

## **MCELLBI N184**

# **IGI CRISPR Workshop: Practical Aspects of Precision Biology for Undergraduates**

**Course Description:** This 1-week workshop will focus on applications of CRISPR technology as a platform for genome editing and functional genomics. The program will consist of lectures from experts in the field and a hands-on laboratory experience demonstrating targeted mutagenesis in cultured human cells. Workshop faculty will address topics in genome editing and CRISPR-Cas9 research, including basic and enhanced CRISPR methods, cellular repair mechanisms, regulation of gene expression, bioinformatics, applications to various organisms, and bioethics.

Three hours of lecture and 5 hours of lab per day. 1 week [1 units]

**Prerequisites:** 110L, 133L, 140L, 150L or 160L or equivalent lab experience

**Grading Option:** P/NP

**Final or other assessment format:** Presentation on the last day of instruction

### **Grading**

To obtain a pass grade you must attend all lectures for the full time, perform all experiments, participate in all labs as evaluated by the teacher and GSIs, and provide feedback on the course content in an end of class evaluation.

There is no exam or paper, but your grade will be determined heavily based on the attendance (30%), participation in labs and discussions (40%) and final presentation (30%).

In order to obtain a passing grade for the class, your overall grade should be 70% or above.

### **Absences**

Because this course is only one week long, planned absences cannot be accommodated. If you have a scheduling conflict with any days of this class, please withdraw. If you are ill or have an unplanned absence, please work with your lab partner to review any lectures or lab procedures that you missed. Extended unplanned absences may result in a NP grade.

### Day 1

#### **9am- 12pm**

Welcome, Course Introduction  
Background on Genome Editing  
Issues in CRISPR-Cas Editing

- Off-target effects
- Delivery

#### **12pm-1pm Lunch Break**

#### **12pm- 5pm**

Lab Day 1

- Lab Safety talk
- Template PCR
- Agarose gel on PCR products
- Set up overnight transcription

### Day 2

#### **9am- 12pm**

Introduction to dCas9  
Uses of dCas9

- CRISPRi
- CRISPRa
- Localization

#### **12pm-1pm Lunch Break**

#### **1pm- 6pm**

Lab Day 2

- Purify sgRNAs
- Determine sgRNA concentration
- Run RNA gel
- Assemble Cas9 RNPs
- Nucleofect HEK293T cells

### Day 3

#### **9am- 12pm**

CRISPR Applications: Guest Lecturer Topics TBD

#### **12pm-1pm Lunch Break**

#### **1pm- 6pm**

Lab Day 3

- Monitor cells
- Target selection and sgRNA design
- Designing primers for genomic DNA targets

### Day 4

#### **9am- 12pm**

CRISPR Applications: Guest Lecturer Topics TBD

#### **12pm-1pm Lunch Break**

#### **1pm- 6pm**

Lab Day 4

- Harvest cells
- Prepare genomic DNA (Quick Extract)
- PCR amplify targets
- Run agarose gel

### Day 5

#### **9am- 10am**

Ethical & Societal Issues Discussion

#### **10am- 12pm**

Final Presentations

#### **12pm-1pm Lunch Break**

#### **1pm- 6pm**

Lab Day 5

- T7E1 assay
- Run agarose gel
- Assess results

## **Resources and Readings:**

TBD, will include:

- All protocols for lab work
- Major CRISPR publications
- News articles and popular science CRISPR articles

## **Lab Citizenship**

Many of you will be working in labs for many years. Common sense, courtesy, and a few standard practices will go a long way to ensuring a good research environment for everyone. Here are a few musts for all lab work- to be applied during this course and any labs you may find yourself in in the future.

- Stay SAFE.
- Be CONSIDERATE of others (their stuff, needs, space, etc).
- Always ASK SOMEONE if you're not sure about something..
- THINK before you do.
- CLEAN UP after yourself
- Maintain a CLEAN workspace.
- Maintain STERILE technique.
- ASK someone before you move their stuff.
- BALANCE the centrifuges.
- ASK SOMEONE how to use a piece of equipment if you haven't used it before.
- READ PROTOCOLS before you attempt them.
- Keep any proteins or enzymes always ON ICE
- CHANGE TIPS between aliquots of important stocks.
- Keep a good LAB NOTEBOOK so you know what you did.
- LABEL TUBES
- If you did something wrong, CONFESS and tell someone. You won't get in trouble for accidents, but you'll get in trouble for not letting people know.

## **Safe, Supportive, and Inclusive Environment**

Whenever a faculty member, staff member, post-doc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process.

Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling (510) 642-1988.

The classroom, lab, and work place should be safe and inclusive environments for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call (510) 643-7985, email [ask\\_ophd@berkeley.edu](mailto:ask_ophd@berkeley.edu), or go to <http://survivorsupport.berkeley.edu/>.