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## 2. CONTACT DETAILS

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3. OBJECTIVES AND LEARNING OUTCOMES FOR THE 2ND MEDICAL YEAR

Phase 2
This phase extends over two years and is designed to:
- Continue and expand the generic skills development with emphasis on the professional aspects and with exposure to geriatric and paediatric patients.
- Emphasise critical thinking and foster insight into the essential role of research in healthcare including aspects of molecular medicine and genetics.
- Commence the development of non-invasive clinical skills at the individual (history taking and physical examination) and community (health promotion) level.
- Introduce students to disease processes and to global as well as national aspects of disease control.
- Commence the development of invasive clinical skills.
- Focus on professional development by exploration of the legal, moral, ethical and economic aspects of safe effective medical practice.

There are 4 modules

Module 1:- BIOCHEMISTRY WITH IMMUNOLOGY, MOLECULAR MEDICINE AND PHARMACOLOGY (15 ECTS)
- Biochemistry lectures cover Introduction (Porter 1 lecture), Coagulation (O'Donnell 6 lectures), Extracellular matrix (Carroll/Volkov 8 lectures), Clinical Endocrinology (Boran 8 lectures), Clinical Biochemistry (Smith 7 lectures)
- Immunology (Jackson/Feighery/Kelly 10 lectures/2 tutorials) [total 42 hours]
- Molecular Medicine II (Molecular Basis of Human Development, Diseases and Therapy) (24 lectures)
- Fundamentals principles of pharmacology including drug actions and interactions. (30 lectures, 6 practicals and a tutorial)

Module 2:- NEUROSCIENCES (20 ECTS)
- This includes the study of the nervous system, from biophysics to behaviour in health and disease. The disciplines of anatomy, biochemistry, pharmacology and therapeutics, physiology and psychiatry all participate in this course which is delivered mainly in lecture format but includes also 5 integrated workshops. Anatomy of the head and neck is also included in this module.

Module 3:- AETIOLOGY, MECHANISMS, MANAGEMENT OF DISEASE (1) (15 ECTS)
- Introduction to microbiology (30 lectures, 6 practicals), Introduction to pathology (30 lectures). Systems and disease related pharmacology (16 lectures, Research Project)

Module 4:- CLINICAL SKILLS (10 ECTS)
- Communication workshops, Laboratory Skills (suturing, knots, catheterisation etc.), rotations through gerontology, radiology, cardiac laboratory, pulmonary laboratory, C P R. Ethics debates.
4. COURSE STRUCTURE

4. 1. MOLECULAR MEDICINE, BIOCHEMISTRY AND PHARMACOLOGY

4. 1. 1. BIOCHEMISTRY WITH IMMUNOLOGY

4. 1. 1. 1. INTRODUCTION
The course in biochemistry with immunology in the Michaelmas term of second year builds upon the sound foundation in biochemistry laid in first year. The course is clinically relevant, mainstream and covered in many, if not all, clinical biochemistry texts books or medical textbooks on biochemistry. The course is horizontally integrated in that subject in that material taught here is directly relevant to material covered later this year and in the years to come e.g. the course this year provides the foundation for pharmacology, molecular medicine, clinical pathology, haematology. The course is also vertically integrated in that knowledge from this course in fundamental to the understanding of e.g. the molecular basis of cancer, diabetes, immune function/dysfunction, diagnosis.

4. 1. 1. 2. COURSE STRUCTURE
The course in Biochemistry and Immunology gives a comprehensive grounding in crucial elements of Biochemistry and Immunology directly relevant to medicine. All lecturers are professional practicing scientists and medical researchers, who update their lectures each year. The topic covered are: Coagulation (Prof. James O'Donnell, St James Hospital, 6 lectures), Extracellular matrix (Dr. Joe Carroll, School of Biochemistry and Immunology, main campus TCD/Dr. Yuri Volkov, Centre for Molecular Medicine, St. James Hospital, 8 lectures), Clinical Endocrinology (Dr. Gerard Boran, 8 lectures), Clinical Biochemistry (Dr. Tom Smith, Department of Endocrinology, St. Vincents Hospital, 7 lectures), Immunology (Dr. John Jackson/Prof. Con Feighery/Dr. Kelly, Department of Immunology and Clinical Medicine, St. James Hospital, 10 lectures/2 tutorials), a total of 42 hours. All material covered in Biochemistry with Immunology is examined at the end of Michaelmas term.

4. 1. 1. 3 DETAILED COURSE OUTLINE

MICHAELMAS TERM – BIOCHEMISTRY WITH IMMUNOLOGY

Please note that this part of the course is examined at the end of Michaelmas term as the Biochemistry exam

Coagulation: Clinical Aspects Prof. James O'Donnell (6 lectures)

Lecture 1 Overview
Lecture 2–Primary haemostasis
Lecture 3–Coagulation cascade
Lecture 4–Regulation of coagulation
Lecture 5–Review and clinical aspects I
Lecture 6–Review and clinical aspects II

Learning Objectives
1) Describe normal haemostatic mechanisms including the interaction of vessel wall, platelets and clotting factors
2) Discuss the clinical relevance of normal haemostasis
3) Describe the initiation and regulation of coagulation cascade
4) Describe the central role played by endothelial cells in regulation of haemostasis in-vivo
**The Extracellular Matrix: Dr. Joe Carroll (4 lectures)**

1. **The extracellular matrix:** overview of composition; collagen, elastin and glucosaminoglycans; collagen-amino acid composition, biosynthesis, post-translation modification and processing, formation of fibres and alternative structures (particularly type IV), genetic defects in collagen structure and exon splicing

2. **Glycosaminoglycans:** classification, synthesis and properties; genetic disorders of glycosaminoglycan metabolism

3. **Calcification:** dietary calcium and absorption; structure of crystalline bone; vitamin D metabolism and calcium transport; regulators of osteoclast and osteoblast activity; parathyroid hormone and phosphate metabolism; regulation of calcium homeostasis; factors affecting the determination of calcium concentration

4. **Molecules involved in cell adhesion:** fibronectin and its binding to cells, collagen and glycosaminoglycans, influences of the cell-cycle and metastasis; cell communication with the morphogenesis and proliferation; laminin, it’s high affinity for type IV collagen and role in epithelial cell function.

Learning Objectives from the course ‘Extracellular Matrix’:
The objective of this short course is to gain understanding of the extracellular macromolecular structures which are present in all tissues. These molecules (collagen, elastin and glycosaminoglycans) determine the texture, rigidity, fluidity, strength, shape, elasticity of the tissues and serve as barriers against infection. The glycosaminoglycans influence the calcification of tissues. The extracellular matrix binds via Fibronectin to cells and forms a direct line of communication to the nucleus; Alterations to the extracellular matrix leads to changes to a cells morphology and biochemistry. Genetic diseases of the extracellular matrix have profound effects on growth, learning, sight, etc. We will also examine how Calcium homeostasis is regulated.

**Clinical Endocrinology Dr. Gerard Boran (8 lectures)**


7. **Growth and sexual development.** Normal and abnormal (precocious and delayed) puberty. Short and tall stature. Male and female pseudohermaphroditism. Associated adrenal enzyme defects. Testicular feminisation. Androgen insensitivity. 5α-reductase deficiency.


**Clinical Biochemistry**
**Dr. Tom Smith (7 lectures)**


2. **Fluid & Electrolytes: Sodium Balance:** Role of renin, aldosterone and atrial natriuretic peptide. Clinical and laboratory assessment of sodium depletion or excess. Causes of Hypernatraemia and Hyponatraemia. Treatment guidelines, clinical cases.


LEARNING OBJECTIVES:
At the end of this series of lectures students will have a basic understanding of the main core areas of Clinical Biochemistry. They will be in a position to understand and explain from a biochemical and pathophysiological point of view derangements in water, electrolyte, lipid, enzyme, acid base and renal function. Case interpretation by integration of clinical and biochemical data is a fundamental learning objective and students will be provided with the information to logically derive diagnoses and suggest patient management and treatment options in the areas covered.

FUNDAMENTAL IMMUNOLOGY

(14 lectures and 2 tutorials)

Lecturers: Con Feighery, John Jackson, Jacinta Kelly, Yuri Volkov

Course Aim
To impart an understanding of how the immune system works and of its importance in maintaining health and causing disease.

1. Introduction to the Immune System in Health and Disease. (1 lecture)
John Jackson
Learning Objectives:
Be familiar with the importance of the immune system in health and disease.
Know the consequences of an inadequate immune system.
Know about the role of barriers
Understand the local and systemic inflammatory responses
Be familiar with the role of immunotherapy to treat and prevent disease.
Summary of topics covered:
Secondary immune deficiency, role of nutrition, extremes of age, introduction to immune manipulation, active and passive immunisation, mechanical barriers, local and systemic inflammation, selected inflammatory disorders (to include sepsis, ARDS, cerebral malaria, rheumatoid arthritis, inflammatory bowel disease), mediators of inflammation (mast cells, plasma cascade pathways, arachadonic acid metabolites, prostaglandins, leukotrienes, cytokines. Introduction to anti-inflammatory therapies and new immune modulating agents.

2. Structure and organization of the Immune system (1 lecture)
Con Feighery
Learning objectives:
To gain an understanding of –
Organization of the immune system
Cells of the immune system
Response of cells to antigen
Lymphoid tissues
Summary of topics covered:
3. Phagocytosis. (1 lecture)  
John Jackson.  
Learning objectives:  
Understand phagocytosis as a primary defence mechanism.  
Know the stages of phagocytosis.  
Be familiar with the concepts of opsonisation, chemotaxis.  
Understand the role of phagocytes in disease.  
Summary of topics covered:  
Neutrophils, macrophages, eosinophils, specialisation within phagocytic cells, production of phagocytic cells, cell adhesion, diapedesis, chemotaxis, opsonisation, ingestion, killing, degranulation of phagocytic cells, introduction to antigen presentation, abscess formation, pneumonia.

4. Introduction to specific immunity  
John Jackson (1 lecture)  
Learning objectives:  
Know the features of specific immunity  
Understand the concept of clonal selection and polyclonal immune responses  
Be familiar with primary and secondary immune responses  
Understand specific antigen recognition by T and B cells.  
Summary of topics covered:  
Adaptive nature of specific immune responses, specificity, memory, clonal origin of immune cells, primary and secondary immune responses, clonal selection and clonal expansion, memory cells, B and T cell activation.

5-6. The role of T cells in the Immune system (2 lectures)  
Con Feighery  
Learning objectives:  
The central role of T cells in the immune response  
Memory T cells help protect against infection  
How T cells depend on other cells for their function.  
Summary of topics covered.  
How T cells respond to antigen.  T cell surface structures.  T cell antigen receptor.  
Presentation of antigens to T cells by antigen presenting cells.  Different types of T cells.  T helper cells.  T cytotoxic cells.  T cells bind to a combination of antigen and major histocompatibility complex (MHC) molecules.  Clinical scenarios: T cells cause chronic viral hepatitis.  HIV infection and certain drugs deplete T cells.

10^{12} T cell clones.  One clone for every antigen.  T cell memory.  Vaccination.  The major histocompatibility complex (MHC).  Transplantation rejection.  Two types of MHC molecules.  T cytotoxic cells bind to Class I molecules.  T helper cells bind to Class II molecules.  Types of cells which have MHC I or MHC II on cell surface.  Clinical scenario: immune deficiency caused by genetic defect in synthesis of MHC.

7. The role of cytokines in the immune system (1 lecture)  
Con Feighery  
Learning objectives:  
Cells which produce cytokines influence the behaviour of other cells  
Blocking cytokine function can control disease  
Summary of topics covered:  
Nature and function of cytokines.  Types of T cell cytokines.  T cell cytokines which promote B cell production of antibody.  Over production of IL-4 and allergic disease.  Cytokines which cause chronic inflammation.  Cytokines produced by other cells.  Clinical scenario: blocking cytokines to control disease e.g. rheumatoid arthritis.  Defect in cytokine receptors cause immune deficiency.
8. The importance of MHC molecules in the immune system (1 lecture)
Jacinta Kelly
**Learning objectives:**
- How antigen binds to MHC molecules
- MHC genes predispose to many inflammatory diseases.
**Summary of topics covered:**
- Two different pathways for antigen to bind to MHC molecules. Endogenous antigen binds to MHC class I: antigen fragment digested by proteasome and transported by TAP1 and TAP2. Exogenous antigen binds to MHC class II: antigen binds after release of invariant chain.
- Clinical scenario: strong association of some inflammatory diseases with MHC molecules – HLAB27 with ankylosing spondylitis, HLA-DQ2 with coeliac disease.

9. Antibody (immunoglobulin) structure and function (1 Lecture)
John Jackson
**Learning objectives:**
- Understand how the structure of antibodies relates to their function
- Know the role of antibody classes
- Be familiar with the different ways in which antibodies may be used in the laboratory
- Know about monoclonal antibodies
- Be familiar with different types of antibody therapy
**Summary of topics covered:**
- Four chain structure of antibodies, variable and constant regions, hypervariable regions, immunoglobulin fold, structure and function of IgG, IgA, IgM, IgE, IgD, monoclonal antibodies, laboratory tests utilising antibodies, antibodies as therapeutic agents.

