

Embryology

Objectives:

1. Describe the critical events that take place during embryo development to form a functional human body
2. Understand the cellular basis of the mechanisms of these events
3. Use this knowledge to predict what would happen if things do not go to plan

Congenital disorders:

- Can be structural or functional
 - Structural: malformation of limbs
 - Functional: metabolic disorders

Periods of human embryology:

- Egg - fertilisation to end of 2nd week
- Embryo - beginning of 3rd week to end of 8th week
- Foetus - 3rd month to birth

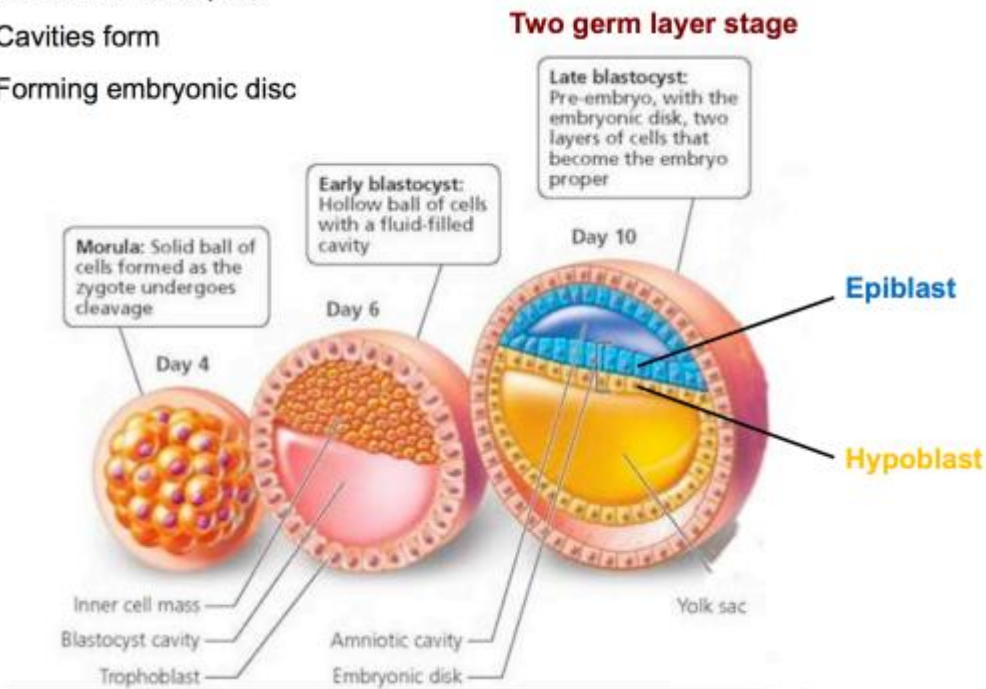
Stages - Egg:

1. Ovulation - secondary oocyte released and swept into oviduct
2. Fertilisation - single sperm penetrates the secondary oocyte. Sperm and egg nuclei fuse resulting in a fertilised egg/zygote
3. Cleavage - The zygote soon undergoes rapid mitotic cell division as it moves along the oviduct toward the uterus becoming a pre-embryo
4. Morula - by day 4 due to successive division a 3D ball of solid cells is produced that enters the uterus. From morula to blastocyst --> you get cell differentiation
5. Blastocyst - day6, pre-embryo becomes a blastocyst
 - Two types of cell
 - Outer epithelial layer - trophoblast --> this forms extraembryonic structures and is part of the placenta - aka they do not contribute to the embryo itself
 - Inner cell mass - embryonic stem cells - give rise to the whole embryo
 - Between 5 and 10 days the blastocyst implants into uterine wall

Gastrulation

- After implantation into cell wall the cells of blastocyst further differentiate and you move onto the **two germ layer stage**:
 - Whereby, the inner cell mass splits and differentiates into the epiblast and hypoblast

- Cavities form
- Forming embryonic disc



- Cavities form
- The embryonic disc begins to form
- Gastrulation begins by the formation of the primitive streak which defines all major body axes. The primitive streak forms from the epiblast on the caudal end
- Formation of the three germ layers: they all give rise to all the tissues and organs
 - Ectoderm
 - Mesoderm
 - Endoderm
- Gives rise to distinct tissues in adult

Formation of the primitive streak

- On the upper surface on the bilaminar disc which is on the epiblast a line of thickened cells will appear --> this is the primitive streak. This occurs approximately 15 days after fertilisation and is the first sign of gastrulation occurring.
- The primitive streak then invaginates to form the primitive groove --> as the groove forms cells start to **migrate medially** into the groove
- The primitive streak will determine where the head and tail of the embryo will be and it does so by forming from the caudal end of the embryo and defines the midline as well

The three layer stage:

- The epithelium cells in the epiblast lose their epithelial properties and be mesenchymal
- The first cells move into the hypoblast to form the embryonic endoderm - they push the hypoblast cell layer outwards and replace it
- Later cells move into the space between the epiblast and endoderm to become the embryonic mesoderm - forms between the two layers - the cells will keep moving in so that they fill the whole embryonic disc
- Cells left in epiblast become the embryonic ectoderm