DRB666 Spring Semester, 2011 (revised: October 29, 2010)
Tuesday, 9 am – 12 pm (3hr).

DRB666 – Applied Developmental and Reproductive Biology
Spring Semester, 2011

Director:
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Tomas Huang  huangt@hawaii.edu

Course Credits:
3 credits

Day and Time:
  Tuesday, 9am -12pm (3 hours / lecture / week)
Total 16 weeks of lectures.
(It will be necessary for students to come in for a brief time on the 2-3 days following a given lab to evaluate the progress of embryo development.)

Locations:
IBR- Manoa Campus (1960 East-West Rd)
IBR- Kakaako Campus (651 Ilalo Street)
Kapiolani Medical Center, Pacific IVF (1319 Punahou Street)

Capacity:
Up to eight graduate students will be accepted.

Course Objectives:
The overall goal of this course is to study the fundamental and applied technologies of developmental and reproductive biology. This course, through its lecture and lab structure, will combine scientific principles and technical approaches to warrant a deep understanding of mammalian development and reproduction.
Course Description:

This is a combined lecture-laboratory course on current technologies and methods for mammalian reproduction and developmental biology. This course is designed to introduce students to the current techniques and science through a lecture and laboratory work. This experimental course consists of 2 sections.

(1) First Section
Nine instructors will give lab lectures individually. The instructors will introduce laboratory work for their research projects. In this section, students learn updated technologies and protocols in different projects related in the field of Developmental and Reproductive Biology.

(2) Second Section
An organizer (Yukiko Yamazaki) will take care of basic technologies and science of gametogenesis and assisted reproductive technologies (ART). The students will study basic science of spermatogenesis and oogenesis using histological samples and laboratory mice. They will also practice mouse in vitro fertilization (IVF). After IVF, the students will observe in vitro development of fertilized oocytes. The students will visit Dr. Tom Huang at the human clinics (Kapiolani Medical Center) to learn human IVF. This section will provide theoretical knowledge of reproductive biology and applied technologies.

Course Topics:
- Oogenesis
- Spermatogenesis
- In vitro fertilization (IVF) of mouse
- Clinical infertility and IVF of human
- Intracytoplasmic sperm injection (ICSI)
- Pre-implantation embryonic development
- Early post-implantation embryos (body axis)
- Sperm genetics and function in fertilization in the context of ART
- The mouse one-cell embryo as a model for the study of mammalian DNA replication and DNA degeneration
- Transgenesis & gene therapy
- Spatial and temporal expression of genes during development
- Sex differentiation of fetal germ cells
- Mammalian nephrogenesis with RNAi
- Embryonic stem cells (mouse, human)
- Stem cell biology/Telomere biology

Materials and Textbooks:
All text materials will be provided to students by course instructors. This will include copies of chapters from books/laboratory manuals, unpublished protocols, published review articles, published data articles, etc. All laboratory supplies
and materials will be provided by course instructors. The cost of this course will be covered from Department of Anatomy, Biochemistry and Physiology funds.

**Course Evaluation and Students Grading:**
The course learning objectives will be directly assessed through one examination at the end of the course. In addition to the exam, a minimum of 90% (43/48hr) attendance hours will be required for passing. The end of year examination will be multiple choice questions or essay provided by course instructors. For passing, a minimum of 55% of questions will have to be answered correctly. Although accumulation of a minimum 55% is sufficient to obtain above F grade, less than B grade will not be accepted by a Developmental and Reproductive Biology graduate program.

The final grades will be determined by the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>96-100 (%)</td>
</tr>
<tr>
<td>A -</td>
<td>90-95</td>
</tr>
<tr>
<td>B+</td>
<td>85-89</td>
</tr>
<tr>
<td>B</td>
<td>80-84</td>
</tr>
<tr>
<td>B -</td>
<td>75-79</td>
</tr>
<tr>
<td>C+</td>
<td>70-74</td>
</tr>
<tr>
<td>C</td>
<td>65-69</td>
</tr>
<tr>
<td>C-</td>
<td>60-64</td>
</tr>
<tr>
<td>D</td>
<td>55-59</td>
</tr>
<tr>
<td>F</td>
<td>&lt;55</td>
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</tbody>
</table>

The course will be assessed through a student survey at the end of the semester. The assessment goal for this course is to have 100% of the students obtain a passing grade or higher.

