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Cover image:
Confocal micrograph of fluorescently labelled HeLa cells.
Nuclei are labelled in blue, tubulin in green and actin fibres in red.

Courtesy of:
Kevin Mackenzie
Microscopy and Histology Core Facility
Institute of Medical Sciences
University of Aberdeen
http://www.abdn.ac.uk/ims/microscopy-histology
Course Summary
The course is designed to give the students a basic understanding of the mechanisms of disease such as cancer and the principles of chemotherapy using as examples the treatment of infection, cancer and inflammation. The rational use of specific drugs will be described, as will the problems of drug resistance. Current therapeutic use of anticancer drugs will be discussed. Specific drugs will be described in detail to illustrate the key principles involved. Synthesis and function of eicosanoids will be discussed.

Course Aims & Learning Outcomes
At the end of the course students will:

1. Have a basic understanding of the development of cancer in man.
2. Have knowledge of the use of drugs in cancer therapy and cancer chemoprevention.
3. Understand the principles of chemotherapy and explain the rational use of drugs in cancer, infection, immunity.
4. Have an understanding of the process of infection by a variety of agents (viruses, bacteria, fungi, parasites).
5. Have knowledge of drug resistance and its modulation.
6. Understand the principles of immunosuppression and the drugs used.
7. Be able to outline the processes associated with inflammation and understand basic therapies associated with the inflammatory response.

Throughout the course emphasis will be placed on understanding the principles of understanding why drugs are effective.

Course Teaching Staff
Course Co-ordinator(s):
Dr Ian Fleming (INF) (ext. 8357)

Other Staff:
Professor Valerie Speirs (VS), IMS
Prof Graeme I. Murray (GIM), Pathology
Dr Elaina Collie-Duguid (ECD), IMS
Dr Isabel Crane (IJC), IMS
Dr Mairi Mclean (MM), IMS
Dr Sam Miller (SM), IMS
Dr Stefania Spano (SS), IMS
Dr Obinna Ubah (OCU), IMS
Dr Indrani Mukhopadhya (IM), RI
Assessments & Examinations

The course will be assessed by both continuous assessment of course work and by written examination. Weightings will be 70% written examination and 30% continuous assessment. All examination and assignments will be marked on the common grading scale (CGS, copy attached).

Written examination
- One paper of 1.5 hours with 2 questions to be answered out of 5.

Continuous Assessment
- One essay; one presentation; one laboratory report.

Resit Examination
- One written paper of 1.5 hours with 2 questions to be answered out of 5. Students must pass the written resit examination.

Class Representatives

We value students’ opinions with respect to enhancing the quality of teaching and its delivery; therefore in conjunction with the Students’ Association we support the Class Representative system.

In the School of Medicine, Medical Sciences and Nutrition we operate a system of course representatives, who are elected from within each course. Any student registered within a course that wishes to represent a given group of students can stand for election as a class representative. You will be informed when the elections for class representative will take place.

What will it involve?
It will involve speaking to your fellow students about the course you represent. This can include any comments that they may have. You will attend a Staff-Student Liaison Committee and you should represent the views and concerns of the students within this meeting. As a representative you will also be able to contribute to the agenda. You will then feedback to the students after this meeting with any actions that are being taken.

Training
Training for class representatives will be run by the Students Association. Training will take place within each half-session. For more information about the Class representative system visit www.ausa.org.uk or email the VP Education & Employability vped@abdn.ac.uk. Class representatives are also eligible to undertake the STAR (Students Taking Active Roles) Award with further information about this co-curricular award being available at: www.abdn.ac.uk/careers.

Problems with Coursework

If students have difficulties with any part of the course that they cannot cope with alone they should notify the course coordinator immediately. If the problem relates to the subject matter general advice would be to contact the member of staff who is teaching that part of the course. Students with registered disabilities should contact Mrs Jenna Reynolds
(medsci@abdn.ac.uk) in the School Office (based in the IMS, Foresterhill), or Mrs Sheila Jones (s.jones@abdn.ac.uk) in the Old Aberdeen office associated with the teaching laboratories, to ensure that the appropriate facilities have been made available. Otherwise, you are strongly encouraged to contact any of the following as you see appropriate:

- Course student representatives
- Course co-ordinator
- Convenor of the Medical Sciences Staff/Student Liaison Committee (Prof Gordon McEwan)
- Personal Tutor
- Medical Sciences Disabilities Co-ordinator (Dr Derryck Shewan)

All staff are based at Foresterhill and we strongly encourage the use of email or telephoning the Medical Sciences Office (01224 437471) (medsci@abdn.ac.uk). You may have a wasted journey travelling to Foresterhill only to find staff unavailable.

