

**Ann and Robert H. Lurie Children's Hospital of Chicago
RESIDENCY ROTATION IN PEDIATRIC LABORATORY MEDICINE**

DEPARTMENT OF PATHOLOGY AND LABORATORY MEDICINE

The Department of Pathology and Laboratory Medicine (DPLM) provides laboratory testing for Lurie Children's within the broad areas of Anatomic Pathology and Laboratory Medicine. Services include screening, diagnosis, and clinical monitoring of therapy and disease. These services are provided by pathologists and laboratory scientists specifically trained in pediatric diseases using state-of-the-art testing and facilities. The DPLM contains the following laboratories and divisions:

Anatomic Pathology
Clinical Chemistry
Cytogenetics Laboratory
Diagnostic Immunology
Hematology and Special Hematology
Microbiology
Molecular diagnostics, HLA
Stem Cell Transplant
Transfusion Medicine

TEACHING STAFF

1. Katrin Carlson-Leuer, PhD,
Cytogenetics
2. Joel Charrow, MD,
Biochemical genetics
3. Lawrence Jennings, MD, PhD,
Molecular diagnostics, HLA
4. Shannon Haymond, PhD,
Pediatric Clinical Chemistry
5. Brenda Suh-Lailam, PhD,
Pediatric Clinical Chemistry
6. Glenn Ramsey, MD,
Transfusion Medicine
7. Xiaotian Zheng, MD, PhD,
Microbiology
8. Aaruni Khanolkar, MBBS, PhD,
Diagnostic Immunology
9. Shunyou Gong, MD,
Hematology and Special Hematology

OVERALL EDUCATIONAL GOALS AND PHILOSOPHY

The principle goal of the Pediatric Laboratory Medicine program is to educate residents in the unique features of diseases in the infant, child and adolescent by focusing upon learning concepts unique to pediatric laboratory practice. Such experience will provide the trainee with the basic knowledge and skills required for the practice of pediatric pathology in an academic or community hospital.

Duration of each Pediatric Laboratory Medicine rotation (Total of 4 weeks)

Hematology	5 days
Chemistry	5 days
Microbiology and virology	3 days
Blood bank	2 days
Molecular diagnostics and HLA	2 days
Immunology and diagnostic flow	3 days

During that time the resident is involved in direct patient care and receives didactic lectures from the faculty and /or their designees.

LEARNING OBJECTIVES

Hematology

- To learn the peripheral blood and bone marrow findings including reference intervals of normal fetuses, newborns, and infants and unique challenges in hematology testing of neonates and infants.
- To learn the differential diagnosis and a sequential laboratory testing of congenital and acquired anemia, neutropenia, and thrombocytopenia in infants and children.
- To learn the morphologic and flow cytometric findings in the peripheral blood and/or bone marrow of pediatric acute leukemias for diagnosis and monitoring of response to therapy for detection of a minimal residual disease.
- To learn the characteristic findings in CSF body fluids that are unique to children (acute leukemia, recent and remote CNS hemorrhage, CNS tissue such as neuroglia, choroid plexus, ependymal cells, bone marrow contamination of CSF, pediatric tumors).

Chemistry

- To learn to recognize common pre-analytical errors and operational challenges unique to pediatric clinical chemistry, including determination of age-, gender- and pubertal stage-specific reference intervals and specimen (blood, urine, and sweat) collection methods.
- To learn the utility for neonatal bilirubin, ionized calcium, meconium drug screening, and glucose monitoring in the neonatal intensive care unit.
- To understand the current practice and recommendations for the clinical chemistry laboratory's role in (a) diagnosis of lead poisoning, nutritional deficiencies (iron and vitamin D), and renal failure, (b) performance and interpretation of endocrine stimulation testing, (c) therapeutic drug monitoring, (d) confirmation of abnormal newborn screen results (cystic fibrosis and hypothyroidism), and (e) diagnosis of neuroblastoma.
- To learn abnormal patterns on hemoglobin electrophoresis and describes limitations of methods used for newborn screening and diagnosis of thalassemias and hemoglobinopathies.

- To acquire a basic understanding of the utility of quality control and point-of-care testing in the clinical laboratory and patient care.

Microbiology and virology

- To understand and be familiar with the laboratory diagnosis of the following infections in pediatric patients: respiratory viruses, enterovirus, CMV, EBV, group A streptococcus, and *B. pertussis* infections.
- To learn the proper testing of specimens from patient with cystic fibrosis.
- To understand the rational and methods for laboratory diagnosis of HIV infections in pediatric patients.
- To understand the principles of testing and rules of reporting of antimicrobial susceptibility assays in pediatric population.

Immunology and diagnostic flow cytometry:

- To gain a general understanding of the classification of Primary Immunodeficiency disorders (PID), the immunological abnormalities associated with PID and the tests available in the laboratory that aid in the diagnosis of PID.
- To gain an understanding of the role of serological testing in the diagnosis and monitoring of patients suspected of a diagnosis of Celiac Disease.
- To learn to identify specific anti-nuclear antibody (ANA) patterns in an indirect immunofluorescence immunoassay (IFA) system.

