TOPIC 11.4: EMBRYOGENESIS

Fertilisation

Fertilisation involves the fusion of male and female gametes
- Animal fertilisation can be internal or external

Human fertilisation is internal and involves key three stages:

Capacitation
- Uterine chemicals dissolve the sperm's cholesterol coat, improving its mobility

Acrosome Reaction
- The acrosome releases hydrolytic enzymes which soften the glycoprotein matrix of the jelly coat *(enables penetration)*

Cortical Reaction
- Cortical granules release enzymes to destroy the sperm binding sites on the jelly coat (prevents polyspermy)

Implantation

After fertilisation, the **zygote** undergoes several mitotic divisions to form a bundle of cells (called a **morula**)

Unequal division of a morula results in a **blastocyst**, with:
- An inner cell mass (develops into an *embryo*)
- An outer layer called the trophoblast (forms the *placenta*)
- A fluid-filled cavity (blastocoele)

These developments occur in the *oviduct* – when a blastocyst reaches the uterus, it becomes embedded in the *endometrium*

Zygote | Morula | Blastocyst

Pregnancy

When a blastocyst implants within the endometrium, it begins to secrete hCG (human chorionic gonadotropin)

hCG prevents the degeneration of the corpus luteum in the ovary (which continues to produce estrogen + progesterone)

Progesterone maintains the endometrium until the placenta develops (at which point, levels of hCG will begin to drop)

Placenta

The placenta functions to provide support to the fetus:
- It is disc-shaped and connected via an umbilical cord

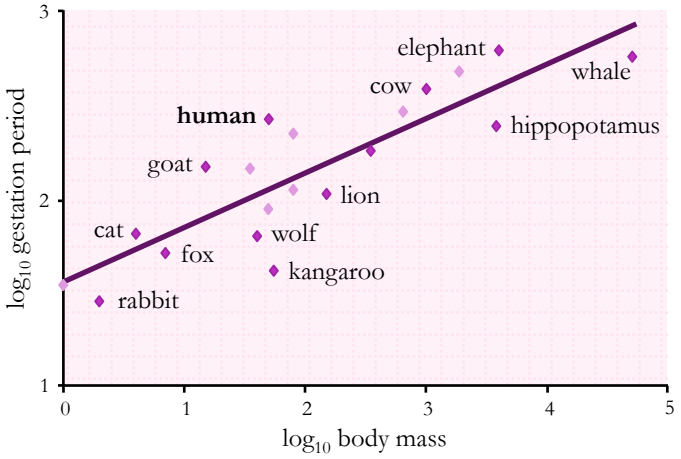
The placenta exchanges materials between mother and fetus
- Maternal blood pools via *open-ended arterioles* into **lacunae**
- Fetal *chorionic villi* extend into lacunae to transfer material
  - ⇨ Nutrients/oxygen/antibodies are transferred to fetus
  - ⇨ Carbon dioxide/waste (urea) is transferred to mother

The placenta produces hormones required for pregnancy
- *Progesterone:* Develops endometrium / stops contractions
- *Estrogen:* Develops myometrium and mammary glands

Gestation Periods

A gestation period is the time taken for a fetus to develop
- Altricial animals are born helpless *(need extensive rearing)*
- Precocial animals are born developed *(no rearing needed)*

While other factors contribute, there is a positive correlation between animal size and development of young at birth



Birth

Birth involves **positive feedback** *(response reinforces change)*
- Stretching of the uterus triggers hormonal release
- Oxytocin stimulates uterine contractions
- Estrogen inhibits progesterone *(was blocking contractions)*