

RCPI*online*

The Royal College of Physicians of Ireland

**THE IRISH COMMITTEE ON
HIGHER MEDICAL TRAINING**

**CURRICULUM FOR HIGHER
SPECIALIST TRAINING**

IN

I M M U N O L O G Y

JUNE, 2004.

IMMUNOLOGY

INTRODUCTION

Immunology is a medical discipline which encompasses both clinical and laboratory aspects. In addition to carrying responsibility for running service laboratories, Immunologists are increasingly engaged in clinical management of patients. Their training has thus to address both the technical and managerial skills of the laboratory and the clinical skills relating to patient care. The discipline of Immunology includes Allergy.

ENTRY REQUIREMENTS

Applicants for Higher Medical Training (HMT) in Immunology must have completed as a minimum, two years General Professional Training (GPT) in approved posts and obtained the MRCP(I) or (UK) or equivalent. A period of experience in Immunology at Senior House Officer (SHO) or Registrar grade is desirable, but not essential before entry to HMT. Other medical specialties particularly relevant to the practice of Clinical Immunology include: Rheumatology, nephrology, infectious diseases, respiratory medicine, dermatology, haematology and paediatrics.

Higher Specialist Training in Immunology is open to applicants with a diversity of relevant previous experience. Applicants for entry to the specialty should recognise the advantage of additional training time spent (1 year) in the general specialist training grades in order to gain a broad range of experience.

GPT should provide a minimum of 24 months involved in direct patient care, at least 6 months of which must be spent on a service or services on which the emergency take is "unselected". "Unselected take is defined as acute medical intake encompassing the broad generality of medicine i.e. not restricted to any single or small group of specialties. If any major component of acute medicine (*e.g. cerebrovascular accidents, myocardial infarctions*) is excluded from the take, this experience must be obtained in other posts. During the period on "unselected take" trainees should have an on-call commitment which averages no less than 4 takes per month.

Graduates of non-Irish/UK medical schools without the MRCP(I) or (UK) who compete for HMT posts must provide evidence of knowledge, training and qualifications equivalent to MRCP(I) or (UK) standard, particularly in the care of acute medical conditions.

Duration & Organisation of Training

The total minimum time to complete HMT in Immunology (CCSCST eligible) is 5 years. In exceptional circumstances, this can include a period of up to 1 year's credit for training in Immunology undertaken at Basic Specialist (*Registrar*) Grade. Following an application and after consideration, the duration of training at SpR grade may be reduced to 4 years: this will require the explicit agreement of the National Specialty Director and the ICHMT Dean of Higher Medical Training. In the SpR grade, trainees will continue to work under Consultant supervision in the Immunology service, gradually widening their knowledge and experience in each area so that by the time they have passed the MRCP Path Part II they are able to work largely independently. The exact rotational arrangements will vary according to the development of departments in the various regional centres, the number of placements on the training scheme and the number of other trainees in the Training Programme. The training scheme should be organised in such a way as to give each trainee some experience in most recognised areas of sub-specialisation. More formal teaching and regionally and nationally organised training courses will supplement the day-to-day supervised training. The rotas should also be arranged in such a way that

SpRs have time available for participation in research projects as part of their training. The more academically inclined trainees will be encouraged to take time out from the training time to include a more sustained period of grant-funded research, working towards an MD or PhD. One year of this research time can count towards the five years needed for the acquisition of a CSCST.

The nature of Specialist Registrar training in Immunology is such that it is not appropriate to specify individual skills to be acquired by the end of any year; rather the five years should be looked at as a whole so that by the end of the training period the overall objectives listed in the following section will have been achieved. Training Programmes will include suitable rotations to cover all the necessary areas of experience and will include secondments to related specialities to ensure that each trainee gains the breadth of experience needed for their future career. Some areas of training are considered optional, however if a trainee wishes to develop competence in such areas, rotations will be modified accordingly.

The total **minimum** time for completion of training in Immunology and award of a CSCST is 5 years.

1. This period of training may include one year of Basic Specialty Training at Registrar grade.
2. Satisfactory completion is consequent upon acquisition of MRCPATH Part II which can only be undertaken after a minimum of 4½ years total training time in the Specialty.

Assessments, Training Record & Examination

Training will be undertaken in posts in departments that are educationally approved by the Faculty of Pathology. Training will be supervised by the Departmental Consultants on a day to day basis under the direction of the designated educational supervisor (*in each hospital*).

A **Training Record** or logbook will be maintained by the trainee. It will be counter signed **quarterly** by the relevant Trainer (*educational supervisor*) and may be used to confirm the satisfactory fulfilment of the required training experience and the acquisition of competence in areas enumerated in the Curriculum. The Training Record will remain the property of the trainee and must be produced at the Annual Assessment and for the final ICHMT decision on certification. The forms of assessment recorded in the Training Record are indicated below.

