
Molecular Medicine

Biology 433

Overview

The interdisciplinary field of molecular medicine seeks to understand the molecular basis of physiological and pathophysiological processes to develop targeted therapeutics and improve human health. Given that distrust of medical science to act in the best interests of the public is on the rise in the United States, the ability to identify and address misinformation and communicate effectively with diverse audiences about topics related to molecular medicine are essential skills for scientists to develop. This course will examine the molecular basis of medical approaches to patient care for select topics with an emphasis on critical analysis of current biomedical literature. The laboratory portion of the course will explore methods used in biomedical research with an emphasis on experimental design and analysis & evaluation of data. Activities in class will be used to develop a sense of belonging in the scientific community and advanced research and communication skills.

Learning Goals

1. Demonstrate an advanced understanding of scientific methods, so that you may analyze and critically evaluate scientific literature, apply laboratory methods specific to the discipline, and interpret data.
2. Demonstrate an advanced understanding of a select topic in the field of molecular medicine.
3. Develop an advanced ability to communicate effectively as a scientist:
 - identify and demonstrate discipline-specific writing conventions
 - understand that writing is a recursive process and develop an effective writing process
 - communicate orally and in writing to diverse audiences with a sense of authority and voice.

Spring 2025

MWF 9:30-10:20 am & W 1:30-4:30 pm,
James 2206

Instructor: Tiffany Frey, Office: James 2221

Email: freyt@dickinson.edu

Writing Associate: Konoka Uematsu

Email: uematsuk@dickinson.edu

Teaching Assistant: Email:

Important Semester Dates

Sunday, January 26

Last Day to Add/Drop

**5 pm Friday, March 7 – 8 am Monday,
March 17**

Spring Break

Monday, March 17

Roll Call Grades Due

Friday, April 18

Last Day to Withdraw from a Course

Friday, May 2

Last Day of Classes

Noon Tuesday, May 6

Deadline to Submit Revised Work

Noon Wednesday, May 14

Graduating Senior Grades Due

Noon Wednesday, May 21

All Grades Due

Schedule

Module 1: Building Community & Project Planning

In order to cultivate a sense of belonging in the scientific community and empowerment to communicate to diverse audiences about the scientific process, we will openly discuss scientific topics that are controversial and/or the public is mis- or disinformed about. This requires us to build trust in the classroom, so we all feel comfortable sharing our experiences and level of knowledge about various topics. In addition, self-reflection will help you think about medical topics you are passionate about and want to further explore. Therefore, module 1 will focus on developing community and group agreements (how will we work together in this course?), connection activities (who are we as scientists and individuals?), and structured dialogue about controversial or misrepresented medical topics (what do we know, or not know, about various issues and what are we passionate about?). This module will culminate with a proposal for a review article topic, which you will spend the rest of the semester working on in a scaffolded manner.

Week	Day	Activity	Assignments
1	M (1/20)	Course Overview Research & Writing Experience Survey for Group Assignments	Pre-Course Sense of Belonging in Science Survey
	W (1/22)	Connection Activity: Who are you and why are you here? (bring an object or picture) Meet your Group	
	W Lab	Community and Group Agreements	
	F (1/24)	Structured Dialogue: Reasons for Vaccine Skepticism	
2	M (1/27)	Group Brainstorming: Controversy, Misinformation, and Disinformation in Medical Science	Work on Literature Review Proposal
	W (1/29)	Connection Activity: How are you feeling? (postcard activity) Share Topic Ideas	
	W Lab	Writing Workshop Kendall Thompson: Using Zotero to Manage References	
	F (1/31)	Konoka Uematsu: Annotating & Organizing References	Literature Review Proposal Due

*This schedule is subject to change at the instructor's discretion.

Module 2: Biomedical Literature Analysis, Synthesis of Information, & Experimental Design

In order to write about a topic in any discipline with a sense of authority and voice, you must first do the hard work of finding, analyzing, and synthesizing primary literature on your topic of interest. Module 2 will focus on these skills – we will initially do this by analyzing data from different types of biomedical research studies including clinical and experimental studies with model systems. While this is happening, you will be finding and analyzing studies about your topic of interest. In the second half of the module, you will provide an update on your research progress and bring data to class for group analysis. This module will culminate in a list of annotated and synthesized references on your topic. In addition, we will practice synthesis of information from the literature in the lab by drafting and testing a protocol based on previously published results.

