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BABS3041
Immunology

Term 1, 2021

Course Outline

SCHOOL OF BIOTECHNOLOGY AND BIOMOLECULAR SCIENCES

FACULTY OF SCIENCE

COURSE INFORMATION

Units of credit: 6
Pre-requisite(s): (BIOC2101 or BIOC2181 and MICR2011)
or (BIOC2101 or BIOC2181 and BABS2202).

Teaching time: Term 1

COURSE SUMMARY

BABS3041 provides a broad and in-depth coverage of immunology. The course is for students majoring in Medical Microbiology, Immunology, Biotechnology, Biomolecular Science, Medical Science and other areas related to human health who are interested in gaining knowledge in Immunology.

BABS3041 consists of 24 one-hour lectures and 8 three-hour practical classes. The course will first introduce the multiple components of the immune system, their functions, interactions and regulations during immune responses. Then the applied and clinical aspects of immunology will be introduced, including allergy, immunodeficiency, immune system and cancer, vaccination, autoimmunity, engineering antibodies, diagnostic immunology and immunological research strategies. The practical classes introduce students to critical immunological techniques such as immune cell stimulation, immunological assays and flow cytometry. The course also introduces students to critical evaluation of immunological issues of community importance and literature.

COURSE AIMS

This course provides students with a broad and in-depth understanding of the immune system and its functions. It also introduces students to the applications related to the immune system and immunology research.

COURSE LEARNING OUTCOMES (ASSOCIATED ASSESSMENTS)

At the successful completion of this course, the students should be able to:

1. Describe different components of the immune system and their responses to infection and cancer (test 1, test 2 and final exam).
2. Explain how immunological abnormalities may cause human diseases and how immunological interventions may prevent and treat human diseases (test 1, test 2 and final exam).
3. Apply diagnostic laboratory techniques to diagnose immunological disorders (test 1, test 2 and final exam).
4. Plan laboratory experiments and interpret experimental data on research in immunology (the assignment and final exam).
5. Critically evaluate scientific literature in immunology and immunological issues of community importance (the assignment and final exam).

STRATEGIES AND APPROACHES TO LEARNING

In normal years, BABS3041 uses Blended Learning strategy, combining face to face teaching with online learning activities and materials.

For year 2021, all lectures and practical classes will be delivered on-line (see the timetables on pages 11 and 12). Lecture notes are available on the course Moodle website.

You can access Moodle site for this course via the UNSW website using your UniPass.

TEXTBOOK

The recommended textbook for this course: **Janeway's Immunobiology 9th Edition. Kenneth Murphy. 2017. Garland Science, Taylor & Francis Group, LLC.**

Other recommended book: ***Kuby* Immunology 8th Edition. 2019. W.H. Freeman and Company.**

COURSE CONVENER AND LECTURERS

Course convener

Associate Professor Li Zhang: Associate Professor Zhang is the course convener and principle lecturer for BABS3041. Associate Professor Zhang obtained her MB BS degree from Fudan University and PhD degree from the University of Cambridge. She has been the convener for this immunology course since 2012. Associate Professor Zhang has a long-standing interest in chronic inflammatory diseases. Her previous research was on autoimmune diseases. Since 2008, her group has been investigating the role of bacterial species in chronic inflammatory diseases and cancer of the gastrointestinal tract, as well astheir effects on immunotherapy. Associate Professor Zhang can be contacted at: Room 4106, Bioscience South E26. l.zhang@unsw.edu.au

Guest lecturers

Professor Stuart Tangye: Professor Tangye is an immunologist from the Garvan Institute of Medical Research. His research focuses on autoimmune disorders, immunodeficiency, inflammatory diseases and allergic diseases. Professor Tangye delivers four lectures for this course including the two lectures on B cell and antibody and the two lectures on T cell functions. s.tangye@garvan.org.au

Dr Debbie Burnett: Dr Debbie Burnett is an Immunologist from the Garvan Institute of Medical Research. Her research focus is understanding how the immune system discriminates between self and foreign antigens and how this relates to pathogen defence and autoimmune disease. Dr Burnett delivers one lecture on antigen receptors and signalling. d.burnett@garvan.org.au

Associate Professor Stuart Turville: Associate Professor Turville is from the Kirby Institute, UNSW. His group researches on the mechanisms of HIV spread and using gene therapy to treat HIV infection. Associate Professor Turville delivers the two lectures on immunodeficiency. sturville@kirby.unsw.edu.au

LECTURE OUTLINE

Overview of the Immune System: Different components of the immune system will be introduced.

