Molecular Biosciences Mini Course (Spring, 2022)

How to make a good egg: A molecular prospective (16:695:634:15915)

Course Instructors:

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*Make sure to email both course instructors with questions related to the course policies/procedures.

Course Description: Production of high-quality gametes is essential for sexual reproduction. In females, this process takes place within the follicle, a supporting structure and functional unit of the ovary. This process is highly error prone, affected by aging, exposure to reproductive toxicants and many disease states. Students will learn about the latest technological advances that clinicians use to select quality eggs, developments in contraception and in fertility preservation.

Course Objective: The purpose of this course is to provide students with a basic understanding of ovarian biology, molecular control of folliculogenesis and oogenesis, how aging, diseases, and xenobiotic exposure impact ovarian functions and egg quality, and the significance of these processes in reproductive medicine.

Course Outcome: After taking this course, students will have a working knowledge of the ovarian processes involved in generating meiotically and developmentally competent eggs, understand the impacts that age have on these processes, and identify reproductive toxicant exposures and disease states that impact egg quality. They will be able to synthesize biomedical findings to communicate the implications of these findings in writing to an audience with broad scientific knowledge.

Course Materials: Lecture slides and primary literature reading assignments. These materials will be posted on Canvas prior to the scheduled lecture for the specific topic. All students registered for this course will be able to access the course when logged into Canvas with your Rutgers NetID and password. The Canvas website address is https://rutgers.instructure.com/courses/168217

Grading: Students will be graded on attendance and participation (10%) and production of 2 "Graphical Abstract" assignments (90%). The graphical abstract assignment instructions are described below. Participation will involve describing figures of manuscripts to the class.

COVID-19 attendance guideline: The attendance guideline of this course will follow Rutgers University's COVID-19 operating protocols. The use of appropriate face coverings is required in the classroom and other student-faculty meeting spaces. Students are required to follow Rutgers's COVID-19 vaccination and booster requirements and other COVID-19 protocols and guidelines. Students who are confirmed with COVID-19 or have suspicious COVID-19 symptoms should contact course instructors to discuss the possibility of attending the lecture virtually. These guidelines might continue to change based on Rutgers University's guidelines.

Academic Integrity Policies: Students are required to be familiar with the university's Policy on Academic Integrity (see https://nbprovost.rutgers.edu/academic-integrity-students). Violation of academic integrity is a

separable offense under the University Code of Student Conduct. Students agree that by taking this course the required assignments may be subject to check for plagiarism by course instructors. Students who do not agree should contact the course instructors immediately.

Course and Instructor Evaluation: Evaluations will be conducted online to assess the design and content of the module and to evaluate each instructor. Your comments and suggestions are greatly appreciated and will be used to modify (and improve) the course in the future.

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Class Schedule: Tuesday, Thursday, 12:00 pm to 1:30 pm
Course period: April 5-28, 2022
Format: In person; 4/19 pending class decision
Location: RWJMS V12 Busch Campus

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Date	Topic	Paper
Session 1- Schindler April 5, Tuesday	Germ cells and meiotic prophase I	Wang and Pepling. 2021. Regulation of meiotic prophase one in mammalian oocytes. *Front Cell Dev Biol*. 2021 May 20;9:667306. Malki et al. A role for retrotransposon LINE-1 in fetal oocyte attrition in mice. *Dev Cell*. 2014 Jun 9;29(5):521-533.
Session 2- Schindler April 7, Thursday	Oocyte meiotic maturation	Sanders *et al*. 2018. Regulation of the meiotic divisions of mammalian oocytes and eggs. *Biochem Soc Trans*. 46 (4): 797-806. Martins et al. 2016. DAZL and CPEB1 regulate mRNA translation synergistically during oocyte maturation. *J Cell Biol*. 129: 1271-1282.
Session 3- Xiao April 12, Tuesday	Ovarian reserve and early phase of folliculogenesis	Reddy *et al*., 2008. Oocyte-Specific Deletion of Pten Causes Premature Activation of the Primordial Follicle Pool. *Science*. 319: 611-13.
Session 4- Xiao April 14, Thursday	Gonadotropin-dependent folliculogenesis and ovulation	Fan *et al*., 2009. MAPK3/1 (ERK1/2) in Ovarian Granulosa Cells Are Essential for Female Fertility. *Science*. 324: 938-41.
Session 5- Schindler April 19, Tuesday * schedule conflict; will decide as group how to reschedule	The aging egg	Quesada-Candela *et al*., 2021. Molecular basis of reproductive senescence: insights from model organisms. *JARG*. 38: 17-32. Chiang et al. 2010. Evidence that weakened centromere cohesion is a leading cause of age-related aneuploidy in oocytes. *Curr Biol*. 20(17): 1522-8.
Session 6- Xiao April 21, Thursday	Ovarian aging	Amargant *et al*., 2020. Ovarian stiffness increases with age in the mammalian ovary and depends on collagen and hyaluronan matrices. *Aging Cell*. 19: e13259.

