

**MASSACHUSETTS GENERAL HOSPITAL HARVARD
MEDICAL SCHOOL TRAINING PROGRAMS IN
CLINICAL AND ANATOMICAL PATHOLOGY**



R E S I D E N C Y – D E S C R I P T I O N O F R O T A T I O N S :

A N A T O M I C P A T H O L O G Y

In Anatomic Pathology, a central skill in patient care is the "training of the eye," which is best done by seeing a large number of well-characterized cases as unknowns, followed by one-on-one teaching by experts who provide definitive answers as to diagnosis and pathogenesis (at the current level of understanding). This is best accomplished by having the opportunity to see a large volume of specimens over a long period of time, and being given responsibility for gross and microscopic analysis that is appropriate to the level of training. The best way to learn anatomic pathology is thus for the trainee to observe the specimen (gross and/or microscopic), formulate an opinion as to the disease process and further evaluation, commit to this opinion in writing, and then have the opportunity to review the case with a more experienced pathologist. At MGH, this is accomplished by placing the residents in the front line of specimen handling: most surgical pathology specimens and all autopsies are first seen by a resident, who becomes responsible for their management, under the supervision of a staff pathologist or "signout fellow" (see Supervision and Evaluation, below). Additional exposure to specimens is provided in teaching conferences at which gross and microscopic features of virtually all the interesting, unusual, or difficult autopsy and surgical pathology cases as well as many cytopathology specimens are presented.

The AP laboratories of MGH are responsible for over 110,000 surgical specimens, 61,000 cytology preparations, and 280 autopsies per year. In addition, a joint cytogenetics laboratory with the Brigham and Women's Hospital performs over 7,500 cytogenetic analyses per year and over 3,200 molecular genetic tests per year. Finally, our residents rotating at the Office of the Chief Medical Examiner participate in over 200 forensic autopsies per year. The core AP rotations include approximately 6 weeks of rotations in Autopsy; 72 weeks in Surgical Pathology, including 4 weeks in Neuropathology, and 5 weeks in Renal Pathology / Immunopathology / Electron Microscopy; 12 weeks in Cytopathology; 1 week in Cytogenetics; 3 weeks in Molecular Pathology; and 2 weeks in Forensic Pathology. Additional weeks of Anatomic Pathology may be devoted to "elective" rotations in which the resident desires or needs more experience. Five graduate

degree Pathologist's Assistants and three Surgical Pathology technicians process most small and many large specimens, once the resident has demonstrated competence. Not all rotations have a resident at all times: over the usual course of two years in AP, each resident will eventually be responsible for approximately 4,000 surgical specimens, 50 autopsies, and 1,500 cytopathology specimens. Many additional cases are also seen at conferences and in consultation.

Goals and Objectives

1. To enable residents to become competent independent practitioners of diagnostic pathology
2. To model and evaluate the residents' acquisition of professionalism and interpersonal and communication skills
3. To teach the administrative and managerial concepts required to ensure timely and clinically useful reporting of diagnoses
4. To instill the habit of critical assessment and improvement of current and potential modes of practice
5. To model and evaluate the residents' understanding of the basic ethical and scientific principles underlying clinical research based on anatomic pathology materials

Supervision and Evaluation

Residents on the AP services are directly supervised by a staff pathologist or "signout fellow" (a fully qualified junior member of the staff), who bears ultimate responsibility for the correct handling and diagnosis of all specimens on the rotation. The staff pathologist/"signout fellow" reviews the gross specimens as necessary, and reviews all microscopic slides on all cases.

Residents on AP are evaluated at the end of each rotation. The faculty who have worked with the resident discuss the resident's progress during the course of the rotation and fill out an electronic assessment form at its end. The Program Director meets with each resident at least twice a year to review all evaluations and offer career counseling. Any serious or urgent issue that arises is addressed immediately, without waiting for the evaluation process.

Elements of Resident Evaluations

Medical Knowledge

Did the resident (as appropriate):

- Demonstrate knowledge of normal anatomy and histology/cytology?

- Submit appropriate sections?
- Identify lesions appropriate for level of training?
- Make diagnoses appropriate for level of training?

Patient Care

Did the resident (as appropriate):

- Gross/preview the appropriate number / types of specimens in a timely manner?
- Ink, section/dissect, and sample specimens correctly?
- Photograph illustrative lesions?
- Prepare accurate gross descriptions?
- Organize slides / paperwork?
- Correct errors in accessioning, labeling, dictation?
- Complete paperwork?
- Anticipate need for clinical history, prior specimen / radiological correlation, additional sampling / levels, specimen radiographs?
- Follow-up on need for clinical history, prior specimen / radiological correlation, additional sampling / levels, special studies?

Interpersonal and Communication Skills

Did the resident always:

- Communicate clearly?
- Establish effective and cooperative relationship with technical staff?
- Establish effective clinical and educational relationship with staff pathologist / clinicians?
- Respond appropriately to feedback?

Professionalism

Did the resident always demonstrate integrity, honesty, and a professional demeanor?

Practice-Based Learning and Improvement

Did the resident (as appropriate):

- Ask focused questions designed to clarify uncertainties about the cases under study?
- Suggest/inquire about appropriate use of additional studies / ancillary techniques as a way of learning more about the cases under study?
- Use the medical literature as a tool for learning?

System-Based Practice

Did the resident (as appropriate) understand the:

- Rationales for diagnostic/therapeutic procedures?
- Clinical significance of pathological findings?
- Indications to recommend physicians undertake additional investigation or carry out further treatment?
- Rationale for performance of ancillary (e.g., molecular, genetic, receptor) studies?

General Description

Anatomic Pathology rotations are divided into Autopsy and Forensic Pathology, Cytogenetic and Molecular Pathology, Cytopathology, and Surgical Pathology, with the last subdivided into organ-based pathology subspecialties (Breast, Bone and Soft Tissue, Cardiac / Pulmonary, Dermatopathology, Ear, Nose, and Throat (ENT), Frozen Section, Gastrointestinal (GI), Genitourinary (GU), Gynecological and Obstetric / Perinatal (OB/GYN), Hematopathology, Neuropathology, and Renal / Electron Microscopy / Immunopathology). Residents generally rotate in weekly blocks, with 8 weeks on Autopsy and Forensic Pathology, 4 weeks on Cytogenetic and Molecular Pathology, 12 weeks on Cytopathology, and 72 weeks on Surgical Pathology, for a total of 96 weeks of Anatomic Pathology. Core training includes 5-11 weeks of experience in each of the Surgical Pathology subspecialties, with additional rotations ("electives") for added experience available in all areas. The resident is responsible for gross dissection, block selection, dictation, and preliminary microscopic diagnosis of all autopsies and some of the MGH surgical pathology cases on each service, as well as review of some of the outside

slides assigned to each service. The resident does the microscopic examination of all the cases he or she grosses, and initially will gross each sort of specimen; after the resident has demonstrated competence, technicians and pathologists assistants will process most small and many large specimens. Residents receive the slides from their cases, preview them, and formulate a written diagnosis. All cases are signed out with either a staff pathologist or a "signout fellow" who has a staff-level appointment. Eight to ten interesting or instructive cases are shown daily at the Anatomic Pathology Out Conference. The Anatomic Pathology faculty give lectures on selected topics. Residents are encouraged to undertake clinicopathologic research projects.

1. Special Studies (Medical Knowledge and Patient Care): On each rotation, the residents learn the indications for, and utility and interpretation of special diagnostic techniques. They interpret all special stains and immunohistochemistry, and review electron microscope prints on their cases.

2. Consultation with Other Physicians (Professionalism and Interpersonal and Communication Skills): On Anatomic Pathology rotations and in the Frozen Section laboratory, the resident has frequent contact with other physicians, and learns how to function as a member of a clinical team. The resident is the contact person on all cases, discusses any questions with clinicians, reviews slides with clinicians on urgent or interesting cases, and calls to report frozen section diagnosis or unexpected or important findings to physicians, under the supervision of a staff pathologist. On each specialty rotation, the resident attends the relevant clinical conferences and presents cases. Residents present selected cases to trainees on other services at regularly scheduled conferences. On-call residents answer calls and perform frozen sections with staff backup.

3. Laboratory Management (Systems-Based Practice and Practice-Based Learning and Improvement): Residents learn accessioning and reporting procedures; they are trained in the use of the Anatomic Pathology computer system and the hospital information system. They learn the operation of the tissue processors and the organization of the histology laboratory in Anatomic Pathology. They have additional opportunities to learn management in the Immunopathology and Electron Microscopy laboratories during the Renal/Immunopathology/EM rotation. Residents are responsible for solving problems in specimen transport, identification and labeling. Chief Residents assist in the running of the Surgical Pathology Gross Room, resolving questions about accessioning and allocation of specimens, and attend the monthly meetings of the AP Supervisors' and Quality Assurance committees. Residents are instructed in coding and computerized retrieval of pathology reports, as well as CPT-4 and ICD-9 coding.

4. Graduated Responsibility (Medical Knowledge, Patient Care, and Practice-Based Learning and Improvement): First-year AP residents learn the technical aspects of autopsy prosection and surgical specimen handling and processing, learn to recognize all normal tissues and most common disease processes, and special handling of certain specimen types, such as breast and lymph node biopsies. By the end of the first year, they are expected to be able to perform complete gross and microscopic examinations of most common types of pathology specimens and write a complete report according to departmental guidelines. Second-year AP residents assume more responsibility for the diagnoses and for conveying information to clinicians. By the end of the second year of training it is expected that most of the residents' diagnoses will not need to be changed, and that a correct interpretation will be rendered on all but the most challenging cases. Third year AP residents assume more independence in their responsibility for diagnosing and presenting cases at clinical conferences.

They may complete reports on their cases and turn them over to the supervising staff for review and cosignature, rather than then signing out at a 2-headed microscope. They diagnose evening and weekend frozen sections, with backup from staff pathologists.

5. Role of Fellows (Systems-Based Practice and Practice-Based Learning and Improvement): There are regularly fellows in Breast Pathology, Dermatopathology, Gastrointestinal Pathology, Gynecologic Pathology, Hematopathology, Neuropathology and Renal Pathology, and often other subspecialties of pathology. Residents have primary responsibility for all specimens. Dermatopathology, Hematopathology and Neuropathology are ACGME accredited subspecialties, and, when there is a fellow on these services, the resident reviews the slides on their cases independently, then both the fellow and the resident sign out with the staff dermatopathologist, hematopathologist or neuropathologist. Surgical pathology fellows in non-ACGME accredited subspecialties are qualified and credentialed as junior members of the staff, and supervise residents and sign out as junior staff ("signout fellow") pathologists.

The following table shows the anatomic pathology staff by subspecialty service, including both the regular staff and the fully qualified junior staff ("signout fellows"). The director or co-director of each service is designated by a "D" and the other faculty on each service are designated by an "F". The services designations are as follows:

AUT = Autopsy Pathology	FS = Frozen Section Service
BR = Breast Pathology	GI = Gastrointestinal Pathology
BST = Bone and Soft Tissue Pathology	GU = Genitourinary Pathology
CV = Cardiovascular Pathology	GYN = Gynecologic Pathology
CYT = Cytopathology	HP = Hematopathology
DP = Dermatopathology	OB = Obstetric Pathology
ENT = Head and Neck (ENT) Pathology	PP = Pulmonary Pathology
FNA = Fine Needle Aspiration Service	RP = Renal Pathology.

	AUT	BR	BST	CV	CYT	DP	ENT	FNA	FS	GI	GU	GYN	HP	NP	OB	PP	RP
Badizadegan									F								
Balassanian					F			F									
Bhan	F																
Black-Schaffer					F							F					
Brachtel		F			F			F									
Colvin																	D
Deshpande					F					F							
Duncan						D											
Eichhorn		F			F							F					
Faquin					F		D	F									
Ferry									F				D				
Frosch														D			
Grabbe					F												
Graeme-Cook																	
Gudewicz		F															
Harris													D				

	AUT	BR	BST	CV	CYT	DP	ENT	FNA	FS	GI	GU	GYN	HP	NP	OB	PP	RP
Hasserjian													F				
Hedley-Whyte														F			
Hoang						F											
Hunt							F										
Koerner		F															
Kradin	F			F					F						F		
Lauwers									D	D							
Lerwill		F							F			F					
Louis														F			
Mark	D			F					F							D	
Mihm					F				F	F							
Mino			F						F	F					F		
Misdraji				F				F		F							
Nielsen			D						F								
Oliva									F		F	F			F		
Osgood				F													
Piris					F												
Pitman				F			D		F								
Rahemtullah									F				F				
Roberts												F			D		
Rosenberg		F															
Sadow							F										
Schneeberger															F		
Sgroi		D															
Shen				F			F										
Smith	F			F												F	
Sohani									F			F					
Stemmer-Rachamimov														F			
Stone	F		D														
Tambouret				F			F					F			F		
Wilbur				D								F					
Wu						F		F			F						
Young											D	D					
Zukerberg									F	F			F				
Zulinska				F													

A U T O P S Y P A T H O L O G Y

Goals and Objectives

1. To acquire skills necessary for dissection of the human body
2. To learn to review the medical record and present a clear and concise clinical history
3. To recognize the gross and microscopic features of diseases, make clinicopathological correlations, and communicate the information to clinical colleagues.
4. To learn the proper reporting and handling of cases under the jurisdiction of the Medical Examiner
5. To learn the application of clinical pathology to the autopsy, particularly bacteriology and toxicology

6. To appreciate and report upon findings not previously recognized in the medical literature

Rotation Description: During their first week in the Department, and prior to beginning their rotation on the Autopsy service, the residents are given a manual to read on autopsy dissection, a book on death certification, and a book entitled The Hospital Autopsy. They view a video on the performance of the autopsy and participate in a group discussion with the Director of the Autopsy Service. Including one introductory week on the Autopsy Service during their first three months of training, residents spend 6 weeks full-time as a junior resident on the Autopsy Service. During the introductory week, a full-time teaching resident is assigned to instruct in autopsy techniques. A staff pathologist devoted to the autopsy is on duty each week to advise and assist in the dissection, review gross and microscopic pathology, and to correlate clinical issues. In addition to the junior resident who covers the Autopsy Service full-time, a senior resident on the cardiovascular / pulmonary pathology service provides the junior resident with teaching and direction under the supervision of the autopsy pathology staff, and serves as the second autopsy pathology resident, when there is more than one autopsy in a day. Residents are responsible for evaluation of the correctness and restrictions of the autopsy permission. They report cases to the Medical Examiner as necessary. They review and abstract the clinical record, consult with clinicians to determine the most salient clinical questions, perform the dissection, record the macroscopic findings, review the organs with the attending pathologist, present the case at the Autopsy Conference, create a list of the Provisional Anatomic Diagnosis with the attending pathologist, select tissue blocks for preparation of slides, examine the slides, formulate a final diagnosis, prepare the final report including clinicopathologic correlation as indicated, and sign the case out with the staff pathologist, then finally communicate the results to clinicians. The respective roles of the junior and the senior resident, when the senior resident is serving in a supervisory role, are as outlined:

Role of a junior resident who is primary prosecutor	Role of a senior resident who is supervisory prosecutor
Review chart	Review chart with junior resident
Communicate as appropriate with Medical Examiner	Advise about communication with Medical Examiner
Communicate as appropriate with Neuropathology	Advise about communication with Neuropathology
Communicate with clinicians	Advise about communication with clinicians
Discuss with senior what will be communicated to autopsy attending	Communicate with autopsy attending
Perform under supervision of senior resident: External examination; Evisceration; Block dissection; Tissue collection for special studies; Microscopic section selection; Organ review with senior resident and autopsy attending; Gross photography	Supervise junior resident's performance of : External examination; Evisceration; Block dissection; Tissue collection for special studies; Microscopic section selection; Organ review with junior resident and autopsy attending; Gross photography
Generate Preliminary Anatomic Diagnosis; Complete Death Certificate; Examine slides (including special stains/immuno as appropriate); Write microscopic description; Generate Final Anatomic Diagnosis	Review with junior resident: Preliminary Anatomic Diagnosis; Death Certificate; Slides (decide whether to order special stains/immuno prior to attending review); Microscopic description; Final Anatomic Diagnosis

Autopsy Conference: The resident and attending staff organize the weekly Autopsy Conference, at which the clinical histories and organs on all cases are presented, as well as selected microscopic slides as below. The resident and staff

invite relevant pathology subspecialists and clinicians, select organs of most teaching value to demonstrate, and prepare microscopic slides by rush processing if such slides are useful for correlation. The resident presents the clinical history and demonstrates the gross findings. Neuropathology fellows and staff present the neuropathology findings. All AP residents attend the conference. During 2 years of AP training, the residents have the opportunity to see the gross organs and hear the clinical correlations pertaining to approximately 500 autopsies.

