

Embryonic Development- 2025

□ Gametogenesis

- Process where cells divide and differentiate to form mature, haploid gametes (sperm & eggs)

□□ Spermatogenesis

- Sperm = male gamete
- Spermatocytes formed in testes
- Continuous production

□ Oogenesis

- Ovum = egg cell
- Formed in ovaries
- Born with ~2 million oocytes
- 400–500 mature in lifetime
- Only 1 matures/month

□ Gamete Chromosomes

- Sperm & egg: 23 chromosomes (22 autosomes + 1 sex chromosome each)
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□ Fertilization

- **Location:** Outer 1/3 of fallopian tube
- High estrogen during ovulation:
 - Increases tube contractility
 - Thins cervical mucus
 - Helps sperm reach ovum (~4–6 hours)

□ Sperm Penetration

- Enzyme: *Hyaluronidase*
- Takes 20–30 seconds
- Only 1 sperm enters
 - Head detaches & enlarges
 - Becomes *male pronucleus*

After Penetration

- Ovum matures → *female pronucleus*
 - Male + female pronuclei unite → **Zygote**
 - Genetic material paired
 - Chromosomal abnormalities can occur at this moment
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□ Early Embryo Development

- **Zygote** spends 24 hrs in ampulla (outer 3rd of fallopian tube)
- Reaches uterus in 3–4 days
- Divides rapidly: Zygote → Morula → Blastocyst
 - Trophoblast: placenta
 - Embryoblast: embryo

□ Implantation

- 6–10 days after fertilization
- Endometrium thickens & becomes vascular
- Blastocyst burrows into endometrium ~implantation
 - May cause light bleeding

Embryonic Development- 2025

☐ Primary Germ Layers (10–14 days post-conception)

☐ 1. Ectoderm

- Nervous system (brain, spinal cord)
- Skin, hair, nails
- Enamel of teeth
- Sense organs (eyes, ears, nose)
- Pituitary gland

☐ 2. Mesoderm

- Musculoskeletal (muscles & bones)
- Spleen
- Urogenital & reproductive systems
- Cardiovascular system
- Teeth

☐ 3. Endoderm

- Lining of digestive & respiratory tracts
 - Liver, pancreas
 - Bladder, urethra
 - Vagina
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☐ Embryonic Membranes

☐ Amnion

- Thin inner membrane (develops wk 2)
- Surrounds embryo
- Holds amniotic fluid
- Becomes outer covering of umbilical cord

☐ Chorion

- Thick outer membrane
 - Develops from trophoblast
 - Chorionic villi (smooth by month 4 except at attachment site)
 - Used for early genetic testing (8–10 weeks)
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☐ Amniotic Fluid

- Clear/yellow, continuously reabsorbed & replaced
- Volumes:
 - 10 mL (wk 8)
 - 250 mL (wk 16)
 - 800 mL (wk 32)
 - 500 mL (wk 41)

Functions

- Movement, protection, temp control
- Electrolyte balance
- Swallowing → excretion by fetus
- Symmetrical growth

△ Abnormalities

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- **Polyhydramnios:** >2000 mL (baby can't swallow)
 - **Oligohydramnios:** <300 mL (renal issues)
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☐ Yolk Sac

- Develops 8–9 days post-conception
 - ⚙️ Functions:
 - Makes RBCs (first 6 weeks)
 - Nourishes embryo before implantation
 - Later becomes part of digestive system & umbilical cord
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☐ Umbilical Cord

- Connects fetus to placenta
 - 40–70 cm long
 - Covered by:
 - **Amnion**
 - **Wharton's Jelly** (protects vessels)
 - Contains:
 - 2 Arteries
 - 1 Vein
 - ☐ Possible issues:
 - **Cord compression**
 - **Nuchal cord** (wrapped around neck)
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☐ Placenta

⚙️ Functions

- **Endocrine gland:** Produces hCG, estrogen, progesterone, hPL
- **Metabolic**
- **Circulatory:**
 - Closed fetal circulation
 - Exchange via **diffusion** through **chorionic villi**