**LEARNING OBJECTIVES AND TIMETABLE**

**Module 2, Leukaemia**

**Haematology BSc Science Year, 2012-2013**

**Co-conveners:** Professor B Bain [b.bain@imperial.ac.uk](mailto:b.bain@ic.ac.uk)

Professor L Foroni [l.foroni@imperial.ac.uk](mailto:l.foroni@imperial.ac.uk)

**Overall objective** The student should be able to describe the clinicopathological features, including cytogenetic, molecular genetic and, where relevant, the immunophenotypic features of the acute and chronic leukaemias and the myelodysplastic syndromes, selected lymphomas and multiple myeloma.

**Detailed objectives** The student should be able to:

* Explain how the cause of leukaemia can be established and describe what is known of the aetiology of acute myeloid leukaemia (AML), acute lymphoblastic leukaemia (ALL), chronic myeloid leukaemia (CML) and the myelodysplastic syndromes (MDS)
* Describe the main inherited and other constitutional syndromes that predispose towards leukaemias and explain how these syndromes contribute to understanding of leukaemogenesis
* Describe, compare and contrast the clinicopathological features of AML and MDS
* Explain the principles of cytogenetic analysis and be able to interpret a karyotype and a karyogram
* Explain the terms ‘oncogene’ and ‘tumour-suppressor gene’ and describe oncogenic mechanisms operating in AML, ALL and MDS
* Outline the principle of molecular genetic analysis and be able to give a brief description of the polymerase chain reaction (PCR), reverse transcriptase PCR (RT-PCR) and fluorescence *in situ* hybridization (FISH)
* Explain how clonality of myeloid cells and lymphoid cells can be established and the relevance of establishing clonality
* Describe the clinicopathological, cytogenetic and molecular genetic abnormalities of common important subtypes of AML including those associated with t(8;21) and t(15;17)
* Describe the clinicopathological, cytogenetic and molecular genetic abnormalities of CML
* Outline the principles of treatment of CML and describe the role of cytogenetic and molecular genetic analysis in monitoring treatment
* Discuss the possibility of cure of AML and CML and how this is influenced by the underlying molecular genetic abnormality
* Describe the clinicopathological, cytogenetic, molecular genetic and immunophenotypic features of acute lymphoblastic leukaemia
* Explain how cytogenetic and molecular genetic analysis has contributed to advancing knowledge in AML, ALL and MDS
* Describe the normal immune system and describe briefly the structure and function of the different classes of immunoglobulin (material from introductory course to be revised)
* Describe the clinicopathological features of chronic lymphocytic leukaemia, non-Hodgkin’s lymphoma and multiple myeloma
* Explain how the cause of lymphoid neoplasms can be established and discuss what is known of aetiological factors and mechanisms of oncogenesis
* Describe the clinicopathological, cytogenetic, molecular genetic and immunophenotypic features of CLL and typical examples of non-Hodgkin lymphoma (e.g. follicular lymphoma, mantle cell lymphoma, Burkitt lymphoma and adult T-cell leukaemia/lymphoma)
* Explain how the immunophenotype of neoplastic lymphoid cells is established
* Describe the role of immunophenotyping in the differential diagnosis of chronic lymphocytic leukaemia and non-Hodgkin lymphoma
* Describe what is known of oncogenic mechanisms in multiple myeloma, including the role of cytokines
* Describe what is known of the aetiology of Hodgkin lymphoma and describe the clinicopathological features
* Discuss the principles of treatment of lymphoproliferative disorders and multiple myeloma and discuss the prospects of gene therapy in these conditions

**Pre-requisites**

You should be familiar with the relevant material delivered in the introductory course.

