Vancouver Community College
Biology 1200/1120
Instructor Maria Morlin

March 2021 – hybrid course

Lab instructions for:

- **Embryo/development lab remote**

Embryo/development lab (remote)

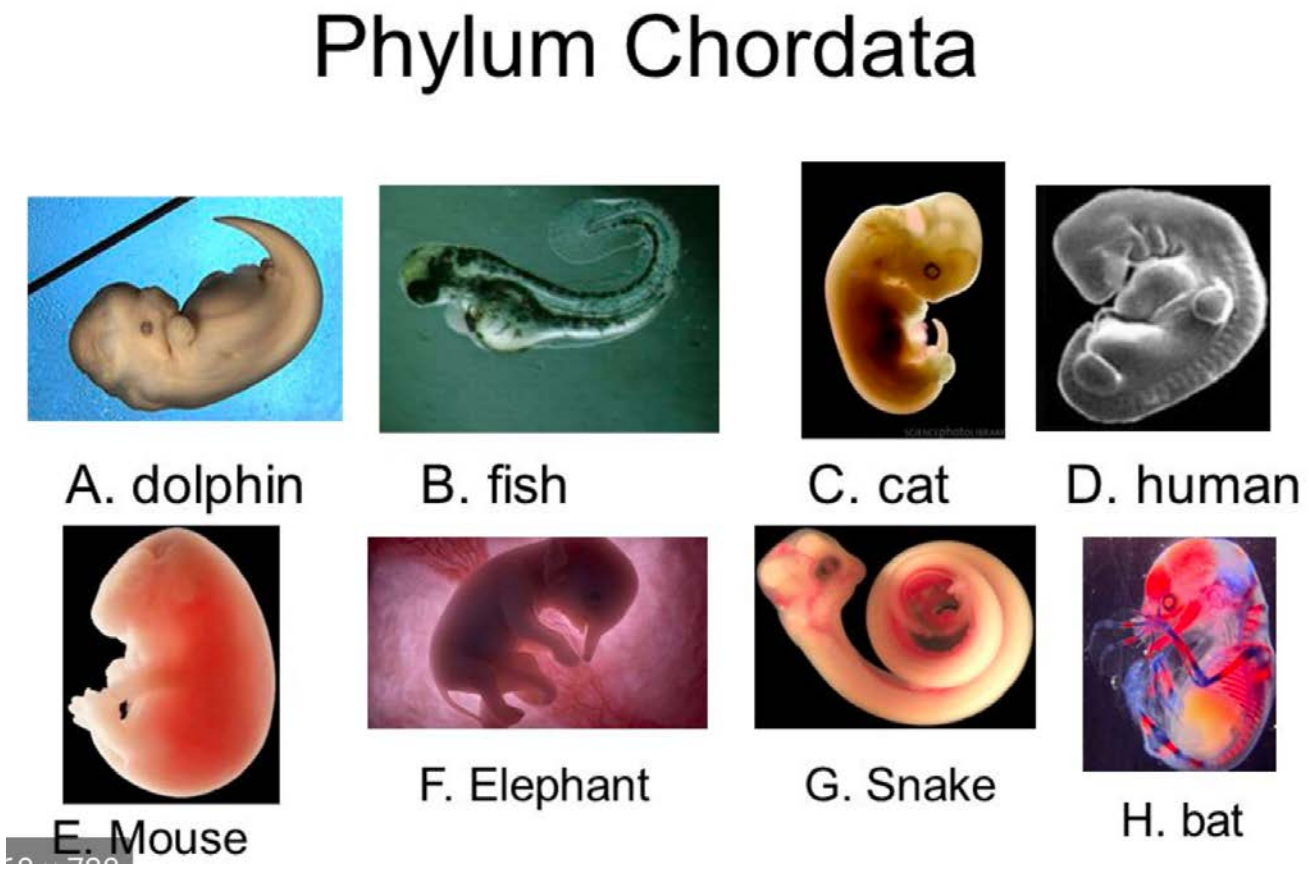
Objectives

- Investigate methods of development research
- Study fertilization and stages of development.

