

Spring 2020

Tuesday/Thursday 8:30-11:30 am

ISB 364

Class size: 24 students

Pre-requisites:

BIO 151 and 152 with minimum C
ANMLSCI, BIOCHEM or BIO 285 with
minimum C

ANMLSCI 390E

Fundamental Vertebrate Embryology

Course Description:

The course is designed to learn the basic principle of embryology including, germ layer establishment, body axis determination, induction, determination, competence and differentiation. The class meet twice a week for 3 hours each. The course will have a lecture component that will describe how an embryo is shaped from a single cell and a laboratory component that will allow students to observe developmental stages and perform classical experiments that were used to demonstrate the basic principles described above. Students are expected to come outside class time to take care of their samples, continue their observations and collect their data, which will take up an extra 3 hours per week.

Course goals:

The main goal of this course is to gain an understanding of how the basic vertebrate body plan is established during embryogenesis. How a single cell can give rise to a complete organism and how cells are organized in tissues and functional organs to perform specific functions. Another goal of this course is to help student understand the design of a scientific experiment to test an hypothesis, predict the outcome and interpret the result.

Course Objectives:

We expect that students will be able to identify and document various developmental stages, position each germ layer and orient histological sections. Documentation can take the form of a drawing or a picture taken out of the dissecting microscope. This part is, by nature, descriptive and will help student to better understand the anatomy of adult animals.

We expect that student will understand the notions of cell communication that are involved during the induction processes and the establishment of vertebrate axis.

We expect that the student will understand how experiments are designed to test an hypothesis and how the results are interpreted.

INSTRUCTORS

Helene Cousin Ph.D. ISB 427N, hcousin@vasci.umass.edu (pronouns: she, her, herself)

Dominique Alfandari Ph.D. ISB 427B, alfandar@vasci.umass.edu (pronouns: he, his, himself)

Materials

- Lab coat

Milestones

1/29/20

- Students need to have acquired the lab coats
- Students need to be up to date with IACUC and EHS trainings

DTBA

Section 1 lab report due

DTBA

Section 2 lab report due

DTBA

Section 3 lab report due

PROGRAM

| SECTION | TOPIC | LAB REPORT CONTENT |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SECTION 1 | <p>Embryology basics. In vitro fertilization, vitelline envelope removal, dissections, embryo staging (on live of pre-fixed embryos). Observation of developing embryos: identification of embryonic germ layers and their derivatives.</p> | <p>Make your own developmental tables which should include your pictures of: 1-embryos at various stages 2- pictures of bisected embryos and annotation of all structures seen 3- correct orientation for all pictures and description of the type of section performed.</p> |
| SECTION 2 | <p>Reverse fate mapping: Embryo will be injected with the lineage tracer beta galactosidase. Students will fix and stain for the beta galactosidase a various stages. Identify the tissue stained and infer which cell was injected using the Moody fate map available on Xenase.</p> <p>Introduction to Induction: Students will perform any of the following historical experiments that allowed the discovery of induction and competence concepts: Nieuwkoop recombinations, animal cap experiments, Spemann-Mangold grafts, Einsteck experiments.</p> | <p>Pictures of the results, including the type of section seen, the orientation of the embryo or section seen, the tissues observe.</p> <p>Analyze the results: what did you see? Why did you see it? What happened in your experiments? If your experiment didn't work, why?</p> |
| SECTION 3 | <p>Molecular analysis of embryos or experiments: Students will prepare embryos or explants they have produced in section 2 and analyze the expression of tissue markers using common laboratory techniques: Western blot, immunostaining and in situ hybridization. Students will have access to various tissue specific antibodies and probes and they will have to select the appropriate ones based on the hypothesis tested.</p> | <p>Pictures of the results clearly annotated and labelled.</p> <p>Analyze the results: what did you see? Why did you see it? What happened in your experiments? If your experiment didn't work, why?</p> |

REQUIREMENTS BEFORE TAKING THE CLASS

TRAINING: All students are expected to complete:

- (1) Animal User Training conducted by IACUC/Research and Engagement. This certification is valid for 4 years.
- (2) Biological Safety Training conducted by the UMass Environmental Health and Safety Office. This certification is valid for 1 year.

If you completed Animal User Training during Animal Science 101, then you do not need to do so again. One Animal User Training session covers all 4 years at UMass. If you still need to complete Animal User Training, please contact Barbara Miller at bsmiller@research.umass.edu or 413-545-0668.

Biological Safety Training is valid for 1 year at UMass. If your Biological Safety Training is more than 1 year old, then you must complete the update in OWL at <http://www.ehs.umass.edu/biological-safety-renewal-training-module>. If you still need to complete the initial classroom Biological Safety Training, please go on-line to register for a session at: <http://www.ehs.umass.edu/biological-safety-training>. You will need to complete these training sessions outside of class-time.

PREREQUISITES

BIO 151 and 152 with minimum C AND ANIMLSCI, BIOCHEM or BIO 285 with minimum C

EVALUATION

| Grade | Points |
|------------------------------|--------|
| Weekly prelab Moodle quizzes | 30 |
| Lab reports | 60 |
| Class attendance | 5 |
| Class participation | 5 |

DETAILS OF THE GRADING

- **Prelab Moodle quizzes**

Each week end, students are required to do the assigned reading and view the instructional videos posted on Moodle. A Moodle quiz corresponding to the aforementioned material will open every Saturday and close the following Monday at midnight. Once quiz is started, the student will have 2 hours to complete and submit it. One quiz per student.

- **Lab reports**

Students will work in pairs in the lab and are expected to hand over three lab reports corresponding to the three sections of the course. These lab report need to include a brief statement of goals, material and method section if appropriate, a result section that will include annotated images taken by the students during the labs and a discussion. One lab report per pair.

- **Participation**

Students are expected to participate in class. Ask questions, answer questions, answer a classmate question... In other words, be active participants!

- **Attendance**

Attendance will be taken at each lab. Excused absences will only be granted in the following circumstances as per University policy:

- **Religious Observances** – Must notify us in advance
- **University Sponsored Athletic Events** – Need note from Athletic Department
- **University Sponsored Field Trips/Competitions** – Need note from sponsoring department
- **Health Reasons** – Need note from medical provider
- **Personal Reasons** – Family illness, death, jury duty, court date, accidents, etc...
- Please notify us as soon as possible if missing a class. If an extended absence is needed the student or student's parents/guardians need to contact the Dean of Students Office. For more information on the University's Absence policy visit their website at <http://www.umass.edu/registrar/students/policies-and-practices/class-absence-policy>

Class etiquette:

It should go without saying but it doesn't hurt to say it anyway:

- No drinks or food allowed in the lab area.
- Do not check social media or other non-urgent personal matters during class time. You will likely use your phone to take pictures of your experiments so don't give in to the temptation!
- Follow proper etiquette when emailing the instructors.

Non-compliance to these rules will affect your participation grade.