Diagnostic Bacteriology Objectives (Edmonton Base Lab)

Selection:	Mandatory
Site:	Edmonton Base Lab (EBL)
Preceptors:	Dr. Peet van der Walt and Dr. Prenilla Naidu (Residency Program Site Coordinators), Dr. Mao-Cheng Lee, Dr. Natalia Solomon, Dr. Robert Verity, Dr. Tatiana Dragan, Dr. Bohdan Savaryn
Length of Rotation:	At least 10 blocks over four years
Prerequisites:	Basic Clinical Year for junior residents; core laboratory rotations for senior residents

General Objectives

EBL Microbiology provides services to Edmonton and most of the northern Alberta, including but not limited to hospitals, community physicians, and continuing care centers. It also provides testing and consulting services for the Northwest Territories, and other clients across Canada. Therefore, a large number and variety of specimen types are processed, exposing residents to a wide range of learning experiences.

This rotation is taken as a junior (PGY-2 to PGY-3) and senior resident (PGY-4 to PGY-5). Expectations are greater for senior residents to accommodate changing perspectives with increasing depth of knowledge, in keeping with graded responsibility as the laboratory training progresses. Objectives for junior and senior residents are indicated where applicable; if not indicated as a junior or senior resident-level objective, the objective is to be achieved at all training levels.

Learners will be expected:

- To understand the role of laboratory investigations in the diagnosis and management of infectious diseases.
- To understand normal bacterial flora and host-pathogen relationships as they pertain to health and disease.

- To learn how the microbiologist and the microbiology laboratory can promote optimal test utilization and good diagnostic and antimicrobial stewardship.
- To learn how the microbiologist and microbiology laboratory provide results that are accurate, timely, and clinically relevant.
- To understand the role of the medical microbiologist and the laboratory in relevant infection control and public health issues.
- To learn about laboratory management and how to work effectively with other laboratory team members to provide service that is clinically relevant, up to date, and cost effective.
- To learn to collaborate effectively with other health care professionals to provide optimal care and safety.

Specific Objectives

During this rotation, the resident will display the following knowledge, skills, and attitudes:

Medical Expert

Definition: As Medical Experts, Medical Microbiologists integrate all of the CanMEDS roles, applying medical knowledge, clinical skills, and professional attitudes in their provision of patient-centred care. Medical Expert is the central physician role in the CanMEDS framework.

- Demonstrates understanding of diagnostic tests and clinical interpretation of results in the centralized community, academic and tertiary care settings.
    - Demonstrates understanding of basic and more common diagnostic tests, able to provide clinical interpretation of results with guidance (junior resident).
    - Demonstrates understanding of relevant diagnostic tests, able to provide clinical interpretation of results independently (senior resident).
- Demonstrates an understanding of the following laboratory diagnostic tools including evaluation and implementation of new tests and methods, their application in a medical microbiology laboratory, including but not limited to:
    - Microscopy, including principles of staining.
        - Demonstrates understanding of basic principles of microscopy and staining, able to interpret stains with guidance (junior resident).
        - Proficient in microscopy, can interpret stains independently (senior resident).
    - Biochemical tests and identification of organisms using mass spectrometry (MALDI-TOF)
        - Familiar with basic laboratory tests and methods and their application in microbiology laboratory (junior resident).
        - Familiar with principals of new media/test validation/verification process (junior resident).

        - Demonstrates expert knowledge of different laboratory tests and methods and their use in the laboratory (senior resident).
        - Able to perform new media/test validation/verification independently or with little guidance (senior resident).
    - Common laboratory culture media, including selection and composition of culture media and incubation conditions.
        - Familiar with most commonly used media and incubation conditions (junior resident).
        - Able to select appropriate media and incubation conditions independently, able to evaluate and implement new media independently or with little guidance (senior resident).
    - Total Laboratory Automation
        - Demonstrates understanding of basic principles of total laboratory automation (junior resident).
        - Demonstrates understanding of advantages and limitations of total laboratory automation (senior resident).
        - Demonstrates knowledge in regard to implementation and management of total lab automation in the centralized laboratory (senior resident).
- *Chlamydia trachomatis/Neisseria gonorrhoeae* and human papilloma virus nucleic acid amplification tests.
    - Demonstrates understanding of basic principles of molecular testing and use of it in centralized laboratory (junior resident).
    - Demonstrates expert knowledge of principles, advantages and limitations of molecular testing.
    - able to provide clinically relevant interpretations for positive, negative and indeterminate values (senior resident).
    - able to troubleshoot independently or with minimal guidance (senior resident).
- Demonstrates knowledge of the pre-analytical (specimen collection, specimen acceptance/rejection, labelling, transport and storage), analytical (laboratory set-up, processing, and testing), and post-analytical (result, reporting, storage) factors which need to be considered to ensure accurate, timely and clinically relevant results are obtained for the following specimens, including but not limited to:
    - Blood
    - Sterile body fluids
    - Tissue biopsies
    - Upper and lower respiratory tract specimens
    - Wounds
    - Swabs
    - Urine and genital specimens
    - Stool
        - Depth of knowledge expected to improve as the resident progresses through training from a junior to senior resident.

