

CELL AND TISSUE ORGANISATION ANHB 3313

Advanced Techniques in Histological Investigations

School of Anatomy and Human Biology

Description

This unit offers an advanced course in investigating the organisation of human cells and tissues. The lectures, seminar/tutorials and laboratory classes cover the sophisticated cellular and molecular events that lead to (a) tissue formation during embryogenesis; (b) growth; (c) homeostasis of normal adult tissues; (d) repair in response to damage; (e) disease; (f) ageing and (g) tissue engineering. The theory, practice and applications of methods of tissue preparation, cell culture, immunocytochemistry, confocal and electron microscopy, in situ hybridisation and image analysis are explored. Using these techniques, students carry out their own projects to investigate the organisation of a specific tissue or organ and present the results by way of a report and seminar. Assessment is based on the practical work, ongoing exercises and laboratory sheets, a group project, essay and one examination.

Unit Co-ordinator: Professor Miranda D Grounds

Scope of the course

The aim of this advanced course is to understand the cellular events responsible for the formation and organisation of tissues, and to become experienced with the theory, practice and applications of a wide range of histology-based techniques. These techniques include: tissue fixation, processing, embedding, cutting and staining, light microscopy (fluorescence and confocal), electron microscopy (transmission and scanning), image analysis, photography and digital image acquisition, *in situ* molecular biology techniques, autoradiography, immunocytochemistry and cell culture.

It also provides a broader perspective of investigative biology to encourage you to enjoy the investigative process, to acquire skills in organisation, problem solving, information retrieval and presentation, and to be fully aware and concerned with the ethics associated with research.

Assumed competencies on entering the course

Basic knowledge of cell biology, histology and tissue structure are required.

Desired outcomes

a) Knowledge

Cell biology

An understanding of the main aspects of cell behaviour that lead to tissue formation and homeostasis. Including:-

- Cell replication, cell movement, cell commitment & differentiation, and cell death.
- Knowledge of the molecular processes underlying these events.
- The complexity, roles and interactions of growth factors and extracellular matrix components that control these events.
- The structure, organisation and role of cytoskeletal components and cell membranes.
- The mechanism of angiogenesis in developing and mature systems.
- An appreciation of the differences and similarities between tissue formation during development and in mature tissues responding to damage.
- Insight into how these cell and molecular processes are involved in disease and ageing and applications to potential therapies and tissue engineering.
- An appreciation of how little is still known about many of these topics.

Investigative biology

Establish necessary skills for the investigative process including:

- Rigorous definition of problems and questions
- Careful and appropriate design of experiments and selection of methods
- A strong respect for the necessity for controls
- Creative thinking
- Careful acquisition of data (from literature, field or laboratory work)
- Rigorous but imaginative validation, manipulation and interpretation of data
- Presentation of investigations both as written and verbal reports.

Techniques for studying cells and tissues

The theory underlying, and application, of a wide range of laboratory-based histological techniques that are used to study cells and tissues. These techniques include:

- Specimen preparation
- Light, electron and confocal microscopy
- Stereology
- Image analysis
- Advanced computer applications
- The immunological and molecular visualisation of cellular events
- Molecular biology techniques
- Cell culture.

You will gain an understanding of:

- The power and limitations of these techniques to address different questions.
- The value of controls in experimental design.

Specific investigative techniques including:

- Use of the library and data bases
- Statistics, computers data collection and organisation
- Methods for presenting data orally & report writing
- Ethics of experimentation, particularly that involving humans and other animals
- The nature of the scientific method, including history and philosophy of science
- Constructive criticism of your own and others work.

b) Skills: acquire the ability to:

- Access, interpret and critically evaluate scientific literature
- Organise, carry out and interpret laboratory and project work
- Write up information and results in a clear and reasoned way
- Present work orally in a clear and interesting manner to an educated audience and to deal with questions
- Carry out simple procedures related to the above techniques, particularly; tissue preparation, staining and analysis at the light and electron microscope level
- Choose a suitable technique and controls for cell analysis in a particular situation.
- Organise, co-ordinate and work in a group.

