

PRACTICAL CLASS PROGRAM:

- Weekly Quiz (10-15 minutes)
- Revise quiz questions (5 - 10 minutes)
- Practical class activities (85 minutes)
- Revise practical class activities (15 minutes)

PRACTICAL CLASS ACTIVITIES:

In this practical class, we will do a number of activities that will allow you to apply, exercise and rehearse the knowledge that you obtained during the first 3 embryology lectures. Please organize yourselves into small groups of 4-5 students to form 6 groups.

We will do the following activities:

1. Embryology models: pre-implantation (group activity) (30 minutes)
2. Embryology models: post-implantation and gastrulation (group activity) (30 minutes)
3. Playdough embryo modelling of pre-implantation embryogenesis (group activity) (30 minutes)
4. Playdough embryo modelling of gastrulating embryos (group activity) (30 minutes)
5. Histology of gonads and preimplantation embryos (individually/group) (30 minutes)
6. Histology of implantation embryos (individually/group) (30 minutes)
7. Study human specimens of developmental abnormalities and present to class in 5 minutes per group (group activity) (50 minutes: 20 minutes preparation + 6 x 5-minute presentations)

We will have tables set up for activities 1-4. Activities 5-7 can be done individually or group-wise anywhere in the classroom. Annemiek will tell when to move on to the next activity and will be available for help. You can also consult your lecture notes and the internet.

LEARNING OBJECTIVES:

- Understand gametogenesis and fertilization
- Understand preimplantation.
- Understand implantation
- Understand the process of gastrulation and the trilaminar embryo.
- Understand the development of the germ layers: ectoderm, mesoderm and endoderm.
- Understand abnormalities associated with this period of development.

Activity 1: Embryology models: pre-implantation (group activity)

Study the embryo models provided and discuss with each other the various stages of development and the structures that you observe. Identify the following:

- Zona pellucida
- Male and female pronuclei
- Cumulus radiata
- Polar bodies
- Blastomeres
- Morula
- Compacted morula
- Blastocyst
- Blastocoel
- Inner cell mass
- Trophoblast

Activity 2: Embryology models: post-implantation and gastrulation (group activity)

Study the embryo models provided and discuss with each other the various stages of development and the structures that you observe. Identify the following:

- Hypoblast
- Epiblast
- Amniotic cavity
- Yolk sac
- Heuser's membrane/exocoelomic membrane
- Chorionic cavity
- Cytotrophoblast
- Syncytiotrophoblast
- Extraembryonic mesoderm
- Trophoblastic lacunae
- Primitive streak
- Node
- Notochord
- Ectoderm
- Mesoderm
- Endoderm
- Neural plate
- Primitive gut
- Cloaca
- Stomodeum/buccopharyngeal membrane

Activity 3: Playdough embryo modelling of pre-implantation embryogenesis (group activity)

Make the following embryonic stages using playdough. Use different colours to represent the different blastomere types/structures:

1. Zygote:
2. Morula:
3. Compacted morula:
4. Blastocyst:

Make a photo of the models, add annotations in Powerpoint or similar, and post the images of these annotated playdough models on [Padlet](#).

Activity 4: Playdough embryo modelling of gastrulating embryos (group activity)

Make playdough models of the following three developmental stages that illustrate the transformation of the bilaminar embryonic disc into a trilaminar embryonic disc (please only model the embryonic disc, and not the cavities and surrounding membranes). Use different colours to represent the different structures:

1. Bilaminar embryo (omit the chorionic sac, amniotic cavity, and yolk sac).
2. Gastrulating embryonic disc
3. Trilaminar embryo

Ensure that the following structures are represented in these models where relevant:

