

# GENERAL LABORATORY ROTATION

*Rotation Director: Neil S. Harris, M.D., Associate Professor*

**1. Description:** The rotation is a combination of clinical chemistry and hematology. This rotation consists of one-on-one daily meetings between the resident and the attending staff. Usually the resident meets with 2 different staff per day. Each session is ~60 minutes. The purpose of these sessions is to discuss pertinent cases, methodologies, disease states, test ordering and test interpretation. Subjects covered encompass the main diagnostic tests of the Core Laboratory including analysis of enzymes, proteins, therapeutic drug monitoring/toxicology, urinalysis, coagulation tests and common examples of coagulation-related laboratory problems. The resident is expected to take part in the consultative activities of the service including serum protein electrophoresis, laboratory hematology, hemoglobin electrophoresis, coagulation, and medical microscopy (body fluids). Training is facilitated through a mix of didactic materials, laboratory exercises, on-call responsibilities, and management experiences. The remainder of the day is dedicated to independent study part of which can be dedicated to a research project or a project oriented towards solving a laboratory problem. As appropriate to the individual case or consultation under review, the ethical, medicolegal, and cost-containment issues are reviewed and discussed. As well, research design, statistics and critical review of the literature are discussed

**2. Goals of the Rotation:** Residents will become familiar with sample procurement, processing, and handling (**pre-analytical** phase of testing); with **analytical** sections (automated general chemistry, urinalysis, electrophoresis, immunoassay, special chemistry); with the **specific chemistry tests** performed in each section (basic chemistries, enzymes, proteins, drugs for therapeutic drug monitoring/toxicology, urinalysis, etc); There will be equal focus on **hematology**, including principles, limitations, interference and quality control criteria for automated complete blood count; evaluation of peripheral blood smears; principles, limitations, interference and quality control for various coagulation instruments and assays; laboratory diagnosis of hemoglobinopathies including electrophoretic methods, and red cell indices; recognition of commonly encountered cells in CSF, pleural and peritoneal samples; recognition of commonly encountered crystals in synovial fluid.

Residents also need to be familiar with **regulatory guidelines** including QC/QA, procedure manuals, safety; and management (residents attend regularly scheduled section meetings) and result reporting through the LIS (the **post-analytical** phase of testing).

**3. Duration of the rotation:** 4 weeks

**4. Duties and responsibilities of residents:** PGY-1 residents are expected to begin interpreting data and problem solving (interference, drug interactions, etc) under the guidance of technologists, medical directors. PGY-2 residents, under the supervision of the medical directors, participate in the consult services for serum, urine, and hemoglobin electrophoresis. The resident will interpret and provide consultative reports on abnormal blood counts, coagulation tests, platelet function studies and cellular and crystal analysis of body fluid. The resident will be involved in approval of off-hour requests for complex tests. Complicated cases will be assigned to the resident for study, assessment, and presentation. This provides graduated responsibility.

**5. Teaching staff:** Neil S. Harris, M.D.; Glen Hortin, M.D.; William E. Winter, M.D

**6. (i) Resident Supervision:** Attendance at Monday morning's CP conference is required. The faculty also interacts with the residents during their one-on-one sessions. Initially, the resident will be closely supervised by the attending pathologist. By the end of the rotation, the resident should be able to assume responsibility of the attending pathologist under minimal supervision (graduated responsibility). Reports are generated in concert with the attending faculty and signed out by the attending faculty. Calls are discussed and reviewed during call report.

ii. **Resident Evaluation: Written monthly evaluation.** Evaluation criteria include attendance, degree of preparedness and participation.

### **General Laboratory Core Curriculum Subjects**

#### **Analytical principles**

Immunoassays  
IFE, western blots  
Nephelometry, turbidimetry  
RIA (competition assays), Immunometric (double antibody) assays, chemiluminescence,  
Electrophoresis - serum, urine, CSF  
Chromatography (L/S ratio, HPLC, GC)  
Method validation: reproducibility, accuracy, linearity, carry-over, etc.

#### **Laboratory Mathematics and assay assessment**

Basic statistics  
Mean, median, mode, SD, parametric distributions, nonparametric distributions  
Assay performance  
Sensitivity, specificity, positive predictive value, negative predictive value, efficiency (accuracy)  
Linearity: defining the upper linear limit  
Defining the lower limit of detection  
Determining reference intervals  
ROC curves  
Run-to-run carry-over

#### **Quality assurance**

Quality control: Precision, Accuracy, Westgard rules  
Proficiency testing

#### **Management principles**

Lab licensing, CLIA

#### **Preanalytic variation**

Tube types, fasting v. nonfasting, body position, illness v. health, cyclic variations

#### **Principles of therapeutic drug monitoring**

indications for therapeutic drug monitoring, peak, trough, half-life, steady state, therapeutic index

#### **Principles of Laboratory Hematology**

Automated CBC, manual differential, and blood cell morphology; anemia - classification, diagnosis, and morphology; red cell functional testing - osmotic fragility, G6PD screen; hemoglobin analysis and hemoglobinopathies; biochemistry and biology of hemostasis, coagulation testing including anticoagulation therapy; compensated polarized light microscopy and examination of synovial fluid.

### **REFERENCES**

1. *Quick Compendium of Clinical Pathology* 2<sup>nd</sup> Edition 2008. Mais DD. American Society for Clinical Pathology
2. *Henry's Clinical Diagnosis and Management by Laboratory Methods*. 21<sup>st</sup> Edition 2007 McPherson RA, Pincus MR.(Eds) Saunders/Elsevier

