BEYOND NEURONS: THE ROLE OF GLIA IN BRAIN FUNCTION AND DYSFUNCTION

Neurobiology 101B

Tuesday, 6:00pm – 7:30pm

Robinson 105

https://canvas.harvard.edu/courses/31206

INSTRUCTOR

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Office hours by appointment via email; digital office hours will be posted 1 week in advance

COURSE DESCRIPTION

The study of glia cells will be approached from the context of their role in disease as a means to better understand their important function in the brain. We will compare and contrast the various types of glia cells and their roles in the healthy brain as well as in various neurological and psychiatric diseases with an emphasis on neuroimmunology in particular. We will draw from primary literature in both basic sciences and translational medicine. Students will evaluate and critique contemporary scientific claims about glia cells informally in class discussions as well as formally during journal club presentations, both of which are important skills used every day by scientists. At the conclusion of this course, students will be able to explain the multifaceted roles of glia in the central nervous system.

PREREQUISITES: MCB 80

ACADEMIC INTEGRITY

Discussion and the exchange of ideas are essential to academic work. For assignments in this course, you are encouraged to consult with your classmates on the choice of paper topics and to share sources. However, you should ensure that any written or presented work you submit/present for evaluation is the result of your own research, writing, and ideas and that it reflects your own approach to the topic. You must also adhere to standard citation practices in this discipline - we will cover the appropriate style in class. Plagiarism of classmates or any other material will result in a failing grade for the course. All Harvard College policies regarding plagiarism apply.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

If you need academic adjustments or accommodations, please turn into the instructor you Faculty Letter from the Accessible Education Office (AEO) as soon as possible (before 9/15/17). Late letters may result in my inability to make adjustments in a timely manner. Any information you give me will be confidential, although I may need to talk to AEO directly. If you are having any other issues that interfere with your ability to do coursework, attend class, or understand the material, please reach out ASAP so I can help you or connect you to campus resources.

DIVERSITY AND INCLUSION

Science is not immune to bias just because scientists think logically about problems. Race, sex, gender, and other biases are present in research papers. I encourage you to be aware of this as you read primary literature and bring it up in class when you see it. Neuroscientists and paper authors are people too, and much of science is subjective and reflects implicit biases of the authors. On the flip side, because authors are people too, I expect you to treat authors with respect even when you have criticisms of their work, and try to stay aware of your own biases based on the names or academic institutions of the authors. I find it helpful to use gender-neutral or plural pronouns (“they”) when discussing the work of researchers to remove some bias from discussions. Most importantly, I expect you to treat your classmates with respect. The diverse backgrounds of everyone in the classroom is important for a discussion of scientific literature that incorporates different viewpoints, both academic and personal. Please take care to try to use classmates’ preferred names pronouns; if you have a name or set of pronouns that differ from your official records please let me know. Inclusive behavior toward diverse identities is a work in progress and I don’t expect everyone to be perfect all the time, and

it's possible I will make mistakes sometimes too. Please let me know if anything in class makes you uncomfortable or you need help finding resources on campus. I also recommend referring to diversity.college.harvard.edu for additional resources.

ASSIGNMENTS

This section contains a summary of the assignments of the course. We will discuss instructions and grading criteria further in class; rubrics are also available on Canvas. Reading assignments and the course schedule are subject to change with no less than two weeks' notice. Most assignments must be turned in using PDF format on Canvas with the exception of presentations. Grades and feedback will be returned within 2 weeks of submissions.

LATE WORK POLICY

Written assignments due at the end of the reading period each semester will not be accepted late and anything turned in after the deadline will result in a zero on the assignment. For oral assignments and presentations missed due to an excused absence (doctor's note), the student is expected to schedule a make-up presentation within one week of their return to class.

