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*PA3802- Mechanisms of Disease and Principles of Chemotherapy*

*Course Handbook 2023-2024*

*Undergraduate Medical Sciences*

*School of Medicine, Medical Sciences & Nutrition*

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# 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

Dr Elaina Collie-Duguid (ECD), IMS

Dr Isabel Crane (IJC), IMS

Dr Sam Miller (SM), IMS

Dr Indrani Mukhopadhya (IM), IMS

Dr Virtu Solano Collado (VSC), IMS

Dr Tara Sutherland (TS), IMS

Dr Obinna Ubah (OCU), IMS

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 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 in regard 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 & 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](http://www.ausa.org.uk) or email the VP Education & Employability [vped@abdn.ac.uk](mailto: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](http://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 the medical sciences office, ([medsci@abdn.ac.uk](mailto:medsci@abdn.ac.uk)) (based in the Polwarth Building, Foresterhill) 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 (Professor 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 telephone the Medical Sciences Office. 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 half session during the summer vacation), coursework will be kept until the end of Fresher’s Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

# Course Reading List

Rang & Dale’s, Pharmacology (9th Edition)

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

Catrin Page, Crash course in Pharmacology (5th Edition)

# Lecture Synopsis

Lecture 1: Course Introduction - Dr Ian Fleming

Outline of the course and general introduction

**Theme 1: Cancer**

**Lecture 2: 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.

**Lecture 3: 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.

**Lecture 4: 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.

**Lecture 5: 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.

**Lecture 6: Pathology of cancer - Professor Valerie Speirs**

This lecture will define pathology and introduction you to cancer pathology, including the types of tumours and their nomenclature. The role of pathology in cancer diagnosis will be discussed including an overview of the pathology report. New and emerging pathology disciplines will be introduced.

**Lecture 7: 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 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 explore other types of human genetic variation and epigenomic variation in susceptibility to common polygenic diseases such as cancer. Furthermore, gene-environment interactions have a central role. Many factors contribute to the complexity of unravelling genotype-phenotype relationships in cancer.

**Lecture 8: 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. Moving away from a one-size fits all approach, prognostic and predictive biomarkers are used in precision medicine to tailor cancer therapy and optimise therapeutic benefit. 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 with therapeutic response and/or patient prognosis.  However, it is now understood that each of these histopathological and anatomical cancer subtypes are made up of diverse molecular subtypes, each with distinct oncogenic drivers, patient prognoses and responses to therapies.  This has allowed use of these molecular subtypes as prognostic or predictive biomarkers in clinical decision making in oncology to improve patient outcomes. Discovery of 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 subtypes with agents targeted against the specific molecular driver in an attempt to improve therapeutic response and patient outcomes.  This has led to a companion biomarker targeted agent approach that utilises a molecular diagnostic assay alongside a targeted agent, in a tailored approach to 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.

**Theme 2: Infectious diseases**

**Lecture 9: Infectious disease – Dr Virtu Solano Collado**

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 will be presented and discussed in detail.

**Lecture 10: 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.

**Lecture 11: 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.

**Theme 3: Immunotherapy**

**Lecture 12: 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.

**Lecture 13: Immunosuppressive drugs - Dr Tara Sutherland**

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.

**Theme 4: Inflammation**

**Lecture 14: Treatment of Chronic Inflammatory Disorders - Dr Indrani Mukhopadhya**

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.

**Lecture 15: 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-17, 23 antagonist biologics, and small molecule inhibitors of Janus kinase

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 computer 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 2 assignments in the course: One practical report and one essay. 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.

Assignment Hand-in Dates

Assignment Hand-in Date

Practical 15th March 2024

Essay 29th March 2024

University Policies

Students are asked to make themselves familiar with the information on key education policies, available [here](https://www.abdn.ac.uk/staffnet/teaching/key-education-policies-for-students-11809.php). 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 the University will calculate your degree outcome.

These University wide education policies should be read in conjunction with this programme and/or course handbook, in which School specific policies are detailed. These policies are effective immediately, for the 2023/24 academic year. Further information can be found on the [University’s Infohub webpage](https://www.abdn.ac.uk/students/) or by visiting the Infohub.

The information included in the institutional area for 2023-24 includes the following:

* Assessment
* Feedback
* Academic Integrity
* Absence
* Student Monitoring/ Class Certificates
* Late Submission of Work
* Student Discipline
* The co-curriculum
* Student Learning Service (SLS)
* Professional and Academic Development
* Graduate Attributes
* Email Use
* MyAberdeen
* Appeals and Complaints

Where to Find the Following Information:

C6/C7- University of Aberdeen Homepage > Students > Academic Life > Monitoring and Progress > Student Monitoriung (C6 & C7)

https://www.abdn.ac.uk/students/academic-life/student-monitoring.php#panel5179

Absences- To report absences you should use the absence reporting system tool on Student Hub. Once you have successfully completed and sent the absence form you will get an email that your absence request has been accepted. The link below can be used to log onto the Student Hub Website and from there you can record any absences you may have.

