EDUCATION MANUAL

TABLE OF CONTENTS

EDUCATION MANAUL

TABLE OF CONTENTS

MICROBIOLOGY ROTATION FOR MEDICAL LABORATORY TECHNOLOGY STUDENTS

Welcome to Microbiology!

Microbiology is an interesting and dynamic science. Your time spent in our lab should be an enjoyable and successful learning experience.

The main objective of this training program is to produce a technologist who has the ability to apply theoretical knowledge to the practical aspects of the Microbiology laboratory, efficiently and with a caring attitude.

During your rotation you will be exposed to all aspects of the department. You will handle specimens from their receipt in the department through to the reporting of results. You will develop the ability to make a presumptive identification of common pathogens and be able to select the correct tests to fully identify them.

Department Information

Toronto Medical Laboratories/Mount Sinai Hospital Department of Microbiology

Mount Sinai Site
(Bacteriology)
14th Floor - Mount Sinai Hospital
600 University Ave.
Toronto, Ontario
(416) 586-4432

TML Site
(Virology, Serology, Mycology, Parasitology)
The Michener Institute
12th Floor - 222 St. Patrick St.
Toronto, Ontario
(416) 340-5898 ext. 2511

Regular Lab Hours

7:45 to 16:00 **or** 8:00 to 16:15

Coffee and lunch schedules should be worked out with the bench tech you are working with. If you are sick or cannot report to the lab please call Martin at (416) 586-4696 and Glen at (416) 586-3137 and leave messages with both.

Orientation

1. Introduction to Dr's Low, Mazzulli, Campbell, MacDonald, and McGeer. Introduction to Administrative Director Martin Skulnick, Manager Katherine Wong, and Charge Technologist Glen Small, Iris Anne Edwards and Robert Chua.

2. Actual walk through tour of lab:
   - where to get clean lab coats, put dirty ones and wash up area
   - various benches, incubators, fridges, store room
   - bathroom and lunchroom facilities, including cafeteria location
   - bulletin board with schedules, notices, lectures
   - library where journals and reference books are kept
   - where main lab manual is kept and NCCLS guidelines Safety Manual, WHMIS Manual and other reference books (QA bench)
   - overview of safety rules e.g. no open toe or open heel shoes, fire alarm pulls, stairway exits, fire extinguishers, eye wash / shower stations.

3. Arrange time for IC talk by IC practitioner - Dr. A. McGeer, Chris Moore or Wayne Lee.

4. Arrange time for full safety talk by Safety Officer - Joanne Sverha, re: WHMIS, etc.

Competencies and Objectives

Please refer to objectives given to you by your individual teaching institutions. Objectives are also available in respective binders with the senior teaching technologist.
Note: Competencies and Objectives are actually set by CSMLS.

Education

There is a 10 week training period for technologists in microbiology. A schedule will be given to you on your first day.

Week One: At Mount Sinai Site

- Monday, introductions and orientation first thing
- Specimen management bench and media preparation for remainder of week

Weeks Two - Eight: At Mount Sinai Site

- covering these benches one week at a time: urines, respiratory, genital/enterics, miscellaneous and sterile fluids, blood cultures, infection control and quality control

Weeks Nine - Ten: At TML Site

- covering mycology in one week and serology/virology in the other.

Students may be given a short topic to present to a small group of technologists (e.g. journal article) if time permits.

There are several tutorials/rounds you may attend:

Departmental seminars are every 2nd Wednesday from 2:15-3:15 p.m. at the Mt. Sinai site (they rotate every 2nd week with general lab meetings).

TML rounds are every 2nd Tuesday from 1:15-1:45 p.m. Check bulletin board for topics and location.

Infectious Disease Lunch hour rounds are every Tuesday from 1:00-2:00 p.m. in Banting Hall, check bulletin board for topics.

Evaluations

Kingston students will have a test weekly and a final at the end of week 10. Tests set up by St. Lawrence College.

Michener students will also write a weekly test which will not count for marking. However, they will write a final at the end of week 10 set by Michener Institute. Michener students will have a practical exam during week 10 which will be marked.

Each student will be evaluated by a technologist working the bench that the student is assigned to that week. Students will also evaluate the benches on their rotation every week. Final evaluation will be done by the Senior Teaching Technologist at the end of 10 week rotation. Each student will be given "unknowns" throughout the microbiology rotation.

TML/MSH Microbiology Department Policy & Procedure Manual	**Policy # MI/EDU/02/v01**	Page 1 of 1
Section: **Education Manual**	Subject Title: **CSMLS - Code of Professional Conduct**	
Issuedby: **LABORATORY MANAGER**	Original Date: June 18, 2001	
Approved by: Laboratory Director	Revision Date:	

CANADIAN SOCIETY FOR MEDICAL LABORATORY SCIENCE (CSMLS) CODE OF PROFESSIONAL CONDUCT

1. Medical laboratory technologists are dedicated to serving the health-care needs of the public. The welfare of the patient and respect for the dignity of the individual shall be paramount at all times.

2. Medical laboratory technologists work with other health care professionals, to provide effective patient care.

3. Medical laboratory technologists shall promote the image and status of their profession by maintaining high standards in their professional practice and through active support of their professional bodies.

4. Medical laboratory technologists shall protect the confidentiality of all patient information.

5. Medical laboratory technologists shall take responsibility for their professional acts.

6. Medical laboratory technologists shall endeavour to maintain and improve their skills and knowledge and keep current with scientific advances.

7. Medical laboratory technologists shall share their knowledge with colleagues and promote learning.

8. Medical laboratory technologists shall be aware of the laws and regulations governing medical laboratory technology and shall apply them in the practice of their profession.

9. Medical laboratory technologists shall practice safe work procedures at all times to ensure the safety of patients and co-workers and the protection of the environment.

GENERAL MICROBIOLOGY REVIEW

1. Review of common organisms should occur in the first week. This review will include:

   #1 *Staphylococcus aureus*

   #2 CNST

   #3 *Enterococcus faecalis*

   #4 *Escherichia coli*

   #5 *Pseudomonas aeruginosa*

   (See Appendix I)

2. Kohler illumination (See Technical Section in Lab Manual)

APPENDIX I - DAY ONE

1. On Day 1, subculture *S. aureus*, CNST, *Enterococcus* spp., *E. coli* and *Pseudomonas aeruginosa* onto MacConkey and Blood agar plates for isolated colonies. (See Appendix II).

2. On the second day gram stain each organism from any one plate. (See Appendix III). Also describe colony morphology for each organism on each of the plates.

3. On the second day also do the following tests and record results: (See Appendix IV).

   Catalase - For either *Staph.* Spp and *Enterococcus* spp.

   Coagulase - For *S. aureus* and CNST

   Bile esculin - For *Enterococcus* spp.

