

Overview of Embryology Practical Classes

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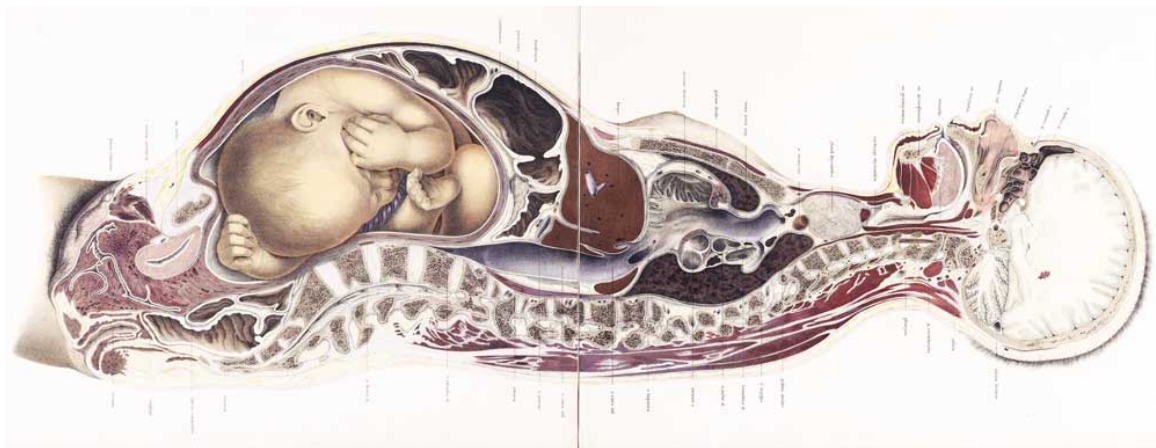
Practical 3:	Embryology – Fertilization
Practical 6:	Embryology – Post implantation to 8 weeks
Practical 9:	Embryology – Placenta and fetal membranes
Practical 12:	Embryology – Embryo to Fetus

Gametes	Fertilization	Blastocyst	Implantation	Embryo	Fetus
Menstrual Cycle			Placenta and Fetal Membranes		

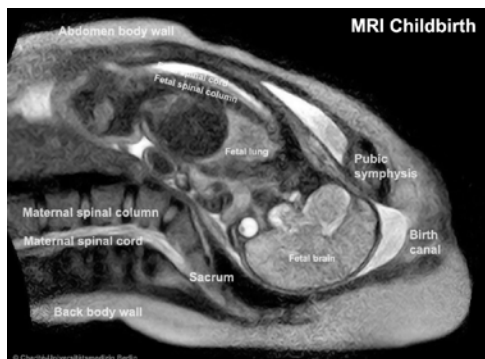
The concept of these practical classes, associated lectures and online resources is to lead you through key events in human prenatal development. This current manual section introduces the topic and provides links to major resources. Additional handouts may be provided on the day of presentation, or made available online, and a glossary of new terms is provided with each online practical class.

Course Online Resource:

UNSW Embryology (<http://php.med.unsw.edu.au/embryology/index.php?title=Medicine>).



This historic plate (1872) is a midline section through the maternal anatomy during late pregnancy showing the fetal size and position as well as the altered maternal anatomy. Wilhelm Braune, (1831-1892)



The birth of a child (2010) recorded in an “open” MRI (magnetic resonance imaging) scanner.

The scanner allows a mother-to-be to fit fully into the machine and recorded during the birth process. The fetal head can be seen just entering the birth canal.

Health and Safety:

Students should read the included SOMS Health and Safety (H&S) Student Risk Assessment sheet in relation to all practical classes. All teaching models and sealed specimens should be handled carefully and there is no eating or drinking in G2/G4 labs, for additional H&S information:

<http://medalsciences.med.unsw.edu.au/SOMSWeb.nsf/page/Health+and+Safety>

<http://medalsciences.med.unsw.edu.au/students/health-safety>

Online Course Resources:

The UNSW Embryology website (<http://php.med.unsw.edu.au/embryology>) will be used throughout your course for BGD-A, BGD-B and BGD-3. The site can be accessed from any internet connected computer. Class supporting material can be accessed from the left hand menu on every page or from the Medicine notes page (<http://php.med.unsw.edu.au/embryology/index.php?title=Medicine>). An iPad version of embryology class notes is being prepared for availability through the iBooks store.

Textbooks:

There are many good embryology textbooks available, select the one that best suits your studying style. The first two listed below were available online through the UNSW library and also linked from your online classes. The last textbook listed below is a more general development (in other species) text and the 6th edition is available freely from the NCBI Bookshelf site.

