LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques

Areas of Study

The course LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques comprises altogether seven laboratory exercises. The goals of these exercises are three-fold: (1) to enhance students' comprehension of what they have learnt in lectures; (2) to provide hands-on experience in the fields of Biotechnology and Molecular Biology; and (3) to prepare students for advanced laboratory studies.

Students will be given exposure to the following areas of molecular biology and recombinant DNA technology:

- Analysis of plasmid DNA by agarose gel electrophoresis
- Restriction endonuclease digestion
- Amplification of DNA by polymerase chain reaction
- DNA recovery from agarose gel
- Plasmid construction by Gibson Assembly
- Microbial culture and aseptic techniques
- Transformation of *E. coli*
- Plasmid DNA isolation
- Site-directed mutagenesis
- Quantitative analysis of recombinant proteins

Learning outcomes

On successful completion of this course, students are expected to be able to:

1. Acquire a sound knowledge of recombinant DNA methodology, gene structure and expression.
2. Perform practical skills relating to molecular biology and bacterial culturing to yield recombinant DNA / protein.
3. Demonstrate analytical awareness via interpretation of experimental results.
4. Plan and execute recombinant DNA techniques in order to determine and interpret genetic modifications.

5. Work and coordinate effectively in a group to accomplish laboratory based tasks.
6. Exhibit accuracy and independence in recording and reporting results.

Learning activity

1. Learning environment: A group of two or three students will collaborate to perform the experiments during the semester. Workbench, routinely used labwares and instruments would be assigned to and managed by each group of students.
2. Pre-lab talk: Contents would focus on basic theoretical and practical issues pertaining to the experiment.
3. Pre-lab demonstration: Specific techniques will be demonstrated by the instructor prior to each laboratory exercise; real time close-up video shot will be shown live. Right after demonstration, students will perform the same techniques by themselves. Students are expected to learn a core set of techniques that will be repeatedly used throughout the semester.
4. Bench supervision: The bench supervisor, who is a technician or postgraduate student, will be in charge of several groups of students. The bench supervisor will provide assistance and instructions to students during the experiment.
5. Exit discussion: In some exercises, on completion of the experimental work, all students would be expected to present their results to the instructor. Additional discussions on data analysis may be conducted on a large group-basis.

Method of assessment

1. Every student is required to submit 7 worksheets. Questions in the worksheets cover underlying principles of experiments, data reporting, data interpretation and statistical analysis.
2. In each laboratory exercise, practical performance, discipline and safety awareness of students will be assessed by the bench supervisor.
3. Every student will be assessed individually in the final examination, which may include written questions and practical tasks. Knowledge on concepts and principles of recombinant DNA technology, and the ability to analyze laboratory data will be evaluated in the written part. Competence on experimental techniques

acquired in this course will be evaluated in the practical part.

Assessment scheme

Method of assessment	Percentage	Learning outcomes to be assessed
Worksheet	21% (3% per worksheet)	(1), (3) and (6)
Laboratory performance	14% (2% per exercise)	(1), (2), (4) and (5)
Final examination (Written and practical)	65%	(1), (2), (3), (4) and (6)

Teaching Team

Instructors:

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Technicians:

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LIFS 3110 Biotechnological Applications of Recombinant DNA Techniques
Fall Term 2018-19

Venue: Room 4160 (Lift 33)

Schedule:

Exercise 1 Analysis of plasmid DNA by restriction digestion and agarose gel electrophoresis

Section 1:	4 Sep (Tue)	14:00-15:50
Section 2:	4 Sep (Tue)	16:00-17:50

Exercise 2 Amplification of DNA by polymerase chain reaction

Section 1:	11 Sep (Tue)	14:00-17:50
Section 2:	18 Sep (Tue)	14:00-17:50
	25 Sep (Tue)	Public holiday, no class

Exercise 3 Plasmid construction by Gibson Assembly

Section 1:	2 Oct (Tue)	14:00-17:50
Section 2:	9 Oct (Tue)	14:00-17:50

Exercise 4 Transformation of *Escherichia coli* by plasmid DNA

Section 1:	16 Oct (Tue)	14:00-17:50
	17 Oct (Wed)	Public holiday, no class
Section 2:	23 Oct (Tue)	14:00-17:50
	24 Oct (Wed)	10:30-11:20*

Exercise 5 Plasmid mini-prep and restriction analysis

Section 1:	29 Oct (Mon)	12:00-12:20
	30 Oct (Tue)	14:00-17:50
Section 2:	5 Nov (Mon)	12:00-12:20
	6 Nov (Tue)	14:00-17:50

Exercise 6 QuikChange site-directed mutagenesis

Section 1:	13 Nov (Tue)	14:00-17:50
	14 Nov (Wed)	10:30-11:20
Section 2:	20 Nov (Tue)	14:00-17:50
	21 Nov (Wed)	10:30-11:20

Exercise 7 Quantitative analysis of recombinant green fluorescent proteins

Section 1:	27 Nov (Tue)	14:00-15:50
Section 2:	27 Nov (Tue)	16:00-17:50

Final Examination To be determined