WELCOME TO THE DEPARTMENT OF PATHOLOGY
AT THE MEDICAL COLLEGE OF WISCONSIN
2012 ANNUAL REPORT
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**Our Mission**

To be a national leader in the education and development of the next generation of physicians and scientists; to discover and translate new knowledge in the biomedical sciences; to provide cutting-edge, interdisciplinary and compassionate clinical care of the highest quality; to improve the health of the communities we serve.

**Pathology**

The medical science concerned with all aspects of disease with an emphasis on the essential nature, causes, and development of abnormal conditions, as well as with the structural and functional changes that result from disease processes.
To the members of the Board of Trustees, the President and CEO of the Medical College of Wisconsin, the Dean of the Medical School and Executive Vice President, the Senior Vice President and Chief Operating Officer, the Dean of the Graduate School of Biomedical Sciences, and friends of the Department of Pathology:

It is my privilege to share with you the summary of activities of the Department of Pathology & Laboratory Medicine at the Medical College of Wisconsin for the past year. The Department of Pathology remains committed to being a leading participant in the effort of the Medical College of Wisconsin to become a premiere institution in health care and medical education in the Midwest. Last year was a pivotal year for the department as we saw many of the initiatives and changes introduced during the past 4 years mature and yield their first fruits.
Service:

The scope and volume of the clinical services provided by the Pathology Department has continued to grow steadily in the past 4 years under the able direction of Dr. Steve Kroft, Vice Chair and Director of Clinical Pathology, and Dr. Eduardo Zambrano, Vice Chair and Director of Anatomic Pathology. The volume of testing in the Clinical Labs continues to increase as the menu of new tests developed by our faculty has steadily expanded. The past 4 years has seen the introduction of several new methodologies in the clinical labs, including an expanded menu of molecular testing, the introduction of MALDI-TOF mass spectrometry for rapid identification of microorganisms, as well as direct identification from culture bottles of common organisms and resistance determinants using nucleic-acid based methods in microbiology, and the introduction of eight-color flow cytometry for state-of-the-art diagnosis and characterization of hematologic disorders, including sensitive detection of minimal residual disease.

The volume of cases in surgical pathology has also continued to increase, from 21,000 accessions in 2007 to 32,000 accessions last year. The volume of consultations from outside hospitals in surgical pathology has also increased by more than 50% since 2007. Another major change that has resulted in dramatic improvement of service quality is the introduction in 2008 of subspecialty signout in surgical pathology, which has resulted in an increased level of accuracy and depth of expertise in the signout of cases, with all subspecialty areas being represented by organ systems and all cases being signed out by a specialist rather than a generalist. The subspecialty signout system has allowed our pathologists to develop into specialists in their respective areas, and to be able to acquire increased depth and greater efficiency, at the same time offering clinicians and surgeons stable and dedicated partners for the care of their patients. Currently, all cases accessioned are allocated to one of 12 subspecialty services, including: GI/liver pathology, GYN pathology, breast pathology, urologic pathology, renal and transplant pathology, head and neck pathology, thoracic pathology, endocrine pathology, dermatopathology, hematopathology, musculoskeletal pathology, and neuropathology. In addition, specialized diagnostic services in cytopathology, autopsy pathology, ophthalmic pathology, molecular pathology, pediatric pathology and forensic pathology are also offered through their respective specialized units.

Education:

The Department of Pathology continues to be a major player in the educational efforts of the Medical College. At the College level, the department has been instrumental in facilitating the transition of the new curriculum for the medical students. Through the efforts of Dr. Elizabeth Cochran, the department’s Director of the Medical Student Pathology Course, pathology faculty have been thoroughly integrated into the Discovery Curriculum at the Medical School and play a critical role in helping integrate the clinical and basic science training of the medical students. Our pathology residency training program has been expanded from its original 12 positions and is now approved for 16 residents. Under the able leadership of Dr. Steve Kroft, the program reorganized and updated its curriculum and was able to attract high-quality candidates during the past four years. Starting in 2012, Dr. Arjun Rao has taken over the role of pathology residency program director, with many changes and improvements being implemented to enhance the quality of the training experience for our residents. The department currently offers several fellowship programs, including surgical pathology, gastrointestinal and liver pathology, hematopathology and cytopathology, as well as a few subspecialty fellowships through its affiliates in blood banking (Blood Center of Wisconsin), pediatric pathology (Children’s Hospital of Wisconsin) and forensic pathology (Milwaukee Medical Examiner’s Office). The department has also been supporting the efforts of the Global Medicine Program at MCW for the last 5 years by sponsoring an International Fellowship in Anatomic Pathology to qualified candidates overseas who wish to come spend a period of time in our department to become familiarized with the level of practice at a modern academic medical institution in the USA. The department has also been offering for the past 4 years an update course (the “Midwestern Conference”), which grants 18-20 AMA CME category-I credit hours for practicing community physicians. This 3-day
course held annually in downtown Milwaukee showcases MCW department of pathology faculty as well as several nationally-recognized experts from other institutions, and provides a broad update of recent progress and problem areas in surgical pathology. The course has been very well-attended and fills a gap in the continuing medical education needs for physicians in our community, thus providing a service to our colleagues and to the maintenance of competence for pathologists in the Southeastern Wisconsin region. Finally, MCW Department of Pathology members also participate actively as faculty members and speakers at major national and international specialty meetings, presenting lectures, posters and abstracts. The department has also hosted and organized various international pathology meetings overseas, including international educational update courses and symposia in Italy, Sweden, Turkey, the Czech Republic, Israel, Ecuador and Mexico.

Research:

The department continues to develop a research infrastructure as a vital component of our efforts to increase our academic visibility at the national level. The department completed, in 2012, the creation of a Clinical and Translational Research Core Facility. The purpose of this lab is to provide an infrastructure that will allow our faculty and residents to pursue translational research by having access to the most advanced and sophisticated molecular pathology techniques. The lab is directed by Dr. A. Craig MacKinnon, M.D., Ph.D., a Board-Certified Molecular and Genetic Pathologist. The lab currently has facilities for core histology services, immunohistochemistry, molecular pathology, and newly acquired next-gen sequencing equipment which will allow us to expand the scope of our research as well as develop and offer new clinical assays for the care of our patients. The Clinical and Translational Research Core Lab has been adopted as a core lab by the Cancer Center, and is open to any researcher or faculty member at the institution who needs services for molecular testing in tissue samples. Parallel to the development of this Core Translational Research Facility, the initiative was also undertaken to develop a centralized, institutional Tissue Bank based in the pathology department. The MCW Tissue Bank was inaugurated on 2012 and is funded by a grant from the Advancing a Healthier Wisconsin Foundation. The bank has already started to accrue its first samples under a novel consenting process that will allow the institution to bank blood and tissues from patients undergoing surgery at Froedtert Hospital and to link the samples to the clinical information of the patients contained in the institution’s Clinical Data Warehouse. The bank is open to all researchers at MCW and it is hoped that it will facilitate the translational and correlative science research projects of faculty members on human tissues, particularly as it relates to cancer research. Plans are ongoing to also start collecting tissues from the Zablocki VA Medical Center. In addition to ongoing clinical and translational research by various clinical faculty members, the department is also developing a research-intensive division in collaboration with the Cancer Center. Dr. Liang Wang was recruited in 2012, and is in charge of developing a cancer genetics program in collaboration with the Cancer Center. He currently holds an RO-1 grant from the NIH to study genetic determinants of gene expression phenotypes in aggressive prostate cancer. Ongoing efforts are in progress to recruit additional funded investigators in collaboration with the Cancer Center to develop a programmatic unit in solid organ cancer research.

Summary:

The pathology department has experienced major growth and change over the past 4-5 years. Fourteen new faculty members have been recruited in the adult division alone over this period. The structure, organization and culture of the department have been gradually changing, with increased emphasis on the quality of clinical services, teaching and research. The department is poised to meet the challenges that lie ahead and feels confident that it will be able to play a significant role in helping MCW become a destination of choice for patients and students in Southeastern Wisconsin. In the following pages, I am delighted to share in more detail the accomplishments in clinical service, teaching and research by our faculty and staff for the academic year 2011-2012.

Respectfully submitted,
Saul Suster, M.D.
Professor and Chairman
New Faculty

IRENE AGUILERA-BARRANTES M.D.
Dr. Aguilera-Barrantes joined the faculty as a member of Surgical Pathology in August 2012. Before joining MCW she was an Assistant Professor in the Department of Pathology at Hospital San Juan de Dios in San Jose, Costa Rica. She completed her Anatomical and Clinical Pathology residency at Ohio State University and her fellowships in Surgical Pathology and Gynecological Pathology at M.D. Anderson Cancer Center, Houston, Texas.

PATRICK M. GARDNER M.D.
Dr. Gardner joined The Medical College of Wisconsin on May 1, 2012. He is currently the Staff Pathologist, Medical Director of the Laboratory, and Vice President of Medical Affairs at St. Joseph’s Hospital, West Bend. He completed his schooling, Pathology residency and Nuclear Medicine fellowship at the Medical College of Wisconsin.

K. KRISHNAN UNNI, M.B., B.S.
Dr. Unni joined our faculty on July 2012. Dr. Unni previously worked at the Mayo Clinic in Rochester, MN, where he was Professor of Pathology and Orthopedics and the pathologist in charge of Musculoskeletal Pathology. Dr. Unni is widely regarded as one of the top authorities in bone tumors in the world.

KIYOKO OSHIMA, M.D.
Dr. Kiyoko Oshima joined the faculty at MCW in February 2013. Dr. Oshima was an Associate Professor at Saint Louis University specializing in Gastrointestinal Pathology and Transplant Pathology including liver and kidney. She received her medical degree at Jikei University School of Medicine in Tokyo, Japan. Dr. Oshima’s responsibilities include gastrointestinal, liver and abdominal transplant pathology service work.
Division of Anatomic Pathology

Eduardo V. Zambrano, MD, MSc
Associate Professor
Director of Anatomic Pathology
Director of Musculoskeletal Pathology
The Division of Anatomic Pathology and subdivision of Surgical Pathology, under the direction of Dr. Eduardo Zambrano, together with the subdivisions of Cytopathology and Autopsy Pathology, under the directions of Dr. Arjun Rao and Dr. Elizabeth Cochran, respectively, play a major role in our patient care, educational and academic missions. The Division of Anatomic Pathology is currently in the final stages of a long process of reorganization, faculty recruitment and acquisition of state of the art equipment, which has resulted in a significant improvement in the overall quality of clinical service. Among the new equipment which has been recently purchased is a bar coding tracking system for surgical pathology specimens which will eliminate potential errors due to mislabeling of cassettes and/or slides; three new H&E stainers with single slide staining and bar coding capabilities, which will eliminate tissue carry-over (“floaters”) while allowing real time tracking of staining process for every single case and slide; and a digital voice recognition dictation system, which will eliminate errors due to third-party transcription, while dramatically decreasing turnaround time of surgical pathology reports. At the teaching level, reorganization of the residency and fellowship programs and recruitment of highly qualified candidates have resulted in an overall increase in the quality of resident training in diagnostic anatomic pathology. We currently offer fellowship training in Cytopathology, Hematopathology, and Gastrointestinal Pathology, and a new Surgical Pathology fellowship training program will be launched in July, 2013. Our residents have consistently been able to obtain fellowship positions in their top choice programs, which rank among the best training fellowship programs around the country.
NEUROPATHOLOGY

The Division of Neuropathology in the Department of Pathology at the Medical College of Wisconsin, under the direction of Dr. Elizabeth J. Cochran, is focused primarily on the provision of excellent and up-to-date diagnostic evaluation of all nervous system biopsies, resections, or autopsies. The division is committed to working with the departmental molecular laboratory in the development of relevant molecular analysis of primary brain tumors, an area of rapid research progress in recent years. To that end, two molecular tests critical for planning of therapy and predictive of prognosis for brain tumors are currently available for diagnostic use and development of additional testing is planned.

With Dr. Cochran’s experience and expertise in the evaluation of brain autopsies from patients with dementia, the division is also working with Dynacare Laboratories to provide the opportunity for autopsy diagnosis of patients with clinically diagnosed dementia to the community of Southeastern Wisconsin.

KEY STATS: CASES

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<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td>Total Neuropathology Cases</td>
<td>418</td>
<td>343</td>
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</table>

THORACIC PATHOLOGY

The Division of Thoracic Pathology, under Dr. Arjun Rao provides high quality diagnostic services to the divisions of thoracic surgery and pulmonary medicine. Our goal is excellent patient care with the provision of diagnostic services and participation in various multidisciplinary conferences and tumor boards. With the newer developments in thoracic oncology, there is an emphasis on accurate diagnosis and typing of lung carcinoma based on small biopsies obtained by minimally invasive techniques. The division collaborates with the departmental clinical translational research laboratory to further test tissue samples for molecular alterations that play significant roles in guiding treatment. These clinical collaborations are leading to research efforts encompassing the spectrum of thoracic oncology. Our teaching efforts are directed at imparting education and training not only to trainees in pathology, but also to pulmonary medicine and radiology residents and fellows.

KEY STATS: CASES

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<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Thoracic Cases</td>
<td>622</td>
<td>648</td>
<td></td>
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</tbody>
</table>

GASTROINTESTINAL & LIVER PATHOLOGY

Under the direction of Drs. Richard Komorowski and Kiyoko Oshima a variety of benign, pre-neoplastic and neoplastic conditions that involve the GI tract, are routinely assessed. GI pathologists make the diagnoses for all of endoscopic biopsies. Also large resections of upper and lower gastrointestinal tract are read by the GI pathologists. There is an active pancreatobiliary and liver service at MCW, and the GI pathologist renders the diagnosis for pancreatobiliary and liver of fine needle aspirations, biopsies and resections including liver transplantation.

KEY STATS: CASES

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GI &amp; Liver Cases</td>
<td>7,673</td>
<td>7,560</td>
<td></td>
</tr>
</tbody>
</table>

UROLOGIC PATHOLOGY

Under Dr. Arjun Rao’s direction, the division of Urologic Pathology provides high quality diagnostic services to the division of urology. Our goal is excellent patient care with the provision of diagnostic services and participation in various multidisciplinary conferences and tumor boards. While all areas of urologic pathology are represented in our case mix, significant areas include prostate and kidney cancer. Our consultation service for prostate cancer patients who have biopsies taken elsewhere, and choose to come here for further treatment, is particularly strong. We have recently instituted a collaboration between the division of urology and the department tissue bank to set up and activate a bio-repository of tissues obtained from patients with all types of urological malignancy for use in current and future research. Our teaching efforts are directed at imparting education and
training not only to trainees in pathology, but also to residents in urology.

