Biology 466/689 session/4-Winter 2022

Advanced Laboratory In Molecular Biology

Lecture location/time: Mondays 14:45-16:15 in HU125

Instructor: Michael Sacher, SP-457.01, michael.sacher@concordia.ca

Tel: 848-2424 ext 5627

Web site (Class notes, lab manual, assignments and info): accessible via Moodle

Technician: Michel Harvey (tel. 848-2424 ext. 3818) (Room SP-375.29)

Lab location: SP-385.01

Lab/tutorial times: Tues (01), Wed (02), Thur (03) starting at 13:30

Lab schedule: week of January 10 – week of March 28 (includes lab exam)

A USB key is mandatory. Results will be in digital format and not printed.

T.A.	Email address
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1. **Office hours: Tuesdays, 12pm-1pm.** You can also email questions to me and I generally respond within a few hours.

2. **Course Description:** The purpose of this course is to introduce you to the theory and practice of experimental molecular biology. As much as possible, the course is intended to mimic conditions that you would encounter in a university or industrial research laboratory. Therefore, the emphasis in the lectures, assignments and exams will be on experimental design, analysis and interpretation of experimental results**.** There will also be a strong emphasis on biological writing skills. To this end, there are 8 weeks of "wet-lab" work, a "wet-lab" test and two tutorials on how to properly write a biological manuscript. You will be expected to incorporate the ideas from these tutorials into the single lab report/manuscript that you will write this semester. Other tutorials will focus on practical online tools.

3. **Marking Scheme: Note that the pass grade for this course is a 50%.**

Item	% of final grade	Notes
Quizzes	10	Two during regular lecture period; 5% each
Lab report	35 (see below)	Hand in to your TA with lab notebook
Lab test	10	Performance in lab
Assignments	15	Two during the term; 10% and 5%
Final exam	30	During regular exam period

Note that not handing in the DHFR report or not writing the final exam will result in automatic failure. Not attending the lab test will result in an additional full letter grade deduction from the final grade.

Lab report	% of final grade:	Due:
DHFR project	35% (30% & 5%)*	April 14 by 5pm
**Note that students must hand in an Introduction and Materials and Methods section through wet lab 7 by March 9 at 5pm. TAs will provide feedback on this. This will account for 5% of your final grade. Late deductions of 10% per day will be applied.*		

4. **Lecture notes:** Lecture notes will be posted in colour as a PDF file. **Students are encouraged to either bring coloured markers/pens/pencils to highlight portions of the notes based on the lectures, or to mark them up on your tablets/laptops.**

5. **Lab Report:** The report is due as per the schedule above. **Upload an electronic version on the Moodle site in .docx format only (no PDFs)**. The file name should be: **last name_DHFR**. Do not use quotes in your reports: reword it and reference it. **Plagiarism of any kind will not be tolerated in this course and will result in severe penalties that may include expulsion from the University. See Code of Conduct (pages 5-6). Further information is available on the course web site including a mandatory quiz on proper referencing. Keep in mind that plagiarism extends to reuse of material submitted by yourself or another person as well.**

   Lab report structure (see pages 7-8 of this course outline for more information and a sample):
   Title: Arial 14 point, across the width of the page. Choose an informative but not over-stated title for your reports.
   Author/affiliation: Arial 10 point, on the line below the title should have your name; next line down should have your affiliation (Concordia University), city, province, country; include your ID number in parentheses after this information.
   The rest of the lab report should be in two columns and Arial 10 point unless otherwise stated, justified left and right.
   Abstract: Brief summary (200 words maximum) stating the goals of the project, the key findings and the key conclusion. Should not contain references and do not overuse acronyms
   Introduction: Provide a brief review of the biology, should not be a literature review, talk about what is known and what gaps there may be in knowledge, a final paragraph should summarize what you will do and may start with the words "In this study, I will….."
   Materials and methods: this should be categorized based on the methodologies used. Subheadings should be in bold. It should be in written (not bullet or step) form. Provide as much detail as necessary without re-writing the lab manual. If a kit was used, you can state the name of the kit followed by "as per manufacturer's protocol".
   Results: This should be in written form and should tell the story of your research. Results should be inserted as they are written about in the text. Each figure must have a valid and informative title (Figure number and title in bold, Arial 8 pt followed by the legend also in 8 pt but not bolded).The figure legend must allow the reader to understand the experiment without having to refer to the written portion of the results section. Gels should be labeled and any symbols in tables or graphs should be indicated.
   Discussion: Do not simply restate the results. They can be briefly summarized but conclusions should be stated. Remind the reader of the experiment that supports your conclusions. If any experiments failed, you should include a subheading in the discussion and provide reasonable explanations as to what may have gone wrong.
   Acknowledgements: No work is completed without assistance. The course technician provided immeasurable support, and labmates may have assisted (e.g. did you lose a sample that a lab-mate supplied to you?).
   Bibliography: This should follow formatting as in The Journal of Cell Biology and should be in alphabetical order in the bibliography. Make sure references are cited in the text: a bibliography without citing in the text will be considered plagiarism. References to Wikipedia or web sites will result in a grade of zero. Limit the use of review articles in your referencing: look up the original article. Avoid overusing one reference. Do not cite the lab manual or the lecture/lecture notes.
   Supplemental information: if your experiments did not work well and you used the data provided on the moodle site in your report, then the supplemental information section should include your data. This should be stated in the results section or the figure legend (e.g. my original data is shown in supplemental figure X). Supplemental figures must have a title and legend on the same page on which they are displayed. Supplemental information should also include any raw data that you used to make graphs or tables and should show calculations