(More textbooks? http://php.med.unsw.edu.au/embryology/index.php?title=Embryology_Textbooks)

1. Moore, K.L. & Persuad, T.V.N. (2008). *The Developing Human: clinically oriented embryology* (8th ed.). Philadelphia: Saunders.
2. Schoenwolf, G.C., Bleyl, S.B., Brauer, P.R. and Francis-West, P.H. (2009). *Larsen's Human Embryology* (4th ed.). New York; Edinburgh: Churchill Livingstone.
3. **Langman's Medical Embryology** (11th ed.) Sadler, T W, (Thomas W.); Langman, Jan. Philadelphia : Wolters
4. Gilbert, S.F. (2010). *Developmental Biology*. (9th ed). Sunderland (MA): Sinauer Associates, Inc. The 6th edition is available online (<http://www.ncbi.nlm.nih.gov/books/NBK9983>) [This online text has limited human focus, so should not be used alone as a replacement for the hardcopy texts recommended].

Online Embryology Resources:

- **Embryo Images** http://www.med.unc.edu/embryo_images mouse scanning EMs and development.
- **Society for Developmental Biology** <http://sdb.bio.purdue.edu>
- **Online Mendelian Inheritance in Man (OMIM)** <http://www.ncbi.nlm.nih.gov/omim> is a searchable compendium of human genes and genetic phenotypes, containing information on all known mendelian disorders and over 12,000 genes.
- **Journals:** <http://php.med.unsw.edu.au/embryology/index.php?title=Journals>

Some selected Journals

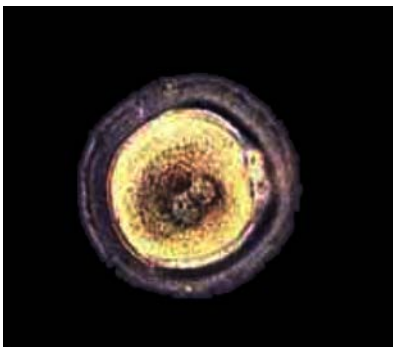
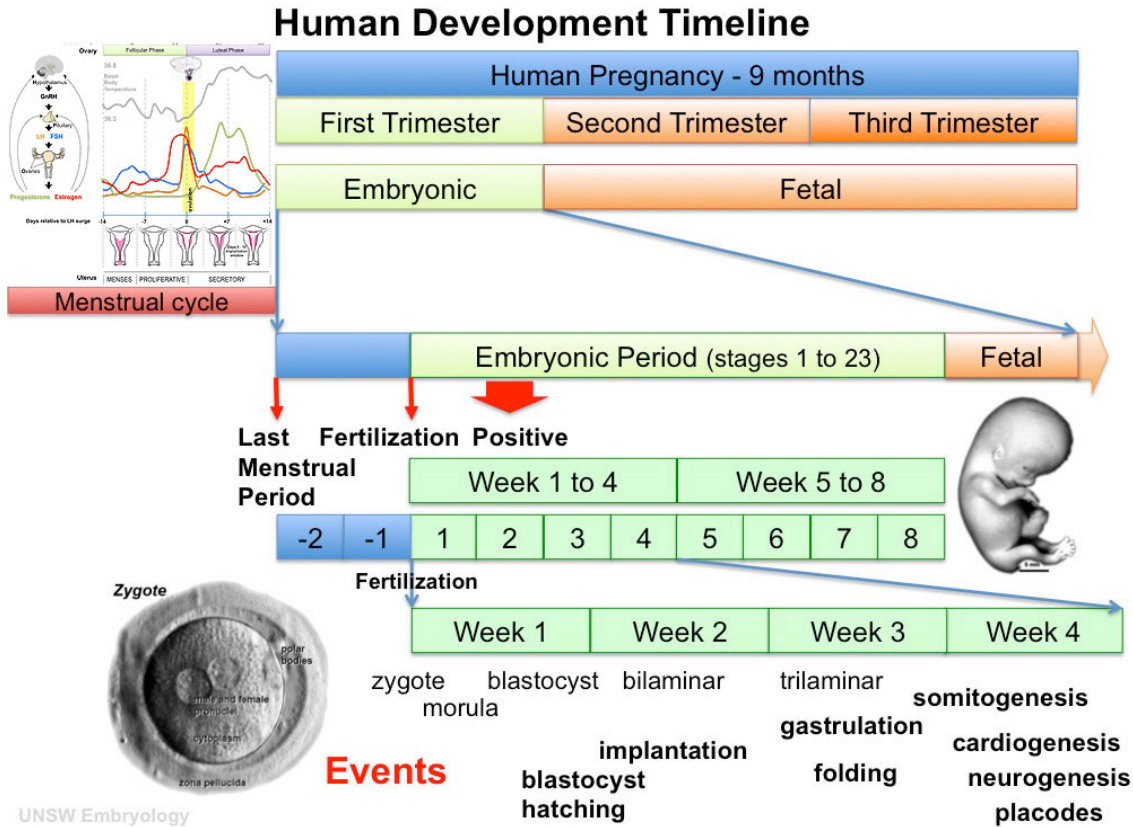
Development <http://dev.biologists.org>