**KEY STATS: CASES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Urologic Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,236</td>
</tr>
<tr>
<td>2011</td>
<td>1,192</td>
</tr>
</tbody>
</table>

**GYNECOLOGIC PATHOLOGY**

The Division of Gynecologic Pathology includes Drs. Behnaz Behmaram, Zainab Basir and Irene Aguilera-Barrantes and continues to provide diagnostic assistance to constantly expanding gynecological and oncologic services. The faculty members of the Division work closely with general OB-GYN and the GYN oncologists. GYN pathology varies from benign conditions, precancerous (cervical dysplasia) and malignant process (vulvar, cervical, uterine, and ovarian cancer).

Participation in activities of the Gynecologic Oncology Group is a vital part of the work of our Division. Biannual GOG meetings are an essential educational instrument providing the newest data related to diagnostic approaches and classification of neoplastic diseases in gynecological practice. Future initiatives include further expansion of research activity and tissue banking in collaboration with gynecologic and oncologic faculty.

**KEY STATS: CASES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total GYN Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>4,943</td>
</tr>
<tr>
<td>2011</td>
<td>5,134</td>
</tr>
</tbody>
</table>

**MUSCULOSKELETAL PATHOLOGY**

Musculoskeletal pathology, under the direction of Dr. Eduardo Zambrano, is involved in the evaluation of diseases that affect bones and soft tissues. The service supports the musculoskeletal oncology program on campus, one of the premier clinical oncology services housed at Frodert Hospital/MCW. The unit is supported by stat-of-the-art immunohistochemical and molecular testing and counts with one of the leading bone tumor experts in the world, Dr. Krishnan Unni.

**KEY STATS: CASES**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Musculoskeletal Cases</th>
</tr>
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<tbody>
<tr>
<td>2010</td>
<td>697</td>
</tr>
<tr>
<td>2011</td>
<td>687</td>
</tr>
</tbody>
</table>

**DERMATOPATHOLOGY**

Under the direction of Dr Jose A. Plaza, our dermatopathology services offers expert skin biopsy interpretation and consultation in the diagnosis of benign and malignant dermatologic diseases. We utilize the most advanced technologies available including light microscopy, immunohistochemistry, immunofluorescence and molecular tests. Our goal is to deliver expert interpretation in dermatopathology.
HEMATOPATHOLOGY

The Hematopathology program, under the direction of Steven Kroft MD with assistance from Drs. Horatiu Olteanu and Alexandra Harrington, encompasses the study of disorders of hematopoietic and lymphoid tissues, usually localized in blood, bone marrow, lymph nodes or spleen. These include benign and malignant disorders as diverse as congenital disorders of red blood cells and leukocytes, acute leukemias, myelodysplastic and myeloproliferative neoplasms, chronic lymphoid leukemias, reactive lymphadenopathies and leukocyte disorders, and many types of non-Hodgkin and Hodgkin lymphomas. Diagnoses in hematopathology often require careful integration of microscopic findings with clinical, immunophenotypic, and molecular data in order to arrive at the appropriate diagnosis and effectively guide therapy.

ENDOCRINE PATHOLOGY

Under the direction of Dr. Saul Suster, Endocrine pathology serves the need of the members of our Endocrinology Division of Internal Medicine and our endocrine surgeons. Endocrine pathology comprises the study of a family of organs and tissues involved in the production of hormones that regulate physiologic processes in the body. These include the pituitary (hypophysis), parathyroid glands, thyroid gland, adrenal glands, and the endocrine portion of the pancreas. A variety of benign and neoplastic conditions can occur that can lead to malfunction of these organs, requiring histologic assessment for correct diagnosis.

RENAL PATHOLOGY

Renal pathology is a subspecialty of anatomic pathology that deals with the diagnosis and characterization of non-tumor (medical diseases, including transplanted kidney diseases) of the kidneys. Renal pathologists work closely with nephrologists, transplant surgeons and urologists, who typically obtain diagnostic specimens via percutaneous renal biopsy and nephrectomy. In non-tumor kidney disease tissue, the renal pathologist must synthesize findings from light microscopy, electron microscopy, and immunofluorescence with clinical information to obtain a definitive diagnosis.
HEAD & NECK PATHOLOGY

Under the direction of Dr. Bryan Hunt, Head & Neck pathology involves the study of many pathologically diverse areas including the oral cavity, larynx, nasal cavity, paranasal sinuses, jaw, facial bones, neck, eyes, ears, and salivary glands. Therefore, this is a subspecialty that requires an understanding of the wide range of both benign and malignant pathologic entities that can involve skin, squamous mucosa, respiratory mucosa, nervous system, soft tissue, bone, eyes, paraganglia, salivary glands, and teeth.

KEY STATS: CASES

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Head &amp; Neck Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,351</td>
</tr>
<tr>
<td>2011</td>
<td>1,637</td>
</tr>
<tr>
<td>2012</td>
<td>1,637</td>
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</tbody>
</table>
AUTOPSY PATHOLOGY

The mission of the Autopsy Division in the Department of Pathology at the Medical College of Wisconsin is to: 1) provide accurate and timely autopsy evaluations for families and clinicians of Froedtert and Community Memorial Hospitals; and 2) teach pathology residents how to competently perform an autopsy.

In the last three years, Dr. Elizabeth Cochran, director of the autopsy service, has focused upon implementation of standard autopsy procedures, reorganization and stream-lining of autopsy reports, and improvements in availability of photographic capability and computer access in the autopsy room. This has resulted in improved overall quality and turnaround time of autopsy performance and autopsy reports, respectively.

On the service, there is a consistent focus on maximizing resident education. To this end, Dr. Cochran is involved in each part of the autopsy process, from the initial dissection, to the microscopic examination, and the critical clinical-pathologic correlation in the final report.

In the past year, the clinical-pathologic conference with the Department of Internal Medicine has been revitalized. It is now a formal conference with presentations of clinical history and course by Internal Medicine residents, and autopsy findings and a didactic presentation by Pathology residents. This conference serves to improve pathology resident presentation abilities and knowledge, and demonstrates the continued importance of autopsy as a quality parameter.

HISTOLOGY

The Histology Department under the medical direction of Dr. Eduardo Zambrano serves a critical role in patient care at Froedtert Hospital / MCW by providing expert services in the processing and preparation of histologic tissue sections for the pathologists. The Histology Lab is also responsible for performing the various special stains received for diagnosis, including standard histochemical stains and the more specialized immunohistochemical stains. The histology lab has recently undergone a massive upgrading of its facilities, with the purchase of state-of-the-art mechanical grossing stations individually equipped with high resolution digital photography cameras and digital voice recognition dictation systems, a complete renovation of the frozen-section suite with real-time audiovisual connectivity with the operating rooms and purchase of a new bar-coded tracking system to prevent labeling errors. In addition, the lab has recently acquired three new state-of-the-art automated stainers with bar-coding capabilities that provide high resolution H&E staining of individual glass slides, eliminating potential contamination with tissue “floaters” (carry-overs) that are occasionally seen with traditional “dip-and-dunk” stainers. The Histology laboratory currently offers more than 210 immunohistochemical and special histochemical stains for clinical use.
The Division of Cytopathology, under the direction of Dr. R Nagarjun (Arjun) Rao, plays a major role in our mission. The division is at the cutting edge of diagnostic services in several areas, especially cancer diagnosis. It plays a crucial role in supporting the mission of the cancer center in areas as diverse as head and neck, thoracic, breast, GYN and pancreaticobiliary oncology. Various measures have been instituted to improve performance, of which noteworthy are the establishment of a daily peer review conference in cytopathology which serves as a great quality assurance/control and teaching tool; and a greater degree of cytopathologist support for immediate adequacy evaluation and triaging of cytopathology specimens. In an era where biopsies are increasingly obtained by minimally invasive procedures, it is vital that great attention is paid to immediate evaluation and triaging to obtain maximal diagnostic, prognostic and predictive information from these small biopsies. Our turnaround time is now consistently at 24 to 48 hours for greater than 90% of non-GYN specimens. The fellowship program has, and continues to provide, robust, comprehensive diagnostic cytopathology training to our fellows who have consistently had high pass rates in the Board examinations and have graduated to go into both community and academic practices. The institution of, and close collaboration with, the molecular pathology laboratory, has provided greater academic opportunities for our fellows. Restructuring of the residency curriculum has meant that the residents are now exposed to cytopathology early during the second year, allowing for better foundations, and the ability to apply for competitive fellowships earlier in residency training.

### KEY STATS: CASES

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td><strong>Assisted Fine Needle Aspiration</strong></td>
<td>851</td>
<td>878</td>
<td></td>
</tr>
<tr>
<td><strong>Unassisted Fine Needle Aspiration</strong></td>
<td>933</td>
<td>970</td>
<td></td>
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<tr>
<td><strong>Non-Gynecologic Specimens</strong></td>
<td>6,186</td>
<td>6,537</td>
<td></td>
</tr>
<tr>
<td><strong>Gynecologic Specimens</strong></td>
<td>54,466</td>
<td>48,846</td>
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Clinical Pathology, also sometimes referred to as Laboratory Medicine, is involved with the analysis of blood, body fluids, and tissues using chemical, hematologic, immunologic, microbiologic, genetic, and molecular methodologies. It is distinguished from anatomic pathology, which is primarily concerned with the diagnosis of disease by histopathologic analysis of tissue specimens. The Division of Clinical Pathology at the Medical College of Wisconsin, under the direction of Steven H. Kroft, MD, encompasses the disciplines of Clinical Chemistry, Coagulation, Cytogenetics, Flow Cytometry, Hematology/Hematopathology, Microbiology, Molecular Diagnostics, and Transfusion Medicine. MCW clinical pathologists and PhD Clinical Laboratory Scientists provide medical oversight of the testing programs in all of these areas in Dynacare Laboratories, Milwaukee. Dynacare performs approximately 8 million clinical laboratory tests annually, serving Froedtert Hospital and other healthcare providers and facilities in the region. In partnership with the highly skilled laboratory professionals who perform actual testing in the laboratory, the members of the Division of Clinical Pathology ensure the provision of accurate and timely laboratory results, in order to allow our clinical colleagues to provide the best possible care to our patients. Clinical Pathologists and Clinical Laboratory scientists are also active members of healthcare delivery teams, providing consultative services to help clinicians choose the appropriate tests and interpret results.
COAGULATION LAB

The Clinical Coagulation Laboratory at Dynacare Laboratories, under the direction of Dr. Alexandra Harrington, MD, MT (ASCP), offers routine and specialty coagulation services for Froedtert Memorial Lutheran Hospital/Medical College of Wisconsin and surrounding inpatient and outpatient facilities. Over the last year, the lab has focused heavily on investigating and controlling pre-analytical variables in coagulation testing and the influence of new anticoagulants on routine coagulation assays. The laboratory is currently working on increasing the test menu and developing a coagulation laboratory patient service.

The Clinical Coagulation Laboratory works closely with physicians from Froedtert Memorial Lutheran Hospital, the BloodCenter of Wisconsin and Childrens’ Hospital of Wisconsin to provide quality patient care in the work-up of complex hemostasis disorders and teach pathology trainees. Our laboratory has an emphasis on education with rotating pathology residents and hematopathology fellows participating in interpretation of coagulation tests, quality improvements projects, and daily instruction on complex coagulation topics.

KEY STATS: CASES

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
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<tbody>
<tr>
<td>Hypercoagulability Molecular Panel</td>
<td>840</td>
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<tr>
<td>PT</td>
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<td></td>
</tr>
<tr>
<td>Factor Assays</td>
<td>700</td>
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</tr>
<tr>
<td>Lupus Anticoagulant Panels</td>
<td>1,200</td>
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<tr>
<td><strong>Totals</strong></td>
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</table>
HEMATOPATHOLOGY LAB

The section of Hematopathology, under the direction of Steven H. Kroft, MD, strives for excellence in patient care, teaching, and clinical and translational research. Our busy clinical service provides integrated reporting designed to provide summative interpretations with rapid turnaround time, in order to allow our oncologists to offer individualized, timely care to their patients. Our hematopathology interpretations are anchored on a cutting edge flow cytometry service, which employs routine 8-color (10-parameter) clinical analyses. We offer advanced flow cytometry studies, including minimal residual disease analysis, immunophenotypic assessment for myelodysplasia, and sophisticated evaluation of T-cell and NK-cell proliferations.

Research in the hematopathology section focuses on practical diagnostic and clinical questions, in particular the application of ancillary techniques to real-life patient care issues. We present numerous abstracts annually at major scientific meetings, publish our work in widely respected journals, and are active in national continuing medical education programs for practicing pathologists. This has led to recognition of our hematopathology program as a center of excellence both locally and nationally.

The resident curriculum in hematopathology strives to provide broad-based training in the laboratory approach to diagnosis of hematologic disorders, both benign and malignant. A multimodality approach is stressed, with incorporation of information from multiple sources, including clinical, hematologic, cytogenetic, flow cytometric, and molecular data. We offer a very competitive, one-year ACGME accredited fellowship program in hematopathology which provides in-depth training based on the same philosophy employed for our resident curriculum. Recently graduated fellows are on faculty at the Moffitt Cancer Center, the University of Tennessee, the Marshall University Joan C. Edwards School of Medicine, and the Medical College of Wisconsin.

KEY STATS: CASES

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBCs</td>
<td>360,000</td>
<td></td>
<td>360,000</td>
</tr>
<tr>
<td>Bone Marrows</td>
<td>1,130</td>
<td></td>
<td>1,130</td>
</tr>
<tr>
<td>Body Fluid / Peripheral Blood Path Reviews</td>
<td>6,300</td>
<td></td>
<td>6,300</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>93,000</td>
<td></td>
<td>93,000</td>
</tr>
</tbody>
</table>
CYTOGENETICS LAB

The Clinical Cytogenetics Laboratory, under the direction of Dr. Peter vanTuinen, provides a full range of cytogenetic, fluorescent in situ hybridization (FISH) and DNA diagnostic testing for congenital disorders, mental retardation, prenatal testing, leukemia, lymphoma, and solid tumors. We continue to serve the entire Froedtert system as well as Children’s Hospital of Wisconsin (CHW), the Veterans Administration and many other smaller hospitals. Physicians from all locations know they can discuss issues with the Director and have commented that they get prompt assistance from the staff in our lab concerning Lab orders.