performed to generate data that were in the results section. All supplemental data should be referred to in the results or figure/table legends. Failure to submit the lab report or a grade of zero on the report will result in automatic failure for the course.

Questions concerning the corrected lab report should be directed towards the TA who graded the report. If you are unsatisfied with the conclusion of the TA, put in writing what the issue is, what the response of the TA was and why you still feel it is unfair, and submit that to the instructor along with the original lab report.

Penalties for missed labs/tutorials: Any incurred penalties will be voided for documented cases of medical and, in rare instances, some family issues. Such notes must be presented within one week of the missed session. A missed lab or tutorial will result in a deduction of 10% from your final grade. The excuse of being ill the day before an assignment or report was due will not be accepted as an excuse for not handing in the assignment or report on time. Do not save things to the last minute.

6. **Quizzes:** There will be 2 quizzes of ~20-30 minutes to take place during the regularly-scheduled lecture time. The dates of each quiz will be announced during the preceding lecture and posted on the web site. **They will be based on the lectures, tutorials and labs up to that point**. There are no make-ups. Missed quizzes due to medical or some family issues must be presented within one week of the missed quiz. There are also 2 online quizzes that must be done prior to the first and second lab (see Moodle site for details). Lastly, there is a referencing quiz that must be done online.

7. **Assignments:** There will be two main assignments (sequencing (5%) and primer design (10%)) that will be discussed in the lecture and posted on the course web site. **Follow the instructions carefully and submit in the proper format**. There will be a 10% deduction from the assignment grade per day late.

8. **Final exam:** During final exam period and covering all concepts (both theoretical and practical) dealt with during the lectures, tutorials and laboratories. Calculators only will be permitted (ie. a calculator on a cell phone is not permitted). **There is no supplemental exam for this course.**

9. **Computer skills:** You should have an email address that you check frequently and you should have internet access. You should also be comfortable using a word processor (Word) and a spread sheet (Excel). For help, contact IITS since they regularly provide free training sessions (http://iits.concordia.ca/services/training/). **A laptop computer will be useful, but is not mandatory, during some of the lectures.**

10. **Books: The following text is strongly recommended:** "*Writing in the biological sciences: A comprehensive resource for scientific communication*". The text is available through amazon (first edition is ~$14, second edition is ~$35; either one is acceptable). The TAs may refer to this text during the tutorials and it will be useful as you write your lab report and beyond should you remain in biology.

    The lab manual is available on line. There are no assigned text books for this class, but you are expected to go back to reference books to refresh yourself on theory you may have forgotten. There are catalogs in the lab, and the information that they contain is also available on the company web sites. There is a copy of "*Molecular Cloning: A laboratory manual*", 3rd edition. Sambrook & Russell, Cold Spring Harbor Laboratory Press" (earlier editions are referred to as Maniatis) in the lab and on reserve at the Vanier library. This three-volume book provides basic and alternative protocols commonly used in molecular biology labs and provides background/practical information. You are welcome to browse the one in the lab. However, please do not take it out of the lab without prior permission since the set is very expensive.

"*Molecular Cell Biology*" by Lodish, et al. (WH Freeman & Co) has a chapter dedicated to recombinant DNA technology. If you do not own the textbook, you can access the content through NCBI Bookshelf: http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=mcb.TOC. Other relevant reading materials will be posted on the BIOL466 homepage as needed. "*Molecular Biology*" by Weaver, used for Biol367, is also an excellent book to reference for some of the subject material.

A copy of Benjamin Lewin's "*Genes XIII*" is also available in the lab. There are many chapters in this book that complement some of the lecture material.