The Faculty of Pathology requires that there should be an annual assessment of trainees using a standard format and record of assessment and logbooks. The assessment will be carried out by a Committee of 4 Members comprising the National Specialty Director in Immunology, the ICHMT Dean of Higher Medical Training, and External Assessor (*for penultimate year and final year assessments only*), and the Honorary Secretary of the Education & Training Committee of the Faculty (*or a suitable alternate to be nominated by the Dean of the Faculty*). It will be the responsibility of the Assessment Panel to indicate where specific deficiencies in the trainee's experience exist, and if required, remedial action will be recommended. In these circumstances, the recommendation to issue a Certificate of Satisfactory Completion of Specialist Training (CSCST) will be withheld until the assessors are satisfied that the remedial actions have been successfully undertaken.

The MRCPATH Examinations will be the main objective assessments of progress. Part I of the MRCPATH is a test of knowledge which can be taken after a minimum of two and a half years training. MRCPATH Part II may be taken after a minimum of four and a half years total training time, of which three and a half years must have been in the SpR grade. Both of these examinations can be taken in Immunology.

The Faculty of Pathology and ICHMT will determine the date of completion of training having regard to:

1. acquisition of MRCPATH by examination **and**
2. satisfactory completion of all the requirements of the Curriculum in a recognised Training Programme.

The Faculty of Pathology will forward their recommendations to the ICHMT for issuance of a Certificate of Satisfactory Completion of Specialist Training (CSCST) in Immunology. This certificate can then be used, along with such other documents as may be required, for an application to the Medical Council for entry to the Register of Specialists and, where appropriate, for issuance of the Council's Certificate of Specialist Doctor (CSD).

RESEARCH, ACADEMIC & OTHER OUT-OF-PROGRAMME APPOINTMENTS:

Research experience is encouraged as part of HMT, and a period of **supervised**, high quality research remains an essential component of specialist training in Immunology as part of the MRCPATH Part II. The research should have relevance to Immunology and may contribute **up to 12 months** towards the time for completion of HMT. It will be essential to acquire in full the balance of the recommended training remaining. Some trainees may wish to extend their period in research beyond 12 months to two or three years, for example to study for a higher degree *PhD or MD*, after obtaining an SpR post, by stepping aside from their programme during HMT. This is perfectly acceptable, but no more than **one** year's educational credit will accrue for full-time research. However, when a research appointment also includes a programmed commitment to another prescribed component of the Curriculum, the trainee may be credited with additional time towards completion. This would be adjudicated on an **ad personam** basis by the ICHMT.

Academic and out-of-programme (e.g. *overseas*) posts are perfectly acceptable for consideration for inclusion in HMT in Immunology provided **prospective** approval has been obtained. It is emphasised to both trainees and supervising trainers that any training plan should be carefully thought out. And if either party has doubts about a particular activity, **prospective** advice from the National Specialty Director should be sought, and if necessary confirmed with the Dean of Higher Medical Training, as there are definite restrictions on the proportion of (*Irish*) HMT that can take place outside the jurisdiction of the ICHMT.

Approval of training in a department outside Ireland will only be considered if evidence of the nature of the training has been submitted in advance to the National Specialty Director through the Dean of Higher Medical Training to the ICHMT. This will normally require a written statement from the department concerned, accepting responsibility for training and identifying the educational supervisor of the post. Overseas training will be recognised for up to a maximum of two years and may consist of clinical training, or include research (*for which a maximum of one year credit is allowed*).

AIM OF CURRICULUM

The goal of the training programme is to enable trainees to acquire the requisite highly specialised scientific knowledge, clinical skills and laboratory skills required to:

- (a) diagnose, treat and where relevant, prevent diseases characterised by immunodeficiency, autoimmunity and allergic states and disorders.
- (b) direct a diagnostic immunology laboratory service.

SUBJECT MATTER

The principal areas of subject matter within the curriculum for Immunology are:

- Generic skills and attitudes essential for independent practice as a Consultant Immunologist
- Acquisition of a core body of knowledge in fundamental Immunology and its applications
- Investigation and management of patients with congenital and acquired immunodeficiency disorders
- Investigation and management of patients with autoimmune (including rheumatic) disease and systemic vasculitides
- Investigation and management of patients with allergy and allergic disorders
- The delivery of a diagnostic immunology laboratory service.

In addition, trainees should

- a) be able to explain the principles underlying the diagnosis, investigation and management of patients with lymphoproliferative disorders, and
- b) be able to explain the principles underlying organ and Bone Marrow transplantation.

Note: Immunological diseases may have both adult and paediatric presentations. Collaborative training with Paediatricians from appropriate sub-specialities will be undertaken. This will allow the trainee to develop the required skills essential for liaising with Paediatric colleagues.