Graded Responsibility: First-year residents learn basic techniques of autopsy dissection and become familiar with normal anatomy and gross and microscopic diagnosis of conditions commonly encountered at autopsy. After the introductory autopsy week, senior residents on the cardiovascular / pulmonary pathology service are assigned responsibility for teaching and supervision of first-year residents and medical students, and residents who have completed the Anatomic Pathology core may function as senior residents attending on the Autopsy Service, assuming staff responsibilities under the supervision of the Director of the Autopsy Service.

Consultation with Clinical Services: Residents discuss each case with an attending physician prior to beginning the autopsy. The clinicians are invited to attend the autopsy or its presentation at the Autopsy Conference, where the resident answers questions from attending physicians or from other members of the clinical services. Residents present completed autopsies, including gross photographs and photomicrographs, at selected clinical conferences as requested by the clinical services. The Chief Resident presents autopsy findings at the weekly Morbidity and Mortality Conference on the medical service, where autopsies often comprise a major component of the conference.

Senior Residents and Fellows: Senior residents and fellows may take additional rotations on the Autopsy service, where they function as an attending pathologist. They supervise junior residents in the gross and microscopic study of the cases and sign out the cases under the supervision of the Director of the Autopsy Service.

Multiprosector Autopsies: Autopsies may be shared by residents in two ways: 1) teaching and senior residents on the Cardiovascular / Pulmonary Pathology service supervise and assist first-year residents, and 2) senior residents may sign out cases on autopsy elective with junior residents. Both teaching and senior residents on the Cardiovascular / Pulmonary Pathology service will typically have an average of five junior resident cases per week, and their distinct roles are as described above. Senior residents taking an autopsy elective who serve as autopsy signout staff under supervision of the Director of the Autopsy Service usually do so for 2 weeks, and are also responsible for an average for 10 cases.

Evaluation: Residents' performance evaluation on the Autopsy Service is carried out verbally on a continual basis by the supervising staff pathologist, and in writing weekly on electronic global performance rating forms reports, as for all residents on Anatomic Pathology.

Director: **Eugene J. Mark, M.D.**, Director of Autopsy Service, Deputy Medical Examiner

Duration: 6 weeks

F O R E N S I C P A T H O L O G Y

Goals and Objectives

1. To become familiar with the range of forensic autopsies and the types of problems encountered, including the rules of evidence and chain of custody, and to appreciate the differences between Forensic Pathology and hospital-based Autopsy Pathology
2. To learn to prepare death certificates that accurately reflect manner of death by accident, suicide and homicide as well as by natural causes
3. To learn the basics of the pathology of violent death, including trauma, motor vehicle accidents, burns, fractures, gunshots, strangulation and poisoning
4. To become familiar with the specialized techniques used in forensic pathology and to be exposed to other aspects of forensic science dealing with ballistics, forensic dentistry, forensic anthropology and toxicology
5. To appreciate how the findings at autopsy merge with police work and legal procedure, including crime scene investigation and court testimony
6. To learn the appropriate level of suspicion of the unexpected finding in seemingly self-evident death
7. To learn the various attributes of post-mortem change, including study of decomposed or dismembered bodies.

Massachusetts General Hospital:

Lecture Series: Residents attend a monthly didactic series of lectures on forensic pathology, given for the most part by board certified forensic pathologists and other members of the Office of the Chief Medical Examiner of the Commonwealth of Massachusetts. These include: Introduction to Forensic Pathology, Forensic Neuropathology, Blunt Force Trauma, Sudden Cardiac Death, Stab Wounds, Embolism, Spectroscopy in Forensics, Gunshot Wounds, DNA in Forensics, Traumatic Asphyxia, Sudden Infant Death Syndrome, Asphyxia, Therapeutic Misadventures, Death in Fire, Forensic Anthropology, Child Abuse, Drugs of Abuse, Poisoning and Alcohol, Forensic Dentistry, and Testifying in Court.

Office of the Chief Medical Examiner:

Residents spend 2 weeks during their second AP year at the OCME in downtown Boston or at another medical examiners' office elsewhere in the United States by special arrangement and permission. The Boston office, under the direction of the Chief Medical Examiner, performs as many as 10 autopsies a day. Residents assigned to this rotation have had previous hospital autopsy experience during their first year. They are exposed to approximately 70 cases during the 2-week rotation and actively participate in approximately 20 of these. Residents attend the morning conference daily, review documents

and issues on all planned cases for the day, attend and participate in the dissections, discuss the findings with the ME, and help to prepare the death certificate. Residents assist in all types of forensic cases, including accidents, suicides, homicides, and natural deaths. All cases are supervised and reviewed by experienced forensic pathologists. Forensic topics (i.e., cause and manner of death, traumatic wounds, toxicology, forensic histopathology, neuropathology, trace evidence and evaluation of vitreous fluid) are reviewed in general as they pertain to cases, as are the specific results of forensic laboratory studies in these cases. The residents keep a list of their cases for documentation. As opportunities arise, the residents are exposed to forensic anthropology and forensic odontology. References on medical forensics are available. The resident may be involved in preparation of an unusual case for journal publication.

Graduated responsibility: Upon return to the MGH, the resident is expected to take increased responsibility for ME cases. Interested residents are encouraged to return to the OCME for more advanced training as an elective.

Scene investigations and court appearances: Residents are invited to participate when these occur during their rotation. They are also invited to accompany Dr. Mindy Hull to court appearances while at MGH.

Elective rotations in forensic pathology:

1. An elective rotation is available at the OCME, allowing increased autopsy participation and opportunities to become familiar with the broader range of responsibilities and technological tools of the forensic pathologist, particularly in the forensic laboratories.
2. With prior arrangement and approval, residents may elect to spend elective time at other Medical Examiners' offices across the country.

Evaluation: The Medical Examiner in Boston is asked to fill out an evaluation form for all residents completing the rotation. For evaluations at sites other than the Boston Office, the resident doing the rotation brings along an evaluation form to be completed by the Medical Examiner, which is then sent by mail to the Director of the Autopsy Service at MGH.

Director: **Eugene J. Mark, M.D.**, Director of Autopsy Service, Deputy Medical Examiner

Duration: 2 weeks

C Y T O G E N E T I C S

Goals and Objectives

1. To understand the preparation and analysis of cytogenetic specimens from blood, bone marrow, amniotic fluid and tissues

2. To become familiar with the role of cytogenetics in the diagnosis of congenital abnormalities
3. To become familiar with the role of cytogenetics in the diagnosis and classification of malignancies

Rotation Description

Residents learn preparation and interpretation of cytogenetic specimens by rotating for one week at the consolidated Cytogenetics service of the Brigham and Women's Hospital, Massachusetts General Hospital, Children's Hospital Boston and Dana Farber Cancer Institute. The site for the rotation is at the Brigham and Women's Hospital, approximately 3 miles from Massachusetts General Hospital. The laboratory is run by the Pathology Department and occupies 3,000 sq. ft. of space located adjacent to Anatomic Pathology and Laboratory Medicine. Residents are exposed to the full spectrum of specimens including amniotic fluids, chorionic villous biopsies, peripheral blood, umbilical cord blood, solid tissues, bone marrows, and solid tumors. Residents observe banding techniques including GTG, QFQ, NOR, as well as fluorescence in situ hybridization (FISH) in both interphase and metaphase cytogenetic analysis for aneuploidy detection and for gene deletion studies. Residents attend the 90-minute working case conference during which all abnormal cases are discussed. This case conference reviews patient history, pathology findings, ancillary test results (including ultrasound, etc.), cytogenetic test results, impact on diagnosis, and genetic counseling implications.

Karyotypes are distributed and discussed, along with discussion of the rationale for choosing specific staining techniques, use of FISH probes, and unanswered questions. Residents also attend individualized signout sessions with the Senior Staff, at which interpretive reports are issued. These sessions include discussion of laboratory techniques, microscopy and imaging technology, review of selected patient folders, and review of karyotypes on instructive cases. These teaching sessions also include discussion of how to correlate results with gross and microscopic pathology findings, other laboratory tests, and cost-effectiveness. Ethical and legal issues including genetic privacy are also addressed. Through the conferences and teaching sessions, the residents learn basic aspects of cytogenetics and the interpretation and clinical correlation of the results. Independent reading and review of a binder of reading materials and instructive abnormal karyotypes with their reports and accompanying pathology reports provides another mechanism for the residents to understand the importance of clinical cytogenetics in modern pathology. Residents can attend genetic counseling sessions during which patients are counseled regarding abnormal pathology and cytogenetic findings.

Integration of Cytogenetic Studies and Test Results with Anatomic and Clinical Pathology Data: This is done on an ongoing basis throughout the resident education. The residents select tissues from tumors and from autopsy cases to be sent for cytogenetic testing, and the cytogenetic test results become part of their formal reports as addenda. The residents perform autopsies on many malformed fetuses with known or suspected chromosome anomalies. These matters are discussed as part of the review and signout of each case. On the Hematopathology rotation, both AP and CP residents review the results of cytogenetics testing of bone marrows for leukemia and myelodysplasia. These results form part of the final Pathology report. Karyotypes are provided to the residents on all cases analyzed. These results are discussed with the staff hematopathologist and are saved in a teaching file together with the Pathology report. In Clinical Pathology, serum screening (for amniotic fluid AFP, uE3, and hCG) identifies pregnancies at risk for aneuploidy and the laboratory provides follow-up on these cases.

Consultative Activities: Residents are invited to attend genetic counseling sessions during the rotation.

Graduated Responsibility: Interested residents may elect additional rotations in Cytogenetics, during which they may take a more active role in analyzing and interpreting results.

Fellows: There is a fellowship in Cytogenetics. Fellows assist in the teaching of residents rotating in the laboratory.

Director: **Cynthia C. Morton, Ph.D.**

Duration: 1 week

M O L E C U L A R P A T H O L O G Y

Goals and Objectives

1. To learn the fundamentals of molecular pathology as they relate to the tissue-based study of human disease diagnosis
2. To appreciate the heterogeneity, variability, and natural history of human neoplastic disorders amenable to scrutiny using techniques of molecular biology.
3. To understand the range of molecular laboratory methods used in clinical diagnosis: DNA and RNA extraction; PCR; DNA fingerprinting; FISH; array comparative genomic hybridization; RT-PCR; expression profiling; mutation screening; laser capture microdissection

Rotation Description

Residents spend three weeks at laboratories of Massachusetts General Hospital-East in the Charlestown Navy Yard. This three-week rotation exposes the resident to the theoretical and practical fundamentals of applied molecular pathology. The laboratory tests assist in the diagnosis of neoplasia by assessing allelic losses in gliomas (by FISH or LOH testing); specific chromosomal translocations at the molecular level (RT-PCR in sarcomas); expression profiling (Affymetrix facility). Residents gain practical experience with DNA extraction from formalin-fixed, paraffin-embedded material as well as RNA from frozen tissues. Residents perform PCR and gel electrophoresis to evaluate tissue mismatches from archival blocks. Residents also gain experience with RISH assays and laser capture microdissection. Didactic instruction includes sarcoma RT-PCR, glioma molecular diagnosis, array comparative genomic hybridization, bioinformatics of RNA expression profiling and tissue banking. Residents rotate through the DNA Diagnostics Laboratory, which specializes in germline DNA mutation screening for neurological diseases, which includes laboratory sign-out with the staff. The residents are provided with a packet of pertinent literature for independent reading.

Consultative Activities: In this introductory rotation, residents do not serve as consultants.

Graduated Responsibility is not possible in this introductory rotation. Interested residents may spend additional time in the laboratory as an elective, to acquire advanced skills and take on more responsibility.

Correlation with Anatomic and Clinical Pathology Data: Residents correlate molecular diagnostic findings with anatomical pathology diagnosis, particularly in the glioma and sarcoma testing.

Other Laboratories: Molecular Pathology techniques are also used and are taught in the Microbiology and HLA laboratory rotations (see separate laboratory descriptions).

Journal Club/Literature Review: A weekly Molecular Pathology Conference features presentations by the residents and fellows.

Director: **A. John Iafrate, M.D., Ph.D.**

Duration: 3 weeks

C Y T O P A T H O L O G Y

Goals and Objectives

1. To recognize the range of cytologic patterns manifested in specimens routinely sampled from tissues for cytologic diagnosis
2. To distinguish benign proliferative changes from malignancy in cytologic specimens
3. To recognize the cytologic features of inflammation, infection, hormonal changes, and antineoplastic therapy
4. To appreciate the significance of various cytologic collection techniques and make appropriate clinical recommendations
5. To distinguish between satisfactory and unsatisfactory cytologic specimens
6. To correlate all of the above and make accurate cytologic diagnoses
7. To perform and interpret fine needle aspiration biopsies

Rotation Description and Graduated Responsibility

Residents have 12 weeks of assigned cytopathology training, and may spend additional elective time. The initial six-week rotation in the first year focuses on basic techniques and diagnosis. The residents meet with a senior cytotechnologist or

cytopathologist once or twice each day for didactic microscopic sessions, using the study sets to supplement material shown to them during the day, and attending the morning Cytology Consensus Conference. They also attend the weekly Cytopathology Didactic Conference at which a variety of topics are covered in detail by a cytotechnologist or cytopathologist. The first week of the rotation covers negative, atypical and dysplastic gynecologic material through carcinoma-in-situ; the second week, invasive carcinoma and treatment effect; the third week, respiratory and fluid specimens including cerebrospinal fluids; the fourth week, gastrointestinal tract, breast, urinary tract, and miscellaneous cytologic material. During the last two weeks, the resident reviews and works up current cases, and signs them out with attending cytopathologists.

During the second 6-week block, in the second year of AP, residents assume greater responsibility for their cases. They actively participate in rapid interpretations of fine needle aspiration biopsies performed by the radiologists and by the cytopathologists. The residents are assigned daily to the various cytology services and look at current cases that have been prescreened by cytotechnologists, formulate a diagnosis, interpret associated cell blocks, obtain any necessary clinical or follow-up information on the case, and sign these cases out with attending cytopathologists.

Fine Needle Aspiration Biopsies (FNAs): During the second-year rotation, residents are trained in the performance and interpretation of FNAs by observing and then performing the procedure. During the observation process, the residents learn to inform the patient about the procedure and its risks, localize lesions, set up the equipment, perform the procedure, make smears, rapidly stain the slides, and interpret them. After sufficient training, usually one week, the residents do the procedure themselves and render a preliminary diagnosis under close staff supervision. By the end of the block, residents have typically participated in approximately 35 aspirations and personally performed approximately 20. The residents also provide preliminary rapid interpretations under staff supervision for aspirations performed by radiologists.

Additional elective time spent in cytology after the initial 12 weeks of training builds on this level of responsibility, and is tailored according to the interests, strengths, and weaknesses of the individual resident.

Consultative Reports/Activities: Cytopathology consultations consist of 1. Discussion of interpretive reports with physicians, and 2. Advising physicians on the submission of specimens, the implications of diagnoses, and on subsequent steps that can be taken to obtain further diagnostic information. The residents participate in discussing difficult cases that they have worked up with physicians, reporting and explaining both fine needle aspirations performed with the attending cytopathologist and those done by the radiologists. They also advise physicians on the preparation and submission of cytopathology specimens when they are on AP call.