10. Why we don't react against our own ‘self’ antigens (1 lecture)
Con Feighery
**Learning objectives:**
- To understand the different ways the body has developed to prevent immune self-damage
- Know types of auto-immune disease
- Be familiar with the basis for diagnosis of auto-immune disease
**Summary of topics covered:**

11-12. Molecular mechanisms of cell interactions (2 lectures)
Yuri Volkov
**Learning objectives:**
- Understand the importance of cell adhesion mechanisms in normal physiological conditions and disease development.
- Know the key functions of adhesion molecules and basic signalling mechanisms induced via this type of cell receptors.
- Be familiar with classification of adhesion receptors and ligands.
- Apply knowledge of adhesion molecule functioning to disease diagnosis.
**Summary of topics covered:**
13-14. Molecular basis of leukocyte migration and recirculation (2 lectures)
Yuri Volkov

Learning objectives:
Know the key steps involved in leukocyte extravasation.
Understand adhesion-dependent internal machinery of leukocyte migration.
Be familiar with chemokine structure, classification and function.
Be able to explain the factors influencing leukocyte tissue-specific homing.

Summary of topics covered:
Multi-step leukocyte navigation paradigm. Mechanistic models of leukocyte migration.
Membrane receptors and soluble factors affecting leukocyte homing. Chemokines, their classification and disease-specific importance. Leukocyte recirculation routes. Multi-factorial mechanisms of cell directed leukocyte recruitment into disease sites.

Tutorials based on case studies

1. Allergy and autoimmunity
John Jackson and Con Feighery

Learning objectives:
Interpret common immunological signs and symptoms
Understand how the immune system may act inappropriately
Understand immunity to harmless environmental antigens (allergy)
Know the different types of allergy and common allergic diseases
Understand the concepts of autoimmunity
Know how the immune system may respond to self antigen
Be familiar with selected autoimmune disorders

Summary of topics covered:
IgE mediated allergy, hay fever, asthma, excezma, venom allergy, food allergy, anaphylaxis, therapy for allergic disorders. Predisposing factors to autoimmunity, features of autoimmunity, mechanisms of autoimmunity, SLE, rheumatoid arthritis, multiple sclerosis, Goodpasture’s syndrome, autoimmune haemolytic anaemia, diabetes and thyroid disease. Therapy for autoimmunity.

2. Immunodeficiency and Cancer
Con Feighery and John Jackson

Learning objectives:
Interpret common signs and symptoms of immunodeficiency
Have knowledge of selected forms of immunodeficiency
Interpret common signs and symptoms of malignancies of cells of the immune system
Understand the putative role of the immune system in cancer

Summary of topics covered:
Primary and secondary immune deficiency disorders, recurrent infection, chronic infection, opportunistic infection, failure to thrive, leukemia, lymphoma, myeloma, clonal proliferation and apoptosis.

4. 1. 1. 4. READING LIST

General suggested reading list (textbooks and encyclopaedic style editions):
Immunology for Medical Students by Roderick Nairn and Matthew Helbert, (Mosby Publishers, 2002).
Lippincott’s Illustrated reviews 3rd edition Champe, Harvey and Ferrier.

Each lecturer will give you their updated reading lists for their course.

In addition, the students are expected to use topic-specific reading lists and online material, as suggested by lecturers on relevant subjects.
4. 1. 2. MOLECULAR MEDICINE

4. 1. 2. 1. INTRODUCTION

Recent years have witnessed a rapid accumulation of knowledge of molecular basis of human diseases giving the rise to Molecular Medicine as a discipline providing an insight into the mechanisms of development of pathological processes at molecular level. Molecular Medicine nowadays continuously supplies novel powerful tools for diagnostics, therapeutic drug development, ethiotropic and pathogenetic treatment of a wide range of ailments, including some of those, which were previously considered incurable. Medical graduates with a good knowledge of Molecular Medicine have a potential of significantly improving the current diagnostic and therapeutic routines and to forming a strong liaison between hospitals, diagnostic labs, biomedical research institutions, and pharmaceutical industry for the ultimate benefit of patients’ treatment. This course is aimed to provide medical students with powerful knowledge in the molecular mechanisms of human disease development and related cutting edge diagnostic tools.

4. 1. 2. 2. COURSE STRUCTURE

The course is taught for the duration of two terms (Hilary) as a series of lectures and tutorials dealing with diverse aspects of Molecular Medicine and is designed to implement the knowledge accumulated by the students in closely related disciplines (Biochemistry, Immunology and Pharmacology) for a better understanding of molecular mechanisms of human disease and contemporary approaches to their treatment. The course does not include scheduled practicals. Additional tutorials dealing with specific aspects of Molecular Medicine can be arranged by request.

Over the Hilary term, the students will be given a series of lectures focused on more specific molecular mechanisms of human diseases. The fundamental knowledge accumulated from the Biochemistry course at the Michaelmas term will be applied here to the in-depth understanding of the molecular aspects of metabolic disorders, diabetes, obesity and disease-related impairs in intracellular biochemical pathways. The knowledge of the molecular basis of immune defence taught during the first term will be further extended and applied to such topics as molecular basis of inflammation, cancer, leukaemia and psychiatric disorders, key aspects of human development, tissue damage and regeneration. The students will be also introduced to novel molecular approaches to diagnostics and therapy, including NanoMedicine and medical proteomics.

HILARY TERM – MOLECULAR MEDICINE (MOLECULAR BASIS OF HUMAN DEVELOPMENT, DISEASES AND THERAPY) (24 LECTURES)

Please note that this part of the course is examined at the end of Hilary term

Course Aim
The overall objective of this part of the course is to empower the students with the knowledge of the essential aspects of molecular mechanisms of disease development, medical genomics and molecular embryology accumulated over the recent years and to enable the medics to apply this information in clinical environment for improved diagnostic and treatment of the patients.

Learning Objectives:
The students are expected to be able to:
- explain the genetic alterations involved in the development of metabolic disorders and cancer
- understand the major molecular mechanisms involved in inflammation
- explain the molecular processes underlying common psychiatric disorders
• understand the molecular mechanisms involved in human development, developmental abnormalities, tissue damage and regeneration and stem cell applications
• describe the major methods used in recombinant DNA and protein technology and define their applications
• be familiar with the use of databases containing information about genomics and genetic disorders
• describe strategies used in gene delivery used for gene therapy
• explain how structural analysis of molecules can be applied to the generation of novel drugs and design of new therapies
• understand the environmental and dietary factors contributing to disease development
• discuss ethical considerations and implications associated with genetic diagnoses.

1-2. Molecular basis of development and molecular embryology (2 lectures)
Paula Murphy
Summary of topics covered:

3-4. Nanomedicine and medical applications of molecular imaging (2 lectures)
Yuri Volkov
Summary of topics covered:
Contemporary approaches to biomedical studies at molecular level. Tools used for visualisation of intracellular processes. Nanomedicine, nanotechnologies and novel diagnostic and drug delivery systems. High content analysis in drug development and screening.

5. Medical proteomics (1 lecture)
Henry Windle
Summary of topics covered:

6-7. Molecular mechanisms of cell damage and regeneration; stem cells origin and applications (2 lectures)
Veronica Campbell
Summary of topics covered:

Andrew Bowie
Summary of topics covered:
Molecular mediators of inflammation. The role of Toll-like receptors and nucleotide-binding oligomerisation domain proteins in infection and inflammation. IL-1 as a factor affecting gene expression. NFkB and inflammatory process development. Tumour necrosis factor and caspases in inflammation.

10. Anti-inflammatory drugs (2 lectures)
Paul Spiers
Summary of topics covered:

11-14. Molecular Mechanisms of Cancer (4 lectures)
Dermot Kelleher
Summary of topics covered:


15-16. Molecular basis of leukaemia and gene therapy (2 lectures)
Mark Lawler
Summary of topics covered:

17-20. Molecular mechanisms of metabolic diseases (4 lectures)
John Nolan
Summary of topics covered:


21-22. Neural development (2 lectures)
Kevin Mitchell

Summary of topics covered:

23-24. Molecular basis of psychiatric disorders (2 lectures)
Derek Morris and Richard Anney

Summary of topics covered:

Molecular mechanisms in aetiology of ADHD. Applications of molecular genetics in diagnostics of psychiatric diseases. Mouse models of ADHD. Dopaminergic hypothesis in ADHD. Treatment approaches and their link to research in ADHD.

4. 1. 2. 4. READING LIST

The cell: a molecular approach (Geoffrey M. Cooper)
Molecular cell biology (Harvey Lodish et al.)
Molecular biology of the cell (Bruce Alberts et al.).
Encyclopedia of molecular cell biology and molecular medicine (Robert A. Meyers)
Molecular Medicine (R.J.Trent)
Essentials of Human Embryology (Larsen)
Introduction to Molecular Medicine (Ross, Dennis W.)
An Introduction to Molecular Medicine and Gene Therapy (Thomas F. Kresina)
4. 1. 3. PHARMACOLOGY

4. 1. 3. 1. COURSE STRUCTURE

This course is aimed at developing a knowledge and understanding of the pharmacological basis of therapeutics in order that the student will gain a critical and intelligent insight into the scientific underpinnings of drug use and abuse. The course comprises a series of lectures, tutorials and student practicals. Student participation in the latter is encouraged and students see at first hand the basis of drug action and learn how to quantify drug effect and the importance of a reliable and reproducible data collection. Toxicology, particularly in relation to drugs, is also considered. Medicines administered to student volunteers include nifedipine, salbutamol, alcohol, anti-histamines. In addition, students each undertake a research project within a two-week period during which they learn to generate and analyse their own data with a view to learning scientific method and reasoning. This usually involves study design, generating personal data, quality control, statistical evaluation, interpretation of results and presentation to an audience by poster. Students must also demonstrate the ability to evaluate literature in the form of a research essay.

ATTENDANCE AT ALL PRACTICALS CLASSES AND FOR THE RESEARCH PROJECT IS MANDATORY.

STUDENTS WILL BE ISSUED WITH A LOGBOOK AND ARE REQUIRED TO GET IT SIGNED AT THE END OF EACH PRACTICAL CLASS/RESEARCH DAY TO VERIFY THAT THEY HAVE PARTICIPATED AND HAVE ACHIEVED A SUITABLE LEVEL OF COMPETENCY. A PERCENTAGE OF THE END OF YEAR MARK WILL BE BASED UPON THE LOGBOOK RECORD

NB: ONLY ONE LOGBOOK WILL BE ISSUED AND IT IS THE RESPONSIBILITY OF THE STUDENT TO KEEP IT SAFE, HAVE IT SIGNED AND RETURN IT TO THE DEPARTMENTAL SECRETARY WHEN REQUIRED.

4. 1. 3. 2. INTRODUCTION

Principles of Drug Action I (Introduction to Pharmacology)

By the end of these lectures the student should be able to:
- grasp the overall aims and objectives of the Basic Pharmacology course and how it relates to Medicine, especially Clinical Pharmacology and Therapeutics

Principles of Drug Action II (Receptor Pharmacology)

By the end of these lectures, the student should be able to:
- know the different ways of classifying drugs and their effects, both therapeutic and toxic
- know the framework for understanding and describing the pharmacology of drugs
- understand the concept and types of pharmacological receptor, agonism, antagonism and related pharmacological terms
- explain the relative selectivity of most drugs

Cholinergic Pharmacology I, II and III

By the end of these lectures, the student should be able to:
- appreciate the distribution and classification of cholinceptors, especially as it relates to the autonomic nervous system and skeletal neuromuscular junction
- know the potential sites for interfering with cholinergic neurotransmission
- describe the functional consequences of cholinergic stimulation and the mechanisms by which these are produced and terminated
- discuss the basic signalling events associated with different cholinergic receptor activation
Adrenergic Pharmacology (x2)
By the end of these lectures, the student should be able to:
• appreciate the distribution and classification of adrenoceptors
• know the potential sites for interfering with adrenergic neurotransmission
• describe the functional consequences of adrenergic stimulation and the mechanisms by which these are produced and terminated
• discuss the signalling events associated with different adrenoceptor agents
• understand mechanisms of dopamine modulation

Pharmacological Modulation of the Presynaptic Adrenergic Neurone
By the end of this lecture, the student should be able to:
• describe the biosynthesis, release and reuptake mechanisms for noradrenaline
• know and understand the mechanisms by which drugs selectively modulate presynaptic adrenergic neurotransmission

Histamine Pharmacology
By the end of this lecture, the student should be able to:
• appreciate the distribution and classification of histamine receptors
• know the potential sites for interfering with histamine storage, release and metabolism
• describe the functional consequences of histamine receptor activation and the mechanisms by which these are produced
• discuss the signalling events associated with different histamine receptor agents

Pharmacokinetics I (Drug Absorption, Distribution and Metabolism)
By the end of this lecture, the student should have:
• An appreciation of factors influencing drug bioavailability
• Knowledge of drug metabolising enzyme systems and understand the importance of enzyme induction and inhibition in the clinical setting

Pharmacokinetics II (Drug Excretion and Clearance)
By the end of this lecture, the student should:
• Have an awareness of factors influencing renal elimination of drugs
• Be familiar with basic pharmacokinetic parameters and understand their clinical relevance

Pharmacogenomics
By the end of this lecture, the student should:
• To appreciate how one’s genetic constitution may influence how the body handles and responds to drugs.