   MUG - For *E. coli*

   Oxidase - For *Pseudomonas aeruginosa* and *E. coli*

APPENDIX II- MEDIA

1. MacConkey Agar
   - Is a selective and differential medium to isolate Gram negative bacilli
   - Lactose fermentors are pink
   - Non-lactose fermenters are pale
   - Peptone base with lactose and neutral red as indicator

2. Blood Agar
   - Typticase soy agar, Brucella agar or beef heart infusion base and 5% sheep blood
   - General purpose medium
   - Used to cultivate fastidious microorganisms
   - To determine haemolytic reactions

3. Chocolate Agar
   - Peptone base enriched with 2% haemoglobin
   - To cultivate *Haemophilus* and *Neisseria* species
   - Also a general purpose medium

4. Haemophilus Agar
   - Selective and differential medium
   - Chocolate base containing bacitracin to inhibit respiratory flora
   - To isolate *Haemophilus*

5. CNA Agar
   - Columbia colistin nalidixic acid agar with 5% sheep blood
   - Selective and differential medium
   - Used to isolate gram positive organism from mixed cultures

6. Brucella Agar
   - With hemin and vitamin K
   - For the isolation and cultivation of anaerobic bacteria
   - With 5% sheep blood

7. LKV Agar
   - Kanamycin-vancomycin laked sheep blood
   - Enriched selective and differential medium for the isolation and cultivation of anaerobic bacteria e.g. *Bacteroides* spp. and *Prevotella* spp.

8. Fastidious Anaerobic Broth
   - Broth culture for anaerobes

9. Hektoen Enteric Agar
   - Selective and differential medium
   - Bile salts and indicator dyes select and inhibit gram positive organisms
   - Lactose, sucrose and salicin present to differentiate between fermenters and non-fermenters
   - Sodium thiosulfate and ferric ammoniumcitrate detect H_2S production
   - *E. coli* are yellow-pink in colour.
   - *Shigella* are green or transparent Salmonella green or transparent with black centers.

10. Selenite Broth
   - Enrichment broth for isolation of *Salmonella* and *Shigella*
   - Inhibits enterococci and coliforms

11. CIN Medium
   - Cefsulodin-irgasan-novobiocin medium
   - Selective and differential for isolation of *Yersina enterocolitica*

12. Campylobacter Blood Agar
   - Enriched selective blood agar
   - Trimethoprim, Vancomycin, Amphotericin B, Polymyxin B and Cephalothin in medium

13. Martin-Lewis Agar
   - Enriched and selective medium for *N. gonorrhoeae*
   - Vancomycin, anisomycin, trimethoprim and colistin in medium

14. Group B Strep Broth
   - Antibiotics Gentamicin and Naladixic in mediuim
   - Selects Gram positive organisms

15. Mannitol Salt Agar with Oxacillin
   - Screen for MRSA

16. (Vancomycin) Enterococcus Agar
   - Screen plate with Vancomycin for VRE

APPENDIX III - GRAM STAIN REACTIONS

Gram positive cocci	-	*Staphylococcus aureus*
	-	Coagulase negative *Staphylococcus*
	-	*Enterococcus faecalis*
	-	Viridans streptococcus
	-	Beta-haemolytic group B streptococcus
Gram positive bacilli	-	*Clostridium novyi*
	-	*Bacillus* species
	-	*Corynebacterium* species
Gram negative coccus	-	*Moraxella cattarhalis*
	-	*Neisseria* species
Gram negative bacillus	-	*Escherichia coli*
	-	*Proteus mirabilis*
	-	*Pseudomonas aeruginosa*

APPENDIX IV - TESTS

1. Catalase
   - bacteria that contain cytochrome enzymes are catalase positive and those that don't are catalase negative
   - *Staphylococcus* +
   - *Streptococcus* and *Enterococcus* -
   - flood bacteria with 3% hydrogen peroxide and observe for bubbles
     catalase
   a) H_2O_2 (3%) $\rightarrow$ Catalase peroxide + H_2O
   b) Catalase peroxide + $H_2O_2 \rightarrow$ Catalase $H_2O + O_2$

2. Coagulase
   - the ability to clot plasma
   - two different coagulase tests can be performed, a tube test for free coagulase and a slide test for bound coagulase, or clumping factor
   - *Staphylococcus aureus* +
   - Coagulase negative *Staphylococcus* -

3. Bile esculin
   - to detect beta glucoside which breaks down esculin to form a black precipitate due to the presence of ferric ions
   - *Enterococcus faecalis* +
   - Beta-haemolytic group B streptococcus -

   Esculin (β glucoside) $\rightarrow$ Esculetin + ferric ions (ferric citrate in medium)
   $\downarrow$
   black precipitate

4. MUG
   - this test is mainly done on the urine bench
   - to detect beta-glucuronidase
   - colourless substrate is broken down to produce a yellow compound
   - Kovac's reagent is added to detect indole production
   - *Escherichia coli* is MUG + and indole +

tryptophanase (produced by bacteria)
Trytophan → ammonia + pyruvic acid + indole

↓

reacts with p-dimethylamino benzaldehyde (Kovac's reagent)

↓

quinoidal red violet

[Indole spot test uses Erlich's reagent 1% dimethylaminocinnamalaldehyde]

↓

blue colour

5. Oxidase
   - to test for the production of oxidase
   - spot inoculate organism on to a filter paper soaked with 1% tetramethylphenylene diamine dihydrochloride - positive is purple, negative is yellow
   - *Pseudomonas aeruginosa* +
   - *Escherichia coli* -

Oxidizing reaction
Reagent 1% Dimethyl or Tetramethyl para-phenylenediamine
↓ on colonies
↓
Indopheneloxidase (produced by bacteria)
↓
↓
Indophenol = black colonies (with dimethyl)
= magneta colonies (with tetramethyl)

The following tests are done on the stool bench to screen for *Salmonella*, *Shigella* and *Yersinia.*

6. Urease
   - Detects urease production
   - Peptones in media utilized producing an alkalinity. Phenol red indicator

Urea →→ammonia

7.	TSI	-	Triple sugar iron agar. 0.1% glucose, 1% sucrose and lactose.
		-	If the glucose is fermented, only a small amount of acid will be produced, which will be neutralized by alkali from peptone metabolism along surface of slant.
		-	Oxidation of peptone cannot take place in the anaerobic conditions in the depth of the medium.
		-	Therefore when glucose only is fermented, the butt of the medium becomes yellow and the slant remains red.
		-	If lactose or sucrose is fermented, the amount of acid produced is large enough to offset alkali production and a yellow slant is produced.
		-	Production of hydrogen sulphide is shown by formation of iron sulphide from the ferrous sulphate.
8.	ONPG	-	To detect enzyme β-D-galactosidase in lactose fermenting organisms. O-nitrophenol-B-D-galactopyranoside $\rightarrow\rightarrow$ O-nitrophenol (yellow)
9.	PPA	-	To detect Phenylalanine deaminase production. Phenylalanine $\rightarrow\rightarrow$ Phenylpyruvic acid + $FeCl_3$ (ferric ions) = blue green

GENERAL OVERVIEW OF WEEKLY BENCH ROTATIONS

Specimen Management and Media

Culture the following specimens:

- Urines
- Stools
- Cervical swabs
- Vaginal swabs
- Throat swabs
- Sputa (including screening)
- Bronchial washings
- Miscellaneous swabs
- Tissues
- Fluids, including CSF

Stain and read Gram smears.

