



MALTA COLLEGE OF PATHOLOGISTS

TRAINING RECORD BOOK FOR MEDICAL MICROBIOLOGY

(INCLUDES BACTERIOLOGY, VIROLOGY, MYCOLOGY, PARASITOLOGY AND INFECTION CONTROL)

i. Scope of this manual

This manual is designed to provide a record of the training received by junior medical microbiologists during the whole of their period of training.

It is intended to assist the trainee and his/her designated supervisor in considering the whole range of skills required of a newly appointed consultant medical microbiologist in a district general hospital or in a teaching hospital. Consideration is also given to training in communicable disease control and in environmental, food and water microbiology. In view of the diverse nature of the subject, the list of techniques and points covered is not necessarily comprehensive, but is designed to provide a framework for fuller discussion of each topic.

The first section outlines the aims of the training, starting on page (1), the resources required and a suggested general structure of training. However, the suggested structure may be amended to suit local circumstances after approval of any significant changes are agreed by the Specialist Training Committee and the Specialist Accreditation Committee, responsible for accreditation of post-graduate training programmes of medical specialists.

The background and qualifications of the trainee at the commencement of training in Microbiology should be recorded.

An individual programme should be constructed for each trainee planned around the past experience, aptitudes and aspirations of the trainee. It should be designed after discussion between the trainee, the designated trainer and the committee on the registration of medical specialists. This programme is intended to outline the structure of the training and should be planned and reviewed at least annually.

The completion of the training record should be complemented with Individual Performance Reviews (IPR) where appraisal of progress can be undertaken and where the trainee's opinions of the training being received should be considered.

ii. Training programme

A comprehensive description of the training programme in Microbiology is available as a separate document.

iii. Introduction

This document sets out a curriculum for trainee medical microbiologists.

The general outline is complemented by a training record in which specific items are listed in some detail.

iv. Aims of training

The aims of training should be to develop the knowledge, skills and attitudes required of medical microbiologists and to give wide experience of the practice of medical microbiology.

The curriculum should centre on training in the following areas (the eight main tasks of the microbiologist as defined by the Microbiology Commission in Helsinki in 1996) to ensure competence to:

- a. Give advice as a physician on the diagnosis, treatment and prevention of microbial diseases.
- b. Provide a scientific basis for laboratory diagnosis; to set protocols and to maintain standards within the laboratory.
- c. Undertake the management responsibilities required from the director of a medical microbiology laboratory.
- d. Take charge of infection controls in hospitals.
- e. Propose hospital policies on the control of antibiotic usage and on the prevention of hospital acquired infection.
- f. Collaborate with national surveillance organisations and public health authorities and to provide laboratory services for these organisations.
- g. Participate in the training programmes for medical microbiologist, infection control practitioners and other experts in the field of microbial diseases.
- h. Undertake research and development in the specialty of microbiological biopathology.

The precise composition of an individual's training programme should be structured around the past experience and aspirations of each trainee. The programme should be designed, and continually reviewed, by discussion between the trainee, the trainer and, at regular intervals, the Postgraduate Dean and/or any official board or committee on the registration of medical specialists.

Each trainee will have to successfully acquire skills in each of the following categories:

- a. specialized factual knowledge of the natural history of infection and its clinical presentation;
- b. technical ability, to enable the trainee to select appropriate methodology and laboratory instrumentation based on practical skills and experience derived from close acquaintance with laboratory technology acquired during training, which includes quality control procedures and quality assurance;
- c. data management skills, including the statistical evaluation of data referring to the populations of patients served and the technical procedures applied in the laboratory as well as familiarity with the application of information technology within the laboratory and familiarity with the use of spreadsheets, databases and statistical packages;
- d. management and communication skills, including experience, under supervision, in formulating departmental policies and applying the leadership and team-work skills necessary to implement them, report writing and report presentation, costing procedures, preparing budgets and acquaintance with contracting procedures;
- e. research and development experience, as this is important for developing skills in independent and team-driven problem solving and in the critical assessment of published work;
- f. presentation skills, both oral and written;

g. knowledge of health and safety at work requirements for laboratories including control of substances hazardous to health regulations;

h. continuing study, leading to continuing medical education (CME) beyond the training post stage. This will enhance the acquisition of life-long habits of reading, literature searches, consultation with colleagues, attendance at scientific meetings, and the presentation of scientific work as part of continuing professional development (CPD).

