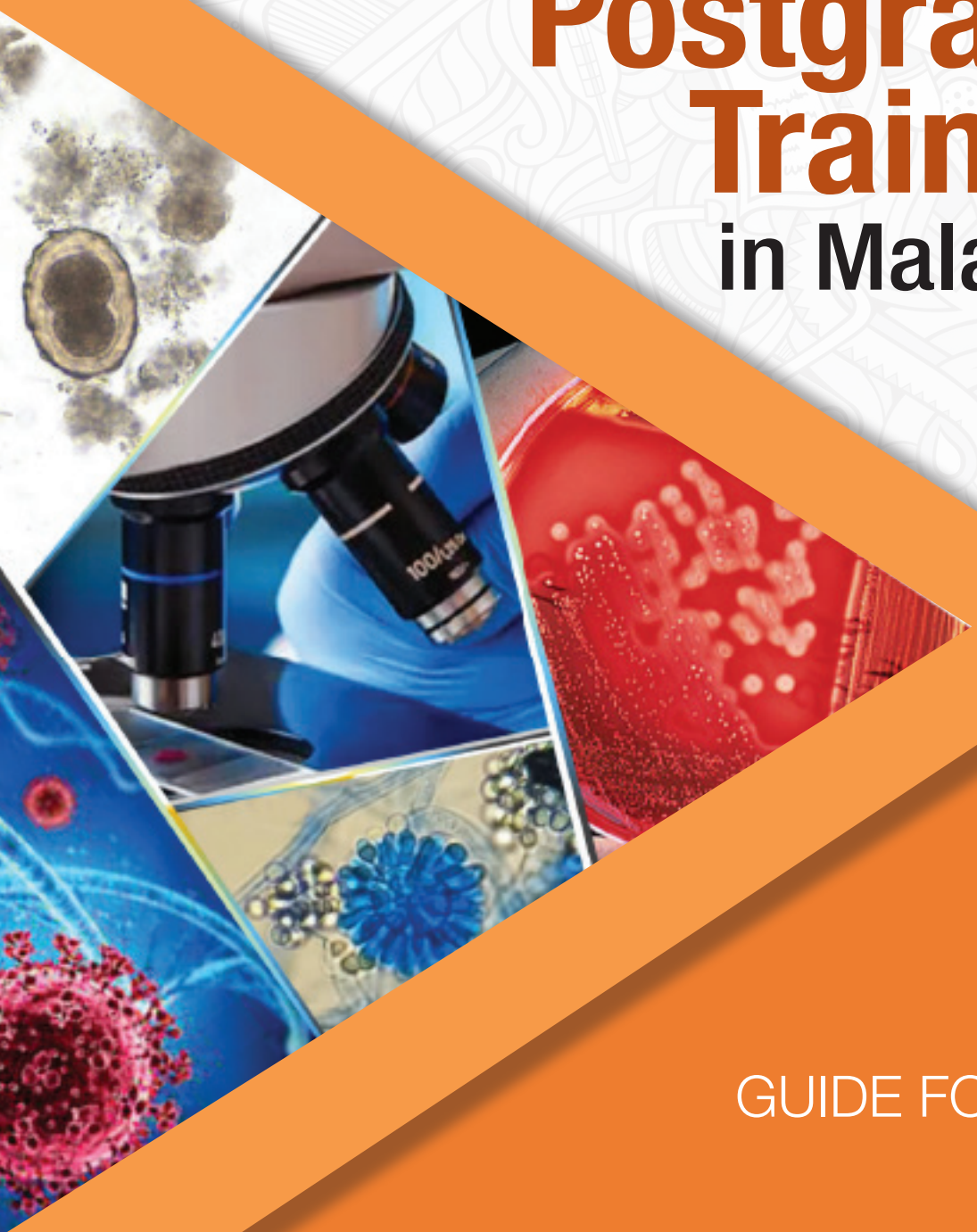
Medical Microbiology Postgraduate Training in Malaysia



GUIDE FOR APPLICANTS

VERSION 1, 2023

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Preface

What is this document?

The purpose of this document is to serve as a guide for prospective applicants by providing the following information:

1. Overview of the Medical Microbiology postgraduate specialty
2. Outline of the Medical Microbiology postgraduate training programme in Malaysia
3. Entry requirements
4. Application and entry process

The National Postgraduate Medical Curriculum

The National Postgraduate Medical Curricula for Pathology

The development of the Curricula for Pathology is the joint and collaborative effort of the institutional members of the Jawatankuasa Bersama Sarjana Perubatan – Patologi (JBSP-Patologi) which is the National Conjoint Specialty Committee overseeing Pathology, appointed by Jawatankuasa Bersama Ijazah Lanjutan Perubatan (JBILP). JBSP-Patologi comprises of members from all the universities offering the Master of Pathology programmes, the Ministry of Health (MOH) and College of Pathologists, Academy of Medicine Malaysia (CPath-AMM). This body has collaboratively established a common and standard training and examination system for the Master of Pathology programmes since 1995. It therefore draws on a wealth of experience and goodwill in the creation of these National Postgraduate Medical Curricula for Pathology, and took direction and guidance from the Master of Pathology Curriculum Review Workshop held at the Universiti Malaya in August 2019. Arising from this, it was agreed that, going forward, the training of mono-discipline Pathology specialists will be consolidated, and that separate curricula will be developed for the disciplines of Anatomical Pathology, Haematology, Chemical Pathology, Medical Microbiology, Forensic Pathology and Medical Genetics.

