

Basic Clinical Year – Medical Microbiology

Selection:	Mandatory
Site:	University of Alberta Hospital, Provincial Laboratory
Preceptors:	Dr. Kinga Kowalewska, Dr. Mathew Diggle, Dr. Greg Tyrrell, Dr. Will Stokes, Dr. Carmen Charlton, Dr. Natalie Marshall, Dr. Ruwandi Kariyasam, Dr. Nathan Zelyas
Length of rotation:	One block (four weeks)
Prerequisites:	None

General Objectives

To provide exposure to the role of the Medical Microbiologist in the microbiology laboratory as well as in the broader context of the healthcare system.

To introduce the resident to the microbiology laboratory, basic microbiology testing and the format of the residency program.

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. The resident will be able to:

- *Understand the role of the Medical Microbiologist in patient care in hospital and community settings.*
 - *Recognize that this role includes but is not limited to: consultation with clinicians, interpretation of results, troubleshooting of laboratory issues, laboratory planning, infection prevention and control, occupational health and safety, antimicrobial stewardship, infectious disease surveillance, education, and research.*
- *Observe and understand the process/route of specimens throughout the laboratory.*
- *Observe specimen receiving and initial processing.*
 - *Recognize the different routes by which specimens arrive in the laboratory and how delays in transit may affect results.*
 - *Understand the criteria by which specimens are accepted or rejected in the laboratory.*
 - *Recognize that the initial processing of specimens differs by source and test requested.*
- *Demonstrate knowledge of Gram staining.*
 - *Understand the principle of the Gram stain as well as its advantages and limitations.*

- Perform the staining procedure.
- Demonstrate basic interpretation of a Gram stain.
- Identify Gram morphologies of common organisms (staphylococci, streptococci, Gram negative bacilli, Gram negative diplococci, Gram positive bacilli, yeast).
- Recognize the use of Gram stain scoring systems in the laboratory (ie Q score, Nugent score).
- Understand the role of Gram stain in specimen work up and organism identification.
- Become familiar with basic principles of organism identification.
 - Recognize the role of initial stains (including but not limited to Gram stains).
 - Describe colony morphology and become familiar with the morphology of several common bacterial organisms including *Staphylococcus aureus*, coagulase negative staphylococci, β -hemolytic streptococci, viridans group streptococci, *Streptococcus pneumoniae*, *Enterococcus* species, *Escherichia coli* and other coliforms and *Pseudomonas aeruginosa*.
 - Develop a basic understanding of different types of media used in the laboratory (examples: solid vs liquid, selective vs differential).
 - Understand the role and principles of common bench top biochemical tests (catalase, coagulase, indole, oxidase).
 - Learn the basics of incubation requirements in the laboratory (anaerobic vs aerobic conditions).
 - Develop an approach to the basic identification of the following organisms: *S. aureus*, coagulase negative staphylococci, β -hemolytic streptococci, viridans group streptococci, *Streptococcus pneumoniae*, *Enterococcus* species, *Escherichia coli* and other coliforms, and *Pseudomonas aeruginosa*.
- Develop basic microscopy skills.
 - Know how to operate and clean the microscope appropriately.
 - Recognize a few common stains used in microbiology (including Gram, acid fast, calcofluor white, acridine orange, etc.).
 - Become familiar with the role of microscopy in diagnostic testing (including but not limited to its role in parasite and fungal identification).
- Understand the principles of susceptibility testing.
 - Recognize the importance of susceptibility results for patient care.
 - Know the main methods used for susceptibility testing in the laboratory and understand the principles of how they work.
 - Have a basic understanding of interpretation of susceptibility results in the laboratory (minimal inhibitory concentration vs zone size, concept of breakpoints).
- Apply the concepts of pre-analytical, analytical and post-analytical phases when discussing specimen flow through the laboratory.
- Recognize that interpretation of microbiology testing may require correlation with clinical details (history, physical examination, other laboratory tests and radiological/surgical findings).
 - Understand the difference between colonization and infection.
 - Understand the concept of "normal flora" and how this may vary by specimen site.
- Appreciate and understand, in principle, the limitations of microbiological tests.
 - Recognize the role of appropriate specimen collection.
 - Recognize that specimen type, volume, collection device and container, time in transit, transport and storage conditions, and other factors, may affect microbiological results.
 - Demonstrate basic understanding of the principles of screening vs confirmatory tests.
- Appreciate the need for STAT processing of microbiological specimens as well as examples of common infections where such specimens are collected.
- Recognize the role of molecular testing in the clinical laboratory.
- Recognize the role of serological testing in the clinical laboratory.
- Appreciate the importance of biosafety and apply it to all work situations in the microbiology laboratory.
 - Complete the laboratory safety orientation.