Science is a collaborative discipline. Very few successful scientists work in isolation. This unit will emphasise the importance of collaboration by using small groups as the basic educational unit. Being able to work well in groups is essential.

c) Attitudes

A sense of excitement at the behaviour of cells and how they become organised to form a range of highly specialised tissues

- A creative and open approach to scientific knowledge and problems
- An appreciation of the great complexity of the subject
- An appreciation of the rapid advances in knowledge and technical procedures in this discipline
- An awareness of the great overlap between many disciplines (both biological and others) and the need to communicate openly and share skills and knowledge
- An appreciation of the emerging field of Tissue Engineering and its potential, as well as the creativity of new approaches in Art & Science
- The need for an open and imaginative approach to problem solving
- A faith in the experimental approach to furthering knowledge
- A rigorous and critical approach to experimental design and interpretation
- Scientific research can be fun and rewarding
- For good students, a desire to pursue further studies in cell biology.

An understanding and interest in investigative techniques cannot be given. It must be earned. This requires active participation in all class activities and particularly in group activities. It relies on vigorous and rigorous discussion and careful examination of all points of view.

UWA's EDUCATION PRINCIPLES

(Taken from the University's Mission Statement)

Students at the University of Western Australia are encouraged to develop the ability and desire:

- To master the subject matter and techniques of their chosen discipline at internationally-recognised levels and standards;
- To acquire the skills required to learn, and to continue through life to learn, from a variety of sources and experiences;
- To adapt acquired knowledge to new situations;
- To write and speak clearly, concisely and logically;
- To think and reason logically and creatively;
- To question accepted wisdom and be open to new ideas and possibilities;
- To develop mature judgement and responsibility in moral, social and practical, as well as academic matters;
- To develop the capacity to take a leadership role in the community.

GUIDELINES ON PLAGIARISM

5 March 1999

Plagiarism is "*the taking and using as one's own of the thoughts, writings or inventions of another*". These thoughts or writings could be, for example, from a book, the internet or from the work of another student.

Like the scientific process, assessment of students at university relies upon the integrity of the participants. The School expects that any piece of work submitted by a student for assessment will be essentially their own work, and that the contributions of others to that work will be appropriately acknowledged. In essence, all students are expected to write their own essays and assignments, just as they are expected to sit the exams themselves.

Students should generally avoid *verbatim* copying of published work, even when the work is cited. They are strongly encouraged to express their knowledge and thoughts in their own words, rather than those of others, because this greatly assists the learning process. However, it is acknowledged that in some circumstances it is desirable to quote directly from a published work.

Plagiarism is a very serious offence that carries substantial penalties. If a student is found to have committed plagiarism, the student may receive a failing grade for the work in question and the School may recommend the matter be dealt with under University Statute 17 (Misconduct). The student may be excluded from the unit.

These guidelines are not intended, in any sense, to discourage students from discussing their views with other students, staff or others outside the university.

Indeed this is strongly encouraged as it is one of the very best ways of learning.

Any student who does not fully understand these guidelines or who experiences difficulties in following them should consult their tutor or unit coordinator.

Ref: Little W., Fowler H.W., Coulson J. & Onions C.T. (1964) The Shorter Oxford English dictionary on historical principles. Clarendon Press, Oxford. p1513.

This is addressed in the IRIS exercise (week 2)

INTRODUCTION

Outline

During the semester you will become familiar with the theory and practise of investigating how human cells and tissues are organised.

