University of Minnesota Lab Medicine and Pathology

Flow Cytometry Rotation

Location: Mayo D210
Duration: One month
Rotation Directors: Sophia Yohe, MD – phone: 612-273-3098 (pager 899-9175)
Elizabeth Courville, MD – phone: 612-273-6054 (pager 899-2883)
Other Faculty: Bartosz Grzywacz, MD, Michael Linden, MD, PhD, Sarah Williams, MD

General Description:
The goal of the flow cytometry rotation is to provide a basic understanding of the principles underlying the application of flow cytometry for immunophenotyping. Components of this rotation are outlined below.

- **Triage specimens** – Obtain clinical-pathologic information in order to determine the appropriate testing methods and panel of monoclonal antibodies to be used.
  1. Obtain bone marrow biopsy schedule for following day from laboratory tech and complete triaging in the late afternoon
  2. Triage lymph nodes, extranodal tissues, body fluids, add-on in-house marrows, and outside marrow biopsies as they come throughout the day
  3. The resident should not make any triaging decisions without first discussing with the teaching faculty on-service (or the hematopathology fellow on flow service). Triaging guidelines will be made available to the resident

- **Observe sample preparation** – the resident will shadow laboratory technologist(s) throughout the steps involved in the instrumentation and staining procedures.
  1. The resident should connect with Paula Shivers or Marya Awker, who will help the resident connect with a flow tech(s) to observe sample preparation, staining, instrumentation, and analysis
  2. The resident is expected to spend ½ to 1 day doing this during the week of the rotation

- **Learn principles of flow analysis using Kaluza software** – the resident will learn general principles of flow cytometry analysis (“gating”) as well as be introduced to gating protocols specific to UMMC
  1. During the first week of the rotation, the resident is expected to observe the flow technologists, the hemepath fellow (if on service), and the teaching faculty as they gate daily cases
  2. During the first week of the rotation, the resident is expected to practice gating strategies using example cases in the “AAA resident cases” file (subfolder in “FACSDiva”). These cases can be reviewed with the teaching faculty on service.
  3. For the remaining weeks of the rotation, the resident is expected to choose 1 to 4 cases daily from the clinical service to gate in Kaluza, representing a spectrum of specimen types. The resident will review these cases with the teaching faculty. The number of cases gated each day will be determined by the workflow and discussion with the teaching faculty.

- **Learn principles of flow interpretation and report generation** – the resident will learn general principles of flow cytometry interpretation and report generation, and will acquire experience performing interpretation and report generation.
  1. The resident should focus on these skills in the last three weeks of the rotation
  2. During the last three weeks of the flow rotation, the resident is expected to choose 1 to 4 cases daily from the clinical service to interpret and generate a preliminary report (as a word document file, not in copath), representing a spectrum of specimen types. The number of cases interpreted each day will be determined by the workflow and discussion with the teaching faculty.

- **Learn immunophenotypes of normal and abnormal cell populations** – the resident will develop an understanding of the immunophenotype of normal B and T cells and the immunophenotype of common lymphomas and leukemias
  1. The resident will gain this understanding via multiple methods including gating and interpretation of daily cases, gating and review of example cases in the “AAA resident cases” file, and review of hematopathology textbooks and relevant articles in the literature.
It is not to be expected that the resident will gain this knowledge solely by interpretation of daily cases, and self-study is encouraged.

Goals and Objectives:
Upon completion of this rotation, the resident will have developed a foundation in:
- The principles of sample triaging and preparation for flow cytometry
- The principles of flow cytometry analysis ("gating")
- The principles of flow cytometry interpretation and report generation including understanding and communicating limitations
- The immunophenotypes of common hematologic malignancies

The learning objectives below reference the corresponding ACGME core competencies: Patient Care (PC), Medical Knowledge (MK), Professionalism (Prof), Communication Skills (CS), Practice Based Learning and Improvement (PBLI), and Systems-Based Practice (SBP).

- Objective #1: Show up on time to work and attend all required conference. Analyze flow cytometry teaching set and view available recorded lectures. (Prof, CS)
- Objective #2: Assist in triaging, gating, interpretation, and report generation of clinical samples (PC, MK)
- Objective #3: Learn the variety of tests available for flow cytometry including CD34 counts, T-cell subsets, immunodeficiency panels (% of lymphocyte subsets), paroxysmal nocturnal hemoglobinuria (PNH) testing, leukemia/lymphoma immunophenotyping, and DNA ploidy (PC, MK).
- Objective #4: Follow a specimen through processing and understand the workflow of a specimen received in the flow cytometry laboratory (MK, Prof, SBP)
- Objective #5: Learn the limitations of flow cytometry, including diagnoses that can be missed and learn the terminology of flow cytometry reporting (PC, MK, SBP, CS).
- Objective #6: Gain basic understanding how flow cytometry works, including basic instrument mechanics and principles of data acquisition (MK, Prof).
- Objective #7: Demonstrate understanding of the immunophenotype of normal B and T cells and the immunophenotype of common lymphomas and leukemias (MK, PC).

Required Reading (resident can choose between the first two listed references):

Recommended Reading:
- “Acute Leukemias of ambiguous lineage,” pages 150-155, by Borowitz, Bene, Harris, Porwit, and Matutes in the WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues, 2008 – Book Chapter

Optional reading

Call Duties: None.

During the rotation, the trainee is expected to join the following conferences:
• Hematopathology Consensus Conference: 8:00-9:00 AM Mon/Tues/Thurs/Fri - multi-headed scope room (time unless otherwise noted)
• Clinical Pathology Conference: Tues 12:00-1:00 PM (weekly) – Mayo D175
• Resident Didactic Series: Wed 7:00-8:00 AM & 9:15-10:15 AM (weekly) – Mayo D175
• Hematopathology Didactic Series: Tues and Thursday 9-1:00 AM – Multi-headed scope room (time unless otherwise noted)
• Lab Medicine/Pathology Grand Rounds: Wed 8:00-9:00 AM (weekly) – 450 MCRB
• Flow cytometry laboratory staff meeting: Tuesdays 1:10 PM in the flow cytometry laboratory

Other Requirements:
• CP case logs should be emailed to the rotation director throughout the rotation to meet program requirements. Dr. Yohe or Dr. Courville will review all cases during the rotations and email feedback to residents. Resident is responsible to upload to the case log repository (available through the resident intranet).
• The resident may be assigned to assist in lymphoma work-ups during business hours as needed.
• The resident may be assigned to present case(s) at Heme malignancy conference

Assessment methods:
Resident performance on this rotation will be assessed by:
• Formative feedback provided by attending physician(s)
• Performance evaluation by faculty based upon review by faculty working with the resident during the rotation. Residents will be evaluated on performance of daily activities, on participation in required meetings and conferences, and on presentations.