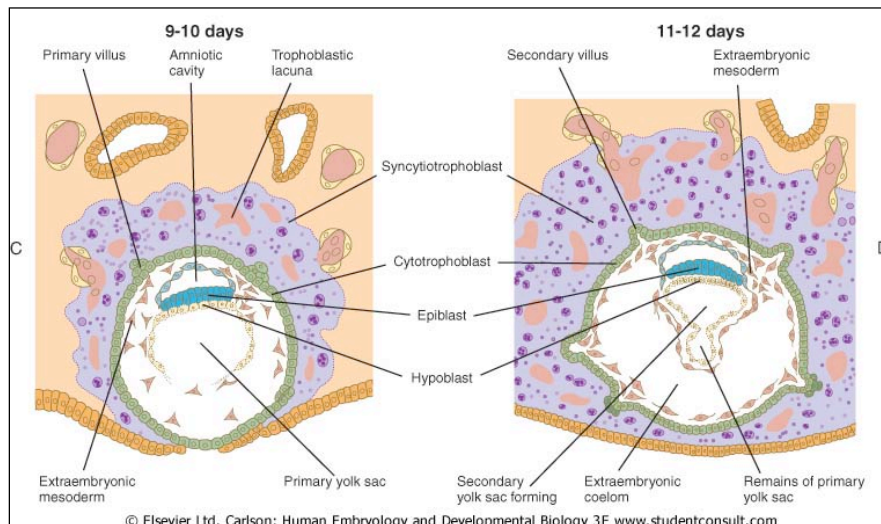


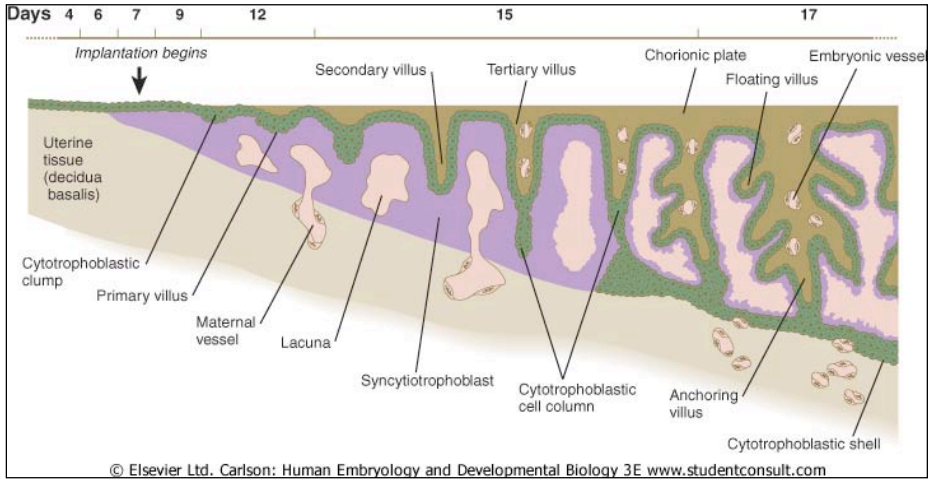
# PLACENTAL PATHOPHYSIOLOGY

Harsh Thaker, MD, PhD  
ht89@columbia.edu