If a course has been completed and students are no longer on campus (i.e. work from second semester during the summer vacation), coursework will be kept until the end of Freshers’ Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

**Course Reading List**

Rang & Dale’s, MM & Ritter, Pharmacology (8th Edition)

- Basic principles of chemotherapy
- Cancer chemotherapy
- Antibacterial agents
- Antiviral drugs
- Antifungal drugs
- Anti-inflammatory and immunosuppressant drugs

**Lecture Synopsis**

**Introduction to cancer biology: Professor Valerie Speirs**

Introduction to cancer biology. Definition of cancer and description of the molecular and cellular basis of cancer development.

**Principles of cancer chemotherapy: Professor Valerie Speirs**

The principles and aims of cancer chemotherapy. Identification of targets for chemotherapy. Coverage of the major classes of anticancer drugs. Explanations of the toxicity of the anticancer drugs. Mechanisms of modulating or limiting toxicity. Concept of combination chemotherapy.
Cancer drug resistance: Professor Valerie Speirs

The basic mechanisms of drug resistance to antibiotics and anticancer drugs. The basic mechanisms by which antibiotic resistance occurs, is spread and the ways in which it can be overcome. The development of resistance in cancer cells and the mechanisms of anticancer drug resistance including multi-drug resistance, glutathione associated drug resistance and atypical multi-drug resistance. The concept of resistance modifiers and their success.

Cancer Chemoprevention: Professor Valerie Speirs

An overview of chemoprevention focussing on advances made in the prevention of breast and colon cancer through epidemiological, in vitro and in vivo studies. This lecture will also cover the criteria for selection of a candidate chemopreventative agent plus the refinement and revaluation of currently suggested chemopreventatives. Agents used and the relative success and failure rates.

Pathology of cancer: Professor Graeme Murray

- Introduction to pathology of cancer
- Definition, classification and nomenclature of cancer
- Concepts of tumour invasion and metastasis
- Modes of tumour spread
- Introduction to models of metastasis

Cancer Genetics: Dr Elaina Collie-Duguid

This lecture will outline cancer as a polygenic disease and the genetic basis of risk of developing cancer. The cellular and molecular complexity of cancer will be explored. The relationship between genomic variation, environmental factors and cancer risk will be discussed. Many genome wide associations studies, focussed on analysis of single nucleotide polymorphisms (SNPs) across the genome, have been performed in recent years in large cohorts of cancer patients to identify the genetic basis of cancer risk. However the results of these studies were in many ways disappointing with a large heritability void remaining. More recent studies of new discovered types of human genetic variation and epigenomic variation, which may underpin susceptibility to common polygenic diseases such as cancer, will be examined.

New therapies for cancer: Dr Elaina Collie-Duguid

In recent years, there has been a paradigm shift in the approach to treatment of patients with cancer. Tumours were previously classified according to their anatomical site and histopathological subtype and these features play a critical role in treatment selection due to the distinct relationships between each subtype and therapeutic response or patient prognosis. However, it is now well understood that each of these histopathological and anatomical cancer subtypes are made up of diverse molecular subgroups each with distinct oncogenic drivers and patient prognoses. Discovery of these critical oncogenic drivers in subgroups of cancer patients with different molecular disease subtypes has been exploited in drug development. The aim is to identify and treat specific molecular cancer subgroups with
agents targeted against the molecular driver in an attempt to improve the therapeutic response and patient outcomes. This has led to a companion biomarker targeted agent approach in the treatment of many cancers. This lecture will outline the background and rationale to companion drug development and will provide specific examples of targeted agents in current clinical use or in the development pipeline.

**Infectious disease: Dr Stefania Spano**

Introduction to Infectious Diseases. The emphasis of this lecture is on the key concepts and strategies that microbes use to infect humans. Bacterial and Eukaryotic pathogens including fungi and malaria will be presented and discussed in detail.

