NRSC 4422-601
Neuroimmunology

Corse description: This seminar will focus on how immune and central nervous systems communicate and influence each other. We begin with the anatomical and cellular basis of the Thymus, Gut, and Brain, then discuss the connection between these organs and how these connections can influence neurological disorders. These issues will be explored through lectures and student presentations of journal articles every week. The course requires no prior knowledge of neuroimmunology, but familiarity with some basic neuroscience and immunology principles will be assumed.

Learning Objectives: The following objectives will be achieved through lectures, analysis of scientific literature, class discussions, and journal presentations.

1. Students will gain an understanding of the anatomical and functional connections between the Thymus, Gut, and Brain.
2. Students will understand and be able to present informed opinions on a variety of basic research papers in the field of neuroimmunology.
3. Students will be able to analyze and critique journal articles.

Course format: In general, the first 4 weeks will consist of introductory lectures. After the midterm exam, the class will consist of 2 students' presentation each week.

Grading:

Attendance	15%
One midterm exam	15%
Journal club presentation	35%
Final paper	35%

- <u>One midterm exam</u>: it will consist of short answer questions designed to assess basic knowledge of the concepts discussed in class.
- <u>Journal club presentation</u>: Each student will be required to read and present one journal article in class during the semester. Presentations will be on the general topic we covered in the lecture from the previous class. I will provide a set of topics and articles you can choose from. We will discuss in class how you can sign up for a presentation. Presentations should focus on the chosen research article and can include information from other sources to help the audience understand the topic/article.

  Example articles:

  1. A microbiome-dependent gut-brain pathway regulates motivation for exercise. 2022 Nature
  2. Immunity to the microbiota promotes sensory neuron regeneration. 2023 Cell
  3. Skull and vertebra bone marrow are myeloid cell reservoirs for the meninges and CNS parenchyma. 2021 Science
  4. Functional characterization of the dural sinuses as a neuroimmune interface.

2021 Cell

5. IL17a promotes sociability in mouse models of neurodevelopmental disorders. 2020 Nature

- Final paper: The final paper (~6-7 pages with 1.5-space, Times New Roman, 11pont) will review a topic of interest in neuroimmunology (already covered in class or novel). Papers must include at least 10 journal articles, or which at least 5 are primary sources.

Student presentations of journal articles: Each student will be required to read and present one journal article in class during the semester.

Schedule (Tentative):

Week	Title: short description
1	Introduction to Neuroimmunology: Basic concepts in neuroimmunology
2	The structure and function of Thymus and Gut on the immune system: How thymus and gut build up our immune system
3	The connection between gut and brain; enteric nervous system, vagus nerve, and microbiome The gut-brain axis
4	Immune systems in the central nervous system; cytokine, cytokine receptors, and immune cells in the brain The new concept 'The immune system in the brain'.
5	Midterm exam
6	Immune cells in the brain: Student presentation (2 students present each week)
7	Cytokine/Cytokine receptors in the developing brain: Student presentation (2 students present each week)
8	Cytokine/Cytokine receptors in the adult brain: Student presentation (2 students present each week)
9	Anatomical connection between the Gut and Brain 1: Student presentation (2 students present each week)
10	Anatomical connection between the Gut and Brain 2: Student presentation (2 students present each week)
11	Gut; The effect of microbiome 1: Student presentation (2 students present each week)
12	Gut; The effect of microbiome 2: Student presentation (2 students present each week)
13	Gut-Brain axis with Stress: Student presentation (2 students present each week)
14	Gut-Brain axis with Obesity: Student presentation (2 students present each week)
15	Gut-Brain axis with ASD: Student presentation (2 students present each week)