There is also a copy of the book "*At the bench*" by Kathy Barker, available in the lab. This is an extremely useful resource for basic laboratory methods and calculations. Do not remove this or any other book from the lab without permission from the technician.

Articles will be added to the course web site. They cover aspects of what was discussed in the lecture and should be read. You will not be responsible for any portion of the article that was not covered in the lectures. However, it would certainly be beneficial to you to read those sections.

12. **Safety:** There is a section on laboratory safety in the beginning of the lab manual. This must be read before entering the laboratory. Within this section is a safety sheet (page 8). **The signed safety sheet must be handed in before the first wet-lab.** There will be a one week grace period. If it is not handed in before the second wet-lab session, then you will not be permitted to enter the lab (see above for penalties for a missed lab).

13. **Prelab and lab performance:** You are expected to have a prelab write-up before each lab session which the TA will review. Among other things, it should include any formulae that will be needed for that week. If it is deemed illegible or plagiarized, you will not be permitted to enter the laboratory for that week. If the TA feels it is incomplete, you will be informed and, if an incomplete/unacceptable prelab is found again, the TA may prevent you from entering the laboratory for that week. The technician will make brief prelab announcements promptly at the beginning of each lab session that are essential to the smooth running of the session. The lab door will be locked and latecomers will be asked to wait in the hallway until after the announcements. Latecomers will be asked to sign a late sheet. Should your name appear multiple times on the late sheet, marks will be deducted from your lab report. In addition, should the technician or TA deem a student to be tardy in their work for reasons not beyond their control (ie. excessive talking, shmoozing, lateness), or if students leave a messy work space after the lab session, marks will also be deducted from the lab report. **There is no admittance to the lab after 1:45pm.** Keep meticulous notes in a laboratory notebook and clearly label tubes that are saved for future weeks. The location and position in the common storage boxes in the freezer should be noted in your lab notebook.

Since expensive reagents are prepared for each lab, not showing up at your scheduled time results is an unnecessary waste of money and preparation time. Changing lab days without prior permission will result in steep deductions since you will not be permitted to enter the laboratory (see section 5).

Welcome to Biology 466. I hope that you enjoy this course and that you will gain valuable research experience over the coming months.

M. Sacher

Code of conduct (taken from University Academic Policies)

the full version is available at:
https://www.concordia.ca/content/dam/common/docs/policies/official-policies/Academic-Code-Conduct-2015.pdf

III Offences

18. Any form of cheating, or plagiarism, as well as any other form of dishonest behaviour, intentional or not, related to the obtention of gain, academic or otherwise, or the interference 4 in evaluative exercises committed by a student is an offence under this Code. Any attempt at or participation related in any way to an offence by a student is also an offence.

19. Without limiting, or restricting, the generality of Article 18 above and with the understanding that Articles 19 a) to l) are to be considered examples only, academic offences include, the carrying out, or attempting to carry out or participating in:

a. plagiarism - the presentation of the work of another person, in whatever form, as one's own or without proper acknowledgement;
b. the contribution by one student to another student of work with the knowledge that the latter may submit the work in part or in whole as his or her own;
c. unauthorized collaboration between students;
d. tearing or mutilating an examination booklet or an examination paper, including, but not limited to, inserting pages into a booklet or taking a booklet or a portion of the booklet or examination paper from the examination room;
e. multiple submission - the submission of a piece of work for evaluative purposes when that work has been or is currently being submitted for evaluative purposes in another course at the University or in another teaching institution without the knowledge and permission of the instructor or instructors involved;
f. the obtention by theft or any other means or use of the questions and/or answers of an examination or of any other resource that one is not authorized to possess;
g. the possession or use during an examination of any non-authorized documents or materials or resource or possessing a device allowing access to or use of any nonauthorized documents or materials;
h. the use of another person's examination during an examination;
i. communication with anyone other than an invigilator during an examination or the obtention of any non-authorized assistance during an examination;
j. impersonation - assuming the identity of another person or having another person assume one's own identity;
k. the falsification of a document, in particular a document transmitted to the University or a document of the University, whether transmitted or not to a third party, whatever the circumstances;
l. the falsification or fabrication of a fact or data or a reference to a source in a work;

Sanctions

21. If a charge is upheld against a student by the Dean pursuant to Article 42, and the Dean does not refer the case directly to an AHP, the Dean must impose one or more of the following sanctions:

a. Reprimand the student;
b. Direct that a piece of work be re-submitted
c. Direct that the examination be taken anew;
d. Enter a grade reduction for the piece of work in question or enter a grade of "0" for the piece of work in question;
e. Enter a grade reduction in the course or enter a failing grade for the course;
f. Enter a failing grade and ineligibility for a supplemental examination or any other evaluative exercise for the course;

g. Impose the obligation to take and pass courses of up to twenty-four (24) credits, as specified by the Dean, in addition to the total number of credits required for the student's program. If the student is registered as an Independent student, the sanction will be imposed only if he/she applies and is accepted into a program.

