PLACENTAL PATHOPHYSIOLOGY

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IMPLANTATION

5-10 days
Primary villus
Amniotic cavity
Trophoblastic lagoon

11-12 days
Secondary villus
Extravillous trophoblast
Cytotrophoblast
Epiblast
Hypoblast
Extraembryonic mesoderm
Primary yolk sac
Secondary yolk sac forming
Remnants of primary yolk sac

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PLACENTAL CIRCULATION

FETAL SURFACE
MATERNAL SURFACE

HISTOLOGY: UMBILICAL CORD
HISTOLOGY: PLACENTAL DISC-FETAL SURFACE

HISTOLOGY: PLACENTAL DISC- MATERNAL SURFACE
HISTOLOGY: VILLOUS ARCHITECTURE

Moore & Persaud: The developing human: Clinically oriented embryology
FUNCTIONS OF THE PLACENTA

PLACENTAL HORMONES
Human Chorionic Gonadotropin (HCG)

- Secreted by Syncytiotrophoblast Cells
- Structurally similar to pituitary LH
- Prolongs survival of Corpus luteum, thus maintaining steroid hormone levels in pregnancy.
- Detectable in maternal plasma 7-10 days after implantation
- Levels peak at 8-10 weeks’ gestation

Human Placental Lactogen (HPL)

- A.K.A Chorionic Somatomammotropin
- Secreted by Syncytiotrophoblast Cells
- Structurally similar to pituitary Growth Hormone and Prolactin
- Metabolic effects- Insulin antagonist
- Promotes breast development
### Placental Endocrine Functions: Steroid Hormones

<table>
<thead>
<tr>
<th>MOTHER</th>
<th>PLACENTA</th>
<th>FETUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL Cholesterol (Blood)</td>
<td>LDL Cholesterol (Blood)</td>
<td>LDL Cholesterol</td>
</tr>
<tr>
<td>DHEAS (Adrenal)</td>
<td>DHEAS (Adrenal)</td>
<td>DHEAS (Adrenal)</td>
</tr>
<tr>
<td>Progesterone</td>
<td>Sulfatase</td>
<td>Estrone</td>
</tr>
<tr>
<td>3 Beta OH steroid DH</td>
<td>3 Beta OH steroid DH</td>
<td>Estradiol</td>
</tr>
</tbody>
</table>

**Key:**
- **DHEAS**: Dehydroepiandrosterone sulfate
- **3 Beta OH steroid DH**: 3 beta hydroxy steroid dehydrogenase


### Dehydroepiandrosterone (C19)

![Dehydroepiandrosterone](image)

**3 beta-hydroxy steroid dehydrogenase**
Androstenedione
\( (C_{19}) \)

Aromatase

 Estrone
\( (C_{18}) \)

17 beta-hydroxy steroid oxidoreductase
OTHER PLACENTAL HORMONES

- Placental Prolactin
- Placental Thyrotropin
- Placental ACTH and CRF
- Placental growth hormone
- Other peptides- Activin, inhibin, follistatin, urocortin, leptin, IGF etc.
Fetoplacental hormones and peptides in prenatal screening

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Status in Tri 21</th>
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</thead>
<tbody>
<tr>
<td>HCG</td>
<td>Elevated</td>
</tr>
<tr>
<td>uE3</td>
<td>Decreased</td>
</tr>
<tr>
<td>AFP</td>
<td>Decreased</td>
</tr>
<tr>
<td>Inhibin A</td>
<td>Elevated</td>
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</tbody>
</table>

AFP is elevated in Neural Tube Defects

DEVELOPMENTAL PATHOPHYSIOLOGY
ECTOPIC IMPLANTATION

PLACENTA PREVIA & PLACENTA ACCRETA
MECHANICAL PATHOPHYSIOLOGY

CORD KNOTS & TWISTS
CORD: VELAMENTOUS INSERTION

ABNORMAL MEMBRANE ATTACHMENT
MEMBRANE RUPTURE: AMPUTATIONS

INFLAMMATORY PATHOPHYSIOLOGY
INFLAMMATION: CHORIOAMNIONITIS

Acute Funisitis
Meconium

Acute villitis
Acute intervillositis.
Placental infection: Listeria

Listeriosis

Placental Microabscesses
Villous necrosis
Heavy growth of Listeria in postmortem cultures
TRANSPLACENTAL (TORCH) INFECTIONS

Parvoviral inclusions in villi
Cytomegalovirus: Characteristic nuclear inclusions

Chronic Villitis (non-specific)
VASCULAR PATHOPHYSIOLOGY

FETAL VASCULAR PATHOLOGY
Maternal Vascular Pathology: Pre-eclampsia

Maternal vascular pathology: Placental Infarct
Maternal vascular pathology: Placental Abruption

NEOPLASTIC PATHOPHYSIOLOGY
VASCULAR TUMOR- CHORANGIOMA

TROPHOBLASTIC TUMORS HYDATIDIFORM MOLES

COMPLETE = Diploid
2 Pat, 0 Mat.

PARTIAL = Triploid
2 Pat, 1 Mat
HYDATIDIFORM MOLES - GENETICS

COMPLETE MOLE

Two sperm (XX or XY) + Egg

or

X sperm + Egg

No Maternal DNA

No Maternal DNA

Duplication of sperm DNA

Paternal chromosomes only (Androgenetic mole)

46XX or 46XY

PARTIAL MOLE

23X + 23X

23Y + 23X

One or two sperm + Egg

46XY

69XXX or 69XY

Maternal and paternal chromosomes (Triploid)

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MULTIPLE GESTATIONS
TWINS- Dizygotic

- TWO AMNIONS
- TWO CHORIONS
  (fused or separate)

TWINS- Monozygotic

- TWO AMNIONS
- TWO CHORIONS
  (fused or separate)
TWINS- Monozygotic

FORMATION OF MONOAMNIONIC TWINS
(including conjoined twins)

TWIN ZYGOSITY AND CHORIONICITY

ZYGOSITY
- Dichorionic: Separate
  - Monoamnionic
    - Always Monozygotic
  - Diamnionic
    - Monozygotic
- Monochorionic: Fused
  - Monoamnionic
  - Conjoined

CHORIONICITY
- May be Monozygotic or Dizygotic
Twin placenta - fused discs

Dichorionic Diamnionic placenta
Monochorionic Diamnionic placenta

Monochorionic twins with Vascular anastomosis
Twin-Twin transfusion syndrome

Twin placenta- Monoamnionic, with entangled cords
Twin placenta- fetus papyraceus

ENJOY THE LAB!