

ANG 6532 (2B73)/ ANT 4531 (2B74) MOLECULAR GENETICS OF DISEASE

Prof. Connie J. Mulligan

Class meets in 120 Fine Arts C

Class time: Tuesday, period 7 (1:55-2:45) and Thursday, periods 7-8 (1:55-3:50)

Contact information:

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Course summary: The availability of whole genome sequences, development of high-throughput sequencing platforms, and public databases of genetic variants have greatly accelerated the discovery of genes involved in disease, leading to breakthroughs in diagnosis and treatment. We will discuss single-gene disorders (e.g. myotonic dystrophy and alpha 1-antitrypsin deficiency) and complex diseases (e.g. cancer and Alzheimer's disease). We will discuss methods used to isolate genes involved in disease as well as genetic testing and types of diagnosis and treatment. We will also discuss pharmacogenomics and epigenetics as well as the ethical, legal and social issues associated with genetic investigation of human health and disease.

Course design: This course is intended for advanced undergraduate and graduate students who have an interest in the molecular genetics of disease. Most human genetics courses spend only 1-2 weeks/semester discussing the genetics of disease, whereas this course focuses on disease for the entire semester. We will discuss the basics of the human genome and the basis of simple and complex diseases, including cause, inheritance, diagnosis, and treatment. We will discuss a number of diseases in detail, with the specifics determined by the state of research for a particular disease, i.e. certain eye diseases are now being treated by gene therapy so we will focus on gene therapies for that day, but will focus on the use of smoking cessation programs to treat alpha 1-antitrypsin deficiency on another day. Throughout the semester, guest lecturers from UF will speak about their research on the diseases that we discuss in class.

The course is intended for students from all colleges and departments – in the past, I have had students from anthropology, chemistry, English, molecular genetics and microbiology, pharmacology, and zoology to name a few. A diverse audience makes for a more interesting class since everyone has different backgrounds, different perspectives, and different interests to contribute to class discussions. Active participation is one of the strengths of the class. It also helps to have a class with undergraduate and graduate students together to bring diverse perspectives to the class. I keep separate sets of grades and assignments for the undergraduate and graduate classes so that each set of students is only compared to his/her cohort.

Course objectives and student goals: The class is fairly intense and demanding because knowledge across a broad range of fields is fundamental to an exploration of the molecular genetics of human disease – in fact, this course may be one of the most challenging courses you have taken with respect to developing expertise and familiarity with a wide range of materials, techniques, publications, etc. All students are expected to do all of the required readings and to follow up with additional readings if something is not understood. Additional readings are listed at the end of each chapter in the textbook and can be found in the references in the journal articles. Furthermore, students should become familiar with searching PubMed or Google Scholar for supplementary, follow-up, or original readings. Finally, there are suggested textbooks to provide additional and supplementary material. Although basic molecular biological concepts will be reviewed, some knowledge of Mendelian genetics and molecular biology (such as Intro Bio, BCS 2011) and a willingness to immerse yourself in the data are expected. Course objectives include:

- Learn about the molecular genetic basis of common simple and complex diseases
- Gain knowledge about the latest molecular genetic techniques to study, diagnose, and treat simple and complex diseases
- Learn about research being conducted at UF on the molecular genetics of certain diseases
- Discuss ethical, legal, and social issues associated with the diagnosis and treatment of diseases

Reading materials: There are two required reading sources - a textbook and journal articles (available on the E-Learning course website, Files folder). The main textbook for the course is Genetics and Genomics in Medicine by Strachan, & Lucassen – be sure to buy the updated 2nd edition published in 2023. Related journal articles as well as news-and-views (N&V) and popular press articles will also be discussed and are available on the E-Learning course website (Files folder). Supplemental texts (for additional background on molecular genetics and more information on genetic diseases, specifically cancer) include How the Human Genome Works by Edwin H. McConkey, Medical Genetics by Lynn Jorde et al. and Medical Genetics at a Glance (very brief by Pritchard and Korf. All textbooks are available at campus bookstores and through online sources such as amazon.com and half.com. In general, at least one journal article will be discussed for each disease that we discuss in detail. If students know of additional articles or diseases that they would like to discuss, please contact me. Instructional materials for this course consist of only those materials specifically reviewed, selected, and assigned by the instructor. The instructor is only responsible for these instructional materials.

