(A) INTRODUCTION

Objective of Training

The aim of this programme is to produce trained microbiologists to provide specialist opinion in their clinical discipline and who should have developed the appropriate management skills to lead the laboratory, if required.

By end of the training, the trainee is expected to acquire the following skills and knowledge:

1. Understand the principles and practices of the various types of tests and be familiar with the scientific basis for laboratory diagnosis of infections.
2. Knowledge of the different types of pathogenic microorganisms, including epidemiology, pathogenesis, natural history of the disease, clinical and laboratory diagnostic approaches, treatment and prevention.
3. Know about specimen collection and the transportation requirements for the different types of tests.
4. Able to set protocols and to maintain standards within the laboratory.
5. Give advice on the diagnosis, treatment and prevention of microbial diseases.
6. Undertake management responsibilities involved in running a medical microbiology laboratory, including staffing, training, budgeting, safety and quality issues.
7. Participate in infection control in the hospital.
8. Participate in hospital policies on antibiotic usage.
9. Collaborate with national surveillance organizations and public health authorities and to provide services for these organisations.
10. Undertake teaching and research for the development in microbiology.

(B) PROGRAMME OVERVIEW

Traineeship Duration for Seamless Training in Microbiology

This is a 5 year training programme, with rotations or postings relevant for microbiology.

(C) ADMISSION REQUIREMENTS

Entry Criteria / Pre-requisites

Applicants must fulfill the following entry criteria / pre-requisites as stated below:

Following qualification as a medical practitioner, trainees should have completed at least one year of post-Housemanship. This period will include at least one year of pre-registration experience (Housemanship).

(D) TRAINING SYLLABUS

A. Detailed Syllabus

1. Scientific basis of medical microbiology
   - Microbial structure, physiology and genetics.
   - Microbial taxonomy and classification.
   - Host defence mechanisms and immunity to infection.
   - Microbial pathogenicity.
   - Epidemiology of infectious diseases, including surveillance and control of infection.
   - Antimicrobial agents, their mode of action and mechanisms of microbial resistance.
2. **Laboratory safety**
- Safety requirements including use of protective equipment when working in a microbiology laboratory. Correct laboratory dress and hygiene practices.
- Handling and disposal of specimens and contaminated articles at the laboratory bench, the dangers of aerosol, and procedure for dealing with biological and chemical spills.
- The principles and operation of biological safety cabinet.
- Procedures for the safe transport of specimens and cultures. Know the national and international packaging and transport regulations for such material.
- The principles and operation of high containment facilities for handling risk group agents.

3. **Sterilisation and disinfection**
- Principles and uses of sterilization and disinfection procedures for the preparation of media, instruments and microbiological waste.
- Use of sterilization and disinfection in the laboratory, hospital and community.

4. **Handling of specimens**
- The optimal methods for collection, transport, storage of each type of specimen type.
- Processing of various specimen types, including appropriate use of personal protective equipment and safety equipment.

5. **Microscopy**
- The principles of light, darkground, phase contrast, fluorescent and electron microscopy.
- Staining methods using various stains, including immunofluorescent stains. Perform and read.
- Appearance of stained preparations and recognition of artefacts and their possible origin.

6. **Culture method**
- The wide range of selective, enrichment and inhibitory media available for general and specialized use, and the choice of the relevant media.
- Processing methods for various specimen types.
- The physical growth requirements of micro-organisms including atmosphere, temperature and incubation time, and the growth kinetics of solid phase and broth cultures.
- The preparation of commonly used media, and understand the internal control process for such preparation.
- The colonial and microscopic morphology of medically important bacteria including mycobacteria.
- Recognition of potential pathogens from a mixture of colonies on culture plates, and isolation of such colonies in order to get pure growth for further work-up.
- The diversity of microbial metabolism and the use of these properties in the identification of bacteria. The use of various conventional and automated methods for the identification of bacteria.
- Supplementary methods leading to the identification of common pathogens including the use of commercially produced kits (eg enzyme immunoassays, latex agglutination).
- The reporting format for various specimen types and growth outcome.