We participate in rotations of Pathology Residents, Hematopathology Fellows, Hematology-Oncology fellows from CHW, Students in the Women’s month-long Health Elective, visiting observers, and welcome those interested to spend time in the lab. The Director participates in weekly Heme-Onc conference, monthly Clinical Genetics rounds at CHW, and the entire lab convenes for a monthly Cytogenetics Case Exchange via the Web with Cytogenetics Labs in Madison, Boston, Marshfield and U. of Chicago. Our lab initiated the Case Exchange, which has garnered national interest as a forum for Cytogenetics abnormal case and issues discussion and education. It is an accredited CME activity, and recently attracted interest on the part of the Association for Professors of Human and Medical Genetics and the American Society of Human Genetics, the latter from which we hope to get support to expand this program to a wider national audience.

We have expanded our service to research efforts on this campus, by serving as a virtual “core lab” in establishing tissue cultures on specimens, performing cryopreservation for future studies, and conducting cytogenetic analysis. In this capacity we serve several investigators at the Children’s Research Institute and the Translational Research facility at MCW.

A major effort in late 2012-early 2013 will be directed to developing genomic microarray analysis as an adjunct to conventional cytogenetic and FISH analysis. This technology renders higher resolution genomic analysis than current traditional techniques. This is already established as an important technology in labs such as ours, and will be an important enhancement of our services rendered to Ob-Gyn, especially in the areas of prenatal diagnosis and analysis of pregnancy loss. Applications in oncology will likely follow as well.

<table>
<thead>
<tr>
<th>Key Stats: Cases</th>
<th>2010</th>
<th>2011</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Samples</td>
<td>4,188</td>
<td>4,499</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Tests</td>
<td>9,201</td>
<td>10,149</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FLOW CYTOMETRY LAB

The Section of Clinical Flow Cytometry, under the Direction of Dr. Olteanu, is an essential component of the Division of Clinical Pathology in supporting the departmental and institutional goals of patient care and education. This area of the laboratory is providing diagnostic services, which support the Division of Hematology and Oncology in providing high quality patient care. In the past 5 years, the clinical flow cytometry laboratory has experienced a tremendous growth in testing volume, sustaining an average 10% increase of leukemia / lymphoma cases per year. In addition, the laboratory has transitioned from 4-color to 8-color flow cytometry testing, which is particularly useful in providing more detailed diagnostic information derived from limited specimens and uses less antibodies, thus contributing to a decrease in operating costs. Our clinical flow cytometry laboratory was the first one in the state of Wisconsin to offer 8-color flow cytometry testing. For the future, we plan on expanding our testing menu and adding additional instrumentation and personnel, as part of our mission to continue supporting the MCW Cancer Center and its programs.

At the teaching level, flow cytometry is an integral part of Hematopathology fellowship training. The successful recruitment of highly qualified individuals in the past 5 years has resulted in an overall increase in the quality of postgraduate training in the Department of Pathology, and 80% of the graduates of our program have accepted academic appointments, thus leading to increased national visibility of the fellowship. For the future, we plan on continuing providing the same high level of training to our fellows, centered on ACGME core competencies, as we prepare for transitioning to the “Next Accreditation System” in graduate medical education.

KEY STATS: CASES

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemia / Lymphoma</td>
<td>1,933</td>
<td>2,177</td>
<td></td>
</tr>
</tbody>
</table>

Immunophenotypic Stability of Sezary Cells by Flow Cytometry

James Vaughan, MD; Alexander M. Harrington, MD; Steven H. Kraft, MD; Holstad Olteanu, MD, PhD
Department of Pathology, Medical College of Wisconsin, Milwaukee, WI
MICROBIOLOGY AND MOLECULAR DIAGNOSTICS LAB

The Microbiology and Molecular Diagnostics department, under the direction of Dr. Nathan Ledeboer and Dr. Blake Buchan, utilizes cutting edge methods and technology to provide accurate and timely patient care. The department has successfully incorporated a number of molecular diagnostic tests to greatly improve analytic sensitivity and specificity, as well as turnaround time for result reporting. We are leaders in bringing in new tests, averaging 6 new test additions versus the national average of 2 tests per year.

We are leaders in infectious disease molecular testing for transplant patients, helping to monitor disease states that can be rapidly devastating to transplant patients. We also provide highly sensitive testing with optimal turnaround time to help monitor patients with HIV and Hepatitis B and C. For respiratory testing, we provide cutting edge technology for influenza and other important respiratory pathogens. During the 2009 H1N1 Influenza outbreak, we were the only laboratory in the state that kept up with testing demands without compromising turnaround time. Most recently, a molecular assay for the detection of Gram-positive organisms directly from positive blood cultures was added to the test menu. This decreased the time to organism identification from 1-3 days to 2 hours, providing physicians with targeted guidance for patient treatment.

In the area of Microbiology, we are leaders in the use of Matrix Assisted Laser Desorption Ionization-Time of Flight (MALDI-TOF) mass spectrometry for organism identification. We were one of the first laboratories to use MALDI-TOF as our primary identification method for yeast. We are currently using it for aerobic organism identifications and are finalizing our validations for anaerobes, mycobacteria, and filamentous fungi. This technology completely changes the face of Microbiology. As an example, yeast identifications required 24-72 hours. With MALDI-TOF, we can have a highly accurate identification within 10 minutes.

The department is also adding specimen processing automation to increase productivity and consistency, while decreasing ergonomic fatigue and hands on time. This will also provide the flexibility to more efficiently utilize staff for technical procedures. Our goal in this area is to add on to this system to ultimately include a full line automation of microbiology cultures.

KEY STATS: TESTS

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>126,919</td>
</tr>
<tr>
<td>2011</td>
<td>139,600</td>
</tr>
</tbody>
</table>
**CLINICAL CHEMISTRY AND TOXICOLOGY LAB**

The Dynacare Chemistry Lab at Froedtert/MCW provides routine and advanced testing services to the Hospital inpatient and outpatient population as well as for outreach clients throughout southeastern Wisconsin and northern Illinois utilizing a fully automated processing and testing platform. The Core Chemistry Lab processes nearly 7.5 million tests annually and provides approximately 200 different test assays. The lab recently implemented the Roche MPA (modular pre-analytics) front-end automation equipment, a robotic processing unit that increases productivity and throughput and serves to standardize processes, reduce turn-around-time, and eliminate human processing errors. Special Chemistry and Toxicology provides services for confirmatory drug testing, HIV, hepatitis, protein electrophoresis, and other specialized tests. Our Toxicology Lab has a full line of confirmatory drug testing and utilizes Tandem Mass Spectroscopy (TMS) technology for high-sensitivity immunosuppressant drug monitoring for transplant and cancer patients, drugs of abuse confirmation, and drugs for pain management. This technology provides increased low-end sensitivity results over more conventional methods.

<table>
<thead>
<tr>
<th>Test</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicarb</td>
<td>446,349</td>
<td>454,650</td>
<td></td>
</tr>
<tr>
<td>Bun</td>
<td>450,071</td>
<td>458,476</td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>446,649</td>
<td>454,913</td>
<td></td>
</tr>
<tr>
<td>Creatinine</td>
<td>462,788</td>
<td>472,338</td>
<td></td>
</tr>
<tr>
<td>Glucose</td>
<td>479,335</td>
<td>497,941</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>458,386</td>
<td>466,757</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>454,481</td>
<td>458,908</td>
<td></td>
</tr>
</tbody>
</table>
TRANSFUSION MEDICINE

The Transfusion Medicine Division, under the direction of Dr. Jerome Gottschall, serves a major role in our clinical labs. The major focus of the Transfusion Medicine Section is to provide medical oversight for the transfusion service of Dynacare Laboratories serving Froedtert Hospital. In addition, there is significant focus in clinical research and in the education of fellows, residents and medical students. There were three major goals in the department this year. The first was to implement automation in the Transfusion Service. The Transfusion Service implemented the ECHO system for antibody screening and antibody detection for red cell antibodies. This implementation went extremely well. The second major focus involves the development of a formal blood management program. This is to ensure best practices in the transfusion of all blood products. In support of this project, leaders within the hospital interested in blood transfusion practices have been engaged and supportive. New guidelines for transfusion have been developed and implementation of these guidelines into the new hospital EPIC medical record system has been accomplished. Evaluation of a computer system to provide data on individual and department transfusion practices in the hospital is started and this will be critical for the blood management program. Another goal that was successfully implemented was the updated requirements for ordering of blood products and support of Therapeutic Apheresis Program in the new EPIC medical record system. This has gone reasonably well. The Transfusion Medicine Section continues to participate in the National Biovigilance Program implemented by the CDC and AABB designed to capture data on transfusion practices and adverse events across the country. The section was one of the leaders nationally in the implementation of this program several years ago.

The Transfusion Medicine Section is heavily involved in the education of fellows, residents and medical students. In September of this year, another Transfusion Medicine fellow completed her fellowship training. She completed a research project related to iron levels in blood donors and presented her findings at two national meetings. She did very well in her training and will stay on as member of the faculty of BloodCenter of Wisconsin. Training continues for all residents in the Pathology Residency program. In addition, the Transfusion Medicine Section provides one-month of training for all fellows in the Hematology/Oncology Adult and Pediatric program. Each year there are between 10-16 medical students who spend a month’s rotation on the Transfusion Medicine Section. This has been a very popular rotation for medical students and provides valuable education for those interested in transfusion practices at the medical student level.

The major focus of research in the department involves Dr. Gottschall’s involvement in a NIH-supported research contract in Blood Banking/Transfusion Medicine that has as its goals improvement in donor management practices and recipient outcomes. This is a seven-year contract that began in 2012 and runs until 2018. The Transfusion Medicine Section and Froedtert Hospital are key participants in this multi-institutional research program. One of the major aspects of this research program is the development of a recipient database on all patients who receive a blood transfusion over the next four years. In addition, several other studies will be done at Froedtert Hospital as part of this research program.
KEY STATS: PRODUCTS TRANSFUSED

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Blood Cells</td>
<td>16,639</td>
<td>19,464</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autologous RBC</td>
<td>35</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Blood</td>
<td>34</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets</td>
<td>5,206</td>
<td>5,463</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh Frozen Plasma</td>
<td>4,785</td>
<td>4,755</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>2,039</td>
<td>3,347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Granulocytes</td>
<td>10</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>28,748</strong></td>
<td><strong>33,136</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KEY STATS: LABORATORY TESTS

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABO/Rh</td>
<td>26,683</td>
<td>27,996</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibody Screen</td>
<td>25,683</td>
<td>27,240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crossmatch</td>
<td>26,028</td>
<td>29,030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Coombs - Adult</td>
<td>1,227</td>
<td>1,342</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Coombs - Newborn</td>
<td>1,894</td>
<td>1,871</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibody Panel</td>
<td>941</td>
<td>1,018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibody Titer</td>
<td>103</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elution</td>
<td>150</td>
<td>277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fetal Screen</td>
<td>182</td>
<td>147</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dleihauer-Betke</td>
<td>71</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irradiations</td>
<td>7,802</td>
<td>7,833</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>90,764</strong></td>
<td><strong>96,883</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Clinical and Translational Research Core Lab, under the direction of Dr. Alexander Craig Mackinnon, MD, PhD, plays a critical role in the science, teaching and research efforts of the department. The CTRL provides basic histopathology, research immunohistochemistry, tissue microarray, laser capture microdissection, and molecular biology services to researchers at the Medical College of Wisconsin and within the surrounding academic community. The CTRL is located on the 1st Floor of the Froedtert Memorial Lutheran Hospital in room 1184.

The CTRL combines two major components in one lab: histopathology and molecular pathology. The histopathology services include: tissue processing, embedding, and cutting both paraffin-embedded and frozen tissue. The CTRL performs standard stains, immunohistochemistry, antibody workup, and in situ hybridization. Tissue microarrays are constructed using a Veridiam VT110C. Digital imaging includes the ACIS III (DAKO), Visiopharm, and Nanozoomer (Hamamatsu). Specialized software is available to image and analyze tissue microarrays, and to manage and store array data.

The molecular services include: nucleic acid extraction from tissues (fresh, frozen, blood, formalin fixed paraffin embedded), nucleic acid quantification, PCR, real time PCR, quantitative PCR, dideoxy sequencing, pyrosequencing, capillary electrophoresis, gel electrophoresis, digital electrophoresis, microarray analysis (Agilent format), and massively parallel DNA and RNA sequencing.
PERSONNEL

Dr. Alexander C. Mackinnon, Jr., M.D., Ph.D., Director (amackinnon@mcw.edu) is certified by the American Board of Pathology in Anatomical Pathology and Molecular Genetic Pathology.

Dr. Xiuxu Chen, Ph.D., (xichen@mcw.edu) is a research scientist who specializes in pathological analysis, tissue culture techniques, tissue microarray design, digital image analysis, statistics, and in situ hybridization. He can be reached at 414-805-1530

Dr. Min Le, Ph.D. (mle@mcw.edu) is the supervisor of molecular diagnostics and molecular biology. She can be reached at 414-805-1548.

Ms. Deyanka Ogrizovic (dogrizov@mcw.edu) is the lab administrator. She can be reached at 414-805-1524.

Ms. Kathryn Stoll, HT(ASCP) (kstoll@mcw.edu) is a histotechnologist who develops and validates immunohistochemistry and special staining protocols. She can be reached at 414-805-1525

Stephen Milligan, Ph.D., (smilligan@mcw.edu) molecular diagnostics

Laurie Popp, HT(ASCP), (lpopp@mw.edu) histology technologist

Kala Schilter, Ph.D., Sherry Wadina Postdoctoral Fellowship in Sarcoma Research (jointly funded position by Departments of Surgery and Pathology)

HISTOLOGY SERVICES AND EQUIPMENT

- Gross description and analysis of tissue specimens
- Gross dissection of specimens (MOPEC)
- Slide printer with barcoding (ThermoSlidemate)
- Cassette printer with barcoding (ThermoPrintmate)
- Tissue processing (Sakura VIP6)
- Tissue paraffin embedding (Sakura TEK6)
- Tissue sectioning to make slides (Thermo HM 355S)
- Frozen sections (Thermo HM 525)
- Slide staining (Leica Autostainer)
- Immunohistochemical analysis (DAKO Autostainer XL)
- Immunofluorescence (Olympus BX61)
- Special staining
- Tissue microarray construction (Veridiam)
- Quantitative image analysis (DAKO ACIS III)
- Laser capture microscopy (Arcturus)
- Pathological interpretation
- Tumor identification

The histology activities are performed by an HT(ASCP) certified histology technologist with twenty years of histology experience. The molecular activities are performed by a Ph.D. level scientist with approximately 27 years of research experience, of which 11 years are focused exclusively on molecular diagnostics

MOLECULAR CORE LAB

- Nucleic acid purification (Qiagen BioRobot EZ1)
- Nucleic acid quantification (Nanodrop; Qbit)
- Agilent Bioanalyzer
- PCR (ABI Veriti)
- Real time PCR (Lightcycler; ABI 7500)
- Reverse transcriptase PCR
- Quantitative PCR (Lightcycler; ABI 7500)
- Dideoxy sequencing (ABI 3500)
- Pyrosequencing (Biotage PSQ 96MA)
- DNA fragment analysis (ABI 3500)
- DNA microarray analysis (Innopsys Scanner)
- Ozone-free working environment (SciGene)
- Gene expression microarray analysis (Innopsys)
- Gel electrophoresis (Agarose, acrylamide)
- Fluorescence in situ hybridization (FISH)
- Next Generation Sequencing (Ion Torrent PGM)

CLINICAL MOLECULAR ASSAYS

The CTRL offers clinical molecular diagnostic testing for routine patient care, clinical trials, and research. The CTRL is in varying states of active development of molecular-based clinical assays as well. The following table summarized this.

