Techniques in Molecular Genetics

2009 edition

H.E. Schellhorn

Day 1

- Introduction
  - Why are we here?
    - Overview
    - Teaching Coordinator, Teaching Assistants
    - Changes for 2009
    - Techniques
  - Use of a Pipetman
  - Streak a culture, Make some media
  - DNA Management Software

Course Rationale

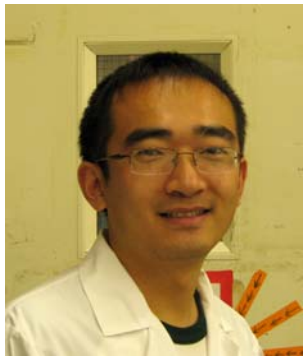
This course is primarily aimed at students who are starting to work in molecular biology research mainly Biology and Molecular Biology student who have completed third year and are working in the Biology department during the summer. The formal part of the course, consisting of two weeks of laboratory/lecture, runs the first two weeks of May.

The objective is to provide participants with formal instruction in the scientific process including laboratory techniques that they need to accomplish their research objectives. By combining theory with practice, much duplication in instruction among labs will be eliminated.

Instructors

Dr. H.E. Schellhorn

Ms. Alison Cowie



Tao Dong

Sarah Chaing

Sharmila Sathiasothy

Significant Changes for 2009

- Increase in number of students -> 27
- Each student will do each procedure
- New certificate of completion
- Overnight assignments
- Course Wiki/Webpage
- Changes in techniques
- Rotation schedule to provide one on one instruction in key technologies..

Grading Scheme

Quiz I	20%	(May 4th, days 1-4)
Quiz II	30%	(May 11th, days 1-9)
Overnight and Rotation Assignments	10%	
Course performance	10%	
Lab notebook keeping	30%	

Use and understand the principle of the following laboratory equipment/tools…

- Laboratory notebook.
- Centrifuge.
- Spectrophotometer.
- Image analysis.
- Scanner.
- Scintillation counter.
- Autoclave.
- pH meter.
- PCR cycler.
- Transilluminator.
- Balance.
- Analytical balance.
- Sonicator.
- Gel dryer.
- Computer.
- Web tools.
- Spreadsheets

Awards

1. Biology Workshop in Molecular Genetics
   Best Labbook Award ($100)

2. Biology Most Productive Protein Production
   Award ($100)

Potential Overnight assignments..

- Use Refworks to write a short essay…
- Write an SOP/AUP
- Read “instructions to authors” and answer a short quiz
- Prepare a table comparing protein methods
- Prepare a table comparing graph types
- Prepare a publication quality graph
- Prepare an order sheet for purchase of chemicals
- Write and submit Primer, DNA sequencing order

Wiki/Website

- Part will be public..some parts will require a login in.
- Include product manuals (PDFs), assay manuals (PDFs) reference tables, calculators and sample spreadsheets.
- Will also include web resource for each technique.

Practical

- Why do experiments fail?
- How to plan experiments
- Where to store samples.

4XX3: Lab Rules and Organization

NO FOOD

Lab coat: General safety, and biosafety level 2 tissue culture work

Safety equipment: Fire, Eye wash, shower

Safety goggles: for acid/base handling, fume hood for HCl, SDS, BME

Gloves: for handling of acrylamide, acid, basis, ethidium bromide
biosafety level 2 tissue culture work

Clean balances!!!

Waste: biological waste vs non-biological waste

Reasoning

- Scientific method
- The falsifiable hypothesis-Popper
- What makes a good (powerful) hypothesis?
- Induction/deduction Reasoning (specific to the general)
- Predictive models
- Theory/Proven fact
- Cause vs correlation
- Reductionist/holistic
- Science/Magic
- Orthogonality
- Conjecture vs plausible explanation

Ethics

- Plagiarism—degrees of plagiarism, recent examinations of the problem
- Fraud
- Accreditation
- Misunderstanding

The 10 most common mistakes made in laboratory research. (HES)

1. Failing to promptly write up experiments and write out protocol before hand.
2. Failing to include the proper controls.
3. Not preparing enough material.
4. Failing to store properly store material promptly.
5. Allowing a distraction to screw up the addition of a key reagent.
6. Improper (usually insufficient) mixing or agitation. esp. frozen reagents.
7. Not discussing results with your supervisor/colleague before proceeding to the next step.
8. Not checking the accuracy of pipettor/pH meter (or other instrument....) before assay.
9. Calculation error made in making up reagent (factors of ten/failure to take into account water of hydration in calculation).
10. Calculation error made in determination of results.
11. Not labelling tubes/dishes etc.