7. **Antimicrobial susceptibility**
- Methods of testing the antibiotic sensitivities of various bacteria including disk diffusion, breakpoint minimum inhibitory concentration (MIC) and MIC methods.
- Perform and interpret MIC and MBC tests as appropriate.
- Antimicrobial assays using biological and automated techniques. Use of antimicrobial assays and their relationship to the therapeutic and toxic effects on a patient in relation to dosage regimen.
- Mechanisms of antimicrobial resistance.
- Choice of antimicrobial testing panel for each organism type.

8. **Antimicrobial usage**
- Advice for clinicians on appropriate choice of antibiotics. Be familiar with the spectrum of activity, pharmacodynamic and pharmacokinetic properties, and side effects of each antimicrobial agent.
- Empiric, directed and prophylactic use of antimicrobial agents.
• Surveillance and prevention of emergence of resistance.

9. Virology
• Laboratory methods for diagnosis of viral infections including viral culture, antigen detection, serology and molecular methods.
• Interpretation of results, for both clinical management and infection control purpose.
• Virology policies in relation to health care workers, pregnancy, immunization and transplantation.
• Special problems associated with the immunocompromised host.

10. Mycobacteriology
• Perform, read and interpret acid fast smears.
• Specimen processing for various specimen types
• Culture for mycobacteria using various methods including liquid and broth based; manual, semi-automated, automated methods. Evaluation of negative and positive cultures.
• Culture confirmation of TB
• Identification of non-tuberculous mycobacteria.
• Molecular diagnosis of TB
• Susceptibility testing for TB
• Immune responses to TB and vaccines eg BCG
• TB infection control policies in health care institutions and public health setting. Sterilization and disinfection methods.

11. Mycology
• Laboratory methods for diagnosis of fungal infections
• Interpretation of results, for both clinical management and infection control purpose.
• Special problems associated with the immunocompromised host.

12. Parasitology
• Laboratory methods for diagnosis of parasitic infections
• Interpretation of results, for both clinical management and infection control purpose.
• Special problems associated with the immunocompromised host.

13. Molecular diagnosis
• Major new molecular-based techniques available for microbiology.
• Advantages and pitfalls in molecular-based diagnosis.

14. Infection control in hospital and community
• Management of local infection control problems, including outbreaks of infection.
• Participation in infection control meetings in hospital, and also local and regional infection control committees, where possible.
• Infection control policies for hospital and community.
• Work with infection control personnel and participate in the education of health care workers involved in infection control.
• Participation in infection control for various hospital departments including clinical and non-clinical areas like kitchen, central sterilization unit, pharmacy and laundry.
• Principles of patient isolation and their application.
• National infection control policies and recommendations eg for MRSA, VRE, Clostridium difficile etc.
• Physical and chemical agents used in hospital infection control.

15. Data handling and IT
• The use and application of information technology in handling laboratory tests information, including requisitioning and reporting of tests, and analysis of data including antibiogram.
• The importance and need for data protection.

16. Quality assurance and management
• Quality control and quality assurance of laboratory results.
• Participation in external quality assurance programmes.
• Participation in audit of laboratories.
Knowledge of any existing laboratory accreditation schemes, and the requirements and process whereby the accreditation is conferred.

17. Clinical experience and liaison
   - Know the special infectious disease issues associated with different clinical specialties eg. medical, surgical, ICU transplants, cardiothoracic, obstetrics and gynaecology, paediatric, family practice, etc.
   - Act as liaison with clinical colleagues and participation in collaborative clinical activities. Emphasis should be placed on close relationship with special areas like Intensive Care Units and special departments like haematology and transplantation, where possible.
   - Participation in clinical rounds and teaching sessions.
   - Provide informed advice on choice of laboratory tests, antibiotic therapy, immunization, preventive measures and infection control where appropriate.

18. Research
   - How to conduct research including the use of statistics and ethical issues.
   - Able to critically appraise journal articles.

19. Management
   - Basic knowledge of important aspects of laboratory management including budget, personnel management and administration.
   - Attend management courses.

B. Training activities/competencies:

1. Training programme

   The trainee will participate in various teaching programmes set by the training centre. This includes bench work, journal readings, teaching and clinical rounds.

   The trainee should also attend and participate in any other relevant training activities organized by other institutions and organizations.