Stain and read Zn stain .

Observe Cryptococcal Latex Agglutination

Prepare a batch of medium from start to finish.

Carry out quality control of media.

Use and check operation of autoclave.

Urine Bench

Read plates for colony counts.

Bacteria to have seen and identified:

Proteus mirabilis
Escherichia coli
Klebsiella species
Staphylococcus saprophyticus
Enterococcus
Yeast
Pseudomonas species

Stool Bench

Know biochemical reactions and specific media for:

Salmonella spp.
Shigella spp.
Campylobacter spp.
Yersinia enterocolitca
Escherichia coli 0157:H7

Genital Bench

Read vaginal smears and wet preps. Should see lots of normal smears and vaginosis smears plus see yeast and *Trichomonas.*

Bacteria to have seen and identified:

Neisseria gonorrhoeae
Beta Hemolytic Streptococcus Group B

Respiratory Bench

Bacteria to have seen and identified:

Group A Streptococcus
Klebsiella pneumoniae
Hemophilus influenzae
Hemophilus parainfluenzae
Streptococcus pneumoniae
Moraxella catarrhalis
Candida albicans
Candida spp.

Miscellaneous & Sterile Fluids

Bacteria to have seen and identified:

Staphylococcus aureus including MRSA
Serratia marcescens
Enterococcus species
Streptococcus milleri group
Bacteroides species
Prevotella species
Clostridium perfringens
Fusobacterium species
Enterobacteriaceae
Pseudomonas species

Perform Cryptococcal Latex Agglutination test (done by send-out bench technologist)

Blood Culture Bench

Operate the BacT Alert machine and assist with processing the specimens. Assist in working up the positives.

Staph. aureus
Neisseria meningitidis
Listeria monocytogenes
Corynebacterium spp.
Viridans streptococcus
Coagulase negative staphylococcus
Enterobacteriaceae
Enterococcus spp.

Serology / Virology

Observe the following procedures:
Serology:

AXSYM machine for serological tests
Monospot Testing, HTLV testing, VDRL test manual tests
Chlamydia, Hep C RNA, Hep B DNA PCR tests
Vidas machine for VZ
Clostridium difficile toxin testing
HIV via EIA (For Residents Only)

Virology:

Specimen Management
Tube cultures
Shell vials
IFA /DFA staining
CMV Antigenemia

Mycology

Observe the following procedures:

Calcofluor stain for fungus

Isolation of various fungi and yeast, including knowledge of different media used.

BOOKS IN MICROBIOLOGY LABORATORY

1. A guidebook to microscopical methods. A.V. Grimstone and R.J. Skaer. Cambridge University Press. 1972.

2. Anaerobe Laboratory Manual. 4th Edition. Lillian V. Holdeman et al. V.P.I. Anaerobe Lab. Blacksburg Virginia. 1977.

3. Antibiotics in Laboratory Medicine. 2nd Edition. Victor Lorian M.D. Williams and Wilkins. Baltimore U.S.A. 1986.

4. Approved Lists of Bacterial Names. V.B.D. Sherman et al. ASM Washington D.C. 1980.

5. Bergey's Manual of Systematic Bacteriology. Vol. 1 Noel R. Krieg. 1984. Vol. 2 Peter H.A. Sneath 1986. Vol. 3 James T. Stanley 1989. Williams and Wilkins. Baltimore MD U.S.A.

6. Biochemical Tests for Identification of Medical Bacteria. 2nd Edition. Jean F. MacFaddin. Williams and Wilkins. Baltimore U.S.A. 1980.

7. Clinical and Pathogenic Microbiology. Barbara J. Howard. Mosby Co. St. Louis Missouri. 1987.

8. Clinical Microbiology Procedures Handbook. Vol. 1 & 2. Isenberg ASM. 1992.

9. Clinics in Laboratory Medicine. Raymond D. Aller et al. Saunders Co. Philadelphia 1985.

10. Collection and Handling of Laboratory Specimens - A Practical Guide. Jean M. Slockbower et al. J.P. Lippincott Co. Philadelphia. 1983.

11. Color Atlas and Textbook of Diagnostic Microbiology. 2nd Edition. Elmer W. Koneman et al. J.B. Lippincott Co. Philadelphia Pennsylvania 1983.

12. Color Atlas and Textbook of Diagnostic Microbiology. 3rd Edition. Elmer W. Koneman et al. Lippincott. 1988.

13. Disinfection Sterilization and Preservation. 4th Edition. Seymour S. Block Lea & Febiger. 1991.

14. Fundamentals of Anaerobic Bacteriology as Related to the Clinical Laboratory. ASM 1980.

15. Handbook of Laboratory Safety. 2nd Edition. Norman V. Steere. CRC Press Inc. 1971.

16. Identification of Enterobacteriaceae. 4th Edition. William H. Ewing. Elsevier Science Publishing Co. Inc. New York. 1986.

17. Identification of Medical Bacteria. 2nd Edition. Cowan and Steel. Cambridge University Press. 1979.

18. Interpretive Medical Microbiology. Harry P. Dalton et al. Churchill Livingstone. New York. 1986.

19. Laboratory Acquired Infections. C.H. Collins. Butterworth and Co. Ltd. 1983.

20. Laboratory Safety CSLT Guidelines. 4th Edition. Gene Shematek. Wayne Wood. CSLT 1996.

21. Laboratory Safety: Principles and Practices. Brinton M. Miller et al. ASM Washington DC. 1986.

22. Laboratory Safety - Principles and Practices. 2nd Edition. Diane Fleming et al. ASM Press Washington. 1995.

23. Manual of Clinical Microbiology. 4th Edition. Edwin H. Lenette et al. ASM Wahington DC. 1985.

24. Manual of Clinical Microbiology. 5th Edition. Albert Balows et al. ASM Washington DC. 1991.

25. Manual of Clinical Microbiology. 6th Edition. Ellen Jo Baron et al. ASM Washington DC. 1995.

26. Manual of Clinical Microbiology. 7th Edition. Patrick R. Murray et al. ASM Washington DC. 1999.

27. Microscopy from the very beginning. Friedrich Karl Mollring. Carl Zeiss, Oberkochen. 1981.

28. Practical Atlas for Bacterial Identification. D. Roy Cullimore. Lewis Publishers. 2000.

29. The Compound Light Microsope. Dale Sinclair R.T. TIMT. 1986.

30. The Shorter Bergey's Manual of Determinate Bacteriology. 8th Edition. Williams and Wilkins. 1977.

31. Wadsworth Anaerobic Bacteriology Manual. 2nd Edition. Vera L. Sutton et al. The Regents of the University of California. 1975.

