Professional Enrichment Course

University of Pittsburgh School of Medicine
Office of Medical Education

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Personalized Medicine:
The Impact of Molecular Testing on Patient Care

Enrollment Period:	Winter/ Spring 2023
Course Dates:	Fridays, January 27, February 3, 10, 17, 24
Student Max:	5
Class Year:	MS1, MS2
Course Director:	Dr. Chiosea, Dr. Aggarwal (co-directors)
Course Administrator:	For issues related to sessions held at Presbyterian Hospital - Lynn Wolkenstein, P: 412-647-7065; F: 412-647-7799; wolkensteinl@upmc.edu For issues related to sessions held at Clinical Laboratory Building – Amy Kirchner-Baker; Clinical Lab Building Rm 8032; 3477 Euler Way Pittsburgh, PA 15213 Division Office: 412-802-6797; F 412-802-6799; kirchnerbakera@upmc.edu
Location:	Two sessions at Department of Anatomic Pathology UPMC Presbyterian 200 Lothrop Street 6A-616 Pittsburgh, PA 15213 Three sessions at Clinical Laboratory Building – Jessica Tebbets; Clinical Lab Building Rm 8032; 3477 Euler Way Pittsburgh, PA 15213
Registration:	Via Amp Up – You will receive an email with enrollment info
Course Description:	Personalized medicine applies knowledge of molecular data for early disease detection, targeted treatment, and detection of person's predisposition to a particular disease. It improves diagnosis and treatment of a disease and advances effectiveness of healthcare. This mini-elective is based in the Department of Pathology and will introduce students to principles and current applications of personalized medicine. During mini-elective students will be

	able to observe and discuss the principles of molecular testing, become familiar with the clinical interpretation of molecular results in all areas of medicine, including oncology, neuro-oncology, endocrinology, and gastroenterology. The training will be conducted in the clinical Molecular and Genomic Pathology (MGP) laboratory, Department of Pathology, University of Pittsburgh. MGP laboratory is one of the largest laboratories in the US focused on molecular diagnostics of solid tumors. It processes over 22,000 samples each year using high-throughput technologies, such as Next Generation Sequencing (NGS) and a variety of the conventional molecular biology techniques. It performs molecular testing for all hospitals of the UPMC system and serves as reference laboratory for other medical centers across the United States. The students will be exposed to various molecular tests (Genomic characterization and MGMT methylation in brain tumors, microsatellite instability [MSI] in colorectal and endometrial cancer, preoperative detection of mutations in thyroid cancer, identification of *EGFR* and *KRAS* mutation in lung and colon cancers, etc.) and learn their implications for clinical practice. They will have opportunity to learn and observe molecular techniques (nucleic acids isolation, PCR, real-time PCR, Sanger and next generation sequencing, and gene expression profiling, etc.) and become familiar with basic administrative technical, safety and quality control issues pertinent to the clinical molecular testing. The course will be based on presentation of individual real-life cases that illustrate the day to day practice in one of the largest molecular laboratories.
Objectives:	• To learn the principles of personalized molecular medicine • To become familiar with molecular testing available to patients with neoplastic diseases • To understand the physician's role in ordering of molecular tests. • To understand the diagnostic utility and clinical implication of molecular test results with respect to patient management, treatment and prognosis.
Pre-Requisites:	None
Requirements:	• Participation in all class sessions. • Completion of assigned reading from current literature (listed below).
Texts:	See in syllabus below

Class format:

During each session, the student will be meeting with the faculty of the Division of Molecular Pathology to review principles of molecular testing in specific area of medicine followed by real-life case sign out. The case sign out will include microscopic evaluation of tumor that is subjected to molecular analysis, review of molecular results (i.e. sequencing, real-time PCR, etc.), and discussion of the results with respect to patient management. Students will look up specific molecular tests as they review cases and will take notes on key molecular features in brain tumors, lung, colon, pancreas, thyroid carcinomas and other neoplastic diseases. Students will finish each afternoon session with reviewing of molecular results for 2- 5 patients. Ample time for direct interaction with faculty will be provided at all times.

Locations:

1. Molecular Anatomic Pathology Sign Out Room; UPMC Clinical Lab Building. 8th Floor, Room 8039, 3477 Euler Way. (Google maps: https://tinyurl.com/yd2bq2ru)
2. Department of Surgical Pathology, Presbyterian University Hospital, A-613, Multi-headed microscope sign out room, 200 Lothrop St, Pittsburgh, PA 15213 (Google maps: https://tinyurl.com/ybpkvg53)

Session 1

Next Generation Sequencing and other molecular testing for personalized patient care. Tour of the Molecular laboratory.

Assigned reading:

None

Session 2

Tour of the pathology Grossing Room and pathology archive.

Molecular testing of lung tumors for presence of *EGFR* and *KRAS* mutations and their role in guiding therapy with anti-EGFR tyrosine kinase inhibitors.

Assigned reading:

Plönes T, et al. Molecular Pathology and Personalized Medicine: The Dawn of a New Era in Companion Diagnostics-Practical Considerations about Companion Diagnostics for Non-Small-Cell-Lung-Cancer. J Pers Med. 2016 Jan 15;6(1).

Session 3

Molecular testing of myeloid neoplasms (lymphoma, leukemia)

Assigned reading:

- *None*

Session 4

Molecular testing of colorectal cancer including detection of *KRAS, PIK3CA,* and *BRAF* mutations and predictive value of these mutations in treatment of metastatic colorectal cancer patients with Cetuximab (anti-EGFR monoclonal antibody) and chemotherapy.

- Detection of MSI in colorectal and endometrial cancers and Hereditary Nonpolyposis Colorectal Cancer (HNPCC) syndrome surveillance.
- Molecular testing of pancreatic fine needle aspirates

Assigned reading:

Tran NH, et al. Precision medicine in colorectal cancer: the molecular profile alters treatment strategies. Ther Adv Med Oncol. 2015 Sep;7(5):252-62

Session 5

Molecular testing of thyroid ultrasound guided fine needle aspiration specimen for preoperative detection of various mutation important for diagnosis and surgical management of patients with thyroid neoplasms.

Assigned reading:

1. *Nikiforova MN, et al. Targeted next-generation sequencing panel (ThyroSeq) for detection of mutations in thyroid cancer. J Clin Endocrinol Metab. 2013 Nov;98(11):E1852-60.*