Toxicology (Txcl)

Graduate School

Txcl 5011. Principles of Toxicology. (2 cr; SP–Grad txcl major or #; A-F only)
Introduction to fundamentals of poisoning in individuals and the environment, assessment of potential health hazards, and application of toxicology in various professional careers.

Txcl 8012. Advanced Toxicology I. (3 cr; QP–5214 or PubH 5261; SP–5011, Chem 4341 or #; A-F only)
Absorption, distribution, metabolism, and excretion of xenobiotics; toxicokinetics; mechanisms of toxicity or specific classes of chemical agents.

Txcl 8013. Advanced Toxicology II. (3 cr; QP–5214 or PubH 5261; SP–8012, Chem 4342, Phsl 5601 or #; A-F only)
Kinetic and dynamic determinants of target organ toxicity; pathological alterations in structure/function relationships for major target organ systems; mechanisms of mutagenesis, carcinogenesis, and teratogenesis.

Txcl 8100. Investigative Toxicology. (1 cr [max 2 cr]; QP–5214; SP–8013 or #; A-F only)
Evaluating toxicology research issues and literature.

Txcl 8333. FTE: Master's. (1 cr; SP–Master's student, adviser and DGS consent)

Txcl 8444. FTE: Doctoral. (1 cr; SP–Doctoral student, adviser and DGS consent)

Txcl 8666. Doctoral Pre-Thesis Credits. (1-18 cr; SP–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

Txcl 8777. Thesis Credits: Master's. (1-18 cr; SP–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

Txcl 8888. Thesis Credits: Doctoral. (1-18 cr; SP–Max 18 cr per semester or summer; 24 cr required)

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