Correlation of Surgical and Cytologic Specimens: 1. When residents rotate on the gynecologic pathology biopsy service, they assist in the comparison of all the prior week's biopsies with the corresponding Pap test results (required Clinical Laboratory Improvement Act [CLIA], cytology-biopsy correlation); 2) Residents routinely examine the cell block and needle core tissue associated with their cytologic specimens; 3) They examine study sets, which contain unusual and abnormal cytologic specimens of all types, with confirming tissue biopsies or resections; 4) At surgical and cytology conferences, cases are presented with corresponding histology correlation; and (5) Residents review cytologic specimens associated with their interesting cases when they rotate through the various surgical subspecialty rotations.

Role of Fellows: The residents and fellows in the Division of Cytopathology have substantially different roles. After an initial training period of several months, fellows act independently, signing out their own cases, performing fine needle aspirations, and attending rapid interpretations of deep-seated lesions, all under staff supervision. The fellow assumes an attending level responsibility for the teaching of residents. Fellows review the CLIA-mandated correlation of Pap tests and biopsies with the residents, bringing non-correlating and difficult cases for review with the attending cytopathologists at the daily multi-headed microscopy session.

Director: **David C. Wilbur, M.D.**

Director of Fine Needle Aspiration Service: Martha B. Pitman, M.D.

Duration: 12 weeks

S U R G I C A L P A T H O L O G Y

The remaining components of Anatomic Pathology are all considered to be subspecialties of Surgical Pathology, and are all under the general direction of the Director and Co-Director of Surgical Pathology. The specific resident rotations vary in their structure and content depending on the specific subject area. These are each described in detail in the following.

Director of Surgical Pathology: **Gregory Y. Lauwers, M.D.**

Duration: 72 weeks

B O N E A N D S O F T T I S S U E P A T H O L O G Y

Goals and Objectives

The study of diseases of bone and soft tissue frequently requires the correlation of radiographic as well as macroscopic and microscopic findings. As a foundation for acquiring knowledge of bone and soft tissue pathology, the first goal is to learn the normal gross characteristics and histology of the musculoskeletal system. In many circumstances, the gross features of the specimen are specific for a disease process, and provide information regarding potential biological behavior. Therefore, the second goal of the rotation is to develop skills of gross inspection and dissection, and the ability to correlate these findings with microscopic and radiographic features. Many diseases of the musculoskeletal system are unusual and require special forms of analysis including frozen section, immunohistochemistry, electron microscopy, FISH, cytogenetics, and PCR. Accordingly, the third goal for the rotation is to understand how best to triage tissue specimens such that the tissue is available in its appropriate state for all relevant testing. The fourth and final major goal is to be familiar with and competent in diagnosing most diseases of bone and soft tissue.

Educational Objectives

AP-1

- Know the grossing protocols outlined in the Department and House Officers' Manual
- Recognize the macroscopic features of normal bone and soft tissue, and be able to identify when a disease process is present.
- Recognize the macroscopic and histologic features of common non-neoplastic diseases of bone and soft tissue, such as osteoarthritis, disc degeneration and the more common metabolic diseases such as Paget's disease of bone.
- Learn the basic staging systems for bone and soft tissue tumors
- Attend the weekly Radiology, Sarcoma Tumor Board, 3:00 Interesting Case, and Consensus Conferences. These will provide information regarding the approach to diagnosis of bone and soft tissue tumors and their treatment.

AP-2

- AP-1 objectives, plus . . .
- Develop a more complete understanding of bone and soft tissue tumors, including being able to generate appropriate differential diagnoses and determine which diagnostic tests are required.
- Understand the basic work-up of bone and soft tissue tumors.
- Know the classification scheme of bone and soft tissue tumors

- Become familiar with the clinical and pathological features of the more common bone and soft tissue tumors.
- Acquire knowledge of the ultrastructure, immunophenotype, and genetic abnormalities of the more common bone and soft tissue tumors.
- Acquire a more complete understanding of non-neoplastic conditions of bone, including metabolic bone diseases and how they need to be evaluated.
- Continue to attend the Radiology, Sarcoma Tumor Board, and Consensus Conferences, and present some of the Tumor Board cases.

AP-3

- Solidify the AP-1 and AP-2 objectives, and . . .
- Become familiar with the less common metabolic bone diseases and their radiographic and histologic features.
- Know the features of all but very unusual bone and soft tissue tumors.
- Know the ultrastructural, immunophenotypic, and cytogenetic characteristics of bone and soft tissue tumors.
- Know the radiographic appearances of bone and soft tissue tumors and be able to generate a radiographic differential diagnosis.
- Present cases at the Sarcoma Tumor Board and respond to questions about them.

Director: **G. Petur Nielsen, M.D.**

Duration: 6 weeks

B R E A S T P A T H O L O G Y

Goals and Objectives

The macroscopic characteristics of diseases of the breast can be especially subtle and nonspecific and require a great deal of practice to develop the skills required for an accurate macroscopic examination. Furthermore, the histological analysis depends more on the recognition of the processes at work in the tissue than on the identification of specific microscopical patterns. To develop the ability to make accurate histological diagnoses, the resident will need to understand certain basic concepts, to appreciate subtle changes in cell structure and arrangement, to recognize alterations in tissue organization, and to weigh all this information judiciously.

Educational Goals

AP-1

- Know the grossing protocols outlined in the Department and House Officers' Manual
- On macroscopic examination, distinguish normal tissue from carcinoma and recognize comedonecrosis
- Recognize fibrocystic changes, adenosis, pseudoangiomatous stromal hyperplasia, and gynecomastia
- Distinguish fibroadenoma from hamartoma
- Recognize radial scar, sclerosing papilloma, and nipple adenoma
- Distinguish typical carcinoma in-situ from typical ductal hyperplasia
- Distinguish typical examples of ductal carcinoma in-situ from lobular carcinoma in-situ
- Classify invasive tumors as either ductal or lobular
- Understand the pathogenesis of Paget's disease of the breast
- Evaluate sentinel lymph node cytokeratin stains
- Understand the grading systems for ductal carcinoma in-situ and invasive carcinoma
- Write up cases, including completing synoptic report tables as appropriate
- Learn breast cancer staging

AP-2

- AP-1 objectives, plus . . .
- Recognize luteal phase changes and pseudolactational changes
- Understand how to evaluate and work-up solid carcinoma in-situ
- Know criteria for special subtypes of invasive carcinoma (tubular, medullary, mucinous, micropapillary, and metaplastic)

- Understand and apply criteria for evaluation of atypical ductal hyperplasia
- Recognize minimal forms of lobular neoplasia (atypical lobular hyperplasia)
- Distinguish phylloides tumor from fibroadenoma
- Understand how to evaluate and work-up spindle cell lesions
- Recognize radiation and chemotherapy effect
- Distinguish complex sclerosing lesions from invasive carcinoma
- Interpret immunohistochemical studies like e-cadherin, smooth muscle actin, and p63
- Understand the clinical implications of diagnoses
- Solidify the AP-1 and AP-2 objectives, and . . .
- Recognize solid papillary carcinoma in-situ and invasive endocrine carcinoma
- Become familiar with myoepithelial and adenomyoepithelial lesions
- Become familiar with cystic hypersecretory carcinoma in-situ
- Become familiar with rare subtypes of invasive carcinoma (adenoid cystic, secretory, cribriform, lipid-rich, glycogen-rich)
- Become familiar with histiocytoid and pleomorphic forms of invasive lobular carcinoma
- Be able to determine which special studies will help in difficult cases
- Interpret ER, PR, and Her-2 immunostains, and Her-2 FISH

AP-3

Director: **Dennis Sgroi, M.D.**

Duration: 6 weeks

C A R D I O V A S C U L A R P A T H O L O G Y

Goals and Objectives

1. Gain an understanding of the normal gross anatomy of the heart including:
 - The branching pattern and distribution of the major coronary arteries.
 - The configuration of the 4 cardiac valves.
 - The locations of the AV and SA nodes.
2. Develop a systematic approach for the gross examination of explanted (and autopsy) hearts.

3. Become familiar with cardiovascular prosthetic devices including:

- Mechanical and bio-prosthetic valves
- Ventricular assist devices
- Atrial-septal defect closure devices
- Aortic balloon pumps

4. Learn the normal histologic structure of the heart and blood vessels.

5. Gain an understanding for the International Society for Heart and Lung Transplantation (ISHLT) grading scheme for acute cellular rejection.

6. Through both pathologic specimen examination and reading, become acquainted with the following pathologic entities:

Rheumatic Valvular Disease

Cardiomyopathies

Carcinoid Valvular Disease

Hypertrophic Cardiomyopathy

Bacterial Endocarditis

Dilated Cardiomyopathy

Aorta / Arteries

Arrhythmogenic Right Ventricular Cardiomyopathy

Aging Changes of Arteries

Myocardium

Atherosclerosis

Lymphocytic Viral Myocarditis

Giant Cell (Temporal) Arteritis

Hypersensitivity Myocarditis

Takayasu Arteritis

Myocardial Catecholamine Toxicity

Aortic Medial Degeneration of Marfan Syndrome

Amyloid Heart Disease

Cardiac Transplantation

Cardiac Sarcoidosis

Acute Cellular Rejection

Cardiac Valves

Humoral Rejection

Myxomatous Degeneration

Chronic Rejection (Allograft Vasculopathy)

Calcific Degeneration

Quilty Lesions

Director: **James R. Stone, M.D. Ph.D.**

Duration: 6 weeks (with Pulmonary Pathology)

D E R M A T O P A T H O L O G Y

Goals and Objectives

The microscopic characteristics of diseases of the skin are subtle and often nonspecific, and one must integrate an understanding of the clinical presentation of the disease in order to make an accurate diagnosis. Furthermore, the histological analysis of inflammatory skin diseases requires an understanding of the patterns of inflammation. The distinction among various atypical melanocytic lesions especially requires observation of large numbers of cases.

Educational Goals

AP-1

· Know the grossing protocols outlined in the Department and House Officers' Manual and how to handle cases that may come to the Department after hours

· Recognize the normal anatomy of the skin

· Recognize cell types in the skin

· Know the basic patterns of inflammation

· Recognize different cystic lesions of skin

· Recognize different types of basal cell carcinomas

· Distinguish squamous cell carcinoma from actinic keratosis

· Evaluate sentinel lymph node immunoperoxidase stains

- Understand the Clark levels of melanoma
- Write up cases, including completing synoptic report of melanomas as appropriate
- Learn melanoma staging
- Be able to recognize common infections including onychomycosis, HPV, herpes, molluscum

AP-2

- AP-1 objectives, plus . . .
- Recognize the diagnostic features of dysplastic nevi
- Understand how to evaluate atypical melanocytic hyperplasias
- Understand the differences between eccrine and apocrine adnexal tumors
- Understand and apply criteria for evaluation of bullous skin diseases

- Understand and apply criteria for evaluation of interface dermatides
- Recognize granulomatous diseases of different etiologies
- Recognize infections due to spirochetes, deep fungi
- Understand how to evaluate hypersensitivity reactions in the skin
- Recognize neuroendocrine tumors
- Become familiar with atypical lymphoid infiltrates
- Understand the clinical implications of diagnoses
- Become familiar with rare subtypes of melanocytic lesions such as deep penetrating nevus, animal type melanoma
- Understand how to diagnosis lentigo maligna and its variants
- Become familiar with soft tissue tumors of the skin
- Be able to grade dysplastic nevi
- Be able to recognize malignant adnexal tumors
- Understand and apply criteria for evaluation of hair disorders
- Become familiar with immunofluorescence in dermatopathology

AP-3

- Solidify the AP-1 and AP-2 objectives, and . . .
- Be able to appropriately work up atypical lymphoid infiltrates
- Become familiar with dermal deposition disorders

Director: **Lyn M. Duncan, M.D.**

Duration: 6 weeks

G A S T R O I N T E S T I N A L P A T H O L O G Y

Goals and Objectives

The study of diseases of the gastrointestinal tract is highly demanding because it encompasses three organ systems (the digestive tract, liver, and pancreas). To be successful, different skills are needed for large surgical and biopsy specimens. For surgical specimens, the macroscopic characteristics of lesions can be subtle and nonspecific, particularly for pancreatic lesions, and the trainee will need practice to develop the skills required. For biopsies, the histological analysis and final diagnosis may depend heavily on the understanding of the pathobiology of the disorders (particularly for medical liver)

and the understanding of the clinical situation. Development of an accurate histological diagnosis may, at times, need to be informed by the clinical presentation, gross appearance and/or endoscopic data.

Educational Goals

AP-1

- Know the grossing protocols outlined in the Department and House Officers' Manual
- Recognize all normal tissue (segments of GI tract, liver and pancreas) on microscopic examination,
- On macroscopic examination, distinguish normal tissue (All segments of GI tract, liver and pancreas) from carcinoma
- Write up cases, including completing synoptic report tables as appropriate
- Learn AJCC/UICC cancer staging protocols
- Understand the clinical implications of the following diagnoses (see below)

Disorders of the Esophagus

Common inflammatory lesions: Reflux Esophagitis, Infectious Esophagitis (viral and fungal-with appropriate studies) and Barrett's Metaplasia

Eosinophilic inflammation (learn to assess the likelihood of an allergic process or eosinophilic gastroenteritis or reflux based on the material and clinical data)

Invasive adenocarcinoma and Invasive squamous cell carcinoma

Disorders of the Stomach

Acute and chronic gastritis/Chronic atrophic gastritis (and understand pathobiologic processes)

Fundic gland polyps

Common neoplasms: adenocarcinoma (intestinal type/diffuse type) and carcinoid tumors

Disorders of the Small Intestine

Common inflammatory conditions: ischemic bowel disease, malabsorption syndromes (Celiac Disease) and Crohn's Disease

Common ampullary neoplasms: Adenoma / adenocarcinoma and carcinoid tumor.

Disorders of the Colon

Active colitis

Ulcerative and Crohn colitis

Neoplastic polyps (Adenomatous, Villous, Serrated) versus hyperplastic polyps

Adenocarcinoma

Disorders of the Appendix

Acute Appendicitis

Carcinoid Tumor

Disorders of the Liver

Viral Hepatitis (A, B, C),

Alcoholic Liver Disease / Nonalcoholic Steatohepatitis

Focal lesion, possibility of pill-induced esophageal lesion

Cirrhosis

Hepatocellular Carcinoma / Cholangiocarcinoma

Koilocytotic change present [consistent with HPV infection]

Benign Bile Duct Tumors

Inflammatory Fibrous Polyp, Squamous Papilloma

Metastatic Tumors

Special types of squamous Cell Carcinoma (Superficial, Verrucous, Epidermoid with Spindle-cell Stroma

Disorders of the Gall Bladder

Cholelithiasis

Disorders of the Stomach

Inflammatory Disorders (Acute Cholecystitis, Chronic Cholecystitis)

Specific Gastritides: Granulomatous, Lymphocytic, Eosinophilic

Disorders of the Pancreas

Acute Pancreatitis

Polyps: Hyperplastic, Adenomatous, Fundic Gland, Inflammatory Fibroid,

Chronic Pancreatitis

Gastric Hyperplasias (Hyperplasia of Parietal and Chief Cells)

Neoplasms

Disorders of the Small Intestine

Ductal Adenocarcinoma

Rarer Malabsorption Syndromes (Tropical Sprue, Whipple's Disease, Others)

Endocrine Pancreatic tumors

Infectious Enterocolitis

AP-2

· AP-1 objectives, plus . . .

· Be able to master and understand the clinical implications of the following diagnoses (see below)

Nonsteroidal Anti-Inflammatory Drug-Induced Gut Lesions

Disorders of the Esophagus

Disorders of the Colon

Gastric heterotopia (inlet patch)

Be able to grade chronic colitis with (mild/moderate/severe) activity or chronic colitis, quiescent

Dysplasia, low or high grade, of Barrett's esophagus or squamous mucosa

Recognize low grade/high grade dysplasia

Rarer colitides: ischemic colitis, pseudomembranous colitis, lymphocytic colitis, collagenous colitis

Rare polyps: fibroepithelial polyp, squamous papilloma

Disorders of the Pancreas

Rectal Ulcer syndrome

Papillary and Solid Epithelial Neoplasm

Disorders of the Appendix

Adenocarcinoma

Cystic tumors with mucinous epithelium (MCN and IPMN)

Mucinous Cystadenoma and cystadenocarcinoma

Acinar Cell Carcinoma

Disorders of the Liver

Inflammatory/non-neoplastic disorders

AP-3

· Solidify the AP-1 and AP-2 objectives, and . . .