TEACHING/LEARNING METHODS

The following teaching/learning methods will be used as appropriate to achieve the specific objectives

- a) "Apprenticeship learning" with senior clinical and non-clinical staff comprising discussion, observation, performance of practical procedures and subsequent evaluation
- b) tailored clinical experience
- c) task-specific on-the-job training
- d) personal study
- e) attendance of appropriate post-graduate education courses and meetings (e.g.: completion of a recognised MSc course in Immunology and/or attendance at meetings and courses run by the Royal Colleges and learned societies e.g. British Society for Immunology, British Society for Allergy and Clinical Immunology, Association of Clinical Pathologists)
- f) participation in multidisciplinary team meetings to plan service provision and individual patient care
- g) use of electronic/web based learning resources
- h) small group teaching e.g. tutorials, journal clubs
- i) carrying out Audit
- j) observation and practice of laboratory methods
- k) undertaking a laboratory based project
- l) secondment to other clinical disciplines, e.g. Rheumatology or Nephrology service

ASSESSMENT METHODS

- 1) Detailed procedures observed (DPO's) by trainer or other professionals and judged to be satisfactory against established criteria
- 2) Portfolio indicating evidence of learning eg. Literature reviews, case reports, publications, evidence-based protocols, patient information sheets and standard operating procedures authored by trainee
- 3) Testing knowledge during tutorials conducted by trainer
- 4) Written case records and presentations
- 5) Completed clinical and laboratory audits
- 6) Evidence of teaching others (including feedback from students)
- 7) Annual training assessments
- 8) Successful completion of relevant courses/degrees/diplomas (e.g. MSc in medical immunology)
- 9) Completion of MRCPATH Immunology Parts 1 and 2

KEY OUTCOMES OF THE TRAINING PERIOD

By the end of training, trainees will:

- Acquire a core body of knowledge in fundamental immunology to underpin clinical and laboratory practice.
- Understand the patho-physiology, including the molecular basis of
 - a) immunodeficiency diseases,
 - b) Autoimmune/rheumatic disease and systemic vasculitides,
 - c) allergic disease.
- Understand and be able to give advice on the appropriate use of laboratory tests
 - a) for the prevention, diagnosis and treatment of primary or secondary immunodeficiency
 - b) the diagnosis and assessment of autoimmune/rheumatic disease and systemic vasculitides;in pursuance of this objective the trainees should be able to perform the analytical phase of serological, cellular and molecular tests, required for assessing immune-competence or autoimmunity using standard operating procedures; they need to be aware of the relevant methods of quality control and quality assurance; they need to be aware of sensitivity, precision and specificity of relevant laboratory tests; they should be able to provide advice regarding clinically appropriate and cost-effective selection of laboratory tests, and be able to interpret these tests in context of clinical findings.
- Understand and be able to explain principles underlying organ and Bone-Marrow transplantation. Trainees will not be expected to have the skills necessary to take **primary** clinical responsibility for such patients, unless they have undertaken requisite specialist training. Attachments to a tissue-typing laboratory and clinical transplantation units will be required.
- Be able to assess and treat adult and patients with Primary Immunodeficiency Diseases. (See Primary Immunodeficiency Diseases, report of an IUIS Scientific Committee, Clin Exp Immunol; 1999, 118 (Suppl1): 1-28, for details of Primary Immunodeficiency Diseases).
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Be able to provide consultative advice on the diagnosis and management of secondary immunodeficiency. Most Immunologists will not be expected to take primary clinical responsibility for the management of patients with HIV infection unless they have undergone additional training and appropriate accreditation. However, trainees need to be aware of the clinical consequences of HIV infection, its epidemiology and prevention, current ideas about treatment and techniques required for monitoring HIV-induced disease.