Molecular diagnostics and HLA genotyping

- To explain some of the limitations associated with molecular techniques including Sanger sequencing, microarray comparative genomic hybridization, RT-PCR, and fragment analysis.
- To learn the testing methods and the clinical utility of molecular diagnostic testing for HLA genotyping and childhood diseases (e.g. developmental delay, leukemia, sarcoma).

DUTIES AND RESPONSIBILITIES OF LABORATORY MEDICINE RESIDENT:

The residents rotate within a number of clinical laboratories during their experience at Lurie Children's. They are involved in direct patient care as pertain to each specific rotation. They also receive didactic lectures from the laboratory director or designee and learn about the technical issues pertaining to all sections.

The resident is expected to attend the AP and CP didactic lectures, Hematopathology Morphology Conference as well as other relevant clinical conferences and teaching sessions. Residents are expected to take active participation in these conferences. According to a pre-established roster of activities, a resident is expected to make formal presentations during which he/she will prepare and use audiovisual materials, bibliographic searches, or any device that may

contribute to enhance the quality of the presentation after appropriate consultation with staff pathologist.

During the entire rotation the residents are encouraged to review the available material in the department study sets in order to enrich their experience in pediatric pathology.

EXPECTED OUTCOMES OF THE LABORATORY MEDICINE ROTATION:

At the end of the Laboratory Medicine rotation the resident is expected to show acceptable level of competence as described in the specific areas below:

Hematology:

- To interpret peripheral blood and bone marrow findings in children at various ages.
- Identifies and apply age-specific reference intervals for complete blood cell counts.
- Make a diagnosis of pediatric acute leukemia and interpret flow cytometric studies for detection of minimal residual disease, provide differential diagnosis and suggest proper testing in infants and children with peripheral cytopenias, and interpret the most CSF and body fluid cytopsin preparation in infants and children.
- The resident is also expected to present to the Core Laboratory staff one talk on a pediatric hematology related topic.

Chemistry:

- To recognize common pre-analytical and analytical issues unique to pediatric clinical chemistry.
- To explain the utility for neonatal bilirubin, ionized calcium, meconium drug screening, and glucose monitoring in the neonatal intensive care unit, to interpret abnormal patterns on hemoglobin electrophoresis in children, to describe the current practice and recommendations for the clinical chemistry laboratory as outlined in the goals and objectives of the rotation.
- The resident is also expected to present to the Core Laboratory staff one talk on a pediatric chemistry related topic.

Microbiology:

- To understand the laboratory diagnosis of the infections outlined in the goals and objectives of the rotation, to be able to report microbial susceptibility assays, to summarize the principles of laboratory diagnosis in children with HIV and proper testing of patients with cystic fibrosis.
- The resident is also expected to present to the Microbiology Laboratory staff one talk on a pediatric microbiology related topic.

Immunology and diagnostic flow cytometry:

- It is expected that the resident learns the principles of nephelometry for the measurement of serum immunoglobulin and complement levels, flow cytometry for the measurement of lymphocyte subsets and immune function assays and ELISA technology for the measurement of specific antibody levels as well as the normal age associated reference ranges and the limitations of the laboratory results; they are expected to recognize specific ANA patterns and titers with specific autoantibodies and the associated connective tissue (autoimmune) disorder.

HLA and Molecular diagnosis:

- The resident is expected to demonstrate an understanding of methods used in HLA and molecular diagnostic laboratories including clinical utility and limitations. The resident's understanding will be assessed by an 'open book' quiz. Residents are encouraged to discuss these questions with staff and faculty.

KEY TEACHING CONFERENCES RELEVANT TO THE LABORATORY MEDICINE ROTATION

The residents should feel free to attend any of the additional conferences at the department as long as the timing of a specific conference is not in conflict with resident's primary responsibilities during their Laboratory Medicine rotation

RESIDENT EVALUATION

Evaluation of individual resident is performed at the end of each rotation. The competency of the residents will be assessed using a Global evaluation method in all 4 out of 6 areas of ACGME competencies (Patient care, Medical knowledge, Interpersonal & Communicational skills, Professionalism). Specific areas that will be evaluated include the following:

- Quality of Clinical Services Provided
- Quality of Communications (including draft surgical pathology reports, dictations, autopsy documentation)
- Improvement in skills and knowledge over the duration of the experience
- Timeliness of clinical services provided

In addition a 360⁰ assessment tool will be used in evaluating the resident's Interpersonal & Communicational skills and Professionalism. All staff members of the Division of Department of Pathology at Lurie Children's provide their input to this evaluation. The 360* assessment will require the input of supporting staff such as the pathologist assistant, laboratory supervisors and technologists, histology technologists, and secretarial staff.

In addition, the residents are expected to evaluate the rotation and make appropriate recommendations for further improvement of GME activities provided by the DPLM.

Contact Information

Residents are scheduled to participate in educational experiences at Lurie Children's Hospital through communication between the resident's Program Director and the Program Director at

Lurie Children's, Michael K Fritsch MD, PhD. Any general questions regarding the educational experience, including the schedule, including vacations and absences should be addressed to Dr. Fritsch, telephone 312-227-3966.

Following the scheduling of the educational experience at Lurie Children's, designated faculty are responsible for the subsequent experience. For the Clinical Pathology experience, the faculty person responsible is Dr. Brenda Suh-Lailam. Please refer questions that pertain to Clinical Pathology to her, telephone 312-227-3974.