Department of Pathology & Immunology

The Department of Pathology & Immunology (http://pathology.wustl.edu) is involved in the clinical diagnosis and monitoring of disease, in the teaching of pathology and immunology, and in research on the molecular basis of disease and immunology.

The department is responsible through its divisions for studying the pathogenesis and the biochemical and anatomical basis of diseases. Pathologists do research on disease processes using molecular, genetic and structural analysis. Pathologists have the responsibility for the cytological and anatomical diagnosis of diseases and for developing novel structural and molecular approaches for the analysis of them, particularly cancers and infectious diseases. The divisions of Anatomic and Molecular Pathology (https://pathology.wustl.edu/divisions/amp), Immunobiology (https://pathology.wustl.edu/divisions/immunobiology), Laboratory and Genomic Medicine (http://pathology.wustl.edu/divisions/lgm) and Neuropathology (http://pathology.wustl.edu/divisions/neuropathology) have faculty involved in teaching, clinical service and research. Prominent areas of research include experimental diabetes, hematology, bone pathophysiology, cancer, and gastrointestinal and vascular pathology.

The department teaches an extensive course during the second year of the curriculum and presents a number of conferences that third- and fourth-year students can attend. The department also offers a number of clerkships. The course director of the second-year Pathology course is Erika C. Crouch, PhD, MD. Students can take clerkships in Autopsy Pathology, Surgical Pathology or Laboratory Medicine, or they may participate in the research activities of the faculty.

The Division of Immunobiology (https://pathology.wustl.edu/divisions/immunobiology) integrates immunobiology activities at the school. It is responsible for the teaching of immunology during the first year of the curriculum (Brian T. Edelson, MD, PhD, is the course director) and for conducting basic research in immunobiology and in the immunological basis of disease.

Many faculty in the department are involved in graduate teaching and participate in the various programs offered by the Division of Biology and Biomedical Sciences (http://dbbs.wustl.edu/Pages). The department has strong participation in the Immunology graduate program.

Website: https://pathology.wustl.edu

Degrees & Requirements

Although the Department of Pathology & Immunology does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs (http://bulletin.wustl.edu/medicine/degrees) section of this Bulletin.

Research

M60 Pathology

Paul M. Allen, PhD
BJC Institute of Health, 8th Floor
Phone: 314-362-8758

This lab's focus is on research in immunology and the recognition of antigen by T cells. We are investigating how the T cell receptor functions developmentally, biochemically and structurally. We utilize in vivo models to study the role of T cells in alloreactivity/grant rejection and inflammatory bowel disease.

Jacques U. Baenziger, MD, PhD
Kingshighway Building, 2nd Floor, Room 2423
Phone: 314-362-8730

Glycobiology; informational role of carbohydrates in protein targeting and reproductive endocrinology.

Jeffrey I. Gordon, MD
4444 Forest Park, 5th Floor
Phone: 314-362-7243

Genomic and metabolic foundations of symbiotic host-microbial interactions in the human gut; impact on obesity and malnutrition.

Michael McDaniel, PhD
3709 West Building
Phone: 314-362-7435

The focus of this laboratory is to study the function and growth of pancreatic islets in Types 1 and 2 diabetes. Mammalian target of rapamycin (mTOR) is a protein kinase that integrates signals from growth factors and nutrients to regulate DNA and protein synthesis. G-protein–coupled receptor agonists such as GLP-1 have been shown to enhance proinsulin biosynthesis and secretion and to stimulate cellular growth and proliferation. Our objective is to further explore the mechanisms of action of GLP-1 to enhance DNA and protein synthesis via mTOR in rodent and human islets. These studies are of fundamental interest for optimizing mTOR to induce cellular growth and proliferation, to enhance pre- and post-islet transplantation in Type 1 diabetes, and to prolong b-cell compensation in response to insulin resistance in Type 2 diabetes. The failure of b-cells in
obesity-associated Type 2 diabetes is believed to correlate with the intracellular accumulation of lipids that contribute to defects in insulin secretion and the maintenance of b-cell mass. Our studies have identified lipoprotein lipase in b-cells; this is a key enzyme for catalyzing the hydrolysis of lipoprotein-associated TAG to produce free fatty acids (FFAs) for local cellular uptake. We are also characterizing the effects of enhanced FFA uptake through fatty acid transporters and determining the regulation of lipid droplet synthesis and breakdown by lipid droplet–associated proteins. Recent studies suggest that FFAs upregulate mitochondrial uncoupling proteins proposed to dissipate the proton gradient across the mitochondrial inner membrane. The objective of this study is to delineate the link between FFAs and b-cell mitochondrial dysfunction in Type 2 diabetes.