32. Wadsworth Anaerobic Bacteriology Manual. 3rd Edition. Vera L. Sutton et al. C.V. Mosby Co. St. Louis, Missouri. 1980.

33. Wadsworth Anaerobic Bacteriology Manual 4th Edition. Vera L. Sutton et al. Star Publishing Co. 1986.

34. Workplace Hazardous Materials Information System. (WHIMS): A Guide to the Legislation. Queens Printer for Ontario. May 1989.

35. Worthwhile facts about fluorescence microscopy. 3rd Edition. H.M. Holz. Carl Zeiss. D-7082 Oberkochen.

36. Zinsser Microbiology. Wolfgang K. Joklib et al. Appleton-Century Crofts N.Y. 1980.

MYCOLOGY - TRAINING MANUAL FOR STUDENTS

Teaching and Supervising Technologist: Subhash K. Mohan

Reference:

1. Davise H. Larone: Medically Important Fungi, A guide to identification, 3rd. Edition, ASM Press, 1995
2. Guy St – Germain, Richard Summerbell; Identifying Filamentous Fungi, A Clinical Laboratory Handbook, Star Publisher, 1996
3. Martha E Kern: Medical Mycology; Self Instructional Text, F A Davis, 1985 (1997)
4. Selected Reference Articles

The student should know the following:

1.0 ***Processing of Specimens***

1.1 Know about proper mycology specimen collection, transportation and planting and the use of selective and/ or non-selective media

1.2 State the appropriate incubation temperature and length of incubation for recovery of various pathogens

2.0 ***Direct Microscopy***

2.1 Demonstrate the proper of use of microscopy in the detection of fungal elements in clinical specimens using: Fungi-Fluor (FS), 10% KOH and Calcofluor White (CW)

2.2 Explain the different uses, advantages and disadvantages of the FS, CW and 10% KOH

3.0 ***Procedure for identification of Yeast***

3.1 Demonstrate the ability to identify various yeasts using Germ Tube, Oxgall, Cornmeal, Urea, EBM, Rapid Yeast ID System, API 20C procedures

3.2 Explain the principles, uses, advantages and disadvantages of the above methods

4.0 ***Protocol for reporting results as per manual policy***

4.1 Reporting positive FS results in SOFT and phoning critical results to ward

4.2 Reporting positive culture results in SOFT and phoning ward where applicable

5.0 ***Procedures for identification of moulds***

Demonstrate the following methods used: Macroscopic Examination of Cultures, Microscopic Examination of Cultures, Scotch Tape Preparation, Tease Mount Preparation, Slide Culture and Sub-Culture. State the purpose of each step as listed above

TML/MSH Microbiology Department Policy & Procedure Manual	**Policy # MI/EDU/08/01/v01**	Page 1 of 2
Section: **Education Manual**	Subject Title: **Microbiology Rotation for Residents**	
Issued by: **LABORATORY MANAGER**	Original Date: June 18, 2001	
Approved by: Laboratory Director	Revision Date:	

MICROBIOLOGY ROTATION FOR RESIDENTS

Welcome to Microbiology!

Microbiology is an interesting and dynamic science. Your time spent in the Microbiology Laboratory should be an enjoyable and successful learning experience.

During your rotation you will be exposed to all aspects of the department. You will handle specimens from their receipt in the department through to the reporting of results. You will develop the ability to make a presumptive identification of common pathogens and be able to select the correct tests to fully identify them.

In order to make your rotation a positive experience for both you and the other members of the department following these guidelines will be useful:

1. Your rotation in the clinical laboratory is first priority.

2. Don't change or delay your rotation without first discussing this with the Chief Technologist and the Teaching Technologist.

3. If you can't help but miss a day from the bench, then assure that the appropriate person has been informed previously. If ill or unexpectedly detained, please phone in first thing in the morning so that the person training you on the bench doesn't wait.

Department Information

Toronto Medical Laboratories/Mount Sinai Hospital Department of Microbiology

Mount Sinai Site
(Bacteriology)
14th Floor - Mount Sinai Hospital
600 University Ave.
Toronto, Ontario
(416) 586-4432

TML Site
(Virology, Serology, Mycology, Parasitology)
The Michener Institute
12th Floor - 222 St. Patrick St.
Toronto, Ontario
(416) 340-5898 ext. 2511

Regular Lab Hours

7:45 to 16:00 **or** 8:00 to 16:15

Coffee and lunch schedules should be worked out with the bench tech you are working with. If you are sick or cannot report to the lab please call Martin at (416) 586-4696 and Glen at (416) 586-3137 and leave messages with both.

TML/MSH Microbiology Department Policy & Procedure Manual	**Policy # MI/EDU/08/02/v01**	Page 1 of 1
Section: **Education Manual**	Subject Title: **Microbiology Rotation for Residents**	
Issued by: **LABORATORY MANAGER**	Original Date: June 18, 2001	
Approved by: Laboratory Director	Revision Date:	

University of Toronto Training Objectives
Postgraduate Training Program in Infectious Diseases

TRAINING OBJECTIVES FOR ADULT INFECTIOUS DISEASES: MEDICAL MICROBIOLOGY ROTATION

The department provides a six month rotation for infectious diseases trainees. The objectives of this rotation are:

1. To familiarize the resident with all microbiology services provided by the department including routine bacteriology, mycology, parasitology, virology, serology, and quality assurance.

2. To familiarize the resident with both the laboratory and clinical aspects of infection by having them rotate on the infection control bench as well as actively participating on the Infection Control Team, assisting with the Surveillance Program, taking part in the investigation of any relevant problems that may arise during their rotation, attend the weekly infection control team meetings and the monthly infection control team meetings.

3. To expose the resident to clinical and applied research by having them carry out a research project over the six months of their rotation. The candidate is expected to submit an abstract to a major national or international meeting and prepare a manuscript for submission for publication.

4. To allow the resident to attend ongoing microbiology and infectious diseases rounds/seminars as well as participate in, and present at, the departmental laboratory rounds and journal club.

5. To familiarize the resident with common clinical problems presented to the medical microbiologist by participating in a discussion of a pre-assigned weekly "question-of-the-week" regarding clinical microbiology and/or laboratory management issues.

6. To familiarize the resident with aspects of laboratory management and quality assurance by having the resident participate in management meetings and as member of the quality committee.