2. Rotations

   The training supervisor will draw up training schedule to enable the trainee to cover all the required aspects of training. This should include sufficient time in various specialty areas as mentioned in the Detailed Syllabus above (points 9 - 13). Feedback from the Microbiology STC should be taken into consideration.

   Rotations to other laboratories during the course the traineeship is preferred. The trainee should check on specific requirements by various colleges (eg RCPA) regarding outside rotations.

3. Presentations

   The trainee should present posters and free paper publications of research projects at local, regional and international relevant meetings.

4. Teaching

   The trainee should participate in teaching for all levels of staff including for laboratory staff, visitors attached to the labs, students, nursing and other hospital staff, on various aspects of microbiology and infection control.

5. Research

   The trainees should participate in and conduct research. This is especially important for the RCPA Fellowship where a research project is required and examinable.
(E) INSTITUTIONAL REQUIREMENTS (FACILITIES & RESOURCES)

There should be adequate number of trained staff who are full-time. Trainees are assigned a supervisor.

The training centre must provide trainees with adequate work space and facilities for the volume and work undertaken.

The training centre must have a reasonable number and variety of appropriate journals and medical texts, and preferably a medical library with borrowing facilities. On-line access should be provided.

There should be regular journal clubs, joint conferences and audit reviews.

(F) SUPERVISION OF TRAINEES

All trainees will be supervised by a designated consultant/supervisor but in general all the consultant staff will be duty bound to take an active part in teaching. Assessment of progress and log should take place at least 6 monthly.

The supervisors should be actively practicing medical microbiology.

The supervisor is expected to:
- Draw up a prospective training programme. This should be devised in collaboration with the trainee and taking into account any recommendations from the STC.
- Delegate training responsibilities to other trainers and facilitate arrangement of various postings and attachments where appropriate.
- Monitor the trainee’s progress by personal observation, feedback and discussion.
- Maintain contact with the STC, and feedback to STC any concerns about the trainee.
- Submit supervisor’s report on the trainee to various institutions and organizations as required.

(G) ASSESSMENT AND FEEDBACK

Logbook

All trainees are expected to keep a log book which will be reviewed regularly by the main supervisor. The log book will have a record of time spent in various postings, benches or disciplines in microbiology. Important cases seen should be recorded.

CME activities and training courses attended should also be recorded.

All projects, publications and teaching experiences e.g. conferences, seminars, papers presented, should also be recorded.

Assessment

All trainees accepted under the Seamless Traineeship programme, will undergo formative assessment starting in second year of training (at 18 to 24 months). Fellowship exams like the FRCPA and FRCPath may be used as formative assessments.

Feedback

Six-monthly interviews with the trainees should be conducted by supervisors and STC to ensure that the training objectives for each rotation have been adequately met, as well as to monitor for any difficulties in workload and training activities. Feedback forms should also be provided at the end of each posting, and the programme supervisor is responsible for collating the results and instituting the appropriate changes to the training programmes.
**H) EXIT CERTIFICATION**

Exit examinations include the FRCPA (Part II) or FRCPath (Part II) examination, or equivalent. Trainees may apply to sit the exit examinations at the appropriate time; and when deemed ready by the supervisor/HOD.

Refer to websites [www.rcpa.edu.au](http://www.rcpa.edu.au) and [www.rcpath.org](http://www.rcpath.org) respectively for information about eligibility and examination details.

**I) GENERAL GUIDELINES**

Please refer to Annex 1 for General JCST Guidelines on the following:

- Leave Guidelines
- Training Deliverables
- Retrospective Recognition
- Changes to Training Period
- Part-time Training
- Overseas Training
- Withdrawal of Traineeship
- Exit Certification

**J) APPLICATION FOR SEAMLESS TRAINEESHIP**

Eligible doctors may enquire with the Joint Committee on Specialist Training (JCST) Secretariat on the next Seamless intake exercise.

Shortlisted applicants will be required to attend an interview.

All successful applicants will be issued with an offer letter of traineeship and are required to revert with their acceptance of traineeship offer to JCST. All successful applicants must be formally registered as a Trainee with the JCST Secretariat prior to commencement of traineeship.