v. Training supervision

a. Every trainee must have a designated trainer of Consultant status at the trainee's base laboratory who will be personally responsible for the trainee's day-to-day training and who will be accountable to the Head of Training, the Post-graduate Training Co-ordinator and the Specialist Training Committee for Pathology and the Specialist Accreditation Committee, responsible for accreditation of post-graduate training programmes of medical specialists.

b. When referred to another location for training, a Consultant, or Scientist of equivalent status, should be identified as being responsible for training for the duration of the attachment.

c. Before agreeing to become a trainer, a Consultant must be able and prepared to set aside sufficient time to undertake this demanding duty. Each trainee should anticipate a weekly, regular, formal one hour tutorial session as a minimum. Furthermore, in addition, there should be training in benchwork and in clinical liaison/ward rounds by the trainer or another medical specialist or a qualified non medical member of the teaching staff (delegation of certain duties to a non consultant medical specialists does not abrogate the trainer's responsibility) as well as frequent open access on an *ad hoc* basis.

d. All trainees must have Consultant cover (preferably on-site) at all times.

e. For more junior trainees, the trainer must be responsible for identifying publishable projects suited to the trainee's experience and interests, for arranging resources, and for overseeing the project up to publication.

f. The progress of training should be reviewed with the trainer, and where relevant the laboratory head, and separately with the Head of Training and the Training-graduate Co-ordinator and the Specialist Training Committee for Pathology and the Specialist Accreditation Committee, responsible for accreditation of post-graduate training programmes of medical specialists on at least an annual basis, or more frequently if requested. This review should be undertaken on a formal basis, with clear agreed goals and achievement reviews.

vi. Training locations

a. Before a laboratory can be designated as a training site, the suitability of the site must be carefully considered.

b. Each post and laboratory must have appropriate recognition.

c. Each laboratory should ideally have the full appropriate accreditation.

d. There should be sufficient non-training grade staff in a laboratory to carry out the routine clinical work. While trainees will often undertake routine work, they must not be relied upon for the running of the laboratory as this will interfere with the training programme.

e. In addition to the suitability of the laboratory, consideration must be given to the scope of clinical material available. In laboratories attached to hospitals with a relatively small range of clinical services, rotation to laboratories at other hospitals will be necessary.

f. Ideally, trainees should be based in laboratories specialising in training which will have more than one trainee. This will facilitate the suggested training structure outlined in section 0, below. In this situation, trainees can discuss cases and issues in medical microbiology with others who are also actively studying for examinations (or who have recently been doing so). This process is also of value to the more senior trainees who themselves begin to learn how to become effective trainers.

g. Resources which must be available before a trainee is allocated to a laboratory: Reasonable quiet office space with a telephone line from where confidential clinical conversations can be carried out; sole use of a desk; filing cabinet and shelf space; ready access to computing facilities (at least one computer between every two trainees) with appropriate software (e.g. wp; spreadsheet; epi-info; reference manager) and connected printer; internet access; a range of suitable up-to-date reference texts within the laboratory, e.g. Principles and Practice of Infectious Disease (Mandel *et al*), The Use of Antibiotics (Kucers *et al*), Principles and Practice of Clinical Virology (Zuckerman *et al*), Manson's Tropical Diseases (Manson-Bahr *et al*).

vii. General structure of training

a. The structure of training needs to be flexible to allow for individual trainee and service requirements. A suggested training structure follows which may be used as a guideline to best practice. It is not intended to be prescriptive. If an alternative training schedule is already in place, this may be followed, subject to approval by the Postgraduate Dean and/or any official board or committee on the registration of medical specialists.

b. A significant part of training should be performed on an apprenticeship basis, with the trainee shadowing the trainer, another consultant or a medical specialist or a qualified non medical member of the teaching staff in service laboratory and clinical duties (referred to as service work).

c. Adequate time should be allowed for non-service benchwork, private study, attending courses and research (referred to as elective work).

d. The proportion of service to elective work should vary between 1:1 and 1:2. It is essential that time for elective work should be allocated in blocks of sufficient length to allow the trainee to make maximum use of the elective time. The elective period should not be used exclusively for annual leave or for covering colleagues' *planned* annual/study leave. A suitable arrangement could entail a rotation (say every three months) of 'first on-call' for clinical duties between three trainees on one site, allowing the other two a clear six months for elective work in every nine months.

viii. Qualifications of the trainee at the end of training

Gaining knowledge and experience:

