TUMOR CYTOGENETICS

Goals and Objectives of the Tumor Cytogenetics Rotation

During the course of residency training in Pathology, both AP and AP/CP resident are required to rotate 2~4 weeks as a single block or in 2 different blocks depending on the interest of each resident. Cancer cytogenetics is a busy service with roughly 3000 accessions per year, which include hematologic malignancies and solid tumors. The cytogenetics work up include G-(Giemsa) banding karyotype analysis and fluorescence in situ hybridization (FISH) using a variety of probes on various types of tissues, including formalin fixed paraffin-embedded tissue sections.

In this rotation, each resident is expected to familiarize with the application of cytogenetic testing in diagnosis and management of cancer. Electronic evaluations are performed by the Cytogenetics director immediately after the rotation for each resident to assess the goals and objectives set by the cytogenetics laboratory.

The goals and objectives for the Tumor Cytogenetics rotation linked to the core competencies as defined by the ACGME are the following:

**DIAGNOSTIC AND PATIENT CARE ACTIVITIES:**

1. To understand the quality control measures in proper collection, preparation and transportation of samples for cytogenetic analysis from peripheral blood, bone marrow, lymph nodes, solid tumors, and other relevant tissues/fluids. Solving problems arising from these issues and obtain all the clinical information needed for processing the specimens by contacting the concerned clinicians and pathology attendings.

2. To understand the clinical and pathological indications to choose specific requirements of handling each type of tumor tissue.

3. To familiarize with the laboratory procedures of culturing and preparing chromosomes from each tissue type, G-banding and FISH procedures, microscopy and karyotyping.

4. To familiarize with International System for Human Cytogenetics Nomenclature (ISCN), specifically how to write and interpret tumor karyotypes.

5. To familiarize how to analyze simple and complex karyotypes, and interpretation of the karyotypic abnormalities.

6. To learn how to choose the type of FISH testing based on the clinical history and pathology findings. Reading of FISH signals on the microscope and their interpretation. Understand the sensitivity and specificity associated with each FISH probe in use and apply this knowledge in interpretation of the results.
7. To be able to prepare tumor cytogenetics reports and write interpretation for the major types of chromosome abnormalities encountered in cancer.

8. To familiarize with the cytogenetic changes associated with specific types of malignancies, and their diagnostic and prognostic implications.

9. To understand the role of pathology findings and other molecular tests in relation to cytogenetics results in arriving at appropriate diagnosis and management of the disease.

**MEDICAL KNOWLEDGE AND ITS APPLICATION:**

Residents must demonstrate knowledge about the evolving developments in clinical and biological (cytogenetic and molecular) areas in cancer and its application to the daily cancer cytogenetics practice.

1. To review the literature on specific topics on cancer provided by the director in relation to cytogenetic and other molecular genetic alterations.

2. To become familiar with database resources currently available on cancer genetics testing and their application in daily use in diagnostic testing.

3. To review recent abnormal and interesting cases and understand how these cases revealed important diagnostic and prognostic information.

4. To understand how the cytogenetic changes have revealed the molecular mechanisms of tumorigenesis in specific types of tumors.

**PRACTICE BASED LEARNING AND IMPROVEMENT:**

1. To understand the regulatory requirements for quality assurance and quality control limitations (CAP/New York State/American College of Medical Genetics), biological hazards (JCAHO) in the cytogenetic laboratory.

2. To understand the appropriate laboratory practices that may have direct impact on quality and turn around time of reporting.

2. To know the appropriate uses for special testing such as FISH, and to be aware of the cost-benefit aspects of cytogenetic testing.

3. To know how to trouble-shoot problems arising from specimen submission, lack of clinical information, or mislabeling.
4. To become familiar with the interactions between the cytogenetics laboratory, molecular diagnostic laboratory, clinical/anatomic pathology services and the clinicians treating the patients.

INTERPERSONAL AND COMMUNICATION SKILLS:

Residents are required to develop skills to effectively exchange the information related to tumor cytogenetics in getting all the clinical details needed and provide results to the healthcare providers.

1. To communicate with referring physicians regarding the information needed in performing the appropriate tests.

2. To be able to communicate and discuss the cytogenetics results to physicians and other related diagnostic services. Obtain information if any follow up testing is needed in specific cases.

3. To review selected abnormal cases representative of interesting cytogenetic abnormalities and discuss with the lab director.

4. To present abnormal cases and review the related literature in appropriate weekly inter-divisional conferences.

5. To know how well to use the pathology laboratory and clinical information systems (e.g., COPATH, WebCIS) in gaining knowledge to interpret the cytogenetics findings.

6. To develop skills to communicate in a professional manner towards all laboratory personnel and clinical staff.

PROFESSIONALISM:

1. To attend all laboratory and inter-laboratory meetings and complete assignments in a timely manner.

2. To preserve patient confidentiality at all times, including presentations at conferences, removing patient identifiers from teaching materials, proper discarding of documents, and reporting results to outside clinicians/patients by following HIPPA regulations.

3. To be sensitive to the feelings of colleagues and other professionals.

SYSTEMS BASED PRACTICE:
1. To understand the limitations of cytogenetic analysis and the laboratory problems that may interfere with timely diagnosis.

2. To know the appropriate use of diagnostic codes (ICD) and billing procedures (CPT) in reporting the cytogenetics test results.

3. To be aware of testing requirements mandated (Federal and State) for each type of test performed in the cytogenetics laboratory.

4. To be aware of the cost-benefit aspects of special tests, especially FISH testing.

5. To be familiar and practice the quality assurance issues in cytogenetics laboratory practice mandated by the regulatory agencies (CAP, New York State and the American College of Medical Genetics).