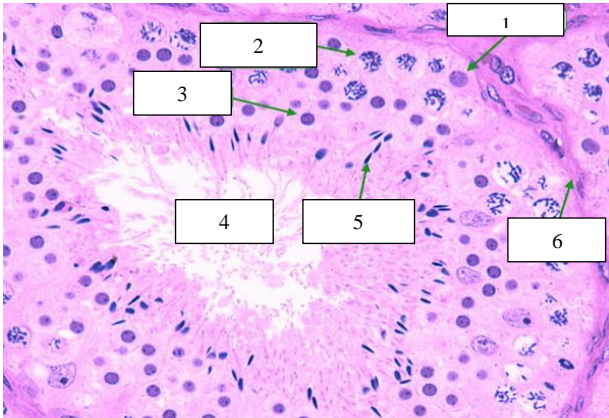
- Epiblast
- Hypoblast
- Node
- Primitive streak
- Ectoderm
- Mesoderm
- Endoderm
- Connecting stalk

What embryonic tissues are formed at gastrulation?

Make a photo of the models, add annotations in Powerpoint or similar, and post the images of these annotated playdough models on [Padlet](#).

Activity 5: Histology of gonads and preimplantation embryos (individually/group)

Identify the tissue and the labelled structures in these images:



Tissue:

1:

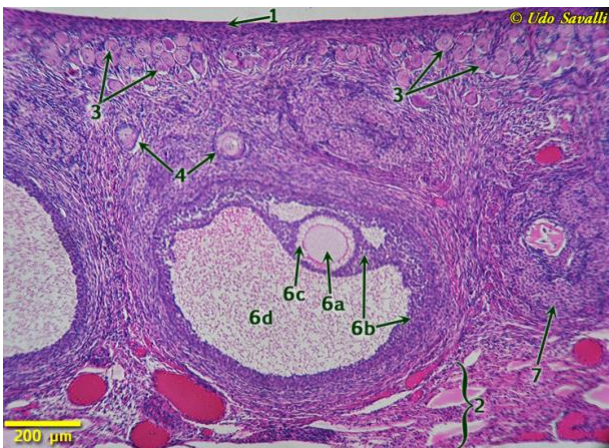
2:

3:

4:

5:

6:



Tissue:

1:

2:

3:

4:

6a:

6b:

6c:

6d:

7:

Please study the 3D reconstructions and serial H&E stained tissue sections through the embryos available on Virtual Human Embryo through the following links:

- [Carnegie stage 2 human embryo](#)
- [Carnegie stage 3 \(early\) human embryo](#)
- [Carnegie stage 3 \(late\) human embryo,](#)

Identify the following structures:

- Blastomere
- Zona pellucida
- Cleavage furrow
- Polar body
- Blastocoel
- Inner cell mass
- Trophoblast
- Hypoblast
- Epiblast

Activity 6: Histology of implantation embryos (individually/group)

Please study the 3D reconstructions and serial H&E stained tissue sections through the embryos available on Virtual Human Embryo through the following links:

- [Carnegie stage 4 human embryo](#)
- [Carnegie stage 5 human embryo](#)
- [Carnegie stage 7 human embryo.](#)

Identify the following structures:

- Blastocoel
- Inner cell mass
- Trophoblast
- Hypoblast
- Epiblast
- Amniotic cavity
- Yolk sac
- Connecting stalk
- Heuser's membrane/exocoelomic membrane
- Chorionic cavity
- Cytotrophoblast
- Syncytiotrophoblast
- Endometrium
- Uterine stroma
- Extraembryonic mesoderm
- Trophoblastic lacunae
- Primitive streak
- Node
- Notochord
- Ectoderm
- Mesoderm
- Endoderm

Activity 7: Study human specimens of developmental abnormalities and present to class in 5 minutes per group

Each group will be assigned a human developmental abnormality related to the first 3 weeks of development. Each group is asked to collectively investigate the disease symptoms and the developmental origins of the abnormality, and to present this to the class in short 5-minute presentations.

REVISE PRACTICAL CLASS ACTIVITIES

In the last 15 minutes we will collectively revise the activities with the entire class to wrap up this prac.