BSc in Medical Sciences with TRANSLATIONAL RESPIRATORY MEDICINE

Introduction
Respiratory disease is common, reflecting environmental, occupational and inherited factors. Respiratory patients have a significant clinical and economic impact on the NHS and respiratory conditions have a substantial personal impact on the affected individuals and their families. This course gives students an opportunity to study in depth the science underlying a number of respiratory conditions and their management.

This course will comprise of three modules in total. Module 1 is a taught module broken down into three blocks of three-week teaching. Each block of teaching is followed with a consolidation week to allow students to engage with self-directed learning, on-line modules and to receive feedback on their coursework from the course lead. Module 2 is a self-directed learning module compromising of two pieces of assessment. One assessment is termed ‘Science in Context’ and forms an individual clinical case study and the other is a group-based critical literature review. Module 3 is the research project module where students will engage on a 15-week project, either in a laboratory or clinical setting.

Course Director
Professor Louise Donnelly l.donnelly@imperial.ac.uk

Course Administrator
Ms Sarah Fort respbscteach@imperial.ac.uk

Aims and Objectives
The aim of this course is to provide a scientific basis for the practice of, and research into, respiratory medicine. It will allow students to achieve the following broad outcomes:

1. Critically appraise literature, synthesise current evidence and opinion, and identify evidence gaps in your subject area
2. Identify and describe the characteristics and rationale of different research methodologies: Eg: quantitative/qualitative, observational/experimental
3. Evaluate applicability of different research methodologies to answer research questions
4. Discuss limitations of research methodologies (bias, confounders, validity, reliability, chance) and understand their implications on methodology, analysis and sample size
5. Interpret parametric and non-parametric data
6. Organise and analyse data, justifying selection of the approaches used
7. Explain results in a descriptive and inferential manner and articulate objective conclusions
8. Communicate scientific concepts, in writing and in speech, for a range of audiences eg: academic and lay writing and presentations
9. Explain the ethical issues of research and their implications, particularly in relation to patients/animals
10. To be able to demonstrate an in-depth understanding of the chosen BSc subject:

a. Demonstrate an understanding of how the use of epidemiology can lead to disease prevention
b. Evaluate how technology, both current and emerging, can be applied for the diagnosis and treatment of respiratory disease
c. Demonstrate understanding of how mechanisms underlying pathophysiology of lung disease can inform strategy for new treatments
d. Critically evaluate how evidence-based medicine and clinical trials lead to development of guidelines and changes in patient care

Content
The course content will include a broad range of respiratory sciences including physiology and pharmacology, pathophysiology, genetics and epidemiology of lung diseases and pulmonary diagnostics. Importantly, students will have the opportunity to attend clinics and observe novel diagnostic procedures in a research-active environment, thus relating their newly acquired scientific knowledge in a variety of clinical contexts. Our BSc students will be encouraged to attend grand rounds and seminars, often from prestigious international visiting scientists and will attend a national conference. By the end of the BSc, students will have an understanding of the scientific basis of lung diseases, the aetiological factors involved, the investigation of these processes, and novel treatments not yet in routine practice.

Format of teaching
The course will be taught in a mixture of self-directed learning, eLearning, interactive face-to-face sessions, quizzes, lectures, seminars, discussion sessions, practical classes and clinic visits. Students will also be encouraged to attend the winter meeting of the British Thoracic Society to gain wider experience of academic medicine.

Module 1:
Module Leader
Dr Duncan Rogers, Royal Brompton campus  
duncan.rogers@imperial.ac.uk

Assessment lead
Dr Pankaj Bhavsar  
p.bhavsar@imperial.ac.uk

Teaching Blocks

1. Global Burden and Clinical Manifestations of Respiratory Disease
   • Epidemiology and Screening
   • Differential Diagnosis: biomarkers, symptoms and patient presentation e.g. breathlessness/ cough
   • Advanced Diagnostics: imaging, invasive/ non-invasive testing

2. Lungs and Airways: mechanisms of function and dysfunction
   • Basic Science in Context: cells & molecules, physiology & pathophysiology
   • Immunity, infection and exacerbation of respiratory disease

3. Advances in Respiratory Medicine: Personalised Medicine
   • Use of AI and 'big data'
   • Advances in treatment and innovation e.g stem cell therapy and lung regeneration; integrated healthcare; clinical trial development
Learning and teaching approach

The taught component structure consists of a 12-week teaching block interspersed with three consolidation weeks (i.e. three blocks of: three weeks of teaching plus one consolidation week). During consolidation weeks there will be associated self-directed learning, on-line modules, group work etc, and they will also provide an opportunity to meet with the course lead to discuss progress, issues, and to receive feedback/feedback on course work and progression.

Scheduled Learning & Teaching Methods will involve dynamic interactive teaching with blended materials to support the core skills-based curriculum. Small Group teaching (seminars, tutorials, debates, team-based learning, journal club, discussions) are important as we strive to provide personalised learning experiences. Laboratory practicals, and Clinical Demonstrations are utilised as appropriate. Technology Enhanced Learning is used extensively throughout the programme to complement other modes of teaching.

Assessments
There will be 3 in-course assessments during the taught component, linked to learning outcomes in core research skills and specialism-specific knowledge. All summative assessments will be preceded by the opportunity for formative experiences with feedback. Two in-course assessments will use written and oral formats to assess the depth of specialism specific knowledge placed within the appropriate scientific context. Also assessed will be an ability to synthesise information, draw conclusions and justify them. The third assessment covers data management and interpretation, as well as communication of findings.