- Be able to assess and treat (in association with rheumatologists or relevant organ-based specialists) adult patients with autoimmune rheumatic disease viz SLE, Scleroderma, Inflammatory muscle disease, and Systemic vasculitides: Wegener's granulomatosis, Microscopic polyangiitis, Cryoglobulinaemic vasculitis, GCA, Takayasu's arteritis, Polyarteritis nodosa, Henoch-Schönlein purpura.
- In close collaboration with paediatric colleagues, trainees need to be able to assess children with recurrent or unusual infections or failure-to-thrive to exclude immunodeficiency diseases and provide advice on appropriate referrals to tertiary-care centres, when more complex interventions e.g. bone marrow transplantation, are required.
- Be able to assess and treat patients with allergic diseases, including identification of clinically significant allergens and provision of avoidance advice, performance and interpretation of skin tests, RAST, symptom & food diaries and allergen challenges as applied to allergy diagnosis.
- Be aware of the definition, diagnosis, differential diagnosis and management of asthma, rhinitis, conjunctivitis and atopic dermatitis. This includes principles of patient education, management of acute and chronic severe disease and management of unwanted effects of therapy.
- Be able to recognise the clinical sequelae of IgE-mediated food allergy, and to distinguish these from intolerance syndromes, to be familiar with the advantages and disadvantages of skin prick testing, exclusion diets, diet diaries and single and double-blind-placebo-controlled food challenge in the diagnosis of food allergy, and to recognise gastro-intestinal disorders which may mimic food allergy and referred patients for appropriate specialist investigation.
- Be able to analyse and manage adverse reactions to drugs, including general and local anaesthetics, antibiotics and other drugs, and be familiar with the principles of drug challenge and desensitisation and provide advice in relation to the use of alternate drugs in allergic patients.
- Be able to describe the mechanisms, common causes, clinical features and differential diagnosis of anaphylactic and anaphylactoid reactions, and to organise the systematic approach to the identification of aetiology, to explain emergency treatment plans, including self-administration of adrenaline in adults and children and to provide management plans to patients prescribed adrenaline auto-injectors, written where necessary, with appropriate liaison between allergist, general practitioner, community paediatrician and school where appropriate.
- Be able to describe the efficacy, limitations, indications and contraindications for allergen immunotherapy and be familiar with different desensitisation regimens, and the advantages and disadvantages of different allergen preparations for immunotherapy, and be familiar with appropriate monitoring prior to, during and after desensitisation injections, including the management of trivial and severe reactions.
- Be able to manage allergic diseases in children as well as adults, and to recognise the differences in the natural history of allergic diseases and approaches to allergen avoidance and treatment in children, and to diagnose and manage allergic diseases affecting the respiratory tract, skin and gut in children, usually in collaboration with Paediatricians.
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Be able to liaise with other clinical colleagues for the optimum management of patients under the care e.g. Organ-Based Specialists, Clinical Geneticists.

- Be able to explain details of diagnosis, natural history, outcome of immunologically mediated diseases and required therapeutic measures, to their clinical colleagues, patients and their carers,
- Be aware of available disease registries and how to use them.
- Be aware of the patient support organisations and how to liaise with them.
- Be aware of relevant sources of information including computerised databases and should have the skills to use information resources to keep up to date with the latest developments in this rapidly developing field.
- Have the ability to work as part of a multi-disciplinary team within the clinical sphere of their activity, as well as in the delivery of their laboratory duties.
- They should have the requisite skills to maintain their Continuing Professional Development.

Therapy of Immunodeficiency Diseases

By the end of the training period:

- Trainees should understand and be able to explain the principles governing immune reconstitution of Immunodeficiency Diseases, including Immunoglobulin Replacement Therapy, bone marrow transplantation and Stem Cell Transplantation, Gene Therapy, Cytokine Therapy
- They should have detailed competence to undertake Immunoglobulin Replacement Therapy, including evidence-based indications for this treatment, the methods of delivery of replacement Immunoglobulin (*including intravenous and subcutaneous therapy*), potential hazards of this therapy, managing complications of this therapy, and organising and delivering home-care therapy.
- In close co-operation with other clinical colleagues (*e.g. specialists in Infectious Diseases, Microbiology and Virology*), they should have the ability to anticipate, prevent, detect and manage infections in immuno-compromised patients.

Therapy of Autoimmune diseases

By the end of the training period:

- Trainees should understand and be able to explain the principles governing the use of immunosuppressive drugs (*Steroids, Azathioprine, Cyclophosphamide, Cyclosporin, Tacrolimus, Sirolimus, and other agents as they enter clinical use*), high dose IVIg, therapeutic monoclonal antibodies (eg. anti-CD3, anti-CD52, anti-TNF), cytokines (*e.g. IL-2, interferons*), other biological agents used for immunomodulation e.g. Anti-Cytokine receptors (*TNF receptor*) and plasma exchange, including evidence-based indications for their use, methods of delivery, adverse effects, precautions needed during therapy (*e.g. in the use of immunisation*).
- Be competent to undertake immunosuppressive and immunomodulatory therapy including high-dose intravenous immunoglobulin therapy, plasma exchange, immunosuppressive drugs as above and biological agents as above

Immunoprophylaxis

(reference: Immunisation against Infectious Disease, Department of Health publication, London, HMSO, 1996 & Immunisation Guidelines for Ireland, 2002 & subsequent editions)

By the end of the training period the trainees should:

- Be able to explain the principles of immunoprophylaxis, including potential advances in the field.
- Be competent to provide consultative advice on immunisation to prevent communicable disease, including:
 - a) how to prevent and deal with adverse reactions,
 - b) immunisation of patients with immunodeficiency,
 - c) contraindications to immunisation,
 - d) the use of test immunisation to assess immune competence,
 - e) using information resources to keep up to date with this field.