Innate Immunity (two lectures): The innate immune system will be introduced in these two lectures. Key cells and molecules of the innate immune system will be described.

Adaptive Immunity: This lecture is an introduction to the adaptive immune system. Antigen, B cells, T cells, the clonal selection theory and immunological memory will be introduced.

B cells and Antibodies (two lectures): The structure and function of antibodies will be outlined. The concept of specificity, affinity and affinity maturation will be discussed. The development of B cells and their generation of the diverse antibody repertoire will be introduced.

T cell Functions (two lectures): The two lectures introduce various types of T cells, their development and functions.

Cytokines: The general nature of cytokines and the function of selective cytokines will be introduced.

Antigen Receptors and Signaling: This lecture introduces the recognition of antigen by B cell and T cell receptors. Co-receptors and molecules of the downstream signaling pathways will also be introduced.

MHC and Antigen Presentation: The special way in which T cells interact with foreign antigen will be introduced. Students will learn about the Major Histocompatibility Complex (MHC).

Mucosal Immunity: Most infections begin at the mucosal surface and mucosal immune system plays an important role in protecting the mucosal surface. The specific features and function of the mucosal immune system will be introduced.

The Immune Responses to Infection (two lectures): Key defences against different types of infections will be outlined.

Immune Evasion: Strategies that are used by microbes to evade host immune response will be described.

Immunodeficiency (two lectures): Students will be introduced to primary immunodeficiencies that affect different components of the immune system. HIV /AIDS will be the focus of the presentation on acquired immunodeficiency.

Allergic Disease: Allergic disease is a serious problem in the modern world. This lecture will introduce cells and molecules of the Type 1 hypersensitivity reaction.

Tolerance and Autoimmunity: The mechanisms by which self-reactivity of B cells and T cells are either eliminated or controlled will be outlined, and autoimmunity will be discussed.

Immune System and Cancer: In this lecture, you will learn cancers of the immune system and the role of the immune system in controlling cancer.

Diagnostic immunology: This lecture will introduce some tests that are commonly used in Diagnostic Immunology.

Vaccination: The history of vaccination will be introduced. Different types of vaccines will be explained, and future challenges for vaccine development will be outlined.

Engineering Antibodies: The engineering of antibodies is a huge industry. The use of antibodies as biopharmaceuticals and the approaches to antibody engineering will be presented.

Immunological Research Strategies: This lecture will describe several strategies that are used in the studies of immunology.

PRACTICAL CLASSES

BABS3041 contains eight practical classes, which will be held on Tuesdays. The contents covered in the morning and afternoon class are same, you need to attend either morning or afternoon class. You will be organized into groups and demonstrators will be assigned.

The specific objectives of the practical classes are:

- To reinforce and better understand information delivered in lectures.
- To provide students with opportunities to explore techniques that are commonly used in immunology research and diagnostic immunology.
- Develop experimental and analysis skills.
- Apply concepts and skills learned in this course to solve problems.

ATTENDANCE TO PRACTICAL CLASSES IS COMPULSORY except for Week 4 practical class.

*LECTURE TIMETABLE

Mon 9 -10 am
Wed 4 -5 pm
Thu 11 am -12 pm

Lecture	Topic	Date		Week	Lecturer
1	Overview of the Immune System	15/2	Mon	1	LZ
2	Innate Immunity 1	17/2	Wed	1	LZ
3	Innate Immunity 2	18/2	Thu	1	LZ
4	Adaptive Immunity	22/2	Mon	2	LZ
5	B cells and Antibodies 1	24/2	Wed	2	ST1
6	B cells and Antibodies 2	25/2	Thu	2	ST1
7	T cell Functions 1	1/3	Mon	3	ST1
8	T cell Functions 2	3/3	Wed	3	ST1
9	Cytokines	4/3	Thu	3	LZ
10	Antigen Receptors and Signaling	8/3	Mon	4	DB
11	MHC and Antigen Presentation	10/3	Wed	4	LZ
12	Mucosal Immunity	11/3	Thu	4	LZ
13	Immune Responseto Bacterial Infection	15/3	Mon	5	LZ
14	Immune Response to Viral Infection	17/3	Wed	5	LZ
15	Immune Evasion	18/3	Thu	5	LZ
	Week 6: Flexibility Week				
16	Secondary Immunodeficiency	29/3	Mon	7	ST2
17	Primary Immunodeficiency	31/3	Wed	7	ST2
18	Allergic Disease	1/4	Thu	7	LZ
	Public Holiday	5/4	Mon		
19	Tolerance and Autoimmunity	7/4	Wed	8	LZ
20	Immune System and Cancer	8/4	Thu	8	LZ
21	Diagnostic Immunology	12/4	Mon	9	LZ
22	Vaccination	14/4	Wed	9	LZ
23	Engineering Antibodies	15/4	Thu	9	LZ
24	Immunological Research	19/4	Mon	10	LZ