Kenneth M. Murphy, MD, PhD
Clinical Sciences Research Building, 7th Floor, Room 7766
Phone: 314-362-2009
Function of dendritic cells in T cell responses and anti-tumor vaccines.

Robert D. Schreiber, PhD
BJC Institute of Health, 8th Floor
Phone: 314-362-8747
Tumor immunology and cancer immunoediting; research on natural and therapeutically induced responses to tumors; definition of the molecular roles of interferon-gamma and interferon-alpha/beta in these processes.

Carl H. Smith, MD
St. Louis Children's Hospital
Phone: 314-454-6029
Placental transport; surface membrane structure and function.

Thaddeus S. Stappenbeck, MD, PhD
Clinical Sciences Research Building, North Tower, Room 1020
Phone: 314-362-4214
My lab studies the cause of inflammatory bowel disease, a condition that leads to spontaneous inflammation of the intestine. We study the mechanisms of host gene mutations as well as abnormalities in host-microbial interactions that drive this disease.

Steven Teitelbaum, MD
Barnes-Jewish Hospital
Phone: 314-454-8463
This lab studies the cellular and molecular mechanisms of bone remodeling, with particular emphasis on osteoclast biology as it relates to the pathogenesis and prevention of diseases such as osteoporosis. We focus on integrin and cytokine biology utilizing a variety of genetically manipulated mice.

John Turk, MD, PhD
6609 Wohl
Phone: 314-362-8190
This lab looks at phospholipase A2 (PLA2) enzymes in the regulation of insulin secretion from pancreatic islet cells (e.g., a novel iPLA2 that does not require Ca2+ cloned from rat and human islets that is involved in cell secretion and proliferation). We also perform studies of iPLA2, its post-translational modifications, and its interactions with other proteins involving mice that are iPLA2-deficient globally or in selected tissues, transgenic mice that overexpress iPL2 in β-cells, and insulinoma cells with genetically manipulated iPLA2 expression. The mass spectrometric characterization of proteins and complex lipids is an important tool in these studies.

Emil R. Unanue, MD
BJC Institute of Health, 8414
Phone: 314-362-8748
Our focus is research that involves immunobiology and immunopathology. We examine cellular interactions that result in immune induction and cellular immunity. These cellular interactions are examined in normal immune responses and in autoimmune diseases. The focus is to identify the proteins responsible for the activation of lymphocytes in Type 1 diabetes.

Herbert Virgin, MD, PhD
Clinical Sciences Research Building, Room 8849
Phone: 314-362-9223
We work on issues at the interface of virology and immunology by analyzing aspects of viral immunity, viral pathogenesis and viral genetics that contribute to virulence and disease.