The Curriculum for Medical Microbiology

The National Postgraduate Medical Curriculum for Medical Microbiology, aims to be applicable to the training of Clinical Microbiologists in Malaysia, for all postgraduate programmes however named. It serves as the guide for all University programmes (e.g. Master of Pathology), and the training centres involved in the delivery of these programmes. It is envisaged that training through parallel pathways which will be developed, will utilise, incorporate and echo the principles and philosophy of Medical Microbiology training embodied in this document.

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Introduction

Purpose of this guide

The purpose of this guide is to inform prospective candidates who are considering a career as a Clinical Microbiologist. It summarises the key aspects of the Medical Microbiology curriculum (entry requirements, process, training structure, assessments, some documentation and exit criteria), and provides a guide as to how to prepare and proceed with the application.

What is Medical Microbiology?

Medical Microbiology, an exciting speciality at the forefront of patient diagnostics, is mainly concerned with the diagnosis of infectious diseases based on the application of various diagnostic modalities to detect the aetiological agent. Clinical microbiologists support and oversee the prevention, diagnosis and treatment of illness caused by microorganisms (viruses, fungi and parasites). They identify the best treatment for particular infectious diseases and monitor patients throughout and following treatment.

They give advice on the best samples to collect to diagnose an infection, such as a swab, blood test or urine test. They then work with scientists in the laboratory to discover what is causing the infection. This might be a bacterium (e.g. MRSA), a fungus (e.g. thrush), or a virus (e.g. influenza). Once the cause of the infection has been identified, and often before, the clinical microbiologist gives advice on how to treat it.

Clinical microbiologists also play a key role in making sure antibiotics are prescribed and used appropriately, by advising on patient management and producing treatment guidelines for a variety of conditions. They do this partly to minimise the emergence and spread of antimicrobial resistance.

Medical Microbiology diagnostic services include bacteriology, virology, mycology, parasitology and clinical immunology. This is the only Pathology specialty that works closely with the hospital infection control unit, surveillance and antimicrobial stewardship teams. They also promote measures to prevent and control the spread of diseases, both in hospitals and amongst the general public.

Apart from clinical duties, clinical microbiologists also work closely with scientific and technical staff in the supervision and management of the laboratory.

The Role of a Clinical Microbiologist

Clinical microbiologists are medical professionals who study the microorganisms that cause illness in humans. They work in hospitals, medical laboratories, and public health facilities. Clinical microbiologists support and oversee the diagnosis, treatment and prevention of diseases caused by microorganisms (bacteria, viruses, fungi and parasites). They give advice on the best clinical specimen to collect to diagnose an infection, and work with scientists in the laboratory to discover the pathogens causing the infection. Clinical microbiologists commonly work with other medical professionals to ensure that their findings are properly interpreted and applied to patient care.

Clinical microbiologists also play a key role in making sure antibiotics are prescribed and used appropriately, by advising on patient management and producing treatment guidelines for a variety of conditions. This is of paramount importance in order to minimise the emergence and spread of antimicrobial resistance. They also promote measures to prevent and control the spread of diseases, both in hospitals and among the general public.

With the seemingly endless growth of superbugs and other antibiotic-resistant bacteria, the analytical and inquisitive minds of Clinical microbiologists are vital in healthcare today, both for treating infections and for fighting the spread of disease.

Size of the Specialty

As of January 2022, there were a total of 780 pathologists registered on the NSR. Of these, Clinical Microbiologists comprise 22% (172), of all NSR-listed pathologists in Malaysia. The recent occurrence of infectious disease outbreaks has emphasised the need for Clinical Microbiologists throughout the country. In addition, the major increase in the number of teaching, private and Ministry of Defence hospitals and laboratories has definitely increased the shortage of clinical microbiologists.

The advances in knowledge and cutting edge technologies in the detection of diseases have significantly increased the scope and pivotal roles of this specialty further contributing to the demand for Clinical Microbiologists.

Unique features of Medical Microbiology

The specialty of Medical Microbiology requires both laboratory skills and clinical acumen. It is a progressive discipline with the rapid evolution of new technologies in diagnostics. Emergence and re-emergence of infectious diseases add interesting and exploratory dynamics to the speciality as the likelihood of the occurrence of a new infectious disease can never be predicted. The major role carried out by clinical microbiologists in outbreak management emphasises the importance of this specialty. It provides an opportunity for interaction and engagement with other clinical specialties in a patient's management. A clinical microbiologist plays a pivotal role in antimicrobial stewardship and in the prevention and control of healthcare-associated infections both in the hospitals and in the community.

Clinical microbiologists work closely with many healthcare professionals such as biomedical scientists, pharmacists, general practitioners and infection control nurses, and often attend clinical multidisciplinary team meetings. They also work with non-clinical colleagues, e.g. estates managers, to make sure buildings are designed and maintained to reduce the risk of infection.

Clinical microbiologists are actively involved in research, spanning molecular biological investigations to clinical trials and implementation science. The global spread of infections means that some microbiologists need to work collaboratively with colleagues abroad, identifying and helping to contain any global infectious threat.

Why choose Clinical Microbiology as a career?

As a Clinical microbiologist you will be amongst the few who will be immersed in or have the opportunity for:

- a close collaboration with many clinical disciplines in your daily work
- a fast-developing field of medicine with rapidly progressing knowledge that integrates
- laboratory and clinical medicine
- the use of cutting-edge and fast developing technologies
- learning many new skills including audits, quality management, financing
- research on the vast amount of archived case material in medical microbiology

With the continuous challenges in emerging and re-emerging diseases, clinical microbiologist will always be relevant in the medical fraternity, particularly in the management of infectious diseases. Being a clinical microbiologist also involves the creation, optimisation and implementation of cutting-edge methods for use in clinical diagnostics, as well as keeping up with current literature. In addition to these duties and depending on the specific position, motivation and experience levels, a clinical microbiologist can also run a research lab, teach at an affiliated university, work on international projects involving infectious diseases, be involved in policy making and consult for the country.