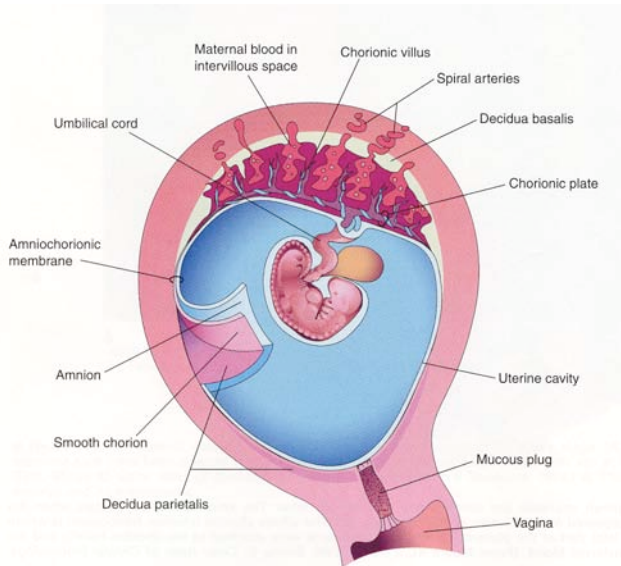
## IMPLANTATION



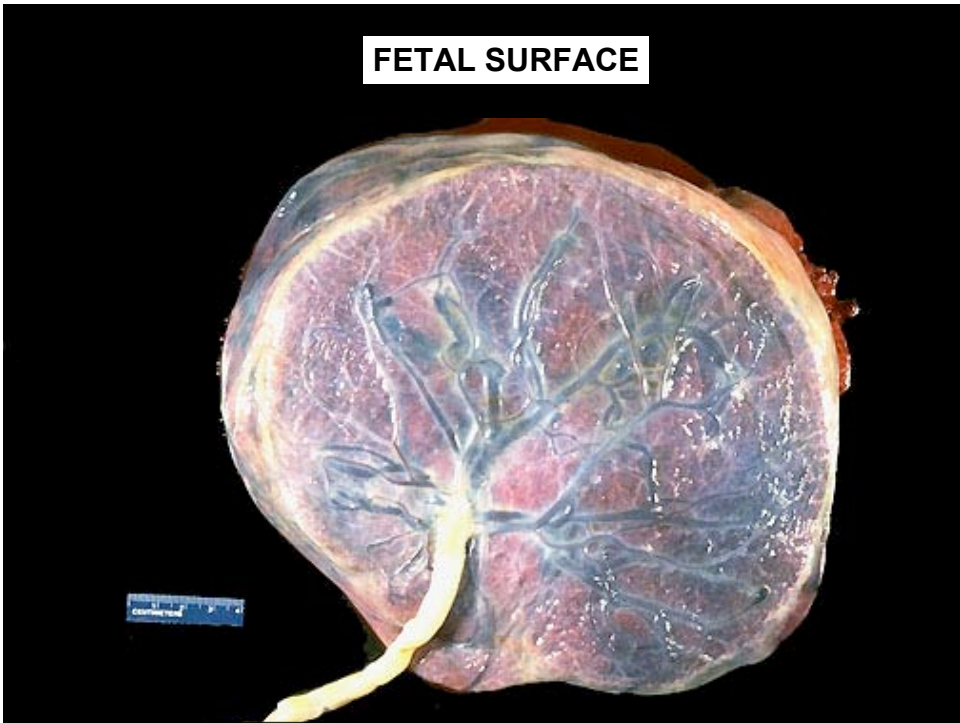
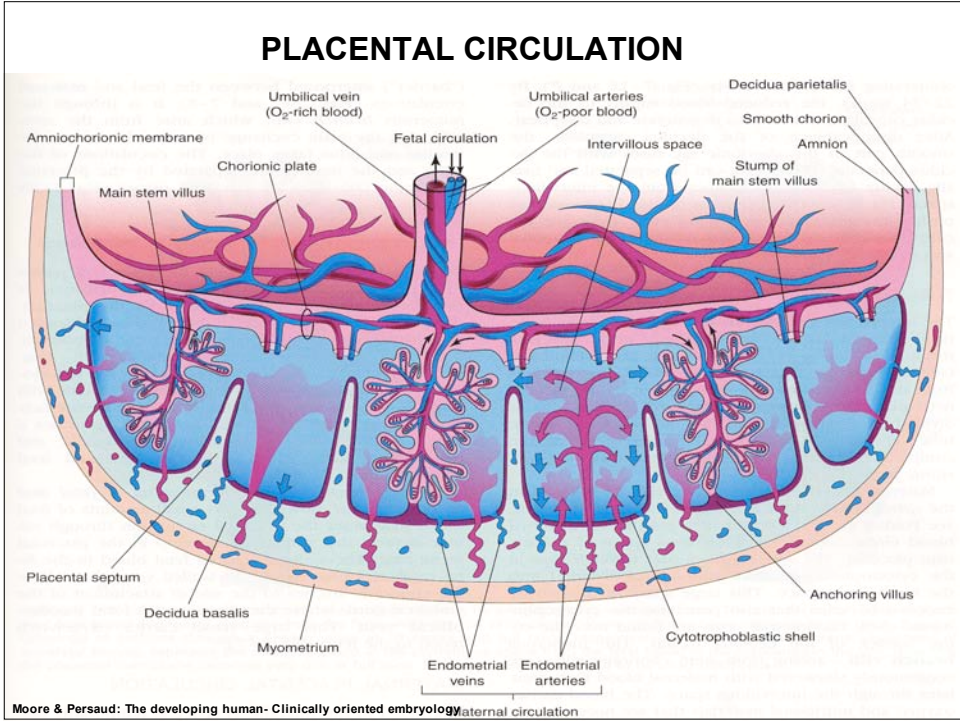
# TROPHOBLAST AND VILLI



