Clinical Laboratory in Medicine

Course Coordinator: **Prof. Micha Rapoport MD**

Course Description

This course introduces a review of basic laboratory methods in quality control, quality assurance, specimen collection and processing, information recording and transfer, normal and abnormal laboratory values, and types of reference intervals. The reference interval is the most widely used medical decision-making tool; it is central to the determination of whether or not an individual is healthy, and when combined with other clinical data helps define the clinical status of a patient. Laboratory instrumentation and basic techniques in the domains of blood bank, pathology, hematology, serology, clinical chemistry, forensic medicine and point-of-care testing, will be discussed.

Visits to the different laboratories of the medical center will be an integrative part of the course.

The course is divided into two parts:

The first segment will deal with quality control in the clinical laboratory, including pre- and post-analytical factors that play a role in the interpretation of test results.

The second part of the course will deal with a review of clinical laboratory methods and will cover most of the techniques used in clinical laboratories including the principles of molecular and immunoassays. This part will include visits to the laboratories.

Credit – 2 credits

Topics

1. **Quality Assurance, Point of Care Testing and Reference Ranges**
    - Role of clinical laboratory tests in diagnosis
    - Quality assurance in the clinical laboratory; importance of pre and post analytical processes
    - Bedside testing, point-of-care testing (POCT)
    - Normal and abnormal values, what do they mean? Too high, too low, subclinical?
2. **The Modern Clinical Laboratory and Principles of Molecular and Immunoassays**
    - Total laboratory automation
    - Immunological techniques: competitive and non-competitive assays, RIA
3. **Common Techniques in Cell Biology Research**

Objectives: To explore the principles and concepts of up-to-date techniques in cell biology research and to ensure that all students attain an appreciation of the different approaches in modern day cell biology practices such as: advanced experimental procedures to identify DNA, some RNA types, and cellular and signaling proteins.

4. **Blood Bank**
    - Blood typing
    - Antibody screening and identification
    - Transfusion
5. **Hematology and Coagulation**
    - The cellular elements in the blood: their formation, morphology and function in normal and pathologic processes
    - The more common anemias by pathophysiology
    - Basic theories of hemostasis including:

      Blood coagulation factors

      Cascade theory

      Fibrinolytic mechanism

6. Pathology and Cytology

Pathology today is a combination of the gold standard microscopy with molecular testing performed on tissues, resulting in a more elaborate and accurate diagnosis and thus enabling more accurate personalized therapy.

- Pathology in the past, present and future: the background and basics of pathology together with its growing role in the evolving targeted therapy
- Breast cancer under the pathologist's microscope – as an example of the role of pathology plays in the diagnostic and therapeutic processes

7. Forensic Medicine

- Introduction to forensic science – the DNA revolution
- Identification of human remains

Course Requirements and Grading System:

1. Mandatory participation in at least 80% of classes: 10%
2. Mandatory participation in at least 50% of practical experience in research: 20%
3. A multiple-choice examination, based on the lectures, at the end of the course: 70%

Required Reading

Donald S. Young "Effects of Preanalytical Variables on Clinical Laboratory Tests" 3rd Edition , AACC Press, 2007.

Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd edition McPherson-Pincus, Saunders, 2011.

William Clarke, D. Robert Dufour. "Contemporary Practice in Clinical Chemistry", 2nd edition , AACC Press, 2011.

Carl A. Burtis, Edward R. Ashwood, David E. Bruns Elsevier. "Tietz Textbook of Clinical Chemistry and Molecular Diagnostics", Fifth edition, 2012.

Kenneth Kaushansky (Author), Marshall Lichtman (Author), E. Beutler, Thomas Kipps, Josef Prchal, Uri Seligsohn "Williams Hematology", Eighth Edition, 2010.