1. The Medical Microbiology Programme

Pathways

Currently, the Master of Pathology (Medical Microbiology), of the Ministry of Higher Education (MOHE), is the main pathway for training. It is a postgraduate clinical coursework programme which is based on supervised competency-based training in diagnostic Medical Microbiology for a duration of a minimum of FOUR (4) years and a maximum of SEVEN (7) years.

Stages of training

The programme is structured into two stages: Stage 1, (Year 1), and Stage 2, (Years 2, 3, 4).

Stage 1 is of ONE (1) year duration. In summary, the trainee will attend an orientation programme, and then undergo supervised apprenticeship training in Medical Microbiology. Trainees will undertake introductory courses in basic medical microbiology which encompasses basic knowledge in bacteriology, virology, parasitology, mycology and clinical immunology. At the end of Stage 1, trainees who have satisfactorily completed all the training requirements will sit for an examination in Medical Microbiology (Part 1 Examination).

Stage 2 is of THREE (3) years duration and the training is primarily focused on highly-specialised medical microbiology and the various deeper ramifications of its practice. Apprenticeship-type service-orientated training is supplemented by lectures, seminars, conferences and case-based discussions, with the aim of progression to Level 5 competence.

During both stages of training, trainees briefly undergo an introduction to the various specialties of Pathology under supervision, which include; Anatomic Pathology, Chemical Pathology and Haematology. Trainees are expected to read widely, not only the literature of Medical Microbiology itself but also related subjects such as biochemistry, genetics, molecular biology and statistics.

In Stage 2, the trainee will also be introduced to research methodology, data analysis and writing a research project report/dissertation. With the guidance of the supervisors (academic/clinical/adjunct), the trainee will plan and undertake a research project and write up a research project report/dissertation. To facilitate an understanding of research methodology, all training universities will conduct a research methodology course and all trainees are required to attend the course. After satisfactory completion of training in Stage 2, the trainee sits for the Final (exit) examination.

2. Entry Requirements

Applicants to the postgraduate training programme must meet the requirements detailed below both in terms of the entry as well as the funding criteria as appropriate.

Applicants funded by the MOH, and applying to University programmes must meet both the MOH and University requirements to be considered for an entrance evaluation.

Self-funded applicants only need to meet the requirements of the programme and institution to which they apply.

Applicants generally fall into the following groups:

1. MOH sponsored.
2. Non-MOH, government sponsored (e.g. Ministry of Defence).
3. Other sponsored trainees (e.g. sponsored by university or private institutions).
4. Private – self funded trainees.
5. International - non-Malaysian foreign trainees who may be self-funded or sponsored by a variety of agencies or government.

The entry requirements for candidates for all the Pathology specialities are generally the same with additional requirements for international candidates.

Essential criteria

Candidates who wish to pursue post graduate training in Medical Microbiology have to fulfil the following requirements:

Component	Entry Requirement	Evidence
Medical Degree registrable with Malaysian Medical Council (MMC)	**Mandatory**	Original certificate
Full Registration with MMC	**Mandatory**	Certificate of registration
Clinical Experience	**Mandatory** 3 years of clinical experience after attainment of the basic medical degree, comprising of: a. satisfactory completion of TWO (2) years housemanship, and b. post-housemanship clinical experience of at least ONE (1) year duration.	Authorised service record
Valid Annual Practising Certificate (APC)	**Mandatory**	Certificate
Clinical Skills and Knowledge as per Entry Essential Learning Activities (ELA)	**Mandatory**	Demonstrate relevant knowledge, skill and attitude of entry ELAs Letters of reference

Component	Entry Requirement	Evidence
Entrance Evaluation	**Mandatory** Pass an entrance evaluation for adequacy in knowledge and aptitude to undertake Pathology training e.g. entrance examination and/ or interview for the Master of Pathology (MPath) Programmes in Malaysia.	Satisfactory performance
Additional requirements for International Candidates		
Good Standing	**Mandatory**	Letter of Good Standing from Medical Council of country of current practice
Temporary Practice Certificate (TPC) or APC from MMC	**Mandatory**	Certificate
Clinical or laboratory attachment for a minimum of THREE (3) months before joining the pathology training programme	**Mandatory**	Satisfactory supervisor's report
If the basic degree is from an institution of higher learning, where the medium of instruction for that degree is not English language, to show proficiency in written and spoken English language by achievement of:	**Mandatory**	a. a score of 600 for a paper-based total (PBT); a score of 250 for a computer-based total (CBT) or a score of 100 for an internet-based total (IBT) for the Test of English as a Foreign Language (TOEFL); or b. band of 6 for the International English Language Testing System (IELTS)

Important:

1. Any falsification of documents will result in the application being rejected and the applicant will be reported to the MMC.
2. Any adverse reports such as an investigation by the MMC must be declared to the Selection Committee.

Entry Essential Learning Activities (ELA)

Entry ELAs are clinical activities that prospective trainees should be able to perform in a trustworthy manner by the time they enter postgraduate training in Medical Microbiology. The Entry ELAs have been selected to represent the typical and basic day-to-day work in Medical Microbiology. They indicate the knowledge, skills and attitudes that the trainees need to be aware of when carrying out the tasks and responsibilities. They also serve as learning opportunities for prospective trainees when they are tasked to undertake the activities and then receive feedback regarding their performance.