Methods

1. We used zoom, images and videos. Students followed instructions given by the instructor, and answered questions.
2. Students used a variety of online sources

Embryos in the phylum Chordata. What are the similarities and differences? What causes these?

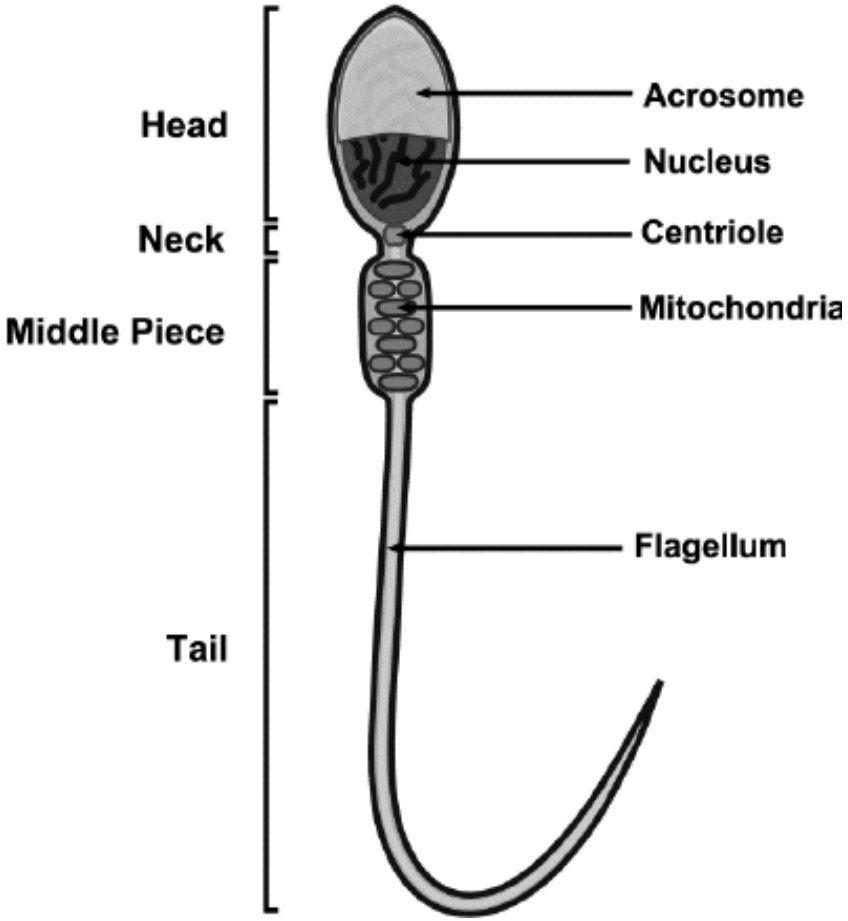


Investigation of fertilization

- The fertilization tango. https://www.youtube.com/watch?v=BXF4M4mG-ZM

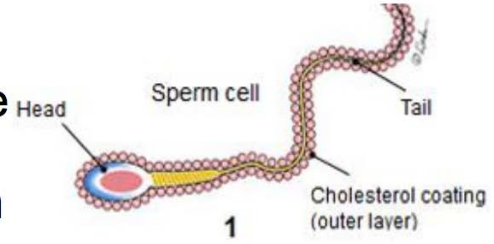
  - How long can sperm survive in the human body?
  - What is the energy source for sperm?
  - Describe capacitation.
  - Describe the acrosomal reaction.