SCHEDULE FOR RESIDENT'S MICROBIOLOGY ROTATION

A schedule will be given to you on your first day.

Week One

Orientation

1. Introduction to Dr's Low, Mazzulli, Campbell, MacDonald, and McGeer. Introduction to Administrative Director Martin Skulnick, Manager Katherine Wong, and Charge Technologists Glen Small, Iris Anne Edwards and Robert Chua.

2. Walk-through tour of lab:
   - where to get clean lab coats, put dirty ones and wash up area
   - various benches, incubators, fridges, store room
   - bathroom and lunchroom facilities, including cafeteria location
   - bulletin board with schedules, notices, lectures
   - library where journals and reference books are kept
   - where main lab manual is kept and NCCLS guidelines Safety Manual, WHMIS Manual and other reference books (QA bench)
   - short overview of safety rules e.g. no open toe or open heel shoes, fire alarm pulls, stairway exits, fire extinguishers, eye wash / shower stations.

3. Arrange time for IC talk by IC practitioner - Dr. A. McGeer, Chris Moore or Wayne Lee.

4. Arrange time for full safety talk by Safety Officer - Joanne Sverha, re: WHMIS, etc.

SPECIMEN MANAGEMENT BENCH AND MEDIA PREPARATION

Mt. Sinai Site Training

One week on each of genital/enteric, infection control and QC benches.
Two weeks on each of urine, respiratory, miscellaneous and blood culture benches.

TML Site Training

Two weeks in each of mycology, virology and serology.

Additional Training

One month with Infection Control Department.
One week at Public Health Lab

Performance Assessments

1. Bench evaluations will be done by both the bench technologist and the student weekly.

2. Unknowns: series of unknown cultures to be given throughout the rotation

3. Weekly Teaching Sessions / Questions
   - one per week that will cover the area of the laboratory that you have been exposed to.
   - Consists of review and discussion with staff microbiologists.

4. Examinations (For Microbiology Residents Only)
   - One practical exam will be given consisting of specimens to work up, and smears to read.
   - An oral may also be given by the Microbiologists

Meetings and Rounds

1. Infectious Diseases/Microbiology Rounds

- 1300 - 1400 every Tuesday

- see bulletin board for list of topics

2. Departmental Seminars

- 1415 - 1515 every Wednesday

- you will be required to present a topic

3. Infection Control Meetings

- 1430 - 1530 every Thursday

4. Lab Management Meetings

- every Wednesday

5. Quality Team Meetings

- every Monday

6. Other Rounds / Seminars

- Please refer to Academic Events Schedule

Projects

- you may be given a project to work on with guidance from the Microbiologist
- plans for the project should be made halfway through the diagnostic rotation and media etc. ordered. (Please check with Glen)

RESIDENT OBJECTIVES AT MSH

SPECIMENS

Reference: Cumitech 9. Collection and Processing of Bacterilogical Specimens

The resident shall:

1.0 Identify properly collected and transported specimens

2.0 Recognize and state problems in poor or unsuitable specimens

3.0 Demonstrate proper and safe handling of all specimens

4.0 Demonstrate proper use of the biological safety cabinet and how it works

CULTURAL TECHNIQUES

The resident shall:

1.0 Select suitable primary media for all types of specimens

2.0 Recognize specimens that should be set up for anaerobes and understand the importance of handling anaerobic specimens promptly and planting them on pre-reduced media

3.0 Demonstrate proficiency inoculating and streaking a specimen on agar media

4.0 Be able to set up cultures in an anaerobic atmosphere and a 5-10% CO_2 atmosphere

5.0 Perform quantitative cultures and report the colony count

6.0 Prepare and read a simple wet mount for *Trichomonas vaginalis* specimen

7.0 Examine and report on the suitability of a sputum for culture (screening of a sputum)

STERILIZATION

Reference: Disinfection, Sterilization, and Preservation, Block, Fourth Edition.

The resident shall:

1.0 Demonstrate aseptic technique

2.0 Select and perform correct sterilization for all types of media and objects

3.0 Demonstrate an understanding of these methods of sterilization and how to quality control them

- 3.1 Dry heat
- 3.2 Moist heat
- 3.3 Filtration
- 3.4 Ultra violet irradiation
- 3.5 Ethylene oxide
- 3.6 Gamma radiation

4.0 Demonstrate an understanding of disinfection

- 4.1 Select proper disinfection for cleaning lab equipment and spills

MEDIA

Reference: Media for Isolation - Cultivation - Identification Maintenance of Medical Bacteriology, McFadden

For media used in the laboratory the resident shall:

1.0 List the main ingredients and describe their functions

2.0 State the classification of the media

3.0 Quality control the medium by

- 3.1 Checking sterility
- 3.2 Checking pH and appearance

3.3 Checking biochemical and growth of control organisms
3.4 Checking media storage is at proper temperature and length of time

GRAM STAIN

For the Gram stain, the resident shall:

1.0 State principle of Gram's method

2.0 Perform a Gram stain

3.0 Recognize and state problems in poor or incorrectly stained slides

4.0 Recognize and report on Gram stained slides of specimens and cultures

5.0 Quantitatively report on direct smears

MICROSCOPY

The resident shall:

1.0 State the principles of operation of light, phase contrast and UV microscope

2.0 Demonstrate proper use and care of the microscopes

3.0 Be able to perform Kohler illumination

SAFETY / WHIMIS

The resident shall:

1.0 State the safety rules for a clinical laboratory

2.0 State procedure to be used for cleanup of various spills:

2.1 Chemical
2.2 Radioactive
2.3 Blood
2.4 Specimens

3.0 Demonstrate proper safety techniques for handling specimens

4.0 State the principles of WHMIS

5.0 Demonstrate the proper handling of chemicals while using MSDS

6.0 Perform all procedures using chemicals using safety techniques as stated in the MSDS

DIAGNOSTIC OBJECTIVES (urine, genital, enteric, respiratory, wound and fluid benches).

Reference: Cumitechs:
- 4A. Laboratory Diagnosis of Gonorrhea
- 14A. Laboratory Diagnosis of Central Nervous System Infections
- 12A. Laboratory Diagnosis of Bacterial Diarrhea
- 17. Laboratory Diagnosis of Female Genital Tract Infections

Clinical Microbiology Procedures Handbook. Editor: Isenberg

For the following sites:

a) respiratory tract (upper and lower)
b) intestinal tract
c) genitourinary tract
d) skin
e) urine
f) blood
g) CSF
h) sterile fluids
i) tissues

The resident shall:

1.0 State which specimens to be taken for the clinical picture of the patient.

2.0 State the specimens to be taken for proper lab work up.

3.0 State the proper collection methods including appropriate time for specimens to be taken, the amount and how to be transported to the laboratory.