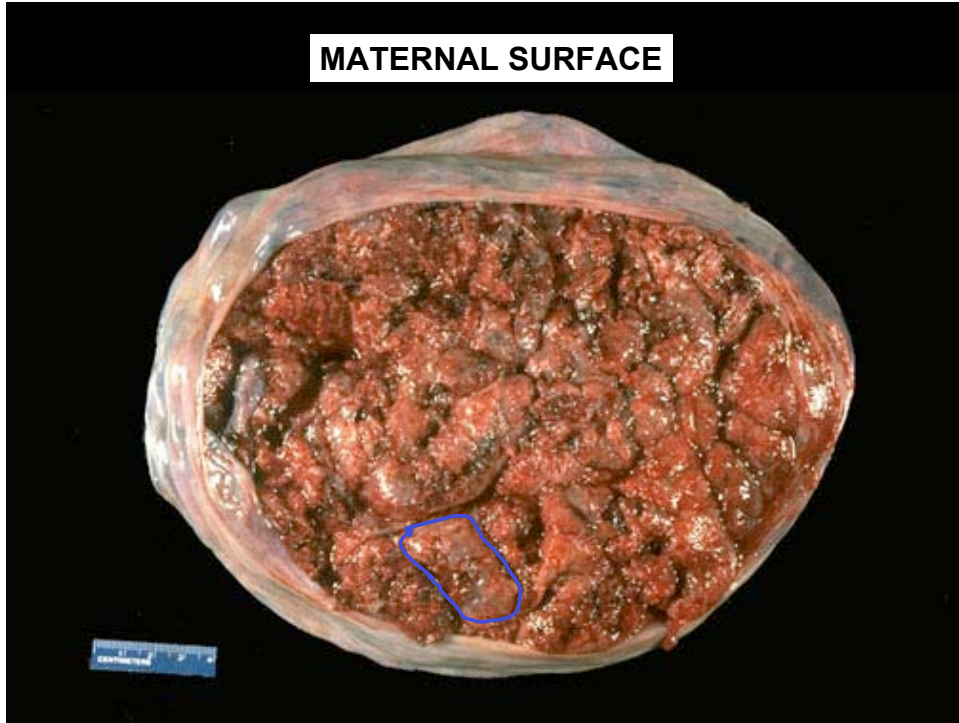
# ANATOMY



Moore & Persaud: The developing human- Clinically