Laboratory Immunology:

At the end of the training period the trainee will have the following competencies:

- Be able to select, interpret and provide clinical advice based on laboratory investigations as set out below, relevant to the diagnosis, assessment and monitoring of patients with suspected immunodeficiency, allergy or autoimmunity.
- Have the ability to write succinct, relevant and understandable reports in response to requests for investigation.
- Be able to perform procedures and investigations, which are in routine use in the immunology laboratory.
- Trainees will be able to explain the concept of **Quality Assurance and Quality Control**. This includes in depth understanding of the following topics: The concepts of internal quality control and external quality assurance sensitivity and specificity - analytic and clinical, accuracy and precision, false positivity and negativity, positive and negative predictive values, evaluation and standardisation of laboratory reagents, interpretation of QA/QC data and ability to apply the information to the routine operation of the laboratory as well as its use in assay trouble-shooting and the maintenance of quality, the role of external agencies (CPA, NEQAS and NQAAP) involved/associated with quality assurance, The role of audit in ensuring quality.
- Health and Safety: Trainees will be able to explain:
 - a) the importance of Health and Safety in the workplace in general and the laboratory in particular and the ways in which this can be ensured the roles of all parties involved in creating a safe environment from which to provide a laboratory Immunology service viz: The Hospital, The department, The individual member of staff, The Health and Safety Authority, The Advisory Committee on Dangerous Pathogens, The Radiation Protection officer & Control of Substances Hazardous to Health.

General Laboratory Management:

- **Process management**

The trainees will be able to:

- a) Distinguish between demand and workload
- b) Explain the staffing and non-staffing infrastructures required to meet demand and workload.

- **Human Resource management:**
- The trainees will understand the scope of:
 - a) Hospital policies and the role of the HR department in staff welfare and departmental - hospital interactions
- **Recruitment, training and retention methods and practice.**
 - a) The roles, training and developmental needs of the differing professional groupings within the department
 - b) The negotiation process
 - c) Disciplinary policies and procedures
- **Financial management:**

The trainees will understand the scope of:

 - a) Budget building, planning and management terminology and methods
 - b) Resource procurement how to undertake equipment evaluation and direct to the procurement process
- **Business Management and organisational structure in the Health Service**
 - a) Health Service management structures; National, Regional, Hospital and Community
 - b) Planning; Short, Medium and Long term
 - c) Service Contract Negotiations

CURRICULUM

The curricula, which follow closely, parallel those developed by the Joint Committee on Higher Medical Training, UK (Immunology, Allergy & Generic Curricula) with appropriate modifications.

1. GENERAL SKILLS AND ATTITUDES

AIM:

To facilitate the acquisition/development of general skills and attitude which are essential for independent practice as a Consultant Immunologist.

SPECIFIC OBJECTIVES:

1. To develop the **habit of lifelong learning** by building on previous undergraduate and general medical training experience so that relevant knowledge of immunology, disease processes and diagnostic techniques is acquired and maintained at a level consistent with the requirements of independent practice in Immunology.
2. Development of **critical skills for the assessment of published literature** and, where possible, to contribute to the advancement of such knowledge.
3. Development of **interpretative skills** such that clinically useful opinions can be produced from laboratory and clinical diagnostic procedures.
4. Developing the ability to provide **good clinical care**, including history taking, examination, selection of and interpretation of investigations, therapeutics, record-keeping and correspondence. Skill in the management of chronic disease, patient education and primary and secondary disease prevention will also be developed.
5. Develop ability to **teach and act as educational supervisor**. Trainees should gain experience teaching undergraduate and postgraduates in medicine as well as other health-care professions. Teaching should include tutorials, more formal lectures, clinical and procedural teaching and training in laboratory procedures. Knowledge of educational supervision, assessment and appraisal should also be gained.
6. Familiarity with **health and safety regulations** relating to the practice of Immunology such that the working environment is safe both for themselves and for their colleagues.
7. Understanding of **information technology** sufficient to be able to use computers for producing reports and laboratory statistics, to search databases and to access e-mail and internet services.
8. Development of **management and communication** skills in order to interact appropriately with medical, scientific, technical and clerical colleagues in the workplace and eventually to function as a team leader, if so requested.
9. Develop the knowledge and skills to deal with the **legal and ethical** issues which occur in the practice of immunology.
10. Develop knowledge and expertise in **risk management**, use of and development of evidence-based protocols and guidelines, and clinical and laboratory audit.
11. **Responsibility for their standard of professional practice** with an awareness of their own limitation, the benefits of team working and the requirements of Continuing Professional Development.