<table>
<thead>
<tr>
<th>Targets</th>
<th>Application</th>
<th>Sample type</th>
<th>Nucleic acid</th>
<th>PCR</th>
<th>Analysis Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGFR, exons 18-21</td>
<td>Lung Cancer</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Sequencing</td>
</tr>
<tr>
<td>KRAS,codon 12/13</td>
<td>Lung, GI, Thyroid</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
<tr>
<td>KRAS,Codon 61</td>
<td>GI, Thyroid</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
<tr>
<td>HRAS,Codon 61</td>
<td>GI, Thyroid</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
<tr>
<td>NRAS,Codon 61</td>
<td>GI, Thyroid, Melanoma</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
<tr>
<td>RET-PTC1</td>
<td>Thyroid</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
<tr>
<td>RET-PTC3</td>
<td>Thyroid</td>
<td>FFPE</td>
<td>DNA</td>
<td>Lab developed</td>
<td>Real time PCR and sequencing</td>
</tr>
</tbody>
</table>
QUALITY ASSURANCE/ QUALITY CONTROL

All samples in the CTRL are initially inspected by a board certified pathologist- typically Dr. Mackinnon or another member of the Department of Pathology at MCW. This is the initial step in the CTRL’s quality assurance (QA) program. Depending upon the downstream application, the sample is further analyzed and specific areas of the specimen are identified and labeled as needed. For example, if an investigator requires microdissection of tumor-rich areas of a specimen, the samples is examined by a board certified pathologist, and appropriate, tumor-rich regions of the specimen are identified and marked. These areas are then isolated either manually or with the assistance of a specialized microscope equipped to perform laser capture microscopy. All samples are subsequently analyzed to ensure that the designated region of interest was in fact isolated.

All samples are accessioned, processed, analyzed, and stored in accordance with conventional laboratory procedures as put forth by the Clinical Laboratory Improvement Amendment (CLIA) of 1988.

GOALS FOR 2013-2014

INCREASED CLINICAL TESTING The CTRL will validate several new assays this year and in FY2013-2014. These include:

- IDH1 (validated),
- thyroid FNA and FFPE panel (work in progress)
- lung cancer panel (EGFR, ROS1, RET1, ALK; work in progress)
- BRAF V600E IHC
- T Cell Receptor Gene Rearrangement analysis
- colon cancer panel (MSI, KRAS, BRAF; validated)

The CTRL supports a clinical trial for the department of surgery. In 2012, approximately 49 cases were profiled. At the beginning of 2012, each case consisted of 6 IHC markers. This number has been expanded to 11. The source of specimen is FNA pancreatic aspirates in which the cell block is made in the CTRL and subsequent pancretectomy specimens. Dr Evans has recruited the University of Cincinnati as a referral center. This will increase the number of samples that the CTRL profiles. The clinical trial will help to elevate the status of MCW and the CTRL/Department of Pathology at a regional and potentially national level. It also provides an impetus to develop cost efficient, high quality clinical lab practices.

Development of NextGenSeq Functions. The CTRL will offer NGS services to the MCW community beginning May, 2013. As a second utilization of this technology, the CTRL will also begin to develop a personalized medicine program in which a patient’s sample will be analyzed for multiple clinically-actionable biomarkers. The goal is to position the CTRL in a strategic position to play a leading role in advanced genomic medicine. Efforts are underway to lay the ground work for this initiative. This includes: defining a testing strategy (gene expression profiling, mutation analysis), identifying clinical collaborators (Dr William Bradley OB/GYN, Dr Doug Evans Surgery), and presenting the proposed plan to colleagues for feedback (MSK group, Surgical oncology group), etc.

Implementation of a new IHC stainer. The DAKO Optimis was demo’ed at the recent USCAP. It will be released summer of 2013. This is a state-of-the-art instrument that does IHC and ISH. The CTRL is working with DAKO reps (Heidi Brass and Mike Lewis) to develop a business model. The plan is to have a dedicated clinical IHC stainer (Ominis) and a research IHC stainer (Autostainer Plus). This will improve TAT and quality.

Development of FISH Efforts are underway to implement in FISH techniques and analysis. This is currently being led by Xiuxu Chen. Current projects include:

- Melanoma panel (6p, 6q, 11p, and Cen6)
- ROS1
- RET1
The Medical College of Wisconsin Tissue Bank serves as a core facility for the Medical College of Wisconsin for prospective banking of tissue and blood for research from Froedtert Hospital patients. Funding for the bank was obtained through a grant from Advancing a Healthier Wisconsin in November of 2010. The MCW Tissue Bank is now fully operational. The program pilot ran from August 9th, 2011, ended October 20th, 2011, and the current program began February 27th, 2012. There have been 651 consented participants to date. The core has banked 1,146 combined aliquots of tissue specimens of frozen tissue, tissue slides, and fixed tissue blocks, and 914 aliquots of various blood specimens.

To name some of the current and ongoing growth opportunities for the bank, we are in the final stages of a research cord blood banking project, which is set to submit its IRB application in 2013. The bank is also in preliminary stages of working with Drs. Johnstone and Jacobs, of the VA, to begin consenting participants from Cardio Thoracic surgeons from the VAMC for specimens to be banked at the MCW Tissue Bank.
Currently, the bank is approved to have MCW Tissue Bank staff alone consent all participants. This requires clinic staff to contact MCW Tissue Bank staff to come to clinic to perform consent conference with patients, and we are IRB approved to consent all Cancer Center patients, Froedtert Cardiology patients, Froedtert Otolaryngology patients, Froedtert OBGYN patients, and Froedtert Orthopaedics patients. The Tissue Bank staff has been working with the MCW Office of Research and Froedtert administration to begin hospital-wide consent for the Bank that would allow Froedtert staff to obtain consent from all patients signing consent for surgery. Froedtert has agreed to begin with pilots in the Cancer Center’s Urology and Cardiothoracic programs, and work on training and implementation is underway.

Specimen request and distribution was IRB approved on September 27th, 2012, and the bank has begun to receive requests from MCW investigators. Requests undergo a dual committee approval process, and once approved must submit for IRB approval prior to distribution. The governance of the bank is controlled by the bank’s Executive Committee, which continues to meet and deliberate on MCW Tissue Bank related matters, including specimen distribution. Membership of this committee includes Dr. Saul Suster (chair), Dr. David Harder (co-chair), Dr. Clark Gamblin, Dr. David Gutterman, Dr. Doug Rizzo, Dr. Ming You, Dr. Susan Tsai, Dr. David Johnstone, and Dr. Elizabeth Jacobs.
Education is one of the main missions of the Pathology Department at the Medical College of Wisconsin.

One of our most significant roles is in the teaching of the next generation of pathologists. The department has a healthy residency program that is accredited for 16 positions. We also offer several clinical fellowships in various subspecialties, and maintain an active International Observer-ship and Fellowship Program for qualified candidates from overseas who wish to spend a period of observation in our department to gain increased or advanced knowledge in various disciplines.

A year-round comprehensive didactic lecture series is supplemented by daily surgical pathology peer review sessions, weekly unknown conferences, weekly clinical pathology conference, fortnightly journal clubs, and innumerable multidisciplinary conferences. The translational research facility is the hub for a newly instituted comprehensive three month block of training in molecular pathology. Involvement in clinical or translational research projects is strongly encouraged, with funding available for travel to national meetings to present abstracts. The department also organizes and sponsors an annual surgical pathology update course in Milwaukee featuring both distinguished visiting lecturers and MCW departmental faculty; attendance at this course is complementary for our trainees.
MEDICAL STUDENTS - MCW DISCOVERY CURRICULUM

The pathology department has long had major involvement in the education of second year medical students through a year-long general pathology course currently directed by Dr. Elizabeth Cochran, in which most of the pathology department faculty are active participants giving lectures in their respective fields of expertise. Academic year 2012/2013 will be the last year the pathology course will be presented, as a new curriculum (the Discovery curriculum) has been in the process of development over the past several years at the Medical college of Wisconsin and was implemented for incoming M1 students in Fall, 2012. During these past several years, Drs. Cochran and Harrington have been working with other disciplines involved in the education of medical students on the development of the new curriculum for the M2 students. The new M2 curriculum will consist of systems-based integrated units in which pathology faculty will continue to be significantly involved, again each in their respective areas of expertise.

Drs. Steven Kroft and Nathan Ledeboer are the directors for the Clinical Research rotation and Dr. Eduardo Zambrano is the director for the Anatomic Pathology rotation for medical students.

RESIDENTS

The pathology residency program at the Medical College of Wisconsin is a four-year, combined Anatomic and Clinical Pathology Program, accepting 4 residents per academic year through the National Residency Match Program. The program is well rounded and balanced, with a strong and pervasive focus on resident education, with the goal of training young physicians for excellence in either academic or community practice.

The rotation schedule integrates AP and CP rotations into each of the 4 years, with complete coverage of every area, yet ample elective time. The surgical pathology rotations are structured around our sub-specialty sign-out system, with extended time devoted to specific organ systems, under the guidance of faculty with sub-specialty expertise. Cytopathology rotations are given as a two-month block in the second year with an additional month scheduled in the third or fourth year with time devoted to both GYN and NONGYN cytopathology. Our CP rotations feature structured curricula and energetic, engaged faculty who are dedicated to teaching.

JULY 1, 2012 – JUNE 30, 2013

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<thead>
<tr>
<th>PGY-1</th>
<th>University of Minnesota Medical School, 2010</th>
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<tr>
<td>Bjorn Batdorf, M.D.</td>
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<tr>
<td>Nicholas Harding-Jackson, M.D.</td>
<td>Rush Medical College, 2012</td>
</tr>
<tr>
<td>Carolina Polanco, M.D.</td>
<td>Universidad Central del Ecuador, 2007</td>
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<tr>
<td>Adam Robin, M.D.</td>
<td>St. Matthew’s University School of Medicine, 2010</td>
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<th>PGY-2</th>
<th>Medical College of Wisconsin, 2011</th>
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<tr>
<td>Maria Hintzke, M.D.</td>
<td>Shahid Beheshti University of Medical Sciences, Iran, 2005</td>
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<tr>
<td>Atousa Ordobazari, M.D.</td>
<td></td>
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<tr>
<td>Emily Hansen, M.D.</td>
<td>Wayne State University School of Medicine, 2011</td>
</tr>
<tr>
<td>Hongmei Li, M.D.</td>
<td>Tianjin Medical University, 2001, China</td>
</tr>
<tr>
<td>Danielle de Stefano, M.D.</td>
<td>Escola de Medicina da Santa Casa de Misericordia de Vitoria, Brazil, 2001</td>
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<th>PGY-3</th>
<th>University of Queensland, Australia, 2009</th>
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<tr>
<td>Jason Chang, M.D.</td>
<td>Medical College of Wisconsin, 2010</td>
</tr>
<tr>
<td>Jessica Lelinski, M.D.</td>
<td>Medical College of Wisconsin, 2009</td>
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<tr>
<td>Lauren Parsons, M.D.</td>
<td>University of Iowa, 2010</td>
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<tr>
<td>Jacob Smith, M.D.</td>
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FELLOWS

The Department of Pathology offers 1-year, ACGME-accredited fellowship programs in Hematopathology and Cytopathology, as well as a 1-year General Surgical Pathology fellowship and a GI/Liver pathology fellowship. Our department also sponsors a Transfusion Medicine fellowship at the BloodCenter of Wisconsin, a Pediatric Pathology fellowship at Children’s Hospital of Wisconsin, and a Forensic Pathology fellowship at the Milwaukee County Medical Examiner’s Office.

JULY 1, 2012 – JUNE 30, 2013

PGY-5

Shannon Rathke, M.D. (Hematopathology) University of Wisconsin School of Medicine and Public Health, 2006

David Baewer, M.D. (GI/Liver Pathology) Medical College of Wisconsin, 2008

INTERNATIONAL FELLOWSHIP AND OBSERVERSHIP PROGRAM

The Department offers an International Fellowship and Observership Program for qualified international candidates who have completed or are about to complete residency training in pathology at their home countries outside of the United States. The program can be customized to the candidate’s needs and areas of interest, and can be spent in a general category, such as general surgical pathology, or in a more focused area, such as hematopathology, dermatopathology or molecular pathology. Observers are able to spend a period of a few months to a full year participating in all the routine service and teaching activities of the department. Participation in research projects is encouraged. The candidate will have no clinical service duties, but will be welcome to observe the routine signout of cases, gross room and autopsy activities, and the activities of the other specialized labs. Candidates will be welcome to participate in the daily Peer Review Conference at the multi-headed scope, and to attend all the lectures and interdisciplinary conferences throughout the hospital and affiliates.