Acute Cholestatic, Infectious Mononucleosis, AIDS
Hepatitis

Be able to master and understand the clinical implications of the following diagnoses (see below)

Drug-Induced Hepatitis

Disorders of the Esophagus

Lesions Affecting Primarily Bile Ducts (PSC, PBC)

Recognize graft-versus-host disease and radiation effect

Cystic Liver Disease

Unusual tumors of the esophagus (Basaloid Type Carcinoma, Small Cell Carcinoma)

Liver Masses

Nodular Regenerative Hyperplasia, Macroregenerative Nodule

Disorders of the Stomach

Focal Nodular Hyperplasia

Gastrointestinal stromal tumor (diagnostic and prognostic criteria)

Liver Cell Adenoma

Consistent with graft-versus-host disease

Hepatocellular Dysplasia (Large Cell Dysplasia, Small Cell Dysplasia)

Consistent with radiation effect

Hepatoblastoma

Gastric Hyperplasias (Ménétrier's Disease, Zollinger-Ellison Syndrome)

Hemangioma, Infantile

Disorders of the Colon

Disorders of the Gall Bladder

Benign neoplasms and Carcinoma of Gallbladder

Unusual polyps: Hamartomatous (Peutz-Jeghers-type), Pseudopolyps, Inflammatory Fibroid, Solitary

Polyposis Syndromes: Cowden's Cronkhite-Canada,
Familial Polyposis, Gardner's, Multiple Juvenile
Polyposis, Peutz-Jeghers, Turcot's

Liver Disease in Pregnancy

Disorders of the Liver

Genetic/Childhood Disorders

Hemangioendothelioma, Epithelioid

Drug-Induced Hepatitis

Hemangioendothelioma, Angiosarcoma

Mesenchymal Hamartoma, Malignant Mesenchymoma,
Angiomyolipoma.

Director: **Gregory Y. Lauwers, M.D.**

Duration: 11 weeks

G E N I T O U R I N A R Y P A T H O L O G Y

Goals and Objectives

To recognize the various common forms of urologic cancer as well as their pre-neoplastic forms and to integrate microscopic analysis with gross evaluation recognizing the importance of astute focused sampling. Furthermore, emphasis will be placed on instructing the residents in including in their reports in a clear manner those aspects, which guide staging, treatment and prognosis. Where indicated, the incorporation of new techniques with conventional gross and microscopic analysis will be stressed.

Educational Goals

AP1

- Be able to satisfactorily gross, using standard guidelines, major forms of large resection specimens of urologic cancer, most particularly radical nephrectomy, radical cystectomy and radical prostatectomy.
- Be able to distinguish prostatic carcinoma from its various mimics.

- Be able to recognize common forms of transitional cell carcinoma of the bladder and adequately assess depth of invasion of bladder wall.
- Be able to recognize common forms of renal cell carcinoma.
- Be able to recognize small foci of prostatic carcinoma in lymph nodes procured with the radical prostatectomy procedure.

AP2-3

- Be able to grade prostatic carcinoma using the Gleason grading system.
- Be able to grade transitional cell carcinoma.
- Be able to grade renal cell carcinoma and recognize uncommon renal neoplasms including oncocytoma and chromophobe cell carcinoma.
- Be able to incorporate in reports of gross specimens information important for staging, treatment and prognosis including evaluation of capsular penetration and margin status in prostatectomy specimen, involvement of Gerota's fascia in kidney resection specimens and margin status in cystectomy specimens.
- Appreciate spectrum of benign mimics of prostatic carcinoma including, but not limited to, various forms of atrophy.
- Become aware of morphologic spectrum of important mimics of bladder cancer including cystitis glandularis and nephrogenic adenoma.
- Be aware of diagnostically important immunohistochemical stains including those helpful in establishing the diagnosis of prostate carcinoma and those that are relevant to the diagnosis and subclassification of renal epithelial neoplasms.
- Be aware of the morphology of Wilm's tumor and other renal neoplasms of childhood.

By the end of the third year, it is expected that the trainee will have exhibited a graduated increased competence in recognition of the various entities incorporated within the AP2-AP3 grouping such that by the end of their third year, they will be able to practice as a signout pathologist and be aware of all common and uncommon forms of neoplasia and its mimics such that when encountering lesions that are beyond their realm of experience they will be able to obtain appropriate consultation.

Director: **Robert H. Young, M.D.**

Duration: 5 weeks

G Y N E C O L O G I C P A T H O L O G Y

Goals and Objectives

Emphasize the crucial importance of correlation of gross findings with microscopic features and clinical background.

A further objective is to emphasize the diverse morphology of female genital tract neoplasia and pre-neoplasia.

Appropriate incorporation of newer technologies, including immunohistochemistry and molecular pathology.

Educational Goals

AP-1

- Know the grossing protocols outlined in the Department and House Officers' Manual
 - On macroscopic examination, distinguish normal tissue from carcinoma and non-neoplastic tumor-like proliferations
 - Distinguish benign, borderline and malignant surface epithelial tumors of the ovary
 - Recognize spectrum of cervical squamous dysplasias and cancers
 - Recognize spectrum of endometrial hyperplasias and cancers
 - Recognize common forms of ovarian cancer
- AP-1 objectives, plus . . .
 - Recognize non-neoplastic endometrial proliferations potentially confused with cancer
 - Recognize unusual forms of ovarian neoplasia, other than surface epithelial tumors
 - Recognize forms of cervical glandular neoplasia including adenocarcinoma in situ
 - Know criteria for grading common forms of ovarian carcinoma
 - Distinguish cervical glandular neoplasia from its mimics
 - Demonstrate progressive increase in knowledge and understanding of gynecologic pathology leading to competency as characterized by the level of safe diagnostic practice expected of a fully satisfactory beginning practitioner

Supervisor: **Robert H. Young, M.D.**

Duration: 11 weeks

O B S T E T R I C P A T H O L O G Y

Goals and Objectives

Expectations for Obstetric Pathology Service

First Week

1. Learn how to put up a placenta- singleton and multigestational: Read the Department Manual for guidance.

2. Understand the different placentations in multigestation (monochorionic vs. dichorionic).
3. Identify villi grossly under the dissecting microscope.
4. Learn common abbreviations.

5. Be able to diagnose histologically: acute chorioamnionitis and meconium, placental infarcts, intervillous thrombi, dichorionic vs. monochorionic dividing membranes.

6. Read the gross atlas of placental pathology.

7. Read about acute chorioamnionitis and meconium (clinical significance).

Second Week

1. Understand the indications for placental examination.

2. Know how to grossly distinguish dividing membranes - dichorionic vs. monochorionic).

3. Be able to grossly identify: intervillous thrombi, placental infarcts, meconium, acute chorioamnionitis.

4. Be able to histologically diagnose: chronic villitis, decidual vasculopathy, chorangiomas.

5. Read about and understand chronic villitis - infectious and non-infectious, know how to differentiate.

1. Know what to look for with specific clinical diagnoses or questions:

-Pre-eclampsia/toxemia, pregnancy induced hypertension

-Intrauterine fetal demise

-Non-reassuring fetal testing (fetal distress)

2. Be able to grossly identify vascular anastomoses in twins.

3. Be able to distinguish grossly, histologically, and biologically partial vs. complete hydatidiform moles.

4. Know the histologic findings in fetal tissues for Trisomy 21.

5. Be able to histologically diagnose: maternal floor infarct, massive chronic intervillitis, meconium myonecrosis.

6. Read and understand the significance of those diagnoses in #5.

Third Week

Expectations for Perinatal Autopsy Service

First Perinatal Autopsy

1. Read the Department Manual for guidance

2. Review human embryology.

3. Have a differential diagnosis in mind before you begin the case, read up about 2 of your top differential diagnoses.

4. Learn how to dissect.

5. Learn how to identify the fetal organs by histology.

6. Read the thin Wigglesworth Perinatal Pathology book.

Second Perinatal Autopsy

1. Be able to do dissection on your own.

2. Be able to diagnose congenital pneumonia.
3. Know the histologic findings that support acute vs. chronic in utero stress.
4. Be able to write up the Preliminary Anatomic Diagnosis and Final Anatomic Diagnosis on your own.

Third Perinatal Autopsy

Director: **Drucilla Roberts, M.D.** (Combined with Gynecologic Pathology)

Duration: 5 weeks

H E A D A N D N E C K (E N T) P A T H O L O G Y

Goals and Objectives

The head and neck surgical pathology service involves multiple organs and a great many possible diagnostic entities. In addition, the nature of the service is such that overlap with other services (e.g. hematopathology, dermatopathology, bone/soft tissue) occurs. In the several weeks of rotation on the head and neck service, it is most unlikely that a resident will personally encounter all of the entities mentioned below. A combination of practical experience on the rotation and individual study may serve to familiarize the residents with these less routine entities.

Thyroid and Parathyroid

- Know the basic gross anatomy of the thyroid gland (right and left lobes, isthmus, and pyramidal lobe)
- Know grossing protocol in house officers' manual, including taking 10 sections of the margin of a solitary follicular nodule.
- Appreciate gross appearance and appropriate sectioning of adenomatous goiter
- Learn normal size, number, and gross appearance of parathyroids, and significance of fat stain
- Ability to differentiate histologically follicular adenoma and adenomatous nodule from follicular carcinoma in straightforward cases and recognize the value of levels in difficult cases
- Ability to diagnose papillary thyroid carcinoma and its follicular variant, and learn an approach to "borderline" follicular lesions
- Be aware of subtypes of papillary carcinoma and their significance

- Ability to suspect and recognize medullary thyroid carcinoma, its immunophenotype, and to be aware of associated syndromes
- Awareness of poorly differentiated thyroid carcinoma (e.g. insular)
- Knowledge of anaplastic thyroid carcinoma and its diagnostic features
- Familiarity with Hashimoto's thyroiditis and other thyroididities
- Approach to diagnosis of MALT lymphoma of thyroid
- Diagnostic features and pathogenesis of thyroglossal duct cyst
- Appreciation of range of normal in parathyroid glands
- Distinction of enlarged hypercellular parathyroid with decreased fat from normal
- Awareness of parathyroid carcinoma and when to suspect it
- Ability to recognize cervical thymic tissue

Salivary glands

- Know gross distinction of normal submandibular gland from fat and lymph node and normal parotid gland from fat.
- Distinguish normal parotid, submandibular, and sublingual glands histologically
- Knowledge of morphologic features of chronic sialadenitis and sialolithiasis, including radiation-induced sialadenitis

- Awareness of "Kuttner" tumor and sarcoid of parotid
- Recognize lymphoepithelial sialadenitis, its association with Sjögren's syndrome.
- Know when to suspect MALT lymphoma of salivary gland and how to proceed further diagnostically
- Awareness of minor salivary gland changes in Sjögren's syndrome
- Be familiar with principal benign salivary tumors: pleomorphic adenoma, Warthin's tumor, oncocytoma, basal cell adenoma, and when to research rarer types.
- Learn proper inking of excision specimens for determination of margins
- Be familiar with principal types of salivary gland carcinoma: mucoepidermoid (with grading), adenoid cystic, acinic cell, polymorphous low-grade adenocarcinoma, salivary duct carcinoma, carcinoma ex pleomorphic adenoma.
- Be aware of the existence of rarer malignancies, e.g. epithelial-myoepithelial carcinoma, basal cell adenocarcinoma, clear cell carcinoma, cystadenocarcinoma, small and large cell undifferentiated carcinoma, lymphoma

Neck

- Familiarity with anatomy of radical and modified radical neck dissection, including procedure for putting up such specimens
- Familiarity with histomorphology of common types of benign neck masses: lymph node hyperplasia/inflammation and its main subtypes (mycobacterial lymphadenitis, typical and atypical, sarcoid, branchial cleft cyst, Kimura's disease, Kikuchi's disease, Rosai-

Dorfman disease, toxoplasma lymphadenitis, cat scratch disease.

- Ability to recognize (or suspect and proceed further diagnostically) main types of cervical nodal lymphomas: Hodgkin lymphoma, small lymphocytic and large cell lymphoma, germinal center cell lymphoma
- Awareness of rarer cervical nodal lymphomas (e.g. T-cell lymphoma, large cell anaplastic lymphoma)
- Awareness of main soft tissue lesions in neck: lipomas and subtypes, nodular fasciitis, fibromatosis and myofibromas, schwannomas, sarcomas of the neck (rhabdomyosarcoma, leiomyosarcoma, synovial sarcoma, fibrosarcoma, malignant peripheral nerve sheath tumor, primitive neuroectodermal tumor)
- Diagnostic criteria for paraganglioma and neuroblastoma
- Familiarity with metastatic carcinomas to cervical nodes and their subtypes (squamous cell, with recognition of importance of extracapsular spread, also the significance of metastatic squamous cell carcinoma of "unknown primary site", adenocarcinoma, neuroendocrine carcinoma, papillary thyroid carcinoma)
- Familiarity with hemangiomas, lymphangiomas (including cystic hygroma), and ranulas

Sinonasal tract

- Approach to putting up a maxillectomy specimen, with gross recognition of nasal cavities, septum, turbinates, maxillary sinus
- Histologic recognition of chronic rhinosinusitis, polyps, eosinophilia

· Ability to diagnose fungal rhinosinusitis: aspergillus, mucormycosis, allergic fugal sinusitis, and their significance

- Knowledge of histologic characteristics of Wegener's granulomatosis, sarcoid, pyogenic granuloma, rhinoscleroma, rhinosporidiosis
- Knowledge of histology of Schneiderian papilloma subtypes
- Knowledge of histology of sinonasal epithelial malignancies (sinonasal carcinoma, keratinizing and nonkeratinizing; adenocarcinoma, intestinal and non-intestinal; rare neuroendocrine carcinomas).
- Familiarity with sinonasal small round cell tumors: olfactory neuroblastoma, rhabdomyosarcoma, small cell carcinoma, lymphoma, primitive neuroectodermal tumor
- Recognition of nasal lymphomas, including sinonasal-type T-cell lymphoma
- Recognition of nasal malignant melanoma
- Recognition of salivary-type nasal tumors: pleomorphic adenoma, adenoid cystic carcinoma, rare others
- Familiarity with connective tissue lesions of sinonasal tract, e.g. chondrosarcoma, osteosarcoma, osteoma, fibro-osseous lesions
- Awareness of sinonasal involvement by lesions of adjacent structures, e.g. pituitary tumors, odontogenic cysts and tumors, meningiomas
- Familiarity with important congenital anomalies: nasal glial heterotopia, encephalocele, nasal dermoid
- Knowledge of normal histology of nasopharynx