Week	Day	Activity	Assignments
3	M (2/3)	Structured Dialogue: Politics and Medical Science	Work on Finding, Analyzing, and Organizing Literature Review References
	W (2/5)	Literature Analysis: Clinical Studies	
	W Lab	Lab Activity: Cell Culture and Flow Cytometry	
	F (2/7)	Literature Analysis: Model Systems	
4	M (2/10)	Literature Analysis: Transcriptomics and Proteomics	Protocol Draft 1 (due at end of lab)
	W (2/12)	Synthesis of Information	
	W Lab	Writing Workshop Protocol Development: Modeling Inflammatory Disease in Cell Culture	Work on Finding, Analyzing, and Organizing Literature Review References
	F (2/14)	Protocol Development: Feedback and Revision Planning	
5	M (2/17)	Student Project Literature Analysis Progress Updates and Data Analysis	Protocol Draft 2 (due at end of lab)
	W (2/19)		
	W Lab	Lab Activity: Cell Viability Assays and Plating Cells	Work on Finding, Analyzing, and Organizing Literature Review References
	F (2/21)	Student Project Literature Analysis Progress Updates and Data Analysis	
6	M (2/24)	Student Project Literature Analysis Progress Updates and Data Analysis	Final Protocol Due
	W (2/26)		
	W Lab	Lab Activity: Cell Viability Assay and Data Analysis	Work on Finding, Analyzing, and Organizing Literature Review References
	F (2/28)	Student Project Literature Analysis Progress Updates and Data Analysis	
7	M (3/3)	Student Project Literature Analysis Progress Updates and Data Analysis	Annotated and Organized References Due
	W (3/5)		
	W Lab	Writing Workshop: Synthesizing References to Tell a Story Activity: Plagiarism and Voice in Scientific Writing Discussion: Review Article Rubric	Annotated and Organized References Due
	F (3/7)	Connection Activity: How are you feeling? How will you re-energize over the break? Generating Graphics	

*This schedule is subject to change at the instructor's discretion.

Week	Spring Break
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Module 3: Developing a Story Through Drafting, Feedback, & Revision

The scientific process of making observations, developing hypotheses, designing experiments, and analyzing data uncovers a scientific story, which is supported by past publications, newly generated data, and ideas for future directions. When we publish a primary article in science, we are bringing together a collection of data that was generated to address a question or test a particular hypothesis. The experiments we include and in what order are examples of how we are telling the story of our science. In addition, our ability to interpret and combine different aspects of the scientific literature about a topic also tells a story and contributes to seeing things in new ways, which leads to new questions and/or hypotheses. The process of doing science is inherently creative and how we tell our stories about the work we do will either engage and energize a particular audience or confuse and frustrate them. The goal of this module is to develop a story about the research you have been doing on your chosen topic. What have you learned? How will you bring different articles and data together to tell a story about your topic? You will have the opportunity to get feedback from the class as you draft your story by giving a presentation, which will inform further drafting and revisions of your review article. In lab, we will learn different methods used to analyze RNA and protein and generate data from these methods that contribute to developing story about inflammation. By the end of this module, you will have drafted a review article for peer review that tells a story about your topic from a unique and engaging perspective.

Week	Day	Activity	Assignments
	M (3/17)	Connection Activity: How are you feeling? (quick follow-up post-break) Using AI in Scientific Writing	Draft Review Article <ul style="list-style-type: none">Presentation
	W (3/19)	Structured Dialogue: Religion and Medical Science	
	W Lab	Lab Activity Measuring Inflammatory Gene Expression: Isolation and Quantitation of RNA	
	F (3/21)	Student Presentations	
10	M (3/24)		
W (3/26)	Lab Activity Measuring Inflammatory Gene Expression: Real Time Quantitative PCR (RT-qPCR)		
W Lab			
F (3/28)			
11	M (3/31)	Student Presentations	
	W (4/2)		
	W Lab	Lab Activity: RT-qPCR Data Analysis + Working with Protein	
	F (4/4)	Student Presentations	
12	M (4/7)		
W (4/9)	Lab Activity: Group Protein Experiment		
W Lab			
F (4/11)			
13	M (4/14)	No meeting due to out of class peer review	Peer Review Revise & Edit Review Article
	W (4/16)	Lab Activity: Group Protein Experiment	
	W Lab	Lab Activity: Group Protein Experiment	
	F (4/18)	Lab Activity: Group Protein Experiment	

*This schedule is subject to change at the instructor's discretion.