- Demonstrates ability to report, validate, and review results generated from the laboratory.
    - Able to report, validate and review results under supervision and with guidance (junior resident).
    - Able to report, validate and review results independently (senior resident).
- Demonstrates an understanding of the methods available for susceptibility testing of bacteria, as well as test interpretation, indications for testing, Clinical and Laboratory Standards Institute (CLSI) and European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines for testing and reporting, clinical utility and potential limitations in the centralized laboratory.
    - Demonstrates understanding of the basic principles and methods for susceptibility testing, indications for testing, interpretation, advantages, disadvantages and limitations of each method (junior resident).
    - Able to interpret and provide clinically relevant results, able to troubleshoot independently, familiar with CLSI and EUCAST guidelines and their differences, able to provide meaningful consultation on additional testing (senior resident).
- Know the Transportation of Dangerous Goods (TDG) requirements for specimens and isolates of bacteria, mycobacteria, fungi, parasites, and viruses.
    - Demonstrates knowledge of TGD requirements (junior resident).
    - Able to select appropriate transportation for different types of specimens and isolates independently (senior resident).
- Demonstrate knowledge in utilization of laboratory information systems for results, storage, retrieval, and analysis.
- Demonstrates understanding of quality assurance, quality control, and proficiency testing in the microbiology laboratory.
- Demonstrates effective problem-solving skills involving troubleshooting technical issues as well as effective clinico-pathological correlation abilities.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Provides effective consultation services with respect to clinical diagnostics, patient management, and antimicrobial selection support in the laboratory through meaningful interactions with clinical colleagues and technical staff to provide optimal, ethical, and patient-centered medical care.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Performs a complete and appropriate assessment of clinical cases, as well as infection control, public health or laboratory problems/issues, including a plan of action with risk and outcome analysis.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Understands and uses preventative and therapeutic interventions effectively.

- Demonstrates knowledge of the principles and practice of laboratory support for infection control and prevention programs as well as public health aspects of diagnostic microbiology.
- Demonstrates knowledge and understanding of laboratory safety methods, safety equipment, and handling of bio-hazard materials and applies that knowledge appropriately.
- Seeks appropriate consultation from other health professionals, recognizing the limits of own expertise.

Communicator

Definition: As Communicators, Medical Microbiologists effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter.

- Assist in the continuing education of physicians and other members of the hospital staff by participating in conferences and case presentations.
- Act as consultant to clinical colleagues on the interpretation and relevance of microbiological findings, with particular regard to their significance in the management of the patient.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Establishes appropriate rapport, trust and professional relationships with colleagues in the laboratory environment as well as allied health care workers, patients, and families (when applicable).
- Accurately seeks, retrieves, and synthesizes relevant information and perspectives of patients and families, colleagues and other professionals.
- Accurately conveys relevant information and reasoning to colleagues and other professionals, including rationale for diagnostic plan or intervention, to technologists, consulting clinicians, and other members of a healthcare team as appropriate.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Effectively provides and receives information and presents it clearly and concisely in verbal and written formats.

Collaborator

Definition: As Collaborators, Medical Microbiologists effectively work within a healthcare team to achieve optimal patient care.

- Demonstrates the ability to consult and delegate effectively in the lab environment, providing advice on the appropriateness of obtaining microbiological specimens and further investigations, as well as issues in appropriate antimicrobial selection; provides feedback and guidance to technologists and other laboratory staff.

    - Requires guidance and supervision (junior resident).
    - Able to demonstrate the above skills consistently, functions independently (senior resident).
- Develops a platform of common understanding on issues, problems and challenges with colleagues and other healthcare professionals to work towards a shared plan of care in the best interests of patients and families.
    - Requires guidance and supervision (junior resident).
    - Able to function independently (senior resident).
- Interacts and collaborates effectively and appropriately in an interprofessional healthcare team by recognizing and acknowledging their respective roles and expertise.
- Establishes good relationships with peers and other health professionals.
- Effectively works with other health professionals to prevent, negotiate, and resolve interprofessional conflict.
- Demonstrates knowledge of the roles and functions of the microbiology lab with respect to infection control and public health.