Pharmacology of Prostaglandins and Leukotrienes
By the end of this lecture, the student should:
• Understand the classification, chemistry, biosynthesis and catabolism of eicosanoids
• know and understand the pharmacological action of drugs acting on prostaglandin and leukotriene receptors

5-Hydroxytryptamine and Peptides
By the end of this lecture, the student should be able to:
• appreciate the distribution and classification of 5-HT receptors
• describe the functional consequences of 5-HT receptor stimulation and block
• discuss the signalling events associated with different 5-HT receptors
• understand the classification of peptide receptors

Pharmacology of Cardiac Rhythm
By the end of this lecture, the student should be able to:

- understand the electrophysiological basis of action potentials
- describe causes associated with common arrhythmias
- appreciate the concepts of the Vaughan-Williams classification
- know and understand the mechanisms of action of antiarrhythmic agents

**Pharmacology of Cardiac Contractility**

By the end of this lecture, the student should be able to:

- describe the direct and indirect effects of cardiac glycosides on the heart
- understand and explain the mechanisms of action of cardiac glycosides and phosphodiesterase inhibitors with regard to cardiac contraction
- appreciate adverse effects of cardiac glycosides and phosphodiesterase inhibitors

**Pharmacology of Vascular Tone**

By the end of this lecture, the student should:

- Understand the importance of nitric oxide and the effects of its manipulation on the vascular wall.
- Appreciate the diversity among the vasodilators in terms of mechanism of action, clinical uses and adverse effects.

**Pharmacology of Volume Regulation**

By the end of these lectures, the student should:

- Learn the tubular transport system and site of action of diuretics
- Know the definition of a diuretic and the type of diuretics available.
- Understand the uses of diuretics in various diseases
- Know and understand the mode of action for various groups of diuretics and know at least one example from each group
- Know and understand the health problems associated with fall and increase in potassium levels in the body and the supplementation of potassium when required.
- Know the effect of diuretics on ion balance in the body and their effect on urine electrolyte and pH values and effects of hypokalaemia (low potassium) on body systems.
- Know the side effects and important drug interactions of diuretics

**Drugs for the Control of Haemorrhage**

By the end of this lecture, the student should:

- know the blood coagulation cascade and various mechanism involved in the control of bleeding
- Know the conditions associated with excessive bleeding and how much blood a patient can loose without serious consequences.
- Understand the meaning of a unit of blood and the anticoagulants used in blood transfusions and for the collection of blood samples for laboratory analysis
- Know various agents which can be applied locally to stop bleeding and those which can be given systemically when the bleeding site is not accessible

**Anticoagulants and Thrombolytics**

By the end of this lecture, the student should:

- know the blood coagulation cascade and various mechanism involved in the control of bleeding
- Know the conditions associated with excessive bleeding and how much blood a patient can safely lose without serious consequences.
- Understand the meaning of a unit of blood and the anticoagulants used in blood transfusions and for the collection of blood samples for laboratory analysis
- Know various agents which can be applied locally to stop bleeding and those which can be given systemically when the bleeding site is not accessible
**Integrated Cardiovascular Pharmacology (2 lectures)**
By the end of this lecture, the student should:
- Have an understanding of modern cardiovascular disease management
- Appreciate that the treatment of cardiovascular disease often involves significant overlap among pharmacological classes of agents (previously considered in the context of individual physiological systems)
- Appreciate that such interference will have predictable secondary/ unwanted consequences.

**Thyroid Hormone Production and Nuclear Receptor Interactions**
By the end of this lecture, the student should:
- Understand the biochemical steps in thyroid form production that are susceptible to interference
- Understand how and with what consequences, thyroid hormones react with cell nuclear receptors.

**Pharmacology of Cholesterol and Lipoprotein Metabolism**
By the end of this lecture, the student should:
- To appreciate the sites of action of drugs that lower plasma lipids especially in relation to cardiovascular risk.

**Pharmacology of Calcium Homeostasis**
By the end of this lecture, the student should:
- To understand how hormones, vitamins and drugs may influence calcium levels and bone content.

**Basic Pharmacology of Insulin and Oral Hypoglycaemics**
By the end of this lecture, the student should be able to:
- describe the mechanisms associated with insulin release and glucose uptake
- understand the kinetics associated with altering the formulation of insulin
- know the mechanisms of action of a range of oral anti-hypoglycaemic agents

**Pharmacology of Hypothalamic and Pituitary Hormones**
By the end of this lecture, the student should:
- Understand the complex interplay between the hypothalamus, pituitary and target endocrine organs
- Appreciate the important role of the hypothalamic-pituitary system in regulating body metabolism and its value to man for survival
- Extend the functions of the hypothalamus and pituitary gland to their dysfunction and its consequences

**Adrenocorticosteroids and Antiadrenocorticosteroids**
By the end of this lecture, the student should:
- Understand the importance of the adrenal gland for human survival and the regulation of its functions by the hypothalamus and the pituitary glands as well as a complex interaction with other endocrine organs
- Know about the different types of corticosteroids and how adrenal dysfunction can lead to severe endocrine disorders
- Appreciate how corticosteroids modulate the immune response

**Revision Lecture**
- Content to be decided by the class

**Sex Steroids and Gonadotrophins I & II**
By the end of this lecture, the student should:
• Know the pharmacological actions of sex steroids (oestrogens, progestogens, androgens)
• Know the drugs that counteract the actions of sex steroids (anti-oestrogens, anti-progestogens, anti-androgens) and their uses and side effects
• Know the uses and side effects of sex steroid antagonists
• Know the uses and side effects of gonadomimetic agents, gonadotrophins and their analogs

**Molecular Targets in Inflammatory Disease**
By the end of this lecture, the student should be able to:
• discuss the functional consequences of immunostimulation and immunosuppression
• know and understand the mechanisms of action of pharmacological agents affecting immune responsiveness

**Molecular Targets in Cancer**
By the end of this lecture, the student should:
• appreciate the principles involved in chemotherapy
• know and understand mechanisms of action of a range of antineoplastic agents
• be able to discuss mechanisms contributing to drug resistance in chemotherapy

**Integrative Inflammation Pharmacology: Gout and Arthritis**
By the end of this lecture, the student should be able to:
• give an overview of the pathophysiology of gout and rheumatoid arthritis
• describe the pharmacological actions of agents used in the treatment of rheumatoid arthritis and gout
• understand the mechanism of actions of these agents

**Integrative Inflammation Pharmacology: Asthma**
By the end of this lecture, the student should be able to:
• describe how pharmacological agents modulate smooth muscle function in the lung
• appreciate the effects of inflammation on smooth muscle function and understand the mechanism by which drugs modify this response

**Pharmacology of Viral Replication**
By the end of this lecture, the student should:
• Have an overview of the viral life cycle and pharmacologic intervention
• Know the pharmacological classes of anti-viral agents
• Describe the mode of action of agents used in the treatment of HIV disease

**Pharmacology of Malaria and Anti-malarial Drugs**
By the end of this lecture, the student should:
• Know and understand the transmission of malaria the type of parasites nature of malaria caused by them.
• Know the stage of the parasite affected by individual groups and the uses of anti-malarial drugs.
• Know the modes of action and sites at which these drugs interrupt the malarial cycle.
• Know the Pharmacokinetics, side effects and drug interactions of anti-malarial drugs.
• Know the anti-malarial drugs used for the prevention of malaria drugs for the control of resistant strain of malarial parasite.
• Know the drugs used for relapsing malaria and the use of anti-malarials during pregnancy and in children.

**Drugs for Protozoal and Helminthic Blood Infection**
By the end of this lecture, the student should:
• Know the transmission and natural course of parasitic infections by Trypanosoma,
Leishmania, Schistosoma and Filaria and Helminth infections in blood
- Understand the mechanisms of action of drugs available for the control of these infections
- Know and understand intestinal parasitic infections of protozoa (Amoeba, Giardia) worms (both round and tape) and the drugs available for the control of these infections.

Pharmacology of Vitamins
- Know the definition of a vitamin and the types of vitamins available.
- Understand the importance of vitamins in health and disease.
- Know and understand some (non-vitamins) essential substances (inositol, choline, carnitine), daily requirements, deficiency symptoms.
- Understand the importance of (non-vitamins) essential substances in the maintenance of good health.
- Understand the symptoms of vitamin deficiency and the problems associated with vitamin overuse (hypervitaminosis).
- Know about the use of vitamins to treat disease.
- Know and understand the safety of vitamins in pregnant and lactating women.

Pharmacology of Agents Modulating Gastrointestinal Motility
By the end of this lecture, the student should be able to:
- describe the mechanisms of action of laxatives and anti-diarrhoeal agents
- know the physiology of the vomiting reflex
- discuss the mode of action of anti-emetic agents

Cellular Pharmacology of Antacids and Anti-ulcer Agents
By the end of this lecture, the student should:
- have an understanding of the pathophysiology underpinning peptic ulcer disease
- be able to list potential targets for pharmacological intervention
- know and understand the mechanisms of action of antacids and anti-ulcer agents

Molecular Toxicology and Teratogenic Drug Effects
By the end of this lecture, the student should be able to:
- Appreciate the diversity of mechanisms contributing to drug / chemical toxicity
- Realise the importance of the relationship between exposure of the foetus to a toxin and development of physiological/ morphological abnormalities
- Explain prototypical mechanism underpinning drug / chemical induced toxicity

Irish Medicines Board
By the end of this lecture, the student should:
- Have a comprehensive understanding of drug regulation at national and international level.

Prescribing
By the end of this lecture, the student should:
- Understand the legal background to the prescription and dispensing of medicines
- Know all the necessary elements of, and be able to write a valid prescription.

Adverse Drug Reactions
By the end of this lecture, the student should have:
- An understanding of drug-related adverse effects, how to look for such effects in clinical practice
- An appreciation of the importance of drug safety monitoring in the marketplace.

Non-Drug Poisoning
By the end of this lecture, the student should:

- Chemicals hazardous to man
- Acute and chronic toxicity
- Direct and indirect mechanisms of non-drug poisoning
- Venoms and toxins, poisons from plants
- Industrial poisoning, mercury, lead, cadmium, arsenic poisoning, chelators, air pollutants, organophosphate insecticides, paraquat
- Carcinogenesis and mutagenesis.

**Drug Overdose**

By the end of this lecture, the student should:

- The overall management of overdose and assessment of such patients is considered with detailed description of the use of antidotes, particularly for paracetamol
- The role of activated charcoal, forced diuresis, haemoperfusion etc. is considered
- The social and psychiatric aspects of suicide and para-suicide are discussed
- The function of the National Poisons Information Centre is outlined

**Introduction to Clinical Pharmacology**

By the end of this lecture, the student should:

- Appreciate the opportunity to learn the safe, effective and economic use of medicine from ongoing clinical attachments

**4. 1. 3. 3. READING LIST**

- British National Formulary (indicates Clinical use of drugs)

4. 2. NEUROSCIENCE

4. 2. 1. HEAD & NECK ANATOMY

4. 2. 1. 1. LEARNING OBJECTIVES

WEEK 5
By the end of this week students should be able to recognise all of the bones of the cervical spine and the skull, they should have a thorough knowledge of the mandible and a basic knowledge of the major fossae of the skull. In addition they should understand the major features of the early development of the brachial arches, face and palate.

WEEK 6
By the end of this week students should have a thorough knowledge of the anatomy of the face and skull, including the extracranial part of the facial nerve and the trigeminal nerve. They should have a thorough knowledge of the maxilla.

WEEK 7
By the end of this week students should understand the anatomy of the anterior and posterior triangles of the neck, including the strap muscles and the thyroid, trachea and oesophagus.

WEEK 8
By the end of this week students should have a good understanding of the temporal bone and the ear. They will also have a deeper understanding of the cranial fossae and the meninges.

WEEK 9
By the end of this week students should have a thorough understanding of the orbit and its contents. They should have a detailed knowledge of the temporal and infratemporal fossa, the muscles of mastication, the mandibular nerve and the temporomandibular joint. They should be able to identify the parotid gland and its important relations.

WEEK 10
By the end of this week students should have a thorough understanding of the pterygopalatine fossa, the maxillary nerve, the nasal cavity and paranasal air sinuses. They should be able to identify the structures of the submandibular triangle and the major blood vessels of the neck.