LZ: Associate Professor Li Zhang, ST1: Professor Stuart Tangye,
DB: Dr Deborah Burnett, ST2: Associate Professor Stuart Turville

*Lectures will be delivered on-line in year 2021

*PRACTICAL CLASS TIMETABLE

Morning groups 10 am - 1 pm
Afternoon groups 2 – 5 pm

Week	Date	Practical class
2	23/2 Tue	Cells and tissues of the immune system
3	2/3 Tue	Tetanus tutorial **Test 1**
4	9/3 Tue	Factors affecting the functions of the immune system
5	16/3 Tue	Cell viability and counting **Test 2**
		Week 6: Flexibility Week
7	30/3 Tue	Isolating & activating splenocytes
8	6/4 Tue	Measurement of IL-2 using ELISA
9	13/4 Tue	Flow cytometry
10	20/4 Tue	Tutorial： Clinical cases

*Practical classes will be delivered on-line in year 2021

ASSESSMENTS

CONTINUOUS ASSESSMENT (50%)

TEST1 (17.5%) and TEST2 (17.5%)

There will be two tests, which will be held at the start of the practical classes in week 3 and week 5 respectively. Each test is worth 17.5% of your final mark.

Students who miss a test may have the chance to sit a supplementary test, only if they submit a medical certificate or other suitable documents to explain their absence to the course convener by the end of the week of the test. There will only be **ONE** opportunity to sit the supplementary test, which will be held in the week following the test.

ASSIGNMENT (15%)

The assignment will be released on Moodle in week 7. The deadline for submission of this assignment is 3pm, 16th April. The assignment should be submitted electronically to Moodle site. There is 10% per day deduction for late submissions. Later submissions should be emailed to the course convenor.

FINAL EXAM (50%)

The final exam is worth 50%, which is scheduled within the exam period at the end of the term. Further information regarding the final exam will be provided in the last lecture.

SPECIAL CONSIDERATIONAND FURTHER ASSESSMENT

Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations. **Students must make a formal application for Special Consideration** for the course/s affected as soon as practicable after the problem occurs and **within three working days of the assessment to which it refers**.

Students should consult the "Special Consideration" section of Moodle for specific instructions related to each BABS course they are studying. Further general information on special consideration can also be found at https://student.unsw.edu.au/special-consideration.

HOW TO APPLY FOR SPECIAL CONSIDERATION

Applications must be made via Online Services in myUNSW. **You must obtain and attach Third Party documentation before submitting the application. Failure to do so will result in the application being rejected.** Log into **myUNSW** and go to **My Student Profile tab > My Student Services channel > Online Services > Special Consideration.** After applying online, students must also verify supporting their documentation by submitting to UNSW Student Central:

- Originals or certified copies of your supporting documentation (Student Central can certify your original documents), and
- A completed Professional Authority form (pdf - download here).

The supporting documentation must be submitted to Student Central for verification **within three working days** of the assessment or the period covered by the supporting documentation. Applications which are not verified will be rejected.

Students will be contacted via the online special consideration system as to the outcome of their application. Students will be notified via their official university email once an outcome has been recorded.

SUPPLEMENTARY EXAMINATIONS

SUPPLEMENTARY EXAMINATIONS:

The University does not give deferred examinations. However, supplementary exams may be given to those students who were absent from the final exams through illness or misadventure. Special Consideration applications for final exams and in-session tests will only be considered after the final exam period when lists of students sitting supplementary exams/tests for each course are determined at School Assessment Review Group Meetings. Students will be notified via the online special consideration system as to the outcome of their application. **It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment.**

The supplementary exam period for T1 2021:

24 May –28 May

Supplementary exams will NOT be offered on any alternative dates.

PLAGIARISM

Plagiarism is using the words or ideas of others and presenting them as your own. It can take many forms, from deliberately cheating to accidentally copying from a source without proper acknowledgement. If any student is caught plagiarizing in this course. they will receive no marks for that course task. For further information on plagiarism, the university Learning Centre has substantial information on the subject including material on how to avoid plagiarism. Information can be found at: www.lc.unsw.edu.au/plagiarism.