- Familiarity with nasopharyngeal lymphoid hyperplasia
 - Knowledge of morphology and behavior of nasopharyngeal angiofibroma
 - Ability to diagnose nasopharyngeal carcinoma, recognize the significance of EBV, and distinguish it from nasopharyngeal lymphoma
 - Familiarity with nasopharyngeal extramedullary plasmacytoma
 - Diagnostic features of squamous cell carcinoma and its variants (verrucous, sarcomatoid, basaloid squamous, acantholytic) and recognition of problem of sarcomatoid carcinoma vs. sarcoma
 - Ability to diagnose minor salivary gland tumors, including canalicular adenoma of the lip
 - Some familiarity with oral traumatic eosinophilic granuloma and HIV-associated plasmablastic lymphoma
 - Familiarity with common odontogenic cysts (keratocyst, dentigerous, radicular) and realization of existence of rarer types (gingival, lateral periodontal, glandular odontogenic, calcifying odontogenic)
 - Familiarity with fissural cysts (nasopalatine duct and nasolabial)
 - Knowledge of diagnostic features of ameloblastoma and odontoma
 - Some familiarity with rarer odontogenic tumors (e.g. Pindborg tumor, Gorlin cyst/tumor, squamous odontogenic tumor, adenomatoid odontogenic tumor, cementoblastoma, odontogenic myxoma, odontogenic carcinoma, ameloblastic fibroma)
 - Diagnosis of gnathic osteosarcoma
 - Knowledge of osseous and fibro-osseous lesions of jaw (fibrous dysplasia, ossifying fibroma [central and peripheral], cemento-osseous dysplasia, Paget's disease of bone)
- Oral Cavity, Oropharynx, and Jaws**
- Knowledge of basic gross anatomy of tongue, jaws, tonsils, hard and soft palate and uvula
 - Approach to orientation and putting up of composite resection specimens and glossectomies
 - Familiarity with the histology of tonsillitis, peritonsillar abscess, oral flora in intestinal crypts, embryonic cartilage remnants
 - Familiarity with common benign tumors and swellings: squamous papilloma, granular cell tumor (with accompanying pseudoepitheliomatous hyperplasia), amyloid deposition, mucocele and ranula
 - Familiarity with diagnostic features of oral lichen planus, oral candidiasis, oral hairy leukoplakia, oral pemphigus and pemphigoid, oral Crohn's disease
 - Knowledge of stages and diagnostic features of oral squamous hyperplasia and dysplasia
 - Diagnosis of squamous carcinoma in situ (severe dysplasia) and superficially invasive squamous cell carcinoma

Larynx

- Knowledge of basic gross anatomy of larynx and approach to putting up a laryngectomy specimen

- Diagnosis of laryngeal squamous papillomas with viropathic (HPV) effect
- Diagnosis of vocal cord polyps and contact ulcer/"granuloma"
- Familiarity with epiglottitis/supraglottitis, laryngeal sarcoid, Wegener's granulomatosis, laryngeal Crohn's disease
- Diagnosis of laryngeal granular cell tumor and its associated pseudoepitheliomatous hyperplasia
- Diagnosis of laryngeal amyloid deposition
- Familiarity with laryngeal cysts: laryngocele, oncocytic cyst, duct inclusion cyst
- Ability to diagnose laryngeal premalignant lesions (hyperplasia, keratosis, grades of dysplasia) and ability to differentiate them from reactive changes (e.g. radiation effect)
- Diagnosis of laryngeal squamous cell carcinoma and its variants (see oral cavity), especially verrucous carcinoma vs. squamous hyperplasia and sarcomatoid carcinoma vs. sarcoma
- Diagnosis of laryngeal mucoepidermoid and adenoid cystic carcinomas
- Diagnosis of laryngeal neuroendocrine carcinoma and paraganglioma
- Diagnosis of laryngeal chondrosarcomas and rare chondromas

Ear

- Approach to putting up an auricectomy or lateral temporal bone resection specimen

- Histologic recognition of middle ear mucosa
- Familiarity with chronic otitis media and cholesterol granulomas
- Diagnosis and pathogenesis of cholesteatoma
- Diagnosis of tympanosclerosis
- Histology of middle ear ossicles
- Some familiarity with auricular gout, enchondral pseudocyst, relapsing polychondritis, chondrodermatitis nodularis helicis
- Diagnosis of aural skin malignancies: squamous cell and basal cell carcinoma
- Diagnosis of paraganglioma ("glomus tympanicum" and "glomus jugulare")
- Some familiarity with rare ear tumors (carcinoid/"adenomatous tumor", endolymphatic sac tumor, eighth nerve schwannoma, meningioma)
- Some familiarity with temporomandibular joint synovial chondromatosis and calcium pyrophosphate dihydrate crystal deposition disease
- Diagnosis of temporal bone Langerhans' cell histiocytosis

Skin

Familiarity with skin lesions commonly affecting the head and neck, e.g. nevi, seborrheic keratosis, epidermal inclusion cyst, dermoid cyst, chondrodermatitis nodularis helicis, basal cell and squamous cell carcinomas, actinic keratosis, sebaceous carcinoma of eyelid, Merkel cell carcinoma, nevus sebaceus, microcystic adnexal carcinoma, hidrocystomas of

eyelid, xanthelasma, syringoma, trichilemmoma, and

pilomatrixoma

Director: **William C. Faquin, M.D., Ph.D.**

Duration: 5 weeks

H E M A T O P A T H O L O G Y

Goals and Objectives

This rotation provides the resident with practical experience in bone marrow and lymph node processing, recognition of normal and pathologic features of hematopoietic and lymphoid tissues, and understanding of the use of ancillary studies in diagnostic hematopathology.

Specific Goals and Responsibilities of Rotation

Service work

- Independently review all bone marrow biopsy and aspirate specimens. This will involve performing differential counts on bone marrow aspirates and completing the bone marrow diagnosis sheet prior to signout. By the end of the rotation, the resident should be able to fill out the sheet with minimal corrections and independently formulate a diagnosis.
- Obtain relevant clinical and laboratory data and retrieve and review peripheral smear (if available) prior to signout. The laboratory typically provides a peripheral smear with each bone marrow case, unless one is not available. The smear should be reviewed and the resident should perform a manual differential count if indicated.
- Sign out the bone marrow cases with the hematopathology attending. By the end of the rotation, the resident should be proficient at recognizing normal hematolymphoid tissue morphology and also be familiar with morphologic, immunophenotypic, and genetic features of common diseases such as myelodysplasia, myeloproliferative disorders, leukemias, lymphomas, and reactive processes.
- Attend frozen sections in which hematopathology is consulted.
- Order and follow up with review and signout of immunohistochemical studies. The resident is responsible for reviewing and bringing these studies to the attending pathologist's attention as soon as possible when they are available.
- Attend signout of lymph node and other tissue biopsy cases and outside consultations. These cases are typically handled by the AP resident (lymph node and other tissue and MGH consultations) or the hematopathology fellow (outside private consultations).

- Review and sign out with the attending hematopathologist lymph node and other tissue biopsy cases (including MGH consultations) when there is no AP resident on service. This includes gross dissection of thymomas (but not other hematopathology specimens, which are handled by the PAs on such weeks). If the CP resident is CP only, thymomas will be handled by a second year CP resident on the service or by the resident on the lung/cardiac service if there is no senior CP resident on service.
- Review bone marrows with the incoming hematopathology resident in the last week of the rotation. The resident (with the help of the hematopathology fellow) is responsible for teaching the incoming hematopathology resident(s) the procedure and technique of counting bone marrows and organizing the bone marrow service. If the incoming hematopathology resident is not available during the last week, this should be done during the penultimate week of the rotation.

Other Goals and Responsibilities

- Interact with clinicians. The resident carries a beeper and typically interacts with clinicians daily; this would include communicating and discussing results and advising on submission of specimens and ordering of special studies. Responsibility in communicating with clinicians is graduated, with near independence in the latter part of the rotation.
- Attend and present selected cases at the Lymphoma Conference (held every other Friday). The number and complexity of cases presented at the conference are gradually increased over the 8-week rotation; assignment of cases should be discussed with the hematopathology fellow and the attending on service.
- Attend and present selected cases at the Leukemia Conference (held once a month). The resident will typically present these cases in the second 4 weeks of the rotation; assignment of cases should be discussed with the hematopathology fellow and the attending on service.
- Attend and present selected cases at the Hematopathology-Cytogenetics Conference (held once a month). The selection and discussion of these cases should be discussed with Dr. Hasserjian at the beginning of each month. Typically the presentation of this conference will be shared with the resident on Flow Cytometry.

Daily Duties and Responsibilities

The resident reviews bone marrow cases as they become available in the afternoon and evening, and should have peripheral smears, CBC result printouts, and relevant clinical information available at the time of sign-out the following morning. The resident's responsibilities in procuring peripheral smears are posted in the heme booth.

Vacation Coverage

The resident on the flow cytometry rotation will cover the above responsibilities if the hematopathology resident is away. If both residents are away or if there is no flow cytometry resident, the above responsibilities will be covered by

(preferably) another resident who has already completed the hematopathology rotation or the hematopathology fellow. The hematopathology resident is responsible for ensuring coverage of these responsibilities during vacation weeks.

Director: **Judith Ferry, M.D.**

Duration: 6 weeks

F L O W C Y T O M E T R Y

Goals and Objectives

This rotation provides the resident with practical experience in interpreting leukemia and lymphoma flow cytometry panels as well as a general understanding of the principles of immunophenotyping and of running a flow cytometry laboratory.

Specific Goals and Responsibilities of Rotation

Flow cytometry service work

- Review and write up all leukemia/lymphoma flow cytometry reports during the rotation. These will typically involve lymph node, bone marrow, cytology, and peripheral blood specimens.
- Correlate flow findings with morphology, when applicable. This will involve retrieving (and having available for signout with the hematopathology attending) all corresponding peripheral blood smear and cytology slides. Appropriate accompanying information (such as CBC results, body fluid cell counts and differentials, and preliminary cytology diagnoses) should also be made available for signout. Bone marrow and lymph node slides are typically available in the heme booth.
- Sign out the flow cases with the hematopathology attending.
- Help the flow cytometry technicians in handling unclear requests or unusual cases. This may include contacting the ordering clinician or looking up clinical details and providing guidance on appropriate panels to run. Dr. Preffer and/or the hematopathology attending will supervise this as needed.
- Handle any follow-up on flow cases, including communication and correlation with cytology, pathology, and/or clinical staff.

- Attend morning hematopathology signout. The resident should try to arrange other responsibilities so as not to conflict with this time period. The resident may leave signout early to review cases with Dr. Preffer during the training period (see below) or if contacted by the flow lab staff to troubleshoot specific cases.

Other goals and responsibilities

- Spend at least two half days (typically in the first week of the first rotation and the first week of the last rotation) in the lab observing cases being immunophenotyped. The resident should schedule this day with the flow lab technicians on the first day of the rotation. This will include the processing, immunophenotyping, and analysis of the resident's own blood sample in the first half-day, and more detailed observation of technical aspects of immunophenotyping during the second half-day.
- Be involved in lab troubleshooting and general lab issues, such as any technical problems with hardware, new antibody validations, and meetings between Dr. Preffer and the laboratory staff, if appropriate.
- Towards the end of his/her rotation, the resident should present a short (15-20 min) series of a few cases he/she has encountered to the flow cytometry technical staff. This would typically take place in the heme booth and would involve showing slides, reviewing the flow scattergrams, correlating the flow/morphology interface, and providing a brief discussion of the disease entity to the staff. The day and time of this should be arranged between the resident and staff.
- Attend any clinical meetings of interest; Dr. Preffer will inform the resident of the time and location of such meetings.

Daily Duties and Responsibilities

The first one to two weeks of the first two-week block is considered the 'training period'. During this period, the resident should retrieve all flow cases periodically during the day and preview them, before reviewing them with Dr. Preffer in the late morning the following day. As the resident becomes more proficient, he/she may calculate the percentages and write the interpretation independently. Note that the flow scattergrams should ideally be reviewed in the flow cytometry lab and should not be removed from the lab except for signout with the hematopathology attending or by obtaining prior permission from Dr. Preffer.

The signout of flow cases should be arranged with the hematopathology attending on service each week, typically in the late morning or in the early afternoon following signout of routine cases. The resident must have reviewed and written up all cases from the previous day and have all corresponding morphology slides and pertinent clinical information (such as CBC and body fluid cell count printouts) available for every case at the time of signout. Most of these cases will be hematopathology cases already available in the hemepath booth. The resident's responsibilities in procuring peripheral smear slides are posted in the heme booth.

Supervision and Instruction

Dr. Frederic Preffer (direct supervision during training period and supervision on specific cases afterwards)

Flow lab staff (supervision of residents during days in lab).

Hematopathology service attendings.

Vacation Coverage

The resident should inform Dr. Preffer and the hematopathology service attending in advance if he/she will be away; these responsibilities will then be divided between Dr. Preffer (calculating and reporting of cases) and the hematopathology fellow (retrieving morphology slides, correlations); the hematopathology fellow will cover all responsibilities if Dr. Preffer is also away. The flow resident may also be asked to cover the bone marrow service if that resident is away; Dr. Preffer and the hematopathology fellow will then cover the flow responsibilities as described above.

Director: **Frederic Preffer, Ph.D.**

Duration: The rotation is 4 weeks in duration, completed as two 2-week blocks during the Hematopathology rotation. These 2-week blocks alternate with 2-week blocks on bone marrow pathology.

N E U R O P A T H O L O G Y

Goals and Objectives

1. Goals: To expose pathology residents to neuropathology and its associated methods including immunocytochemistry, histochemistry, teased nerve fiber preparations, electron microscopy and molecular genetics.
2. Objectives: At the end of the rotation:
 - a. Residents should be familiar with methods of processing different types of neuropathological specimens;
 - b. Residents should be able to make diagnoses on frozen sections from neurosurgical specimens;
 - c. The residents should be able to diagnose the common brain tumors and be familiar with the standard grading systems for gliomas and meningiomas;
 - d. Residents will be able to communicate with clinicians about the issues involved in the analysis of brain tumors;
 - e. Residents should be able to differentiate primary muscle disorders from neuropathic disorders on muscle biopsy;
 - f. Residents should understand the approach to and evaluation of peripheral nerve;

g. Residents should know how to approach the neuropathological aspects of an autopsy including analysis of the clinical record; removal, cutting and description of the brain, spinal cord and peripheral nerves; submission of suitable blocks for histologic analysis; analysis and description of microscopic sections; and completion of a clinical pathological correlative comment.

Duties during the rotation

1. To process, analyze and sign out all of the neurosurgical specimens during the rotation, with attendance at morning sign out.
2. To attend the Tuesday afternoon Clinical Neuropathological Conference and the Tuesday evening Mystery Case Conference.
3. To attend Wednesday morning Tumor Review by the Neuropathology staff.
4. To attend the Pediatric Neurooncology Conference on Wednesdays; the adult Neurooncology Conference on Thursdays and the Pediatric Neuropathology Conference monthly on Wednesday afternoons.
5. To attend all brain cutting conferences during the rotation.
6. To remove brains in rotation with the neurology resident and the neuropathology fellow. A microscopic description is expected for all brain slides submitted.
7. To work-up and analyze the muscle and nerve biopsies with the neuropathology fellow including histochemistry, electron microscopy and teased nerve fiber preparation.
8. To utilize the teaching sets to familiarize themselves with common neurological diseases and to contribute new cases to the study sets.

Daily Surgical Pathology Conference

Residents on Neuropathology may attend this conference but will still be expected to be available for neuropathology frozen sections.

Director: **Matthew P. Frosch, M.D., Ph.D.**

Duration: 5 weeks

Educational Objectives

Goals and Objectives - Rotation #1 (1 week, all residents)

1. Normal histology of the lung and normal gross anatomy of the lung in surgical specimens and autopsy.
 - 1a. Categorize disease processes by anatomic compartment.
2. Become acquainted with the standard reference books in pulmonary pathology.
3. Description of the common pathological processes in the lung.
 - 3a. Become familiar with the synoptic reports for lung tumors.
4. The common classification of lung tumors and inflammatory diseases of the lung.
5. The common classification of inflammatory diseases of the lung.
6. The basics of lung transplantation pathology.

Appportionment of time

1. Review pathology material of the day including grossing and microscopical review.
2. Handle rush specimens, principally in the late afternoon and principally relative to transplantation pathology.
3. Attend Pulmonary-Cardiac Pathology Consensus conference on Wednesday at 11:00 AM at the multi-headed microscope in the Cytology Laboratory, Warren building, first floor.

4. Review consultation cases from other services and those arriving in the mail.
5. Attend the Tufts Lung Pathology Club (bimonthly) if one occurs during the rotation.
6. Attend autopsy conference and surgical reference when pulmonary cases are shown.

Disease Processes: To become acquainted with in reading from the literature and seeing cases.

Medical Lung Disease

Usual interstitial pneumonitis

Non-specific interstitial pneumonitis

Desquamative interstitial pneumonitis

Bronchiolitis obliterans organizing pneumonia.

