ADVANCED TOPICS IN CELL BIOLOGY
MCB6772 Section 2E39, Spring – 2023
1 credit

Time: Tuesdays and Thursdays; 8:00 AM to 10:00 AM EST
(In-person meetings in MCS room 1044)

Instructors: Peter Kima (pkima@ufl.edu) & Zhonglin Mou (zhlmou@ufl.edu)

Course Description: Specific topics about cell structure and function published in recent journal articles with microbiological interest animal and plant systems will be studied. The specific topic for this semester will be cell-surface receptors. We will discuss how cell surface receptors were discovered and how they are involved in transferring extracellular signals. The role of cell surface receptors in host-microbe interactions will be the focus of this semester.

Course Objectives:

- To develop an understanding of current advances and approaches in the study of the cell biology of eukaryotes.
- To gain insight on differences between plants and animals pertaining particularly to their susceptibility or capacity to resist or to be exploited by microbial pathogens.

Student Responsibilities:

You are expected to read the research papers and upload questions and/or comments under Assignments in Canvas (do not send to the instructor) for each class. At least 3 questions or comments on each paper are required. You are encouraged to watch the videos of the in-person class discussion, which will discuss the review and research articles. The links to the videos will be posted in Canvas. You can also attend the in-person class if possible.

There will be one quiz on each article (8 in total) and quiz questions will be extracted from the assigned research articles.

A written paper of 1-2 pages (11 point) will be expected from each student no more than 1 week after the end of the course. The paper will be in response to questions that will be made available before the end of the course. You will also be expected to prepare about 20 Powerpoint slides for a 30-min presentation on an animal paper or a plant paper you will learn in the course.

Student Evaluation:

Quizzes will be worth 40% of grade; final paper will be worth 30% of grade; participation (submission of questions and/or comments) will be worth 10% of grade; Powerpoint presentation will be worth 20% of the grade.

Final grades will be based on the following performance standard (100 points total):

92 - 100 %	=	**A**
85 - 91.9 %	=	**B+**
80 - 84.9 %	=	**B**
75 - 79.9 %	=	**C+**
70 - 74.9 %	=	**C**
60 - 69.9 %	=	**D**
Less than 60 %	=	**E**

Course Schedule:

(Quiz questions will be from the papers **highlighted in bold**)

2/7
Topic: *Introduction to the course & cell surface receptors in animal immunity and pathogenesis I*
Presenters:
Articles:

1. Jackson CB, Farzan M, Chen B, Choe H. Mechanisms of SARS-CoV-2 entry into cells. Nat Rev Mol Cell Biol. 2022 Jan;23(1):3-20 (Review)
2. **Qing E, Hantak M, Perlman S, Gallagher T. 2020. Distinct roles for sialoside and protein receptors in coronavirus infection. mBio 11:e02764-19. https://doi.org/10.1128/mBio.02764-19.**

2/9
Topic: *Cell surface receptors in animal immunity and pathogenesis II*
Presenters:
Articles:

1. Johnston, E.L.; Heras, B.; Kufer, T.A.; Kaparakis-Liaskos, M. Detection of Bacterial MembraneVesicles by NOD-Like Receptors. Int.J. Mol. Sci. **2021**, 22, 1005. https://doi.org/10.3390/ijms22031005 (Review)
2. **Bitto NJ, Cheng L, Johnston EL, Pathirana R, Phan TK, Poon IKH, O'Brien-Simpson NM, Hill AF, Stinear TP, Kaparakis-Liaskos M. *Staphylococcus aureus* membrane vesicles contain immunostimulatory DNA, RNA and peptidoglycan that activate innate immune receptors and induce autophagy. J Extracell Vesicles. 2021 Apr;10(6):e12080. doi:. 10.1002/jev2.12080.**

2/14
Topic: *Cell surface receptors in plant immunity and pathogenesis I*
Presenters:
Articles:

1. Boutrot & Zipfel 2017. Function, discovery, and exploitation of plant pattern recognition receptors for broad-spectrum disease resistance. Annu Rev Phytopathol. 55:257-286. (Review)
2. **Pruitt et al. 2015. The rice receptor Xa21 recognizes a tyrosine-sulfated protein from a gram-negative bacterium. Sci Adv 1, e1500245.**

2/16
Topic: *Cell surface receptors in plant immunity and pathogenesis II*
Presenters:
Articles:

1. Macho & Zipfel 2014. Plant PRRs and the activation of innate immune signaling. Mol Cell. 54:263-272. (Review)
2. **Kadota et al. 2014. Direct regulation of the NADPH oxidase RBOHD by the PRR-associated kinase BIK1 during plant immunity. Mol Cell 54, 43-55.**

2/21
Topic: *Cell surface receptors in animal immunity and pathogenesis III*
Presenters:
Articles:

1. Bonsignore P, Kuiper JWP, Adrian J, Goob G and Hauck CR (2020) CEACAM3—A Prim(at)e Invention for Opsonin-Independent Phagocytosisof Bacteria. Front. Immunol. 10:3160. doi: 10.3389/fimmu.2019.03160 (Review)
2. **Baker EP, Sayegh R, Kohler KM, Borman W, Goodfellow CK, Brush ER, Barber MF. Evolution of host-microbe cell adherence by receptor domain shuffling. Elife. 2022 Jan 25;11:e73330. doi: 10.7554/eLife.73330**

2/23
Topic: *Cell surface receptors in animal immunity and pathogenesis IV*
Presenters:
Articles:

1. Cova MM, Lamarque MH, Lebrun M. How Apicomplexa Parasites Secrete and Build Their Invasion Machinery. Annu Rev Microbiol. 2022 Sep 8;76:619-640. doi: 10.1146/annurev-micro-041320-021425. (Review)
2. **Suarez C, Lentini G, Ramaswamy R, Maynadier M, Aquilini E, Berry-Sterkers L, Cipriano M, Chen AL, Bradley P, Striepen B, Boulanger MJ, Lebrun M. A lipid-binding protein mediates rhoptry discharge and invasion in Plasmodium falciparum and Toxoplasma gondii parasites. Nat Commun. 2019 Sep 6;10(1):4041. doi: 10.1038/s41467-019-11979-z**

2/28
Topic: *Cell surface receptors in plant immunity and pathogenesis III*
Presenters:
Articles:

1. Yasuda et al. 2017. A look at plant immunity through the window of the multitasking coreceptor BAK1. Curr Opin Plant Biol 38: 10-18. (Review)
2. **Perraki et al. 2018. Phosphocode-dependent functional dichotomy of a common co-receptor in plant signaling. Nature 561: 248-252.**

3/2
Topic: *Cell surface receptors in plant immunity and pathogenesis IV*
Presenters:
Articles:

1. Wan et al. 2019. Plant cell surface immune receptor complex signaling. Curr Opin Plant Biol 50, 18-28. (Review)
2. **Wang et al. 2019. Extracellular pyridine nucleotides trigger plant systemic immunity through a lectin receptor kinase/BAK1 complex. Nat Commun 10, 4810.**