At the end of training the trainee should have gained experience in the following areas:

a. possess theoretical and practical knowledge, skilfulness and experience in bacteriology, virology, parasitology, mycology and serology, so that he/she is capable of independently arranging the content and organisation of a microbiological study for the benefit of patient care resulting in clinical consultation and a hospital epidemiological study;

The trainee should among other things:

b. be able to assess relevant scientific literature and to apply (adjust) it for use in diagnostic/scientific research;

- c. have sufficient theoretical and practical knowledge of molecular biology and immunology, to be able to assess (adjust) the developments and to use these for medical microbiological diagnostic scientific research;
- d. make sure that he/she possesses sufficient knowledge of management methods, so that these can be used for organisation, management and personal policy of a medical microbiological laboratory;
- e. orientate themselves to function in the field of prevention and the fight against infectious diseases;
- f. acquire sufficient knowledge to be able to execute or give guidance in hospital hygiene and hospital epidemiology programmes.

Cursory education:

The trainee should through work placements and/or participating in courses have obtained insight in the parasitology, mycology, immunology, statistic/epidemiology, management and public health.

Educational duties:

The trainee should have given information and fulfilled educational tasks to medical students, co-assistants, trainee - nurses and paramedical staff.

Participating in discussions and meetings:

The trainee should gain experience through regular attendance of clinical and pathological conferences as well as Antibiotic Team and Infection Control meetings.

Trainee details, personal development plans, and achievements

Instructions for completion of numbered sections

Appropriate sections of the logbook should be completed at intervals no less frequently than monthly. Where only part of a section has been covered at a session, the "Comments" column should be used to indicate the subject matter discussed. A number of spare sheets have been included at the end to allow trainees and trainers the opportunity to include further topics as desired.

It must be emphasised that the "Stage reached" columns should be used to record the depth to which the topic has been discussed. It is NOT intended to grade the level of knowledge of the trainee but to provide a useful checklist of any uncompleted topics at each stage of the trainee's training period.

The "Stage reached" section is divided into four columns, numbered 1 to 4. Once a topic has been discussed, the appropriate box should be completed by the trainer with his initial and date. Topics covered at outside lectures, such as at an MSc course, may be entered individually for each topic at the appropriate stage. These numbers refer to the following stages:

- 1 A subject has been discussed at a basic level. It would be expected that the trainee would need help and supervision most of the time in performing task/dealing with subject
- 2 The theory behind a subject has been discussed at a level sufficient to enable the trainee to

troubleshoot the procedure or to enable him to cope with performing the task/dealing with subject under close supervision

3 The subject has been discussed comprehensively, such that the trainee should be able to cope with performing the task/dealing with subject with limited supervision

4 The subject has been discussed comprehensively and the trainee has a knowledge of the associated literature and should be competent to perform the procedure/deal with subject independently

Following the core topics, several blank lines are allowed for the completion by the trainee and the trainer for any other topics as desired.

For some topics it would be inappropriate to complete the "Stage reached" column for each entry at any particular level. In such cases, the appropriate comments line can be used. Similarly, for other topics (e.g. management) it may be felt inappropriate to broach the subjects until stages 3 or 4.

i. Health and safety at work safety at work

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Received local laboratory safety notes				
Acquainted with local fire safety rules				
Acquainted with local accident reporting policy				
Acquainted with working of Safety Committee				
Acquainted with Safety regulations				
Acquainted with Categorization of Pathogens				
Familiar with indications for use and correct operation of Class 1, 2 and 3 safety cabinets				
Familiar with regulations relating to Category III laboratory				
Familiar with international and national postal regulations				

ii. Clinical experience

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has gained experience of liaison with clinical colleagues through regular ward visits, in particular with staff on high dependency units (e.g. ICU)				
Understands the management of infection in various organ systems and patient types				
Has gained experience of dealing with clinical problems in specialist clinical areas: Paediatrics including ICU				
Obstetrics				
Orthopaedics				
Sexually transmitted diseases, including AIDS				
Organ transplantation				
Haematology (profound neutropenia)				
Has gained experience of liaison with general practitioners, particularly by providing telephone advice when requested				
Has participated in on-call rotas (with consultant cover)				
Has participated in postgraduate educational meetings				
Has participated in the multidisciplinary approach of patient care				