Mark A. Watson, MD, PhD
Clinical Sciences Research Building, North Tower, Room 1029
Phone: 314-454-7919
Our laboratory is interested in defining patterns of somatic gene mutation, gene expression and quantitative tumor clonality that can be used to predict distant site metastases and therapeutic vulnerability in patients with lung and breast cancer. Experimental approaches use histopathological review as well as the next-generation DNA exome and RNA sequencing (NGS) of primary cancer patient tissues, coupled with bioinformatics and statistical modeling, to identify candidate biomarker patterns that may be useful for the clinical management of cancer patients.
Faculty

Anatomic and Molecular Pathology Division Head
John Pfeifer, MD, PhD, Vice Chair for Clinical Affairs

Immunobiology Division Head
Paul M. Allen, MS, PhD

Laboratory and Genomic Medicine Division Co-Heads
Charles Eby, MD
Thaddeus Stappenbeck, MD, PhD

Neuropathology Division Head
Robert E. Schmidt, MD, PhD

Visit our website for more information about our faculty (https://pathology.wustl.edu/people) and their appointments.

A

Michael Alberti, MD
Instructor in Pathology and Immunology (Pending Dean's Approval) (primary appointment)
BS California Lutheran Universit 2005
MD University of Alabama 2013

Paul M Allen, PHD, MS
Robert L. Kroc Professor of Pathology and Immunology (primary appointment)
BS University of Michigan 1974
PHD University of Michigan 1981
MS University of Michigan 1977

Gaya K Amarasinghe, PHD
Professor of Pathology and Immunology (primary appointment)
Professor of Biochemistry and Molecular Biophysics
Professor of Molecular Microbiology
BS City College 1997
PHD University of Maryland 2001

Ferdinand Enginco Amarillo, PHD
Associate Professor of Pathology and Immunology (primary appointment)
PHD Florida State University 2010

Neil William Anderson, MD, BS1
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Assistant Professor of Pediatrics
MD University of Wisconsin-Madiso 2009
BS1 University of Wisconsin-Madiso 2005

Maksym Artomov, PHD, MS
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Associate Professor of Biomedical Engineering
PHD Mass Inst of Technology (MIT) 2009
MS University of Chicago 2005

B

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Assistant Professor of Pathology & Immunology (Pending Executive Faculty Approval) (primary appointment)
MD New York University 2013

Michael James Barratt, PHD
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PHD KINGS COLLEGE LONDON 1994

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BS Nebraska Wesleyan University 1998
PHD University of Nebraska 2004
MD University of Nebraska 2006

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PHD University of CA Berkeley 2001
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BS Georgetown University 1974
MD University of Texas Galveston 1981

Kathleen Byrnes, MD
Assistant Professor of Pathology and Immunology (primary appointment)
MD Tulane University 2013
BS Washington Univ in St. Louis 2008

C

Dengfeng Cao, PHD, MD
Professor of Pathology and Immunology (primary appointment)
PHD University of Pittsburgh 2001
MD Peking Union Medical College 1996

Yang Cao, PHD
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PHD Univ of Wisconsin Madison 2014
Marina Cella, MD
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MD University of Genova 1989

Deyali Chatterjee, MD
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BS Seoul National University 1982
PHD University of Illinois 1988

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BA Washington Univ in St. Louis 2004
MD Washington Univ in St. Louis 2012

Marco Colonna, MD
Robert Rock Belliveau MD Professor of Pathology (primary appointment)
Professor of Medicine
MD Parma University 1983

Leigh Anne Compton, PHD, MD
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BS Centenary College Louisiana 1998
PHD Vanderbilt University 2005
MD Vanderbilt University 2008

Joseph C. Corbo, MD, AB, PHD
Professor of Pathology and Immunology (primary appointment)
Professor of Genetics
Professor of Ophthalmology and Visual Sciences
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AB Stanford University 1990
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PHD University of California 1997

Richard James Cote, MD
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Head of the Department of Pathology and Immunology
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Erika C Crouch, MD, PHD
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MD University of Washington 1979
PHD University of Washington 1978

Sonika M Dahiya, MD
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Gautam Dantas, PHD
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Professor of Biomedical Engineering
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Professor of Pathology in Pediatrics
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MD Washington Univ in St. Louis 1966

George J Despotis, MD
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Associate Professor of Anesthesiology
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Professor of Pediatrics
PHD Indiana University Bloomington 1992
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Eric James Duncavage, MD
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BS Univ of Wisconsin Madison 1975