- The **lectures and tutorials** will introduce you to histology- based techniques used to observe the structure, organisation and functions of cells and tissues. The lectures will also describe cellular events and the factors and mechanisms that control how cells behave and interact.
- Many of the tutorials are devoted to generic skills, applicable to 3313 and to general scientific endeavour.
- The **laboratory classes** will provide first hand experience with a wide range of histology based and microscopic techniques.
- You will apply some of these techniques in a **laboratory based research project** to describe and answer questions about a specific tissue. This project will give you experience in all aspects of research from project design, organisation, group dynamics, laboratory work, digital imaging, and presentation of the work in both written and oral form.
- You will gain experience in scientific writing through one individual **essay** and various tasks. This will increase your skills in word processing and reference management systems (e.g. endnote).
- You will become proficient at **seminar presentation** using digital technology and power point presentations.
- You will participate in critical evaluation of scientific writing in **journal clubs**, explore relevant web sites and become familiar with electronic publishing.

Venues

All lectures are scheduled for **Social Sciences (SSCI) lecture room 1 (G28)**. All Tutorials are in Anatomy G39 (or elsewhere as advised) and this is intended to be the room that you can use when there are no other 3rd year formal classes in progress. Laboratories will be held within the 3rd year lab (1st floor): however, some may be in the Dental Lab G02 and in other rooms in Anatomy -you will be advised. Students are expected to attend **all** classes. Once you have been allocated to your groups these will remain in place (occasional changes are allowed in consultation with M Grounds). It is emphasised that you **MUST** sort your tutorial and lab groups out and finalise them in week 1: there are too many students and the organisation is too complex to allow changes.

Access to computers

Computers in the Histology laboratory on the ground floor (room G.03) can be used by 3rd year students when not being used by other set classes. During semester 1 many of the 46 computers will be available from 8am to 4.30pm Monday to Friday during semester. There is a printing facility in G.03.

Internet Access is moderated (check: http://www.uwa.edu.au/it/network/aarnet/aarnet_pricing/faq).

See the School website for information about student computing facilities:

http://www.anhb.uwa.edu.au/for/students/student_computing

Assessment

- Final exam (details given in Week 12) 45%
- Laboratory sheets + tasks 18% (due within 1 week of the class)
- Essay 8% (due in Week 8)
- Journal clubs 6%
- Project and presentation 20% (due Week 13)
- Workbook/reflective journal 3% (due at exam)

Reference books

Molecular biology of the Cell, Alberts B *et al* [eds] 4th Edition, Garland Publishing. This is an excellent, clearly written reference book for comprehensive information on cell and molecular aspects. It would be useful to own. [hereafter referred to as Alberts]

Histology: a text and atlas. 4thed. Ross MH, Romrell LJ, Pawlina. This is a very comprehensive reference book for all aspects of tissue structure and histology. [hereafter referred to as Ross]

Developmental Biology. Gilbert SF (4th Edition). Sinauer, Sunderland

Principles of Development Wolpert L *et al* (2007) Oxford University Press

NOTE: Gilbert 4th Edition and Alberts 4th Edition are used. Chapters and pages given as references in the Handbook apply to THESE editions and therefore may vary slightly when using other editions of these books. Just use your intelligence to find the matching pages if using a more recent or other edition of these texts.

Wolpert is a superb text for Developmental Biology. There are many excellent Developmental Biology books in Miranda's office and in the library that you can borrow.

The books below, related to Histology, Cell Biology and Developmental Biology, are in Closed Reserve of the Biological Sciences library

- **Theory and Practice of histological techniques**. Ed. Bancroft and Stevens, 3rd edition.
- **Ham's histology**.
- **Electron microscopy methods and protocols**. Ed. MA Nasser Hajibagheri.
- **Biomedical research applications of scanning electron microscopy** Ed. GM Hodges, RC Hallows.
- **Histological and histochemical methods : theory and practice**. J.A. Kiernan.
- **Microwave Cookbook for Microscopists**. Kok, Boon
- **Techniques in neuroanatomical research**. Ed. Ch. Heym and WG. Forssmann.
- **Manual of histological demonstration techniques**. HC Cook
- **Manual of histopathological staining methods**. FA. Putt.
- **Carleton's Histological technique**. Rev. and rewritten by RAB Drury, EA Wallington. 1967-2..
- **Principles of Development**. Wolpert L, Jessel T, Lawrence P, Meyorewitz E, Robertson E and Smith J (2007). Oxford University Press, Oxford (UK). 3rd Edition. ISBN: 0-19-927536-X
- **Developmental Biology**. Gilbert S (2000). Sinauer, Sunderland. ISBN: 0-87893-243-7
- **Animal Cell Culture – A Practical Approach**. Freshney RI ed. IRL Oxford University Press
- **Immunobiology**. Janeway CA *et al*, 5th edition, 2001, Garland Publishers, New York.
- **The Art of Genes. How organisms make themselves** (2000). E. Coen. Oxford University Press.
- **Cell Biology**. Pollard TD & Earnshaw WC (2002). Elsevier Science (USA)

