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LECTURE: 11:00-11:50 am Tuesday in Sudro 27
LAB: Loftsgard 202 (begins the 1st week of the semester, 1/11 - 1/13)
R. Ian Freshney, {text recommended but not required, 3 copies of
the 4th edition on reserve in library}
Gustad and E. Berry

COURSE SUMMARY
In this class the focus will be on basic animal cell culture methods as well as some specialized applications of these techniques.

COURSE GOALS
1. To give students hands-on experience with a variety of cell culture procedures.
2. To make students appreciate the diligence required for the successful culture of animal cells.
3. To demonstrate to students the wide variety of animal cell culture techniques used in industrial, clinical and research laboratories.
4. To teach students the proper method for maintaining a laboratory notebook.
5. To provide students with training in the use of cell culture tools and equipment.

LECTURE TOPICS:

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<tr>
<th>Lecture</th>
<th>Topic</th>
<th>Text</th>
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<tbody>
<tr>
<td>#1</td>
<td>Course Introduction</td>
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<tr>
<td>#2-5</td>
<td>Introduction to Animal Tissue Culture</td>
<td>Chapter 1</td>
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</tbody>
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| #6-10   | Tissue Culture Challenges
            Tissue Culture Contamination
            Environmental Requirements for Tissue Culture | Chapter 6, 19
            Chapter 8, 9 |
| #11-12  | Scale-Up of Tissue Culture Systems | Chapter 26 |
| #13-15  | Stem Cells | Chapter 17 (p.283-284) & Chapter 23 (p.419-420) |

Lecture notes are available in Blackboard. Students are encouraged to print the outlines and bring them to class. In class, students may find it useful to add supplemental information to the notes.

Students are also encouraged to print and/or read the weekly supplemental lab notes, also available in Blackboard.
ACADEMIC HONESTY AND SPECIAL NEEDS

Academic dishonesty and plagiarism are prohibited according to university policies. For more information please refer to the following website: http://www.ag.ndsu.edu/academics/honor.htm

Any student with special needs should contact the instructor immediately.

MICR 445/645 – GRADING

LABORATORY: Labs (week 1-14) will be worth 10 points each (total of 140 points): Points will be awarded for participation, completion, punctuality, and quality of work. Quality of work includes such things as the health of the cells, successful completion of the experiment, and good laboratory technique. An unexcused absence from lab will result in forfeiture of all lab points. Some lab points will also be deducted from students with >1 excused lab absence and from students whose technique is habitually poor (i.e. lab points are not strictly attendance points). The weekly lab ‘overview’ (beginning of each lecture period) is considered part of lab. Therefore, an unexcused absence from lecture will result in the forfeiture of 3 of that week’s 10 lab points.

PUNCTUALITY: Lectures begin with a lab overview, and labs often begin with demonstrations. Therefore, punctuality is mandatory. Points will be deducted for habitual tardiness.

LABORATORY NOTEBOOKS: Notebooks will be worth 300 points based upon a midterm and a final evaluation, each worth 150 points (1st assessment more lenient, with corrective comments; final assessment more stringent). Details regarding the proper preparation/maintenance of a laboratory notebook can be found on the last page of this syllabus. Notebook assessment rubrics are available at the Blackboard website and in the lab manual (appendix IV).

QUIZZES (total of 210 points): For each "lab week" (week 1-14) there will be a 15 point 'on line' quiz, available at the course website: http://bb.blackboard.ndsu.nodak.edu. These "review/preview" quizzes are designed to assess knowledge of past information and to encourage students to pre-read the upcoming lab material. Quizzes will be available only through 10:00am Tuesday each lab week (the only exception will be on line quiz #1, which will be available through 5pm Friday of week one).

EXAMS: 1st Exam (75 points)- Mar. 1, 2011 {during lecture- covers lab (weeks 1-6) and lecture topics}
2nd Exam (75 points)- Apr. 19, 2011 {during lecture- covers lab (weeks 7-12) and lecture topics}
Final Exam (200 points)- officially scheduled for Thurs., May 12, 2011, 10:30am – 12:30pm; likely will be rescheduled due to conflicts with rDNA Lab Final
(Final Exam is Comprehensive – covering lab and lecture topics)

Exams and quizzes will cover information from both the lectures and the laboratory. Questions will be derived from lecture material, lab powerpoints, and the lab manual (including videos). Should an exam be missed due to class cancellation, the test will be administered during the next class period. Due to past abuses, I am forced to announce that there will be no flexibility in the scheduling of examinations. Therefore, the examinations must be taken at the scheduled times (exceptions allowed only in extreme situations). Please plan your test preparation accordingly.

Examination rules: no talking/whispering, no sharing of calculators, no wandering eyes.

Total Points = 1000; GRADES: A=900-1000, B=800-899, C=700-799, D=600-699, F < 600

Makeup for labs, quizzes, and exams will be allowed only if discussed ahead of time with the instructor. Failure to make prior arrangements with the instructor will result in a score of “0”. I will try to accommodate reasonable requests.
# MICRO 445/645 - 2011 SPRING SEMESTER LABORATORY SCHEDULE