JULY 1, 2011 - JUNE 30, 2012

Observership

Nazia Fuad University of Punjab, Lahore, Pakistan. 1996

Luisa Gomez, M.D. Coahuila State University Medical School, Mexico, 2001

Maria Franco, M.D. Universidad Nacional de Asuncion, Paraguay, 2010

Vanessa Klaassen, M.D. San Sebastian University, Chile, 2008

Gerardo Vides Almonacid, M.D. University of Buenos Aires, Argentina, 2003

Pablo Mucientes, M.D. Universidad de Concepcion, Chile. 2004

Vamsi Parini, M.D. NTR University of Health Sciences, Vijayawada, Andhra Pradesh, India, 2003

JULY 1, 2012 – JUNE 30, 2013

Observership

Karen Arispe, M.D. Mayor de San Simon University, Bolivia, 2006

Cheng Luo, M.D. North Sichuan Medical College, China, 1991

Lisley Calixto, M.D. Santa Catarina South University, Brazil, 2008
Autopsy Conference
Clinical Pathology Conference
Grand Rounds
Hematologic Malignancy Conference
Midwestern Conference: Update Course in Surgical Pathology
Peer Review Conference
Arkadi M. Rywlin International Pathology Slide Seminar Symposium in Anatomic Pathology
The Department of Pathology provides continuing medical education to physicians at the Medical College of Wisconsin, the community, the state of Wisconsin and internationally. The department sponsors educational activities to maintain and improve professional skills and knowledge of MCW faculty, community pathologists and clinical laboratory specialists. These meetings’ objective is to enhance the understanding of clinical and basic medical research, as well as to teach to appreciate how medical knowledge is acquired, evaluated and disseminated so as to be able to critically analyze current medical issues and future advances. These goals are met through Grand Rounds lectures, Hematologic Malignancy Conferences, daily Peer Review Conference and other speciality conferences. Dr. Saul Suster also directs a national Pathology Update Conference held annually in downtown Milwaukee, the “Midwestern Conference”. The Arkadi M Rywlin International Pathology Slide Seminar is an international venue created in 1991 to promote and advance the exchange of ideas among academic pathologists throughout the world in a spirit of cooperation and collegiality. The department sponsors and organizes international symposiums staffed by members of this organization, which take place at various locations throughout the world. In addition, our faculty present at various national meetings, including the United States and Canadian Academy of Pathology (USCAP) annual meeting, American Society of Clinical Pathologists national meeting and the College of American Pathologists national meeting. Faculty and resident posters were listed prominently at these events.

USCAP posters and film are available for viewing on the Medical College of Wisconsin Pathology website:
http://www.mcw.edu/pathology/EdActivities/USCAP_2012.htm
PEER REVIEW CONFERENCE

A daily Peer Review Conference (PRC) is held in the Chairman’s Office at an 18-headed microscope, during which all interesting, difficult or problem cases of the day are reviewed with the participation of the surgical pathology faculty, residents, fellows, and visitors. This daily conference, directed by Dr. Suster, serves a dual purpose:

- **Quality Assurance**: problem cases are discussed by the faculty to resolve issues related to difficult or ambiguous diagnoses or interpretations, review the quality and results of special stains, discuss criteria for diagnosis, appropriateness of classification and terminology, and best-practice issues related to the cases being discussed;

- **Teaching**: the conference is attended by pathology residents and fellows as well as visitors in the department and serves as a powerful teaching tool for discussing advanced concepts in pathology and testing the level of progress of the residents.

Residents and fellows are invited to actively participate in this conference and to share their opinions on the cases being presented as well as partake in the discussions around the cases. A high resolution monitor connected to the microscope allows for an expanded audience. The conference is accredited for CME credits by the MCW Office of Continuing Medical Education. A detailed log is kept of all the cases discussed and their resolution. This conference presents a forum not only for exposing the residents, fellows, medical students and visitor to real-time problem-solving in surgical pathology, but also allows faculty members to sharpen their skills, remain updated in areas other than their own fields of expertise, and streamline the process of patient care delivery by presenting in an efficient manner select cases to a large group of peers in a single daily session, thus helping to expedite the signout of problem and difficult cases.
**MIDWESTERN CONFERENCE: UPDATE COURSE IN SURGICAL PATHOLOGY**

The department, in seeking to fulfill its commitment to the community for providing a venue for advanced continuing medical education, offers a yearly Update Course in Surgical Pathology, “The Midwestern Conference”, which takes place in downtown Milwaukee every year during the month of September. This update course is meant to provide pathology practitioners in our community and the neighboring states with a means for obtaining CME credits required for the maintenance of their license and to provide timely updates in a variety of fields in surgical pathology for the busy practicing pathologist. This 3-day course takes place over a weekend and provides 18-20 AMA-accredited Category-I CME credit hours. Starting FY2013, a component of SAM credits is going to be added for the younger pathologists who require them for recertification. The course covers a broad spectrum of topics in surgical pathology, and showcases MCW pathology faculty in addition to 5-6 invited guest speakers from other prestigious academic institutions throughout the USA. The course offers a balanced review of the most important advances in diagnostic anatomic pathology, as well as updates on newer techniques and cutting-edge applications of translational research studies utilizing molecular genetic methods. The conference is attended every year by more than 100 community pathologists from 20 states and from abroad. The objectives of the course include:

- Evaluate current criteria for diagnosis in various subspecialty areas in surgical pathology
- Recognize the proper application of immunohistochemical and other ancillary techniques for the diagnosis of problematic cases
- Become familiar with advances in terminology and classification of neoplastic and non-neoplastic disorders

The conference has been viewed as an interesting and very informative venue for sharing knowledge about current medical practices. The Department of Pathology will continue to invite guest speakers who specialize in their chosen field. Discussion is generated through the use of case presentations, an audience response system, as well as time allocated for direct discussion between faculty and colleagues.

The department’s division of informatics headed by Sheng Xiong, plays a critical supportive role for the management of our laboratory and research information throughout the department. During the previous few years, the department has made great progress in updating and modernizing its information systems. New workstations were implemented for all staff and faculty members last year to improve day to day operations and efficiency. Windows 7 is currently being rolled out to meet MCW’s IT recommendations. All microscopes throughout the department have been outfitted with state-of-the-art digital photography equipment, which are able to run on Windows 7 64bit versions. Our informatics team has also been instrumental in the implementation of the new laboratory information system for the Clinical and Translational Research Core Lab (CTRL), including the customization of the LIS system to allow proper tracking and triaging of service cases for patient care vs. research accounts. In 2012 the department also implemented the new VisioPharm software to assist our faculty in image analysis. The VisioMorph™ system provides a set of highly specialized tools that can fa-
cilitate key aspects of working with quantitative image analysis and data management. The image analysis tools have been optimized for the specific challenges in whole slide imaging, and simplify the unambiguous expression of histological end-points in terms of spectral, spatial, morphological and contextual image properties.

The department also acquired a high-capacity digital image slide scanner, the Nanozoomer. This unit can run a batch of 210 slides automatically. It can scan at a resolution of 1.9 billion pixels in a 20mm X 20mm sample size. Digital slide imaging is currently being utilized in the department for various applications, including teaching of medical students, archival of images in the department’s databank, and for research applications. The department has also acquired a separate high-capacity server for storage and rapid retrieval of patient information for teaching and research, without need for burdening the clinical server in Dynacare Labs. This has resulted in a quicker turn-around-time for searches for prospective research projects and has greatly facilitated the development of new research protocols. Finally, our informatics division is working with the faculty to create a new website for the department that will help us introduce our department to our friends and collaborators and provide a more ample window to the outside for our routine activities.
Research and discovery are important missions for the Pathology Department at MCW. A broad spectrum of research activities are carried out in the department, including clinical research, translational research, and basic science research in collaboration with other departments throughout the college. Funded research activities are supported by various government agencies, (NIH, DOD, etc.), American Heart Association, the Advancing a Healthier Wisconsin Endowment, and other private and industry sources.

The department also actively collaborates with several of the other departments on campus, as well as outside institutions in funded research. Active collaboration on projects is promoted through our Clinical and Translational Research Core Lab, which houses the capability to support researchers throughout campus with a variety of specialized molecular techniques on solid tissue samples. Funded research is also supported by the department through the activities of our MCW Tissue Bank, which is housed and operated by the Department of Pathology.

A cancer genetics program has been recently initiated in collaboration with the Cancer Center and is headed by Dr. Liang Wang. The Pediatric Pathology
Division is also actively engaged in research, and houses several research cores that support clinical and translational research for the Children’s Research Institute, including a Histology and Imaging Core, a pediatric tissue bank, and an Analytical Tissue Core. Researchers in the Pediatric Pathology Division at Children’s Hospital participate in collaborative research with investigators throughout the institution and have several funded projects for translational and basic science research. Finally, an actively funded research program headed by Dr. Bruce Dunn at the Zablocki V.A. Medical Center is engaged in the study of Helicobacter Pylori infection of the gastrointestinal tract and angiogenesis.
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<tr>
<th>Principal Investigator</th>
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<td>Buchan</td>
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<td>Coburn</td>
<td>The Heart of OSPC as a Borrelia Burgdorferi Adhesin</td>
<td>NIH/NIAID</td>
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<td>Hines</td>
<td>Children's Environmental Health Sciences Core Center</td>
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<td>WHRP Grant - Estrogen Receptor Alpha 36</td>
<td>Women's Health Research Program</td>
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<td>Huang</td>
<td>ER-a36 is a Valuable Biomarker for Predicting</td>
<td>Cancer Center</td>
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<td>Jarzembowski</td>
<td>Safe Sleep and Immunization Promotional Baby Kits</td>
<td>Children's Hospital Medical Staff</td>
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<td>Jarzembowski</td>
<td>Evaluation of Chromosomal Translocation Patterns in Synovial Sarcoma</td>
<td>CHW/CRI</td>
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<td>Kehl</td>
<td>Develop Molecular Assays to Detect Infections Agents - Peru</td>
<td>MCW</td>
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<td>Lawlor</td>
<td>Mechanisms and efficacy of myostatin inhibition in myotubular myopathy</td>
<td>NIH-K08</td>
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<td>Pew Charitable Trust</td>
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<td>Lawlor</td>
<td>CTSI-Pilot: ActRIIB-mFc Treatment in Nemaline Myopathy</td>
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<td>Lough</td>
<td>Induction of Cardiovascular Cells from hESCs by Embryonic Cues</td>
<td>NIH/NHLBI</td>
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<td>Malogolowkinm</td>
<td>Diffusion-weighted imaging to evaluate cellularity of solid tumors in children, adolescents, and young adults</td>
<td>MCW Cancer Center ($10,000 beginning 4/13) - Imaging Seed grant</td>
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<tr>
<td>Miao</td>
<td>Role of NgBR in Endothelial Cell Function</td>
<td>NIH-NHLBI</td>
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<td>Miao</td>
<td>American Heart Association</td>
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<td>Miao</td>
<td>Roles of Nogo-B and NgBR in Tumor Angiogensis</td>
<td>Am. Cancer Soc./MCW Cancer Ctr</td>
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<td>Nilooifar</td>
<td>Role of SGLT3 in Diabetes-medicated increased renal sodium reabsorption</td>
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<td>North</td>
<td>Exploratory Planning for a Proposed GEOHealth Hub in the Alto Mayo Region</td>
<td>&quot;NIH/NIEHS/Fogarty International Center&quot;</td>
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The department maintains a Research Coordinating Office to assist the faculty in the adult portion of the practice with the management of all research protocols in the department. Our Research Coordinator, Mrs. Patti Wolf, acts as the liaison between the Medical College of Wisconsin Internal Review Board (IRB) and the principle investigators and their study staff. This office is charged with ensuring compliance of regulatory issues. Annual IRB approvals and reviews, amendments, continuing progress reports, reportable events, as well as the maintenance of essential faculty documents (CVs, licenses, site laboratory certification, CITI certification) and eBridge SmartForm requirements and updates are part of the role of the coordinator. The office is also responsible for monitoring current funding opportunities offered by federal, state and local agencies. The creation of online and paper submissions to the MCW Grants & Contracts Office includes monitoring funding proposals which adhere to all State, Federal, professional regulations as well as Medical College and departmental rules and policies. Our Research Coordinating Office assists with all auditing activities for our institutional review board (IRB), strictly adhering to HIPAA standards and OSHA Regulations, and tracking and retaining all study records required to meet IRB compliance guidelines.

Patricia J. Wolf, MBA
Clinical Research Coordinator
pwolf@mcw.edu
414-805-8449

**RESEARCH COORDINATING OFFICE**
Translational & Biomedical Research Center

The translational and biomedical research center, directed by Dr. Liang Wang, is an important component of the Department of Pathology’s efforts at advancing cancer research in collaboration with the Cancer Center. The lab is located at the fourth floor of the Translational and Biomedical Research Building. The lab is equipped with state-of-the-art technology for modern molecular biology and genetics research. It provides research training opportunities for research fellows as well as clinical fellows. Currently, the lab is composed of one research technician who supports laboratory investigation and three postdoc fellows who are involved in intensive research training in the areas of Cancer Genetics, Translational Medicine and Bioinformatics.

The research focus of the lab is in genome variation and human cancer. Specifically, the lab is interested in investigating the genetic basis of human cancers including prostate, esophagus and lung cancer using gene expression profiling, genomewide SNP genotyping, systems biology-based network analysis and large scale case-control association studies. The lab is also interested in the development of cancer biomarkers including prostate, pancreas, colon and lung by testing blood/tissue DNA/RNAs in well-characterized patient populations using genomewide methylation, next generation sequencing and bioinformatic approaches. Examples of the research efforts currently being carried out include a large scale RNA sequencing project that aims to analyze RNA sequences in over 500 prostate cancer patients. The goal is to identify genes and genetic variants that contribute to aggressive forms of prostate cancer. Another project is to identify blood-based biomarkers that can predict drug response and clinical outcomes in prostate and colon cancer patients. This project also uses large scale next generation sequencing technology and examines circulating RNAs as potential biomarkers for early detection and outcome prediction. In the next few years, the lab is expected to lay a solid foundation as a leader in this emerging cancer research field.

The research activities of the lab are being supported by grants from the National Institute of Health and Advancing a Healthy Wisconsin Foundation.
The Division of Pediatric Pathology, under the Direction of Paula North, M.D., Ph.D., has a full-time faculty of nine board-certified pathologists, 8 of whom have subspecialty boards in Pediatric Pathology, plus one in Hematopathology, one in Forensic Pathology; and one in Neuropathology. Three Clinical PhD’s serve as Directors of Microbiology/Virology, Immunology, Clinical Chemistry, and Molecular Diagnostics. The Division’s faculty also includes 4.5 FTE PhD basic scientists. In addition to excellence in general pediatric anatomic and clinical pathology, the CHW/CSG Division of Pediatric Pathology has nationally and internationally recognized expertise in a number of fields, including diagnosis of pediatric and adult vascular anomalies (vascular tumors and malformations), perinatal and placental pathology, pediatric hematopathology, cardiac and lung pediatric pathology, pediatric neoplasia, nerve and muscle pathology, pharmacogenetic testing, biochemical genetic testing, and molecular diagnosis of infectious and inherited disease.