4.0 State the organisms that commonly occur as pathogens, plus state what organisms may occur as commensal flora.

5.0 Recognize and differentiate pathogens from commensal flora in the specimens.

For all the organisms listed below:

Staphylococcus aureus
Coagulase negative Staphylococcus
Staphylococcus saprophyticus
Streptococcus pyogenes
Streptococcus agalactiae
Streptococcus pnuemoniae
Viridans Streptococcus
Enterococcus spp.
Streptococcus milleri group
Neisseria gonorrhoeae
Neisseria meningitidis
Moraxella catarrhalis
Pseudomonas aeruginosa
Burkholderia cepacia
Acinetobacter species
Pasteurella multocida
Shigella species
Salmonella typhi
Salmonella spp.
Escherichia coli
Yersinia enterocolitica
and all *Enterobacteriaceae*

Haemophilus influenzae
Haemophilus species
Campylobacter jejuni/coli
Campylobacter fetus
Listeria monocytogenes

Corynebacterium diphtheriae
Corynebacterium jeikium
Actinomyces israelii
Nocardia asteroides
Clostridium difficle
Clostridium perfringens
Bacteroides fragilis group
Prevotella melaninogenicus
Fusobacterium species
Propionibacterium species
Mycobacterium species
Mycobacterium tuberculosis
Candida albicans
Candida species
Cryptococcus neoformans

The resident shall:

1.0 Identify and record colonial appearance

2.0 Select optimal temperature, gaseous requirement and suitable media for isolation. Describe any special media that may be required, their main ingredients and functions.

3.0 Describe as applicable the typical cellular morphology, Gram stain reaction or wet mount appearance in direct smears and in culture.

4.0 Select and perform differential tests for identification.

5.0 Interpret all tests performed and identify the organisms.

6.0 State the principles, reagents and controls involved in all the differential tests for identification.

7.0 State the optimal method of susceptibility testing and the typical susceptibility pattern.

8.0 State the epidemiology, clinical significance and infection control implications.

9.0 State the problems of laboratory detection, identification and susceptibility testing.

BLOOD CULTURES

Reference: Cumitech 1A. Blood cultures II

The resident shall:

1.0 State in what clinical situations blood cultures are to be taken.

2.0 State the proper collection methods.

3.0 For the blood cultures bottles

- 3.1 list the major ingredients, and understand the purpose of each.
- 3.2 state the recommended incubation time and temperature for all types of blood cultures.
- 3.3 explain how and why blood cultures are subcultured.

4.0 For the Blood Culture machine in the laboratory

- 4.1 state the principle of operation
- 4.2 demonstrate proficiency in operating the machine
- 4.3 perform regular routine maintenance
- 4.4 recognize and solve minor problems

5.0 Demonstrate the proper procedures for working up positive blood cultures.

6.0 Describe the operation of the following blood culture system

- 6.1 conventional
- 6.2 lysis centrifugation
- 6.3 infrared
- 6.4 radiometric
- 6.5 colorimetric detection (Bac-T-Alert)

ANAEROBES

Reference: Cumitech 5A. Practical Anaerobic Bacteriology

The resident shall:

1.0 Describe the principles of the anaerobic jar and anaerobic chamber, PRAS and rolled tube systems.

2.0 Operate the anaerobic jar utilizing proper techniques for achieving and monitoring anaerobiosis.

3.0 Differentiate organisms by their oxygen requirements.

4.0 State which specimens are suitable for anaerobic culture.

5.0 Describe the proper collection technique and transport for anaerobic specimens.

6.0 Discuss the type of media to be used for anaerobes.

GENITALS

The resident shall:

1.0 Define bacterial vaginosis.

2.0 Differentiate between vaginosis, vaginitis or normal vaginal flora by Gram stain and wet preparations.

3.0 For *Trichomonas vaginalis* the resident shall:

- 3.1 describe how to examine a wet mount.
- 3.2 state it's main differentiating characteristics
- 3.3 explain clinical significance

ANTIMICROBIAL SUSCEPTIBILITY TESTING

Reference: Cumitechs 25. Current Concepts and Approaches to Antimicrobial Agent Susceptibility Testing

6A. New Developments in Antimicrobial Agent Susceptibility Testing: A Practical Guide

NCCLS Guidelines

The resident shall:

1.0 Discuss all the antimicrobial agnets used in the laboratory by:

- 1.1 describing their antimicrobial spectrum
- 1.2 stating the kind of activity they have (bactericidal, bacteriostatic)
- 1.3 identifying the agents by their class

2.0 For each of the following antimicrobial susceptibility testing methods:

Kirby Bauer
MIC / MBC broth dilution
MIC agar dilution
MIC micro broth dilution

- 2.1 state the principle
- 2.2 perform and report results of the methods used in the laboratory
- 2.3 select proper quality control procedures and indiate what troubleshooting would be done if the QC did not work
- 2.4 explain limitations of each method

3.0 Describe the Beta Lactamase Test by:

- 3.1 explaining the principle of the nitrocefin, acidometric, and iodometric methods
- 3.2 performing and reporting the results
- 3.3 stating the clinical significance of β-lactamase producation

ANTIMICROBIAL SUSCEPTIBILITY TESTING

The resident shall:

4.0 Identify Methicillin Resistant *Staphylococcus aureus* (MRSA) by:

- 4.1 explaining how MRSA's are detected
- 4.2 stating the clinical significance of such an isolate
- 4.3 discussing the problems in detecting MRSA

5.0 Identify Penicillin resistant Pneumococcus by:

- 5.1 explaining the procedure used for screening and confirmation
- 5.2 stating the criteria used to define resistance, relative resistance, and susceptible to Penicillin
- 5.3 describing the clinical significance

6.0 Discuss the emerging new trends for susceptibility testing of *Enterococcus* by:

- 6.1 explaining what synergy is and shy it's important for *Enterococcus*
- 6.2 determining synergy between Ampicillin and Gentamicin by the different methods available
- 6.3 performing high level aminoglycoside testing and interpreting the results
- 6.4 VRE

7.0 ESBLs

SEROLOGY

Reference: Manual of Clinical Laboratory Immunology, Fourth Edition.