Infection

1. Purulent infections.
2. Necrotizing infections.
3. Granulomatous infections.
4. Scarring infections.

Lung Carcinomas

Squamous cell carcinoma

Adenocarcinoma

Large cell carcinoma	Fibrosing pleuritis
Small cell carcinoma	Diffuse malignant mesothelioma
Other Neoplastic Lesions	Fibrous mesothelioma
Carcinoid tumor	Artifacts
Adenoid cystic tumor	Inadequate specimen
Mucoepidermoid carcinoma	Crushed cells
Vascular Pathology	Bubble effect
Necrotizing vasculitis	Atelectasis
Capillaritis	Other Conditions
Polyarteritis and giant cell arteritis	Dust diseases
Pulmonary hypertension	Drug diseases
Pleural Pathology	Hypersensitivity reactions
Reactive pleuritis	Congenital lesions
Empyema	

Goals and Objectives - Rotation #2 (2 or more weeks elective)

1. Review any items not already encountered with initial short rotations.
2. Review all extramural consultations and arrive at diagnoses independently.
3. Review as much as possible the teaching collection of pulmonary consultation cases going back for several thousand cases.
4. Attend Pulmonary Medicine Rounds (Wednesday, Ether Dome, noon).

Director: **Eugene J. Mark, M.D.**

Duration: 5 weeks (with Cardiac Pathology)

R E N A L P A T H O L O G Y

Goals and Objectives

Skills

- Learn how to analyze renal biopsy pathology studies -

LM, EM, IF

One-on-one signout with staff

Consensus conference, Friday 9:00 am

Study of teaching cases available on Warren 5.

- Become competent at presenting renal case with digital images

Instruction by renal path staff

Presentation of case at a renal conference, Friday

- Learn how to correlate clinical with pathological findings

Renal path staff

- Learn how to write up a diagnostic renal pathology report

Renal path staff

- Learn basics of database use (Filemaker Pro)

Renal Path files on CDROM

Instruction by A. Bernard Collins

- Learn how to search literature (PubMed)

Instruction by A. Bernard Collins, renal path staff

- Learn how to communicate with clinicians

Discussion of cases at conferences and in consultation

Knowledge

- Learn common patterns of renal disease and criteria for diagnosis

Reading Robbins chapter / Heptinstall / Syllabus material

Laboratory Techniques

- Learn basics of IF preparation and use of fluorescence scope

Instruction by A. Bernard Collins

- Learn basics of EM preparation and use of EM scope

Instruction by Martin Selig

- Learn how to take digital images (LM, IF, EM scanning)

Instruction by A. Bernard Collins, Martin Selig, renal path staff

Specific Objectives by Rotation

Rotation #1 (2 weeks, all residents)

- Learn the findings in normal kidneys, as examined by LM, EM and IF
- Learn to describe the pathologic findings accurately and systematically (LM, IF, EM)
- Learn how IF and EM are performed
- View several cases in the IF scope with A. Bernard Collins or staff
- Learn how to interpret ANCA and anti-GBM assays
- Learn the key morphologic, ultrastructural and immunofluorescence findings of the following diseases
 - Acute glomerulonephritis
 - Necrotizing and crescentic glomerulonephritis (ANCA, anti-GBM)
 - IgA nephropathy / Henoch-Schönlein purpura
 - Diabetic glomerulosclerosis

Glomerular diseases

- Minimal Change
- Focal segmental glomerulosclerosis (primary, secondary)
- Membranous Glomerulonephritis
- Membranoproliferative GN

Rotation #2 (2 weeks, AP / CP and AP residents)

- Learn how to measure the GBM morphometrically and measure fibrillar deposits
- Be able to take EM, IF and LM digital photomicrographs

- Acute glomerulonephritis

- Necrotizing and crescentic glomerulonephritis (ANCA, anti-GBM)

- IgA nephropathy / Henoch-Schönlein purpura

- Diabetic glomerulosclerosis

Transplant pathology

- Acute cellular rejection (type 1 and 2)
- Acute humoral rejection
- Chronic rejection
- Calcineurin inhibitor toxicity (acute tubulopathy, chronic arteriolopathy, TMA)
- Polyomavirus acute interstitial nephritis (PAIN)

Vascular diseases

- Thrombotic microangiopathy
- Malignant hypertension / Scleroderma

- Search and retrieve information in Filemaker Pro (CDROM)

- Add cases to the renal pathology teaching set

- Present and discuss a case at the 3:00 PM Friday Renal Clinico-Pathologic Conference

- Write up 6 or more finished, definitive surgical pathology reports

- Learn the key morphologic, ultrastructural and immunofluorescence findings of the following less common and / or more complicated diseases

Glomerular diseases

- Lupus nephritis (RPS / ITN classification)
- Mixed cryoglobulinemic (Type II) glomerulonephritis
- Collapsing focal sclerosis / HIV nephropathy

Diseases with distinctive EM deposits

- Immunotactoid / fibrillary glomerulopathy
- Amyloidosis
- Monoclonal immunoglobulin deposition diseases
- Dense deposit disease

Hereditary glomerular diseases

- Thin basement membrane disease
- Hereditary nephritis
- Congenital nephrotic syndrome
- Type III collagen glomerulopathy
- Nail patellar syndrome
- Fabry's disease

- LCAT deficiency

Vascular diseases

- Eclampsia
- Vascular lesions in lupus nephritis, especially with anti-phospholipid antibodies
- Atheromatous emboli
- Tubular diseases
- Myeloma cast nephropathy
- Nephrocalcinosis
- Oxalosis
- Cystinosis
- Myoglobinuria
- Obstructive uropathy / reflux nephropathy
- Acute Tubular Necrosis

Tubulo-interstitial nephritis

- Acute interstitial nephritis (drug allergy)
- Sarcoidosis
- Tuberculosis
- Acute and chronic pyelonephritis

Cystic Diseases

- Autosomal dominant polycystic disease
- Autosomal recessive cystic disease

- Medullary cystic disease / nephrophthisis

- Dysplasia / hypoplasia

- Acquired cystic disease

Drug induced renal diseases

- Papillary necrosis (analgesic nephropathy)

- Lithium induced renal disease

- Aminoglycoside toxicity

Director: **Robert B. Colvin, M.D.**

Duration: 5 weeks (including Electron Microscopy and Immunopathology)

**F R O Z E N S E C T I O N S E R V I C E (O P E R A T I N G R O O M P A T H O L O G Y
C O N S U L T A T I O N S E R V I C E)**

Goals and Objectives

1. To become competent in preparing frozen sections
2. To become competent in frozen section diagnosis
3. To understand the limitations and indications for intraoperative consultations and learn to communicate effectively with surgeons and other clinicians to guide intraoperative patient management
4. To become familiar with the need for special tissue studies on various specimen types and to become proficient in selecting and preparing tissue for special studies

Rotation Description

The resident covers the Frozen Section Laboratory from 8 AM to 6 PM each weekday, from 8 AM to 5 PM with a staff pathologist, and from 5 PM to 6 PM with the on-call Senior Resident, and staff backup available by pager. The laboratory provides 25 to 30 intraoperative consultations per day. The resident is responsible for accepting the specimen from the OR staff, and making sure the indications for the frozen section are clear; the resident is responsible for making and recording a gross description, and for selection and preparation of samples for frozen sections or other special studies in consultation with the staff pathologist. After the resident has demonstrated competence, technicians cut most of the frozen sections. The resident examines the slides with the staff member, formulates a diagnosis, and as he/she becomes more experienced, communicates that diagnosis to the surgeon. Many specimens come to this laboratory for gross examination and evaluation for research procedures, which, in conjunction with the tissue bank technician, is also a responsibility of the resident.

Graduated Responsibility

First-year residents are responsible for developing and demonstrating proficiency in gross preparation of tissue for frozen section and for cutting and staining frozen sections of a sufficient quality and with acceptable speed for diagnosis. They acquire familiarity with the various special procedures for specific specimen types, such as breast biopsies and lymph node biopsies for lymphoma. They are also expected to be able to deal with the more

common diagnostic questions that arise, such as metastatic cancers and evaluation of resection margins. Second year residents are expected to be skilled at preparing frozen sections, should be able to handle most straightforward diagnostic situations, and recognize when a case is unusual or needs consultation. Senior residents in AP are expected to be able to handle all types of intraoperative consultation reliably; they supervise the junior residents on night and weekend call and are responsible for the diagnosis on all operating room consultations from 5 PM to 8 AM on weekdays and from 5 PM Friday through 8 AM Monday, with backup available by staff pathologists.

Director of Surgical Pathology: **Gregory Y. Lauwers, M.D.**

Duration: 6 weeks

SENIOR RESIDENT IN ANATOMIC PATHOLOGY

The third year of AP typically includes 3 months as Chief Resident in AP, 2 months of teaching gross pathology to junior residents, 3 months of Anatomic Pathology service work, and 4 months of elective time, during which they may do additional rotations in the subspecialty of their choice, or may pursue a program of clinical or laboratory research under the direction of a member of the faculty. All elective time must be planned in advance and a written description of the program or project submitted to the Program Director for approval. Residents who have completed the Anatomic Pathology core are eligible to sign out autopsies. They have the option of working up and writing out their own surgical pathology case reports, then handing them in to the staff pathologist for review and cosignature ("senior resident signout"), rather than routinely reviewing their preliminary diagnoses on each case with the staff at two-headed microscopes. The senior residents in AP are responsible for the supervision and teaching of junior residents involved in on call activities including intraoperative consultations at night and on the weekend, under supervision of the staff.

CHIEF RESIDENT IN ANATOMIC PATHOLOGY

The Chief Resident in Anatomic Pathology is selected from among those residents who have at a minimum completed the AP core program. In general, there are four AP Chief Residents per year. Under appropriate staff supervision, their responsibilities include the AP residents' daily schedule, orientating new residents, interviewing applicants, participating in the Quality Assurance and Residency Training Committees, interpreting evening and weekend frozen sections, presenting cases at Medical and Surgical Rounds, and teaching medical students and residents. Chief Residents may rotate as junior staff on subspecialty services, doing both gross examination and supervised senior resident signout and, according to their interests, on the Autopsy Service. Non-service time can be spent in research or advanced training in Anatomic Pathology subspecialties.

R E S I D E N C Y – D E S C R I P T I O N O F R O T A T I O N S :

C L I N I C A L P A T H O L O G Y (L A B O R A T O R Y M E D I C I N E)

The Clinical Laboratories are responsible for more than six million laboratory examinations per year. Training in Laboratory Medicine is accomplished by a combination of practical and didactic experience, with approximately twenty lectures delivered and interpretative signout rounds in each of the six core rotations. The Laboratory Medicine residents carry a beeper for each area at all times and are the first line of consultation for the clinical staff.

Training in Laboratory Medicine for residents pursuing combined Anatomic and Clinical Pathology certification (AP/CP) consists of an 18-month core of Laboratory Medicine, which includes 12 months of basic rotations and 6 additional months of structured training as a Senior CP Resident. Senior resident rotations are in Cytogenetics, Molecular Diagnostics, HLA, Flow Cytometry and Blood Banking. The core rotations include 8 weeks each in Blood Banking / Transfusion Medicine and in Coagulation, in Hematology / Immunology and in Hematopathology, and in Clinical Chemistry / Laboratory Management and in Microbiology.

For straight CP residents, the first year is identical to that of APCP residents. The second year includes 6 months of additional rotations in core laboratories, in which the resident assumes more responsibility for laboratory management and clinical consultations, and supervises junior residents. Four months of the second year is typically spent as CP Chief Resident. Most straight CP residents prepare to make the transition into their research year(s) during their second year.

B L O O D B A N K I N G / T R A N S F U S I O N M E D I C I N E S E R V I C E

Goals and Objectives

1. To become familiar with the operation of a donor facility, including blood donor qualifications and the management of donor reactions.
2. To understand the applications, limitations, and complications of therapeutic apheresis
3. To acquire a basic understanding of immunohematology and transfusion therapy, in part through the assessment and management of transfused patients.

The Massachusetts General Hospital is a FDA licensed blood collection facility and has one of the largest hospital-based blood transfusion services in the United States. Approximately 20,000 whole blood donations are

collected on site or on our mobile units and over 60,000 components are transfused annually. This rotation includes 20 lectures and hands-on experience in all areas of transfusion medicine. During this rotation, each resident has direct experience with all aspects of blood banking, including recruitment and initial evaluation of donors, blood component collection, preparation and storage, and use of the information system. Residents actively participate in evaluation of donors and blood collection. The resident participates in laboratory testing for transfusion compatibility as well as ABO/Rh typing, antibody screening and testing for infectious diseases. Experience is gained in all aspects of blood component transfusion, from indications for transfusion to evaluation and treatment of major or minor reactions. The resident evaluates and manages the transfusion therapy of outpatients as well as therapeutic apheresis.

Interpretative reports generated by the resident include transfusion reaction work-ups (approximately 30 per resident) and serology work-ups (approximately 110 per resident). In addition, the residents are responsible for consult notes for new apheresis patients (approximately 8 per resident) and apheresis procedure notes (approximately 60 per resident), new outpatient evaluations (approximately 20 per resident) and outpatient transfusion notes (approximately 120 per resident).

Consultative Activities: The resident carries the Blood Transfusion Service beeper and is backed up by the fellow (or CP Senior Resident) and a staff member unless arrangements are made to sign it out to the fellow. Calls from the clinical staff usually relate to appropriate component utilization, referrals for apheresis, techniques for limiting allogeneic blood use, or management issues, especially in patients with coagulopathies or massive transfusion.

Graduated Responsibilities: During the first week of the rotation, the resident does not carry the Blood Transfusion Service consult beeper, which is assigned to the fellow or staff physician. By the second week, the resident can usually handle a reasonable portion of the calls and begins to carry the beeper full time. As noted above, there is always back-up by a fellow or Senior Resident and a staff physician. The resident's written work is always reviewed by a staff physician. Initially, the resident always works with the fellow or resident present, but as the rotation progresses and the resident demonstrates competence in specific tasks, s/he begins to function more independently.

Role of Fellows: The resident is usually first call for consults (after the phase-in period) whereas the fellow's role is to back up the resident under staff supervision. The fellow may supervise some activities of the resident and is expected to function with a greater degree of independence. The fellow is often the one to instruct the resident about practical patient management tasks (e.g. how to call in a consult, how to get a line placed, how to get a "wet read" from radiology, etc.). The fellow spends a year in the Blood Transfusion Service and is expected to be able to formulate plans for managing more complex patient care problems.

Computer System: The residents are instructed on the use of the Blood Transfusion Service information system and the role it plays, particularly in such key functions as blocking the collection and issue of unsafe or inappropriate blood components.

Director: Christopher P. Stowell, M.D., Ph.D.

Co-Director: Walter H. Dzik, M.D.

Duration: 8 weeks

HISTOCOMPATIBILITY LABORATORY

Goals and Objectives

1. To become familiar with the structure and function of the different classes of human MHC molecules, especially as they pertain to transplantation.
2. To become familiar with the techniques involved in HLA typing using both serologic and molecular assays, and to be aware of how each may be used and interpreted.
3. To become familiar with the techniques involved in HLA antibody screening and the interpretation of the results so that the type and specificities of the antibodies may be defined.
4. To become familiar with the techniques used for crossmatch before transplantation of various solid organs and/or bone marrow, and to learn the relevance of results obtained using different techniques.
5. To learn about the rules and procedures involved in recipient and living donor workups, and in allocation of cadaver donor organs at the MGH and across the United States.
6. To become familiar with the techniques involved in monitoring for donor specific HLA antibody post-transplant and their relevance in the diagnosis and treatment of humoral rejection.
7. To become familiar with the techniques involved in monitoring for engraftment or mixed chimerism after allogeneic hematopoietic stem cell transplant, and to learn about the interpretation and significance of the results.

Rotation Description

During their rotation through the Histocompatibility Laboratory, residents receive the following lectures: Introduction to Transplant Immunology and the MHC; Histocompatibility Testing-Serological Methods; HLA Antibody Screens using Solid Phase Assays; Clinical Applications of HLA Typing; MGH Protocols for Typing and Crossmatching; Molecular HLA Typing Techniques; Detection of Chimerism after Allo Transplantation; Post-transplant Crossmatching; and Desensitization Protocols; Cellular Assays.