**Clinical Service:** The Pediatric Pathology Division has led the development of a successful transition of the CHW Clinical Laboratory into a LEAN environment to improve turn-around time for central core tests. It has also embarked on an expansion of the CHW Molecular Diagnostics Lab for the implementation of new molecular tests for pharmacogenetic analysis, including a new reference offering in forensic pharmacogenomic testing for the Medical Examiner’s office, congenital heart disease (proximal 22q11.2 syndrome), cystic fibrosis and infectious disease (EBV quantitative PCR, HSV glycoprotein specific, Varicella zoster virus PCR, qualitative CMV, qualitative EBV). The Division also played a key role in the multi-disciplinary development of the Whole Genome Sequencing Program at Children’s Hospital of Wisconsin (CHW), which is accredited by the College of American Pathologists. In Clinical Chemistry, Dr. Lo added new diagnostic support for our pediatric transplant population by initiating immunosuppressant testing using a LC/MS/MS method to provide more accurate results. In Histology, the CHW Clinical Lab’s scope in immunohistochemistry, immunofluorescence, and in-situ hybridization was widely expanded under the direction of Dr. North. Another major FY12 clinical service initiative was the establishment of a CAP-accredited Pediatric Pathology Nerve and Muscle Lab for clinical nerve and muscle biopsy diagnostics (Dr. Lawlor).

**Research:** The Division of Pediatric Pathology began in FY12 to realize the benefits of its recent investments in the recruitment and development of basic and translational scientific faculty. One of the Division’s two junior basic scientists, Dr. Robert Miao, a 50/50 co-recruit with Pediatric Surgery, was awarded his first NIH R01 grant and also an MCW Cancer Center grant for his studies of the role of Nogo-B and NgBR in endothelial cell function and tumor angiogenesis. The second of the Division’s junior basic scientists, Dr. Rashmi Sood, was funded by an American Heart Association Scientific Development Grant and a March of Dimes Basil O’Connor grant and has submitted her first NIH R01 grant application. Dr. North was funded as a Core Director for a P01 Program Project grant (NIH/NIHLBI) and the P30 Children’s Environmental Health Sciences Center (a UWM-CRI partnership grant), and Dr. Lawlor was funded by an NIH K08 award for his congenital myopathy studies.

The Division of Pediatric Pathology continues to direct 3 institution-wide, fee-for-service research core facilities in the Children’s Research Institute (the CRI Histology and Imaging Cores and the Pediatric Biobank and Analytical Tissue Core) and to co-direct a 4th core (the CRI Nucleic Acid Extraction Core). The CRI Histology Core, directed by Dr. North, became CAP certified in 2012 and is now able to help with CHW stain optimizations and clinical consult work. The CRI Imaging Core, directed by Dr. North with the assistance of Imaging Specialist, Dr. Suresh Kumar, continues to offer state-of-the-art microscopic imaging including fluorescence and brightfield wide-field microscopy, traditional confocal and multi-photon laser-scanning microscopy, and laser capture microdissection. The CRI Pediatric Biobank and Analytical Tissue Core implemented its BigR Tissue Banking Database and added new high resolution slide scanning and image analysis services. This facility, supported by a generous grant from the Mid-West Athletes Against Childhood Cancer Fund, offers human tissue and fluid procurement and banking as well as tissue-appropriate analytical services including iCys laser scanning cytometry, high-resolution slide scanning and image analysis, tissue microarray production, tissue DNA/RNA extraction, and cell line generation. The CRI Nucleic Acid Extraction Core, co-directed by Dr. Sander in partnership with the Department of Pediatrics and with support from Pediatric Biobank Scientific Director Dr. Lerch-Gaggl, added extraction and purification services for RNA as well as DNA from solid tissue samples using the Maxwell 16 platform. FY12 also saw the revival of the CRI Unexplained Infant Death Center (UIDC), directed by Dr. North and coordinated by Dr. Tetzlaff, with expansion of the previous Wisconsin SIDS Center.
by over 20 new members from multiple clinical and basic science MCW Departments and Divisions (including 5 from Pediatric Pathology), the University of Wisconsin-Milwaukee, and the Milwaukee Medical Examiner’s Office.

**Education:** The Pediatric Pathology faculty was active in the training of MCW medical and graduate students as well as Pathology and Pediatrics residents and fellows in multiple fellowship programs for the Department of Pediatrics and Division of Pediatric Surgery. Importantly, a new Pediatric Pathology Fellowship program was approved by the ACGME for one fellow annually to begin in FY13. Both Drs. North and Jarzembowski served as MCW medical student Pathway mentors. Dr. Suchi coordinated a robust Pediatric Pathology Seminar Series hosting several nationally and internationally prominent outside speakers. Internationally, Dr. Lerch-Gaggl organized and led both a workshop and an Interactive Discussion Table at the 2012 annual meeting of the International Society for Biological and Environmental Repositories (ISBER) in Vancouver, and Dr. North conducted a course on the histopathology of vascular anomalies for the International Society for the Study of Vascular Anomalies in Malmo, Sweden.

**Honors and Accomplishments:** In January of 2012, the Pediatric Pathology Division’s Stanley Lo, PhD became President of the National Academy of Clinical Biochemistry after a one year term as President-Elect. Dr. Tara Sander was recognized in January 2012 by the Business Journal as a member of its prestigious “40 under 40” program and also served as Chair of the Committee for Career Development, Women and Minorities of the American Society for Investigative Pathology and as a Councilor of the American Society for Investigative Pathology. Dr. North served as a member of the Scientific Committee of the International Society for the Study of Vascular Anomalies and as a member of the Medical Advisory Boards of the National Organization for Vascular Anomalies and the Lymphangiomatosis & Gorham’s Disease Alliance. Dr. Jarzembowski became a neuroblastoma central reviewer for the Children’s Oncology Group. In October of 2011, the Division of Pediatric Pathology hosted a successful and highly reviewed annual fall meeting of the Society for Pediatric Pathology in Milwaukee.
The Pathology Department at Community Memorial Hospital, under the direction of Neil L. Drake, M.D., PhD., plays a key role in the community. The department provides anatomic and clinical pathology services and physician leadership services in the hospital and associated clinical laboratories. The hospital in the past year has undergone medical staff reorganization along clinical service lines. The Pathology Department is now joined with medical oncology and radiation oncology in a cancer care service line. The Pathology Department will be responsible for ongoing quality control and participation in cancer care services at Community Memorial hospital.

| Neil L. Drake, MD, PhD, Medical Director |
| Gerardo Fronda, MD, Assistant Professor, MCW; Pathologist, CMH |
| Margaret L. Menezes-Ruocco, MD, Assistant Professor, MCW; Director of Cytopathology, CMH |
The Anatomic and Clinical Pathology laboratory at St. Joseph’s Hospital in West Bend, under the direction of Dr. Patrick Gardner, plays a significant role in the mission to provide personalized and trusted care to patients and their families in the community. The laboratory has seen significant changes in the past 2 years which have lead to improvements in the delivery of clinical laboratory services.

As part of a Froedtert Health laboratory initiative, clinical chemistry instrumentation was replaced and standardized with that in the Dyancare laboratory. This allowed for standardization of testing and reference ranges across the health system improving service to our clinicians and limiting potential errors. The laboratory continues to participate in system initiatives to standardize testing, improve efficiencies and share staff in efforts to continuously improve care and drive down cost.

The Anatomic Pathology practice was combined with the Community Memorial practice in the spring of this past year further coordinating care across the system.

The laboratory has an active role in the newly expanded Kraemer Cancer Center in West Bend supporting the expansion of the Froedtert Health cancer network into the West Bend community. This includes supporting a cancer center recently awarded accreditation with commendation and the work to establish an accredited breast care program.

Patrick Gardner, MD, Laboratory Medical Director, Vice President of Medical Affairs
Veterans Affairs Medical Center (VAMC)

For over a decade the Milwaukee Department of Veterans Affairs Medical Center (VAMC) laboratory has served as one of two core laboratories in Veterans Integrated Service Network 12 (VISN 12), headquartered in Chicago. Milwaukee provides complete anatomic pathology services for the Tomah and Iron Mountain VAMCs and provides cytology support for the Madison VAMC. The Milwaukee VAMC clinical laboratory offers a variety of tests including all mycobacteriology analyses for VA hospitals in VISN 12.

Bruce E. Dunn, MD, Professor of Pathology, MCW; Chief of Pathology, VAMC
Catherine Hida, MD, Assistant Professor
Suhas H. Phadnis, PhD, Assistant Professor
Elena Roukhadze, MD, PhD, Assistant Professor
Members of the faculty in the Department of Pathology at the Medical College of Wisconsin come from diverse backgrounds and display a wide range of interests and expertise. All are inspired by the same principle, that of practicing in an environment that is conducive to personal and professional growth in the specialty. Whether the main emphasis lies in teaching or research, the overall philosophy is that of belonging to a community of individuals who are dedicated through teamwork and professional respect to advance the boundaries of our field through practice, teaching and discovery.

TEACHING AWARDS

Medical Student Teaching Awards: The Medical College recognizes each year a small number of faculty members for their role in medical student teaching with the “Outstanding Teacher” award. Honorees for the year 2011-2012 school year were:

- Susan M. Becker (Koethe), PhD
- Arjun Rao, MD

Resident Teaching Award: The department honors one of its faculty members every year with the “Faculty Teacher of the Year” award for excellence in resident teaching and in recognition for outstanding educational contributions to the department. The award is voted on by the residents. The recipient for the 2011-2012 award was:

- Dr. Eduardo Zambrano

Myron Schuster Award: This award is given to a deserving pathology resident each year in recognition for exemplary performance as a pathology resident and for lasting positive contributions to the pathology training program. The award, which includes a monetary stipend, is funded by a generous grant from the Myron Schuster, M.D. estate, and honors the memory of Dr. Schuster, an MCW Department of Pathology alumni who had an exemplary career as a pathologist. The recipient of the 2011-2012 Myron Schuster Award was:

- Dr. Neil Anderson
Meet Our Faculty

Saul Suster, MD,
Professor and Chairman, Medical College of Wisconsin

MD, Catholic University of Guayaquil School of Medicine, Ecuador, (1976)
Residency in Anatomic Pathology, the University of Tel-Aviv School of Medicine, Chaim Sheba Medical Center, Tel-Aviv, Israel (1979-1984)
AP/CP Resident in Pathology, The Mount Sinai Medical Center of Greater Miami and University of Miami School of Medicine, Miami, FL (1984-1988)
Fellowship in Research and Surgical Pathology, Yale University School of Medicine, New Haven, CT (1988-1990)

Board Certification
American Board of Pathology (AP/CP)

Research Interests
- Characterization of tumors of the thoracic cavity including lung, mediastinal and pleural neoplasms
- Tumors of the thyroid gland and other endocrine organs
- Pathology and biology of tumors of soft tissue and skin

Publications

Irene Aguilera-Barrantes, MD,
Assistant Professor of Pathology, Medical College of Wisconsin

Anatomical and Clinical Pathology Residency, Ohio State University, (2004-2008)
Surgical Pathology Fellowship, M.D. Anderson Cancer Center (2008-2009)
Gynecological Pathology Fellowship, M.D. Anderson Cancer Center (2009-2010)

Board Certifications
Anatomic and Clinical Pathology (2008)

Research Interests
- Ovarian serous neoplasms
- Cervical adenocarcinomas
Publications


Zainab Basir, MD,
Associate Professor of Pathology, Medical College of Wisconsin

MBBS, (Bachelor of Medicine, Bachelor of Surgery) Fatima Jinnah Medical College, Lahore, Pakistan (1975-1982)
Residency, Pathology, Medical College of Georgia, Augusta, GA (1992-1994)
Residency, Pathology, Indiana University Medical Center, Indianapolis, IN (1994-1997)
Cytopathology Fellowship, Indiana University Medical Center, (1997-1998)

Board Certifications
Anatomic and Clinical Pathology, 1997
Subspecialty Cytopathology, 1999

Research Interests

» Breast pathology
» Gynecologic pathology

Publications


Behnaz Behmaram, MD, MBA,
Associate Professor of Pathology, Medical College of Wisconsin

MD, School of Medicine, Tehran, Iran, (1976)
Residency, Pathology (AP), Downstate Medical Center Kings County Hospital, Brooklyn, NY (1976-1977)
Residency, Pathology (AP/CP), St. Raphael Hospital Affiliated with Yale University School of Medicine, New Haven, CT (1977-1980)
Fellowship, Surgical Pathology, Hartford Hospital, Hartford, CT (1982-1983)
MBA, University of Connecticut, (2001)

Board Certifications
Pathology (AP/CP)
Cytology

Research Interests
» Gynecology Oncology
» Breast Pathology
» Cytopathology

Publications


Meet Our Faculty

Blake Buchan, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin

PhD, Microbiology – University of Iowa, Iowa City, IA (2009)

Board Certifications
American Board of Medical Microbiology (ABMM), Board eligible

Research Interests
» Molecular Diagnostics

Publications


Elizabeth J. Cochran, MD,
Professor of Pathology, Medical College of Wisconsin
Director of Neuropathology, Director of Autopsy Service,
Director of Second Year Medical Student Pathology Course

MD, Rush Medical College, Chicago, IL (1982)
Neurology Residency, Northwestern University/Northwestern Memorial Hospital, Chicago, IL (1984-1985)
Anatomic Pathology Residency, Northwestern University/Northwestern Memorial Hospital, Chicago, IL (1985-1987)
Neuropathology Fellowship, Institute of Pathology, Case Western Reserve University, Cleveland, OH (1987-1989)
Surgical Pathology Fellowship, Rush University Medical Center, Chicago, IL (1989-1990)

Board Certifications
Anatomic Pathology
Neuropathology

Research Interests
» Pathological evaluation of aging changes of the brain, mild cognitive impairment, Alzheimer's disease and non-Alzheimer's disease dementias
» Pathology and biology of primary brain neoplasms

Publications

Neil L. Drake, MD, PhD,
Medical Director, Department of Pathology, Community Memorial Hospital

MD, University of Nebraska College of Medicine (1976)
PhD, University of Wisconsin-Madison, Biochemistry (1987)
Pathology Residency (AP/CP), University of Chicago, Chicago, IL (1983-1987)
Fellowship, Anatomic and Surgical Pathology, Tufts New England Medical Center (1991-1993)
Additional Fellowship, Los Alamos National Laboratory, Harvard University (19871991)

Board Certification
Anatomic and Clinical Pathology

Publications

Bruce Dunn, MD,
Professor of Pathology, Medical College of Wisconsin;
Chief of Pathology, Veterans Affairs Medical Center

MD, Medical University of South Carolina (1981)
Anatomic and Clinical Pathology Residency, Yale-New Haven Hospital (1981-1985)
Board Certification
Anatomic and Clinical Pathology