2. THE ACQUISITION OF A CORE BODY OF KNOWLEDGE IN FUNDAMENTAL IMMUNOLOGY AND ITS APPLICATIONS

AIM:

To provide the trainee with a core body of knowledge in fundamental immunology to underpin clinical and laboratory practice. (*Further details of fundamental immunology are provided in Appendix A*)

SPECIFIC OBJECTIVES:

Extensive knowledge of

- 1) Cells of the immune system
- 2) Cytokines, chemokines and other inflammatory mediators including lipid mediators
- 3) Phagocytic cells and their function
- 4) Antibody mediated immunity
- 5) Complement system
- 6) Cell mediated immunity.
- 7) Natural immunity
- 8) Regulation of the immune system
- 9) Hypersensitivity mechanisms
- 10) Mechanism of allergic inflammation
- 11) Pathogenesis of immunodeficiency
- 12) Pathogenesis of allergic diseases
- 13) Immunological Tolerance and the pathogenesis of autoimmunity
- 14) Scientific basis of allergy
- 15) Scientific basis of management of allergic disorders
- 16) Scientific basis of allergen immuno-therapy
- 17) Scientific basis of immunoprophylaxis
- 18) Scientific basis of therapy of primary immunodeficiency
- 19) Scientific basis of immunosuppressive and immunomodulatory therapy
- 20) New developments in therapy of immunodeficiency
- 21) New developments in therapy of allergic disease
- 22) Scientific basis of laboratory immunology

Adequate knowledge of:

23. Immunobiology of transplant rejection and its prevention
24. Classification and biology of malignancies of the lymphoid system

TEACHING/LEARNING METHODS:

- Attendance at a recognised MSc course in Immunology and/or
- Attendance at meetings and courses run by the Royal Colleges and learned societies:
 - Irish Society for Immunology
 - British Society for Immunology
 - British Society for Allergy and Clinical Immunology
 - Association of Clinical Pathologists
- Attendance at journal clubs
- Personal study
- Literature search & critical review
- Guidelines

3. STRUCTURED CLINICAL TRAINING

AIM:

To provide the trainee with the skills and knowledge required to:

- a) assess and manage patients with congenital and acquired immunodeficiency - antibody and cell mediated defects, complement deficiency and neutrophil defects, at a consultant level. (Use report IUIS Scientific Committee: Clin an Exp Immunology 1999; 118 (Suppl): 1-28 or updated equivalent reports as a guide
- b) Investigate and manage patients with autoimmune/rheumatic diseases and systemic vasculitides
- c) Investigate and manage allergy and allergic disease

SPECIFIC OBJECTIVES:

History taking

Physical examination

Selection and interpretation of appropriate laboratory and ancillary investigations (e.g. Lung function tests, CT scans etc)

Formulating differential diagnoses

Therapeutic Interventions:

Understand putative mechanisms of action of various immunological therapies including immunoprophylaxis

Have a working knowledge of the evidence base for the use of various immunological therapies including immunoprophylaxis

Be able to explain the indications for the use of these therapies including immunoprophylaxis

Be able to explain adverse effects associated with individual therapies and immunoprophylaxis

Diagnosis and management of immunodeficiency disorders in adults and children:

- Antibody deficiencies
- T-Cell/Severe Combined Immunodeficiencies
- HIV diseases

- Complement deficiencies
- Phagocyte deficiencies
- Asplenia
- Rare conditions
- Protocols for genetic studies of immunodeficiency syndromes
- Clinical features of congenital and acquired immunodeficiency syndromes
- Clinical assessment of patients with suspected secondary immunodeficiency
- Selection and interpretation of laboratory investigations
- Requesting and interpreting specific antibody titres and vaccination responses
- Functional analysis of complement
- Requesting and interpreting lymphocyte immunophenotyping & function testing
- Requesting and interpreting neutrophil function tests
- Management of i.v. immunoglobulin replacement therapy
- Management and prophylaxis of infections in the immunosuppressed patient

Diagnosis and Management of Systemic Autoimmune Disorders

- Diagnosis and management of SLE
- Diagnosis of rheumatoid arthritis and seronegative arthropathies
- Differential diagnosis of rheumatic diseases
- Rare Rheumatic Disorders: diagnosis
- Periodic fever syndromes - Diagnosis
- Systemic vasculitis including Cryoglobulinaemia

Diagnosis of Organ Specific autoimmune diseases

- Diagnosis of autoimmune skin diseases
- Diagnosis of autoimmune liver diseases
- Diagnosis of autoimmune endocrine diseases
- Diagnosis of autoimmune gastro-intestinal diseases
- Diagnosis of autoimmune neuro muscular diseases
- Diagnosis of rare autoimmune diseases

Diagnosis and management of allergic diseases in adults and children

- Anaphylaxis
- Urticaria/ Angiooedema
- Drug & vaccine allergy
- Anaesthetic reactions
- Atopic dermatitis
- Latex allergy
- Venom hypersensitivity

- Paediatric immunotherapy
- Allergen immunotherapy

Diagnosis of Lymphoproliferative disease and myelomatosis

- Myelomatosis and paraproteinaemias
- B-Cell malignancies
- T-Cell malignancies
- Rare disorders

Immunological Procedures

- Administration of Immunoglobulin (IV)
- Administration of Immunoglobulin (SC)
- Lung function tests: performance and interpretation
- Skin prick testing
- Imaging
- Skin biopsies
- Protocol for systematic investigation of anaphylaxis
- Protocol for emergency management of anaphylaxis in adults and children
- Management of home therapy programmes
- Understanding of principles and applications of patch testing