WEEK 11
By the end of this week students should be fully acquainted with the oral cavity including the tongue, the floor of the mouth and the palate. They should also be able to identify the internal features of the pharynx and demonstrate a knowledge of its structure.

WEEK 12
By the end of this week students should understand the early development of the special senses and have a detailed knowledge of the larynx.

WEEK 13
The last part of week 12 plus week 13 are spent in revising the anatomy of the head and neck.
4. 2. 1. 2. READING LIST

There is a wide choice of anatomy books available, but in reality it is difficult to go far wrong since the overall quality of modern anatomy books is excellent.

1. In Third Year retain your main textbook and atlas of anatomy from Second Year.
2. Get a book on Neuroanatomy if you have not already done so.
3. An embryology book is highly desirable. Alternatively, you may rely on your lecture notes and consult the library.
4. Reference books are useful in three main ways. Firstly they are helpful when your main textbook seems inadequate or unclear. Next, they are useful in learning how to systematically describe any structure. Finally, the introductory chapters to each system give an overview not provided in general textbooks. It is something of a luxury to buy a reference book, as there are copies in the library.

Below are some books that we recommend listed by title, author and publisher, but don’t feel compelled to choose from this list.

| Main Textbooks | • Last’s Anatomy: Sinnatamby: Churchill Livingstone  
| • Gray’s Anatomy for Students: Drake, Vogl and Mitchell: Elsevier  
| • Clinical Anatomy: Monkhouse: Churchill Livingstone  
| • Clinically Oriented Anatomy: Moore: Williams & Wilkins |
| Atlases | • Atlas of Human Anatomy: Netter: CIBA-Geigy  
| • A Colour Atlas of Human Anatomy: McMinn & Hutchings: Wolfe  
| • Human Anatomy: Gosling et al: Mosby  
| • Grant’s Atlas of Human Anatomy: Grant: Williams & Wilkins |
| Neuroanatomy | • Neuroanatomy - An Illustrated Colour Text: Crossman & Neary: Churchill Livingstone  
| • Clinical Neuroanatomy and related Neuroscience: FitzGerald and Folan-Curran: W B Saunders |
| Embryology | • Langman’s Medical Embryology: Sadler: Williams & Wilkins  
| • Medical Embryology: McLachlan: Addison Wesley |
| Reference | • Gray’s Anatomy: Williams et al: Longman  
| • Principles of Neural Science: Kandel, Schwartz and Jessel [Ed]: McGraw Hill  
| • Human Embryology and Developmental Anatomy: Bruce Carlson: Mosby |
4. 2. 2. NEUROSCIENCE

4. 2. 2. 1. INTRODUCTION

Neuroscience is the study of the nervous system, from biophysics to behaviour, in health and disease. In view of the complexity of the nervous system the subject is taught in a multidisciplinary and interdisciplinary manner. Approaches taken include molecular, biochemical biophysical, cellular, genetic, physiological, pharmacological, structural, behavioural and psychological. The Psychiatry/Psychology component gives special emphasis to covering topics across the ages.

The contact teachers for different departments are:
Anatomy       Mr Paul Glacken (pglacken@tcd.ie)
Biochemistry   Dr Gavin Davey
               (Examination coordinator; gdavey@tcd.ie)
Pharmacology/Therapeutics Prof. Michael Rowan (Course coordinator; mrowan@tcd.ie)
Physiology    Prof. Roger Anwyl (ranwyl@tcd.ie)
Psychiatry    Dr Aiden Corvin (psych@tcd.ie)
Other teachers from within College and associated hospitals will also be involved.

4. 2. 2. 2. LEARNING OBJECTIVES

It is important that students try to study the different aspects of the thematic areas in an integrated way.

Thematic areas covered include:
NERVOUS SYSTEM DEVELOPMENT
CELLULAR AND MOLECULAR NEUROSCIENCE:
Synaptic and Ionic Mechanisms
NEURODEGENERATION: common mechanisms
SENSORY SYSTEMS: Central Sensory / Perceptual pathways and Information Processing
BEHAVIOURAL & COGNITIVE NEUROSCIENCE: Cognition and Language / Speech
MOTOR SYSTEMS: Central Motor Pathways and Control
General Topography of the Nervous System
REGULATORY SYSTEMS: CNS Arousal / Activation Mechanisms
REGULATORY SYSTEMS: Affect (Motivation and Emotion)

4. 2. 2. 3. LECTURE SYNOPSIS

Lecture Synopses

WEEK 18

(Biochemistry) Cell-types in the brain and their functions.

(Anatomy) Introduction: CNS development
Ectodermal origin of the neural plate, neural folds and neural tube; Formation of brain and spinal cord; Alar and basal plates; Motor and sensory neurons; Rhombencephalon (myelencephalon and metencephalon), mesencephalon and prosencephalon (diencephalon and telencephalon); Formation of the medulla, pons, midbrain, cerebellum, basal ganglia, thalamus, hypothalamus, pituitary and the cerebral hemispheres; Development of the ventricular system.
(Physiology) Ion channels 1
Introduction to ionic channels. Electrophysiological properties of Na channels and Ca channels. Role of Na and Ca channels in generation of action potentials.

(Anatomy) Cerebral hemispheres: topography
Meninges; Sulci; Gyri; Frontal, parietal, temporal, occipital and limbic lobes; Inferior aspect of brain; Insula; Cortical areas (Brodmann); Primary motor cortex; Premotor cortex; Supplementary motor area; Primary sensory cortex; Auditory cortex and language areas; Visual cortex; Association cortex; Commissural, projection and association fibres; Structural aspects; laminar organisation of the cerebral cortex; Isocortex and neocortex.

(Physiology) Ion channels 2
Electrophysiological properties of K channels. Role of K channels in generation of action potential and in regulation of frequency of action potentials.


(Psychiatry) Brain and Mind
What we know about the interaction between brain processes and mental states. The interactions between the physical and the mental and between biological and psychological.

(Psychiatry) Cognitive development I
Piaget’s theory as the main theory of cognitive development, how theories of development might inform clinical work, Intelligence and its measurement, the concept of IQ and its advantages and limitations.

(Biochemistry) Acetylcholine neurotransmission. NMJ. Docking proteins and evidence from botulinus and tetanus toxins. Stimulation of release by chemical, neurotoxic, ionic and electrical means. Mechanisms and control of release - the role of calcium ions and of phosphorylation events.

(Anatomy) Ventricles and CSF
Lateral ventricle: Central part, with frontal, occipital and temporal horns; interventricular foramen; relationship with caudate nucleus, septum pellucidum, corpus callosum, fornix, thalamus, forceps major, calcar avis, amygdala, hippocampus and tela choroidea. Third ventricle: Relationship with the fornix, corpus callosum, thalamus and interthalamic adhesion, hypothalamus, anterior commissure, lamina terminalis, optic chiasm, posterior commissure, pineal gland, cerebral aqueduct and tela choroidea. Interpeduncular fossa: Tuber cinereum, infundibulum, pituitary gland, mamillary bodies, posterior perforated substance. Fourth ventricle: Lateral boundaries, roof and floor; lateral and dorsal recesses; Median aperture (of Magendie), lateral apertures (of Luschka); Median sulcus, medial eminences, sulcus limitans; Superior fovea, facial colliculus, locus coeruleus, striae medullares (taeniae), inferior fovea; Hypoglossal triangle (trigone), vagal triangle, vestibular area, auditory tubercle. CSF Pathways

(Physiology) Transmitter receptors 1
Introduction to transmitter receptors and ion channels involved in synaptic transmission. Iononotropic receptors and metabotropic receptors. Properties of nicotinic acetylcholine receptors.

WEEK 19
(Pharmacology) Drugs and synaptic transmission I
Psycho- and Neuro-pharmacology, Classifications of drugs acting on the central nervous system
Blood-brain barrier to drugs.
State-dependence of drug action and effects. Placebo effect.
Arousal continuum. Mood continuum.
Neurotransmission and sites of drug action.
Targets for drugs at the CNS synapse—excitatory and inhibitory circuitry.
Pre- and post-synaptic interference (positive or negative) with receptors / effectors, synthesis, storage, release, reuptake / transporters and degradation.
Drugs acting at synapses: Amino acid receptors including glutamate, GABA and glycine. Subtypes of amino acid receptors and selective drugs.

(Biochemistry) Aminergic Transmission 1. Synthesis of catecholamines and serotonin; properties of the enzymes involved, nature and control of these processes and the effects of drugs. Post-synaptic events, metabotropic and ionotropic receptor biochemistry and the roles of second messengers. Trace amines. False transmitters. Catabolism-vesicle competition.

(Anatomy) The thalamus and geniculate bodies
Anatomic subdivision into lateral (dorsal and ventral tiers), mediodorsal and anterior groups of nuclei; Functional subdivision into specific, non-specific and association nuclei; Thalamic peduncles (radiations) and their connections.

(Physiology) Transmitter receptors 2.
Excitatory transmission and glutamate receptors. Functional properties of AMPA and NMDA glutamate receptors.

(Pharmacology) Drugs and synaptic transmission II
Drugs and synaptic transmission I continued.

(Anatomy) The internal capsule; the basal ganglia
Internal capsule: Location and relations; anterior limb, genu, posterior limb retrolentiform and sublentiform parts; Fibre groupings (Anterior, superior, posterior and lateral thalamic radiations; Pontocerebellar fibres; Corticonuclear and corticospinal fibres); Blood supply; Correlations with clinical syndromes following stroke. Basal Nuclei (Ganglia): Caudate nucleus, putamen, lentiform nucleus, globus pallidus, substantia nigra, subthalamic nucleus and the nucleus accumbens; Connections and basic circuits; Hypokinesia, hyperkinesia, tremor and rigidity; Information from clinical disorders such as Parkinson's Disease, Huntington's chorea and hemiballismus.

(Physiology) Transmitter receptors 3
Functional properties of metabotropic transmitter receptors, including amine and peptide receptors.


(Psychiatry) Cognitive development II
Emotional intelligence, a popular concept in recent years; the evidence to support the concept. The development of social cognition is discussed, for example empathy, self-control etc., and how these are related to the concept of emotional intelligence.

(Psychiatry) The development of personality, The definition of personality, personality development during childhood and adolescences.

(Biochemistry) The amino-acid transmitters (glutamate, GABA and glycine).

(Anatomy) Ascending pathways
Spinal ganglia; Modalities of sensation and their segregation; Posterior grey horn; Laminae of Rexed; Clarke's thoracic nucleus; Spinothalamic pathway; Posterior column/medial lemniscal pathway; Spinoreticular tract; Spino-olivary tract; Spinotectal tract; Posterior spinocerebellar and cuneocerebellar tracts; Anterior spinocerebellar and rostral spinocerebellar tracts; Dissociated anaesthesia; Brown-Séquard syndrome.

(Physiology) Transmitter receptors 4.
Inhibitory transmission in the CNS. GABAA receptors. Simple brain circuit involving excitatory and inhibitory synapses.

WEEK 20

(Pharmacology) Local Anaesthetics
General properties of local anaesthetics, their pharmacokinetics, pharmacodynamics and actions on various body systems.
Factors affecting differential nerve sensitivity including use-dependent block. Side effects of local anaesthetics and those associated with accompanying use of vasoconstrictors. Amides and ester classification.
Methods / routes of administration.

(Biochemistry) Some other transmitters
Hypoxia and ischemia responses - excitotoxic and re-perfusion damage. Formation, functions and possible toxicity of NO. Possible functions of D-serine. CO. Other possible retrograde messengers. Purinergic and other putative neurotransmitters.

(Anatomy) Descending pathways
Anatomy of anterior grey horn; Tonic and phasic alpha-motor neurons; Renshaw cells; Spinal reflexes; Corticospinal tract; reticulospinal, vestibulospinal, tectospinal and olivospinal tracts; Raphespinal tract, aminergic pathways and central autonomic pathway; Upper and lower motor neuron lesions; Stroke; Transection of the cord; Anterior poliomyelitis; Motor Neuron Disease;

(Physiology) Somatosensory system 1

(Pharmacology) General Anaesthetics I
Definitions. Aims and stages of general anaesthesia – Guedel’s signs.
Inhalational anaesthetics – advantages and disadvantages:
Nitrous oxide (analgesia), halothane, sevoflurane.
Minimum alveolar concentration (MAC) and factors influencing it.
Intravenous anaesthetics – advantages and disadvantages:
Ultra short acting barbiturates: thiopentone.
Nonbarbiturates: ketamine, propofol, neurosteroids.
Sites and mechanisms of action.
Adverse effects, pharmacokinetics and drug interactions. Malignant hyperthermia.
Balanced anaesthesia, conscious sedation. Peri-anaesthetic drugs
Centrally and peripherally acting spasmolytics. Sites and mechanisms of action.
Progabide, diazepam, baclofen, tizanidine, dantrolene.
(Anatomy) The visual pathways
Retinal layers, photoreceptors, bipolar cells, ganglion cells, horizontal cells and amacrine cells; macula lutea, fovea and optic disk; Central visual pathway, including the optic nerve, chiasma and tract, lateral geniculate nucleus and geniculocalcarine tract; Visual cortex and its blood supply; Visual association cortex; Visual reflexes; Lesions of the visual pathways.