LAB RULES & SAFETY

Biological laboratories are inherently dangerous places and it is the responsibility of everyone who works in the laboratory to ensure that the risks are minimized. It is your responsibility to ensure that you come to labs prepared and work in a manner that will not put yourself or others in danger. Risks related to each practical class are outlined individually. Some general laboratory rules are outlined below.

- Wear a fastened lab coat.
- Wear disposable gloves when handling samples and other experimental materials and dispose the gloves if they are contaminated.
- Dispose all materials in the appropriate bins. All contaminated waste must go in the biohazard bags provided. Broken glass must go in the broken glass bin and anything sharp in the sharps bin.
- Wear fully enclosed shoes, preferably made of a sturdy material.
- Keep all hair tied back.
- Move calmly and slowly around the lab.
- Keep only what is necessary on your desk. All other things should be kept in the cabinets provided.
- Wipe down benches, before and after the practical class.
- Act maturely and responsibly.
- Do not eat, drink, apply makeup or chew gum (or pens). Any food or drink you have must be stored inside your bag at all times during the lab.
- Do not invite any one into the lab. Only the people who are meant to be in the lab should be there.
- Keep all experimental reagents and equipment covered. Never leave things such as pipette tips etc lying around uncovered unnecessarily.
- Never attempt to recap a needle.
- Label all samples with your name, date, demonstrator and what kind of sample it is.
- Never handle 'clean items' such as your bag whilst wearing gloves. Even if you think your gloves are clean, they may not be.
- Wear safety goggles when handling things that may splash into your eyes.

BIOLOGICAL HAZARDS

- All biological samples are potentially harmful if ingested or exposed to body surfaces. Ensure that you wash your hands thoroughly with an anti-microbial detergent and dry them thoroughly before leaving the lab.
- All specimens of cells, tissues or body fluids from humans or animals are potential sources of infection. Every effort is made to ensure that any specimens you receive are not infectious. However, the use of universal precautions when handling specimens is essential. The main principle of universal precautions is to assume everything is a source of infection.
- Always wear gloves, a lab coat, closed toe shoes and when there is a chance of splashing, safety goggles. keep your lab coat in a plastic bag after classes to avoid spreading any potential contamination.

CHEMICAL HAZARDS

Most buffers and media used in the course are not or low hazards at the concentrations used, however all chemicals should be considered potentially hazardous.

PHYSICAL HAZARDS

Common sense precautions must be observed when dealing with heat sources such as Bunsen burners water baths as well as sharp objects.

IN CASE OF EMERGENCY

- If there is an accident with a biological sample, try to mop up what you can and call a fellow student to get a demonstrator to help. Do not move yourself in case you spread the contamination further.
- If there is a fire, remove yourself from immediate danger and call someone in authority to help.
- Call a demonstrator immediately if anything happens. Do not try and deal with the situation yourself.
- If you splash something in your eye, flush it out at an eye station immediately and ask someone to call a demonstrator for help.
- If there is a medical emergency call a demonstrator for help, and then try and ascertain what caused the emergency (e.g. leaking gas tap, exposed power cable) and rectify the situation if you think you can do so safely. If not, wait for your demonstrator.

SAFELY REMOVING GLOVES

In the immunology lab, we often wear gloves to protect ourselves from the substances that we are working with. However, this only works if we can safely remove those gloves without contaminating our hands (photos used with

permission from the University of Maryland, Department of Environmental Safety).

	Pinch one glove in the palm and pull towards the ends of the fingers until the gloves folds over.
	Keep pulling so that the fingers are inverted.
	Scrunch the removed glove in the palm of the other gloved hand.
	Now, slide your index finger underneath the remaining glove.
	Pull the glove down over the fist.

	Touch only the inside of the gloves and drop into the appropriate container. Wash hands thoroughly.

HEALTH AND SAFETY PRECAUTIONS FOR ELECTRONIC DEVICES INCLUDING LAPTOP COMPUTERS AND MOBILE PHONES

Mobile phones: For your own safety when using your mobile phone in class please ensure it is placed in a plastic zip lock bag. Every student will be provided with a zip lock bag in their first practical class which they should continue to use during the session (keep it with your lab book). If you misplace or loose this bag you will be expected to provide your own zip lock bag.

Computers and tablets: this applies to either your own device or those supplied by the school. Please cut a section of benchcoat (this will be provided in the lab class) and place your device on this on the lab bench to separate it from your other laboratory work. DO NOT wear gloves when using these devices. If the lab is being used as a dedicated DRY LAB (please check signage on the door) you will not be required to do this as the benches will be cleaned and decontaminated before your class.

RISK ASSESSMENTS

You will be required to complete Risk Assessment forms before wet laboratory classes.