4. STRUCTURED LABORATORY TRAINING

AIM:

To provide trainees with the skills and knowledge to be able to direct a diagnostic immunology laboratory at Consultant level

SPECIFIC OBJECTIVES

- a) Competent performance of the following Laboratory Immunology Procedures and Methodologies
 - 1) Gel Immunoprecipitation, simple and electrodiffusion, single or double diffusion in one or two dimensions/phases e.g. radial immunodiffusion and Countercurrent Immunoelectrophoresis
 - 2) Protein Electrophoretic separation +/- immunoprecipitation e.g. Serum/Urine protein electrophoresis, capillary-zone electrophoresis, immunofixation, isoelectric focusing
 - 3) Enzyme linked immunosorbant assay (ELISA)
 - 4) Radioimmunoassay (RIA)
 - 5) Fluid phase Immunoprecipitation e.g. nephelometry and turbidimetry
 - 6) Passive particle agglutination,
 - 7) Western (Immuno) blotting utilising patient serum probes

- 8) Assessment of Neutrophil function: Respiratory burst and killing capacity e.g. Fluorochrome activation by flow cytometry; NBT reduction/chemotaxis studies
 - 9) Enumeration of the major and minor lymphoid populations employing flow cytometric techniques of phenotyping and sorting
 - 10) Isolation of lymphocytes and assessment of functional responses to mitogen stimulation
- b) Knowledge, competent performance and interpretation of the following Laboratory Immunology Assays:
- 1) Quantification of Immunoglobulins i.e. IgG, IgA, IgM, IgG subclasses, IgE and fragments (light and heavy chains) in serum and other body fluids e.g. urine & CSF
 - 2) Immunochemical Procedures: Trainees should be familiar with procedures for:
 - a) isolating and purifying serum protein fractions by gel filtration (exclusion chromatography) and purifying antibodies by specific immunoabsorption and elution using solubilized antigens;
 - b) labelling relevant proteins by fluorescent dyes, enzymes, radioactive tracers, etc.
 - c) fractionating proteins by salting out and chromatographic methods
 - 3) Methods for measuring specific IgG and IgE antibodies i.e. functional antibodies (tetanus, H influenzae and Pneumococcus), precipitins (avian, aspergillus), anti-venom and other allergen specific antibodies
 - 4) Detection and quantification of Paraproteins (monoclonal immunoglobulins)
 - 5) Detection and quantification of Cryoglobulins
 - 6) Detection and quantification of acute phase proteins
 - 7) Detection and quantification of other relevant proteins and molecules e.g. Beta 2 microglobulin, Tryptase, Histamine, ECP
 - 8) Investigation of Complement activation pathways (classical and alternative), individual components and products resulting from complement activation, complement control proteins, particularly CI-inhibitor
 - 9) C3 nephritic factor and other complement component autoantibodies
 - 10) Detection of auto antibodies including gastric parietal cell and related autoantibodies to smooth muscle, mitochondria, LKM, intrinsic factor, ANA and related rheumatic and connective tissue disease associated autoantibodies Rheumatoid factor, dsDNA, ENA, ANCA, MPO, PR3 and GBM antibodies, Antiphospholipid antibodies, Thyroid, pancreatic islet cell, adrenal, ovarian, sperm, acetylcholine receptor and other antineuroendocrine or exocrine specific antibodies
 - 11) Serological methods for the diagnosis of Coeliac disease
 - 12) Histopathology Procedures: Trainees must have knowledge of basic histology and be familiar with immunopathological changes seen in patients with immunologically mediated diseases (i.e. auto-immunity, hypersensitivity, lymphoid malignancy), affecting the kidney, bonemarrow, skin, blood vessels and the lymphoid system
 - 13) Direct immunofluorescence examination of skin, oral mucosa and renal biopsies

- 14) Assessment of Neutrophil function: Neutrophil phagocytosis, respiratory burst and killing capacity e.g. using fluorochrome activation by flow cytometry, chemiluminescence Candidal/S. aureus killing, NBT reduction, chemotaxis studies
- 15) Methods for determination of clonality of lymphocytes by Ig and TcR gene rearrangement studies
- 16) Isolation of mononuclear cells using density gradient and magnetic bead separation techniques
- 17) Assessment of lymphocyte function by determining proliferation after stimulation with mitogens and antigens including allo-MHC; investigation of cytokine synthesis and secretion profiles and effector function characterisation e.g. analysis of Th1 and Th2 profiles HLA typing by serological (*Lymphocytotoxicity*) and molecular genetic methods; PCR Sequence Specific Primer/Oligonucleotide (SSP/SSO)
- 18) Procedures used in Molecular Biology:
 - Theoretical knowledge of procedures used in gene cloning and the basic principles of gene cloning including preparation of DNA, use of vectors, screening of gene libraries and the potential use of products resulting from gene cloning, for diagnostic tests in the Clinical Immunology Laboratory
 - Preparation and storage of DNA from peripheral blood cells
 - Knowledge of digestion of DNA by restriction enzymes for the examination of restriction fragment length polymorphisms (RFLP) for genetic analyses
 - Knowledge of the technique of Southern blotting, the preparation of probes for RFLP analyses, Polymerase Chain Reaction, Northern Blotting, extraction of the probe from plasmids and the isotopic or enzymatic labelling of probes
 - The application of molecular methods for the detection of gene defects causing primary immunodeficiency
- 19) Knowledge of HLA typing by serological (Lymphocytotoxicity) and molecular genetic methods;
 - PCR Sequence Specific
 - Primer/Oligonucleotide (SSP/SSO)
- 20) Knowledge of methods used in the detection of anti-HLA antibodies and cross-matching