Main course personnel
Prof Miranda GROUNDS (Co-ordinator)
<http://www.anhb.uwa.edu.au/staff/mg.html>

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1. LECTURES AND TUTORIALS

Many of the lectures and tutorials relate to the description and applications of the techniques used to examine cells and tissue sections. Other lectures describe aspects of cellular behaviour and the multitude of molecular and other factors that control this, as a background to understanding how tissues are formed and maintained. Additional lectures cover general skills and ethical issues related to research. **It is expected that students will attend all lectures.** Most lectures are available on Lectopia. Powerpoint slides are also put up onto the unit website.

2. TASKS

Various tasks and short questions will be associated with different lectures and laboratories. These are designed for your benefit to assist in understanding and thinking about the topics. They are clearly outlined on the front page of the WWW and you should check the due dates. They should be completed and returned to the 3313 box in room 2.04 by the due date. Late returns will lose one mark per week. **Work will NOT be accepted if it is later than 3 weeks after the due date:** this will be strongly enforced since time management is an important part of this course. (A written excuse at the time of due submission may allow for an extension) Completion and quality of responses is assessed, along with journal club activities.

3. LABORATORY CLASSES

- You will gain first-hand laboratory experience in the techniques of: tissue fixation, processing, embedding, cutting and staining, light microscopy (fluorescence and confocal), electron microscopy (transmission and scanning), fluorescent activated cell sorting (FACS), image capture and analysis, *in situ* molecular biology techniques, immunocytochemistry and cell culture.
- Students must wear suitable clothing and covered shoes (thongs are not acceptable), otherwise they will not be able to participate in the laboratory practicals. **A laboratory coat is required for all “wet laboratory classes”.**
- You must **commit yourself to either the Monday or the Thursday laboratory** group, although your preferred option may not be possible as there need to be roughly equal numbers in each class. Notification **MUST** be given if you are unable to attend a laboratory class, otherwise points may be lost.
- **An assessment of 18%** will be based on completed laboratory sheets and tasks. These should be returned to the laboratory supervisor for marking **within 1 week of the class**, otherwise you will lose 1 point/week. The marked sheets will normally be returned to you within 2 weeks. **Please note that these activities form a significant part of your overall assessment and are also designed as ongoing revision: late submissions (after 3 weeks) will simply not be marked.**

4. JOURNAL CLUB

Students will have the opportunity to critically assess material presented from published journal articles. In **Journal Club I**, you will be divided into groups and given an article to read, summarise and criticise, and the group will then present the story to your fellow students.

For **Journal Club II**, one of the original research papers cited in your essay (below) will serve as the basis for a short presentation (about 4 minutes to allow time for questions – total of 5 minutes) that should tell a story. Prepare what you are going to say and rehearse it so that you have it well sorted out in advance. State the title of the article & where published. Extract the key points, do not give too much detail. Excite your fellow students. Say WHY the paper is of interest; how it was done, what they found. Can use up to 2 overheads if required or can write on the board. Be prepared for questions. **Stick to the given time.**

In **Journal Club III**, scientific articles in the popular press will be critically discussed and compared with conventional scientific reports.