22. If a charge is upheld by an AHP pursuant to Article 62, the AHP must impose one or more of the following sanctions:

a. Any or all of the sanctions listed at Article 21;

b. Impose a suspension for a period not to exceed six (6) academic terms. Suspensions shall entail the withdrawal of all University privileges, including the right to enter and be upon University premises;

c. Expulsion from the University. Expulsion entails the permanent termination of all University privileges.

The title should be informative but not overstated, Arial 14 pt bold, centred on the page; name and affiliation should be 10 pt not bold

Michael Sacher
Concordia University, Department of Biology, Montreal, Quebec, Canada (student ID#)

ABSTRACT

The report must have one inch margins on all four sides, justified left and right. The title should not exceed two lines and should span both columns in width. From this point onwards use Arial 10 pt unless stated otherwise and format the manuscript into two columns. As stated below, some of the figures may span 2 columns in width. The abstract should be in bold typeface. The word count for this section is limited to 200 words. Briefly summarize the key findings and end with a one sentence conclusion. There should be a concise background to set up the context of your study. Avoid referencing in the abstract and minimize acronyms to those that are commonly used in the manuscript. Figures that are inserted into the text should be made to fit one column width. If you feel that they need to be enlarged for better reading you can do so and its figure legend should also span 2 columns, but make sure the main text continues to be formatted into two columns.

INTRODUCTION

Each section heading should be in capital lettering. The Introduction should not be an exhaustive literature review. Rather, understand the goals of the project and then decide what to write about. The reader should be given enough background information to understand the issue that you are addressing in the present study. Talk about open questions in the field. You can have a concluding paragraph that briefly lays out what you will do in the upcoming report. Such a paragraph commonly begins with “Here, …..was studied….” Or “In the present study,….”. Do not refer to this work as “In this project” or “In this experiment”. Do not forget to reference throughout the manuscript. Do not overcite a single reference and be sure to cite original research, not review articles, in your citations. See the reference section below for details and style (Milev et al, 2015). Acronyms should be spelled out entirely before their first use. The first paragraph of a section should not be indented. All subsequent paragraphs of the same section should be indented 0.25 inches with no line breaks between paragraphs. Your Introduction section must be no shorter than 1 column (~400 words, not including references) and no longer than 1.5 columns. Graders will not read beyond 1.5 columns, resulting in a grade deduction.

MATERIALS AND METHODS

Subheadings should state the technique only

Each subheading should be in bold and italics. Do not simply re-write the lab manual. The subheadings should state the technique only. No rationale for using the technique; that could be in the results section. Decide on what was done overall and then describe how that was done. Enough detail to allow repetition of the experiment is good. Nitty-gritty detail should be avoided. This is not to be written as a detailed protocol. There are to be no more than 6 subheadings. Leave one line space between each subheading.

Keep it brief but informative

A paper is written for a target audience that understands the details. So just provide the necessary info, and the reader who wants to repeat the experiments will know how to work out the fine details. Not everything done in a lab makes its way to the paper. There is a certain level of trust in science that proper controls were done so the experimental controls do not have to be talked about in the methods section. Do not provide amounts of stock solutions added, simply provide the final concentrations. In short, the techniques used are not cutting-edge and are done in most labs. Therefore, the common portions of those techniques do not need to be detailed. But whatever is unique to your experiments should be mentioned.

RESULTS

How to start a results section

Your manuscript is a story. Start telling that story by briefly reminding the reader what your goal is. Results should also be categorized with descriptive subheadings. Leave one line space between each subheading. Do not show results without explaining them in the results section. Make sure your Results section flows from one subheading to the next. A basic outline for each subheading would be to state the question or hypothesis for that section, then briefly present the experimental design and results. A final sentence should state the conclusion for that section. The next section should be connected to the previous section by stating what knowledge is now lacking. Phrases like “knowing…., it was important to test….” or “based on the previous data, ….”. Avoid the use of the term “we” since this was not a group project. You can restructure the sentence to avoid using that term.