oriented embryology

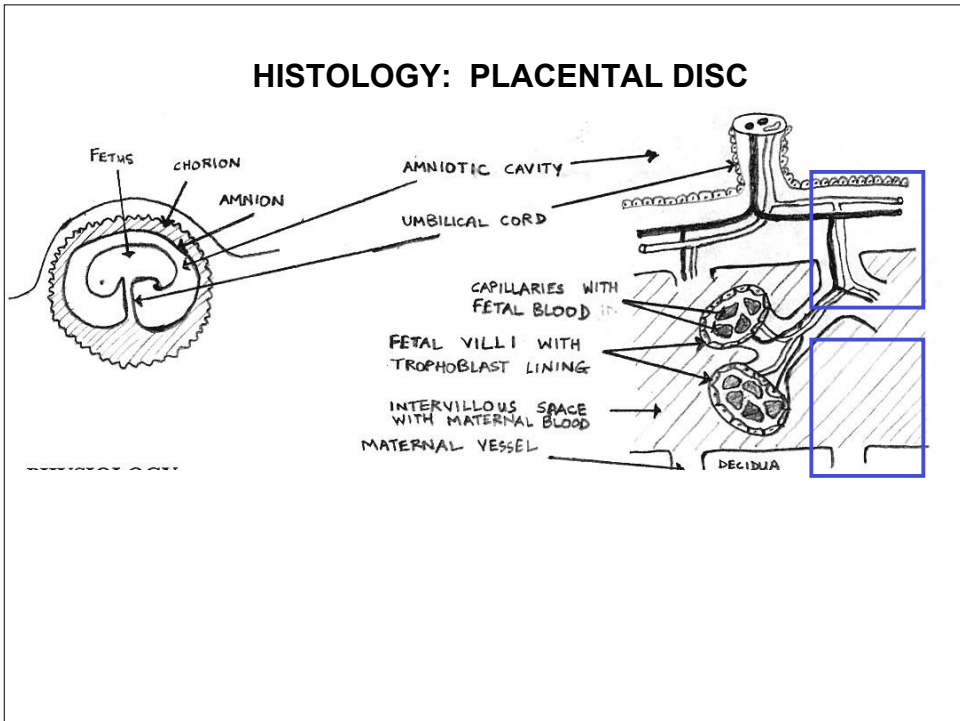
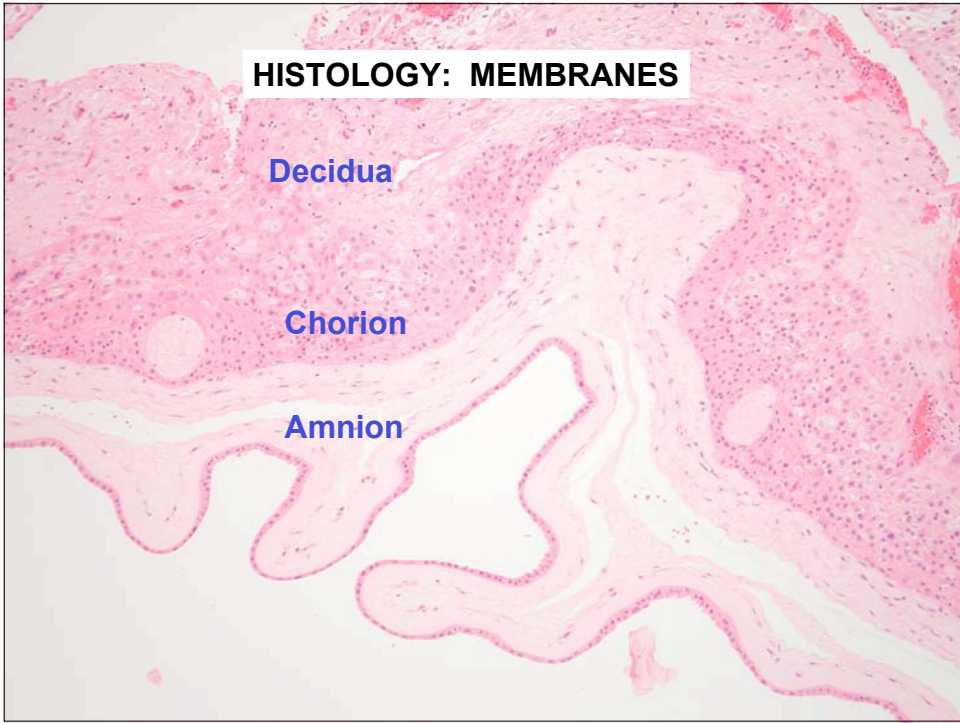