<table>
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<tr>
<th>LAB WEEK</th>
<th>DATE</th>
<th>LABORATORY</th>
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| 1        | 1/11-13| Ex. 1- Introduction, Safety, Dilutions, Pipette usage, Aseptic Technique, Equipment, Water purification {video: basic sterile technique}  
Ex. 2- Media Preparation |
| 2        | 1/18-20| Ex. 3- Subculturing or “Splitting” Cells  
Ex. 4- Counting Cells—Hemocytometer {videos: trypsinizing attached cells & quantifying viable cells} |
| 3        | 1/25-27| Ex. 5- Nutrition Experiment |
| 4        | 2/1-3  | Ex. 6- Colormetric Cell Quantitation (Ex. 5 results)  
Ex. 7- Plating Efficiency (using myeloma or hybridoma cells) |
| 5        | 2/8-10 | Ex. 8a- Cellular Bioassay – Step 1 |
| 6        | 2/15-17| Ex. 9- Chromosome analysis  
Ex. 7- Plating Efficiency (complete) {video: microscopic cell characterization} |
| 7        | 2/22-24| Ex. 10- Primary Cell Cultures |
| 8        | 3/1    | **1st Exam in lecture- 3/1** {1st exam material: week 1-6 labs, lectures, & videos}  
*no official labs 3/1 or 3/3* - students should monitor their 1st cultures: record observations & split if necessary |
| 9        | 3/8-10 | Ex. 8b- Cellular Bioassay – Step 2  
**3/14-18- SPRING BREAK- Lab Notebooks Due 5:00pm 3/11/11** {Exercises 1-9 will be graded} |
| 10       | 3/22-24| Ex. 11- Toxicity Assay  
Ex. 13a- Cryopreservation-freeze {video: cryopreservation} |
| 11       | 3/29-31| Ex. 12- Neutral Red Assay & Ex. 13b- Cryopreservation-thaw |
| 12       | 4/5-7  | Ex. 14- Virology: Plaque and Microtiter assays {old stem cell video}  
{fix plaque assay plates on d-3 or 4; store @ 4°C until week 12} |
| 13       | 4/12-14| Ex. 15- Somatic Cell Fusion- set up, maintain for 3 weeks  
Ex. 14- Virology assays- read TCID₅₀, stain & read plaque assay  
**2nd Exam in Lecture-4/19** {2nd exam material: week 7-12 labs, lectures, & videos}  
{students responsible for previewing lab material prior to lab}  
Ex. 17- Coat Mycoplasma ELISA plate  
Ex. 16- Immunocytochemical Assays |
| 14       | 4/26-28| Ex. 17- Mycoplasma detection ELISA {videos: stem cells}  
*no official labs 5/3 or 5/5- Lab wrap-up (continue to feed & monitor Somatic Cell Fusion Cultures – Ex. 15) |

**Lab notebooks due 5:00pm 5/9/2011** - final notebook assessment includes ex. 3, 10-17  
*late notebooks will be accepted but 5 points will be deducted for each day they are late*
GRADUATE STUDENT PAPER: Graduate students will be required to complete a 4-6 page review paper (due 5/6/2011). The paper should be a summary of ≥3 cell culture-based research papers from academic journals. Consult with the instructor if you desire more details regarding this assignment.

LABORATORY NOTEBOOKS – the instructions (below) should be followed carefully!!

Students will be required to maintain a legible, accurate, up-to-date, and complete laboratory notebook throughout the entire semester. This notebook will be similar to those kept in a research lab. Basically it is a lab “diary” and an informal collection of laboratory exercise write-ups. Laboratory notebooks are very important: 1) they are legal records of what has been done in the lab, 2) they are necessary for preparing research manuscripts for publication, 3) they are used for the preparation of patent applications for innovative research developments, 4) they are necessary for determining either subsequent or corrective steps to make in research experiments or projects, and 5) they are necessary to teach/train new lab personnel in the techniques specific to that laboratory. Laboratory notebooks are kept in research, clinical, diagnostic, and industrial laboratories. Thus, knowing how to keep a laboratory notebook is very important.

The notes shall be kept in a bound (i.e. no 3-ring binders or tablets) notebook, not on loose-leaf paper or lab stationary (paper towels). The notebooks will need to be kept up-to-date and legible at all times. All entries should be made in ink. If corrections are necessary they should be written next to the original entry (no erasing/removal of information) and accompanied by your initials and the date of the correction.

The following information should be kept in the notebook (refer to the lab notebook grading rubrics, appendix IV in manual, for more details).

1. The date and time should be recorded for each and every time you are in the laboratory (even if outside of regular lab time, including occasions when access is denied by a locked lab door; the lab should be accessible 7:30-4:30 M-F).
2. What is actually done each and every time you are in the laboratory (results and observations made during each experiment and/or visit to the laboratory).
3. An informal lab write-up of each exercise, with each section clearly labeled.
   a. Exercise number and title (e.g. Ex.2 – Media Preparation).
   b. A 1-2 paragraph ‘introduction’ (includes the exercise's purpose, principle, and background info.)
   c. A ‘materials and methods’ section with a brief overview of the reagents, equipment, and procedure, followed by the statement: “Refer to the laboratory manual for further details regarding materials and methods”.
   d. A ‘results’ section for each exercise (if applicable) with only results, no commentary.
   e. A ‘discussion’ section at the end of each exercise. This will include: what the experiments(s) demonstrated, what the results mean, whether there were problems or mistakes in technique (and how those influenced the results).
4. Frequently you will find questions in the lab manual. The answers to these questions should be included in your lab notebook. Likewise, you will occasionally find specific directions in the lab manual regarding items to include in your lab notebook. Those directions should be heeded.
5. I expect to see an entry in your laboratory notebook for all 17 labs. Obviously this includes labs such as 1, 2, and 16 (which are primarily demonstrative lab exercises).

Laboratory notebooks are a crucial component of this course. Failure to complete and turn in an acceptable laboratory notebook will result in failure of this course; regardless of your point total (incompletes are no longer an option except in extreme cases).

Exemplary laboratory notebooks can be examined in Van Es 125.