**Detailed Syllabus:**
The detailed syllabus provided below refers to 3 hr lab work including lecture. (The order of lectures will be changed).
<table>
<thead>
<tr>
<th>Date</th>
<th>Instructor (Location)</th>
<th>Lecture Topic</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 11</td>
<td>Yukiko Yamazaki, Tavia Shiroma (Kakaako)</td>
<td>Course Guidance &amp; Safety Instruction</td>
<td>Orientation of DRB666 (Y.Y.) and Safety Training (T.S.).</td>
</tr>
<tr>
<td>Jan. 25</td>
<td>Yukiko Yamazaki (Kakaako)</td>
<td>Spermatogenesis</td>
<td>Lecture &amp; practice Observation of testis histology (paraffin section). Dissection of fresh testis.</td>
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<td>Feb. 1</td>
<td>Yukiko Yamazaki (Kakaako)</td>
<td>In vitro fertilization (1)</td>
<td>Lecture &amp; practice Sperm preparation for IVF (pre-incubation and morphological observation of incubated sperm)</td>
</tr>
<tr>
<td>Feb. 8</td>
<td>Yukiko Yamazaki (Kakaako)</td>
<td>In vitro fertilization (2)</td>
<td>Lecture &amp; practice IVF (pre-incubation of sperm, oocyte preparation, IVF, observation of fertilized oocytes)</td>
</tr>
<tr>
<td>Feb. 9, 10, 11*</td>
<td>Yukiko Yamazaki (Kakaako)</td>
<td>In vitro development of mouse embryo after IVF</td>
<td>Lecture &amp; observation Development of fertilized oocytes (from 1-cell to blastocyst stage)</td>
</tr>
<tr>
<td>Feb. 15</td>
<td>Monika Ward (Manoa)</td>
<td>Sperm function in assisted reproduction</td>
<td>Lecture &amp; practice Demonstration of intracytoplasmic sperm injection, practice of sperm freezing and analysis.</td>
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<td>Feb. 22</td>
<td>Tomas Huang (Kapiolani Medical Center, Pacific IVF)</td>
<td>Clinical infertility and in vitro fertilization</td>
<td>Lecture only. About Human IVF clinic where different lab procedures such as egg retrieval, insemination, embryo evaluation and cryopreservation may be observed.</td>
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<tr>
<td>March 1</td>
<td>Exam. 1 (Kakaako)</td>
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<tr>
<td>March 8</td>
<td>Jack Somponpun (Kakaako)</td>
<td>Study of mammalian nephrogenesis with organotypic kidney explant preparation</td>
<td>Lecture &amp; practice Cellular and molecular mechanisms of nephron differentiation with in vitro system and RNAi.</td>
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<tr>
<td>Date</td>
<td>Speaker (Location)</td>
<td>Topic</td>
<td>Description</td>
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| March 15 | Yukiko Yamazaki      | Sex differentiation of fetal gonads                                  | Lecture & practice
Observation of fetal testis and ovary. |
| March 22 | Spring Break         |                                                                      |                                                                             |
| March 29 | Steve Ward (Manoa)   | The mouse one-cell embryo as a model for the study of mammalian DNA replication and DNA degeneration during apoptosis. | Lecture only. Micromanipulation of mouse gametes as unique models for analyzing DNA replication. Autonomy of the nucleus from oocyte cytoplasmic controls. |
| April 5  | Stefan Moisyadi      | Transgenesis and gene therapy                                        | Lecture & practice
Active non-viral DNA transfer methods for transgenesis and gene therapy       |
| April 12 | Keith Fong (Kakaako) | Genetic knock-out mouse models for understanding gene functions and disease | Lecture & practice
How to generate Knock-out mouse. Practice genotyping of Sirt1 KO strain by PCR. |
| April 19 | Yusuke Marikawa      | Embryonic stem (ES) cells                                            | Lecture & practice
Basic properties of ES cells. Observation of live and fixed ES cells. Practice simple staining of ES cells. |
| April 26 | Rich Allsopp (Kakaako)| Methods to purify hematopoietic stem cells                          | Lecture only. Modern methods to identify and purify hematopoietic stem cells from mice and human. |
| May 10   | Exam. 2 (Kakaako)     |                                                                      |                                                                             |

* This lecture is followed by IVF experiment.