While in the laboratory, residents perform a Class I serological typing on themselves, discuss the results of their own typings, and evaluate typings and haplotype assignments of patients and their family members. They also HLA type themselves using a molecular assay and learn how to interpret the results of those assays, and evaluate how these assays are used to identify optimal hematopoietic stem cell transplant donors by reviewing patient cases. They thaw a panel cell and screen multiple patients' sera using the AHG cytotoxicity technique, and observe antibody screens done using solid phase techniques (ELISA and/or Luminex beads). They then spend time analyzing antibody screens done by various methods on a series of potential transplant recipients. They observe the STR method for chimerism analysis and review a number of case studies using this assay.

Residents attend conferences where consultations by HLA lab staff occur, including: renal patient "Family Meeting", Transplant Inpatient Rounds, and the Bone Marrow Patient Conference. Residents wishing to specialize in Histocompatibility Testing, Immunopathology or Blood Banking are encouraged to acquire graduated responsibilities in the laboratory through additional elective rotations.

Director: Susan Saidman, Ph.D.

Duration: 2 weeks

C O A G U L A T I O N S E R V I C E

Goals and Objectives

1. To become competent in the diagnosis of complex coagulopathies
2. To become familiar with the management of hemorrhagic and thrombotic disorders
3. To have a basic understanding of the disorders associated with excess bleeding and clotting, and what laboratory tests are used to diagnose them.
4. To become competent in interpreting coagulation test results.

Rotation Description

Residents learn to diagnose and manage coagulation and bleeding disorders by performing the preliminary interpretation of 30-40 coagulation panels daily and signing out at interpretive Coagulation Rounds with Drs. Laposata and Van Cott. Tests include dozens of assays for factors in the procoagulant, anticoagulant, and fibrinolytic pathways. Residents actively participate in inpatient and outpatient coagulation consults, a monthly pediatric coagulation conference, and various laboratory management activities. There are 12 lectures in

coagulation, given by the two laboratory directors. Clinicians whose patients are under study often attend Coagulation Rounds.

Consultative Services: Dr. Van Cott has a unique consultation service with patient practice and consults from all over the United States.

Director: Elizabeth M. Van Cott, M.D.

Duration: 8 weeks

H E M A T O L O G Y

Goals and Objectives

1. To become competent in interpreting peripheral blood smears, hemoglobin electrophoresis and quantitation, hemogram data, hematology-related chemistry and immunology tests, and quantitative flow cytometry
2. To acquire the ability to generate useful differential diagnoses for patients with red blood cell or white blood cell disorders by integrating the laboratory data with the clinical history
3. To learn to effectively recommend efficient diagnostic testing based on the hematologic differential diagnosis

Rotation Description

The resident learns blood cell morphology by reviewing all abnormal peripheral blood smears (~5/week) and signing them out with the Director at interpretive rounds. The resident learns to recognize most types of hemoglobinopathy by reviewing all hemoglobin electrophoreses (~50/week) and relevant clinical data prior to interpretive signout with the Director. The resident learns the use of hematology analyzers (cell counter instruments), the flag policy for hemogram data and differential, examination of body fluids, routine coagulation testing and automated urinalysis analyzers, as well as microscopic examination of urine sediments through a series of laboratory bench sessions conducted by technologists. The rotation includes 8 lectures on Hematology and Medical Microscopy.

Consultations: After an introductory period, the residents carry a beeper for hematology laboratory consultations (review of abnormal results or appropriate test orders, etc.).

Graduated Responsibility: The resident is expected to take increasing responsibility for beeper consultations, interpretive analysis of smears and electrophoresis, and reporting results to clinicians. In the second year of CP, the resident may return to the laboratory and take on supervisory responsibility for junior residents

Director: Aliyah Sohani, M.D.

Duration: 8 weeks (with Immunology)

IMMUNOLOGY

Goals and Objectives

1. To become familiar with the performance and interpretation of agarose gel electrophoresis, immunoelectrophoresis, and immunofixation applied to serum, spinal fluid, and urine
2. To become familiar with nephelometry for the quantitation of immunoglobulins, complement proteins, and acute phase reactants
3. To become familiar with performance and interpretation of indirect immunofluorescence for the detection auto-antibodies and direct immunofluorescence for the diagnosis of renal disease
4. To become familiar with assays for complement activity and its inhibitors; analysis of cryoprecipitable proteins and serum viscosity

Rotation Description

Immunology Laboratory: The resident is instructed in the performance and interpretation of results from immunoelectrophoresis, agarose gel electrophoresis, immunofixation applied to serum, urine, and cerebrospinal fluid; indirect immunofluorescence for antinuclear antibodies, ELISA to detect the specific antibodies responsible for certain patterns of nuclear fluorescence; measurement of serum viscosity and the differential diagnosis of diseases that elevate it; nephelometry for the measurement of serum IgG, IgA, IgM, alpha-1-antitrypsin, ceruloplasmin, haptoglobin, kappa and lambda epitope-bearing proteins, complement proteins; measurement of total hemolytic complement; detection and identification of cryoproteins and antibodies involved in hypersensitivity pneumonitis. Residents participate in daily interpretive signout of protein electrophoresis, immunofixations, and ANAs with the laboratory director (~100 cases/week). They obtain clinical information as needed, and suggest further diagnostic testing. Four lectures are given in each quarter or cycle. They are electrophoresis, complement, antinuclear bodies and evaluation of immunodeficiency diseases.

Consultative Activities: Residents interact with clinicians by responding to beeper calls for advice on ordering and interpreting tests, with the supervision of the laboratory director.

Graduated Responsibility: During these rotations, residents achieve greater independence in the consultation service and take a more active role in the interpretive rounds. Interested residents may take additional electives, achieving greater technical and interpretive competence, as well as teaching junior residents.

Director: Mandakolathur Murali, M.D.

Duration: 8 weeks (with Hematology)

H E M A T O P A T H O L O G Y

Goals and Objectives

1. To learn the technical aspects of bone marrow and lymph node biopsy processing
2. To become proficient in recognizing normal hematopoietic and lymphoid cell and tissue morphology
3. To recognize the morphologic features of common diseases of the hematopoietic system, including myelodysplasia, myeloproliferative disorders, myeloid and lymphoid leukemias and lymphomas, as well as reactive processes
4. To understand the indications for and interpretation of hematopoietic cell marker studies (flow cytometry and immunohistochemistry) and genetic studies (cytogenetics and molecular genetics) in the diagnosis of hematologic malignancies

Rotation Description

Residents develop skills in hematopoietic tissue and lymph node morphology by participation in the Hematopathology diagnostic service. The CP resident is responsible for independently reviewing all bone marrow biopsy specimens and related peripheral blood and bone marrow smears, and obtaining relevant clinical and laboratory data. Residents perform differential counts on marrow aspirates, and formulate and write their diagnosis for each case prior to signout with an attending hematopathologist. Flow cytometry and immunohistochemistry results are reviewed and signed out with the cases. Karyotypes are reviewed on all leukemias and myelodysplasias and the CP resident presents interesting cases at a monthly Cytogenetics Conference. An AP resident on the service is responsible for lymph node and other tissue biopsies. The CP resident has the opportunity to review these cases, as well as outside consultations submitted to the hematopathologists. There is a didactic lecture series in Hematopathology. Residents attend the monthly Hematopathology Surgical Pathology Conference where instructive cases are discussed.

Consultative Activities: Clinicians interact with the resident on a daily basis, discussing clinical data and pathology results. The resident carries a beeper and advises clinicians on submission of specimens and ordering special studies. The resident attends and presents cases (1-3/week) at the weekly Lymphoma Conference.

Graduated Responsibility: By the second 4 weeks, residents are expected to perform a correct differential count, fill out the bone marrow report with minimal corrections, present all cases at Lymphoma Conference, and handle most telephone consultations independently. Second year CP residents may return to Hematopathology and take responsibility for outside consults and acquire additional skills in flow cytometry.

Director: Judith A. Ferry, M.D.

Duration: 8 weeks

FLOW CYTOMETRY

Goals and Objectives

1. To become familiar with the technical aspects of flow cytometry for immunophenotyping and DNA analysis
2. To understand the role of immunophenotyping in immunodeficiency and lymphoma/leukemia diagnosis
3. To interpret and apply the results of flow cytometry to diagnostic problems

Rotation Description

The Flow Cytometry laboratory provides CD4/CD8 monitoring of HIV+ and other immunodeficiency patients, as well as DNA-ploidy analyses, stem cell monitoring, and immunophenotyping for lymphoma and leukemia. Specimens include blood and bone marrow, fine needle aspirations from cytopathology, body fluids, and tissue specimens. During the hematopathology rotation, residents have an introductory session with the laboratory director, with instruction in basic principles and interpretation of scattergrams. Residents spend the first few days learning practical aspects of flow cytometry. The residents then are directly involved in flow cytometry analysis and interpretation of hematopathology cases with graduated increasing responsibility; the resident presents cases to the hematopathology team at signout. Residents learn the indications for and interpretation of flow cytometry during Hematopathology signout, and are involved in the decision to obtain specimens for flow cytometry. A lecture on flow cytometry is included in the Hematology/Immunology/Immunopathology lecture series. Flow cytometry results are often presented in the monthly Hematopathology Surgical Pathology conference and at Lymphoma Conference.

Director: Frederic I. Preffer, Ph.D.

Duration: 4 weeks (with Hematopathology)

C L I N I C A L C H E M I S T R Y

Goals and Objectives

1. To become acquainted with basic principles of assay development and evaluation, including sensitivity, specificity, precision, accuracy, and variation
2. To become familiar with laboratory testing in various clinical settings such as endocrinology and acute care testing (blood gases and electrolytes)
3. To become proficient in clinical toxicology by reviewing and interpreting clinical cases and understanding laboratory methodologies
4. To become acquainted with current issues in laboratory management such as cost effectiveness, information systems assessment, and reengineering
5. To become familiar with problems in laboratory redesign and consolidation

Rotation Description

Basic training in Clinical Chemistry consists of an 8-week rotation in the Chemistry Laboratory, a lecture series, rounds in Toxicology, a 24-hour beeper consult service, and project involvement. This is also a time when residents learn management skills that will prepare them to become laboratory directors. Residents become familiar with each area of the Clinical Chemistry Laboratory. Residents rotate through all the major areas in the laboratory including accessioning, toxicology, blood gas, automated instruments, point-of-care testing, and immunodiagnostics. A general introduction to each of these laboratories is given by the laboratory director or the chief technologist, and, in addition, these areas are taught in the lecture series and during General Chemistry rounds. The residents attend twice-weekly Toxicology Conference. Interesting cases in toxicology are discussed and interpreted. Clinical Care Rounds with Chemistry staff are attended twice per week.

Consultative Reports/Activities: After an introductory period, residents take full-time beeper call to serve the hospital as the consultant (with staff backup) in Clinical Chemistry. Residents either alternate days each weekend or alternate whole weekends of cross-coverage with the residents on Microbiology, so as to allow for one full day off each week on average. Residents are paged by clinicians with questions concerning the proper ordering and interpretation of Chemistry tests, including those performed in Endocrinology, Reproductive Endocrinology, Neurochemistry, and Toxicology laboratories. Additional consultations are referred from the laboratory and the

laboratory phone service to the resident. Consult cases are presented weekly at beeper rounds with the Clinical Pathology Chief Resident.

Graduated Responsibility: As the rotation progresses, residents achieve more independence in answering beeper consultations. They also take more responsibility for working up toxicology cases prior to signout. In the second year of CP, the resident takes supervisory responsibility for the junior resident on the service and may take a more active role in clinical consultations.

Role of Fellows: The Chemistry Fellow provides supervision and informal teaching for the resident in the Chemistry laboratory.

Director: James G. Flood, Ph.D.

Duration: 8 weeks (with Laboratory Management)

L A B O R A T O R Y M A N A G E M E N T

Goals and Objectives

1. To become acquainted with current issues in laboratory management such as cost effectiveness, information systems assessment, and reengineering.
2. To become familiar with problems in laboratory redesign and consolidation.

Residents receive specific instruction in laboratory management through a series of 23 lectures on Medical Informatics and Laboratory Management during their Clinical Pathology rotations. During this series, the residents become familiar with all aspects of laboratory management, including Hospital Administration and Regulation, Laboratory Information Systems, Aspects and Impact of Managed Care, Laboratory Safety, Quality Assurance, Robotics and Automation, Budgets, Personnel, Risk Management, Laboratory Statistics and Management. Lectures on Risk Management and Infection Control/Laboratory Safety are presented annually during Pathology Grand Rounds. Residents are instructed in safety and infection control during an orientation session at the beginning of their first year. For interested residents, there are specific management opportunities during each laboratory rotation. These may include operations improvement, quality assurance studies, or systems management. Residents may participate in CAP inspections.

In Anatomic Pathology, residents learn the management and operation of the Histology Laboratory and, during their rotations in Electron Microscopy and Immunopathology, they are exposed to management issues in those laboratories. Residents participate in the quality assurance activities of Anatomic Pathology by 1. Performing the CLIA mandated review of Pap tests when reviewing cervical biopsy specimens on the Gynecologic Pathology

rotation, 2. Completing a QA form on every autopsy signed out, indicating unexpected findings, 3. Attending staff meetings at which results of QA reviews are presented, and 4. AP Chief Residents' participation as members in the QA Committee. On both AP and CP services, cost-effective laboratory use is stressed in daily activities, including signout and conferences. Residents responding to queries from clinicians advise them on the most cost-effective approach to obtaining a diagnosis.

Information Systems and Medical Informatics: Residents have access to and are instructed in the use of the Clinical Laboratory Information System (Misys), the patient care information of the MGH (CAS), the Blood Transfusion Service Information System, and the Anatomic Pathology Information System (PowerPath). The residents use the patient care information system for assistance in clinical consultations and for clinicopathological and radiology correlations, as well as to obtain information necessary to sign out an individual case. They also use the systems to gather data for specific projects in the Clinical or Anatomical laboratories. The residents may be involved in discussions for modifying and updating the laboratory information systems.

Each resident has a computer with flat-panel display on an ergonomic mounting at his or her desk. These are connected to AP and CP laboratory information systems and the electronic patient medical record (CAS), and have unlimited PubMed and Internet access through the MGH. The Microsoft Office software suite is available, as is Outlook for email, with all residents being provided email accounts through the MGH. Residents are instructed in the use of all the computer systems and may take advanced training courses offered by the MGH either through Information Services or the Treadwell Library. They typically perform literature searches in preparation for conferences and in order to gather information relevant to interesting cases. In addition, they use literature searches in gathering background information for projects and publications.

Director: Kent B. Lewandrowski, MD

Duration: 8 weeks (with Clinical Chemistry)

M I C R O B I O L O G Y L A B O R A T O R Y

Goals and Objectives

1. To become acquainted with the basic microbiological characteristics of the principal pathogenic bacteria, fungi, viruses and parasites encountered in infectious diseases
2. To become familiar with the strategies employed in the Microbiology Laboratory for the diagnosis of infectious diseases, including methods for specimen processing; culture, identification and susceptibility testing of pathogenic microorganisms; and non-culture methods such as serological studies and direct detection of microorganisms via microscopic and molecular genetic methods

3. To gain an appreciation for the concepts of laboratory management as applied to operations in a microbiology laboratory

Rotation Description

Basic resident training in Medical Microbiology consists of an eight week rotation in the Clinical Microbiology Laboratories. Residents become familiar with clinically important microorganisms and their roles in infectious diseases through a combination of bench work, smear and plate rounds, lectures given by the Microbiology staff, and Infectious Disease Unit rounds and conferences. The rotation encompasses experience in all areas of the Clinical Microbiology Laboratories: general bacteriology (including antimicrobial susceptibility testing and blood cultures), anaerobic bacteriology, mycology, mycobacteriology, serology, virology, parasitology, and molecular diagnostics. Residents learn basic techniques during laboratory bench work in each area, for which they are paired with a senior technician or supervisor each morning. Lectures are given by Microbiology Laboratory staff covering diagnostic and molecular techniques as well as a wide range of clinical infectious disease topics. Residents attend "Bug of the Day Rounds" (weekly) and "Plate Rounds" (biweekly) with laboratory directors, where clinical cases are reviewed in real time. Other resident responsibilities include assisting the CP Chief Resident with Medical Microbiology cases for Laboratory Medicine Rounds, and handling laboratory consultations. Each resident is also expected to prepare a formal lecture on a Microbiology topic for the Laboratory Medicine Thursday Conference. For interested residents, there are research opportunities and laboratory management-oriented projects. Electives may be arranged by residents for greater in-depth experience in Medical Microbiology.