For **Journal Club IV**, you will be asked to compose a title and write an abstract for a particular article. Then the groups will outline the main points of these articles for discussion.

5. ESSAY

The essay is on *Principles of conditions used for Immunostaining tissues and cells*. You chose ONE of the following topics as a focus for this essay.

1. Fluorescent markers to detect antibodies
2. Histochemistry to detect antibodies
3. Immunogold to detect antibodies

The essay should mention the isolation and preparation of tissue sections and cultured cells and discuss the relative merits and disadvantages of different ways of tissue/cell **preparation** with respect immunostaining using light microscopy and in some cases electron microscopy. This will cover all fixed and frozen tissues. The essay should also discuss antibodies, what they are, how they are used and ways to amplify them, controls, with a focus determined by which of the above 3 aspects you select. You should not describe in great detail (i.e do not give recipes) the detailed methodology for application of the antibodies. You should include a minimum of 6 references to papers. The essay should also specifically discuss 2 research papers (about a paragraph for each) **published within the last 5 years** that use some of the techniques you have described. These should be integrated into the main text. Suggest you browse through the display journals in the Medical Library at the QEII Medical Centre or at the Biological Sciences Library or use the Internet to access the latest information.

The essay should be about 4-6, A4 pages of single spaced 12 point typing (excessive length will be penalised). It is due by **mid-Week 8 (by 9am lecture on Wednesday 30th April)**, or you can hand it in earlier, before the non-teaching study break. **Late essays will not be accepted and will not be marked:** you have plenty of time so manage it well, be disciplined and plan ahead. You should start this by Week 2 at the latest as it will take time to acquire the information. This is designed as an important exercise in scientific writing and accessing recent literature for you, early in the semester. 60% for how complete, up-to-date and critical the information is and how well it is organised and presented as a coherent story; 20% for the discussion of 2 original papers – these should be integrated into the text of the essay and should not only be summarised to say what they did, but also why this paper is of interest (attach a photocopy of the front page **ONLY** of each article at the back of your essay); 20% for appropriate citation of references within the text and at the end [see section on this under 'writing up the project']: overall grammar and spelling and layout is included here. The use of a few heading can improve the essay. Please leave a one-line space between paragraphs.

I highly recommend that you consult the classic short book *A Guide to Scientific Writing* by David Lindsay (was in Faculty of Agriculture at UWA), 2nd edition, Longman, Australia. This is excellent and covers all aspects of writing up (getting started, organisation, references, grammar, style, pitfalls, etc). It is available in the library and also at the UWA bookshop. Suggest you buy a copy.

See also notes to scientific writing on the 313 website. <http://www.lab.anhb.uwa.edu.au/hb313/>

An excellent reference if you have any confusion about the use of commas and apostrophes is *Eats, Shoots and Leaves (the zero tolerance approach to punctuation)* by Lynne Truss (2003), Profile Books, London, UK. Available from bookshops.

Note: a discussion of one of the scientific papers will form the basis for Journal Club II in Week 9.

6. WORKBOOK/REFLECTIVE JOURNAL

The purpose of this is to encourage you to read outside class and to think about what you have heard in both lectures and tutorials that do not involve the "transmission of facts". Thinking is often very hard and many of us are very resistant to it. In the reflective journal you have to show you have thought about the topics involved and applied the ideas to your reading or life outside the class. Get a book and stick things in throughout the semester and write brief comments. I would expect to see mainly newspaper and magazine cuttings on relevant topics and maybe some web pages and, MOST IMPORTANTLY, YOUR own thoughts, brief notes and comments on each topic. Start it in week 2 and fill it in as you go – can always go back and add more comments.

*Your workbook must be submitted **before** the final exam (you may hand it in at the start of the exam).*

7. PROJECT

The aim is to describe a tissue in terms of cell types, arrangement and function using some of the techniques outlined above. You will work in small groups that will each study a different tissue. The project is designed to give first hand experience in the laboratory techniques of tissue preparation and analysis combined with organisational and presentation skills. The project is worth 20% of the final marks.