It is important to do the assigned reading for every week (textbook and articles) so you add to the knowledge you already have about genetics, disease, etc. and can participate in class and group discussions. Even though it's possible to look up answers to virtually any question you might have on the internet, you need a basic knowledge of any topic in order to frame an intelligent question. For instance, you need to know there are hundreds, if not thousands, of genes and genetic variants involved in schizophrenia and other mental health disorders before you can start searching for such genes and genetic variants.

Course communications: I can be reached by email and through the messaging (“Inbox”) tool in E-Learning

Course format: The course meets twice a week and the course format is in-person lecture (by me and by guest lecturers) plus discussion with substantial class participation. Attendance via Zoom is not available. Evaluation of student performance is based on class participation, weekly quizzes, team discussions, one written exercise, and one exam.

Grading: UF grading policies are at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Grading: Final grades will be determined by the following five categories: participation (50 pts), weekly quizzes (10 pts each, 100 pts total), team-based discussions (10 pts each, 50 pts total), 1-2 problem sets (50 pts), and one exam (100 pts). Possible points total 350. Grades will be based on the following point percentages: 93-100%=A, 90-92.99%=A-, 87-89.99%=B+, 83-86.99%=B, 80-82.99%=B-, 77-79.99%=C+, 73-76.99%=C, 70-72.99%=C-, 67-69.99%=D+, 63-66.99%=D, 60-62.99%=D-, <60%=E.

- **Participation** is required of all students and will be based on each student's contribution of original comments, questions, etc. to the class. Simply showing up for class does not constitute participation. Punctuality is important and participation points will not be awarded to students who are late to class.
- There will be weekly **quizzes**, to be taken in class, during the semester. The quizzes consist of multiple choice questions administered through E-Learning and are intended to ensure that you are doing the readings every week and to help prepare you for the exam. The lowest score on your quizzes will be dropped. Missed quizzes cannot be made up. Quizzes must be taken in class because they are closed book and there are no safeguards to ensure that other material are not consulted outside of class, e.g. Honorlock.
- There will be 4-6 **team-based discussions**. Teams will be determined by the instructor and the discussion exercise will take place in class. Teams will be given issues or questions to discuss based on

the week's reading and will present a short (~2 min) summary of their discussion to the class. Grades will be based on participation as determined by team members. Missed team-based discussions cannot be made up.

- There will be 1-2 **problem sets** involving the analysis of hypothetical molecular data. The exercises are intended to give students an opportunity to perform analyses similar to those conducted in the discussion papers and will be graded on effort and accuracy. The exercises are due two weeks after they are assigned. Students who miss a class in which an exercise is assigned are expected to make up any missed material and to turn in the exercise on time, i.e. two weeks after the exercise was assigned.
- There will be 1 **exam** that will consist of essay and multiple-choice questions. Questions must be answered during the exam period without use of books or notes of any kind.

Strategies for success:

- "Learning is not a spectator sport. Fundamentally, the responsibility to learn is yours and yours alone. For learning to happen in any course, you must take an active role in the process. For our class, you are expected to come to class 'prepared' and 'ready to learn', which requires you to read and to study the assigned reading before you come to class." Excerpted from Romack 2010, Enhancing Students' Readiness to Learn, Faculty Focus Special Report: 11 Strategies for Getting Students to Read What's Assigned.
- Furthermore, to get the most out of class, you must arrive on time (5 minutes late is not on time) and you must not use computers or cell phones for non-class-related activities during class. While you may think that you can multi-task and follow the lecture while playing on your phone, you will definitely learn less than if you give the class your undivided attention. Finally, punctuality is a show of respect for your instructor and classmates and is important not just in class but in a job and your future career.
- It is important to complete all the readings on time and it is best to read the readings throughout the week. In this way, you have time to think about and process the information during the week and in between different readings. Ideally, you would read some every night of the week. The amount of reading material is modest, particularly for an anthropology course. This is because it is expected that you will re-read anything you don't understand the first time. I often re-read journal articles and discover things that I completely missed on the first read. Or new items will come to light after having read a different, but related article. This is the intent of the readings – that they relate to each other and increase your knowledge and expertise in a synergistic way. During your reading, you should take notes and use these notes to provide you with material to ask questions and contribute to class discussions.
- You have two weeks to work on the exercise(s). The intent is that you will use the first week to start on the exercise and come to class the next week (i.e. the week before the exercise is due) with any questions you have about the exercise. Do not wait until the second week to start the exercise. I am always available by email to ask questions about the exercises.
- Finally, you should review material throughout the course rather than trying to cram everything in the night before the exam. Ask for help in taking notes, comprehending the material, or preparing any of the written or oral assignments – I am available during office hours, you can schedule an appointment outside of office hours, and I am always available by email.