Module 4: Oral Communication with Scientists & Non-Scientists

Now that you are fully informed about your topic, it's time to verbally share it with other people! You will have the opportunity to share your group's protein analysis method and results in lab, which will provide practice communicating within the scientific community. In addition, you will develop and share a short elevator pitch about your review article topic for non-scientists and brainstorm additional ways to communicate your information with non-scientists. Who would benefit from learning about your topic and what is the best way to share it with them? We began this course considering the rise in distrust in science to do what is best for the public and we will end it by thinking about effective and engaging communication strategies that scientists can use to communicate with the public to help combat distrust.

Week	Day	Activity	Assignments
14	M (4/21)	Connection Activity: How are you feeling? Konoka Uematsu: Crafting an Elevator Pitch	Review Article Due
	W (4/23)	Structured Dialogue: Communicating with the Public about Polarizing Scientific Issues	Prepare Oral Presentations
	W Lab	Lab Activity: Protein Data Analysis and Presentation Prep	
	F (4/25)	Elevator Pitches	Meet with Prof. Frey to Discuss Review Article and Course Grade Presentations
15	M (4/28)		Post-Course Sense of Belonging in Science Survey and Course Evaluation
	W (4/30)		
	W Lab	Protein Analysis Presentations	
	F (5/2)	Elevator Pitches	

*This schedule is subject to change at the instructor's discretion.

Finals Week	All Revised Work Due by Noon on Tuesday May 6
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Assignments and Evaluation

You will be evaluated throughout the semester on the assignments listed below. Detailed rubrics for all major writing and presentation assignments will be posted on Moodle at the time of the assignment.

- Review Article (Individual, 50%):** A literature review is essential for many types of scientific writing. A topic of interest in the field of molecular medicine will be chosen by each student and data from primary scientific sources will be analyzed and synthesized to tell a story in a literature review about the topic. Components:
 - Proposal (5%): Due Friday, January 31
 - Annotated and Synthesized References (10%): Due Friday, March 7
 - Presentation (for feedback from class on the story, 10%): Friday, March 21-Wednesday, April 9
 - Review Article (20%): Due Monday, April 21
 - Elevator pitch on topic (5%): Friday, April 25 – Friday, May 2
 - Optional Final Review Article Revision: Due Tuesday, May 6 by noon
- Review Article Draft & Peer Review (Individual, 10%):** A full draft of your review article will be due week 13 (April 12-April 18) for peer review. Students will sign up for a 75-minute session outside of class with the course Writing Associate (Konoka Uematsu). During this session, students will use the review article assignment rubric to evaluate and provide feedback on peers' drafts. For this assignment, a peer review rubric will be used to evaluate the quality of 1) your review article draft, 2) feedback you provide to your peers, and 3) reflection on the feedback you receive and revision plan. All peer review work is due at the end of the peer review session.

3. **Participation (Individual, 5%):** Participation in class and lab activities are important components of your learning in this course. On occasion, individual students or groups will be required to sign up to meet with me or the course Writing Associate (WA) outside of class time at a mutually convenient time. Also, lab groups will be responsible for maintaining cells for experiments throughout the semester outside of class meeting times and will be held accountable for group participation and communication as outlined in the group agreement generated the first week of the course. Surveys and discussion board posts may be used to collect feedback and information from the class. In addition, the quality of your contribution to class discussions will be evaluated using the class contribution rubric posted to Moodle.
4. **Lab Products & Notebook Entries (Group, 20%):** Each group will maintain a lab notebook and complete short writing assignments based on work done in the lab. This category includes the protocol you will draft, test, and revise in Module 2 as well as data figures and associated short writing assignments (such as the analysis & evaluation of data and figure legends) you will generate in Module 3.
5. **Lab Presentation (Group, 15%):** Each lab group will be assigned a protein analysis method, which will be used by the group to measure inflammation. Details about the lab method and results will be shared by the group with the class on the final day of lab (Wednesday, April 30).

Class Resources

Class Writing Associate (WA): We are fortunate to have Konoka Uematsu (Biology '26) as a Writing Associate (WA) for this course. Konoka has completed the Writing Program course "Working with Writers: Theory and Practice" (WRPG 214) and works as a writing tutor in the Norman M. Eberly Multilingual Writing Center (MWC, see below).