**Introductory and supplementary reading (available in library).**

Bain BJ. Haematology: a Core Curriculum. Imperial College Press, London, 2010. (Relevant chapters provide an introduction to module 2)

Mughal TI, Goldman JM and Mughal ST, Understanding Leukemias, Lymphomas and Myelomas, Taylor and Francis, London, 2006. (This book is written mainly in a fairly straightforward manner and may be useful as an introduction)

Bain BJ, Leukaemia Diagnosis, 4th Edn., Wiley-Blackwell, Oxford, 2010 (This book is in much greater depth than the other two)

**Note to teachers (except external guest lecturers)**

For each lecture, the students should have access to either Word document (1-2 pages of A4) or a Power Point Presentation (PPP) (or both). Either a handout or a PPP should be sent to [webmaster.feo@imperial.ac.uk](mailto:webmaster.feo@imperial.ac.uk) so that it can be placed on the intranet. The students prefer to have access to material BEFORE the lecture as some of them like to read it in advance so that they can then understand the lecture better. If your PPP is too large a file to email it should be sent to <https://fileexchange.imperial.ac.uk> with the webmaster being notified of the site where it can be found.

Students have been given a printing allowance so you do not need to print handouts. However it would be appreciated if they could be uploaded a day in advance so that students can print them and annotate them if they wish.

If **external guest lecturers** are willing to leave a copy of a PPP for the benefit of the students this would be greatly appreciated as it saves the students having to take detailed notes.

**BSc in Haematology, Module 2, 2012-2013**

**Week 1: St Mary’s Hospital except Friday afternoon 16/11/12**

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| **Monday 12th November**  St Mary’s Hospital | **Tuesday 13th November**  St Mary’s Hospital | **Wednesday 14th November** | **Thursday 15th November**  St Mary’s Hospital | **Friday 16th November**  **AM:** St Mary’s Hospital  **PM:** South Kensington |
| 9.00-10.00  **Dr S Abdalla**  CML  **Cockburn LT** | *Chance to attend clinic (Dr Rowley and Dr Abdalla)* | 9.15-12.00 (Haematology clinics)  Clinic E  (Max. of 2 students with Dr. S. Abdalla, 2 with Dr. A. Shlebak)  *Note: patients with multiple myeloma attend Dr Abdalla’s clinic* | *Chance to attend the Lymphoma Clinic* | **St Mary’s**  9.15 – 12.00  Haematology clinics  Clinic D, Dr Marks and Dr Layton  (Maximum of 2 students with each consultant)  *Note: patients with leukaemia attend Dr Marks’ clinic* |
| 10.00-11.00  **Dr S Abdalla** Overview of acute myeloid leukaemia  **Cockburn LT** |
| 11.00-12.00  **Dr I Gabriel**  Lab diagnosis of ALL/AML – morphology & cytochemistry  **Cockburn LT** |
| 1.00-2.00  **Prof B. Bain**  Cytogenetic analysis in acute leukaemia  **Peart Room** | 1.00-2.00  **Prof J Apperley**  The modern management of CML  **Clinical Lecture Theatre** |  |  | 12.45 – 1.45  Staff Round (optional) **Cockburn LT** |
| **2.00-3.00**  **Prof B. Bain**  Principles of immunopheno-typing and its use in acute leukaemia **Cockburn LT** | 2.00-3.00  **Dr V. Jayakar** Overview of ALL  **Peart Room** | SPORTS AFTERNOON | 2.00-3.00  **Dr I. Gabriel**  Case presentation  **Cockburn LT** | **South Kensington**  1.00-2.30 Group 1  2.45-4.15 Group 2  **Dr D. Marin**  Workshop: Interpreting survival curves  **Sir Alexander Fleming building**  **G28 computer lab** |
|  | 3.00-4.00 **Professor B. Bain**  Oncogenes in acute leukaemia  **Peart Room** | 3.00-4.00  **Dr. S Abdalla** Introduction to myelodysplastic syndromes  **Cockburn LT** |
| 4.00-5.00  **Prof B. Bain**  CAL Acute leukaemia, CML and MDS  **Hynds Lab** |  |