Useful websites:

Although basic molecular biological concepts will be reviewed, some knowledge of DNA structure, Mendelian genetics, and molecular biology is expected (such as Intro Bio, BCS 2011). Useful information is provided by several websites:

<https://elearning.ufl.edu> – access to e-Learning course website

<http://www.uflib.ufl.edu> - UF database of available electronic journals (may only be available from a campus computer or through a vpn)

<http://www.ncbi.nlm.nih.gov/PubMed> - National Library of Medicine database of over 11 million journal articles dating back to the 1960s

<http://www.genomesonline.org/> - status of genome sequencing projects

Attendance and punctuality: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>. Because the class format is mainly discussion and class participation, it is very difficult to make up missed classes by borrowing notes, watching lectures, etc. Therefore, students are strongly encouraged to attend all classes and to arrive on time. Punctuality is important because I summarize important logistical items at the beginning of class (if you cannot make it to class on time because of other classes or work conflicts, please let me know). Attendance via Zoom is not available. If you do miss class, you will only be allowed to make up work if you provide documentation of the reason you missed class and only at my discretion. Computers and cell phones should be used sparingly in class. In a seminar format, it is more important to participate in class discussions than to record everything on your computer. Additionally, it can be very off-putting for me or a guest speaker to speak to a sea of laptop backs.

Copyright information: Publication of any course materials without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Accommodations: UF is committed to achieving full accessibility for people with disabilities, and I am committed to making this classroom accessible to you. If there are ways in which the overall structure of the course and general classroom interactions could be adapted to facilitate improved participation, please do not hesitate to raise your ideas with me: Your comments and suggestions about the format of readings, lectures, and class discussions are always welcome.

If you require accommodation due to a disability, please make an appointment or visit during my office hours so that we may discuss your needs. Students requesting classroom accommodation must first register with the [Disability Resource Center](#). The DRC will provide documentation to the student who must then provide this documentation to me when requesting accommodation.

Evaluations: Students are expected to provide feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Academic honesty: Academic honesty and integrity are fundamental values of the University of Florida community. Students should be sure that they understand the UF Student Honor Code. Students caught cheating or plagiarizing on any assignment in this class will be reported to the Dean of Students and receive a zero for the assignment.

As a result of completing the registration form at the University of Florida, every student has signed the following statement: “I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.” On all work submitted for credit by students at the University of Florida, the following pledge is

either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions – prohibited behavior includes the use of AI applications to write assignments. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class. The latest student honor code and student conduct code can be found at <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>

An excellent website that discusses plagiarism, correct citing of references and correct use of quotes is <http://mediasite.video.ufl.edu/mediasite/Viewer/?peid=adaa44500eaf460a84f238e6b9a558f9>. All students should read this material at least once. Remember that the university considers self-plagiarism to be plagiarism.

Critical thinking and freedom of speech: Students are encouraged to employ critical thinking and to rely on data and verifiable sources to interrogate all assigned readings and subject matter in this course as a way of determining whether they agree with their classmates and/or their instructor. No lesson is intended to espouse, promote, advance, inculcate, or compel a particular feeling, perception, viewpoint, or belief.

U Matter We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Other resources include:

- [Counseling and Wellness Center](#): Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.
- [Student Health Care Center](#): Call 352-392-1161 for 24/7 information to help you find the care you need.
- Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual assault counseling
- [University Police Department](#): Visit UF Police Department [website](#) or call 352-392-1111 (or 9-1-1 for emergencies).
- [UF Health Shands Emergency Room / Trauma Center](#): For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608.
- [GatorWell Health Promotion Services](#): For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell [website](#) or call 352-273-4450

Course schedule (some guest speakers and associated readings are still being confirmed):