**MATERNAL SURFACE**

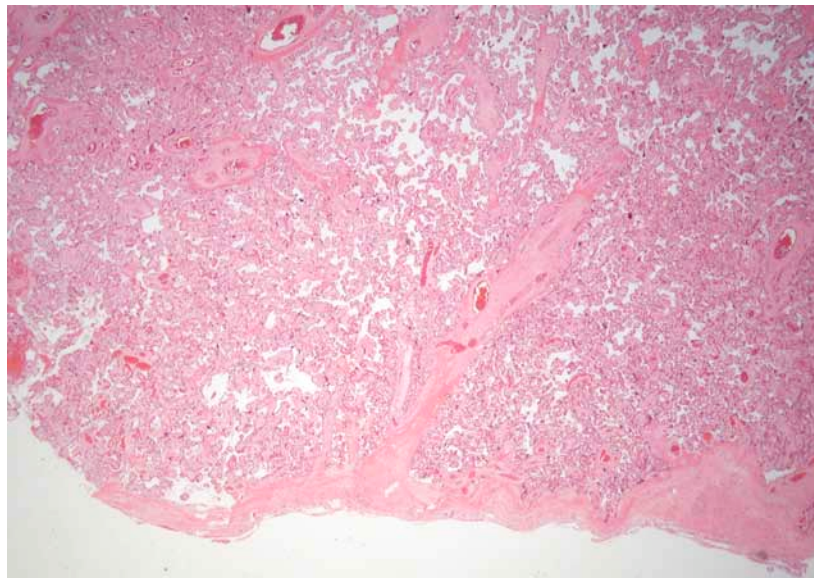
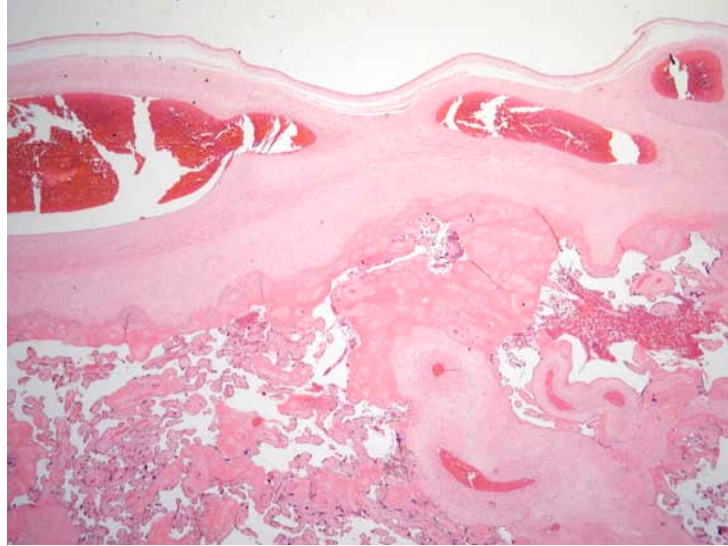