**Antibiotics: Dr Sam Miller**

The development of antibiotics has been a major factor in the control of bacterial diseases. Antibiotics target activities that are unique for bacteria with minimal side effects to the host. This lecture will describe examples of specific antibiotics and consider their sites of action and the evolution of resistance in bacteria.

**Antivirals: Dr Indrani Mukhopadhya**

The development of successful antivirals is difficult due to the close integration of virus replication cycle with the host cell infected by the virus meaning that it is difficult to identify specific targets for the virus. This lecture will consider some of the possible targets that have been considered and will describe the use of successful antivirals against Hepatitis C Virus and Human Immunodeficiency Virus as examples of these drugs.

**Cancer Immunotherapy: Dr Isabel Crane**

This lecture will look at the role of the immune system in Cancer and how more often than not the cancer evades destruction by the immune system. This teaching session will also look at the emerging field of immune-therapeutics using cancer vaccines and monoclonal antibodies in the treatment of cancer.

**Immunosuppressive drugs: Dr Isabel Crane**

This lecture will look at some of the common immunosuppressive drugs that are used in preventing or treating allograft rejection and also in treatment of autoimmune disease. Their mode of action will be considered. Newer therapies targeting T and B cells and costimulatory molecules will also be discussed.

**Treatment of Chronic Inflammatory Disorders: Dr Mairi Mclean**

The aim of this lecture is to introduce the clinical manifestations of chronic inflammatory disorders in many body sites and then focus on inflammatory bowel disease (IBD) to showcase treatment strategies employed for these disorders. IBD is a chronic, relapsing, remitting inflammatory disorder of the gastrointestinal tract and the two clinical phenotypes
are ulcerative colitis and Crohn’s disease. Each has distinct clinical and pathogenic aspects, and IBD remains a huge health burden on society. The lecture will provide an overview of the aetiology, epidemiology and pathology of IBD, describe the current and emerging treatment strategies including thiopurines, anti-cytokine and anti-integrin biologic agents and discuss current modalities in clinical decision making in IBD including therapeutic drug monitoring.

**Anti-inflammatory Drugs: Dr Obinna Ubah**

Description of classes, mechanisms of action, clinical use and side effects of anti-inflammatory drugs. This lecture will also shed light on the use of ‘Biologics’ in the management/treatment of chronic inflammatory diseases, and mechanisms involved in resistance to treatment. Emphasis on pro-inflammatory cytokines TNF-alpha & IL-1 antagonist biologics.

**Practical/Lab/Tutorial Work**

**Laboratory Work**

**Cell Culture Lecture and Practical.**

This will take the form of a Cell Culture practical. Please observe the Safety Instructions enclosed with the laboratory manual.

Laboratory reports should be prepared with the aid of a word-processor and the data analysed with the aid of appropriate software packages. The DEADLINE for handing in completed laboratory reports as specified in the practical schedule.

**Course Assignments**

There are 3 assignments in the course: one essay; one presentation and one practical report. The assignments form part of your continuous assessment for the course and the marks will contribute to your final CGS mark for the course. Failure to complete assignments will result in your not being awarded a class certificate and therefore not permitted to sit degree examinations for this course.

**Hand-in Dates**

<table>
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<tr>
<th>Assignment</th>
<th>Hand-in Date</th>
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<tr>
<td>Practical</td>
<td>15th March 2019</td>
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<tr>
<td>Essay</td>
<td>22nd March 2019</td>
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<tr>
<td>Presentation</td>
<td>26th March 2019</td>
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University Policies

Students are asked to make themselves familiar with the information on key institutional policies which been made available within MyAberdeen (https://abdn.blackboard.com/bbcswebdav/institution/Policies). These policies are relevant to all students and will be useful to you throughout your studies. They contain important information and address issues such as what to do if you are absent, how to raise an appeal or a complaint and how seriously the University takes your feedback.

These institutional policies should be read in conjunction with this programme and/or course handbook, in which School and College specific policies are detailed. Further information can be found on the University’s Infohub webpage or by visiting the Infohub.