(Physiology) Somatosensory system 2
Nociception. Processing of nociceptive information in the CNS
(Biochemistry) Common neurodegenerative mechanisms. Protein aggregation diseases (PD, AD, HD, Prions). Apoptosis/Necrosis.

(Psychiatry) Genetic aspects of personality and mental illness
Basic principles of behavioural genetics, major and minor genes, twin and adoption studies, interactions between genes and the environment, genetic aspects of psychiatric disorders and behavioural traits, quantitative traits, recent developments in the molecular genetics of psychiatric disorders.

(Biochemistry) Brain growth & development

(Anatomy) The cerebellum
Gross anatomy: Median vermis, right and left hemispheres; Anterior, posterior and flocculonodular lobes; Lobules and folia
Functional subdivisions: Vestibulocerebellum (Archeocerebellum), Spinocerebellum (Palaeocerebellum), Pontocerebellum (Neocerebellum)
Nuclei: Fastigial nucleus, Nucleus interpositus (globe and emboliform nuclei), Dentate nucleus
Cortical structure and cell types: Granular layer; Granular cells, receiving mossy fibres from all sources except the ION, Golgi cells Piriform layer; Purkinje cells, receiving parallel fibres from the granular cells and climbing fibres from the ION Molecular layer; Stellate and basket cells, receiving parallel fibres and synapsing on Purkinje cells, Afferent (A) and efferent (E) connections: Superior peduncle: Anterior spinocerebellar tract (A); Tectocerebellar tract (A); Rubrocerbellar tract (A); Trigeminal afferents (A); Dentato-rubro-thalamic tract (E); Uncinate fasciculus (E) Middle cerebellar peduncle: Cortico-ponto-cerebellar tract (A); Inferior cerebellar peduncle: Posterior spinocerebellar tract (A); Cuneocerebellar tract (A); Rostral spinocerebellar tracts (A); Reticulocerebellar tract (A&E); Vestibulocerebellar tracts (A&E); Olivocerebellar tract (A); Functional aspects and applied anatomy: Overall function of the cerebellum in planning and co-ordinating movement; its role in learning new movements, Ataxia, intention tremor, dysmetria, dysdiadochokinesis, scanning speech, nystagmus, hypotonia, gait abnormalities, etc; Effects of midline versus lateral lesions of the cerebellum.

(Physiology) Somatosensory system 3
Nociception. Functioning of endogenous analgesic circuits and transmitters.

WEEK 21

(Pharmacology) General Anaesthetics II
General Anaesthetics I continued.

(Psychiatry) The neurobiology of pain and placebo effects

(Anatomy) The blood supply of the brain
Vertebral and carotid arteries; Circle of Willis; Cortical and central branches; Territories of the anterior, middle and posterior cerebral arteries; Vertebro-basilar branches; Venous drainage of the brain; Arterial occlusion and haemorrhage.

(Physiology) Vision 1
Processing of visual information in retina.

(Pharmacology) Narcotic analgesics

(Anatomy) The brain-stem: topography
Midbrain; Crus cerebri and interpeduncular fossa, substantia nigra, red nucleus, superior and inferior colliculi, cerebral aqueduct, periaqueductual grey matter, central tegmental tract, superior cerebellar peduncles and their decussation. Pons; Basilar pons, corticopontine and corticospinal fibres, pontine nuclei, transverse fibres of the pontocerebellar pathway entering the middle cerebellar peduncles, medial lemniscus, spinal lemniscus, trigeminothalamic tract, lateral lemniscus, central tegmental tract, nuclei and roots of the trigeminal nerve. Medulla; Pyramids and their decussation, olives, gracile and cuneate tubercles and fasciculi.

Sites of emergence of cranial nerves III - XII; Blood supply of the brainstem. Corticospinal pathway; Cortico-ponto-cerebellar pathway; Cortico-rubro-olivo-cerebellar pathway; Dentato-rubro-thalamo-cortical pathway.

(Physiology) Vision 2
Processing of visual information in visual cortex.

(Psychiatry) Functional imaging in Neuropsychiatry

(Psychiatry) The neurobiology of mood and psychosis
This lecture deals with the neurochemical basis for the pharmacological treatment of schizophrenia and depression. In schizophrenia, the dopamine and dopamine serotonin hypothesis of this disorder is outlined and the modern history of neuroleptic development in this area is explored. The different biochemical theories of depression are dealt with and our current understanding of how antidepressants actually work is discussed.

(Pharmacology) Non-narcotic analgesics

(Anatomy) The brain-stem: nuclei and tracts
Nuclei of cranial nerves III - XII:
General somatic efferent: III, IV, VI, XII
General somatic afferent: Sensory nuclei of V (Spinal, Pontine & Mesencephalic)
Special somatic afferent: Cochlear and vestibular nuclei
General visceral efferent: E-W (III), Superior & inferior salivatory nuclei (VII, IX), Dorsal motor nucleus of X, Cardioinhibitory nucleus (X)
Special visceral efferent: Motor nucleus of V, Motor nucleus of VII, Nucleus ambiguus (IX, X & XI) Spinal nucleus of XI
General visceral afferent: Commisural Nucleus Special visceral afferent: Nucleus of the solitary tract
Nuclei of pathways ascending from spinal cord: Nucleus gracilis, nucleus cuneatus
Nuclei of pathways to and from the cerebellum: Accessory cuneate nucleus, Inferior olivary
nucleus, Pontine nuclei; Red nucleus

(Physiology) Motor 1
Introduction to control of movement by the CNS The role of the motor cortex.

WEEK 22

(Pharmacology) Antidepressants and mood-stabilising drugs
Types of antidepressant drugs. Therapeutic and toxic effects
Modes of acute and delayed actions.
Tricyclics, MAO inhibitors (including RIMA), SSRIs, SNRIs. Novel agents.
Mania. Lithium and other agents. Therapeutic and toxic actions

(Anatomy) The spinal cord and its blood supply
General topography and features of the spinal cord; Extent; Cervical and lumbar swellings;
Meninges; Anterior median fissure, posterior median sulcus; Central canal; Anterolateral and
posterolateral sulci; Grey and white matter; Anterior and posterior commisures; Cell types;
Blood supply of spinal cord;

(Physiology) Motor 2
Control of movement by higher cortical areas, frontal cortex, pre-motor and supplementary
motor areas.

(Pharmacology) Neuroleptics
Neurolepsis and antipsychotic effects. Types, actions (dopaminergic pathways and receptor
subtypes, 5-HT) and effects. Neuroleptanalgesia. Motor and endocrine side effects. Atypical
agents. Chlorpromazine, haloperidol, sulpiride, thioridazine, rispiridone, clozapine

(Anatomy) Hearing and balance
Brief review of cochlea and vestibular apparatus. Central Auditory Pathway: Cochlear neural
connections; Cochlear nuclei; Trapezoid body; Superior olivary nucleus [SON]; Lateral
lemniscus; Inferior colliculus; Inferior brachium; Medial geniculate nucleus; Primary auditory
cortex; Acoustic reflexes; Descending auditory pathways; Deafness. Vestibular nuclear
connections; Vestibular nuclei; Lateral and medial vestibulospinal tracts; Medial longitudinal
fasciculus; Vestibulospinal and vestibulo-ocular reflexes; Vestibulocortical pathway;
Vestibulocerebellar connections; Nystagmus; Unilateral and bilateral vestibular disease;
Menières disease.

(Physiology) Motor 3
Role of cerebellum and basal ganglia in motor control.

(Psychiatry) The Psychology of stress and coping.
The psychophysiology of arousal, individual vulnerability to psychosomatic symptoms and
hysteria in relation to personality, the environment and the mind-body interface.

(Psychiatry) The Psychology of Memory
Normal memory and forgetting, the effects of stress and psychological state on memory.
False memories.

(Pharmacology) Anticonvulsants
Classification of seizures according to drug sensitivity.
Convulsant drugs and animal models.

Sodium channel block. Phenytoin, carbamazepine.
Calcium channel block. Ethosuxamide, trimethadione.
GABA-ergic agents. Gabapentin, vigabatrin, tiagabine, phenobarbitone, clonazepam.

(Anatomy) Language centres; aphasia
History of the development of our current ideas about language; Brief review of the auditory and visual pathways to the primary sensory cortex; Wernicke's area; Supramarginal gyrus and arcuate fasciculus; Broca's area and its projections to the primary motor cortex; Cortical connections to Wernicke's and Broca's areas; Visual association cortex and the angular gyrus; pathways involved in reading aloud; Wernicke's aphasia; Broca's aphasia; Global aphasia; Transcortical aphasias; Anomia; Alexia with and without agraphia; Dyslexia; Kana and Kanji; Aprosodia.

(Physiology) Awake-sleep cycles
Electrophysiological monitoring of EEG and sensory evoked potentials. Sleep cycles. Physiological generation of slow wave sleep and rapid eye movement sleep.

WEEK 23

(Pharmacology) Drug dependence and psychotropic drugs of abuse I
Psychological and physical dependence, tolerance. Withdrawal syndromes.
Agents: Opiates; CNS depressants (including ethanol), amphetamine, MDMA and cocaine; psychotomimetics, cannabinoids, anticholinergic deliriants, nicotine, caffeine. Patterns of abuse and dependence.
Mechanisms (including reward pathways).
Pharmacological treatments including disulfiram, clonidine, naltrexone, acamprosate, methadone, diazepam.


(Anatomy) The limbic system
Olfactory pathway; Olfactory nerves; Olfactory bulb and tract; Olfactory striae; Primary olfactory cortex; Anosmia. Septal area; Cingulate and parahippocampal gyri; Hippocampal formation; Amygdaloid nucleus; Mamillary bodies; Anterior thalamic nucleus; Papez' circuit; Afferent and efferent connections; Functional aspects; Memory; Drive-related behaviour; Temporal lobe epilepsy; Klüver-Bucy syndrome.

(Pharmacology) Drug dependence and psychotropic drugs of abuse II.
Drug dependence continued.

(Anatomy) The autonomic nervous system
General organisation of the autonomic nervous system; Hypothalamus; Sympathetic and parasympathetic systems; Enteric system; Visceral afferent and efferent pathways; Visceral vs. somatic pain

(Physiology) Functions of higher "associational areas" of cortex Functions of higher associational areas of cortex. Frontal and parietal cortex. Split brain studies. Neurophysiological studies of consciousness.

(Psychiatry) Neurobiology of sleep and related disorders
The functions of sleep, the sleep stages and electrical changes in the brain, Physiological changes, control of sleep, sleep disorders.

Wednesday 3pm (Psychiatry) Attention and Perception

(Pharmacology) Anxiolytic and sedative/hypnotics

(Anatomy) Anatomical basis of clinical signs
A general review of the CNS to show how a knowledge of neuroanatomy assists in clinical neurological diagnosis; Numerous examples.

(Physiology) Plasticity of the brain
Effect of sensory input on development of brain functioning.

WEEK 24

(Psychiatry) Normal ageing and neurodegeneration

(Psychiatry) Psychology and Neurobiology of crime

4.2.4. INTERDEPARTMENTAL NEUROSCIENCE WORKSHOPS

INTERDEPARTMENTAL NEUROSCIENCE WORKSHOPS

Five inter-departmental workshops are held during the term on topics of clinical interest. The primary aim of these workshops is to provide students with the opportunity to critically discuss neurobiological aspects of topics such as Alzheimer’s disease, Parkinson’s disease, drug addiction and ischaemic brain damage/stroke. A series of short (~10 minute) presentations by members of staff provide a focus of discussion for each workshop.

1. **Brain development and Schizophrenia** (Primarily Psychiatry and Genetics)

2. **Ischemic brain damage / stroke Workshop** (Primarily Medical Gerontology, Biochemistry and Pharmacology)

3. **Parkinson’s disease Workshop** (Primarily Psychiatry, Biochemistry and Pharmacology)

4. **Drug addiction** (Primarily Psychiatry, Psychology and Pharmacology)

5. **Alzheimer’s disease Workshop** (Primarily Psychiatry, Biochemistry and Pharmacology)
   Normal ageing. Case histories. Pathophysiology and genetic factors. Interdisciplinary discussion including present (donepazil) and future pharmacological treatments. Potential disease modifying drugs.

4.2.5. NEUROANATOMY PRACTICAL SCHEDULE

1. **External topography of the brain**
   Meninges; Sulci; Gyri; Lobes; Cortical areas (Brodmann); Primary motor cortex; Premotor cortex; Primary sensory cortex; Auditory cortex and language areas; Visual cortex; Inferior aspect of brain; Insula.