January 14 – Introduction and AI exercise

January 16 & 21/Week 1 - Background

Lecture

- Introduction
- Plagiarism

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 1 (Fundamentals of DNA, Chromosomes, and Cells) – 20 pp
- Articles (** articles are available as pdfs on E-learning):
 - ** Eight fingers and eight toes, Jorde, 2023, *HGG Advances*.
 - ** NIH megastudy analyzes first 250,000 genomes, Kaiser, 2024, *Science*
 - “The baby was gravely ill. Rapid sequencing turned around a diagnosis in 13 hours – and pointed to a treatment”, Joseph, 2021 STAT
<https://www.statnews.com/2021/07/22/rapid-sequencing-baby-diagnosis-13-hours/>
 - New initiative aims to sequence half a million genomes of people with African ancestry for health studies, Pérez Ortega, 2023, *Science*,
<https://www.science.org/content/article/new-initiative-sequence-half-million-genomes-people-african-ancestry-health-studies>
 - “Why can some kids handle pressure while others fall apart?” Bronson & Merryman, NYT, Feb 6, 2013, <http://www.nytimes.com/2013/02/10/magazine/why-can-some-kids-handle-pressure-while-others-fall-apart.html>
 - “Is Claudine Gay a plagiarist?” Rufo & Brunet, Dec 10, 2023,
<https://christopherrufo.com/p/is-claudine-gay-a-plagiarist>
 - “Harvard Finds More Instances of ‘Duplicative Language’ in President’s Work”, Schuessler, NYT, Dec 20, 2023,
<https://www.nytimes.com/2023/12/20/us/harvard-claudine-gay-plagiarism.html?smid=nytcore-ios-share&referringSource=articleShare>
 - “Claudine Gay: What just happened at Harvard is bigger than me”, Gay, NYT, Jan 3, 2024,
https://www.nytimes.com/2024/01/03/opinion/claudine-gay-harvard-president.html?campaign_id=190&emc=edit_ufn_20240103&instance_id=111625&nl=from-the-times®i_id=87569322&segment_id=154191&te=1&user_id=2e3ca399bdce54b3d3c6cfbdc8361680
 - AI hallucinates because it’s trained to fake answers it doesn’t know, Zhao, 2025, *Science*, https://www.science.org/content/article/ai-hallucinates-because-it-s-trained-fake-answers-it-doesn-t-know?utm_source=sfmc&utm_medium=email&utm_content=alert&utm_campaign=SCiEToc&et rid=34819171&et_cid=5783477
 - Does using ChatPGT change your brain activity? Study sparks debate, Jones, 2025, *Nature*, https://www.nature.com/articles/d41586-025-02005-y?WT.ec_id=NATURE-20250703&utm_source=nature_etoc&utm_medium=email&utm_campaign=CONR_41586_AWA1_GL_DTEC_054CI_TOC-250703 OR What happens when you use ChatGPT to write an essay? Cross, 2025, *NSA Today* AND Your Brain on ChatGPT: Accumulation of Cognitive Debt when Using an AI Assistant for Essay Writing Task, Kosmyrna et al. 2025, arXiv, arxiv.org/abs/2506.08872

Team discussion #1

January 23 & 28/Week 2 – Introduction to genetics

Lecture

- Background material
- How to read a scientific article
- PubMed search

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 2 (Fundamentals of Gene Structure, Gene Expression, and Human Genome Organization) – 26 pp
- Articles (** articles are available as pdfs on E-learning):
 - How to make America healthy: the real problems — and best fixes, Pearson, 2025, *Nature*, https://www.nature.com/articles/d41586-025-01969-1?WT.ec_id=NATURE-20250626&utm_source=nature_etoc&utm_medium=email&utm_campaign=CONR_41586_AWA1_GL_DTEC_054CI_TOC-250626
 - ** The influence of evolutionary history on human health and disease, Benton et al. 2021, *Nature Reviews Genetics*, 22:269-283.
 - ** Envisioning a new era: Complete genetic information from routine, telomere-to-telomere genomes, Miga and Eichler, 2023, *Am J Human Genetics*.
 - ** Abolish race correction, Roberts, 2021, *The Lancet*.
 - ** Delivering drugs with microbots, Nelson & Pané, 2023, *Science*.