iii. Infection control in hospital and the community

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has had first hand experience of local infection control problems including outbreaks of infection and their management				
Understands the possible implications on bed management of use of side rooms and ward closures				
Is familiar with the workings of infection control meetings including local and district infection control committees				
Is aware of those areas of hospital and community health that require infection control policies				
Has worked closely with the infection control nurse both in day to day duties and in the education of others on infection control issues				
Has participated in visits to clinical and non-clinical areas to advise on infection control, including kitchen inspections conducted by environmental health officers				
Has an understanding of the principles of patient isolation and the hierarchy of isolation				
Is familiar with any documents relevant to infection control such as reports of Committees of Enquiry and with any existing working party recommendations				
Has some understanding of hospital design and engineering problems				
Understands the indications for monitoring theatre air supplies				

iv. Sterilization and disinfection

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands principles of sterilization using moist heat				
Understands principles of sterilization using dry heat				
Understands principles of sterilization using other methods				
Understands principles of disinfection using various chemicals in laboratory setting				
Understands principles of disinfection using various chemicals in hospital ward setting				
Understands principles of disinfection using various chemicals in special hospital settings (e.g. endoscopy units)				
Understands principles of disinfection using various chemicals in general practice setting				
Understands the functions and management of Central Sterilization Unit				

v. Specimen procurement and handling

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
For each specimen type, is aware of optimal methods of collection, transportation (including transport media), storage, reception, identification and documentation				
Is able to assess degrees of urgency for the processing of specimens, including the provision of out-of-hours service and the communication of preliminary results as applicable				
Is able to decide upon further testing or processing of a specimen as appropriate				
Is aware of existing reference facilities and their appropriate use				

vi. Laboratory techniques in microbiology: Specimen microscopy

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands the principles of light, darkground, phase contrast, fluorescent and electron microscopy, and is able to set up a light microscope with dark ground and phase contrast facilities				
Is able to perform routine staining techniques including using fluorescent dyes				
Is familiar with the appearance of stained preparations and is able to recognize artifacts and their possible origin				

vii. Laboratory techniques in microbiology: Culture methods

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has a basic understanding of the diversity of microbial metabolism				
Is aware of the wide range of selective, enrichment and inhibitory media available for general and specialized use and is able to chose relevant media in common use or in medical and environmental laboratories				
Is familiar with physical growth requirements of micro-organisms including optimal temperature and has an appreciation of the growth kinetics of both solid phase and broth cultures				
Is familiar with the preparation of media in common use and has an understanding of internal quality control of such preparations				
Is able to process all common specimens, to recognize potential pathogens from mixture of colonies on culture plates, and to separate such colonies in order to achieve the pure growth necessary for further work				

viii.

Laboratory techniques in microbiology: Further processing of cultures

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is able to perform tests leading to the identification of all common pathogens, including the use of commercially produced kits.				
Understands the principles of identification media and is able to use them appropriately				
Understands the principles behind multipoint identification technology				
Is aware off available reference facilities for finer identification including serotyping and other phenotypic and genotypic typing methods				

ix. Laboratory techniques in microbiology: Susceptibility testing

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is able to test the antibiotic susceptibilities of an isolate using the common techniques of disc testing and breakpoints and understands of the principles behind multipoint susceptibility testing technology				
Is able to perform and interpret MIC and MBC tests as appropriate				
Is able to perform full and half chequerboard titrations				
Is able to carry out serum cidal levels				
Is able to perform antimicrobial assays using biological and automated techniques				
Has an understanding of antimicrobial assays and their relationship to the therapeutic and toxic effects on a patient and be able to advise on dosage regimens accordingly				

x. Laboratory techniques in virology for microbiology trainees

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands principles of common serological testing methods, including complement fixation test, enzyme linked immunosorbent assay, single radial haemolysis, particle agglutination, immunoblot assay				
Understands the principles behind virus isolation using cell culture, including preparation and propagation of cell lines, choice of cell line, inoculation of clinical specimens, recognition of cytopathic effects, use of neutralization and other confirmatory tests				
Is aware of the principles of electron microscopy, including direct detection, concentration methods and more specialized uses and the indications for its use				
Understands principles behind antigen/DNA/RNA detection using e.g. immunofluorescence, PCR, ELISA				

xi.