Three equally important aspects to research are:

- **Planning:** Spend a lot of time thinking and reading about the science, exploring new ideas, inventing possibilities and rejecting ideas, before deciding which aspect to study. There is no point in wasting energy, time and precious research funds on an idea that has a weakness or was not properly thought through. Once a project is formalised, a lot of organisation needs to go into designing the experiments, obtaining the appropriate reagents or materials (sometimes from overseas), booking surgery, obtaining ethics approvals etc before the work can be carried out.
- **Experiments:** Careful thorough execution is required. **Good controls must be included from the outset.** Full and methodical documentation of everything you do is essential. May need to logically dissect out problems you encounter and design new experiments as the work proceeds.
- **Reporting:** Keep good records of everything – write it all down. This is your responsibility. The data are real. However, the interpretation of data may change in light of new information. Writing up the work for publication or conference presentation makes you examine the data very critically and means you extract maximum information from your work. If it is worth doing it is worth writing up (usually). Unless you communicate your results to others clearly and accurately, the value of doing the work in the first place can be questioned.

Outline

- A group will usually consist of about 5-6 students. Each group will use appropriate techniques to describe a different tissue (e.g. brain, skeletal muscle, spleen and eye) in terms of cell types, arrangement and function or some aspect of cell behaviour. The tissue or cells will be studied and assessed as part of the set laboratory practicals with some additional work
- At least one simple investigative question will be posed and an attempt made to answer it: examples are - *What is the relative area or proportion of a particular cell type? Are there differences between species or different ages? What happens during injury or disease? What is the optimal stain to detect a particular cell type? What is the effect of a particular drug? What is the expression pattern of a particular gene?* These questions/hypotheses do not need to be new observations but are designed to expose you to investigative research. They will be developed in conjunction with your academic consultant.

- The various projects may use a different range of techniques depending on the tissue/cells and the questions addressed (see below).
- As communication and organisation is an important part of this exercise, you may like to appoint a leader or even consider a contract between the group members to clarify their roles.
- A written group outline of the proposed work - about one A4 page long and including a title, short background, aims, hypotheses, techniques and time line is required by **Week 4** (by the 9am lecture on Wednesday, March 26th). Use headings and include any new references that you may have found. This is an important exercise as it means you will have discussed and decided early in the semester how you are going to organise your time and the project. Please note that you will have to start work on this project **EARLY** in the semester in order to complete the work for your formal seminar presentation in Week 13: this is an intense program so plan things well.

Academic consultant

Each project will have an “Academic consultant”. You will meet with your consultant in Week 2 to organise the project and to discuss the study tissue, questions/hypotheses to be tested and outline any particular stains or techniques. In Week 8 and Week 11/12 (during project time or some other convenient time that you organise with your consultant), you will review with your consultant the work achieved. Participation beyond this basic “consultation role” will depend on the individual academic and be organised by them at the beginning of the project. In some instances, it may be possible for additional tissues treated in particular ways to be provided for examination and photography; for special stains or antibodies to be provided for the students to use; or for the students to participate in supervised activities within specific research laboratories.

Basic plan

- The basic format for the project is that fixed tissue sections will be treated with simple stains. For this work, students will work closely with the Histology personnel (Cell Central) to cut, stain and photograph appropriate tissue sections at the light and electron microscope level.
- It is the responsibility of each group to organise mutually suitable times to do this. A relatively low load of formal contact hours for 3313 allows for this additional time to be organised. Note that Mary Lee is only available on Monday, Wednesday and Thursday between 9.30am and 2:30pm. Appointments to undertake this basic work, and also any specialised work with the ‘academic consultant’, should be finalised by Week 8.
- You will meet with your consultant in Week 2 to plan the project and a written outline of the proposed work must be submitted (to Miranda Grounds & a copy to your consultant) by mid-Week 4.
- It is essential that you keep a systematic written record in a notebook of all work undertaken (if in doubt write it down!), and that all materials such as slides etc are clearly labelled and identified as yours.
- The project activities should be completed by the end of Week 12 with all digital documentation and final preparation for presentation.
- The work will be presented (using power point) orally during Week 13.
- The written report must be finished by Week 13 (end of semester) and **handed in by the deadline of 9am Thursday 5th June.**
- The exercise in time management, planning and communication is an important aspect of the project training.