ASSIGNMENT WEIGHTS

Assignment Group	*% total*
Mini Critical Analysis (best 2 of 3)	20%
Journal Club presentation	15%
Journal Club written assignment	15%
In-class Figures facilitation	15%
Dialectical Notes	10%
Online discussion questions and participation	10%
Class attendance and Participation	5%
In-class paper facilitation	10%

WEEKLY ASSIGNMENTS

READINGS: Each week, students are assigned 1-3 papers to read prior to class. If you are new to reading primary research papers, expect to spend 2-3 hours reading each article and taking notes (see next point). This time commitment should go down over time as you become more adept at navigating research papers.

DIALECTICAL NOTES: For each assigned paper, students will generate notes in the dialectical style (we will go over what this means in class). Please bring your notes to class so you can reference them during class discussion. Notes will be graded as complete/incomplete and returned the following week.

ONLINE DISCUSSION QUESTIONS AND PARTICIPATION: Using the dialectical notes generated for each paper, students are to choose and submit at least one question or discussion point per paper, and respond to at least two other questions or discussion points in the Canvas online discussion for the week. Discussions will close at 11:59pm on the Monday prior to class.

CLASS ATTENDANCE AND PARTICIPATION: To receive full credit for the day in class, you must attend class and speak at least twice during the class discussion (responding to another student or asking a question). More than two unexcused absences per semester will result in the loss of a full letter grade. If you need to miss class for personal or medical reasons, please speak to the instructor prior to class to receive make-up work to prevent the loss of a letter grade.

FIGURES FACILITATION: Each week in class we will break down the figures for the next week's assigned readings so that each student covers one figure or a fraction of a figure. Students are expected to be prepared to discuss the purpose of the experiments in the figure, explain the relevant methodology, as well as understand the conclusion of each figure and generate any relevant critiques.

PAPER FACILITATION: Each student will facilitate discussion of at least two of the assigned journal articles throughout the year. The number of times students will present will be based on class size. The student facilitator is expected to be prepared to verbally present the material from the paper (no slides required): background, hypothesis, methods, conclusions, and future directions. The facilitator will not need to discuss any of the figures. I will first ask for volunteers at the end of each class period and if there are none students will be randomly chosen.

LARGE ASSIGNMENTS

MINI CRITICAL ANALYSIS: Students will concisely summarize the findings of one of the primary research articles (not reviews) covered in class, discuss the significance of the article, and provide positive and negative criticism as well as potential future directions for the research. Paper text should be close to, but not exceed, 500 words. One Mini Critical Analysis is due at the end of the Fall reading period and another at the end of the Spring reading period, but students are encouraged to turn in analyses as soon as it is convenient for them. Additionally, if you are unhappy with your grades on the two analyses, you may submit a third analysis of a different assigned paper and I will drop your lowest score. Thus, it is to your advantage to complete your analyses as early as possible. I will return graded and commented analyses within two weeks of receiving them.

JOURNAL CLUB PRESENTATION: During the first semester of the course, students will find a paper (not a review) of their choosing (not from class) from a high-impact (>4) journal, published within the last two years (no papers prior to September of 2015) and related to glia to present during a class journal club. Students will submit this paper on Canvas for instructor approval by 10-4-2017. Students will put together a 20-minute slide presentation in the Journal Club format (covered in class). Students are expected to cover background, methods, future directions, and critical analyses of the paper as well as covering key figures and data from the paper. Journal Club presentations will happen in class on 11-7-2017, 11-21-17, and 11-28-17; students will be assigned randomly to each date.

JOURNAL CLUB WRITTEN ASSIGNMENT: During the second semester of the course, students will find a paper (not a review) of their choosing (not from class) from a high-impact (>4) journal, published within the last 3 months (no papers prior to October 2017), and related to glia. Students will submit their paper selection on Canvas for instructor approval by 2-7-2017. Students will then write an in-depth critical analysis of this paper in the format of the Journal of Neuroscience "Journal Club" paper format (will be covered in class). Students are expected to reference material aside from the chosen article, preferably work that is not directly referenced by the paper in question. Paper outlines or drafts should be submitted prior to spring break (March 9) for feedback and 10 additional points on top of the final grade, plus useful feedback to improve your grade. Feedback on drafts will be returned within 2 weeks. Final papers are due after the spring reading period. In order to confirm that you have read to this point in the syllabus, you should send the instructor a picture of a cat and/or any questions you have.

