BS317-15 Advanced Immunology

22/23

Department
Life Sciences
Level
Undergraduate Level 3
Module leader
Philip Young
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The module focuses on molecular mechanisms by which the immune system protects the host from infectious agents. Apart from presenting key components of the immune system, insight is provided into the strategies invading pathogens use to counteract the host defence. Frequently, these result in failure of pathogen elimination and in diseases due to loss of immunological control. The module builds on the phenomena learnt in the immunology modules of years 1 and 2 (BS127 and BS211), providing more detail on underlying mechanisms and incorporating molecular and cell biological aspects. In addition, new topics, such as natural immunity, dendritic cells, and the mutual interaction between the immune system and key classes of microorganisms (viruses, bacteria, parasites) will be discussed.

Module web page

Module aims

1. To develop knowledge and understanding of molecular immunology
2. To develop knowledge and understanding of key themes in innate and adaptive immunity
3. To develop knowledge and understanding of the 4 stages of immune responses
4. To develop knowledge and understanding of central and peripheral tolerance
5. To develop knowledge and understanding of data handling and statistical tests needed in Immunological

research

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Lecture 1: Introduction to the immune system (revision of Y1-2 modules and introducing Y3 course) Lecture 2: PRR and PAMPs: main receptors involved in the innate immune response, their targets and intercellular signalling that they activate Lecture 3: Natural Killer Cells: role of NKs in immune responses, their activation and inhibition and their effector functions. Lecture 4: Antibodies: Function, structure, isoltypes and control on antibody production Lecture 5: TCRs: Structure, function and signalling through the TCR Lecture 6: Diversity and Repertoire: Generation of receptor diversity in the adaptive immune response Lecture 7: MHC molecules: Structure and function of MHC molecules Lecture 8: MHC Class I: Epitope processing and display in class I molecules Lecture 9: MHC II: Epitope processing and display in class II molecules Lecture 10: APC: role and effector functions of professional APCS Lecture 11: T cell Activation: Tripartite signals involved in T cell activation Lecture 12: T cell Differentiation: Signalling involved in T cell differentiation and clonal expansion Lecture 13: T Helper cells: Differentiation of T Helper cells and their effector functions Lecture 14: Apoptosis: Extrinsic apoptosis and how CTLs and NKs trigger target cell death Lecture 15: CTLS: activation, differentiation and effector functions of CTLs Lecture 16: B cells: activation, differentiation and development of B cells. Lecture 17: Central tolerance: Thymic and bone marrow tolerance Lecture 18: Peripheral Tolerance: T and B reg cells and their role in controlling immune responses and contraction
Workshop 1: Null hypothesis testing and to-to-event analysis: review of t-tests/ u-tests, ANOVA (1-way), correlation and linear regression (including Passing Bablok), Logistic regression (binary), Cox regression and Kaplan Meier
Workshop 2: Revision session

Learning outcomes

By the end of the module, students should be able to:

- LO1 Critically analyse and reflect on key themes in innate immunology
- LO2 Critically analyse and reflect on key themes in adaptive immunology
- LO3 Critically analyse and reflect on key themes in B and T cell differentiation, activation and clonal expansion
- LO4 Critically analyse and reflect on molecular signalling in T and B cell activation
- LO5 Demonstrate understanding of statistical tests and data analysis

Research element

Time to event analysis and clinical trial data analysis

Subject specific skills

1. Detailed knowledge of the innate and adaptive immune system

2. Detailed knowledge of the different cells of the immune system
3. Molecular understanding of how immune responses are instigated and contracted 4. Molecular understanding of how immune responses can be evaded

Transferable skills

1. Critical analysis of research papers 2. Poster design
2. Survival analysis in SPSS

Study

Study time

Type	Required
Lectures	18 sessions of 1 hour (11%)
Seminars	2 sessions of 1 hour (1%)
Other activity	10 hours (6%)
Private study	120 hours (71%)
Assessment	20 hours (12%)
Total	170 hours

Private study description

Students are expected to spend 120 hrs on self direct learning (including reading research papers and background material to prepare for the final open book assessment)

Other activity description

In-module assessment- 10 hours is based on the 5 tasks (1 for each of the statistical analyses, and 6 hours to produce the final poster)

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time
In-Module Assessment	20%	

Students will need to analyse a clinical trial dataset and produce a poster based on their data

Openbook Assessment	80%	20 hours

Final assessment for the module will be on open book assessment. This is an essay based assessment consisting of 4 questions- students need to answer 2. The essays cannot be answered using lecture notes alone- students will need to perform background research and essays will need to be fully referenced.

Assessment group R

	Weighting	Study time
Openbook Assessment	100%	

Final assessment for the module will be on open book assessment. This is an essay based assessment consisting of 4 questions- students need to answer 2. The essays cannot be answered using lecture notes alone- students will need to perform background research and essays will need to be fully referenced.

Feedback on assessment

Summative: In-module assessment will be marked and detailed feedback provided

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Availability

Courses

This module is Option list B for:

- Year 3 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)