Techniques that may be used:

- The basic histological technique used will be paraffin embedded sections stained with Haematoxylin & Eosin and Van Giesan’s stain.
- Special stains can be used to show one or more special histological features.
- Electron microscopy is used to show the ultrastructure.
- Specific antibodies on frozen (or fixed) tissues identify the distribution of a particular protein.
- Tissue culture shows the appearance or behaviour of the cells *in vitro*.
- *In situ* hybridisation demonstrates gene expression by identifying a specific type of mRNA.

Image capture and analysis

Students are encouraged to use the image acquisition equipment and computer digitisation at CellCentral for presentation and printing of images (as an alternative to conventional photography). The QUALITY of your histological images is an important aspect of your project. Generous time is provided for this. Note that charges are now incurred for using many facilities in research: behave as if this applies to Cell Central, so plan your time there wisely.

Assessment

Written Project Report (12%) Each student will write an essay on the project in the form of an independent scientific paper. This should be about 4 pages (and no more than 6 pages) in length, of typed, single-spaced, 12 point text on A4 paper. The title page, illustrations (figures/diagrams/tables), captions and references are additional to this. There will be a penalty for excessive length.

The paper should have an: Abstract; Introduction; Methods (brief outline); Results with illustrations or original pictures (with captions); Discussion; References; Acknowledgements. It should be modelled on a standard scientific paper. (See also notes under ESSAY and following detailed information for the written paper).

It is recommended that you complete an advanced draft of the Introduction, Methods & References by the beginning of Week 11 to avoid a rush at the end: you are strongly encouraged to collate and write as you go.

The final written report must be submitted by 9am Thursday 31st May. The marked projects will be available for collection at the exam.

Seminar (8%) One single seminar will be given by each group, usually divided into 5-6 linked presentations (max 15 minutes) each, with an additional 5 minutes for questions (maximum time 20 minutes). The members of the group should develop the seminar together, the presentations should be linked and each speaker introduced. The mark is for the overall group presentation and answers to questions. All students are expected to attend all seminars and ask questions, and will also help grade each seminar according to guidelines provided. (See separate handout: on “points to watch out for in seminar presentations”). A program for Week 13 will be organised for these project presentations.

Problems

It is appreciated that the contribution of the individuals may vary within the group project. If a student is clearly not participating fully, this should be discussed within the group and with the co-ordinator (Miranda Grounds) or the academic consultant, as deemed necessary. One of the aims of this project is to expose you to the satisfaction and potential difficulties associated with teamwork, as much research is the result of interactions within a group. If such problems arise they should be addressed by Week 9 where possible. Marks may be adjusted accordingly within a group if such a situation persists. A questionnaire is distributed to self-assess the group dynamics.

WRITING UP THE PROJECT

The aim is to **clearly, accurately, critically, and comprehensively** present the work that you have done in the project. The paper is YOUR version of the project. It should be about 4 pages (and no more than 6 pages) in length, of typed, single-spaced, 12-point text on A4 paper. The title page, illustrations (figures/diagrams/tables), captions and references are additional to this. There will be a penalty for excessive length. The paper should have an: Abstract; Introduction; Methods (brief outline of materials & methods); Results with illustrations or original pictures (with captions); Discussion; Acknowledgements; References.

Note: throughout the work avoid the use of First person i.e. Do NOT say “I” or “we found” instead use “xxx was found”.

Abstract: This is essentially a short summary of what you did, why, and what you found. It is an exercise in identifying the key points of the work and should be less than 200 words. This is best written last when the rest of the paper is completed.