Kendall Thompson, Ph.D., Science Library Liaison: Library liaisons are available to help you with all aspects of the research process that involves using library resources. Kendall Thompson is the library liaison for the sciences and will hold Mobile Librarian hours throughout the semester in X and in the X. You can also schedule an appointment using the following link: <https://libcal.dickinson.edu/appointments/thompken>

The Norman M. Eberly Multilingual Writing Center (MWC): The MWC consists of both English and foreign language writing tutoring services. The English writing tutors work with native and nonnative speakers of English, and the foreign language writing tutors work with writers of Arabic, Chinese, French, German, Hebrew, Italian, Japanese, Portuguese, Russian, and Spanish. Writers of all levels and abilities need feedback to develop their ideas and grow as writers. Dickinson's trained peer writing tutors can help you generate ideas, begin drafting, revise a rough draft, figure out your professor's preferred documentation style, understand and respond to professor feedback, and edit your writing – among other things.

The MWC provides face-to-face appointments with online tutoring available as needed. Please show up promptly for appointments as there will be a ten-minute grace period after which the tutor may no longer be available. To schedule an appointment at the MWC, use the online scheduler at <https://dickinson.mywconline.com/>.

SOAR: Academic Success Support and More: SOAR stands for **S**trategies, **O**rganization, & **A**chievement **R**esource, and students can find a wealth of strategic academic success tools (like weekly planners, semester calendars, and much more) at www.dickinson.edu/SOAR or by going to Old West's Lower Level (aka "the OWLL"). Online or in person, you'll find apps, tips, and other resources related to organization, study skills, memory strategies, note-taking, test-taking, etc. If you'd like to attend a SOAR workshop or request one-on-one assistance with developing a strategy for a manageable and academically successful semester, email SOAR@dickinson.edu, or go to the OWLL and SOAR!

Policies

Grading: Evaluation of work in this course emphasizes feedback on assignments to help students meet course learning goals. There will be opportunities for revision based on instructor feedback for all written assignments before assigning a final grade, which will be determined with input from the student based on rubrics. All grades will be posted to the Moodle gradebook. Roll call grades will be reported mid-semester as S, U, or I. S means satisfactory (C or above), U means unsatisfactory (C- or below), and I means that the grade is incomplete (substantial work has not been turned in for evaluation). If you receive a grade of U or I at roll call, you should schedule a meeting with me to determine the problem and develop a plan to improve your grade. The following scale will be used to assign letter grades:

A: 93-100%	A-: 90-92%	B+: 87-89%	B: 83-86%	B-: 80-82%	C+: 77-79%
C: 73-76%	C-: 70-72%	D+: 67-69%	D: 63-66%	D-: 60-62%	F: 59% or lower

Email: Email is my preferred way to communicate about class-related business. I usually respond to email within 1 business day, which is 24 hours during the week (Monday-Friday) and 48 hours over the weekend (Saturday/Sunday). I tend to respond to email first thing in the morning and then again at the end of the day. On occasion, I will flag non-urgent emails during the week and answer them on the weekend. If you need to reach me and I have not responded to your email, please call or text my cell phone: 410-591-4848.

Appointments: Each week, I will reserve a minimum of three hours in my schedule for student appointments (either in-person or by Zoom). Use my [Calendly link](#) (also posted at the top of the course Moodle site and at the bottom of my email signature) to sign up. I will do my best each week to provide diverse day and time options for meetings and will add hours as necessary depending on the course schedule. Please keep in mind that the times I choose each week are best for my schedule. However, please email me if you are unavailable during my selected times and we will find a mutually agreeable time to meet. I want to get to know you and help you be successful. Therefore, I encourage you to schedule time with me outside of class to:

- clarify concepts from lab
- talk to me about your grade
- talk to me about research (All majors under the Biology Department require some form of research to graduate. I love to talk about the work I do in my lab-I study inflammation, specifically related to autoinflammatory diseases-and am also happy to give general advice about finding research opportunities both on and off campus.)
- talk to me about your career options or about my career path (I am a pre-health advisor and have considered many different career options myself over the years. I'm happy to brainstorm with you or talk about how to achieve your specific goal.)
- talk about school-life and/or work-life balance (I have an active family-husband, two kids, and two high maintenance dogs-along with personal interests outside of a very busy career. I have done several professional development programs to help achieve balance in life and am always trying to do better in this area. I love to talk about it and share tips.)
- talk to me about diverse topics and generally get to know each other
- request a letter of recommendation (which will be stronger if you visit me frequently for any of the reasons above!)