Research Interests
» Primary diagnostic telepathology
» Angiogenesis

Publications


Gerardo P. Fronda, MD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Pathologist, Community Memorial Hospital

MD, University of Santo Tomas, Manila, Philippines (1980)
Residency, Michael Reese Hospital and Medical Center, Chicago, IL (1991)
Surgical Pathology Fellowship, Loyola University Medical Center, Maywood, IL (1992)

Board Certification
Anatomic Pathology
Cytopathology

Publications
» Gould NS Bharati, Fronda GP, Jones C “Anomalous Origin of Left Coronary Artery from Pulmonary Artery Leading to Demise in a Neonate” Human Pathology 22 (10) 1991, pp 1044-1046


Patrick Gardner, MD,
Laboratory Medical Director, St. Joseph’s Hospital;
Vice President Medical Affairs, St. Joseph’s Hospital, West Bend

MD, Medical College of Wisconsin (1993)
Anatomic Pathology / Clinical Pathology residency, Medical College of Wisconsin (1993–1997)
Nuclear Medicine fellowship, Medical College of Wisconsin (1997–1998)

Board Certification
American Board of Pathology AP/CP (1998)

Gabriela Gheorghe, MD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Director of Hematology, Children’s Hospital of Wisconsin

Anatomic and Clinical Pathology residency, University of Colorado Health Sciences Center, Denver, CO (2004-2007)
Hematopathology Fellowship, Indiana University School of Medicine, Indianapolis, IN (2007-2008)
Pediatric Pathology Fellowship, University of Pittsburgh Medical Center, Pittsburgh, PA (2008-2009)

Board Certification
Anatomic and Clinical Pathology
Hematopathology
Pediatric Pathology

Research Interests
- Pathologic characterization of hematopoietic entities in pediatric patients

Publications

Jerome L. Gottschall, MD,
Professor of Pathology, Medical College of Wisconsin;
Senior Medical Director, BloodCenter of Wisconsin

M.D., The Ohio State University, College of Medicine (1974)
Residency, Pathology, University of Kentucky Medical Center (1975-1979)
Fellowship, Blood Banking, BloodCenter of Wisconsin (1980)

Board Certification
Pathology (Anatomical and Clinical), American Board of Pathology (1980)
Blood Banking, American Board of Pathology (1982)

Research Interests
» National Heart Lung and Blood Institute’s Recipient Epidemiology and Donor Evaluation Study III (REDS III)
» Pathogenesis and treatment of thrombotic thrombocytopenic purpura (TTP)
» Immunohematology, especially autoimmune and drug-induced hemolytic anemias, and clinical applications of red cell genotyping.
» Blood donor eligibility issues related to iron deficiency.

Publications
» Sandler, Gottschall JL. Postpartum Rh Immunoprophylaxis. Obstetrics & Gynecology 2012;120:1428-1438

Alexandra Harrington, MD, MT(ASCP),
Assistant Professor of Pathology, Medical College of Wisconsin;
Director of Coagulation and Hematology, Dynacare Laboratories

MD, Medical College of Wisconsin, Milwaukee, WI (2000-2004)
Residency, Anatomic & Clinical Pathology, Medical College of Wisconsin Affiliated Hospitals,
Milwaukee, WI (2004-2008)
Fellowship, Hematopathology, Medical College of Wisconsin Affiliated Hospitals, Milwaukee,
WI (2008-2009)

Board Certifications
Anatomic and Clinical Pathology
American Society for Clinical Pathology (Medical Technology)
Hematology (Pathology)

Research Interests
» Flow cytometry of myeloid disorders
» Plasma cell myeloma
» Benign hematology disorders

Publications
» (Harrington AM, Olteanu H, Kroft SH), A dissection of the CD45/side scatter “blast gate”. Am J Clin Pathol 2012 May;137(5):800-4 PMID 22523220
**Chun He, MD, PhD,**  
*Assistant Professor of Pathology, Medical College of Wisconsin*

MD, Hebei Medical University, China (1985)  
PhD, Immunology, Medical University of South Carolina (2004)  
Residency, Anatomic and Clinical Pathology, Conemaugh Valley Memorial Hospital affiliated with Temple University School of Medicine, Pennsylvania (2004-2008)  
Fellowship, Renal Pathology, Johns Hopkins University Hospital, Baltimore, Maryland (2008-2009)

**Board Certification**  
Anatomic and Clinical Pathology

**Research Interests**

- Kidney diseases such as focal glomerular sclerosis, diabetic kidney disease, and membranous proliferative glomerulonephritis  
- Transplant pathology

**Publications**


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**Catherine Hida, MD,**  
*Assistant Professor of Pathology, Veterans Affairs Medical Center*

MD, Medical College of Pennsylvania (1992)  
Pathology Residency and Hematopathology Fellowship, Albany Medical Center (1995-1996)  
Cytopathology Fellowship, Hospital of University of Pennsylvania (1997-1998)

**Board Certification**  
American Board of Pathology, Anatomic and Clinical  
American Board of Pathology, Cytopathology

**Research Interests**

- Cytopathology

**Publications**

Jian Huang, MD, Assistant Professor of Pathology, Director of Tissue Procurement and Quality Control, Tissue Bank

MD, Gannan Medical College (Clinical Medicine) China (1985)

Research Interests

» Roles of ER-a36 in HER2 signaling in breast cancer
» Molecular mechanisms of how tetraspanin family regulates the trafficking of estrogen receptor(s) in breast cancer
» Development of novel biomarkers in breast cancer

Publications


Bryan C. Hunt, MD,
Assistant Professor of Pathology, Medical College of Wisconsin

The Chicago Medical School, North Chicago, IL (2005)
Anatomic and Clinical Pathology Residency, Cook County Hospital, Chicago, IL (2005-2007)
Anatomic and Clinical Pathology Residency, Yale –New Haven Hospital, Yale University School of Medicine, New Haven, CT (2007-2009)
Cytopathology Fellowship, Medical College of Wisconsin, Milwaukee, WI (2010)

Board Certification
Cytopathology (2012)
Anatomic and Clinical Pathology (2011)

Research Interests

» Head and neck pathology
» Salivary gland tumors
» Immunohistochemical and molecular applications in cytopathology

Publications

Jason A. Jarzembowski, MD, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Program Director, Perinatal Pathology, Children’s Hospital of Wisconsin;
Associate Director, Pediatric BioBank, Children’s Hospital of Wisconsin

Ph.D., Molecular and Cellular Pathology, University of Madison, WI (1998)
M.D., University of Wisconsin, Madison, WI (2002)
Residency, Anatomic & Clinical Pathology, University of Michigan Hospital & Clinics, Ann Arbor, MI (2002-2006)
Fellowship, Pediatric Pathology, St. Louis Children’s Hospital & Washington University Medical Center, St. Louis, MO (2006-2007)

Board Certification
Pediatric Pathology, (2007)
Anatomic and Clinical Pathology (2007)

Research Interests
» Neuroblastoma
» Molecular biology of pediatric solid tumors
» Placental pathology
» Fetal and infant health

Publications


Sue C. Kehl, PhD, D(ABMM),
Associate Professor of Pathology, Medical College of Wisconsin;
Associate Director, Clinical Laboratory, Children’s Hospital of Wisconsin;

PhD, Medical College of Wisconsin (Pathology) (1979-1984)
Post Doctoral Fellow in Public Health and Medical Microbiology, Mount Sinai Medical Center, University of Wisconsin-Milwaukee Clinical Campus (1984-1986)

Board Certification
Diplomate, American Board of Medical Microbiology

Research Interests
» Development of rapid tests for detection of infectious disease, including molecular methods
» Epidemiology of S. pneumoniae and the impact of widespread vaccine use

Publications
» Evaluation of a rapid and completely automated real-time reverse transcriptase PCR assay for diagnosis of enteroviral meningitis. (Nolte FS, Rogers BB, Tang YW, Oberste MS, Robinson CC, Kehl KS, Rand KA,
Rotbart HA, Romero JR, Nyquist AC, Persing DH) J Clin Microbiol 2011 Feb;49(2):528-33 PMID 21159942


Susan M. Koethe, PhD,
Professor of Pathology, Medical College of Wisconsin;
Work Group Leader, Curricular and Interprofessional Development, MCW Community Medical Education Program

PhD (Immunology), Harvard University, Cambridge, MA (1974)

Research Interests
» Innovations in medical education
» Introduction of unique quality indicators to laboratory medicine

Publications


» Koethe, SM, Kroft, SH: Hospital Laboratory Leadership and the “Dyad” Model of Management. In Press, Laboratory Medicine

Richard Komorowski, MD,
Professor of Pathology, Medical College of Wisconsin

MD, Marquette Medical School (1967)
Resident, Pathology, Medical College of Wisconsin (1968-1972)
Summer Fellowship, Biochemistry, Marquette University (1964-1965)
American Cancer Society Clinical Fellowship (1970-1972)

Board Certification
American Board of Pathology: Anatomic and Clinical (1972)

Research Interests
» Graft host disease: Mechanisms; Surgical Pathology
» Steatohepatitis: Genetics; Surgical Pathology

Publications

» Chen X, Das R, Komorowski R, van Snick J, Uyttenhove C, Drobyski WR. Interleukin 17 is not required


» Gawrieh S, Marion MC, Komorowski R, Wallace J, Charlton, M, Kissebah A, Langefeld, CD, Olivier M. Genetic variation in the peroxisome proliferator activated receptor-gamma gene is associated with histologically advanced NAFLD. Dig Dis Sci, 09 December 2011 (online)

Steven H. Kroft, MD,
Professor of Pathology, Medical College of Wisconsin; Vice Chair for Clinical Pathology, Director of Hematopathology

MD, University of Illinois College of Medicine (1991)
Anatomic and Clinical Pathology Residency, Northwestern University (1991-1996)
Hematopathology Fellowship, University of Michigan (1996-1997)

Board Certification
Anatomic and Clinical Pathology
Hematology (Pathology)

Research Interests
» Application of specialized ancillary techniques, in particular flow cytometry, to diagnostic, clinical, and biologic issues related to hematologic disorders.

Publications


Suresh N. Kumar, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin; Imaging Specialist of CRI Imaging Core, Children’s Hospital of Wisconsin

PhD, Biochemistry, Osmania University, India (1998)

Research Interests
» Regulation of Indoleamine 2, 3-dioxygenase expression in malignant tumors and vascular malformations
» Imaging and microscopic techniques

Publications
» E-cadherin is critical for collective sheet migration and is regulated by the chemokine CXCL12 protein during restitution. (Hwang S, Zimmerman NP, Agle KA, Turner JR, Kumar SN, Dwinell MB) J Biol Chem 2012 Jun
Michael W. Lawlor, MD, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Director, Pediatric Pathology Neuromuscular Laboratory
Children’s Hospital of Wisconsin

M.D., Ph.D., Loyola University Chicago, Maywood, IL (2004)
Anatomic Pathology Residency, Massachusetts General Hospital, Harvard Medical School, Boston, MA (2004-2006)
Neuropathology Fellowship, Massachusetts General Hospital, Harvard Medical School, Boston, MA (2006-2008)
Research Fellowship, Human Molecular Genetics, Children's Hospital Boston, Harvard Medical School, Boston, MA (2008-2011)

Board Certification
Anatomic Pathology
Neuropathology

Research Interests
» Pediatric muscle disease (X-linked myotubular myopathy and nemaline myopathy)
» Preclinical trials of novel therapeutic agents
» Skeletal muscle pathology
» Skeletal muscle physiology
» In vitro models of skeletal muscle function and disease
» Centralization of tissue storage and access for congenital muscle disease

Publications


Nathan A. Ledeboer, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Medical Director, Clinical Microbiology,
Molecular Diagnostics, Dynacare Laboratories & Froedtert Hospital

PhD, Microbiology, University of Iowa, Iowa City, IA (2000-2005)

Board Certification
Diplomate, American Board of Medical Microbiology

Research Interests
- Development of rapid molecular techniques for detection of infectious diseases
- Methicillin-Resistant Staphylococcus aureus antimicrobial resistance
- Vancomycin-Resistant Enterococcus detection
- Antimicrobial resistance
- Mass Spectrometry for identification of bacteria, yeast and fungi
- Application of Mass Spectrometry for antimicrobial resistance detection
- Next Generation Sequencing applications in infectious diseases
- Laboratory Automation

Publications
- Comparison of the MALDI Biotyper system using Sepsityper specimen processing to routine microbiological methods for identification of bacteria from positive blood culture bottles. (Buchan BW, Riebe KM, Ledeboer NA) J Clin Microbiol 2012 Feb;50(2):346-52 PMID 22162549

Alexandra F. Lerch-Gaggl, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Pediatric Pathology, Medical College of Wisconsin,
Scientific Director of the Pediatric BioBank & Analytical Tissue Core, Children’s Research Institute

Ph.D., University of Salzburg, Austria (1996-2000)
MS, University of Salzburg, Austria (1990-1996)

Research Interests
- Biospecimen science
- Pediatric vascular anomalies and cancers
- Molecular mechanisms of circadian rhythm and metabolism
- Molecular basics of ribosomal synthesis in regard to cancer formation
- Advanced microscopy techniques and digital image analysis
Publications


Stanley F. Lo, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Technical Director, Clinical Chemistry, POCT and Biochemical Genetics,
Director, Reference Standards Library, Children’s Hospital

PhD, University of Minnesota, Bioorganic Chemistry, (1992)

Board Certification
American Board of Clinical Chemistry

Research Interests

- Standardization of chemistry testing
- Biochemical genetic testing
- Pharmacogenetic testing

Publications


Alexander Craig Mackinnon, Jr., MD, PhD,
Assistant Professor, Medical College of Wisconsin;
Director, Clinical and Translational Research Core Lab

MD, University of Illinois, Urbana, IL, (1996-2004)
PhD, University of Illinois, Urbana-Champaign, IL (1996-2004)
Residency, Anatomical Pathology, University of Chicago, Chicago, IL (2004-2007)
Postdoctoral Fellowship, Cardiovascular Pathology, University of Chicago, Chicago, IL (2007-2008)
Clinical Fellowship, Molecular Genetic Pathology, University of Chicago Medical Center/ Northshore, Chicago, IL (2008-2010)

Board Certification
Molecular Genetic Pathology
Anatomic Pathology
Research Interests
» Molecular diagnostics of solid tumor and hematological malignancies
» Cardiovascular pathology
» Cell adhesion/Integrin signaling

Publications


» Extracolonic gastrointestinal tract morphologic findings in a case of pseudomembranous collagenous colitis. (Fons ME, Stein DJ, Patel A, Ferrer MS, Ammon H, Mackinnon AC, Komorowski RA, Yan BC) Ann Diagn Pathol 2012 Jun 1: PMID 22658854