All prospective applicants are required to fulfil the following entry level ELAs prior to entry into Medical Microbiology training:

ELA 1	Sample collection and handling (pre-analytical variables)
ELA 2	Requesting appropriate laboratory investigations
ELA 3	Laboratory investigation in a patient with infectious diseases

*The list of entry ELAs is not exhaustive and may be updated according to programme requirements.

A full description of the Entry ELAs is included in Appendix 2.

Personal Qualities

- Applicants should have an inclination for pathophysiology of diseases. They should have an interest in relating the laboratory investigations with the clinical history and other investigations to arrive at a diagnosis and in aiding patient management.
- They should be committed to self-learning and have the aptitude for searching online Pathology education resources.
- They should be committed to continued professional development and life-long learning. They should have the aptitude for group fora, professional discourse, and participation in live and virtual seminars/ webinars and conferences.
- They should behave with integrity, honesty and responsibility at all times in their practice.
- They should have critical and analytical thinking in their practice. They should be problem-solvers rather than complacent followers.
- They should have an empathetic nature and communicate well with colleagues and patients.

3. Entry Process

Overview

Candidates should apply online either to the university of their choice (non-MOH candidates), or through the Ministry of Health of Malaysia (MOH-sponsored candidates). Candidates who have shown evidence of satisfactory experience, adequacy in knowledge and aptitude are successfully shortlisted and called for an interview, following which they are informed by the relevant university of their success or otherwise.

Malaysia Ministry of Health sponsored candidates

To be eligible for sponsorship from Ministry of Health (MOH), candidates must be currently serving in MOH and free from any disciplinary action by any health regulatory bodies. An updated evidence of clinical service in MOH must be supplied along with the evidence of satisfactory job performance (i.e. achieving a minimum of 85% in their Annual Appraisal Report for three successive years).

Applications for the MPath programme will be advertised in mainstream newspapers and the MOH website in July each year or otherwise determined. Ministry's candidates are advised to refer to the Training Management Division (Bahagian Pengurusan Latihan – BPL, e-hlp.moh.gov.my) of MOH for updated information on application for all Masters Specialty training programmes. Applications for pre-entrance evaluation are available at https://rb.gy/skbrm9 The entry quota for candidates from the MOH is the highest, comprising of 80-90% of the total intake each year.

Other candidates e.g. non-MOH candidates/private /international candidates

Applications should be made directly to individual universities offering the MPath programme through the university's website at any time throughout the year. Candidates may apply to more than one university. Sponsorship into the MPath programme will have to fulfil the requirements of the sponsoring employer of the applicant.

Application processing

Applications are processed by the respective organisations and candidates are informed of their success in the shortlisting process by the Ministry of Health and/or University. Successfully shortlisted candidates are informed of their interview arrangements by the Ministry of Health and/or University.

Entrance Examination for the Master of Pathology Programmes

The entrance evaluation for adequacy in knowledge and aptitude to undertake MPath training is usually carried out via an entrance examination that is common to all the Pathology Specialties, e.g. the MedEx (Medical Specialist Pre-Entrance Examination), which is conducted jointly with the Malaysian Examinations Council (MEC) under Act 225. Details of the Pathology component of the MedEx are in Appendix 3.

Interviews

Interviews are conducted by Ministry of Health and/or University.

Summary of Essential Criteria

Event	Process
Document compilation	Applicants must compile the following documents for presentation: • Sijil Pelajaran Malaysia (SPM) or its equivalent and any other pre-university certificates as evidence of education level • Basic medical degree certification • Certificate of registration with the MMC • Curriculum vitae with details of work experience • Evidence of previous training records
Application	
MOH-sponsored candidates	Applications can be made online at ehlp.moh.gov.my Applications for pre-entrance evaluation are available at http://apps.mpm.edu.my/medex/public/register
Non-MOH sponsored candidates	Applications can be made online at the postgraduate studies web link of the respective universities.
Entrance Evaluation	An entrance evaluation which can take the form of an entrance examination e.g. Medical Specialist Pre-Entrance Examination (MedEx) [see Appendix 3] or an interview.
Shortlisting	MOH-sponsored candidates and non-MOH sponsored candidates, on satisfactory performance at the Entrance Evaluation will be shortlisted by their respective sponsors (if relevant) and the list of potential candidates presented to the participating training universities.
Outcome	The universities will select the candidates for training based on the number of training positions available. Successful MOH-sponsored candidates will be informed by the Training Division of MOH. Non-MOH sponsored candidates will be informed of the outcome by the respective universities.
Orientation	Successful candidates will attend an Orientation/ Induction Programme at the respective training universities at the commencement of the academic year.

The list of currently accredited Training centres is provided in Appendix 1.

Induction Process

The Orientation/Induction process is a set of steps put in place to orientate the trainee to the institution, curriculum and training requirements. Each higher education provider or university is responsible for the organisation and conduct of the programme for its own candidates.

The Induction programme covers the following aspects:

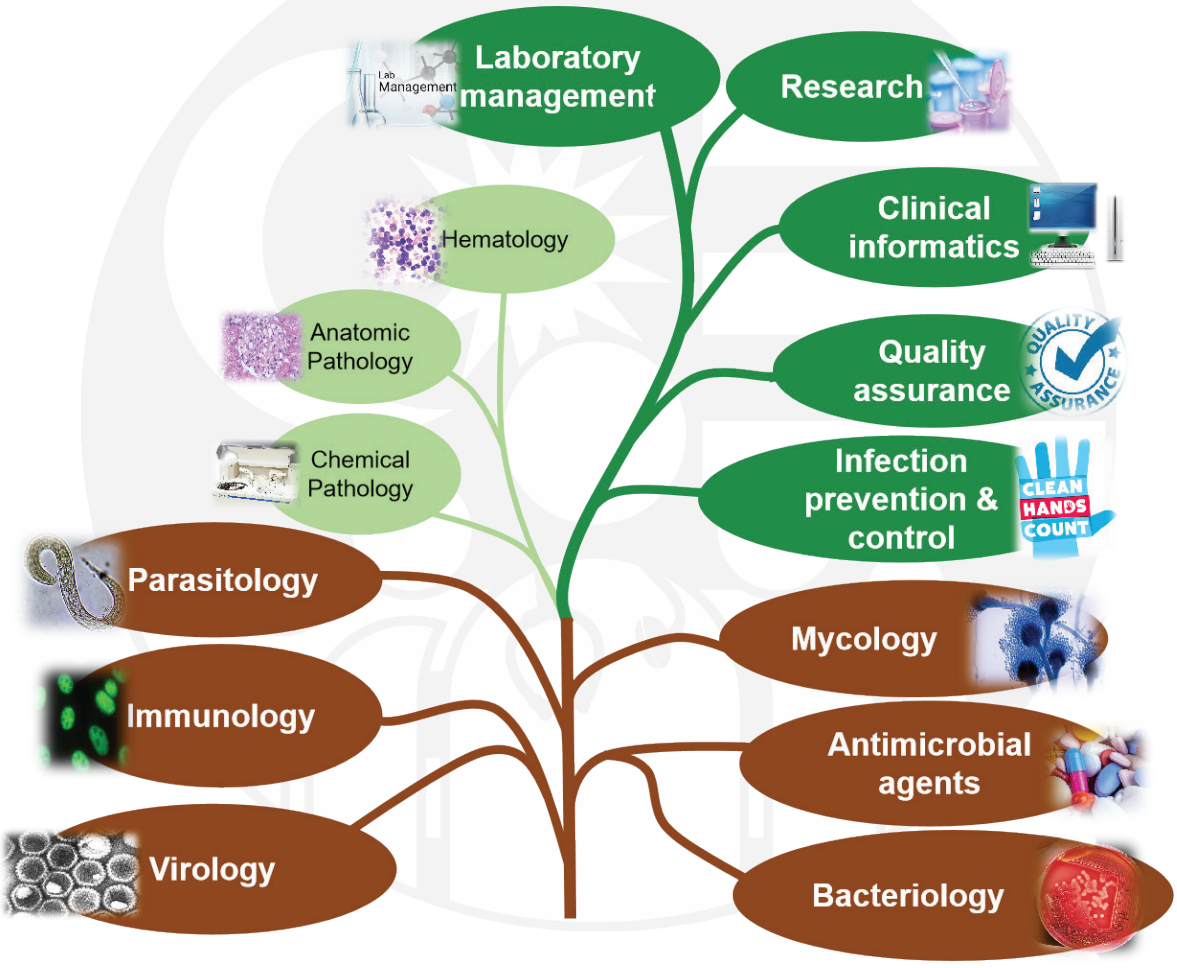
- Registration process
- Payment of Fees
- Details of the programme of study to be followed
- Learning opportunities that will be provided
- Assessment processes and their purposes
- Location of training centres
- Duties of trainees
- Details of course structures and study programme
- Workplace guidelines and protocols
- Support provided in the workplace
- Role of trainers
- Continuous Professional Development (CPD) requirements
- Attendance during training
- Disciplinary processes
- Processes to report concerns about training
- Systems for supporting a trainee in difficulty

4. Syllabus

The syllabus defines what will be taught and learned throughout the training programme in Malaysia. It outlines the domains and competency levels to be achieved in each stage of the training programme. It details the generic and specialty-specific breadth of knowledge, skills and attitudes that a trainee needs to attain and apply to patient care.

The syllabus provides a framework for the:

1. structure of the training programme.
2. competencies expected in the domains of knowledge, skills and professional behaviours.
3. expected levels of competency at different stages of training.



The Medical Microbiology Syllabus Overview Diagram. A 'Tree of Life' illustrating the relationship between the various elements in Medical Microbiology training programme, incorporating core (roots), and complementary areas (branches).

The syllabus is designed such that the trainee undergoes a spiral progression of competence achievement in Medical Microbiology and is expected to progressively acquire a range of knowledge, skills and values during the 4-year period of training. This progression starts at Level 1 up to Level 5 when the trainee who has satisfactorily completed training is ready to present themselves for the Final (exit) examination.

Training Structure

This is a fully-supervised 4-year programme structured as TWO (2) Stages, offered by local Universities accredited to provide the programme.

Stage 1 (year 1) of the programme focuses on foundational knowledge and practical skills in Medical Microbiology. This must be sound enough as the basis on which to build on, prior to entry into the more patient-centred and practice-focused training of Stage 2. To assess that the required level has been achieved, there is a formal Part I examination at the end of Stage 1, which must be satisfactorily passed in order to progress to Stage 2.

Stage 2 (years 2, 3 and 4) of the programme focuses on the spiral acquisition of specialised knowledge and practical skills in Medical Microbiology through the handling of increasingly complex clinical cases. Concurrent with this is the development of professional behaviours, conduct and character to achieve the competence level required of a specialist Clinical Microbiologist. There is a formal Part II (Final) examination at the end of Stage 2 that serves as the exit assessment.

Competency Indicators

The competence levels, which reflect a combination of knowledge and skills achievements, are as below. At each level, knowledge would precede and usually exceed skills but should always be appropriate and adequate to support skills competence.

Level	Description
1	Observer status only
2	Assistant status
3	Able to perform under close and direct supervision
4	Able to perform under indirect supervision
5	Able to perform unsupervised

Knowledge and Skills Syllabi in Medical Microbiology

The syllabus broadly covers THREE (3) major focus areas (clinical, technical and management aspects of Medical Microbiology) in which the trainee must progress in both knowledge and skills throughout the training programme.