Consultative Activities: Clinical consultations are provided by teaching rounds and plate rounds. In addition to the Microbiology staff, the Infectious Disease fellows and staff attend Plate Rounds, and there is extensive discussion of clinical cases. Residents will handle consultations, review microscopic smears, and actively participate in microbiologic interpretations. Residents are on-call by pager to handle consultations regarding specimen handling, test selection, and test interpretation.

Graduated responsibility is assumed by residents by handling laboratory consultations and cases for Laboratory Medicine rounds with increasing independence.

Director: Mary Jane Ferraro, Ph.D., M.P.H.

Duration: 8 weeks

S E N I O R R E S I D E N T I N C L I N I C A L P A T H O L O G Y

The second year of Clinical Pathology includes 6-12 months of advanced rotations in areas of the Clinical Laboratories. Required rotations include Tissue Typing, Flow Cytometry, Molecular Pathology, Cytogenetics

and Blood Bank. The choice and length of the remaining rotations are determined by the specific interest of the resident in consultation with the Residency Program Director and the Associate Director for Clinical Pathology. CP Senior Residents help orient new first year residents to the service on which they are rotating, provide back-up and cover the beeper when the first year resident is not available.

C H I E F R E S I D E N T I N C L I N I C A L P A T H O L O G Y

Residents who have completed 12 months of core clinical pathology training are eligible for selection as Chief Resident. The Chief Resident is responsible for the residents' annual rotation schedule, interviewing residency applicants, supervising and teaching junior residents, and serving as a backup to junior residents on the Clinical Pathology consultation service. The Chief Resident also conducts Laboratory Medicine Rounds for Medical House Staff 4 days/week and serves as a member of the Residency Training Committee.

R E S I D E N C Y – C A L L S C H E D U L E

The call schedule varies depending on the rotation.

In Anatomic Pathology, residents can expect to be on call 7-8 weekends per year. On service, residents take call approximately 1 night every 2 weeks. They are expected to be in the hospital until 8:00 PM; after that, call is by beeper.

Clinical Pathology residents carry the beeper of the laboratory service on which they are rotating. The beeper is covered either alternating days each weekend or on alternating whole weekends by the resident on the paired laboratory service, by the senior resident or fellow on the rotation, or by the Chief Resident, all with backup by the Attending Staff.

R E S I D E N C Y – C O N F E R E N C E S

Didactic Conferences and Lectures: These include Pathology Grand Rounds, the introductory anatomic pathology lecture series for first-year residents, presentations throughout the year during the Anatomic Pathology Outs Conferences, and the laboratory medicine lecture series given in conjunction with every pair of clinical pathology rotation. Residents are expected to attend these conferences except when precluded by urgent clinical responsibilities, as these cover both basic information relevant to their training and more advanced research and basic science topics. The educational rationale for these conferences is introduction to basic medical knowledge and its application to patient care.

Departmental Conferences based on Current Cases: The daily Anatomic Pathology Out Conference is organized by senior AP residents, and is the principal teaching conference in anatomic pathology. Residents on anatomic pathology rotations are expected to review the slides that are "put out" at least one day prior to the conference, and be prepared to comment on them at the conference. Autopsies are presented at the weekly Autopsy Conference, which is organized by the autopsy staff pathologist and residents on the service. Residents present the decedent's history and autopsy gross findings, and are expected to have microscopic correlations ready for interesting findings. Interested clinicians and subspecialist pathologists are invited to attend as appropriate. Neuropathology fellows and staff attend to review the neuropathology findings. All these conferences involve participation on a case-by-case basis of the residents, and thus provide opportunities not only for the introduction of medical knowledge and its application to patient care, but also challenge the residents to develop their skills, attitudes, and behaviors in practice-based learning and improvement and interpersonal and communication skills. Regular Consensus Conferences are held on all services in both anatomic and clinical pathology to discuss interesting or difficult cases among the faculty. These are attended by the residents and fellows on service, who are encouraged to participate as well as observe. These conferences thus provide excellent opportunities for the trainees to see how their faculty deal with real world aspects of practice that involve all the core competencies, and in particular to see how they balance their professional responsibilities with their concern for systems-based practice.

Clinical-pathologic Correlation Conferences: Many clinical services hold working conferences at which pathologists present cases. Residents rotating on each of the corresponding pathology subspecialty services are expected to attend these conferences and present selected cases as their experience permits, under the supervision of a staff pathologist. These include Gynecology Tumor Board, Sarcoma Conference, Lymphoma Conference, Renal Conference, GI Conference, and Breast Conference. Residents also present their autopsy cases at various clinical service rounds, including Pediatrics and Neurology. Residents prepare and present pathology material under supervision of a faculty member. AP Chief Residents present cases at the monthly Department of Medicine Morbidity and Mortality Conference. Residents rotating through the CP laboratories also attend clinical service rounds as appropriate. The Chief Resident in CP reviews interesting current cases with the Medicine residents at Bigelow Rounds four times/week. Second and third year AP residents present cases of interest to Oncology fellows, Pulmonary fellows, and Radiology residents at regular weekly conferences. They prepare and present these cases themselves, seeking advice from their faculty as they deem appropriate. Finally, the Clinicopathologic Conferences (published in the New England Journal of Medicine as the Case Records of the Massachusetts General Hospital) are held weekly, and senior residents are encouraged to present one of these, with appropriate faculty supervision. In all these conferences, the resident's growing medical knowledge, understanding of the pathologist's role in patient care, and ability to access appropriate information resources, and communicate efficiently and meaningfully are exercised.

Formal Presentations by Residents: In order to learn critically to review the medical literature and give a formal presentation, residents are required to give Molecular Pathology and Research Conferences based on interesting cases. They review the recent literature on both basic science and clinical aspects of the disease, and make a formal, didactic presentation to other residents and staff, lasting 30 minutes. In clinical pathology, there

are required 45-minute formal presentations for each rotation on a specific topic. These represent exercises in teaching that also require critical review and interpretation of the current medical literature, both of which relate to several competencies required in pathology practice, including the specific competencies of medical knowledge and patient care, as well as the general ones of practice-based learning and improvement and interpersonal and communication skills.

National Course Offerings: The department faculty offers annual courses in cytopathology, dermatopathology, breast, gastrointestinal, gynecological and obstetric pathology, and surgical pathology, sponsored by Harvard Medical School and attended by registrants from around the world. Since the residents are generally welcome to attend these courses, regular departmental conferences are usually canceled during these times to permit them to attend. This is not only intrinsically educational, but also puts into the context of the registrants' perspective on their actual practices, the significance of the learning activities and faculty with whom the residents are training.

R E S I D E N C Y – O P P O R T U N I T I E S F O R T E A C H I N G

"On the Job" Teaching: During the first several months of the academic year, teaching residents (2nd and 3rd year AP residents) are assigned to teach new residents on both the Autopsy and Surgical Pathology services. Pathology residents also supervise medical students rotating through the service on elective. Second-year Clinical Pathology residents supervise junior Clinical Pathology residents as well as medical students and clinical residents on rotation. Housestaff from the clinical services regularly consult with their opposite numbers on the pathology service on open cases, providing an opportunity for mutual education between services.

Working Conferences: Residents on the AP Service attend and present selected cases at clinical conferences when they are assigned to that service, including Gynecology tumor board, Sarcoma conference, Lymphoma conference, Renal conference, GI conference and Breast conference. They also present their autopsy brain cases at Neuropathology conference. Residents are responsible for preparing and presenting pathology material under the supervision of a faculty member. Chief Residents present cases at the monthly Department of Medicine Morbidity and Mortality Conference. The Chief Resident in CP reviews current cases with the medicine residents four times/week at Bigelow Rounds. Interesting test results from current patients are discussed at each session. CP residents and directors or supervisors from relevant laboratories participate. Test performance, interpretation, and appropriate utilization are reviewed, along with the pathophysiology of the disease.

Didactic Conferences with Clinical Services: Second and 3rd year AP residents present cases of interest to Pulmonary fellows, Radiology residents, and Oncology residents at regular weekly conferences. They prepare and present these cases themselves, seeking advice from faculty as they deem appropriate.

Formal Presentations: Residents present Molecular Pathology and Research conferences to the Department, based on interesting cases they have encountered; they review current medical literature on both the clinical and the basic scientific aspects of the disease, and make a formal didactic presentation to other residents and staff,

lasting 30 minutes. Each resident prepares at least one conference each year. While on the hematopathology rotation, residents present at the Cytogenetics Conference, and on clinical pathology rotations, each resident presents a Case Conference once in every two-month block. Senior residents are encouraged to present an MGH Clinicopathologic Conference (published in the New England Journal of Medicine as the Case Records of the Massachusetts General Hospital).

Medical Students: Residents are encouraged to participate in the laboratory teaching of pathology at the Harvard Medical School and the Harvard-MIT Health Science and Technology program. In general, residents in the 3rd year of AP and the 2nd year of CP are most likely to have time to participate in this activity. Residents also participate in teaching medical students taking hospital-based clerkships, and in particular MGH AP and the CP Chief Residents are the primary presenters for pathology each week in our Harvard Medical School Principal Clinical Experience Case-Based Sessions.

R E S I D E N C Y – E V A L U A T I O N

Each resident receives an electronic global performance rating addressing each core competency at the end of every rotation. Each staff member who has supervised a resident is automatically emailed a request to link to and fill out this global performance rating online. The completed forms are summarized by the Program Administrator and then reviewed with the residents at their semi-annual cumulative general performance evaluation, which are held in alternation with the Program Director and the Associate Program Director for Anatomic Pathology or with the Associate Program Director for Clinical Pathology. Evaluations are requested from faculty at the end of rotations at affiliated institutions and electives at other institutions; these are incorporated with the global performance ratings and are reviewed with the residents at their semi-annual cumulative general performance evaluation meeting.

Another assessment of the resident's performance is at the regularly scheduled departmental conference on Molecular Pathology and Research. This is a CME type conference evaluation, which assesses the resident's ability effectively to locate, appraise, and communicate information on the application of emerging scientific knowledge to pathology. The annual ASCP RISE examination is required of all residents, and performance of our residents is used as an overall assessment tool for the training program. Each resident's national percentile performance and his or her relative performance in each area compared with his or her peers in the program are discussed with him or her at the first semi-annual meeting after the examination. These results are also specifically used as a calibrator by subject area for our global, general, and focused observation systems of performance assessment in the area of medical knowledge. Our AP information system generates case and procedure log type reports the residents use in preparing their ABP applications. We are using of a 360° assessment for AP residents in the grossing area to ensure quality and provide feedback in the areas of professional behavior and communication skills.

We have implemented a focused observation and evaluation system in AP. This entails prospective assessment, on a per case basis, of resident confidence/hesitancy. Being prospective and comprehensive, it is free of prior expectation bias, thus offering the potential objectively to assess our balance of training across AP subspecialties. Over time, it can establish expected ranges of resident performance in the areas of medical knowledge and patient care.

The faculty member supervising each rotation provides ongoing feedback on the resident's performance. The results of these online faculty end-of-rotation evaluations are immediately available to the resident online. In addition, faculty are encouraged informally to discuss with the resident the strengths and weaknesses of the resident's performance during and at the end of each rotation, and to seek feedback about the quality of the learning experience. Serious or urgent problems are reported immediately to the chief resident and, as appropriate, the Program Director, for discussion with resident and faculty, without waiting for this formal evaluation process.

Each resident is strongly encouraged to select a faculty mentor based on compatibility and mutual interests. To ensure this takes place, discussion about whether the resident has found a suitable mentor is included in each semi-annual assessment meeting. Faculty mentors are given access to the same evaluation information as the resident him/herself, and the resident is encouraged to meet with the faculty member to discuss both the course of the resident's training and future career plans.

The Residency Training Committee discusses each resident's readiness to progress to the next level of responsibility, based on the evaluations submitted, their own experience with the resident, and available objective performance assessments. In the event there is concern that a resident may not be ready for increased responsibility, this is discussed with the resident by the Program Director, and a plan is developed for the remainder of the year to maximize the likelihood of success for the resident, and in any case to ensure there is a clear mutual understanding of the issues involved. Elective rotations and advanced positions such as senior call in anatomic pathology are awarded only to trainees who show clear evidence of accomplishment. Residents whose performance does not demonstrate that they are ready for such responsibilities are required instead to perform additional rotations on core services as appropriate to the circumstances.

In addition to electronic records of end-of-rotation evaluations, paper copies of semi-annual evaluations are kept in an evaluation folder within each resident's departmental personnel file. A separate evaluation file exists for each resident. This is accessible to the resident and faculty mentor, the Program Administrator, the Program Director and Associate Director, the Department Administrator, and the Service Chief.

The cumulative evaluation of each resident's final six months of training is discussed with the resident by the Program Director or Associate Director, and this is documented at the final semi-annual evaluation. It includes a statement on the resident's competency to commence independent practice. This is considered the resident's final written evaluation, and becomes a permanent part of his or her credentialing file.

The Residency Training Committee considers several factors in evaluating the educational effectiveness of our training programs. These include objective information on our residents' ASCP RISE performance and ABP examination results, as well as subjective assessments of the faculty, the rotations, the conferences, and the program itself from the residents.

Evaluations of the contributions of each member of the teaching staff are solicited automatically by email from each resident at the end of every rotation with a faculty member. These are completed by the residents online, and are made available to the faculty members only in unattributed batches of ten to maintain anonymity. They are also provided in detail to the Chief of Service for feedback to individual faculty members, and in summary form by the Program Director to the Credentialing Committee for consideration in decisions on reappointment to teaching positions. This feedback has resulted in significant improvements in availability and teaching by several faculty members.

At the end of the academic year, each resident is required to fill out an anonymous comprehensive evaluation of the program. These evaluations are summarized by the Program Administrator and then reviewed and presented by the Program Director and Associate Director to the Residency Training Committee, where they form one of the bases for programmatic change. Programmatic feedback on resident workload from this evaluation, and from analysis of the daily duty hour records that are kept by the residents on the online residency management system, continues to direct the ongoing reevaluation and adjustment of service assignments and of resource and time allocation on rotations.

R E S I D E N C Y – V A C A T I O N

All residents may take up to four weeks of vacation per year as per the requirements of the American Board of Pathology.

R E S I D E N T A N D F E L L O W F R I N G E B E N E F I T S P R O G R A M

Each resident and fellow has a practice-funded account on which he or she draws for fringe benefits, including books, subscriptions, memberships and dues, travel, non-clinical Pathology Photo usage, publication costs and reprints. Each trainee is thus responsible for determining the allocation of his or her own spending for such professional expenses. Additionally, each resident has an allowance of up to \$1,000 per year for participation in national or international professional conferences.

These fringe benefits are made available annually to trainees in our funded clinical training programs, including residency programs (Anatomic, Clinical and Neuropathology), ACGME (Cytopathology, Dermatopathology,

Hematopathology, Neuropathology, and Transfusion Medicine), and non-ACGME (Clinical Chemistry, Medical Microbiology, and Subspecialty Surgical Pathology) fellowship programs.

The following are the amounts that are available by year of training in pathology:

Pathology Training Year	Amount
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First-Year	\$800
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Second-Year	\$900
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Third-Year	\$1,000
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Fourth-Year	\$1,100
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Fifth-Year or More	\$1,200
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