Team discussion #2

January 30 & February 4/Week 3 – Methods – DNA cloning, sequencing and microarrays

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 3 (Principles underlying core DNA technologies)
- Articles (** articles are available as pdfs on E-learning):
 - ** Linking genome variants to disease: Scalable approaches to test the functional impact of human mutations, Findlay, 2021, *Hum Molec Genet*.
 - ** Is there a way to reduce the inequity in variant interpretation on the basis of ancestry? Appelbaum et al. 2022, *Am J Human Genetics*
 - Childbirth is deadlier for Black families even when they're rich, expansive study finds, Miller, Kliff and Buchanon, *NYT*, 2023, <https://www.nytimes.com/interactive/2023/02/12/upshot/child-maternal-mortality-rich-poor.html>
 - **Optional - Linking the non-coding genome to human health, Dhindsa & Petrovski, 2024, *Nature*.

Team-based discussion #3

February 6 & 11/Week 4 – Genetic variation

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 4 (Principles of genetic variation)
- Articles (** articles are available as pdfs on E-learning):
 - What's so special about the human brain? Smith, 2024, *Nature*, https://www.nature.com/immersive/d41586-024-03425-y/index.html?WT.ec_id=NATURE-202410&sap-outbound-id=BA04F6F5B080AF05B1118C10377E62BEA065D16C&utm_source=standard&utm_medium=email&utm_campaign=000_SKN6563_0000037384_41586-Nature-20241031-EAlert&utm_content=EN_70203_20241031&mkt-key=42010A0557EB1EDA9B9DA5A931B95D86
 - **Understanding human uniqueness in the pre-genomic era, Tung, 2024, *Nature Reviews Genetics*.
 - **Advancing genomics to improve health equity, Madden et al. 2023, *Nature Genetics*.

- ** Genetic mutations you want, Williams, 2016, *PNAS*.
- **Sources of gene expression variation in a globally diverse human cohort, Taylor et al. 2023, *Nature*.

Guest speaker – Dr. Kiley Graim, Assistant professor, Computer & Information Science & Engineering, College of Engineering – machine learning, large-scale genetic datasets, human health & disease - Confirmed

February 13 & 18/Week 5 – Monogenic disorders

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 5 (Single-gene disorders: Inheritance patterns, phenotype variability, and allele frequencies)
- Articles (** articles are available as pdfs on E-learning):
 - ** Human embryonic genetic mosaicism and its effects on development and disease, Waldvogel et al. 2024, *Nature Reviews Genetics*.
 - **A founder event causing a dominant childhood epilepsy survives 800 years through weak selective pressure, Grinton et al. 2022, *Am J Human Genetics*.
 - **Alpha1-antitrypsin deficiency, Silverman & Sandhaus, 2009, *New England J Medicine*.

Guest lecturer - Dr. Karina Serban, Assoc professor, Dept of Pulmonary, Critical Care & Sleep Medicine, College of Medicine – alpha 1-antitrypsin deficiency – confirmed

February 20 & 25/Week 6 – Gene regulation and epigenetics

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 6 (Principles of gene regulation and epigenetics)
- Articles (** articles are available as pdfs on E-learning):
 - Video – TED-Ed – What is epigenetics: - Carlos Guerrero-Bosagna, https://www.youtube.com/watch?v=_aAhcNjmvhc
 - ** Low birthweight is associated with epigenetic age acceleration in the first 3 years of life, Quinn et al. 2023, *Evol Med Public Health*.
 - ** “A patchwork mind: How your parents’ genes shape your brain”, *Scientific American*, 2009, <http://www.scientificamerican.com/article.cfm?id=a-patchwork-mind>

Guest speaker – Dr. Jim Resnick, Professor, Dept of Molecular Genetics and Microbiology – imprinting, genetics of Prader-Willi and Angelman syndromes – confirmed

Done - February 27 & March 4/Week 7 – Complexities with monogenic disorders

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 7 (How genetic variation in DNA and chromosomes causes disease) – Lots of good information, but can read lightly
- Articles (** articles are available as pdfs on E-learning):
 - Errors in the Huntington’s disease gene accumulate slowly and then all at once, Rajagopal and Gelfman, 2025, *Nature*, https://www.nature.com/articles/d41586-025-00717-9?WT.ec_id=NATURE-20250320&utm_source=nature_etoc&utm_medium=email&utm_campaign=CONR_41

586_AWA1_GL_DTEC_054CI_TOC-250320&sap-outbound-id=C049B25ECF0409A36422477DA105AFA7A2D864CD

- **Reverting to old theories of ageing with new evidence for the role of somatic mutations, Franco & Eriksson, 2022, *Nature Reviews*.
- **Longitudinal increases in somatic mosaicism of the expanded CTG repeat in myotonic dystrophy type 1 are associated with variation in age-at-onset, Morales et al., 2020, *Hum Mol Genet*, 29:2496-2507 – just read the title and abstract
- “24-year-old researches treatment for her own crippling disease: ‘I’m in a race against time’”, People, Dec 2, 2021, <https://people.com/health/24-year-old-researches-treatment-for-her-own-crippling-disease-im-in-a-race-against-time/>
- **Perspectives of the Friedreich ataxia community on gene therapy clinical trials, Trantham et al., 2024, *Mol Ther Meth Clin Dev*, 32:1-9.