The information included in the institutional area for 2018/19 includes the following:

- Absence
- Academic Appeals & Complaints
- Assessment (Common Grading Scale)
- Codes of Practice on Student Discipline (Academic and Non-Academic)
- Class Certificates
- Exam Results
- Transcripts
- MyAberdeen
- TurnitinUK
- Feedback
- Communication
- Aberdeen Graduate Attributes
- The Co-Curriculum
# Medical Sciences Common Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade Point</th>
<th>% Mark</th>
<th>Category</th>
<th>Honours Class</th>
<th>Description</th>
</tr>
</thead>
</table>
| A1    | 22          | 90-100 | Excellent      | First         | • Outstanding ability and critical thought  
• Evidence of extensive reading  
• Superior understanding  
• The best performance that can be expected from a student at this level |
| A2    | 21          | 85-89  |                |               |                                                                             |
| A3    | 20          | 80-84  |                |               |                                                                             |
| A4    | 19          | 75-79  |                |               |                                                                             |
| A5    | 18          | 70-74  |                |               |                                                                             |
| B1    | 17          | 67-69  | Very Good      | Upper Second  | • Able to argue logically and organise answers well  
• Shows a thorough grasp of concepts  
• Good use of examples to illustrate points and justify arguments  
• Evidence of reading and wide appreciation of subject |
| B2    | 16          | 64-66  |                |               |                                                                             |
| B3    | 15          | 60-63  |                |               |                                                                             |
| C1    | 14          | 57-59  | Good           | Lower Second  | • Repetition of lecture notes without evidence of further appreciation of subject  
• Lacking illustrative examples and originality  
• Basic level of understanding |
| C2    | 13          | 54-56  |                |               |                                                                             |
| C3    | 12          | 50-53  |                |               |                                                                             |
| D1    | 11          | 47-49  | Pass           | Third         | • Limited ability to argue logically and organise answers  
• Failure to develop or illustrate points  
• The minimum level of performance required for a student to be awarded a pass |
| D2    | 10          | 44-46  |                |               |                                                                             |
| D3    | 9           | 40-43  |                |               |                                                                             |
| E1    | 8           | 37-39  | Fail           | Fail          | • Weak presentation  
• Tendency to irrelevance  
• Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts |
| E2    | 7           | 34-36  |                |               |                                                                             |
| E3    | 6           | 30-33  |                |               |                                                                             |
| F1    | 5           | 26-29  | Clear Fail     | Not used for Honours | • Contains major errors or misconceptions  
• Poor presentation |
<p>| F2    | 4           | 21-25  |                |               |                                                                             |
| F3    | 3           | 16-20  |                |               |                                                                             |
| G1    | 2           | 11-15  | Clear Fail/Abysmal | -             | • Token or no submission |
| G2    | 1           | 1-10   |                |               |                                                                             |
| G3    | 0           | 0      |                |               |                                                                             |</p>
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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Room</th>
<th>Title</th>
<th>Session</th>
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<td><strong>Week 31</strong></td>
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<td>Mon 25 Feb</td>
<td>14:00-15:00</td>
<td>1:032/033</td>
<td>Introduction to PA3802</td>
<td>Lecture</td>
<td>INF</td>
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<td>15:00-16:00</td>
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<td>Introduction to practical</td>
<td>Practical</td>
<td>INF</td>
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<td>Cell culture Practical</td>
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<td>Practical Tutorial</td>
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<td>New Therapies for Cancer</td>
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<td>Antivirals</td>
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<td>Mon 25</td>
<td>14:00-15:00</td>
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<td>Presentation practice</td>
<td>Lecture</td>
<td>INF</td>
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<td>Anti-inflammatory Drugs</td>
<td>Lecture</td>
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<td>1:032/033</td>
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<td>Fri 29</td>
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</table>

**Staff**
- Dr Ian Fleming (INF), IMS - Course Co-ordinator
- Professor Valerie Speirs (VS), IMS
- Prof Graeme I. Murray (GIM), Pathology
- Dr Elaina Collie-Duguid (ECD), IMS
- Dr Mairi Mclean (MM), IMS
- Dr Obinna Ubah (OCU), IMS
- Dr Isabel Crane (IJC), IMS
- Dr Indrani Mukhopadhya (IM), RI
- Dr Sam Miller (SM), IMS
- Dr Stefania Spano (SS), IMS