Topic	Content
Bacteriology	• Classes, morphology, characteristics of bacteria • Aetiology, epidemiology, pathogenesis, clinical manifestation, laboratory diagnosis, principles of management, prevention and control of bacterial infections • Microscopic examination and staining methods • Culture, identification and antimicrobial susceptibility test for common bacterial pathogens • Non-culture methods and their interpretations: Serological and molecular methods • Laboratory automation and information system
Virology	• Structure and function medically-important viruses • Aetiology, epidemiology, pathogenesis and clinical manifestation of common viral infections • Specimen types and handling in virology • Principles of diagnostic tests in virology • Interpretation of virology tests
Mycology	• Morphology, cultural characteristics of medically important fungi • Aetiology, epidemiology, pathogenesis, clinical manifestation and laboratory diagnosis of fungal infections • Antifungal susceptibility testing • Microscopic and culture methods for fungal identification • Non-culture methods for fungal diagnostics
Parasitology	• Medically-important parasites, their morphology and life cycle • Aetiology, epidemiology, pathogenesis, clinical manifestation and laboratory diagnosis of common parasitic infections • Diagnostic methods in parasitology
Immunology	• Organisation of immune system, innate and adaptive immunity • Clinical immunologic disorders, their laboratory diagnosis and management • Interpretation of routine and specialised immunological tests
Infection Prevention and Control	• Organisational frameworks of infection prevention and control • Epidemiological and clinical aspects of healthcare-associated infections (HCAIs) • Principles of infection prevention and control of HCAIs • Antimicrobial stewardship

Topic	Content
Quality Assurance in Medical Microbiology	• Quality management system in medical microbiology laboratory • Quality assurance and quality control
Antimicrobial Agents	• Classes of antimicrobial agents active against bacteria, fungi, parasites and viruses • Mechanism of actions of common antimicrobial agents in clinical practice • Mechanism of resistance to antimicrobial agents • Antimicrobial susceptibility testing

Learning Outcomes

The knowledge and skills syllabi charted assumes that the Medical Microbiology knowledge cuts through and supports all the various modalities that the trainee has to undergo through the training programme. Only specific knowledge entities for the specific modality will be outlined in the chart.

Stage 1

1. To apply basic theoretical knowledge in the selection, interpretation and reporting of laboratory tests for “non-complex” cases.
2. To apply standard operating procedures in laboratory management including laboratory organisation, quality assurance, laboratory safety and infection control.
3. To demonstrate an understanding of medico-legal implications of Medical Microbiology reports.

Stage 2

1. To develop the appropriate competencies in the selection and utilisation of routine and specialised techniques and assays.
2. To demonstrate the appropriate competencies in the interpretation and reporting of results in order to optimise patient care.
3. To develop the appropriate competencies in the management of laboratory services, including implementation of quality assurance system.
4. To apply the basic understanding of other specialties i.e., Haematology, Chemical Pathology and Anatomical Pathology in relation to infectious diseases.
5. To acquire the appropriate competencies in developing and undertaking research.

5. Assessment Tools

The formative assessments in Medical Microbiology training will be carried out mostly by workplace based assessments (WBAs). This is the appraisal of the trainee's professional skills and attitudes that evidences the trainee's actual performance in the workplace and are used to ensure the trainee reaches the expected standard before progressing to the next stage of training. They also provide regular feedback to the trainee on their progress. The assessment methods for WBAs include Direct Observed Practical Skills (DOPS), Case-Based Discussions (CBD), Evaluation of Clinical Events (ECE), as well as Multisource Feedback (MSF). The WBA methods (adapted from the Royal College of Pathologists, UK) are purposed as shown in Appendix 5:

For the university programme, summative assessments are made up of two end of stage examinations, the Part 1 examination and the Final (Exit) examination. The Part 1 examination which is taken at the end of Stage 1 of training is intended to identify the trainee's suitability to continue training in medical microbiology. The Final (Exit) examination is intended to ensure the trainee has achieved a level that allows them to practice as an unsupervised clinical microbiologist. The formative assessments in the parallel pathway essentially capture the same concept as that of the university programme. The summative assessments will follow requirements of the respective bodies granting the qualifications of the parallel pathway.

Summary of the Assessment Strategy for Medical Microbiology Trainees:

Element	Details	End of attachment	End of year	End of training	Comments
Portfolio	Record of professional learning, WBAs, supervisor reports, reflections, and development activities	N/A	Satisfactory completion of the year (at Annual Review)	Satisfactory completion of training (at Annual Review)	The Portfolio is a record of all training activities and forms an integral part of the evidence to demonstrate professional development. Subsequently used for NSR registration.
Research / Audit reports	Evidence of project management	N/A	Conducted throughout years 2-4. Progress to be demonstrated	Submitted as part of the evidence for completion of training	Application of the scientific approach including formulating an idea, literature reviewing, interpretation and analysis OR an audit/ quality improvement exercise.