Guest speaker – Dr. Shandra Trantham, UF Genetics & Genomics PhD program graduate – Friedreich’s ataxia – confirmed

March 6 & 11/Week 8 – Complex diseases, part I

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 8, pp 239-276 + 283-287 (Alzheimer disease) (Identifying disease genes and genetic susceptibility to complex diseases)
- Articles (** articles are available as pdfs on E-learning):
 - **FDA approves Alzheimer’s drug amid safety concerns, Reardon, 2023, *Nature*.
 - ** Blood tests could soon predict your risk of Alzheimer's, Abbott, 2024, *Nature*.
 - Using artificial intelligence and patient medical records to predict Alzheimer’s disease, UF News, 2023, https://news.ufl.edu/2023/02/ai-to-predict-alz/?utm_source=University+of+Florida+ICBR&utm_campaign=fd30402fc1-EMAIL_CAMPAIGN_2_15_2021_8_47_COPY_01&utm_medium=email&utm_term=0_106d7741a2-fd30402fc1-113702185 ‘Valley of Forgetting’ Review: In pursuit of the mystery of Alzheimer's, Landro, WSJ, 2025, <https://www.wsj.com/arts-culture/books/valley-of-forgetting-review-in-pursuit-of-the-mystery-of-alzheimers-38154126>
 - Why women’s brains are more resilient: it could be their ‘silent’ X chromosome, Bourzac, 2025, *Nature*, https://www.nature.com/articles/d41586-025-00682-3?WT.ec_id=NATURE-202503&sap-outbound-id=37ADD35382D435692249F9232523912CB2DC0154
 - **Humanized APOE genotypes influence lifespan independently of tau aggregation in the P301S mouse model of tauopathy, Williams et al. 2023, *Acta Neuropath Comm* 11:99.

Guest speaker – Dr. Paramita Chakrabarty, Associate professor, Department of Neuroscience – Alzheimer’s disease – confirmed – 3:15-4pm

Problem set #1 assigned

March 13 (AABA) & 25/Week 9 – Complex diseases, part II

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 8, pp 276-300 minus pp 283-286 (Identifying disease genes and genetic susceptibility to complex diseases)
- Articles (** articles are available as pdfs on E-learning):

- ** The applicability of polygenic risk scores in under-represented populations, Riefski & Terry, 2023, *Genet Test Mol Biomarkers*.
- ** Genetic loci and novel discrimination measures associated with blood pressure variation in African Americans living in Tallahassee, Quinlan et al, 2016, *PLoS ONE*
- **Including diverse populations enhances the discovery of type 2 diabetes loci, Fatumo, 2024, *Nature Reviews Genetics*, 25:82
- ** The self-fulfilling process of clinical race correction: The case of Eighth Joint National Committee Recommendations, Savage and Panofsky, 2023, *Health Equity*.
- Optional – Follow the citations: Tracing pathways of “race as biology” assumptions in medical algorithms in eGFR and spirometry, Fuentes, Espinoza & Cobbs, 2024, *Soc Sci Med*.

Team-based discussion #4

March 18 & 20 – Spring break

March 27 & April 1/Week 11 – Genetic treatments, Part I

Reading assignments:

- *Genetics and Genomics in Medicine (GGM)*, Chpt 9, pp 301-328 (Genetic approaches to treating disease)
- Articles (** articles are available as pdfs on E-learning):
 - ** Costly Genes, Karayiorgou, 2020, *PLoS Genetics*.
 - ** For better drugs, diversify clinical trials, Bumpus, 2021, *Science*, 371:570-571
 - ** Pharmacogenomics: Current status and future perspectives, Primohamed, 2023, *Nature Reviews Genetics*.
 - “A revolution is coming to medicine. Who will it leave out?, NYT, 2023, <https://www.nytimes.com/2023/08/05/opinion/personalized-medicine-genes.html>