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Professor of Medicine
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PHD Washington Univ in St. Louis 1995
MD Washington Univ in St. Louis 2004
UNKNOWN Brown University 1995
Takeshi Egawa, PHD, MD
Associate Professor of Pathology and Immunology (primary appointment)
PHD Osaka University 2002
MD Osaka University 1994

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Assistant Professor of Medicine
Assistant Professor of Molecular Microbiology
BS Cairo University 2004
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PHD University of Rochester 2017
BS Roberts Wesleyan College 2009

Cole John Ferguson, PHD, MD
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BA Yale University 2003
PHD University of Michigan 2013
MD University of Michigan 2013

John Lawrence Frater, MD
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BS University of Notre Dame 1992
MD Medical College of Ohio 1996

Daved H Fremont, PHD
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Professor of Biochemistry and Molecular Biophysics
Professor of Molecular Microbiology
BS Univ of Wisconsin Madison 1986
PHD University of CA San Diego 1993

Joseph P. Gaut, PHD, MD
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Associate Professor of Medicine
PHD Washington Univ in St. Louis 2004
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Susan Gilfillan, PHD
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MD Universidad Autonoma De Nuevo 1978
BS1 New Mexico St University 1971

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Director of the Center for Genome Sciences
Dr Robert J Glaser Distinguished University Professor
Professor of Developmental Biology
Professor of Medicine
Professor of Molecular Microbiology
BA Oberlin College 1969
MD University of Chicago 1973

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PHD Washington Univ in St. Louis 2010

Ann Marie Gronowski, MS, PHD
Professor of Pathology and Immunology (primary appointment)
Professor of Obstetrics and Gynecology
MS Iowa State University 1988
BS University of Illinois 1985
PHD Univ of Wisconsin Madison 1992

Brenda Jean Grossman, MS, MD
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Professor of Medicine
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MS Saint Louis University 2003
MD Medical College Georgia 1980

Ian Sean Hagemann, PHD, MD
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PHD Washington Univ in St. Louis 2008
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BA Georgetown University 1989
BA1 Georgetown University 1989
DVM Tufts University 1995
Anjum Hassan, MD1, MD  
Associate Professor of Pathology and Immunology (primary appointment)  
MD1 School Not Listed 1989  
MD Aga Khan University 1989

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MD Fudan University 1993  
PHD Rutgers University 2001

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Professor of Genetics  
MD Washington Univ in St. Louis 1995  
PHD Washington Univ in St. Louis 1995

Matthew Charles Hibberd, PHD  
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PHD Washington Univ in St. Louis 2016  
BS Lincoln School of Commerce 2007

Li-Hao Huang, PHD  
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PHD Dartmouth College 2013  
BS National Taiwan University 2003

Ronald R Jackups Jr, MD, PHD  
Associate Professor of Pathology and Immunology (primary appointment)  
Associate Professor of Pediatrics  
MD University of Illinois Chicago 2008  
BS Washington Univ in St. Louis 2000  
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Eynav Yafit Klechevsky, PHD  
Assistant Professor of Pathology and Immunology (primary appointment)  
PHD Baylor University 2007

Friederike H. Kreisel, MD  
Associate Professor of Pathology and Immunology (primary appointment)  
G Alexander Patterson MD and Mid America Transplant Endowed Distinguished Chair in Lung Transplantation  
MD Goethe University 1995

Hannah Rachel Krigman, MD  
Associate Professor of Pathology and Immunology (primary appointment)  
MD University of North Carolina 1988  
BA Amherst College 1983

Jack H Ladenson, PHD  
Oree M Carroll and Lillian B Ladenson Professor of Clinical Chemistry in Pathology and Immunology (primary appointment)  
Professor of Clinical Chemistry in Medicine  
PHD University of Maryland 1971  
BS Pennsylvania State University 1964

Yi-Shan Lee, MD, PHD  
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MD National Taiwan University 2000  
PHD Duke University 2008