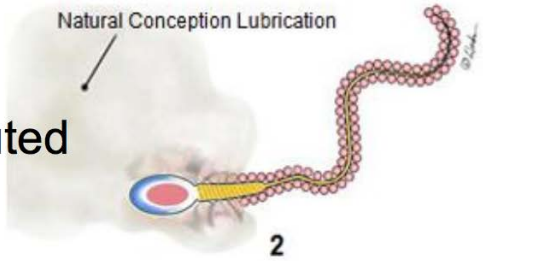
Sperm structure, sperm capacitation

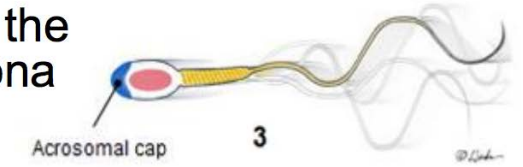


Sperm Capacitation

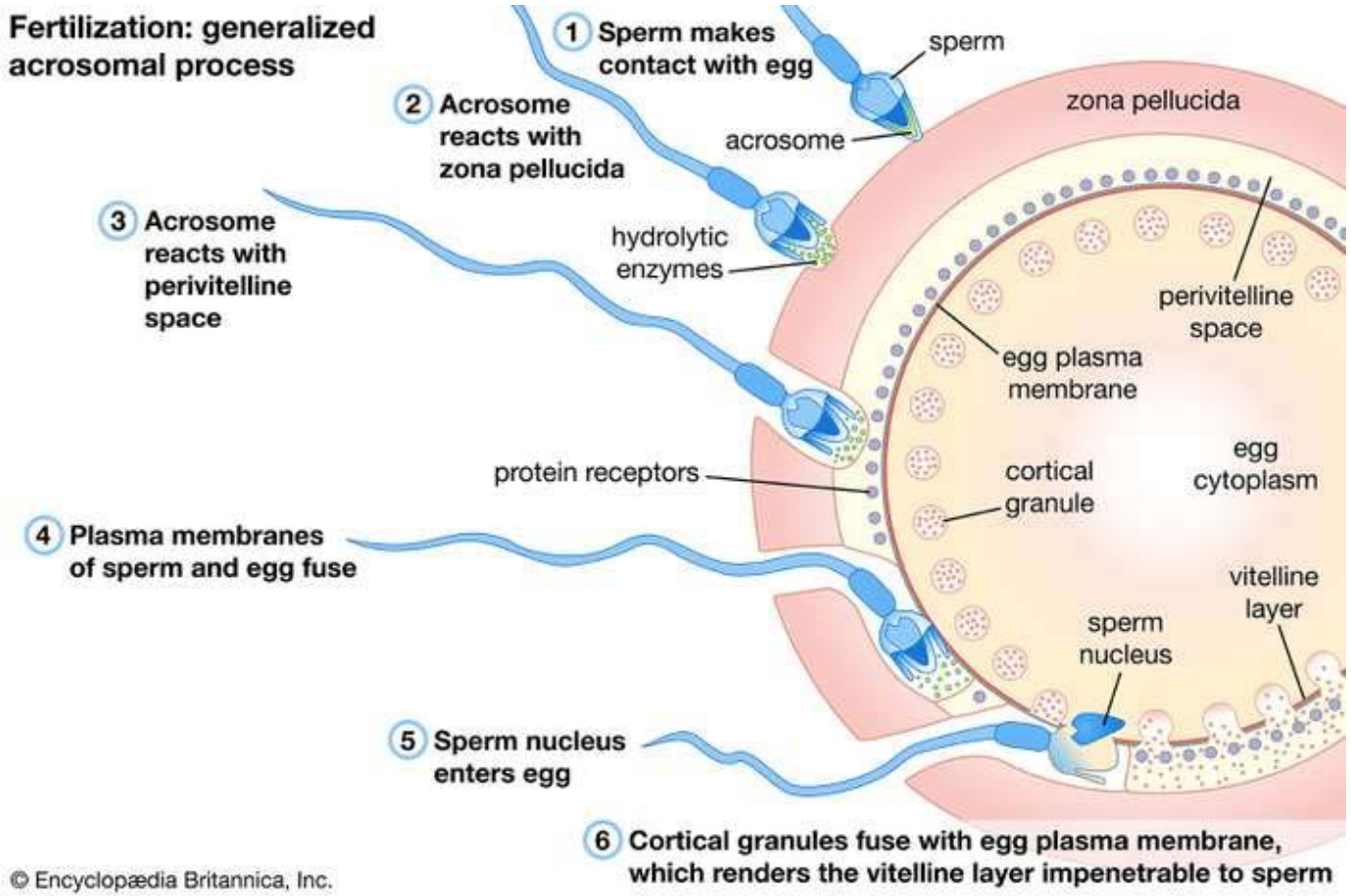
- Sperm acquire ability to fertilize eggs through this process
- Occurs while migrating through female reproductive tract
- Process in sperm involves:
  - Cholesterol withdrawal
  - Surface proteins redistributed
  - Calcium influx
    - Increases motility → whiplashing
- Capacitated sperm penetrate the corona radiata, contact the zona pellucida and undergo the acrosome reaction