Figures must have titles and legends

Any figure that you display must have a title and a legend. The figure title will be in Arial 8 pt, bold typeface. The figure legend will also be Arial 8 pt but not bolded. A figure legend should be written so that a reader can just look at the figure and legend and know what was done in that particular figure. Number figures consecutively (Figure 1, Figure 2, etc). Insert the figure in the text shortly after it is referred to. Figures may have multiple panels as long as they are related to each other. Figures can span two columns to make them larger and readable. In such cases the legend should also be two columns wide underneath the figure. Tables may also be used both in the materials and methods section and the results. Tables should be numbered consecutively (Table 1, Table 2, etc). If using posted data make sure you state that in the legend and refer to the appropriate supplemental figure with your negative results.

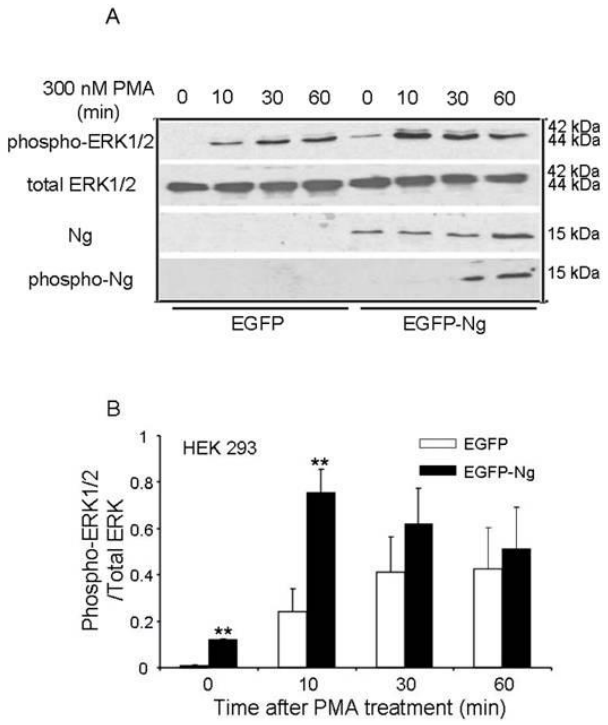

Figure 1. The figure number and the title for the figure legend should both be in bold. The legend should be in 8 pt font and should accurately describe what is being shown in the figure. The reader should be able to read the legend and know exactly what was done in the experiment without having to refer to the written results section. (**A**) Describe each panel if there are multiple panels. In the legend, the panel letter should be bold and in parentheses. All panels in the figure should be labeled with a corresponding description for each panel. (**B**) Lanes should be numbered and the numbering should be described in the legend. The figure above is simply an example of a well-labeled image. If you use posted data from the course web site, be sure to state that at the end of the legend and state that your original data is shown in supplemental figure X. Raw data used to generate a figure should also have a reference to the appropriate supplemental figure or table.

DISCUSSION

Briefly remind the reader of your results without going in to detail. What questions did you answer, or what novelty did you now add to the field? How do your results support your conclusions? What other possibilities are there that have not necessarily been discounted? What would you do in the future? How does your study fit into the field more broadly? If need be, include a subheading at the end of this section to discuss what may have gone wrong with any of your experiments that did not work. The Discussion section must be no longer than 1.5 columns. There is no restriction on minimum length.

ACKNOWLEDGEMENTS

Be sure to thank everyone who helped you in this work. That includes fellow students who may have provided you with reagents that you accidentally lost, as well as the course technician without whom none of this would have been possible.

REFERENCES

Make sure you include references. A report without references will be considered plagiarism and incur severe consequences. References must be in the J. Cell Biol. style and listed alphabetically. The first line of the reference is left-justified and the other lines are indented. Right-left justification for the references is required. Use Arial 9 pt. An example is below. Do not include DOI codes after the references. No referencing to web sites, Wikipedia, the lab manual or lecture notes will be tolerated (see page 2 of the course outline). Endnote is recommended, and includes the J. Cell Biol. style.

Milev, M.P., B. Hasaj, D. Saint-Dic, S. Snounou, Q. Zhao, M. Sacher. 2015. TRAMM/TrappC12 plays a role in chromosome congression, kinetochore stability, and CENP-E recruitment. *J Cell Biol*. 209:221-234.

SUPPLEMENTAL INFORMATION

Your report will include all data you generated. You must decide on what is key to show in the main results section. If you used the posted data, this supplemental information section must also include your data, complete with a figure legend. You should also include any raw data that was used to generate graphs or tables or used to obtain any reagents used. Be sure to describe what you are showing and its interpretation. Possible reasons why it did not work should be discussed in the section at the end of the Discussion (see above). Figures should be numbered as Figure S1, Figure S2, etc. and referred to in the main results section or in the appropriate figure legends.