Course in Cellular Physiology of the Kidney - MSCBMP 2895

Course Director:

Ossama Kashlan, PhD (primary contact) – S828B Scaife Hall obk2@pitt.edu

Participating Faculty:

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Focus of the class:

This course will provide an introduction to the kidney with an emphasis on kidney structure and function. The course, which meets once a week (two hours each session), will be taught through both lecture and in class discussion of the primary literature. Discussion of how bench top findings can be translated to treatments in the clinic will be facilitated by a diverse faculty that includes both basic and physician scientists. After receiving an introductory lecture on the kidney, will learn about the specialized cell types that comprise the kidney and lower urinary tract. Subsequently, you will be introduced to renal stem cells and how they lead to kidney development and repair. Next, you will learn the functions of the kidney, including regulation of water and ion balance. You will also learn about acute kidney injury, chronic kidney disease, and end stage kidney disease, and how nephrologists manage these disorders.

Meeting times and place:

Class will meet on Wednesdays From 2:00-4:00 on Zoom
https://pitt.zoom.us/j/97397940224
Passcode: 531310

Structure of the Course

The course, which meets once a week, will be taught through both lecture and in class discussion of primary research papers. The lectures will cover basic information needed to understand the topic at hand and then use examples to understand how the kidney accomplishes its amazing function. Each module may also include one or more discussion sessions in which we will review important papers in the field. We always start these sessions by answering questions about unfamiliar techniques or ideas. No question is stupid, and any question you may have is likely one that other students have as well. We then examine each paper. *Particular emphasis is placed on the hypothesis or questions being answered, the different approaches utilized by the authors, the conclusions of the papers, and the experiments that support these conclusions*. When possible we will also discuss how the experimental findings could be translated for use in a clinical setting.

Attendance:

Attendance at all sessions is required. Any absences must be pre-approved by your course director. In the case of illness or other life events, you must contact the course director.

Course Sessions:

Session I – June 7, 2023 - (Boyd) An introduction to the kidney

Paper: Control of glomerular hypertension limits glomerular injury in rats with reduced renal mass. Anderson S. Meyer TW, Renneke HG, Brenner BM J Clin Invest. 1985;76(2):612-619

Review: Homeostasis the Milieu Intérieur and the Wisdom of the Nephron Hoenig M and Zeidel M. Clin J Am Soc Nephrol. 2014 Jul;9(7):1272-81.

Session II – June 14, 2023 – (Kashlan) How the kidney maintains acid- base and divalent ion homeostasis

Paper: Biver S, Belge H, Bourgeois S, Van Vooren P, Nowik M, Scohy S, Houillier P, Szpirer J, Szpirer C, Wagner CA, Devuyst O, Marini AM. A role for Rhesus factor Rhcg in renal ammonium excretion and male fertility. Nature. 2008 Nov 20;456(7220):339-43.

Review: Brown D, Wagner CA. Molecular mechanisms of acid-base sensing by the kidney. J Am Soc Nephrol. 2012 May;23(5):774-80

Session III – June 21, 2023 – (Stolz) Renal tissues – histology and function

Paper: None – if you have access to a Histology text, skim through the portion on renal tissues for a primer.

Session IV – June 28, 2023 (Kleyman) How the kidney regulates Na^+ and K^+ homeostasis

Paper: Carrisoza-Gaytan R, Ray EC, Flores D, Marciszyn AL, Wu P, Liu L, Subramanya AR, Wang W, Sheng S, Nkashama LJ, Chen J, Jackson EK, Mutchler SM, Heja S, Kohan DE, Satlin LM, Kleyman TR. Intercalated cell BKalpha subunit is required for flow-induced K+ secretion. JCI Insight 2020 Apr 7;5(8):e130553. PMID 32255763.

Session V – July 5, 2023 – (Tan) – Acute, chronic, and end stage kidney disease

Paper: Genovese G et al., Association of trypanolytic ApoL1 variants with kidney disease in African Americans. Science 2010; 329(5993): 841-5. PMID 20647424

Review: Friedman DJ and Pollak MR. APOL1 Nephropathy: From Genetics to Clinical Applications. Clin J Am Soc Nephrol 2021 Feb 8;16(2):294-303. doi: 10.2215/CJN.15161219

Other reading material:
Umeukeje E et al., You are just now telling us about this? African American Perspectives of testing for genetic susceptibility to kidney disease. J Am Soc Nephrol, 2019, 30(4):526-530. (patient perspectives on ApoL1)

Session VI – July 12, 2023 – (Ray) – Glomerular Filtration

Paper: Robert Faulhaber-Walter, *Limeng Chen,*Mona Oppermann,*Soo Mi Kim,*Yuning Huang,*Noriyuki Hiramatsu,*Diane Mizel,*Hiroshi Kajiyama,*Patricia Zerfas,†Josephine P. Briggs, ‡ Jeffrey B. Kopp, * and Jurgen Schnermann* Lack of A1 Adenosine Receptors Augments Diabetic Hyperfiltration and Glomerular Injury. 1046-6673/1904-722 J Am Soc Nephrol 19: 722-730, 2008

Session VII – July 19, 2023 - (Carattino) How the kidney maintains water homeostasis

Paper: Preston GM, Carroll TP, Guggino WB, Agre P. Appearance of water channels in Xenopus oocytes expressing red cell CHIP28 protein. Science 1992 Apr 17;256(5055):385-7.

Review: http://www.sciencedirect.com/science/article/pii/S0304416513005291

Session VIII – July 26, 2023 - (Hukriede) Kidney development and regeneration

Paper: TBD