**BSc in Haematology, Module 2, 2012-2013**

**Week 2:**

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| **Monday 19th November** | **Tuesday 20th November**  Hammersmith Hospital | **Wednesday 21st November**  St Mary’s Hospital | **Thursday 22nd November**  St Mary’s Hospital | **Friday 23rd November**  Hammersmith Hospital |
| PRIVATE STUDY | PRIVATE STUDY | 9.15-12.00 (Haematology clinics)  Clinic E  (Max. of 2 students with Dr. S. Abdalla, 2 with Dr. A. Shlebak)  *Note: patients with multiple myeloma attend Dr Abdalla’s clinic* | *Chance to attend the Lymphoma Clinic* | 9.15-10.45  PRIVATE STUDY  or  *chance to attend clinic at St Mary’s (Dr Marks and Dr Layton)* |
| 10.00-11.00  **Dr D. Macdonald**  Chronic lymphocytic leukaemia  **WEC LT 3** |
| 11.00-12.00  **Dr D. Marin**  Management of acute myeloid leukaemia  **WEC LT 3** | 11.15 - 12.15  **Dr L. Foroni**  Revision of  Molecular technique and clinical applications  **WEC Seminar Room 5** |
|  | 12.00 -1.00  **Dr A. Karadimitris**  Constitutional syndromes and leukaemia  **WEC LT 3** |  | 12.30-1.30  **Dr G. Gerrard and Dr L. Foroni**  Designed Drugs  **Cockburn LT** | 1.00-1.45  **Philippa May**  Seminar on  cytogenetic **WEC Seminar Room 1** |
| *Chance to attend clinic (Dr Shlebak)* | 2.00-3.00  **Professor J. Apperley**  Bone Marrow Transplantation  **WEC Seminar Room 4** | SPORTS AFTERNOON | 2.00-3.00 **Dr V. Jayakar**  APL  **Cockburn LT** | 1.45-2.30  **Dr Letizia Foroni**  Detecting minimal residual disease  **WEC Seminar Room 1**  2.30-4.00  **P May and L Foroni**  Laboratory practical  (group of 8 to visit the labs)  **G Block level 2**  **Imperial Pathology**  **Laboratory** |
| 3.00-4.00  **Dr D. Marin** Practical class, acute leukaemia and MDS (microscopy)  **Cyclotron Building, Lab 612** | 3.00-4.00  **Dr S. Abdalla**  Pathobiology of Myeloma  **Cockburn LT** |
| 4.00-5.00  **Dr S. Abdalla**  Treatment of Myeloma  **Cockburn LT** |

**BSc in Haematology, Module 2, 2012-2013**

**Week 3**

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| **Monday 26th November** | **Tuesday 27th November**  St Mary’s Hospital | **Wednesday 28h November** Hammersmith Hospital | **Thursday 29th November**  St Mary’s Hospital | **Friday 30th November** Hammersmith Hospital |
| PRIVATE STUDY | 10.00-11.00  **Professor B. Bain**  ALL cytogenetics/ molecular genetics  **Hammersmith WEC SR1** | 9.00 – 10.00  **Dr A. Rahemtulla** Multiple myeloma + **video**  **WEC LT 3** | 10.00-11.00  *Chance to attend the Lymphoma Clinic* | 10.00-11.00  **Dr E. Kanfer**  Diffuse large B-cell lymphoma  **WEC Seminar Room 5** |
| 11.00-12.00 **Professor B. Bain**  Immunophenotyping in acute leukaemia (practical)  **Hammersmith WEC SR1** | 10.00-11.00  **Dr. E. Kanfer**  Complications of treating acute leukaemia    **WEC LT 3** | 11.00-12.15  **Dr K. Bailey**  Leukaemia – past, present and future **Clinical Lecture Theatre** | 11.00-12.00 **Professor K. Naresh**  Infection and lymphoma **WEC Seminar Room 5** |
| PRIVATE STUDY | PRIVATE STUDY | 11.00-12.00  **Dr  L. Foroni** Clarifying some difficult concepts (1)  **WEC LT 3** | 12.30-1.30  **Prof D. Grimwade** APL **Clinical Lecture Theatre** | 12.00 – 1.00  **Dr R. Szydlo** JClub/Seminar Interpreting Trials  **WEC Seminar Room 3** |
| *Chance to attend clinic (Dr Shlebak)* |  | SPORTS AFTERNOON | 2.00-3.00  **Prof B. Bain** Lymphoma aetiology and Burkitt lymphoma  **Cockburn LT** | 2.00 -3.00  **Dr L. Foroni and**  **Dr M. Papaioannou**  Microscopy  **CWB-7S2**  **Southside Lab** |
| 3.00-4.00  **Lucy Cook**  HTLVI and ATLL  **Cockburn LT** |  |
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**BSc in Haematology, Module 2, 2012-2013**