The resident shall:

1.0 Define antibody and antigen

2.0 State the principle, perform, read, report and interpret the results for the following tests:

Chlamydia PCR
Hepatitis AXSYM
Rubella AXSYM

CMV AXSYM
VZV - VIDAS
Heterophile Antibody (screening test)
Cryptococcal Latex Agglutination
RPR (VDRL) Syphilis Screening Test
HIV PCR
HIV EIA
HTLV-1 EIA
HCV RNA
HBV DNA

MYCOLOGY

The student shall:

1.0 Identify properly collected and transported specimens for culture.

2.0 Perform and report on microscopic preparations form direct specimens by identifying fungal elements.

3.0 Select suitable primary media and atmospheric conditions for each specimen.

4.0 Describe cultural requirements and differentiate the following microscopically and culturally:

Microsporum
Trichophyton
Epidermophyton
Aspergillus species
Blastomyces dermatitidis
Coccidioides immitis
Histoplasma capsulatum
Sporothrix schenkii
Penicillium species
Yeast (eg. Candida, Crypto)

5.0 Describe the appearance of *Malassezia furfur* in a direct mount of skin scales.

VIROLGOY

Reference:

1. Schmidt N., Emmons R. Diagnostic Procedures for Viral, Rickettsial and Chlamydial Infections. 1989: American Public Health Association, New York. Sixth Edition.

2. Wiedbrauk D., Johnston S. Manual of Clinical Virology. 1993: Raven Press, New York.

3. Lennette E. (Ed.) Laboratory Diagnosis of Viral Infections. 1992: Marcel Dekker, New York. Second Edition.

The resident shall:

1.0 Describe how a virus differs from bacteria.

2.0 For the following virus families:

a) Herpesviridae
b) Orthomyxoviridae
c) Paramyxoviridae
d) Parvoviridae
e) Retroviridae
f) Togaviridae
g) Picornaviridae
h) Reoviridae

2.1 Classify according to:
- a) RNA or DNA
- b) Single or double stranded
- c) Nucleocapsid symmetry
- d) Positive or negative sense
- e) Prescence / absence of envelope
- f) Size range

2.2 State the important human pathogens within these families.

3.0 Explain what is meant by the following terms and give 2 examples for each:

- a) Primary cell line
- b) Diploid cell line
- c) Continuous cell line

4.0 List the major components of:

a) Viral Transport Media
b) Growth Media
c) Maintenance Media

5.0 For the following culture methods:

a) Shell vial technique
b) Tube culture technique

5.1 Briefly describe the method
5.2 List advantages and disadvantages for each method.

6.0. For the following viral illnesses:

a) Herpes zoster
b) Viral meningitis
c) Systemic CMV disease
d) Viral respiratory illness

6.1 List the appropriate specimens to be collected.
6.2 Describe appropriate specimen collection, transport and storage techniques.
6.3 Describe suitable inoculation and incubation techniques including selection of appropriate cell lines, culture methods and incubation.
6.4 State the virus(es) which may be expected to be detected.
6.5 Describe any rapid tests which may be used to aid in diagnosis.

7.0 For the viruses listed below:

a) Herpes simplex type 1 and 2
b) Cytomegalovirus
c) Varicella Zoster
d) Influenza A and B
e) Parainfluenza 1, 2, and 3
f) Respiratory syncytial virus
g) Adenovirus
h) Enterovirus
i) Coxsackievirus
j) Poliovirus

7.1 State the optimal cell line(s) for isolation.
7.2 State the virus' effect on that cell line including a description of any cytopathic effect produced.
7.3 Describe the test(s) used for definitive identification once isolated, including any controls needed. (e.g. IFA stains)

8.0 Describe one method of anti-viral susceptibility testing.

CMV ANTIGENEMIA

The resident shall:

1.0 Explain the significance of determining the presence of CMV antigen in the blood.

2.0 Show proficiency in CMV Antigenemia testing by:

2.1 Discussing proper specimen collection.
2.2 Stating the principle of the procedure.
2.3 Performing the procedure with quality control.
2.4 Reporting results including quantitation of positive samples.

MYCOLOGY - TRAINING MANUAL FOR RESIDENTS

Teaching and Supervising Technologist: Subhash K. Mohan

Reference:

1. Davise H. Larone: Medically Important Fungi, A guide to identification, 3rd. Edition, ASM Press, 1995
2. Guy St – Germain, Richard Summerbell; Identifying Filamentous Fungi, A Clinical Laboratory Handbook, Star Publisher, 1996
3. Martha E Kern: Medical Mycology; Self Instructional Text, F A Davis, 1985 (1997)
4. Selected Reference Articles

The Trainee at all levels of training shall know:

1.0 ***Processing of Specimens***

1.1 Know about proper mycology specimen collection, transportation and planting and the use of selective and/ or non-selective media

1.2 State the appropriate incubation temperature and length of incubation for recovery of various pathogens

2.0 ***Direct Microscopy***

2.1 Demonstrate the proper of use of microscopy in the detection of fungal elements in clinical specimens using: Fungi-Fluor (FS), 10% KOH and Calcofluor White (CW)

2.2 Demonstrate and interpret fungal elements examined microscopically such as yeast, pseudo hyphae, septate or non-septate hyphae, narrow or broad base attachment etc. and/ or suspect or identify certain pathogens presumptively based on structure

2.3 Explain the different uses, advantages and disadvantages of the FS, CW and 10% KOH

3.0 ***Procedure for identification of Yeast***

3.1 Demonstrate the ability to identify various yeasts using Germ Tube, Oxgall, Cornmeal, Urea, EBM, Rapid Yeast ID System, API 20C procedures

3.2 Explain the principles, uses, advantages and disadvantages of the above methods

3.3 Ability to recognize organisms looking like yeast such as Prototheca based on structure

4.0 ***Protocol for reporting results as per manual policy***

4.1 Reporting positive FS results in SOFT and phoning critical results to ward

4.2 Reporting positive culture results in SOFT and phoning ward where applicable

5.0 ***Procedures for identification of moulds***

5.1 Demonstrate the following methods used: Macroscopic Examination of Cultures, Microscopic Examination of Cultures, Scotch Tape Preparation, Tease Mount Preparation, Slide Culture, Sub-Culture, Phase Conversion, Permanent Mounts and Stock Preparation

5.2 Explain the purpose of each of the above

6.0 ***Identification of the following fungi to the genus and/ or species level where indicated:***

<u>Rapid Grower:</u>

Aspergillus fumigatus, *niger*, *flavus* and *terreus*
Penicillium species and Paecilomyces species
Fusarium species and *Acremonium species*
Scopulariopsis species and *Trichoderma species*
Scedosporium species (apiospermum and prolificans) and *P. boydii*

<u>Zygomycetes:</u>

Rhizopus species
Mucor species
Absidia species

Dematiaceous Moulds:

Cladosporium species
Curvularia species and *Bipolaris species*
Alternaria species and *Exophiala species*

Superficial Mycotic Agents:

Dermatophytes and Scytalidium species
Trichosporon beigelii
Malassezia furfur (Pityriasis versicolor – microscopic only, no culture necessary)

Dimorphic Fungi:

Histoplasma capsulatum and Blastomyces dermatitidis
Sporothrix schenckii and *Penicillium marneffei*
(*C. immitis* – Demonstration only)

7.0 ***Identification of Actinomycetes and other Filamentous Organisms***

Nocardia species
Streptomyces species
(Compare to Rapid Grower *Mycobacteria*)

TML/MSH Microbiology Department Policy & Procedure Manual	**Policy # MI/EDU/10/v01**	Page1 of 1
Section: **Education Manual**	Subject Title: **Bench Technologist - Teaching**	
Issued by: **LABORATORY MANAGER**	Original Date: June 18, 2001	
Approved by: Laboratory Director	Revision Date:	

BENCH TECHNOLOGIST - TEACHING

The bench technologist teaching the students should:

1. Discuss the nature of the specimens and the organisms (both pathogens and commensals) likely to be found in them. The student should be told how to identify these organisms and how the media is used for this purpose.