Fertilization



Sea urchin fertilization

- https://www.youtube.com/watch?v=fO4UWj01Gx8

Describe what you observe.

Fertilization cone formed by cortical granules.

Fertilization cone formation: Gendered Innovations: Stanford

- https://www.youtube.com/watch?v=gtPd4Yn_18c

Human embryo fertilization to day six blastocyst.

- https://www.youtube.com/watch?v=RcjJ8LUvdkc
  - When does the embryo appear to get larger along the timeline?

Article on polarity and cell division:

- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5062000/

Sperm competition

Article: Sperm competition – the need for speed:

- https://elifesciences.org/articles/32009?gclid=EAIaIQobChMIn9a3_7m-6AIVFarsCh1HsQgCEAMYASAAEgJYJfD_BwE

Hopi's talk on sperm competition:

- https://www.youtube.com/watch?v=TnT5xHwq_ww

Sperm cooperation

Blog: Sperm cooperation

- https://www.lehmiller.com/blog/2014/8/7/sperm-cooperation-sometimes-sperm-swim-together-to-enhance-performance

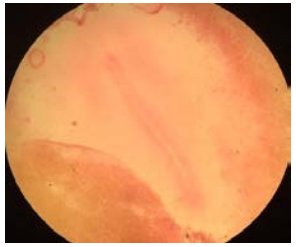
Zebrafish as a model for development studies

- https://www.youtube.com/watch?v=bEgygtbEo2A

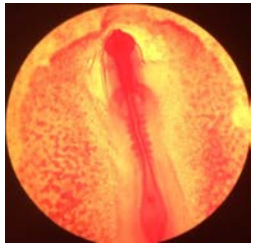
  - Why are zebrafish a good model for development studies?
  - Before 1000 cells are reached, what control differentiation?