Date	Topic	Paper
Session 7- Xiao April 26, Tuesday	Ovarian disease and birth control	Rosenfield and Ehrmann. 2016. The Pathogenesis of Polycystic Ovary Syndrome (PCOS): The Hypothesis of PCOS as Functional Ovarian Hyperandrogenism Revisited. *Endo Reviews*. 37(5): 467-520.
Session 8- Schindler April 28, Thursday	Clinical advances in making and detecting good eggs Graphical Abstract discussion	De Rycke *et al.*, 2020. Clinical experience of preimplantation genetic testing. *Reprod*. 160 (5): A45-58.

Graphical Abstract Assignment Instructions

Due: April 26, 2022 (recording); April 28, 2022 (peer evaluation forms)

Description: "*A picture is worth a thousand words*." After you have written or read 5,000-10,000 words, do you ever find yourself wondering what the main, take-home points of the manuscript are? Sometimes, the writing is clear, but often by the time you have sifted through a jargon-heavy article, your head is swimming with new concepts, technologies and findings and you forget the big picture. Many journals now require authors to submit **Graphical Abstracts** that summarize the key findings of the article so that readers can absorb the main message of a paper with a simple look. A great example is the Cell Press journals like *Current Biology*.

Your assignment is to select 2 papers we read this semester and design your own graphical abstracts that summarize them. One paper is from Schindler, the other from Xiao. You will then be required to record a 3-minute oral presentation of each abstract (2 total) and share them with your assigned mini-group. You will then view the recordings of members of your mini-group, complete peer evaluations, and discuss your evaluation with your group on the last day of class.

Instructions:

1. Choose your favorite assigned papers from the oocyte (Schindler) and ovary (Xiao) sessions. You will therefore select **2 papers**.

2. Design a graphical abstract that is a "visual indication of the results" in the paper (see tips on next page). Feel free to use your preferred design application (ie- Powerpoint, Canva, Illustrator, Photoshop, etc) and use science graphic icon apps like BioRender or Bioicons to obtain professional looking scientific cartoons.

   Note: 2 papers = 2 graphical abstracts

3. Use Zoom to record a **3 minute** presentation for each abstract. You will need to share your screen, and hit record. The easiest way to share recordings is to select "save to cloud." A few minutes after you save the recording, you will be emailed a link and password. This is due on **Tuesday, 4/26 by 9 pm**.

   Note: 2 papers = 2 graphical abstracts = 2 recordings

4. Upload the links and passwords on Canvas Assignments for instructor review and grading. Share the recording links and passwords with your group for their viewing and evaluation.

5. View the recordings of members of your small group (4-6 recordings, depending on group size). Complete an evaluation form (see Peer Evaluation Form document). This is due on **Thursday, 4/28 by 12pm**. Upload all peer evaluations on Canvas Assignments.

6. During class, workshop and discuss each group member's abstracts and videos.

7. Your final score will be an average of the instructor's score (see rubric posted in Canvas) with the average of your peer evaluation scores. This will be 90% of your final grade.

Graphical Abstract Tips (taken from Cell Press):

Your Graphical Abstract should:

- Provide a visual indication of the results shown
- Be distinct from any main-text items already included in the paper itself
- Emphasize the new findings from the paper without including excess details from previous literature

Tips and tricks
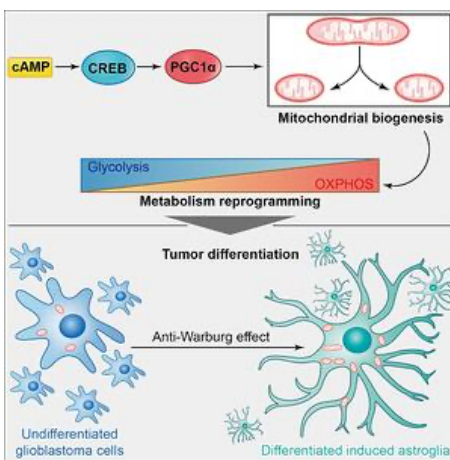
Do:

- Use simple labels and add text sparingly
- Avoid unnecessary or cluttering elements
- Make sure the image reads from top to bottom or from left to right
- Use programs like Adobe Photoshop to create your image **(Note: Powerpoint is ok for class purposes!)**
- Use our Graphical Abstract guidelines for authors
- Reach out to your local IT support for help to resize or alter your Graphical Abstract
- Look at some current examples for inspiration

Don't:

- Include data items of any type; all the content should be in a graphical form
- Provide your eTOC blurb and Highlights in the image; the Graphical Abstract file you submit is the exact file that will be used online, and we *do not* edit your Graphical Abstract
- Use jargon; readers should be able to understand the image without needing a dictionary
- Cram shapes and content together; use the space of the image efficiently
- Use caricatures, especially of animals

Advice from Cell Press staff

"The most common mistake we see authors make is the addition of a white border or too much white space within the image. When building your Graphical Abstract, keep in mind that the file must contain only the image you'd like us to use online, rather than an image pasted onto a large white background. Since we do not edit or alter the image, it's important that the Graphical Abstract is in its final shape when provided to us. What we see is what we use."

    – *Cell Reports* Publication Associates

"I personally love Graphical Abstracts that show the flow of experiments and their conclusions. When simplified, and if truly image focused, a Graphical Abstract can be pretty effective. Be aware that your Graphical Abstract is going to be on the cover of the PDF version of your paper. This means that the image will create a reader's first impression of the paper. In addition, it will likely be used on social media."

    – Sabbi Lall, *Cell Reports* Editor-in-Chief