Workplace-based assessments	DOPS ECE CBD MSF	Minimum 1 DOPS every 3 months Minimum 1 CBD and 1 ECE every 4 months	Minimum 4 DOPS every year (years 2-4) Minimum 3 CBDs and 3 ECEs every year 1 MSF for every year (but more frequently if needed)	Minimum 12 DOPS Minimum 9 CBDs and 9 ECEs Minimum 4 MSF Evidence of 1 consultation to clinician in managing / resolving a case	WBAs provide an opportunity for feedback and reflection. They will also be used as part of the evidence for the end of year/ training Portfolio review.
Educational and Clinical Supervisor Reports	Summary of progress through postings and learning sessions	Satisfactory completion of attachment			Part of the Portfolio
Courses, Workshops and Conferences	Developing knowledge and skills				Part of the Portfolio

Summary of the Examination for Medical Microbiology Trainees:

Part	Examinations	When	Components	Occurrence	Comments
1 (SA-1)	Medical Microbiology (Part 1 Examination)	End of Stage 1 (end of Year 1)	MCQ, Essay and OSPE	Once per year	A candidate is allowed a maximum of two (2) repeat examinations to pass the Stage 1 examination.
2 (SA-2)	Medical Microbiology Final (exit) Examination	End of Stage 2 (end of Year 4)	Essay, Practical and Viva Voce	Once per year	A candidate is allowed a maximum of four (4) repeat examinations. The maximum duration permitted for the completion of the entire programme is seven (7) years.

Mapping of Assessment Objectives with Methods of Assessments

Assessment Objectives	DOPS	ECE	CBD	MSF	SA-1	SA-2
Demonstrate the trainee's achievement of knowledge and skills as appropriate to each phase of training.	✓		✓		✓	✓
Identify and ensure the candidates' suitability for progression in training in Medical Microbiology.					✓	
Provide the trainee with feedback on their progress.	✓	✓	✓	✓		
Ensure the trainee is ready to progress to the next stage of training.	✓	✓	✓			
Ensure the trainee at the end of the training programme can practice as an independent general Clinical Microbiologist.	✓	✓	✓	✓		✓
Demonstrate the development of the skills for effectively training and teaching undergraduate and postgraduates in the field of Medical Microbiology.	✓	✓		✓		
Demonstrate the development of research skills in Medical Microbiology.	✓	✓				
Demonstrate managerial skills for the laboratory.	✓	✓	✓	✓		
Demonstrate familiarity with laboratory accreditation.			✓			
Demonstrate the ability to act professionally at all times.		✓		✓		

6. Appendices

Appendix 1: Accredited Training Centres

List of training centres accredited for Medical Microbiology Training by the National Conjoint Specialty Committee – Pathology

University Centres

- Pusat Perubatan Universiti Malaya
- Pusat Perubatan Universiti Kebangsaan Malaysia
- Hospital Universiti Sains Malaysia
- Hospital Pengajar UPM
- Hospital Pengajar UiTM

Ministry of Health

- Hospital Kuala Lumpur
- Hospital Sultanah Aminah, Johor Bahru
- Hospital Tengku Ampuan Afzan, Kuantan
- Hospital Sultanah Nur Zahirah, Kuala Terengganu
- Hospital Raja Perempuan Zainab II, Kota Bharu
- Hospital Sultanah Bahiyah, Alor Setar
- Hospital Raja Permaisuri Bainun, Ipoh
- Hospital Selayang
- Hospital Tuanku Ja'afar, Seremban
- Hospital Melaka
- Hospital Serdang
- Hospital Tengku Ampuan Rahimah, Klang
- Hospital Tuanku Fauziah, Kangar
- Hospital Sungai Buloh
- Hospital Pulau Pinang

Appendix 2: Entry ELAs

Entry Essential Learning Activity 1		
Activity	Sample collection and handling (pre-analytical variables)	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Lists the causes of pre-analytical errors. Recognises the importance of providing complete and correct information on the request form. Recognises the correct technique and containers used for sample collection. Explains the safety and infection control measures to be taken during sample collection. Explains the appropriate sample transportation.	Performs appropriate venepuncture. Follows appropriate procedures for collection of various specimens. Chooses appropriate containers for sample collection. Adheres to the safety procedure during sample collection. Transports the sample to the laboratory as per the requirement.	Recognises knowledge limits and asks for assistance when necessary. Talks to the patient in a polite manner explaining the procedure. Communicates with the patient with empathy and respect especially if complications occur.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Systematic approach in collecting samples and giving instructions to the patient. Understands the gravity of non-adherence to the above, which can affect patient management and safety.	Failing to recognise the importance of pre-analytical variables. Not knowing the importance of safety procedure.	Failing to know the importance of providing complete and correct information on the request form.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Entry Essential Learning Activity 2		
Activity	Requesting appropriate laboratory investigations	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Describes how to request investigations for microbiological samples. Explains the necessity for correct sample labelling. Explains the necessity for appropriate relevant clinical history to be filled into the request form. Demonstrates the safety measures to be taken in transport of the samples.	Able to complete request forms or order on LIS for microbiological tests. Ensure correct sample labelling. Ensures appropriate relevant clinical history to be filled into the request form/LIS. Apply safety measures in handling and transport of the samples.	Informs the clinician/nurses about inappropriate tests requests. Recognises the importance of communication between the laboratory and the clinician regarding appropriate tests request. Recognises the limitations of knowledge and seeks guidance appropriately.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Demonstrate an ability to undertake life-long learning. Knows the indications for microbiology laboratory investigations.	Failing to follow procedures on requesting microbiology laboratory investigations.	Failing to know the importance of communication with laboratory regarding test indications.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Entry Essential Learning Activity 3		
Activity	Laboratory investigation in a patient with an infection	
Description (if necessary)		
All items on the table below are examples, they do not constitute an exhaustive list in any aspect		
Knowledge Know, Facts, Information	**Skill** Do, Practical, Psychomotor, Techniques	**Attitudes + Values** Feel, behaviours displaying underlying values or emotions
Describes the pathophysiology of infectious diseases caused by bacteria, viruses, fungi etc. Describes clinical presentations of various infectious diseases. Describes the laboratory diagnostic modalities for any infectious diseases.	Recognises clinical presentations in patients with infectious diseases. Interprets microbiology laboratory results.	Informs the managing team about the pertinent findings. Recognises the importance of communication between the laboratory and the managing team in the management of the infection. Recognises the limitations of knowledge and seeks guidance appropriately.
Behavioural Markers		
Positive Things that should be done, correct techniques or practices, things a trainee might do right	**Negative** Things that should not be done, incorrect techniques or practices, things a trainee might do wrong	**Negative Passive** Things that may be forgotten or omitted that constitute incorrect or substandard care, things a trainee forgets to do
Applies the knowledge on pathogenesis and pathophysiology of infectious diseases in relation to clinical presentations. Considers the factors that can affect the results.	Failing to recognise common clinical findings in infectious diseases. Failing to recognise or act upon abnormal/alarming results.	Failing to recognise abnormal/alarming results. Failing to discuss abnormal results with managing team which jeopardise the patient's management.
Assessment/Evidence		
Logbook Report from the supervisor at the hospital where they were working prior to entering the programme		