**Week 4**

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| **Monday 3rd December**  St Mary’s Hospital | **Tuesday 4th December**  Hammersmith  Hospital | **Wednesday 5th December**  St Mary’s Hospital | **Thursday 6th December**  St Mary’s Hospital | **Friday 7th December**  St Mary’s Hospital |
|  |  | 9.15-12.00 (Haematology clinics)Clinic E (Max. of 2 students with Dr. S. Abdalla, and 2 with Dr. A. Shlebak)  *Note: patients with multiple myeloma attend Dr Abdalla’s clinic* | **Submit Essay by 10.00 a.m.**  *Chance to attend the Lymphoma Clinic* | 9.15 – 12.00  Haematology clinics  Clinic D  (Maximum of 2 students with each consultant)  *Note: patients with leukaemia attend Dr Marks’ clinic* |
| 10.00-11.00  **Professor B. Bain** Follicular lymphoma  **Peart Room** | 10.00 – 12.00  **Dr A. Chaidos and A. Karadimitris**  More Immuno-phenotyping  including a practical  demonstration  **WEC LT 2** |
| 11.00-12.00  **Prof B. Bain**  Immunopheno-typing in LPD  **Cockburn LT** |
| 12.00-1.00 **Prof B. Bain**  CAL LPD (1/2 group)  **Hynds Lab** |  | SPORTS AFTERNOON |  | 12.45 – 1.45 Staff round  **Cockburn LT** |
| 1.00-2.00  **Prof B. Bain**  CAL LPD (Group 2)  **Hynds Lab** | 1.00 – 2.00  **Dr L. Foroni**  Molecular technique in lymphoma diagnosis/ follow-up  **WEC LT 2** |
| 2.00-3.00  **Professor B. Bain**  Journal Club  **Cockburn LT** | 2.00 – 3.00  Therapy of non-Hodgkin’s lymphoma  **Dr. E. Kanfer**  **WEC LT 2** |  |  |
| 3.00-4.00 **Dr M. Thompson**  Histology of LPD  **Cockburn LT** | 3.00-4.00  **Dr D. Marin,**  **Dr M. Papaioannou**  LPD (Microscopy)  **CWB-7S2**  **Southside Lab** |  |
|  | 4.00-5.00  **Dr D. Milojkovic**  Management of MDS  **WEC LT 2** |  |  |

**BSc in Haematology, Module 2, 2012-2013**

**Week 5**

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| **Monday 10th December**  St Mary’s Hospital | **Tuesday 11th December** | **Wednesday 12th December**  St Mary’s Hospital | **Thursday 13th December**  St Mary’s Hospital | **Friday 14th December**  St Mary’s Hospital |
| 9.00-10.00  **Dr A. Innes** Immunological complications of chronic lymphocytic leukaemia  **Cockburn LT** | *Chance to attend clinic (Dr Rowley and Dr Abdalla)* | 9.15-12.00 (Haematology clinics) Clinic E (Max. of 2 students with Dr. S. Abdalla, and 2 with Dr. A. Shlebak) *Note: patients with multiple myeloma attend Dr Abdalla’s clinic* | *10.00-11.00 Chance to attend the Lymphoma Clinic* | 9.15 – 12.00  Haematology clinics  Clinic D  (Maximum of 2 students with each consultant)  *Note: patients with leukaemia attend Dr Marks’ clinic* |
| 10.00-11.00  **Prof B. Bain**  Hodgkin lymphoma  **Cockburn LT** |
| 11.00-12.00  **Prof B. Bain**  Practical Immunophenotyping in Lymphoproliferative disorders  **Cockburn LT** | 11.00-12.00  **Dr M. Heller and Prof B. Bain**  Revision module 3  **Cockburn LT** |
|  |  | SPORTS AFTERNOON | 12.30-1.30  **Dr E. Terpos** Myeloma bone disease  **Cockburn LT** |  |
|  |  | 2.00-3.00  **Dr E. Terpos** MDS  **Cockburn LT** | 2.00-3.00 **Academic Secretary and Prof B. Bain**  In Course assessment  **Cockburn LT** |
|  | 3.00-3.30  **Prof. B. Bain**  Feedback on course  **Cockburn LT** |