Margaret L. Menezes-Ruocco, MD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Director of Cytopathology, Community Memorial Hospital
MD, University of Minnesota Medical School, Minneapolis, MN (1996)
Residency, Transitional Hennepin County Medical Center, Minneapolis, MN (1996-1997)
Residency, Anatomic and Clinical Pathology, Evanston Northwestern Healthcare, Evanston, IL (1997-2001)
Fellowship, Cytopathology, University of Iowa Hospitals and Clinic, Iowa City, IA (2001-2002)

Board Certification
Anatomic and Clinical Pathology (2001)
Cytopathology (2003)

Qing (Robert) Miao, PhD,
Assistant Professor of Pathology and Surgery
Division of Pediatric Pathology
PhD, Medical University of South Carolina, Charleston, SC (2002)

Publications


» A noncoding antisense RNA in tie-1 locus regulates tie-1 function in vivo. (Li K, Blum Y, Verma A, Liu Z,
R. Nagarjun (Arjun) Rao, MD, FRCPATH, 
Associate Professor of Pathology, Medical College of Wisconsin; 
Director of Cytopathology, Residency Program Director, 
Cytopathology Fellowship Program Director

MD, Postgraduate Institute of Medical Education and Research, Chandigarh, India (1990) 
MRCPath, Royal College of Pathologists, United Kingdom (1995) 
Residency, University Hospitals of Cleveland/Case Western Reserve University, Cleveland, OH (1999) 
Fellowship, MetroHealth Medical Center/Case Western Reserve University, Cleveland, OH (2000)

Board Certification
Anatomic and Clinical Pathology (1999) 
Cytopathology (2001)

Research Interests
» Pulmonary pathology
» Smoking-related interstitial lung disease
» Lung and mediastinal cytology

Publications


Paula E. North, MD, PhD, 
Professor and Chief (Pediatric Pathology), Children’s Hospital of Wisconsin, 
Director, Children’s Research Institute Histology and Imaging Cores, 
Medical Director, Pediatric Biobank and Tissue Analytical Core

PhD - Molecular Biology, Vanderbilt University, Nashville, TN (1982) 
Post-doctoral fellowship in Physiology, Vanderbilt University (1982-1984) 
MD, University of Arkansas for Medical Sciences, Little Rock, AR (1992) 
Postdoctoral Fellow, Physiology, Vanderbilt University School of Medicine, Nashville, TN (1982-1984) 
Residency in Pathology (Anatomic and Clinical), School of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR (1992-1995)
Board Certification
American Board of Pathology Anatomic and Clinical Pathology (1996)
Pediatric Pathology (1999)

Research Interests
» Pathogenic mechanisms in vascular tumors and malformations of infancy and childhood
» Pediatric molecular diagnostics
» Global laboratory medicine - development of sustainable models for telepathology-supported laboratory testing in challenging environments

Publications


Horatiu Olteanu, MD, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Program Director, Hematopathology Fellowship,
Director of Flow Cytometry, Dynacare Laboratories

MD, “Iuliu Hatieganu” University of Medicine and Pharmacy, Cluj-Napoca, Romania (1996)
Anatomic and Clinical Pathology Residency, University of Texas Southwestern Medical Center, Dallas, TX (1998-2003)
Ph.D. (Biochemistry), University of Nebraska, Lincoln, NE, (2003)
Hematopathology fellowship, Medical College of Wisconsin, Milwaukee, WI (2007-2008)

Board Certifications
Anatomic and Clinical Pathology (2007)
Pathology – Hematology (2008)

Research Interests
» Clinical and pathologic characterization of hematolymphoid malignancies

Publications


Kiyoko Oshima, MD, DSc,  
Associate Professor of Pathology, Medical College of Wisconsin

MD, Jikei University School of Medicine, Tokyo, Japan (1983)  
Doctor of Science, Jikei University School of Medicine, Tokyo, Japan (1991)  
Residency, Department of Pathology, Lutheran General Hospital, Park Ridge, IL (1996-1999)  
Fellowship, Blood Bank, University of Chicago, Chicago, IL (2000-2001)  
Fellowship, Surgical Pathology, University of California, Los Angeles, CA (2001-2002)

Board Certification  
Anatomic and Clinical Pathology (2001)

Research Interests  
» Pancreas and biliary diseases  
» Liver diseases and transplant pathology  
» Barrett’s esophagus

Publications

» Ulmasov B, Xu Z, Talkad V, Oshima K, Neushwander-Tetrt BA: Angiotensin II signaling through the AT1a and AT1b receptors does not have a role in the development of cerulean-induced chronic pancreatitis in the mouse. Am J Physiol Gastrointest Liver Physiol. 299(1): 70-80, 2010


Anand Padmanabhan, MD, PhD,  
Assistant Professor of Pathology, Medical College of Wisconsin;  
Medical Director, BloodCenter of Wisconsin;

MA and PhD in Biochemistry, Brown University (2003, 2006)  
Medical School, MBBS Thanjavur Medical College, India (2000)  
Resident, Clinical Pathology, Columbia University Medical Center (2009)  
Fellow, Transfusion Medicine, The Institute for Transfusion Medicine (ITxM)/University of Pittsburgh Medical Center (2010)

Research Interests

» Heparin induced Thrombocytopenia and Thrombosis (HIT)  
» Use of apheresis in solid organ and hematopoietic stem cell transplantation

Publications


» Stotler B*, Padmanabhan A*, Devine P, Wright J, Spitalnik SL, Schwartz J. Transfusion requirements in
Obstetric Patients with Placenta Accreta, Transfusion, 2011 Dec;51(12):2627-33. * both authors contributed equally


Suhas H. Phadnis, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin; Veterans Affairs Medical Center
PhD, Molecular Biology, JNU, India (1983)
Research Interests
- Molecular diagnostic assays
- H. pylori pathogenesis

Publications

Jose Antonio Plaza, MD,
Associate Professor of Pathology, Medical College of Wisconsin; Director of Dermatopathology
Anatomic and Clinical Pathology Residency, The Ohio State University Medical Center, Columbus, OH (2002-2006)
Surgical Pathology Fellowship, Mayo Clinic, Rochester, MN (2006-2007)
Dermatopathology Fellowship, MD Anderson Cancer Center, Houston, TX (2007-2008)

Board Certification
Anatomic and Clinical Pathology (2006)
Dermatopathology (2008)

Research Interests
- Melanocytic tumors
- Adnexal neoplasms
- Cutaneous Lymphomas
- Inflammatory dermatosis

Publications


Elena Roukhadze, MD, PhD,
Assistant Professor of Pathology, Veterans Affairs Medical Center

MD, Moscow Medical School (1981)
PhD in Anatomy, Histology, and Embryology (1986)
Residency in Pathology, Rush Presbyterian Medical Center (1997-1999)
Residency in Pathology, Advocate Illinois Masonic Medical Center (1999-2002)

Board Certification
Anatomic and Clinical Pathology

Research Interests
- Pathology of colon cancer
- GU pathology

Tara Sander, PhD,
Associate Professor of Pathology,
Pediatric Pathology, Medical College of Wisconsin;
Scientific Director of Molecular Diagnostics, Children's Hospital of Wisconsin

Ph.D., Medical College of Wisconsin, Milwaukee, Wisconsin (2000)

Research Interests
- Molecular basis of congenital and acquired vascular diseases including vascular anomalies, valvular heart disease, acute lung injury, and cancer
- Endothelial cell function and vascular response to injury
- Transcriptional regulation of the SCAN domain family of zinc finger proteins

Publications


Annette D. Segura, MD,
Assistant Professor of Pathology, Children’s Hospital of Wisconsin

MD, University of Illinois (1980)
Pathology Residency, Medical College of Wisconsin (1984)
Pediatric Pathology Fellowship, Children’s Hospital of Wisconsin (1986)

Board Certification
Anatomic Pathology, American Board of Pathology
Pediatric Pathology, American Board of Pathology

Research Interests
» Pediatric brain tumors
» Pediatric skin tumors

Publications


Rashmi Sood PhD,
Assistant Professor of Pathology, Children’s Hospital of Wisconsin

PhD in Molecular Biology from the Tata Institute of Fundamental Research, University of Bombay, India (1986-1992)

Research Interests
» Role of coagulation, platelet and metabolic disorders in pregnancy complications affecting maternal and fetal health: Development of rodent models and examination of disease mechanisms.

» Women’s health: Estrogen and coagulation cross-talk

» Environmental pollutants and placental health

Publications


James F. Southern, MD, PhD,
Associate Professor of Pathology, Children’s Hospital of Wisconsin

PhD, Physical Chemistry, University of Arkansas, Fayetteville, AR (1972)
MD, University of Oklahoma Health Sciences Center, Oklahoma City, OK (1979)
Residency, Anatomic and Clinical Pathology, Dartmouth-Hitchcock Medical Center, Hanover, NH (1979-1980)
Residency, General Surgery, University of Oklahoma Health Sciences Center, Oklahoma City, OK (1980-1981)
Residency, Anatomic and Clinical Pathology, University of Oklahoma Health Sciences Center, Oklahoma City, OK (1982-1984)
Clinical and Research Fellow in Pathology, Massachusetts General Hospital, Boston, MA (1984-1986)

Board Certifications
American Board of Pathology
Anatomic and Clinical Pathology
Pediatric Pathology

Research Interests

» Cardiac Dysmorphology
» Hepatopathology
» Urologic Pathology
» Pulmonary Pathology

Publications


Mariko Suchi, MD, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Staff Physician, Children’s Hospital of Wisconsin

MD, Nagoya City University Medical School (1983)
PhD, Nagoya City University Medical School (1987)
Anatomic and Clinical Pathology residency, University of Michigan Medical School (1996-2000)

Board Certification
Anatomic and Clinical Pathology
Pediatric Pathology

Research Interests

» Gastrointestinal diseases in children
» Pancreas of childhood diseases
Publications


Sara Szabo, MD, PhD,
Assistant Professor of Pathology, Medical College of Wisconsin;
Associate Director, Fellowship in Pediatric Pathology,
Children’s Hospital of Wisconsin

MD, University of Pecs Medical School, Pecs, Hungary (1989)
PhD, Tulane University, New Orleans, LA (2003)
Fellowship in Pediatric Pathology, Texas Children’s Hospital and Baylor College of Medicine, Houston, TX (2003-2004)

Board Certifications
Anatomic and Clinical Pathology
Pediatric Pathology

Research Interests
» Pediatric Surgical Pathology and Molecular Pathology
» Placental Pathology and Maternal-Fetal Medicine
» Vascular Anomalies

Publications


Julie Tetzlaff, PhD,  
Assistant Professor of Pathology, Children's Hospital of Wisconsin  

PhD, Loyola University, Chicago, IL (2005)  

Research Interests  
» Sudden Infant Death Syndrome  
» Vascular Anomalies  
» Neuroscience  
» Environmental and Occupational Health studies in Peru  

Publications  

K. Krishnan Unni, MD,  
Professor of Pathology, General Surgical Pathology  

MBBS, All India Institute of Medical Sciences, New Delhi, India (1958-1962)  
MS, Mayo Clinica, Rochester, MN (1967-1970)  
Internship, All India Institute of Medical Science, New Delhi, India (1963-1964)  
Pathology Fellowship, Mayo Graduate School, Minneapolis, MN (1967-1970)  

Board Certification  
American Board of Pathology; Anatomic  

Research Interests  
» Bone tumors  

Publications  
Peter VanTuinen, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Director of Clinical Cytogenetics, Dynacare Laboratories

PhD, Physical Anthropology, Minor Genetics (1985)
Postdoctoral Fellowship, Baylor College of Medicine (1985 - 1988)

Board Certification
American Board of Medical Genetics (1990)

Research Interest
» Cytogenetic and molecular characterization of neoplastic genomic rearrangements
» Comparative primate genomic evolution

Publications


Liang Wang, MD, PhD,
Associate Professor of Pathology, Medical College of Wisconsin;
Translational and Biomedical Research Center,
Medical College of Wisconsin Cancer Center

BMed (M.D.), North China Coal Medical University, China (1985)
M.Sc. (major in Cytogenetics), Henan Medical University, China (1988)
Ph.D. (major in Cancer Genetics), Peking Union Medical College, China (1995)

Board Certification
Member (American Society of Human Genetics)
Member (American Association for Cancer Research)

Research Interests
» Genetic basis of human cancers including prostate, esophagus and lung cancers
» Biomarkers in human cancers including prostate, pancreas, colon and lung

Publications
33(7):1270-6.


**Eduardo V. Zambrano, MD, MSc,**  
**Associate Professor of Pathology, Medical College of Wisconsin;**  
**Vice-Chairman and Director of Anatomic Pathology;**  
**Director of Musculoskeletal Pathology**

M.Sc. in Molecular Biology, Faculty of Sciences, Vrije Universiteit Brussel [Free University of Brussels], B, Belgium, (1994)  
MD, School of Medicine, Catholic University of Guayaquil, Ecuador (1985-1992)  
Anatomic and Clinical Pathology (AP/CP) Residency, Yale-New Haven Hospital, Yale University School of Medicine (1997-2002)  
Clinical Fellowship in Pediatric Pathology, Boston Children’s Hospital, Harvard Medical School (2002-2003)

**Board Certification**  
Anatomic and Clinical Pathology, American Board of Pathology (2003)  
Pediatric Pathology (2003)

**Research Interests**

» Molecular and genetic abnormalities in bone and soft tissue neoplasms  
» Markers of prognostic significance in sarcomas  
» Application of specialized molecular and cytogenetics techniques to diagnostic and clinical issues related to musculoskeletal neoplasms  
» Pediatric tumors

**Publications**


131. ZAMBRANO E, Suster S. Letter to the editor: In response to malignant gastrointestinal neuroectodermal tumor showing overlapped immunophenotype with synovial sarcoma: CD99 and SOX10 antibodies are useful in its differential diagnosis”. AJSP, 36(12):1908.


J. PLAZA, Prieto G., *Inflammatory Skin Disorders* Demos Medical Publishing New York, NY 20012


CDM Fletcher, KK UNNI, F Mertens, *Pathology and Genetics of Tumours of Soft Tissue and Bone* (IARC WHO Classification of Tumours)

UNNI, K. KRISHNAN, Indwards, Carrie Y. *Dahlin’s Bone Tumors: General Aspects and Data on 10,165 Cases*: 6th (sixth) Edition Lippincott Williams & Wilkins (December 1, 2010)