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BAS Hendrix College 1988  
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PHS Stanford University 2014  
MD National Taiwan University 2009

Heide Maria Lind, MD  
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MD University of Iowa 1979

Chang Liu, MD, PHD  
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MD Peking Union Medical College 2004  
PHD Oregon Health Science Univers 2010

Ta-Chiang Liu, MD, PHD  
Assistant Professor of Pathology and Immunology (primary appointment)  
MD National Yang-Ming University 1997  
PHD Imperial College 2003

Latisha D Love-Gregory, BS2, PHD  
Instructor in Pathology and Immunology (primary appointment)  
BS Rust College 1995  
BS2 Rust College 1995  
PHD University of MO Columbia 2001

Olga Y. Lubman, PHD  
Instructor in Pathology and Immunology (primary appointment)  
BS Goucher College 1998  
BA Goucher College 1998  
PHD Washington Univ in St. Louis 2002

Horacio M Maluf, MD  
Professor of Pathology and Immunology (primary appointment)
Mena Magdi Zaki Mansour, MD1
Assistant Professor of Pathology and Immunology (primary appointment)
MD1 Alexandria University 2005

Samantha N. McNulty, PHD
Instructor in Pathology and Immunology (primary appointment)
BS Saint Louis University 2005
PHD Washington Univ in St. Louis 2012

Nima Mosammaparast, PHD, MD
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PHD University of Virginia 2005
BS University of Rochester 1998
MD University of Virginia 2006

Kenneth M Murphy, MD, PHD
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Eugene Opie First Centennial Professor of Pathology and Immunology
Howard Hughes Medical Institute Investigator in Pathology and Immunology
MD Johns Hopkins University 1984
PHD Johns Hopkins University 1984

Theresa L Murphy, PHD
Professor of Pathology and Immunology (primary appointment)
BS University of Arizona 1978
PHD Johns Hopkins University Medic 1983

Rakesh Nagarajan, MD, PHD, BA1
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MD Washington Univ in St. Louis 2002
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Julie Ann Neidich, MD
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MD George Washington University 1983

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BS Univ of Wisconsin Madison 1985
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Eugene Merle Oltz, PHD
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PHD Columbia University 1987

Bijal A. Parikh, MD, PHD
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MD U Medical-Dental Of New Jersey 2006
PHD Rutgers University 2004

Jonathan Robert Brestoff Parker
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Michael Louis Patnode, PHD
Instructor in Pathology and Immunology (primary appointment)
BS University of Washington 2015
PHD University of California 2015

Jacqueline Elise Payton, MD, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
BS Bradley University 1996
MD University of Illinois 2004
PHD University of Illinois 2002

Richard J. Perrin, MD, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
MD University of Illinois Chicago 2004
PHD University of Illinois 2001
BS Yale University 1992

John David Pfeifer, MD, PHD
Professor of Pathology and Immunology (primary appointment)
Professor of Obstetrics and Gynecology
Vice Chairman for Clinical Affairs of Pathology and Immunology
MD University of California 1988
BA University of California 1981
PHD University of California 1987

Gwendalyn Jan Randolph, PHD
Unanue Distinguished Professor of Immunology (primary appointment)
Professor of Medicine
BS Temple University 1991
PHD State University of New York 1995

Alejandro Reyes
Adjunct Assistant Professor of Pathology and Immunology (primary appointment)

Jon H Ritter, MD
Professor of Pathology and Immunology (primary appointment)
BA Mankato St University 1983
MD University of Minnesota 1988

Nidhi Rohatgi, PHD
Instructor in Pathology and Immunology (primary appointment)
PHD All-India Inst of Medical Sci 2005

Stephen Matthew Roper, MS, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
BS Texas Tech University 2004
MS Texas Tech University 2007
PHD Medical University of Sth Car 2015

Marianna B Ruzinova, MD, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
MD Cornell University 2005
PHD Cornell University 2004