COURSE SCHEDULE

Date	*Topic*	*Weekly Assignments*
9-5-2017	Course introduction, overview of glia, dialectical note-taking	
9-12-2017	Glia in development, reading journal articles, and journal clubs	Online Discussion
9-19-2017	Microglia development and origins	Dialectical notes Online Discussion
9-26-2017	Autism, glia, and sex differences	Dialectical notes Facilitation or Figure Online Discussion
10-3-2017	Glia, stem cells, and neurogenesis	Dialectical notes Facilitation or Figure Online Discussion **Paper selection for Journal Club Presentation due 10/4**
10-10-2017	Infectious diseases in the CNS: focus on Zika	Dialectical notes Facilitation or Figure Online Discussion **(deadline extended to Tuesday 10AM)**
10-17-2017	Astrocytes, gliotransmission, and epilepsy	Dialectical notes Facilitation or Figure Online Discussion
10-24-2017	Glia in psychiatric disease: focus on astrocytes in depression	Dialectical notes Facilitation or Figure Online Discussion
10-31-2017	Glia in CNS cancers	Dialectical notes Facilitation or Figure Online Discussion
11-7-2017	**Student presentations Group 1**	Dialectical notes **(Group 1 – only required for your paper)** Online Discussion
11-14-2017	**NO CLASS – SOCIETY FOR NEUROSCIENCE MEETING**	
11-21-2017	**Student presentations Group 2**	Dialectical notes **(Group 2 – only required for your paper)** Online Discussion
11-28-2017	**Student presentations Group 3**	Dialectical notes **(Group 3 – only required for your paper)**

		Online Discussion **Mini critical analysis due by end of reading period**
	NO CLASS – WINTER BREAK	
1-23-2017	Schwann cells, peripheral myelination, and peripheral nerve injury	Dialectical notes Facilitation or Figure Online Discussion
1-30-2017	CNS myelination and oligodendrocytes	Dialectical notes Facilitation or Figure Online Discussion
2-6-2017	Spinal Cord injury	Dialectical notes Facilitation or Figure Online Discussion **Journal Club paper selection due 2/7**
2-13-2017	Glia in aging	Dialectical notes Facilitation or Figure Online Discussion
2-20-2017	Blood brain barrier and neurovascular unit	Dialectical notes Facilitation or Figure Online Discussion **(deadline extended to Tuesday 10AM)**
2-27-2017	Glia and the brain lymphatic system – "glymphatic system"	Dialectical notes Facilitation or Figure Online Discussion
3-6-2017	Glia and circadian rhythms	Dialectical notes Facilitation or Figure Online Discussion **Journal club paper drafts (optional) due 3-9**
	NO CLASS – SPRING BREAK	
3-20-2017	Glia and Alzheimer's disease	Dialectical notes Facilitation or Figure Online Discussion
3-27-2017	Synapse pruning and its relevance to Alzheimer's disease and development	Dialectical notes Facilitation or Figure Online Discussion
4-3-2017	Glia response to drugs of abuse	Dialectical notes Facilitation or Figure Online Discussion
4-10-2017	Deleting glia	Dialectical notes Facilitation or Figure Online Discussion
4-17-2017	Induced pluripotent stem cells (IPSCs) and ethical questions	Dialectical notes Facilitation or Figure Online Discussion
4-24-2017	Traumatic brain injury and CTE	Dialectical notes Facilitation or Figure Online Discussion **Journal club final paper due after reading period** **Remaining Mini Critical Analysis papers due after reading period**