Chicks as a model for development studies

- https://www.youtube.com/watch?v=vBGumRAWaa0



Chick 16 hours



Chick 24 hours

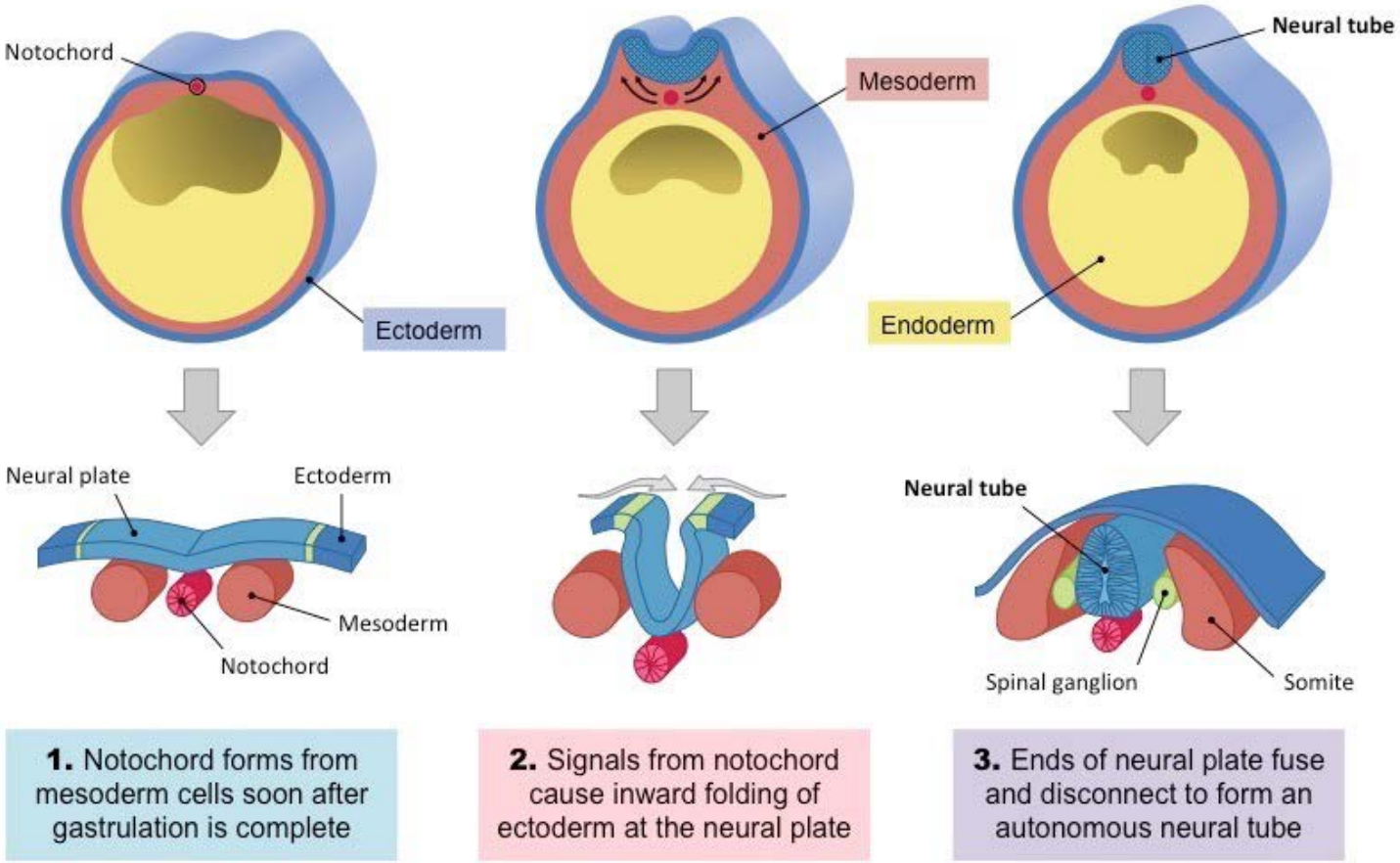
Chick 33 hours

Chick 48 hours

Chick 72 hours

- Which structures are visible at each stage?

Neurulation



C. Elegans as a model in neurology
https://www.youtube.com/watch?v=zjqLwPgLnV0

- Why use *C. elegans*?

Differentiation

First discoveries

- https://www.youtube.com/watch?v=z1_acvRB6Jo

An article about gene expression regulating cell differentiation:

- https://www.nature.com/scitable/topicpage/gene-expression-regulates-cell-differentiation-931/

Khan Academy on early embryogenesis

- https://www.youtube.com/watch?v=dAOWQC-OBv0

- What is the result of each stage of early development?
  - Cleavage
  - Blastulation
  - Gastrulation
  - Neurulation

Khan Academy: on cell differentiation or specialization

- https://www.youtube.com/watch?v=YtvL-LQlPrU

- Which cell does not have a nucleus?
- A gene turned on is being _____.
- Are genes also turned off in a cell?
- What are the features of cells that make them different?
- How do they know which proteins to make?
- What do transcription factors and mRNA do?
- What is inductive signalling?

Review development:

- https://www.khanacademy.org/science/biology/developmental-biology/development-and-differentiation/a/introduction-to-development