Robert Edward Schmidt, MD, PHD
Professor of Pathology and Immunology (primary appointment)
MD Washington Univ in St. Louis 1976
BA Washington Univ in St. Louis 1969
PHD Washington Univ in St. Louis 1976

Robert D Schreiber, PHD
Andrew M Bursky and Jane M Bursky Distinguished Professor (primary appointment)
Professor of Molecular Microbiology
BA State University of New York 1968
PHD State University of New York 1973

Molly Schroeder, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
BS Saint Louis University 2006
PHD Baylor College of Medicine 2012

Mitchell G Scott, PHD, MS
Professor of Pathology and Immunology (primary appointment)
Clinical Research Assistant Professor of Medicine
PHD Washington Univ in St. Louis 1982
MS University of Missouri 1977
BS Washington Univ in St. Louis 1974

Jennifer K Sehn, MD
Assistant Professor of Pathology and Immunology (primary appointment)
BS Georgia Tech 2007
MD Washington Univ in St. Louis 2011

Andrey S Shaw, MD
Adjunct Professor of Pathology and Immunology (primary appointment)
MD Columbia University 1984
BA Columbia University 1979

Kathleen C Sheehan, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
BS University of Notre Dame 1980

PHD Saint Louis University 1986

Thaddeus S. Stappenbeck, MD, PHD
Conan Professor of Laboratory and Genomic Medicine (primary appointment)
Professor of Developmental Biology
BA Northwestern University 1987
MD Northwestern University 1995
PHD Northwestern University 1994

Sanjay Joshua Swamidass, MA, PHD, MD
Associate Professor of Pathology and Immunology (primary appointment)
Associate Professor of Biomedical Engineering
MA University of California 2006
PHD University of California 2007
BS University of California 2000
MD University of California 2009

Wojciech A. Swat, MS, PHD
Associate Professor of Pathology and Immunology (primary appointment)
MS University of Warsaw 1989
PHD University of Basel 1992

Steven L Teitelbaum, MD
Messing Professor of Pathology and Immunology (primary appointment)
Professor of Medicine
MD Washington Univ in St. Louis 1964
BA Columbia University 1960

Suzanne Renee Thibodeaux, MD, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
MD Univ Texas Health Sci San Anto 2013
BS Tulane University 2005
PHD Univ Texas Health Sci San Anto 2011

Emil Raphael Unanue, MD
Paul and Ellen Lacy Professor of Pathology and Immunology (primary appointment)
MD Havana University 1960
BS Institute of Secondary Educati 1952

Steven John Van Dyken, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
PHD University of San Diego 2006
BS Calvin College 1998

Siddarth Venkatesh, PHD, PHD
Instructor in Pathology and Immunology (Pending Dean's Approval) (primary appointment)
Courses

Visit online course listings to view offerings for M60 Path (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M60).

**M60 Path 523 Immunology**

The course consists of lectures, laboratory exercises and clinical correlations. It covers all aspects of the immune response: general properties of the immune system, effector molecules, cells and their function, cellular interactions, vaccines, and immunological diseases. Two laboratory exercises focus on blood typing and allergy. Students will also meet in groups (20-25 students) with clinicians to discuss a variety of clinical cases that relate to the course material.

Credit 37 units.

**M60 Path 665 Pathology**

This course is a comprehensive survey of the biology and morphology of human disease through a combination of lectures and laboratory sessions. The year begins with a review of basic disease mechanisms at the cellular and molecular level. Subsequently, the pathogenesis and characteristics of important diseases involving each organ system of the body are presented. During the year, students will become familiar with the methods of contemporary pathologic analysis. They will also learn how the results of pathologic studies are used in the clinical setting to establish diagnoses, to assess prognosis and response to therapy, and to evaluate the quality of patient care.