Module 2: Self-Directed Learning; Group and Independent Analyses 2019-2020

Module Leaders

Literature review
Dr Adam Byrne, South Kensington Campus a.byrne@imperial.ac.uk

Critical summary of the topic: Students will work in teams to investigate given topics and write a critical review that will be submitted for review by a different team. Part of the task will then be to address these comments. Each team is required to submit and review a manuscript.

Aims
- Seek and use published data
- Provide a critical synthesis of a scientific problem
- Assess data, consider caveats and draw appropriate conclusions
- Provide professional, constructive peer review
- Respond professionally to criticisms of the work

Assessment
Students are given starter papers and then are required to perform a literature search, critically appraise the literature, and write a ‘Critical Summary of the Topic (CST)’. There will be 3 stages to the submission process, which is likened to a scientific journal article submission and revision process:

1) You will submit your CST for peer review, including a covering letter to the editor.
2) Your group will then peer review another group’s CST, providing critical and constructive feedback in a professional way. You will advise the editor on the group’s expert opinion of the CST, and whether it should be published or rejected, or modified.

3) Finally, your group will receive back their own CST for modification following peer feedback from another group. As a group, you will provide a revised submission; will submit your final version CST, along with another covering letter to the editor, detailing your responses to the feedback, justifying your amendments and defending parts that you wish to remain unaltered.

Science in Context
Dr Phil Molyneux, South Kensington Campus p.molyneaux@imperial.ac.uk

Aims
- Link evidence-based clinical practice with scientific research
- Perform literature searching to support clinical practise and decision-making
- Deliver a concise clinical guidance message that promotes best practice
- Consider wider implications that may form the foundation for subsequent larger research programmes.

Learning and teaching approach
Students will attend respiratory clinics and identify a patient of interest

Assessment
Clinical Case Study.
1) Summary of the case
2) In-depth critique of the current and emerging evidence underlying the pathophysiology of the disease

Module 3: Project (15 weeks)

Module Leaders
Dr Mohamed Shamji, South Kensington campus m.shamji99@imperial.ac.uk

Projects - A wide variety of laboratory, library, and clinical projects will be offered.

Past BSc Project Titles Offered in Respiratory Science
- Epigenetic regulation of immunoglobulins
- Predictive accuracy and clinical impact of Xpert MTB/RIF for diagnosis of smear-negative tuberculosis using bronchoalveolar lavage fluid
- Electron tomography to distinguish inner dynein arm defects in Primary Ciliary Dyskinesia from secondary loss of dynein resulting from respiratory infection.
- Relationship between invasive and non-invasive markers of inflammation in children with severe therapy resistant asthma (STRA)
- Diversity of Aspergillus species in BAL samples obtained from lung transplant recipients: Identification and antifungal susceptibility testing
- The role of TREM-1 in secondary bacterial pneumonia
- Investigating mechanisms of lung repair following injury
- Comparison of 2 image processing software methods, Hermes and Siemens for lung lobar quantification in predicting differential and lobar lung function in the pre-operative assessment of lung resection surgery patients
- Are rat and mouse epithelium important allergens in laboratory animal allergy?
- The toxicity of nanomaterials at the alveolar interface critically depends on their interactions with respiratory secretions
- E-cigarette exposure of monocyte derived macrophages: are they as harmless as portrayed?
- Genes for atopy – do they modify IgG responses to indoor allergens?
- Using fluorescence to report on the mode of inhibition of Aurora-A kinase inhibitors
- Arterial oxygen content in patients with PAVMs: A 30 year series
- Exercise testing patients with pulmonary arteriovenous malformations
- Mechanisms of pericyte mobilisation in allergic airway disease
- Free haemoglobin as a modulator of inflammation in lung epithelium: Implications for the acute respiratory distress syndrome (ARDS)
- Prevalence of airflow obstruction in a large sample of non-smokers
- Effect of human neutrophil supernatants on human airway smooth muscle cells
- Marine products for pulmonary disease: a systematic review of clinical studies
- Towards the application of bacteriophage as a therapy for *Pseudomonas aeruginosa* infection in patients with cystic fibrosis
- Do laboratory animal workers carry out laboratory animal allergens from the animal facilities?
- Role of T follicular helper cells in Seasonal Allergic Rhinitis
- IgG-Associated Serum Inhibitory Activity: Biomarker of Allergen-Specific Immunotherapy efficacy?
- An evaluation of the utility of extra-thoracic hyper-responsiveness testing in chronic refractory cough
- An evaluation of the utility of cardio-pulmonary exercise testing in the evaluation of unexplained breathlessness
• The relationship between innate lymphoid cells and airway remodelling in paediatric severe asthma

• The effect of chemokine receptor antagonists on CCL3L1 induced intracellular calcium release and cell migration in PBMC

• How does aberrant cell polarity promote lung tumourigenesis?

• Establishing the role of GPR35 in the modulation of eosinophil function

• Examination of corticosteroid suppression of stimulus-specific cytokine release in peripheral blood mononuclear cells (PBMCs) of severe and non-severe asthma.

• Sensitisation to foods in a cohort of adults

• Genetic influence on serum KL-6 levels in patients with systemic sclerosis associated interstitial lung disease and healthy controls

• The under diagnosis of COPD in the community using spirometry alone

• Role of α1-antitrypsin in cystic fibrosis