2. **Medial surface of the brain**
   Sulci; Gyri; Lobes; Cortical areas (Brodmann); Primary motor and Sensory cortex;
Supplementary motor area; Ventricles and aqueduct; Corpus callosum; Fornix; Septum pellucidum; Brain stem.

3. The brain-stem
Midbrain, pons and medulla; Tectum and tegmentum; Cerebral and cerebellar peduncles; Colliculi and pineal body; Red nucleus and SN; Interpeduncular fossa; Cranial nerves III-V; Pontomedullary junction; Cranial nerves VI-XII; Pyramid and olive; Gracile and cuneate fasciculi and tubercles; Roof and floor of fourth ventricle.

4. The cerebellum; fourth ventricle; CSF pathways
Vermis and hemispheres; Lobes and fissures; Functional subdivision into archicerebellum, palaeocerebellum and neocerebellum; Cerebellar peduncles; Central nuclei; Boundaries, roof and floor of fourth ventricle; Review of CSF production, circulation and absorption.

5. Spinal cord; blood supply of the CNS, Meninges; Linea splendens, ligamenta denticulata and filum terminale; Spinal arteries; Anterior sulcus; Posterior columns; Dorsal and ventral nerve roots; Cauda equina; Circle of Willis; Cerebral arteries and their territories.

6. Wiegert sections of brain-stem and spinal cord, 3 sections through spinal cord - cervical, thoracic and lumbar; 5 sections through brainstem - upper and lower midbrain, pons, upper and lower medulla.

7. Sections of the basal ganglia and internal capsule Insula; Extreme capsule; Claustrum; External capsule; Putamen; Globus pallidus; Caudate nucleus; Internal capsule; Thalamus; Lateral and third ventricles.

4. 2. 2. 6. READING LIST
Some aspects of this unit are dealt with in the recommended texts for Anatomy, Biochemistry, Physiology and Pharmacology (Rang et al). Other specific reading may be recommended during the course.

Neurochemistry:
There is no small book on the subject that can be recommended. The standard textbooks (e.g., Voet & Voet) contain a chapter on neurochemistry, which should give you most of what you need to supplement the lectures. The list below is for those who want to find out much more.


Some Web Sites
Some of these can be quite fun and informative, if you have some time to spare.

http://faculty.washington.edu/chudler/neurok.html - Neuroscience for kids; despite the name well worth looking at.

http://pegasus.cc.ucf.edu/~Brainmd1/brain.html - brain model tutorial; basic but worth a view

http://web.indstate.edu/thcme/mwking/nerves.html - Biochemistry of neurotransmitters; very simple
4. 3. AETIOLOGY, MECHANISMS AND TREATMENT OF DISEASE

4. 3. 1. CLINICAL MICROBIOLOGY

4. 3. 1. 1. INFORMATION

The Department of Clinical Microbiology is largely located on the campus of St. James's Hospital and at the Adelaide and Meath Hospital (incorporating the National Children’ hospital) at Tallaght. Lectures take place on site in the Trinity Centre in St. James's Hospital, in the Trinity Centre at Tallaght Hospital and on the main Trinity College campus. Together with the Department of Immunology, Department of Histopathology and Morbid Anatomy and the Department of Haematology it forms the Division of Laboratory Medicine. We are part of the School of Medicine.

The Department has been on its present site since 1981 and provides a comprehensive routine service to some 300 General Practitioners as well as St. James's Hospital. The National Bone Marrow Transplantation Service, Burns and HIV services are on site.

An extensive programme of teaching is in place to Undergraduate and Post-Graduate Medical, Science, Pharmacy and Nursing students. The laboratory is recognised for training for the M.R.C.Path. and coordinates the MSc in Molecular Pathology course in conjunction with the Dublin Institute of Technology.

Research leading to the M.D., M.Sc. and Ph.D. degrees is undertaken in the Department.

The Department has an extensive research programme.

4. 3. 1. 2. STUDENT INFORMATION AND LECTURE CONTENT

Aims and Objectives of Undergraduate Course in Microbiology.

The objective of the Clinical Microbiology Undergraduate Course is to ensure the student has a broad understanding of the Epidemiology, Pathogenesis, Clinical and Laboratory diagnosis and Management of infections. The aim is that the student understands and complies with the basic principles of prevention of infection whether in the community or healthcare setting and has a clear understanding of how to use the Clinical Microbiology laboratory. The course covers Community Acquired Infection, Health-Care Associated Infection, Tropical Infection and their prevention and associated public health issues.

The course in Medical Microbiology is divided into two sections:

The Second Medical Year, which deals with the different groups of infecting agents and their characteristics and diagnosis. Basic information on antimicrobials is given. A critical lecture is given on Precautions to be taken in the Prevention of Infection in the Clinical Setting. All students must attend the lecture and sign a form to state that they understand the document supplied.

The Third Medical Year is in essence the clinically applied third year material and in addition, important clinical aspects of infection prevention and chemotherapy. Finally, the objective of these lectures is to focus on up-to-date knowledge and concepts in a rapidly advancing field. Students should be aware of the current problems on a local and global scale.

http://www.medicine.tcd.ie/clinical_microbiology/courses/student_area/Year2/

Introduction to Bacteria: Basic structures of bacterial cells - their functions and relevance to infection.
**Fungi & Protozoa Rickettsia, Coxiella, Chlamydia, Mycoplasma:** Difference between procaryotes and eucaryotes. Types of human infection seen in normal and immunocompromised. Diagnosis of fungal infection: Specimens for laboratory handling, etc. Management of fungal infection. Description and classification of these organisms. Outline of their importance in human infections. Diagnosis and treatment of these infections.

**Pathogenicity & Virulence:** Infection results from an interplay between host and microbe. Consider host defence mechanisms (other than immunological) with regard to different body systems. Consider microbe virulence factors which enable organisms to overcome local defence mechanisms i.e. adherence, antiphagocytic activity, enzyme and toxin production, etc.

**Viruses 1 & 2:** Basic description of the main DNA and RNA viruses that are of importance in humans is given. Multiplication and response of the host. Various modes of spread e.g. by inoculation and intrauterine infection. The expression of disease. and the clinical and laboratory diagnosis. The current treatment of viral infections is described in the fourth medical year.

**Vaccination and Immunisation:** Vaccination is now seen as the major approach to prevent infection. Molecular techniques are being used to develop safe and effective vaccines. Vaccines may be given in a national programme for all citizens or selectively for those at special risk e.g. Hepatitis B.

**Precautions to be taken in the Prevention of Infection:** As stated, this is an essential lecture where the students attendance is compulsory and a student signature is required to confirm attendance.

**Antimicrobials 1 - 4:** Important groups of antimicrobial agents their history and origins and mode of action. Modes of resistance to antimicrobials - genetic basis of resistance - spread of resistance - criteria for choice of an antibiotic. The role of the microbiology laboratory in selected reduction and use of antimicrobial agents - susceptibility testing and antibiotic assay. Antiseptics and disinfectants.

**Staphylococci:** Coagulase positive and negative Staphylococci. Human skin and nasal carriage of these organisms. Pathogenic mechanisms: Antibiotics used to treat these organisms and explanation of terms MRSA, EMRSA, GISA and VRSA.

**Staphylococcal Infection:** Types of human infection caused by staphylococci. Difference between hospital and community-acquired infection. Diagnosis and management of these infections.

**Skin Infections and Infestations:** Bacterial infections of skin caused by Staphylococci, Streptococci, anaerobes and mycobacteria. Dermatophyte Infections Candida infections Viral Infections - Parvovirus, etc. Infestations - Scabies and lice.

**Streptococci:** Catalase negative Gram positive cocci, Lancefield groupings etc., carriage sites. Pathogenic mechanisms, antibiotics used. Diagnosis and management of these infections.

**Streptococcal Infections:** Types of infection caused by different streptococcal groups.

**Bacteraemia and Septicaemia:** The modes of entry of bacteria into the bloodstream. The significance of these infections.

**Gram negative bacteria 1 The enterobacteria**
**Gram negative bacteria 2** Spiral organisms

**Gram negative bacteria 3** Neisseria and Pseudomonads

**Mycobacteria:** Characteristics of mycobacteria. Different species and their importance. Laboratory diagnosis and pathogenicity.

**Anaerobes & Sporeformers:** What is an anaerobe? Strict, moderate, microaerophilic, facultative. Where anaerobes are found in human normal flora (emphasise type of specimen to be sent for anaerobic culture). Sporeformers - non-spore forming anaerobes and types of infection caused in human. Treatment of these infections.

**Listeria/Corynebacterium/Legionella:** A brief overview of these organisms and the epidemiology of the infections they cause.

**Haemophilus/Brucella/Bordetella:** *Haemophilus influenza* is a very important human pathogen. Capsulated type b is the most important. A vaccine has been introduced. Despite the expenditure of hundreds of millions of pounds on the eradication of brucella and tuberculosis from cattle in Ireland, this has not been achieved. Brucellosis and Tuberculosis are still present in many herds. *Bordetella pertussis* can be a lethal disease. New vaccines are under investigation.

### 4. 3. 1. 3. READING LIST - 2ND AND 3RD MEDICAL YEAR

http://www.medicine.tcd.ie/clinical_microbiology/courses/student_area/reading_list.php

Medical Microbiology, Updated Edition, 3rd edition
Cedric Mims et al
ISBN 0323035752 Elsevier Mosby · Published November 2004
SJ 616.01 +N33* 11 Copies in John Stearne

Medical Microbiology 5th ed
Murray Rosenthal & Pfaller
ISBN 0-323-03303-2 Elsevier Mosby - Published May 2005
SJ 616.01 N01*4 6 copies, also available at the Hamilton Library

Medical Microbiology: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control
by David Greenwood Richard C. B. Slack , John F. Peutherer , Michael R. Barer
# ISBN-10: 0443102090

These texts are in colour and have on-line access at

http://www.studentconsult.com/

For 3rd Medical Year Tutorials the following is highly recommended
Problem-orientated clinical microbiology and infection

Hilary Humphreys and William L. Irving.
Author: Humphreys, Hilary.
For further reading in Virology please consult

Notes on medical microbiology

Morag C. Timbury et al. ISBN 0443071640

Other texts

A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control
ISBN 0443070776
Churchill Livingstone · September 2002
616.01 K5*15, 9 copies in Hamilton, 9 copies in John Stearne
4. 3. 2. PATHOLOGY

4. 3. 2. 1. GENERAL PATHOLOGY

Cell Injury & Death

Causes of cell injury.
Reversible and irreversible cell injury.

Structural changes of reversible and irreversible cell injury, macroscopic, microscopic and ultrastructural appearances.
Necrosis – definition, types of necrosis, including gangrene sequelar.
Apoptosis – definition, causes, morphology and mechanisms.

Systemic effects of cell injury.
Autolysis and post mortem changes.

Cellular adaptations to injury

Growth disturbances – atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia.

Subcellular alterations – lysosomes, endoplasmic reticulum, mitochondria and cytoskeletal changes. Heat shock proteins.

Intracellular accumulations – fatty change, cholesterol and cholesterolesters, proteins, glycogen.


Extracellular Pathology

Pathology of collagen, elastin, basement membranes. Amyloid.
Pathological calcification – dystrophic and metastatic.
Uric acid deposition.

Ageing

Factors known to affect life span; common diseases of old age; theories to explain the ageing process.

Tissue Responses to Injury

Inflammation

Definition; causes, difference between inflammation and infection.


Healing, Regeneration & Repair


Vascular Disturbances

Neoplasia

Definition and terminology. Basic structure of neoplasms – neoplastic cells, stroma and angiogenesis.

Definition of benign and malignant tumours – characteristic differences, especially in terms of differentiation, growth rate, local invasion and metastases. Gross appearance of tumours and correlation with behaviour. Classification of neoplasms by histogenesis (cell of origin).


Carcinogenic agents – chemicals, radiant energy, viruses, bacteria, fungi and parasites. Multistep hypothesis of carcinogenesis.

Epidemiology of cancer. Occupational and behavioural risks.

Host factors in carcinogenesis – age, gender, race, diet, inherited genomic instability, premalignant lesions and conditions.

Host defence, cell mediated and humoral immunity.

Immunosurveillance.

Clinical effects of neoplasia – local effects, general effects – cachexia and paraneoplastic syndromes.

Laboratory diagnosis – morphological techniques, excision/biopsy, fine-needle aspiration, cytology, immunocytochemistry, flow cytometry
- biochemical assays for tumour markers
- molecular diagnosis
- DNA microarray analysis

Prognostic factors – type of tumour, grading and staging of tumours. Tumour dormancy.

Infections & Parasitic Diseases

Importance of infections & parasitic diseases.

Changing patterns – effects of travel, change in the environment, new infectious diseases.

Methods of identifying organisms in tissues.

Types of reaction in tissues to the presence of an organism. Interaction with hosts immune state.