Leader

Definition: As Leaders, Medical Microbiologists are integral participants in health care organizations, organizing sustainable practices, making decisions about allocating resources and contributing to the effectiveness of the healthcare system.

- Understands and makes effective use of information technology.
- Utilizes sound judgement, time, and available resources effectively to make cost-effective decisions regarding use of healthcare resources.
    - Requires guidance and supervision (junior resident).
    - Able to make decisions independently (senior resident).
- Allocates finite health care and health education resources effectively to optimize patient care and educational needs.
- Participates in activities that contribute to the effectiveness of their health care organizations and systems such as relevant internal and external meetings and courses.
- Demonstrates the following abilities to be able to function as a leader in a laboratory setting.
    - Understanding of professional, personnel, and financial issues involved in provision of diagnostic services in academic/non-academic hospitals and non-profit laboratories, including advantages and disadvantages.
    - Understanding of the role of audits, quality control, assurance, and improvement, risk management, occurrence/incident reporting, proficiency testing programs, and laboratory accreditation processes on local and national level.
    - Knowledge of the assessment of test efficacy, method, and equipment evaluation.

    - Knowledge of cost containment and efficiency, cost benefit ratios, effectiveness, and efficacy as they relate to medical care.
        - Develops an understanding and knowledge of management functions in the centralized laboratory (junior resident).
        - Able to function as a leader with minimal guidance (senior resident).
- Sets realistic priorities and uses time effectively.
- Effectively balances career expectations and personal life.

Health Advocate

Definition: As Health Advocates, Medical Microbiologists responsibly use their expertise and influence to advance the health and well-being of individual patients, communities, and populations.

- Identifies the determinants of health of the patients and populations that they serve.
- Responds to individual patient health needs and issues as part of patient care to ensure continuing standards of care are maintained.
- Understands the specialist's role to intervene on behalf of the community with respect to the social, economic, and biological factors that may affect community health.
- Acquires appropriate knowledge of quality issues in the laboratory to ensure patient safety and accuracy of medical reports.
- Acquires the knowledge of and participates in regular evaluations of laboratory practices and test selections to ensure they meet community needs, acting as a member of an interdisciplinary team of professionals responsible for patient health.
    - Develops knowledge and skills under supervision (junior resident).
    - Able to function independently (senior resident).

Scholar

Definition: As Scholars, Medical Microbiologists demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application, and translation of medical knowledge.

- Demonstrates the ability perform critical appraisals of medical and scientific information and its sources, successfully integrating this information and applying it appropriately to practice decisions.
- Recognizes, understands, and assumes responsibility for continuous self-assessment, ongoing maintenance of professional competence and lifelong self-directed learning as basic tools for excellence.
- Appreciates the importance and necessity of ongoing research to expand/develop new knowledge as well as the importance of distribution of this knowledge to learners of all kind.

- Contributes to development, dissemination, application, and translation of new knowledge through research and development.
- Facilitates learning including teaching/training of students, peers, healthcare professionals, patients, and other community members.
- Develops, implements, and monitors a personal strategy for continuing education and maintenance of professional competence.
- Participates in rounds, conferences, teaching sessions, and other professional activities.

Professional

Definition: As Professionals, Medical Microbiologists are committed to the health and wellbeing of individuals and society through ethical practice, profession-led regulation, and high personal standards of behaviour.

- Delivers the highest quality of care with integrity, honesty, compassion, and respect for diversity.
- Meets deadlines, is punctual, and completes follow-up.
- Exhibits appropriate professional behavior, performs duties in a dependable and responsible manner thus fulfilling medical, legal, and professional obligations of the specialist.
- Demonstrates a commitment to excellence and ongoing professional development.
- Demonstrates a commitment to their patients, profession, and society through ethical practice.
- Demonstrates an awareness of personal limitations, seeking advice when necessary and accepting advice graciously.
- Demonstrates the ability to balance personal and professional roles and responsibilities.
- Demonstrates flexibility and a willingness to adjust to changing circumstances.

Outline of Rotation

Time: 8:00 am - 5:00 pm: once daily learning on the bench is completed, the rest of the day is spent with the microbiologist-on-call (MOC). All residents must check in with the MOC before leaving at the end of the day.

Location: #200, 10150-102 street (entrance on the second level via Manulife Building pedway). On your first day, report to the Microbiology Clinical Supervisors (Darcy, Paula, Jeanette or Shawn) through reception/security. Although all general rotation schedules are provided for each resident, more detailed information about your rotation schedule will be obtained onsite from the preceptor or the designate. This site can be reached by the LRT (get off at the Bay Enterprise Station) from UAH. Offsite AHS reciprocal parking is available. EBL will provide you with office space, access to microscopes, AHS computers, a landline phone, and a locker with a key for personal items. In case of

problems/questions contact Dr. Peet van der Walt or Dr. Prenilla Naidu (site coordinators) or designate, or the Program Director.

