

2020 Fall BC498 Research
For Kade Walsh, Blue LED light induced cytotoxicity and mutagenicity research
(3 Credits 9 Lab hours)

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Time and place: TBA, MRB453 (Kato Lab)

Purpose and Course Outline

Blue LED is commonly used in light devices. People are constantly exposed to light from blue LED devices such as TVs, PCs and smartphones. Blue LED light is also used for neonatal jaundice treatment.

The previous research from my laboratory and others showed that the blue light spectrum is toxic to cell cultures, but not as toxic as ultraviolet light. Although the blue spectrum is approximately 400-500 nm, blue LED light provide very narrowband blue spectrum light near 450 nm. We hypothesized that the light with this specific wavelength is comparatively toxic to mammalian cell cultures, which is previously shown.

Kade will learn to use the light dosimetry methods, cell culture techniques, cytotoxicity analysis as well as mutagenicity analysis methods. Upon completion of the project, Kade will write a draft of scientific manuscript and polish it with Dr. Kato and other colleagues for submission. Kade will provide a PowerPoint presentation at the end of semester to Dr. Kato. This research course will be focused on mammalian cell culture basics and further biological endpoints. The course will be taught by hand on techniques for learning and conducting experiments independently by Kade's time management (~9 hours per week). Relevant papers will be provided by Dr Kato. Successful students will be spending 1-hour reading articles and experiment planning before class, and 1-hour data collection and analysis of experimental summary of each lab session.

Evaluation will be carried out by lab attendance and final presentation. Traditional final letter grades will be assigned from lab attendance (50%) and the final presentation (50%).

Student Learning Objectives: Upon completion of this course, students will be able to:

- Describe experimental approaches to analyze the mammalian cell culture
- Participate in active discussion about the cellular and molecular basis underlying the cell culture to assess cellular toxicity
- Review and summarize current research articles in the field of mammalian cell biology
- Learn how to write a research paper

Textbook and Reading Materials: Research and review articles will be selected by instructor.

Hybrid style teaching: The course will be taught in a face to face format but in the unexpected circumstances, students will learn laboratory techniques in Zoom sessions.

Syllabus (tentative schedule depending on progress)

1. Light dosimetry I. dosimetry by light meter
2. Light dosimetry II. Spectrum analysis by spectrumradiometer
3. Basic mammalian cell culture techniques
4. Analysis of cytotoxicity I. colony formation assay.
5. Analysis of cytotoxicity II. Oxidative stress analysis.

6. Analysis of cytotoxicity III. Cell cycle analysis and apoptosis induction
7. Analysis of mutagenicity I. HPRT mutation assay.
8. Analysis of mutagenicity II. Sister chromatid exchange formation.
9. Analysis of mutagenicity III. Alkali comet assay
10. Analysis of mutagenicity IV. Endoreduplication formation.