Developmental Dynamics <http://www3.interscience.wiley.com/cgi-bin/jhome/38417>

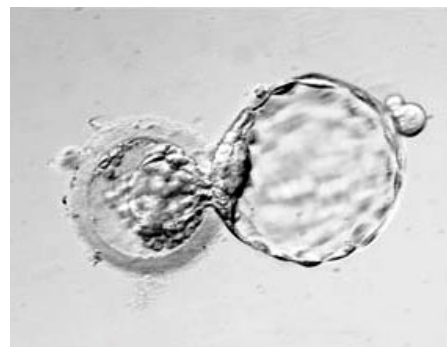
Human Reproduction: <http://humrep.oupjournals.org>

Practical 3: Embryology fertilization

Gametes	Fertilization	Blastocyst	Implantation	Embryo	Fetus
Menstrual Cycle			Placenta and Fetal Membranes		



Human Zygote
(Carnegie stage 1, day 1)



Blastocyst hatching from zona pellucida
(Carnegie stage 3, day 4-5)

Aim

Understand key events in human development from gametogenesis, to fertilization and implantation.

Key Concepts

Gonad, gametogenesis, ovary, oocyte, sperm, meiosis/mitosis, follicle, ovulation, zona pellucida, polar bodies, hormonal changes, mechanism of fertilization, post-fertilization changes, corpus luteum, zygote, morula, blastocyst, zona pellucida, embryoblast, trophoblast, ectopic implantation, abnormalities.

Key Reading:

1. Schoenwolf, G.C., Bleyl, S.B., Brauer, P.R. and Francis-West, P.H. (2009). Chapter 1, 2, and 3 in *Larsen's Human Embryology* (4th ed.). New York; Edinburgh: Churchill Livingstone..
2. Moore, K.L. & Persaud, T.V.N. (2008). Chapter 1 and 2 in *The Developing Human: clinically oriented embryology* (8th ed.). Philadelphia: Saunders.

Online Resource:

http://php.med.unsw.edu.au/embryology/index.php?title=BGDA_Practical_-_Fertilization_to_Implantation

Introduction

Fertility and infertility issues are a common clinical topic and a scientific knowledge of this process is vital for your ability to explain key concepts to patients. This is also an area where scientific research is still making great clinical changes in regulating fertility (birth control), infertility (in vitro fertilization) and prenatal diagnosis (invasive/non-invasive testing). Note that fertility, infertility, genetic testing and stem cells are key current ethical and legal topics.

The generation of gametes (haploid) in the ovary (oocyte, egg) and testis (spermatozoa) and their coming together at fertilization (diploid) and the early events that follow are the focus of this practical class.

Fertilization occurs during the normal female menstrual cycle and the first 1 to 2 weeks of development occur without implantation within the uterus and only implantation can stop the menstrual cycle. Fertilization is a highly regulated biological process combining two different genetic backgrounds in a unique new combination with future postnatal health ramifications. Due largely to the timing, birth control, genetic and uterine abnormalities most fertilization events will not continue to develop into an embryo and will be lost. Note also that it is during these first 2 weeks that both embryonic stem cells are available and twinning events can occur.

Implantation of the conceptus leads to maternal and embryonic changes that include the development of a specialized shared organ, the placenta. These topics will be covered in other lectures and practicals. Only abnormal implantation events will be covered in this current practical.

The practical class will work through a series of online materials that cover gametogenesis, fertilization and implantation. The online materials alone are sufficient to cover the topic at this current level, additional content and resources are provided as links on each page. Make sure to construct your own notes and resources during the practical and attempt the linked Quiz when you have finished in your own time.

Notes

1. All events that occur from gametogenesis to implantation cannot be covered in depth in today's two hours class. All practical material is available online and content is permanently available through the web, as are the additional resources.
2. All timings are only approximate and refer to embryonic days from fertilization (post-fertilization age) and **not** the clinical measurement from Last Menstrual Period (LMP) or gestational age (GA).
3. Some of the later implantation events will also be revised in the Embryology class (Practical 7) so today mainly focuses on the earlier events.
4. Consider also the maternal changes that occur during this period, that commence after fertilization with implantation (week 2). This will be also covered in the Fetal Membranes class (Practical 8).
5. Other Anatomy classes cover anatomy and histology of the gonads and uterus will be covered in
6. For the new terms introduced in the class use the linked glossary (A - Z found at the bottom of each page) or the search window (at the top of each page).