Attendance: Class discussions are central to your learning, and so I expect regular attendance in class. I design courses in a way that makes the learning active and collaborative, and so you get the most out of class if you attend, engage, and participate. That said, I understand that for various reasons you may not be able to attend every class or lab session. Please let me know if you must miss a class or lab as soon as possible and we will determine an appropriate course of action to help you keep up with the work.

Late Policy: Due dates for assignments have been set to help you keep up with the work for this course and be successful. They have also been set based on my schedule so I can provide quality feedback in a timely manner while balancing other obligations. In addition, lab and peer review work is based on group collaboration and missing a lab or peer review session where group writing and/or feedback has taken place cannot be rescheduled. However, I do understand that circumstances out of your control may prevent you from attending a group writing/feedback session or miss an individual assignment deadline. For this reason, you have **one free pass** to use throughout the semester in the event that you miss a deadline for an assignment. To use your free pass, please email me to reschedule the due date, which will be determined based on the course schedule and your individual circumstances. After you use your free pass, **one letter grade/day will be deducted for late assignments.**

Academic Integrity: Information adapted from the [Dickinson College Academic Integrity webpage](#):

Students are expected to do their own work on individual writing assignments and presentations in this course. Lab assignments will typically be completed by lab groups during class, and it is expected that all group members who collaborated to complete the assignment will have their names on the final product. Do not hesitate to reach out to me if you are ever uncertain about these guidelines. Any suspected violations of this policy will result in submission of an Allegation of Academic Misconduct form and an academic misconduct hearing will be scheduled.

In addition, it is expected that you will properly attribute the ideas and words of others in your work by properly citing your references.

Use these guidelines to avoid plagiarism:

- Always provide clear and accurate citations for the sources that inform your work.
- Remember that almost all quotations and statistics require citations. Specific facts and ideas borrowed from others, even if expressed in your own words, also require citations.
- Summaries of an author's argument require citations. It is true that matters of general knowledge do not usually require citations, but when in doubt, provide appropriate acknowledgement according to citation style for the course.
- Understand that paraphrasing means to summarize in your own words. **The surest way to avoid plagiarism when summarizing is to write with sources and notes closed.** If you cannot explain what an author argued from memory, then you probably do not understand it well enough to paraphrase.

Policy on the use of Generative Artificial Intelligence (GAI): I am asking you to create unique content in this course, including a review article telling a scientific story from a unique perspective and one or more figures that support your writing visually. It is possible that AI can support these tasks and enhance your work. Therefore, AI-assisted idea generation (including brainstorming and generating ideas for improvement) and editing (improving clarity and quality of **student-generated work**) are acceptable in this course. If you use AI for **any aspect** of assignments in this course, you must explain how in an acknowledgments section for the assignment. If AI-generated content is present in your final assignment, you must provide the original work with no AI content as an appendix. If you are unsure if your use of AI in this course is acceptable, please ask. Also, be aware that this is the AI policy for this course and does not apply to other courses or professors. If you are uncertain about the use of AI in any of your courses, you should ask the professor.

Accommodating Students with Disabilities: Dickinson values diverse types of learners and is committed to ensuring that each student is afforded equitable access to participate in all learning experiences. If you have (or think you may have) a learning difference or a disability – including a mental health, medical, or physical condition– that would hinder your access to learning or demonstrating knowledge in this class, please contact Access and Disability Services (ADS). They will confidentially explain the accommodation request process and the type of documentation needed to determine your eligibility for reasonable accommodations. To learn more about available supports, go to www.dickinson.edu/ADS, email access@dickinson.edu, call (717)245-1734, or go to the ADS office in Room 005 of Old West, Lower Level (aka "the OWLL").

If you've already been granted accommodations at Dickinson, please follow the guidance at www.dickinson.edu/AccessPlan for disclosing the accommodations for which you are eligible and scheduling a meeting with me as soon as possible so that we can discuss your accommodations and finalize your Access Plan. If you will be using any test-taking accommodations in this class, be sure to enter all test dates into your Access Plan in advance of our meeting. ADS will be happy to provide any assistance you may need.

- This class may be recorded for accommodation purposes. Please do not record the class unless you have an official accommodation to do so.

Physical Access to Our Classroom and my Office: This class meets on the second floor of James Hall in the Rector Science Complex, which has an elevator, located in the atrium directly in front of the main entrance. If you require the use of an elevator to access the second floor, please let me know, and be sure that ADS (access@dickinson.edu) knows as well. If there is ever a malfunction with the elevator, I will gladly arrange to meet you at an alternative location, either in the building, nearby, or by video conference.