Credit 115 units.
M60 Path 702 Laboratory Medicine Clerkship
This elective is designed to teach the student how clinical laboratory assays are used in the diagnosis of disease and to help them understand the quality assurance tools the laboratory utilizes to ensure the reliability of tests. The four-week elective includes rotations through laboratories in clinical chemistry, clinical microbiology, transfusion medicine, molecular diagnostics, and hematology. During the elective, the student will have a daily schedule that includes didactic sessions with senior staff and house staff. Particularly useful clinical skills to be acquired include morphology of peripheral blood smears and bone marrow biopsies; interpretation of coagulation tests, biomarkers of cardiac damage, and serum protein electrophoresis patterns. Also covered are the appropriate use of blood component therapy, therapeutic apheresis, and the identification of infectious organisms. Students will attend quality assurance meetings with senior staff, participate in microbiology rounds, and present case discussions during this elective. Credit 154 units.

M60 Path 750 Surgical Pathology Clerkship
This elective is designed to familiarize students with the discipline of surgical pathology and to encourage the development of basic skills in gross pathology and histopathological interpretation. The Laboratory of Surgical Pathology at Barnes-Jewish Hospital receives a broad range of medical biopsy material in addition to specimens derived from the busy surgical subspecialty practices. As a result, this elective is beneficial not only for students considering a career in pathology, but also for students planning careers in internal medicine, surgery, obstetrics-gynecology, pediatrics, radiology, radiation oncology, and dermatology. Students on this elective will (1) learn how patient specimens are received and processed, (2) acquire skills in the gross examination and microscopic diagnosis of disease through active participation and (3) learn the role of the pathologist in the preoperative, intraoperative, and postoperative care and management of patients. Students will function as junior house staff managing their own cases with supervision from residents, fellows, and attending pathologists. Students may also wish to participate in ongoing research projects within the department as time, and interest, allows. The daily schedule for students begins at 8:00 a.m. with morning conference. In general, the student will be able to complete all gross examination and sign-out activities by 4:30 p.m. to participate in any of the academic or other working activities of the division. Student time distribution: Clinical duties 85%, Conference/Lectures 15%; Major teaching responsibility: Attending staff, residents and fellows; Patients seen/weekly: N/A; On-call/weekend responsibility: None.

M60 Path 805 Autopsy Pathology
This elective is designed to introduce students to autopsy pathology. Students will assist in performing autopsies, and together with the first-year pathology residents, will participate in all of the activities of the Autopsy Service including brain cutting, specialty microscopic conferences, and weekly autopsy case conferences. Students will be under the direction of senior pathology faculty.

M60 Path 807 Dermatopathology
The student will be involved in all activities of the dermatopathology service. These include review, discussion and signout of microscopic skin specimens. Signout occurs each day with a team that includes an attending, fellow, and residents from both dermatology and pathology. The medical student will work closely with the residents and fellows on preview cases prior to signout. Dermatology Grand Rounds is held on Thursday mornings and is mandatory. In addition, dermatopathology slide review conferences are held on Friday mornings and are mandatory. Other learning opportunities include informal unknown slide sessions, weekly Inpatient Dermatology Clinicopathologic Conference and monthly Cutaneous Lymphoma Conference. The primary goal of this elective is to acquire basic competence in the diagnosis of skin diseases at the microscopic level. A secondary goal is to acquire understanding of the structure and function of the laboratory at the technical, administrative and medical professional level as it pertains to skin specimens.

M60 Path 812 General Cytopathology
This elective is designed to familiarize students with the discipline of cytopathology and to encourage the development of basic skills. Cytopathology impacts many different areas of patient care and medical practice. The Cytopathology Laboratory at Barnes-Jewish Hospital receives a broad range of medical cytopathology material involving fine needle aspiration (FNA) biopsies, body fluids, and Pap tests. As a result, the elective is beneficial for students considering a career in pathology and for students planning careers in internal medicine, surgery, OB-GYN, ENT, and radiology. The focus of the experience can be customized based on the interest of the student. Desk space and a microscope are provided. Students on the elective will learn how patient specimens are received and processed; acquire skills in the microscopic diagnosis of disease through active participation; and learn the role of the cytopathologist in the care and management of patients. Students will have the opportunity to function as junior house staff, managing their own cases with supervision from residents, fellows, and attending cytopathologists. There are textbooks and extensive study sets that permit students to focus on specific areas of interest. The daily schedule for students begins by previewing the cytology cases at 8:00 a.m. Students will attend daily pathology didactic conferences at noon. In general, the student will be able to complete sign-out activities by 4:30 p.m.