Problem set #1 due at the start of class on March 27

Guest speaker - Dr. Larisa Cavallari, Professor, Dept of Pharmaceutical Sciences and Director, UF Center for Pharmacogenomics – Pharmacogenomics – confirmed

April 3 & 8/Week 12 – Genetic treatments, Part II

Reading assignments:

- *Genetics and Genomics in Medicine (GGM)*, Chpt 9, pp 328-359 (Genetic approaches to treating disease)
- Articles (** articles are available as pdfs on E-learning):
 - “Baby Is Healed With World’s First Personalized Gene-Editing Treatment”, Kolata, 2025, NYT, <https://www.nytimes.com/2025/05/15/health/gene-editing-personalized-rare-disorders.html?smid=nytcore-ios-share&referringSource=articleShare>
 - **“Tweaking genes with CRISPR or viruses fixes blood disorders”, Kaiser, 2020, *Science*.
 - **”Is CRISPR safe? Genome editing gets its first FDA scrutiny” Ledford, 2023, *Nature*.

- Life without sickle cell beckons boy who completed gene therapy, NYT, 2024, <https://www.nytimes.com/2024/10/21/health/sickle-cell-disease-gene-therapy-patient.html?smid=nytcore-ios-share&referringSource=articleShare>
- ***"A gentler way to tweak genes: Epigenome editing" Kaiser, 2022, *Science*.
- Gene therapy restores vision in first-ever trial for rare, inherited blindness, UF News, Sept 2024, <https://news.ufl.edu/2024/09/blindness-gene-therapy/>
- **Gene therapy for retinal degenerative diseases: Progress, challenges, and future directions, Drag et al., 2023, *Inv Ophthalmol Vis Sci*, 64: Article 39

Guest speaker – Dr. Astra Dinculescu, Assist professor, Dept of Ophthalmology, College of Medicine – Gene therapy and eye disease - confirmed

April 10 & 15/Week 13 – Cancer

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 10 (Cancer genetics and genomics – read lightly)
- Articles (** articles are available as pdfs on E-learning):
 - ** A cancer legacy, Once viewed as tragic anomalies, many childhood cancers may have their roots in inherited mutations, Couzin-Frankel, 2016, *Science* 351: 440-443
 - ** Researches take aim at cancer drugs' toxic side effects, Couzin-Frankel, 2022, *Science*.
 - ** Relative risk: Mutations in BRCA genes predispose women to cancer, but outside influences shape the ultimate risk, Velasquez-Manoff, 2015, *Nature*, 327:5116-5117
 - Cancer Care Is Getting Personal. Local Doctors Can't Keep Up. Abbott, 2024, WSJ, <https://www.wsj.com/health/healthcare/cancer-treatment-personalized-doctors-170f4be6>
 - "What if everything your doctors told you about breast cancer was wrong?", Mother Jones, Aschwanden, 2015, <http://www.motherjones.com/politics/2015/10/faulty-research-behind-mammograms-breast-cancer/>

Team discussion #5 – maybe on April 15

April 15 & 17/Week 14 – Genetic testing

Reading assignments:

- *Genetics and Genomics in Medicine* (GGM), Chpt 11 (go light on methods and focus on "Overviews", examples with specific diseases, or ethical issues)
- Articles (** articles are available as pdfs on E-learning):

- ** Protect newborn screening programs, Owens et al. 2023, *Science*.
- ** Socioeconomic barriers surrounding genetic counseling, Korte and Terry, 2023, *Genetic Testing and Molecular Biomarkers*.
- ** The controversial embryo tests that promise a better baby, Kozlov, 2022, *Nature*.
- ** Trials of the heart, Phillips, 2022, *Nature*.
- “For some families of color, a painful fight for a cystic fibrosis diagnosis”, NYT, 2024, <https://www.nytimes.com/2024/05/29/well/live/cystic-fibrosis-screening.html?smid=nytcore-ios-share&referringSource=articleShare&u2g=c&pvid=4CEBF194-191B-4757-9FA1-1D652675ABD6&sgrp=c-cb>
- “A geneticist’s research turns personal”, NYT, 2012, <https://www.nytimes.com/2012/06/03/business/geneticists-research-finds-his-own-diabetes.html>

Exam - TBD