Introduction: This should provide a background to the material you are going to present. In addition to providing background (descriptive and/or historical) information, it should clearly state the **aim/hypotheses and scope** of the work. It is usually helpful to include (at least) one diagram in the Introduction.

Methods: should mention the standard procedures (refer to, but do not describe in detail the methodology for routine stains) and briefly outline any other methods used - a diagram might be useful in some instances. State species, age and sex of tissue if possible. Your role throughout should be clearly indicated i.e. what material was supplied to you, whether you actually cut and stained, whether you only viewed prepared material. You should avoid the use of THEN in Methods...it is a very common trait to put it in everywhere. Watch out for this.

Results: Present **your original material**. Mainly the tissues that you have prepared, cut, stained and/or analysed and photographed. You can show other material to illustrate a point but must indicate when this was not prepared, looked at or actually photographed by your group.

The Results should say what you tried even if it did not work. **The quality of the figures with appropriate labelling and captions (and final magnification as a scale bar or x mag.) is very important.** You should indicate if you took the photos or if the photos are from another source. Remember that the histology aspects of the project are important.

Diagrams and Figures should be included in the text near the appropriate text. You **must** refer to each Figure at least once in the text (e.g. see Figure 1c). The text tells the 'story' and should refer to the Diagrams/Figures/Tables to illustrate a particular point. Each of the Diagrams/Figs/Tables must have a number and a title/description/caption. If in doubt, **check how this is done in different journals**. Do not put Figures as an Appendix, as an Appendix is essentially additional information that is not central to the story and can be removed without any major impact (as in your own appendix).

The **Discussion** should critically discuss the techniques used and problems encountered. In particular it should comment on the significance of the results obtained. Relate your observations to those in the literature and try and find some relevant papers to compare your study with. Suggestions for improvement or future directions for this work should also be included.

Acknowledgements, if appropriate, briefly acknowledge the contribution that others made to this work and thank them. If in doubt is always better to be generous.

References

It is recommended that you learn how to use ENDNOTE as part of the skills base you will need. Classes in the library have been organised for you on Tuesday 23 March (Easter Tuesday) 4-5pm and Thursday 27 March 9-10 am. Just sign up for these or another class using the sheets (see T1 in week 4 of Timetable or else you can sign up for a class at a time that suits you. Many people can help you with ENDNOTE and it is required for Honours and all future scientific writing.

References to papers are usually around 6 and probably should not exceed 12. They **must** be correctly cited in the text. For listing at the end they should conform to a standard format. Look at 3 different journals and compare the styles (see also separate handout). See also the ANHB1100 www site. <http://www.lab.anhb.uwa.edu.au/hb100/>

I prefer the citation of the name within the text [e.g. Smith, 1998 or Smith & Jones, 1998, or Smith et al., 1998 – depending on how many authors], rather than the use of numbers, and I prefer the full reference listed at the end in alphabetical order. Examples of one format for references are:

For a journal article Fan Y, Maley M, Beilharz M, Grounds M. (1996) Rapid death of donor myoblasts after intramuscular injection in myoblast transfer therapy. *Muscle & Nerve*.19; 853-860.

- Look at the audience. Don't just talk to the screen. Find someone to eyeball and talk to them. Tell them the story.
- Be enthusiastic. If you are not, then why should anyone else be?
- Dress reasonably smartly. Too casual may imply disrespect for the audience.
- My old Professor used to advise “ **Say what you are going to say**” (i.e. give a clear introduction, state precisely what the aim or hypothesis is and outline a plan for the talk)
“Say it”
“Say what you said” (i.e. briefly summarise and give the overall conclusions)
- Write out the aim or hypothesis.
- Write out a brief conclusion.
- Never ever apologise for the quality of a slide or a result. Should always be able to discuss shortcomings in a positive way!
- Don't preview slides in front of the audience.

Be critical of other talks and seminars you attend – see what points you think are good and work well, and others that could be improved. Write these down and remember them for your own presentations.