M60 Path 813 Molecular Pathology
This elective is designed to introduce students to the field of molecular pathology, including established molecular diagnostics and Next Generation Sequencing clinical assays. Students will learn through observation in the laboratory, didactic sessions, resident and fellow presentations, sign out with attending pathologists, and clinical informatics workshops. Students will work with residents/fellows on the rotation and participate as part of the team.

M60 Path 815 OB-GYN Pathology
This elective stresses the principles of anatomic pathology when applied to operative material in obstetrics and gynecology. The student will examine gross and microscopic specimens in the OB-GYN Pathology Lab and review pertinent literature with a senior pathologist. Ample time will be available for attending regular conferences in OB-GYN and Pathology.

M60 Path 820 Surgical Pathology
This elective is designed to familiarize students with the discipline of surgical pathology and to encourage the development of basic skills in gross pathology and histopathological interpretation. The Laboratory of Surgical Pathology at Barnes-Jewish Hospital receives a broad range
of medical biopsy material in addition to specimens derived from the busy surgical subspecialty practices. As a result, this elective is beneficial not only for students considering a career in pathology but also for students planning careers in internal medicine, surgery, obstetrics-gynecology, pediatrics, radiology, radiation oncology, and dermatology. Students on this elective will learn how patient specimens are received and processed; acquire skills in the gross examination and microscopic diagnosis of disease through active participation; and learn the role of the pathologist in the preoperative, intraoperative, and postoperative care and management of patients. Students will function as junior house staff, managing their own cases with supervision from residents, fellows, and attending pathologists. Students may also wish to participate in ongoing research projects within the department as time and interest allow. At the end of the rotation, students are required to do a formal case presentation for the residents, fellows, and attending staff. The daily schedule for students begins at 8:00 a.m. with morning conference. In general, the student will be able to complete all gross examination and sign-out activities by 4:30 p.m. Students are welcome to stay beyond 4:30 p.m. to participate in any of the academic or other working activities of the division.

**M60 Path 825 Introduction to Neuropathology**

The course is structured to give the student a full-time immersion in the specialty of neuropathology, including both neurosurgical and neuroautopsy-derived material. There are daily didactic sessions that cover the spectrum of neurological diseases, review gross and microscopic neuro-anatomy, discuss approaches to the diagnosis of nervous system disease, and point out the interrelationships of research to clinical problems. Multiple clinical conferences and diagnostic working sessions complement the required reading, use of a large microscopic divisional study set, and project work.

**M60 Path 860 Clinical Laboratory Medicine**

This elective is designed to teach the student how clinical laboratory assays are used in the diagnosis of disease and to understand the quality assurance tools the laboratory utilizes to assure the reliability of tests. The four-week elective includes rotations through laboratories in clinical chemistry, clinical microbiology, transfusion medicine and hematopathology. During the elective the student will have a daily schedule, which includes didactic sessions with senior staff and house staff. Particularly useful clinical skills to be acquired include: morphology of peripheral blood smears and bone marrow biopsies; interpretation of coagulation tests, biomarkers of cardiac damage and serum protein electrophoresis patterns; appropriate use of blood component therapy and therapeutic apheresis; and identification of infectious organisms. Students will attend quality assurance meetings with senior staff, participate in microbiology rounds, and present case discussions during this elective.

**M60 Path 900 Research Elective — Pathology**

Research opportunities may be available. If interested, please contact the Department of Pathology and Immunology.