Appendix 3: The Medex Pre-Entrance Examination

The Medical Specialist Pre-Entrance Examination (MedEx) – Pathology component

The salient features of the Pathology entrance examination are:

a. Two true-false Multiple Choice Question papers relating to understanding of basic anatomical pathology, haematology, chemical pathology, medical microbiology, forensic pathology, medical genetics and immunology.

b. Marking system: A computerised marking system is used. There is negative marking within the question and the minimum score for each question is ZERO (0) i.e. there will be no carryover of negative marks.

c. Selection of candidates for entry into the Master of Pathology programme will be based on the best performing candidates of the year's cohort.

Please refer to the MedEx website for updates on the examination:
https://www.mpm.edu.my/en/medex/scope-of-knowledge

Appendix 4: Recommended Materials

The following textbooks or their equivalents are recommended for use throughout the master of Pathology (Medical Microbiology) training (latest edition preferable):

a. Mandell, Douglas & Bennet. Principles and Practice of Infectious Diseases.

b. Stephen D Allen, MD, William M Janda. Koneman Color Atlas of Diagnostic Microbiology. Washington C Winn

c. Jawetz, Melnick & Adelberg's. Medical Microbiology.

d. Richard Goering, Hazel M Dockrell, Mark Zuckerman, Derek Wakelin, Ivan Roitt, Cedric Mims, Peter L Chiodini. Mim's Medical Microbiology.

e. Patrick R Murray, Ellen Jo Baron, James H Jorgensen, Michael A Pfaller, Robert H Yolken. Manual of Clinical Microbiology.

f. Larry M. Baddour, Sherwood L Gorbach. Therapy of Infectious Diseases.

g. Michael Loeffelholz, Richard L. Hodinka, Benjamin Pinsky, Stephen Young. Clinical Virology Manual

h. Monica Cheesbrough. District Laboratory Practice in Tropical Countries

Journals

a. American Journal of Infection Control

b. BMC Infectious Diseases

c. Clinical and Experimental Immunology

d. Clinical infectious diseases

e. Current Opinions in Infectious Diseases

f. Emerging infectious diseases

g. Journal of Clinical Microbiology

h. Journal of hospital infection

i. Journal of Immunology

j. Journal of Clinical Virology

k. Lancet Infectious Diseases

l. Reviews in Clinical Microbiology

Guidelines

a. Relevant Clinical and Laboratory Standards Institute (CLSI) or other reference laboratory documents e.g. Performance Standards for Antimicrobial Disk Susceptibility Tests

b. Malaysian clinical practice guidelines (CPG)

c. IDSA, CDC, WHO guidelines

Medical Microbiology Trainee Guides

a. Master of Pathology Guidebooks

b. Malaysian Standard for Specialist Training https://rb.gy/kkbe8

c. Royal College of Pathologists (UK) Curriculum for Specialty training in Medical Microbiology/Virology https://rb.gy/lnuuuw

d. The Royal College of Pathologists of Australasia Trainee Handbook https://rb.gy/t0r55

Appendix 5: Workplace-based Assessments (WBAs)

Adapted from the Royal College of Pathologists, UK

DOPS are used to assess the trainee's ability to demonstrate the skills required for the different stages of training. The assessor provides immediate feedback to the trainee and further develops the trainee's strengths as well as identifying areas for improvement.

ECE are used to assess the trainee's ability to perform tasks which involve teamwork and interacting with other professional colleagues.

CBD is used to assess the trainee's ability to apply their medical knowledge in decision-making for patient care, and running a safe, efficient and reliable Medical Microbiology service.

MSF is used to assess the trainee's behavioural characteristics. Generally, the supervisor's report provides the main feedback. The supervisor may also take into consideration comments from other staff who have had the opportunity to work with the trainee. The trainee may conduct a self-appraisal and discuss this with their supervisor, with the objective of ensuring the trainee is guided to reach the conduct level required at the professional level of a medical specialist.

Glossary of Terms

CBD	Case-based discussion
CPath-AMM	College of Pathologists, Academy of Medicine Malaysia
DOPS	Directly observed practical skills
ECE	Evaluation of clinical events
JBILP	Jawatankuasa Bersama Ijazah Lanjutan Perubatan
JBSP	Jawatankuasa Bersama Sarjana Perubatan
MMC	Malaysian Medical Council
MOH	Ministry of Health Malaysia
MOHE	Ministry of Higher Education
MPath	Master of Pathology
MSF	Multi-source feedback
NPMC	National Postgraduate Medical Curriculum
NSR	National Specialist Register
SA	Summative assessment

e ISBN 978-967-0023-12-0

Contact

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