General pathology of diseases caused by bacteria, viruses, fungi, parasites and prious. Selected examples to illustrate mode of spread, tissue reaction, identification of organism in tissues, type of disease and host modifying factors.

Environmental Pathology

Inhaled pollutants – air pollution and occupational dust diseases (pneumoconiosis)*. * (Covered in lectures on respiratory diseases).

Enumeration of diseases associated with smoking.

Chemical injury – organic and inorganic compounds, metals, gases, toxic mushrooms. The
pathology of alcohol (covered in 4th medical year) and drug abuse. Adverse reactions of therapeutic drugs.

Physical agents – mechanical trauma, thermal injury, atmospheric pressure, electrical injury, ultraviolet light, ionising radiation injury (mechanisms and morphological changes, complications of radiotherapy, whole body radiation).

**Nutritional Pathology**

4. 4. 1. CLINICAL SKILLS

INTRODUCTION

The three components of undergraduate medical education are; knowledge, skills and attitudes. In the first year of the course of the course almost all the time is spent in acquiring a sound knowledge base. It should however be noted that, in year 1, through small group learning students are encouraged to develop learning skills, teamwork, information handling, critical thinking and the ability to self assess, all of which are central to later professional practice

From year 2 onwards although the acquisition of knowledge continues by various modes of delivery the emphasis of the course changes to focus more directly on the application of knowledge to patient centred situations. During these years there is a clear and often unacknowledged need to develop communication skills in general but particularly patient communication and management and also the skill of effective communication as a working member (often leader) of a multidisciplinary team. Additionally and most importantly a wide range of technical and surgical skills must be developed in order to ensure delivery of a safe, effective health care service to patients.

The technical and surgical skills range from the ability to record and interpret peripheral pulses and blood pressure readings through suturing phlebotomy and cannulation, catheterisation, basic life support and ultimately the skill of full patient management in emergency situations and in daily good medical practice.

It is indisputable that the only place to perfect these skills is in the clinical setting with real patients but, it is essential that the student has achieved an acceptable level of competence in the Laboratory setting prior to exposure to the patient to ensure the least possible stress and inconvenience to both patients and students.

The clinical skills programme to be presented in 2008/2009 is as follows:-

1. A set of four introductory lectures
   - A synopsis of the development of health care from the 1700’s through the biomedical model of the 19th and 20th century to the bio psychosocial model currently emerging
   - The person behind both partners in the doctor patient relationship, the rights, the realities, the support networks, life skills and thinking skills and non verbal communication
   - A plan for medical history taking
   - A plan for general physical examination

2. Four Communications workshops on History taking for each student.
   The format is role play where students alternate doctor and patient roles. The use of both roles is seen as an opportunity for each student to experience what it feels like to be a patient and serves as a starter exercise for the realisation that empathy is an essential part of therapy. The first and second workshops are straight forward history taking exercises based, in the first instance on a very simple patient scenario and on the second occasion on a much more complicated story.
   The third workshop deals with information handling (a) summarisation and verbal presentation to a group of information derived from the literature and weekly medical newspapers (b) delivery of a healthy lifestyle message to individual patients e.g. prevention of heart disease (c) brief written report on current controversial issues
   The fourth workshop deals with special situations such as breaking bad news, and obtaining consent for a procedure.

3. Review of Canadian communication skills videos. (3 sessions per student)
   These videos are used in association with the Calgary – Cambridge method of teaching communications and text books on teaching and learning communication skills in medicine by Kurtz, Silverman and Draper.
4. Ward visits with Communication Skills Tutors - Students are observed during a patient interaction and receive immediate feedback on the skills observed from the perspective of the Tutor and the patient.
Among the skills highlighted during the ward visits are:-
Empathy and listening, Open questions, Relationship building skills, Resisting immediate follow up of first concern, Identifying and eliciting the patients agenda, Non verbal cues, Clarification of issues and impressions, Flexibility in pursuit of patient leads, Ability to control the flow of irrelevant detail.
Information giving - Sufficient to ensure patient understanding and facilitate autonomous decision making, Realistic reassurance, End of session open questions.

5. Diagnostic imaging
Three lectures on the basic interpretation of chest and abdominal X-ray and common abnormal findings.
Insight into the range of diagnostic imaging available in the investigation of disease
Recognition of common features of frequently used x-rays e.g. chest, abdomen etc.

6. Cardiovascular rotation (2 sessions per student )
Attend the ECG department in groups of 3-4
Basic cardiac rhythm interpretation lunchtime seminar
Angiography, Echocardiography, Stress Testing

7. Gerontology (2 students per day in SJH hospital)
Students will attend a Multidisciplinary meeting and the Hospital Geriatric day care centres in order to observe the range of services available to patients and to demonstrate the link between hospital medicine and health care in the community. There may be an extension of this programme to include AMNCH as the year continues.

8. Skills Laboratory (8 sessions per student per year)
All students will rotate through the clinical skills laboratory at St James’s where Ms Clare Martin and Ms Triona Flavin, and AMiNCH where Ms Philippa Marks, Ms Marie Morris, deliver a programme on practical skills such as basic suturing and knot tying , IV cannulation, Basic life Support ( Adult ), vital signs, point of care testing and examination of the breast, testes, eyes and ears
4. 4. 2. MEDICAL ETHICS II

Dr Martin Dyar, Dr. Ruth Pilkington
Hilary and Trinity Terms, 2009

4. 4. 2. 1. OVERALL AIM

This course aims to deepen your study of medical ethics by adapting the theories, principles and skills of deliberation introduced in the first year to a more extensive discussion of issues of ethical concern in clinical practice and medical science.

4. 4. 2. 2. OUTCOMES

On completion of this course you should:
be proficient in the application of the major concepts and theories of medical ethics in discussions of care and treatment decisions;
have developed the skill of recognizing, evaluating, and constructing ethical arguments on more than one side of an ethical issue;
possess a clear understanding of the ethical significance of confidentiality and truth-telling, and some of the challenges inherent in both principles;
understand the key terms and appreciate the major themes that have emerged with regard to the moral dimensions of genetic science;
have begun to develop an advanced understanding of the key ethical questions that pertain to medical decisions at the beginning and the end of life;
possess an understanding of the major positions within feminist ethics and to formulate a personal response the idea of an ethic of care in modern medicine;
possess an advanced understanding of the field of medical humanities, with a basic competence in relation to the incorporation of literary texts as tools in medicals ethics study and discussion.

4. 4. 2. 3. DELIVERY

The Year Two Medical Ethics course comprises both large group lectures and small group ethics debating sessions. You will have eight lectures which will take place in Hilary term. Where appropriate, aspects of the problems from your debating sessions will be incorporated in the lectures. Group discussion will be used in tandem with the traditional lecture format, and weekly reading assignments will be central. For the ethics debates, students will be assigned to groups of ten. Each group will attend a pre-debate lecture where the crossover between public speaking and the art of communication in medicine will be explored. A framework for reflecting upon and enhancing your debating skills, with particular reference to body and voice, will be explained. The format of the debate, including etiquette, timing issues, the conventions of rebuttal, team membership and adjudication, the motion, and readings for the debate topic, will be presented at this time also. No less than a week after your introductory lecture, each group of ten will meet for a one hour session where the debate will take place. In advance of the debate, division of groups into teams will be done in a random fashion, as will the selecting of which team is opposition and which proposition for the given motion. One of the primary benefits of this exercise is the manner in which it prompts the articulation of numerous ethical perspectives surrounding a given topic. You may find yourself assigned to a team whose position in the debate you do not fully agree with. This offers a useful opportunity to engage with and more fully understand an opposing worldview to your own, and students are encouraged to embrace this challenge, should it fall to them. Meeting with your assigned fellow team members outside class time will be necessary.
4. 4. 2. 4. LECTURE OVERVIEW

In this eight week course we will be extending our study of moral theory and the principles and core concepts of medical ethics by applying methods of ethical analysis to a number of issues central to the doctor-patient relationship as well as broader topics in clinical practice and the biomedical sciences. Topics will include confidentiality, consent, the ethics of assisted reproduction, and medical ethics at end of life. We will also consider a number of schools of thought which attempt to present approaches to healthcare ethics that address what is sometimes seen as an over-theoretical or abstracting tendency in the principles-based approach to medical ethics. Key here shall be readings and discussion of the so-called 'ethic of care', the ethics of communication, and narrative ethics. In this course, regularly and where appropriate, we will aim to strike a balance between the traditional lecture format and group discussion. Weekly reading assignments will be given. None of these will be excessive, but all are essential for your meaningful engagement with the course.

4. 4. 2. 5. OUTLINE

Large Group Sessions
You will have eight lectures, each of which will entail some amount of discussion and a series of set readings. The topics of these lectures are as follows:

Lecture One: The Ethics of Genetics
This lecture provides an introduction to the central ethical questions pertaining to advancements in genetic science. Five areas are considered: genetic information, genetic testing, reproductive choice, gene therapy, and cloning.

Lecture Two: The Ethics of Reproductive Medicine
This lecture introduces a selection of the central ethical concerns in three areas: abortion, maternal-fetal relationships, and assisted reproduction.

Lecture Three: Ethics at the End of Life
This lecture provides an overview of legal categories relevant to end of life clinical decision making. Additionally we explore three principles that are central to the ethics of end of life decisions: sanctity of life; the moral distinction between foresight and intention (the doctrine of double effect); and the moral distinction between acts and omissions. The contours of debates surrounding Do-Not- Resuscitate orders are also incorporated here.

Lecture Four: Medicine and Poetry
This lecture explores the place of literary texts in bioethics discussions, with particular emphasis on the relationship between poetry and medicine. Applying the fundamentals of narrative ethics as a point of departure, we ask questions relating to the role of the medical humanities as a new dimension of medical education.

Lecture Five: Ethics of Care and Communication
This lecture introduces central themes in feminist ethics, with particular reference to the work of Carol Gilligan and Joan Tronto. We also extend our exploration of the fiduciary nature of the doctor-patient relationship, the idea of veracity in medicine, and the role of communication in the promotion of patient autonomy.

Lecture Six: Ethics of Research
This lecture presents the historical context of current international norms in research ethics, and introduces the role of principles, touching on the primary ethical issues relevant to children and incompetent adults as research patients, and research in the third world.
Lecture Seven: Ethics of Resource Allocation
This lecture introduces two theories that address the question of how we might distribute our health resources fairly: QALY theory and Needs theory. It also presents some perspectives on the strengths and weaknesses of each. Additionally the question is explored as to whether a person’s responsibility for bringing poor health upon themselves should effect how their priority for medical care is assessed.

Lecture Eight: Selected Topic
One lecture will be left open to explore a bioethics topic of particular interest to the class. This lecture will be agreed between the students and the course directors early in the term.

4. 4. 2. 6. KEY TEXTS
5. ASSESSMENT AND EXAMINATION ARRANGEMENTS

5. 1. MODULE 1:

BIOCHEMISTRY WITH IMMUNOLOGY
The Examination in Biochemistry is in Michaelmas term 2008
One 3 hour paper two sections:
Section A: Essay questions do 2 from 5 (coagulation/extracellular matrix)
Section B: Clinical questions do 3 from 6 (immunology/endocrinology/clinical biochemistry)
Section A accounts for 25%; section B accounts for 75%
“Pass/Fail” and “Distinction” viva voce examinations early in Hilary term.
Venue: School of Biochemistry. Date to be finalised.

MOLECULAR MEDICINE
The exam will take place in Hilary term. In spring, the students will have separate examination in Molecular Medicine covering the material taught during the Hilary term. The exam (2.5 hours) consists of two parts. Part A offers an essay type question (can be chosen from the list) and constitutes 30% of the overall mark. Part B consists of short either/or questions, covering the diverse scope of theoretical material of the course and including brief clinical case studies. Each of these has to be attempted and the answers carry equal percentage of marks (value of part B is 70% of the total exam mark).

PHARMACOLOGY
Students are examined in the form of a continuous assessment involving a written examination at the end of Michaelmas Term (30%), and a Trinity Term written examination (70%).

Michaelmas Term examination (30%)
50 Multiple Choice Questions 15%
10 Short Answer Questions 15%

Trinity Term examination (70%)
50 Multiple Choice Questions 23%
10 Short Answer Questions 23%
1 Essay (choice out of 3) 11%
1 Research Project Essay and Logbook 13%

A viva examination for Distinctions and marginal students will be held after the Trinity Term Examination. Students who have not attained sufficient marks to be invited for a marginal viva will be invited to discuss their situation at this time.

The Supplemental Examination (100%) has the same structure as the Trinity Term examination except that students will choose 2 from 4 essays and the Research Project essay will be omitted. In the case of students allowed to sit this examination for the first time on medical grounds, the total will account for 75% and the remaining 25% will derive from the continual assessment.

Two College prizes are awarded to the students with the highest marks for the year. As follow-on from the research projects students may submit a Research Essay during the summer months for a prize sponsored by Pfizer Pharmaceuticals. The winning candidate then competes with the other five Medical Schools for a gold medal and prize.