- *Be aware of where to access additional safety information if necessary.*
- *Practice standard precautions at all times in the laboratory.*
- *Have a basic understanding of organism risk groups and levels of biosafety.*
- *Adhere to specific biosafety precautions when appropriate.*
- *Develop a basic understanding of the use and importance of quality controls in the laboratory.*

Communicator

Definition: As Communicators, Medical Microbiologists effectively facilitate relationships with other microbiologists, technologists, clinicians and laboratory stakeholders.

The resident will be able to:

- Establish professional relationships with colleagues, microbiologists, technologists and other laboratory personnel.
 - Communicate using an approach that is characterized by empathy, respect and compassion.
 - Communicate with respect and due consideration for individual sensitivities and diversity of values, beliefs and ethnicity, irrespective of personal perspectives and preferences.
- Respond to non-verbal communication and use appropriate non-verbal behaviours to enhance communication where appropriate.
- Manage disagreements and conflicts respectfully.
- Elicit and synthesize accurate and relevant information to aid in interpretation of microbiology results
 - When necessary, gather relevant clinical information from physicians, nurses or other healthcare personnel involved in the patient's care.
- Share microbiology results and interpretations with healthcare teams when appropriate.
 - Communicate the result or interpretation clearly and accurately.
 - Recognize when to seek help in providing clear explanations.
 - When appropriate provide management advice with the assistance of a more senior resident or microbiologist.
- Document and share, as appropriate, written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy.
 - Present problems, solutions and opinions, and summarize them accurately and clearly in verbal, written and electronic form.
 - Demonstrate proficiency in using the vocabulary and appropriate abbreviations specific to the discipline and workplace.

Collaborator

Definition: As Collaborators, Medical Microbiologists effectively work within a healthcare team to achieve optimal patient care. The resident will be able to:

- Work effectively with physicians and other members of the laboratory diagnostic team.
 - Compare and contrast enablers of and barriers to collaboration in health care.
 - Respect established rules of the team.
 - Receive and appropriately respond to input from other healthcare professionals.
 - Differentiate between task and relationship issues among healthcare professionals.
 - Describe the role and scope of practice of Medical Microbiologists and other professionals within the department team and recognize their expertise.

- Identify referral and consultation as opportunities to improve quality of care and patient safety by sharing expertise.
- Work with physicians and other members of the laboratory diagnostic teams to prevent misunderstandings, manage differences and resolve conflicts.
 - Actively listen to and engage in interactions with collaborators.
 - Identify communication barriers in a healthcare team.
 - Communicate clearly and directly to resolve conflicts.
 - Listen to, understand and find common ground with collaborators.

Leader

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

- Work effectively and efficiently in a healthcare organization.
- Utilize information technology to optimize patient care and life-long learning activities.
- Contribute to the improvement of healthcare delivery in teams, organizations and systems.
 - Recognize the role of the microbiology laboratory in the healthcare system.
 - Describe the elements of the healthcare system that facilitate or protect against adverse events or near misses.
 - Use health informatics for patient management, to improve the quality of patient care and to optimize patient safety.
- Engage in the stewardship of healthcare resources.
 - Model practice patterns after senior colleagues who deliver a high standard of service.
 - Account for costs when choosing diagnostic options.
 - Apply evidence and guidelines with respect to utilization relevant to common clinical scenarios.
- Develop leadership in professional practice.
 - Appreciate leadership styles as they relate to healthcare.
 - Appreciate how self-awareness, self-reflection and self-management are important to developing leadership skills.
 - Appreciate aspects of his/her own style (including strengths, weaknesses and biases) that are relevant to leadership.
 - Actively engage in change initiatives led by others.
 - Appreciate how healthcare goals from diverse stakeholders help set the direction for healthcare delivery.
- Manage his/her practice and career.
 - Set priorities and manage time to balance residency and personal life.
 - Develop systematic habits for practice management (e.g., checklists, prompts, to-do lists and standard operating procedures).
 - Use tools and technologies to manage his/her schedule.

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. The resident will be able to:

- Identify determinants of health affecting patients.
- Contribute effectively to improve the health of patients and communities through understanding and supporting disease prevention methods, such as infection control and vaccination, and promotion of healthy lifestyles.
- Respond to the individual patient's health needs by advocating within and beyond the clinical environment.
 - Recognize and respond appropriately in advocacy situations - including those arising from trying to provide optimal care for hospitalized patients.
- Describe communities or populations facing health inequities.
- Demonstrate knowledge of the role of patient education and preventative medicine in clinical practice, including public health aspects of disease.