2. Make sure the organism(s) listed in each section are seen and worked up. If the organisms have not been seen in actual specimens, then the students should subculture the stock cultures and work on them as actual specimens. (Allow enough time for subculture).

3. Demonstrate all procedures used in identification of pathogens on the bench, and to make sure the students perform all the procedures on their own proper guidance.

4. Allow the students to work on the specimens independently for some (or all) of the time on the bench.

5. Read specimen grams with the student.

6. Complete bench evaluation on each student they work with.

EVALUATION FORMS

EVALUATION FOR _____ BENCH

DATES OF BENCH ROTATION: _____ TO _____

TRAINEE'S NAME: _____

			ACCEPTABLE		
	1	2	3	4	5

I KNOWLEDGE OF THEORY

Knowledge of:

Appropriate / Inappropriate specimens	1	2	3	4	5
Ingredients and principle of media	1	2	3	4	5
Principle of instrumentation used	1	2	3	4	5
Potential pathogens	1	2	3	4	5
Principle of biochemical tests used to identify Potential pathogens	1	2	3	4	5

II APPLICATION OF THEORY TO PRACTICE

Assessment and processing of specimens to include:

Reading of gram stains	1	2	3	4	5
Recognition of colonial morphology	1	2	3	4	5
Selection of potential pathogens	1	2	3	4	5
Appropriate workup of potential pathogens	1	2	3	4	5
Recognition of need for repeat testing	1	2	3	4	5
Accurate reporting of results	1	2	3	4	5

III TECHNICAL SKILLS

Manual dexterity	1	2	3	4	5
Attention to detail	1	2	3	4	5
Streaking for isolated colonies	1	2	3	4	5
Aseptic technique	1	2	3	4	5
Performs bench procedures according to Established method	1	2	3	4	5
Adheres to safe laboratory practices	1	2	3	4	5

IV WORK ORGANIZATION

Judgement of priorities	1	2	3	4	5
Ability to sequence tasks	1	2	3	4	5
Performance under pressure	1	2	3	4	5
Attention to detail	1	2	3	4	5
Neatness in work area	1	2	3	4	5

V ACCOUNTABILITY & DEPENDABILITY

Assumes responsibility for own work	1	2	3	4	5
Recognizes and acts within own limitations (asks for help when needed)	1	2	3	4	5
Co-operates with technologist to ensure Bench work is completed	1	2	3	4	5
Able to work independently	1	2	3	4	5
Initiates activity when appropriate	1	2	3	4	5
Effective utilization of spare time	1	2	3	4	5
Punctuality	1	2	3	4	5

Attendance: List times not present on bench:

VI COMMUNICATION & INTERPERSONAL SKILLS

Ability to comprehend instructions	1	2	3	4	5
Accepts and acts on constructive criticism	1	2	3	4	5
Ability to work with others	1	2	3	4	5

VII COMMENTS

Technologist's signature _____

Bench Evaluation For Student

Bench:

Dates of Rotation:

Length of Rotation adequate_____ inadequate _____

Were the objectives covered?

Were you allowed to actively participate on the bench?

Questions welcomed and answered

General Comments:

Toronto Medical Laboratory and Mount Sinai Hospital
Department of Microbiology, Mycology Section
Trainee Evaluation Form For Technologist

Name of the Trainee:

Dates of training:

Training Section: Mycology **Supervising Technologist:** Subhash K. Mohan

Unacceptable——————————— Superior
1 2 3 4 5

1.	**Skill and competence in performance:**		
	a.	Manual dexterity	1 2 3 4 5
	b.	Accuracy	1 2 3 4 5
2.	**Knowledge base:**		
	a.	Demonstrates relationship between principles & procedures	1 2 3 4 5
	b.	Interpretation of test results	1 2 3 4 5
	c.	Recognition of errors	1 2 3 4 5
3.	**Care and concern for order and clarity:**		
	a.	Attention to detail	1 2 3 4 5
	b.	Neatness in maintenance of work area	1 2 3 4 5
	c.	Accuracy and legibility in reporting results	1 2 3 4 5
4.	**Efficiency and organization:**		
	a.	Ability to sequence task (priority setting)	1 2 3 4 5
	b.	Adherence to established protocol	1 2 3 4 5
5.	**Dependability and commitment:**		
	a.	Carries out duties promptly with enthusiasm	1 2 3 4 5
	b.	Able to work independently	1 2 3 4 5
	c.	Shows initiative (ideas for improvement)	1 2 3 4 5
	d.	Responsible	1 2 3 4 5
	e.	Demonstrates emotional stability in stressful situation	1 2 3 4 5

6. Interpersonal relation:

a.	Co-operation with others	1 2 3 4 5
b.	Ability to accept constructive criticism	1 2 3 4 5
c.	Tactful in dealing with colleagues and personnel	1 2 3 4 5

7. Communication:

a.	Ability to give clear and precise instructions and/ or explanations	1 2 3 4 5
b.	Good communication	1 2 3 4 5
c.	Ability to ask for clarification in case of doubt	1 2 3 4 5

Comments:

Supervising Technologist's signature

Toronto Medical Laboratory and Mount Sinai Hospital
Microbiology Department: **Mycology Section**

Bench Training Evaluation Form For Trainee - To be completed by the trainee at the end of training

Name of the trainee: _____

Dates of training: _____

Supervising Technologist: **Subhash K. Mohan**

Disagree 1 2 Agree 3 4 Strongly Agree 5
(Circle one)

1. The objectives specified in the bench manual as applicable to your specific needs were covered during bench training. 1 2 3 4 5
   If disagree please explain:

2. The supervising technologist was patient and supportive (Approachable) 1 2 3 4 5

3. Frequent opportunities for questions and discussions were offered 1 2 3 4 5

4. The supervising technologist was able to give:
   a. Clear and precise instructions 1 2 3 4 5
   b. Explanations 1 2 3 4 5

5. Feed back about your performance was given throughout the rotation 1 2 3 4 5

6. There were adequate hands-on participation on the bench 1 2 3 4 5

7. The supervising technologist's teaching abilities are:
   € Poor € Fair € Average € Above Average € Outstanding

Comments:

Trainee's signature