Environmental microbiology for microbiology trainees

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is aware of the existence of statutory requirements for certain food, water or milk types				
Is aware of the existence of statutory standards for bacterial and viral counts in bathing waters				
Is able to examine common types of food, water and milk for total counts, specific organism detection and special tests				
Is aware of available technologies for the detection of <i>Cryptosporidium sp.</i> and viruses from food or water samples				
Understands the principles behind interpretation of results on different food types and can advise environmental health officers and others accordingly				
Is aware of methods for detection of <i>Legionella sp.</i>				
Is able to undertake and interpret air sampling within hospital operating theatres				

xii. Parasitology for microbiology trainees

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is able to examine appropriate samples including faeces, urine and blood for parasites and when to refer specimens to specialist laboratories for further examination				
Is aware of the range of serological investigations and where they are performed				
Has gained experience in the clinical management of patients with parasite infection				
Is familiar with the management of ectoparasite infestation, including scabies, lice etc.				

xiii. Mycology for microbiology trainees

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is able to examine appropriate samples for fungi and knows when to refer specimens to specialist laboratories for further identification and susceptibility				
Is aware of the range of serological investigations and where they are performed				
Has gained experience in the clinical management of patients with fungal infection				

xiv. Epidemiology and statistics

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands the various methods of collecting data about communicable diseases, and the limitations of such data				
Understands the principles of case control and cohort studies				
Is able to construct basic data collection questionnaires using appropriate software packages, e.g. epi-info				
Understands the role of the local public health laboratory				
Has taken part in the management of community outbreaks of infection, e.g. food poisoning among guests following a function				
Understands the importance of statistics in the planning and execution of studies and knows when to seek expert assistance from a statistician				
Is aware of the statistical problems encountered in clinical trials, and of the types of statistical errors				
Can select and perform appropriate basic statistical analyses, including t-test, chi-square test, regression and correlation				

xv. Data handling

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has a basic understanding of information technology and, in particular, computerized laboratory data handling				
Is familiar with standard word processor, spreadsheet, relational database, statistics and epidemiology software packages				
Is familiar with the basic methods for electronic data transfer with local and remote computer systems				
Is familiar with the requirements of data protection				
Is aware of available technologies for data broadcasting				
Understands the importance of a standardized coding system				

xvi.

Quality Assurance

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands the difference between quality control and quality assurance				
Has experience of quality control using available schemes				
Understands the necessity for, and has taken part in, clinical audit, both internally within the laboratory and in the clinical setting in association with clinical colleagues				
Understands the procedures of laboratory accreditation				

xvii. Emerging technologies

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Is aware of all major new technologies available to medical microbiology (e.g. monoclonal antibodies and polymerase chain reaction)				
Is aware of all available automated, rapid techniques available to medical microbiology				
Is able to critically evaluate the need for emerging techniques within the laboratory, including cost effectiveness and effects on staffing levels and working practices				
Awareness of use of near-patient tests				

xviii. Research and development

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has undertaken research projects appropriate to grade and training stage				
Has submitted paper(s) for publication in peer review journals				
Is aware of sources of funding for research projects and understands the processes involved in obtaining grants for research activities				
Can evaluate critically the published work of others				

xix. Teaching and training

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has had experience of teaching undergraduate medical students in tutorials groups and, if possible, formal lectures				
Has had experience of teaching doctors from other specialities (when suitably senior)				
Has had experience of teaching nurses (usually on infection control topics)				
Has had experience of training junior medical and scientific staff				
When appropriately senior, has had experience of training junior medically qualified microbiologists and virologists				

xx. Laboratory management and legislation

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Understands the necessity for, and has acquired the inter-personal skills necessary to deal with other members of staff both in the laboratory and outside				
Has regularly attended departmental management meetings and has been given delegated responsibility				
Has regularly attended divisional management meetings and has been given delegated responsibility				
Has regularly attended regional consultant microbiologists' meetings and has been given delegated responsibility				
Has regularly attended hospital infection control committee meetings and has been given delegated responsibility				
Has regularly attended drugs and therapeutics committee meetings (when antimicrobial/antiviral agents are discussed) and has been given delegated responsibility				
Understands the financing of a laboratory and how to allocate resources within the laboratory				
Understands the principles of personnel recruitment and selection and has joined appointments committees				
Has a clear understanding of individual performance review and has gained some experience in its application				
Has attended a suitable management course				
Understands the necessity for and the workings of the National Continuing Medical Education scheme				
Is aware of the duties of confidentiality of personal medical information				
Any other relevant legal requirements				

xxi.

Additional topics

Topic	Stage reached (when applicable) - Trainer's initials and date			
	1	2	3	4
Has basic knowledge of the immunological response to infection and laboratory methods to study immunity				
Has experience in molecular biology technology				