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. The resident will be able to:

- Understand the nature of and need for a personal learning plan to enhance professional practice.
 - Develop and implement a personal self-directed learning strategy.
 - Identify and prioritize, with guidance, personal learning needs based on formal curriculum learning objectives.
 - Define reflective learning as it relates to medicine.
 - Use exam results and feedback from teachers and peers to enhance self-assessment and improve learning.
 - Compare, with guidance, self-assessment with external assessments.
 - Participate effectively in collaborative group learning.
- Facilitate the learning of students, residents, the public and other healthcare professionals.
 - Recognize the power of role modeling and appreciate factors that can positively or negatively affect the learning environment.
 - Recognize and describe strategies for reporting and managing witnessed or experienced mistreatment.
 - Work within his/her limitations, seeking guidance and supervision when needed, to ensure patient safety is maintained when learners are involved.
 - Learn effective teaching methods to facilitate learning.
- Provide effective feedback to enhance learning and performance.
 - Evaluate teachers and programs in an honest, fair and constructive manner.
- Integrate best available evidence, contextualized to specific situations, into real-time decision-making.
 - Appreciate the different kinds of evidence and their roles in clinical decision-making.
 - Describe the advantages and limitations of pre-appraised resources.
 - Select appropriate sources of knowledge as they relate to addressing focused questions.
 - For a given clinical case, demonstrate the application of evidence during decision-making.
- Critically evaluate, with guidance, the integrity, reliability and applicability of health-related research and literature.
- Contribute to the dissemination and/or creation of knowledge and practices applicable to health.
 - Appreciate the basic scientific principles of research and scholarly inquiry.

- Appreciate the common methodologies used for scholarly inquiry in medicine.
- Appreciate the role of research and scholarly inquiry in contemporary health care.
- Appreciate the ethical principles applicable to research and scholarly inquiry.

Professional

Definition: As Professionals, Medical Microbiologists are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation and high personal standards of behaviour. The resident will be able to:

- Exhibit appropriate professional behaviours and relationships in all aspects of practice, reflecting honesty, integrity, commitment, compassion, respect, altruism, respect for diversity (racial, cultural, gender and belief) and maintenance of confidentiality.
 - Exhibit honesty and integrity with other physicians and other health professionals.
 - Demonstrate caring and compassion.
 - Recognize and respect boundaries.
 - Demonstrate sensitivity to issues concerning diversity with respect to peers, colleagues and patients.
 - Consistently maintain confidentiality in the clinical setting, while recognizing the special limitations on confidentiality.
- Reflect on experiences in the clinical setting to identify personal deficiencies and modify behaviour accordingly.
 - Meet deadlines, be punctual, monitor patients appropriately and provide follow-up.
 - Remain calm, act in a timely manner and prioritize appropriately.
 - Demonstrate an awareness of personal limitations, seeking advice when necessary and accepting it graciously.
- Appreciate the appropriate ethical concepts to address ethical issues encountered during clinical and academic activities.
- Recognize personal conflicts of interest and demonstrate an approach to managing them.
- Use technology-enabled communication, including online profiles, in a professional, ethical and respectful manner.
- Follow relevant policies regarding the appropriate use of electronic medical records.
- Demonstrate accountability to patients, society and the profession.
 - Understand the social contract between the profession of medicine and society.
 - Understand physician roles and duties in the promotion of the public good.
 - Appreciate and understand the levels of reciprocal accountability of medical students, physicians and the medical profession in relation to individual patients, society and the profession.
 - Appreciate the tension between the physician's role as advocate for individual patients and the need to manage limited resources.
- Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation.
 - Understand and recognize key behaviours that are unprofessional or unethical.
 - Personally respond to peer group lapses in professional conduct.
- Demonstrate a commitment to physician health and well-being to foster optimal patient care.
 - Use strategies to improve self-awareness to enhance performance.
 - Understand the connection between self-care and patient safety.
- Manage personal and professional demands for a sustainable practice throughout the physician life cycle.

- Identify strategies to support personal well-being, a healthy lifestyle and appropriate self-care, with the help of a primary health professional, therapist, and/or spiritual advisor.
- Seek appropriate health care for own needs.
- Use strategies to mitigate stressors during transitions and enhance professional development.
- Seek mentorship to address professional development needs.
- Promote a culture that recognizes, supports and responds effectively to colleagues in need.
 - Recognize the multiple ways in which poor physician health can present, including disruptive behaviour, and offer support to peers when needed.
 - Appreciate the importance of early intervention for colleagues in need of assistance, identify available resources, and describe professional and ethical obligations and options for intervention.
 - Practice positive behaviours and deal with negative behaviours to promote a collegial work environment.

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