[Log In - Student Hub (ahttps://www.abdn.ac.uk/studenthub/loginbdn.ac.uk)](https://www.abdn.ac.uk/studenthub/login)

Submitting an Appeal- University of Aberdeen Homepage > Students > Academic Life > Appeals and Complaints

https://www.abdn.ac.uk/students/academic-life/appeals-complaints-3380.php#panel2109

Academic Language & Skills support

For students whose first language is not English, the Language Centre offers support with Academic Writing and Communication Skills.

Academic Writing

* Responding to a writing task: Focusing on the question
* Organising your writing: within & between paragraphs
* Using sources to support your writing (including writing in your own words, and

citing & referencing conventions)

* Using academic language
* Critical Thinking
* Proofreading & Editing

Academic Communication Skills

* Developing skills for effective communication in an academic context
* Promoting critical thinking and evaluation
* Giving opportunities to develop confidence in communicating in English
* Developing interactive competence: contributing and responding to seminar discussions
* Useful vocabulary and expressions for taking part in discussions

More information and how to book a place can be found here

Medical Sciences Common Grading Scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Grade | Grade Point | % Mark | Category | Honours Class | Description |
| 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 |  |
|  |
| 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 |  |
|  |

PA3802 Course Timetable: 2023-24

* **Dates** shown below are for live teaching activities. Most lectures will be pre-recorded and shared in MYAberdeen; these are to be studied in the times where there are no live activities. The relevant lecture recordings should be watched before their associated question and answer tutorial to maximise learning.
* **Times** are UK Time and show the timings of live sessions (either on campus or via MyAberdeen)
* **Venues:** Polwarth 2.054; Medical Physics workshop D2; STH – Science Teaching HUB

**Timetable Key:**

|  |
| --- |
| Blue = Live classes delivered in person or as a live session in MyAberdeen |
| Yellow = Assessments |
| Grey = No scheduled classes for PA3802 on these days |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date | Time | Room | Title | Session | Lecturer |
| Week 31 | | | | | |
| Mon 26 Feb | 14:00-15:00 | Polwarth 2.054 | Lecture 1: Introduction to PA3802 | Lecture | INF |
| Tue 27 Feb |  |  |  |  |  |
| Wed 28 Feb |  |  |  |  |  |
| Thu 29 Feb | 10:00-15:00 | STH, lab 1.007 | Lab practical | Practical | INF |
| Fri 1 Mar | 1400-15:00 | Polwarth 2.054 | Tutorial on practical report | Tutorial | INF |
| Week 32 | | | | | |
| Mon 4 Mar |  |  |  |  |  |
| Tue 5 Mar |  |  |  |  |  |
| Wed 6 Mar | 10:00-11:00 | Medical Physics workshop D2 | Question and answer tutorial on cancer lectures 2 - 4 | Tutorial | VS |
| Thu 7 Mar |  |  |  |  |  |
| Fri 8 Mar |  |  |  |  |  |
| Week 33 | | | | | |
| Mon 11 Mar | 14:00-15:00 | Polwarth 2.054 | Question and answer tutorial on cancer lectures 5 & 6 | Tutorial | VS |
| Tue 12 Mar |  |  |  |  |  |
| Wed 13 Mar | 10:00-11:00 | Medical Physics workshop D2 | Question and answer tutorial on lectures 7 & 8 | Tutorial | ECD |
| Thu 14 Mar |  |  |  |  |  |
| Fri 15 Mar | 14:00-15:00 | Polwarth 2.054 | Tutorial on essay writing | Tutorial | INF |
| 17:00 | MyAb (Turnitin) | Assessment due (Practical report) | Assessment |  |
| Week 34 | | | | | |
| Mon 18 Mar |  |  |  |  |  |
| Tue 19 Mar |  |  |  |  |  |
| Wed 20 Mar |  |  |  |  |  |
| Thu 21 Mar | 13:00-14:00 | Polwarth 2.054 | Question and answer tutorial on lectures 9 & 10 | tutorial | VSC, SM |
|  | 14:00-15:00 | Polwarth 2.054 | Question and answer tutorial on lectures 11 & 14 | tutorial | IM |
| Fri 22 Mar |  |  |  |  |  |
| Week 35 | | | | | |
| Mon 25 Mar | 14:00-15:00 | Polwarth 2.054 | Question and answer tutorial on lectures 12 & 13 | Q & A tutorial | IJC, TS |
| Tue 26 Mar |  |  |  |  |  |
| Wed 27 Mar | 10:00-11:00 | Medical Physics workshop D2 | Lecture 15: Anti-inflammatory Drugs | Lecture | OCU |
| Thu 28 Mar |  |  |  |  |  |
| Fri 29 Mar | 17:00 | MyAb (Turnitin) | Assessment due (essay) | Assessment |  |

Staff

* Dr Ian Fleming (INF), IMS

- Course Coordinator

* Professor Valerie Speirs (VS), IMS
* Dr Elaina Collie-Duguid (ECD), IMS
* Dr Isabel Crane (IJC), IMS
* Dr Sam Miller (SM), IMS
* Dr Indrani Mukhopadhya (IM), IMS
* Dr Virtu Solano Collado (VSC), IMS
* Dr Tara Sutherland (TS), IMS
* Dr Obinna Ubah (OCU), IMS

Campus Maps - Foresterhill



Polwarth Floor Plans

Diagram, schematic

Description automatically generated

Diagram

Description automatically generated

Diagram

Description automatically generated