General Description

To achieve all core microbiology objectives, the rotation is taken throughout a resident's training as they advance from junior to senior resident. The first four rotations at EBL will be introductory blocks while more advanced training occurs in subsequent rotations.

The introductory rotations will include a basic overview of the different areas of the laboratory from the "front-end processing" to the analytic bench processes and the post-analytic interpretation and reporting of results. This will introduce the resident to the services provided by EBL as a front-line laboratory supporting community clinics, physicians' offices, community hospitals, and health centres, tertiary referral acute care hospitals such as the Royal Alexandra Hospital, Grey Nuns Community Hospital, Misericordia Community Hospital, and the tertiary/quaternary care hospital (University of Alberta Hospital). Here, residents will learn the basics of service delivery to all levels of health care facilities, community physicians and other health care professionals in Edmonton, Northern Alberta, and other health regions including remote communities. Subsequent advanced rotations provide an in-depth review of these services, as well as learning alternative approaches to the professional clinical practice of microbiology functioning in a more senior capacity as a junior consultant, fine-tuning their professional skills.

During the **introductory** rotations (the first 4 blocks spent at EBL), residents will spend a significant amount of time on different benches learning basic microbiology skills and getting familiar with bench protocols and workflow using the help of bench technologists. Residents are expected to initially observe and listen to instructions, then gradually introduce hands-on experience as mutually agreed upon between the resident and respective technologist. During the day, all residents are encouraged to join the MOC on twice-daily laboratory bench rounds, and then again when the technologists finish their bench duties. During their on-call week, residents will not be expected to sit on benches but will have to perform on call duties under close supervision from the MOC, as specified in the relevant document.

During the **advanced** rotations (after the first 4 blocks spent at EBL), residents will still have bench rotations to participate in but are expected to actively participate in clinical service; carrying out clinical and laboratory consultations with decreasing levels of supervision as they gain experience and competence, review blood cultures and other critical specimens. Residents are expected to provide teaching for junior learners and health care professionals (technologists, nurses, clinicians, etc) and participate in relevant meetings (Microbiologist-at-large meetings), journal clubs, or other activities that contribute to the effectiveness of the laboratory or other healthcare organizations.

Medical Microbiologist preceptors for the medical aspects of bench-based learning

The Medical Microbiologists are responsible for the different benches and will become preceptors to residents to provide the medical aspects for each bench. This will include regular teaching sessions on various topics. Residents should approach the relevant bench leads ahead of time as soon as they receive their schedule from the assistant manager. If the microbiologist is away, the resident should contact the other microbiologists.

Sessions may be interactive or didactic and include, for example, the following:

1. Case discussions

2. Bench set-up

3. Bench SOP: Principles, methods

4. Bench updates: New technologies/methods

5. Bench audit

6. Antimicrobial susceptibility testing: criteria, methods, limitations

7. Assessment of practical duties such as:

A. Gram stain reviews

B. Colonial characteristics of different organisms

C. Tests used for identification

D. Reading and interpreting susceptibility results

E. Reviewing final reports

F. Role of the Medical Microbiologist (laboratory physician) in diagnostic stewardship

Working up "unknowns"

The residents will be expected to work through the collection of "unknown" isolates in their own time. These are frozen isolates which are accompanied by questions. Results should be discussed with their bench preceptors

Lunchtime presentation to technologists and microbiologists

Residents will be required to prepare a 30-minute presentation. This can be an interesting case they have seen or any laboratory-related topic. They should arrange a suitable date with the assistant manager

Evaluation by the Medical Microbiologists

I. The rotation coordinators will conduct the Block evaluation, after getting feedback from the other microbiologists.
II. The MOC supervising the resident during the on-call week will provide the on-call evaluation.
III. Evaluations will be provided by One45, which the residents will be responsible for sending to the relevant evaluating microbiologist.

Throughout both introductory and advanced rotations, residents are released from all duties for the duration of Academic Half Day formal teaching activities, on Tuesday afternoons (12 pm – 5 pm). There are other activities such as Infectious Diseases Case Rounds (Thursdays at 11 am – 12 pm), Laboratory Medicine and Pathology Rounds (Thursdays at 12 – 1 pm), Tropical Medicine Rounds (Monthly on a Wednesday 10 am – 11 am), etc, outside of the Academic Half Day time slot, available for residents to attend whenever possible.

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