5. RESEARCH

Trainees must develop the skills to plan, analyse and critically appraise research projects and papers.

All trainees will be encouraged to undertake at least one clinical research project, as well as choosing, developing and writing up a case history of interest to clinical immunologists. As immunology is a relatively young speciality, it is recognised that an ability to share new information encountered in practice is an essential skill for all Consultant Immunologists.

Some trainees will wish to pursue an academic career and should be encouraged to be actively involved in major grant-funded research projects, possibly requiring an extension of their training time. This may be easier if they are appointed to lecturer posts to which special arrangements apply regarding credit towards completion of training. Those SpRs who are aiming at a general service career should show evidence of an inquiring mind, by participating in one or more research project(s) of a standard suitable for presentation at a scientific meeting or publication in a peer reviewed journal.

Appendix A:

FUNDAMENTAL IMMUNOLOGICAL KNOWLEDGE

Principles of body defence

Cell injury /death and inflammation
Non-specific defence mechanisms (barriers/humoral/cellular)
Specific defence mechanisms (humoral/cellular)

Complement

Genetics, structure, function, control in defence and in disease
Deficiencies

The acute phase response and inflammation

Cells of myelomonocytic lineage, NK cells and non-specific defence

Ontogeny, structure, phenotype, function and activation
Chemokines and migration from the blood vasculature
Complement and Fc receptors, adhesion molecules
Phagocytosis, intracellular/extracellular killing
Respiratory burst and secretory products

The basis of specific immunity

Antigens: types, structures, processing and presentation
Immunogenetics: polymorphisms, generation of diversity and rearranging
genefamilies
Immunoglobulins: structure, function and antigen binding
Major Histocompatibility Complex: structure, function and regulation
T cell receptors: structure, function and antigen binding

T and B Lymphocytes

Ontogeny, phenotype, subpopulations
Receptor/ligand interactions and cell activation
Effector functions

Organisation of the lymphoid system

Primary and secondary lymphoid organs
Population dynamics
Lymphocyte migration
Mucosal and other compartments of the lymphoid system

Cytokines, chemokines and immunomodulators

Cytokines and Chemokines: origin, structure, effects, site(s) of
action (receptor), metabolism regulation and gene activation
Inflammatory mediators (e.g. leukotrienes, prostaglandins and
Platelet-activating factor): origin, structure, effect, site(s) of
Action (receptor), metabolism and regulation

Hypersensitivity mechanisms

IgE mediated: acute and late phase reactions
IgE, IgA-, and IgM-mediated: opsonization, complement fixation,
antibody dependent, cell-mediated cytotoxicity, stimulation and
blocking
Immune complex mediated: physiochemical properties and
clearance
Cell-mediated: participating cells, effector mechanisms and
granuloma formation
Other: natural killer cells; lymphokine-activated killer cells and
cutaneous basophil hypersensitivity

Immunoregulation

Tolerance: clonal selection, suppression and antigen paralysis
Cell-cell interactions: help and suppression
Idiotype networks: inhibition and stimulation

Mechanisms of autoimmunity**Transplantation immunology**

Histocompatibility: major and minor antigens and principles of cross matching
Graft rejection: mechanism
Graft-versus-host reactions and their mechanisms

Tumour immunology

Tumour markers: leukaemias and lymphomas; cancer immunology
Oncogenes: translocation and breakpoints

Immunotoxicology

Mechanisms of adverse reactions to xenobiotics
In vivo and *in vitro* evaluation of immunotoxic compounds
Clinical aspects of immune disorders induced by drugs or environmental chemicals

Immunotherapy

Drugs
Vaccines
Antibodies
Recombinant molecules
Others

STATEMENT OF ORIGIN

Following consultation with colleagues in the U.K., Dr. Mary Keogan and Dr. Con Feighery set out a training programme similar to examples currently established in the U.K. Following adjustments for local needs, we have developed an outline rotational programme capable of delivering the Irish Immunology Curriculum.

Dr. Mary Keogan

Dr. Con Feighery