Sample questions: Available on the Trinity web site:
http://www.tcd.ie/Local/Exam_Papers/index.html
5. 2. MODULE 2: NEUROSCIENCES

HEAD AND NECK ANATOMY

Michaelmas Term
Spot Examination 10%

Hilary Term
Short Essay Questions 45%
Practical Examination 45%

The Pass mark is 50%. Students with a mark of 45% - 50% will be required to attend a Pass/Fail viva voce examination with the External Examiner.

Students with an overall mark of 75%, taking the average of the anatomy marks of Second and Third Years together, may be awarded a Distinction in Anatomy, subject to a successful Distinction viva voce examination with the External Examiner.

Supplemental Examinations
Short Essay Questions 50%
Practical Examination 50%

[The Michaelmas Spot examination does not count towards the Supplemental Examinations]
The Pass mark is 50%. Students with a mark below 50% will be required to attend a Pass/Fail viva voce examination with the External Examiner.

NEUROSCIENCE

There will be a joint 2 hour long paper at the end of Hilary Term, covering the themes taught by the Departments of Physiology, Biochemistry, Psychiatry and Pharmacology. This will consist of four sections – approximately 30 min should be allocated per section.

1. Section 1: Physiology – Answer one essay from choice of two.
2. Section 2: Biochemistry - Answer one essay from choice of two.
3. Section 3: Pharmacology - Answer one essay from choice of two.
4. Section 4: Psychiatry – Extended matching questions.

5. 3. MODULE 3: AETIOLOGY, MECHANISMS, MANAGEMENT OF DISEASE (1)

CLINICAL MICROBIOLOGY

2nd Medical Year

7.5 Practical (MCQ exam)
30 questions
12.5 Exam (MCQ exam),
70 questions assessing Clinical Microbiology and Parasitology

3rd Medical Year

35 MCQ/Written Paper (Michaelmas Term)
45 Written and practical Papers (Hilary Term)
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100 Total
PATHOLOGY

In Trinity term there is an MCQ paper that accounts for 20% of the Fourth Year Pathology examination.

5. 4. MODULE 4:

CLINICAL SKILLS

The planning group have agreed on the compilation of a portfolio in the form of a logbook by each student with a requirement that each student is to complete the stated number of sessions in each of the 7 areas. Students who are deficient in any area of the logbook will be offered a remedial opportunity during the summer vacation. Failure to complete the logbook before the start of the 2007 / 08 academic year would preclude that student from rising with the year. The course is also assessed by OSCE at the end of the year during which any of the practical skills covered in this year can be examined.

MEDICAL ETHICS

This course is assessed by OSCE at the end of the year. You will be required to make a presentation illustrating your command of a chosen topic from the course as explored during the lecture series. Please remember that full participation in the ethics debates is also a prerequisite for passing the course. Attendance at lectures is also necessary in order to pass the course, and this will be monitored throughout the term.

Evaluation
The School of Medicine will ask you to complete course evaluation forms at the end of the year. Your evaluation is considered an important means for us to recognise issues that are relevant to the augmentation of the course. Be as open and extensive in your responses as you wish.
6. SCHOLARSHIPS AND AWARDS

6. 1. SCHOLARSHIPS

Students should consult Section S of The University of Dublin Calendar for full details of benefits and conditions (www.tcd.ie/Junior_Dean/Scholars/Scholar/index.php)

Benefits
Award of scholarship entitles a student to:
• free Commons,
• free accommodation in college during the 9 months of the formal teaching year,
• reduction in fees and a stipend.
These benefits may be held for up to four years, provided that the awardee remains a registered student.

Examination procedure
Scholarship is awarded in the Second Medical Year and the basis of a student’s performance in formal examinations in Human Form and Function the four core disciplines of anatomy, Biochemistry with Immunology, neuroscience and physiology plus a Special Topic for the year that embraces advanced reading in the core disciplines. The special topic for this years Scholarship examination is 'Memory'.
Successful candidates must achieve an aggregate mark of at least 70% for all disciplines and at least 65% for each discipline. For the purpose of calculating the aggregate mark, the weighting of the individual marks is: core disciplines 67%, Special Topic 33%.

The examinations to be used for qualification for Scholarship for 2008/9 will be as follows:

First Year:
• The normal Second Year papers in Human Form and Function and Biochemistry (Michaelmas, Hilary and Trinity Terms)

Second Year:
• The normal Second Year papers in Biochemistry with Immunology, Anatomy and Neuroscience (Michaelmas and Hilary Terms).
• A 3-hour paper consisting of 3 essay questions covering anatomical, biochemical and physiological aspects of the Special Topic (Hilary Term). The Special Topic for 2008/9 is Memory. Students are expected to research the anatomical, physiological and biochemical basis of memory. For recommended research papers they should contact Roger Anwyl (Physiology, ranwyl@tcd.ie), Paul Glacken (Anatomy, pglacken@tcd.ie) and Gavin Davey (Biochemistry, gdavey@tcd.ie).

Eligibility to sit
In view of the prestige and the practical benefits of obtaining Scholarship, the School of Medicine would like to see all students who have a realistic expectation of succeeding, sitting for the examination. The process is non-competitive, so an individual’s chance of succeeding is not altered by the number of other candidates. Anybody may enter but, realistically, students who have not been achieving relatively high marks are not likely to succeed.
We recommend anyone who achieved consistent Second Year marks of 65% or above to sit. Students are encouraged to talk with their tutors before making a final decision. Students who are interested in sitting should make themselves known to the Medical School Office at an early date and must give notice of their intention to take the examination on the prescribed form, available from the Senior Lecturer’s Office, by the date specified in the Calendar. If they wish to withdraw their application, they are asked to do so at least two weeks before the first day of the Hilary examination period.

50
6. 2. AWARDS

Pharmacology

Two College prizes are awarded to the students with the highest marks for the year. As follow-on from the research projects students may submit a Research Essay during the summer months for a prize sponsored by Pfizer Pharmaceuticals. The winning candidate then competes with the other five Medical Schools for a gold medal and prize.
7. COLLEGE POLICIES
7. 1. PERSONAL INJURY PROCEDURE

Practical Schedule

Please read carefully the information below concerning safety in the laboratory and in the clinical situation.

Safety in the Laboratory

- Make yourself aware of the emergency exists from the laboratory
- In the event of evacuation specific instructions will be given

Many cultures used in the laboratory are potentially pathogenic. It is therefore vital that good safe laboratory practice and aseptic technique should become second nature to the student. It is good practice to follow the same safety rules irrespective of the degree of hazard involved.

- You are required to own and wear a Howie style laboratory coat (sold in the Student’s Union Shop) at all practical sessions. Failure to do so will exclude you from the practical session. The coat must be buttoned up at all times. This is to protect your normal clothes from contamination and damage. This must not be worn on the wards or elsewhere.

- No smoking, eating or drinking is permitted in the laboratory.

- If you spill cultures report the fact immediately to a demonstrator, who will give you further instructions.

- All materials should be handled so that there is no inadvertent contamination of the environment or yourself. For example, wet preparations of bacteria on sides and used pipettes should be submerged in disinfectant immediately after use to prevent contamination on the bench. Do not work with bacterial cultures or chemicals over a laboratory manual or notebook.

- Do not rush around or carry sharp items around the laboratory. At any sign of misconduct you will be asked to leave the laboratory.

- Always leave the bench clean and tidy. Always remember that in shared laboratory areas other students will be using the bench and their safety should not be put at risk.

- Always wash hands with Hibiscrub before leaving the laboratory. Dry them thoroughly with a paper towel.

- Report any accident/incident, even if trivial, to a demonstrator.

7. 2. MICROBIOLOGY SAFETY IN THE HOSPITAL

Each individual is responsible for his/her own safety and that of others, whether patient or staff. Most safety precautions are common-sense. Hand washing is of utmost importance – wash your hands before and after attending each patient.

Ensure that you are immunised against infectious diseases such as polio, rubella, TB and Hepatitis B.

You must observe strictly the guidelines set out for the management of patients with
hepatitis, or who are suspected of suffering from hepatitis. In such cases, it is essential that body fluids, especially blood, are carefully handled and that needles and syringes are correctly disposed of.

Each ward has been provided with guidelines for the isolation and management of infective diseases. Also available are policies concerning the use of antimicrobials and disinfectants, the maintenance of closed urinary drainage and i.v. catheterisation. Consult these documents and abide by the policies contained in them.

7.3. PLAGIARISM

The following text is reprinted from the College Calendar Academic Progress (pages G12-14) and should be borne in mind by all students:

“...Plagiarism is interpreted by the University as the act of presenting the work of others as one’s own work, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University. Plagiarism can arise from deliberate actions and also through careless thinking and/or methodology. The offence lies not in the attitude or intention of the perpetrator, but in the action and in its consequences.

Plagiarism can arise from actions such as:

(a) copying another student’s work;
(b) enlisting another person or persons to complete an assignment on the student’s behalf.
(c) quoting directly, without acknowledgement, from books, articles or other sources, either in printed, recorded or electronic format;
(d) paraphrasing, without acknowledgement, the writings of other authors;

Examples (c) and (d) in particular can arise through careless thinking and/or methodology where students:

(i) fail to distinguish between their own ideas and those of others.
(ii) fail to take proper notes during preliminary research and therefore lose track of the sources from which the notes were drawn;
(iii) fail to distinguish between information which needs no acknowledgement because it is firmly in the public domain, and information which might be widely known, but which nevertheless requires some sort of acknowledgement;
(iv) come across a distinctive methodology or idea and fail to record its source;

All the above serve only as examples and are not exhaustive. Students should submit work done in co-operation with other students only when it is done with the full knowledge and permission of the lecturer concerned. Without this, work submitted which is the product of collusion with other students may be considered to be plagiarism. It is clearly understood that all members of the academic community use and build on the work of others. It is commonly accepted also, however, that we build on the work of others in an open and explicit manner, and with due acknowledgement. Many cases of plagiarism that arise could be avoided by following some simple guidelines:

(i) Any material used in a piece of work, of any form, that is not the original thought of the author should be fully referenced in the work and attributed to its source. The material should either be quoted directly or paraphrased. Either way, an explicit citation of the work referred to should be provided, in the text, in a footnote, or both. Not to do so is to commit plagiarism.
(ii) When taking notes from any source it is very important to record the precise words or ideas that are being used and their precise sources.
(iii) While the Internet often offers a wider range of possibilities for researching particular themes, it also requires particular attention to be paid to the distinction between one’s own work and the work of others. Particular care should be taken to keep track of the source of the electronic information obtained from the Internet or other electronic sources and ensure that it is explicitly and correctly acknowledged.

It is the responsibility of the author of any work to ensure that he/she does not commit plagiarism.

Students should ensure the integrity of their work by seeking advice from their lecturers, tutor or supervisor on avoiding plagiarism. All departments should include, in their handbooks or other literature given to students, advice on the appropriate methodology for the kind of work that students will be expected to undertake.

If plagiarism as referred to above is suspected, the Head of Department will arrange an informal meeting with the student, the student’s tutor, and the lecturer concerned, to put their suspicions to the student and give the student the opportunity to respond.

If the Head of Department forms the view that plagiarism has taken place, he/she must notify the Senior Lecturer in writing of the facts of the case and suggested remedies, who will then advise the Junior Dean. The Junior Dean will interview the student if the facts of the case are in dispute. Whether or not the facts of the case are in dispute, the Junior Dean may implement the procedures set out in CONDUCT AND COLLEGE REGULATIONS §2...."
TRINITY COLLEGE DUBLIN
School of Medicine
Student Subject Exemption Form

Please refer to your student handbook/study guide for further information regarding the granting of exemptions

Must be returned to the Medical School Office by Friday, 7th November 2008
Exemptions cannot be approved after this date

STUDENT NAME:

________________________________________________________________________

COURSE: ______________________ I.D. NUMBER: ______________________

YEAR: ______________________ TUTOR: ______________________

EXEMPTION SOUGHT FROM (subject)

________________________________________________________________________

It is assumed that this exemption is sought from both examinations/assessment, coursework etc. Should the case be otherwise, e.g. exemption from coursework only, please state (otherwise leave blank):

________________________________________________________________________

JUSTIFICATION (include relevant academic qualifications and evidence of primary degree in the subject):

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STUDENT'S SIGNATURE: ______________________ DATE: ______________________
TRINITY

MED DAY

**Friday 7th November 2008**

This year TRINITY MED DAY will be supporting:

♥ The Centre of Cardiovascular Risk in Younger Persons – AMiNCH, Tallaght
♥ The Stroke Unit – St James’s Hospital
♥ Trinity Access Programme (TAP)

Events include….

Street Collection
“Sports Day” fun on Campus
Inflatable Games
Med Student Talent Show
Night Out
Med Soccer Cup
TAP Medical Open Day

….And Much much more!!

Play your part in making a difference!