**HISTOLOGY: UMBILICAL CORD**



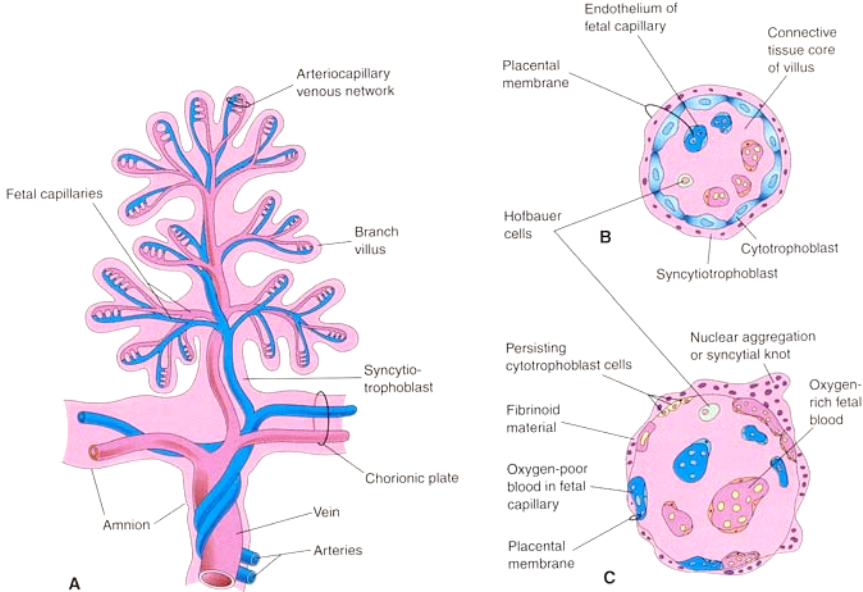


**HISTOLOGY: PLACENTAL DISC-FETAL SURFACE**

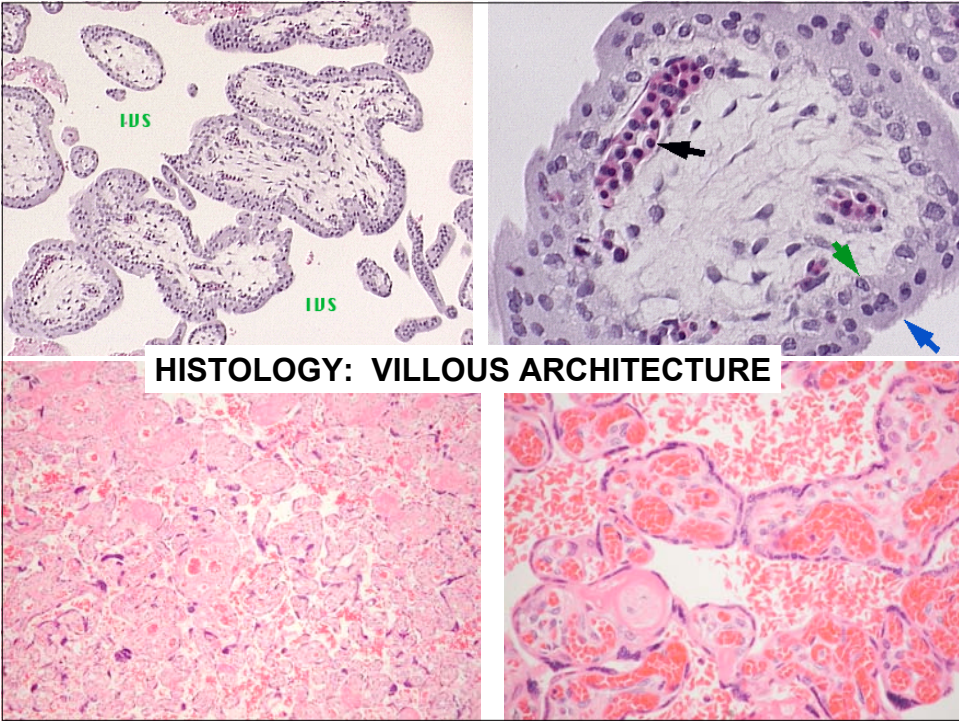


**HISTOLOGY: PLACENTAL DISC- MATERNAL SURFACE**

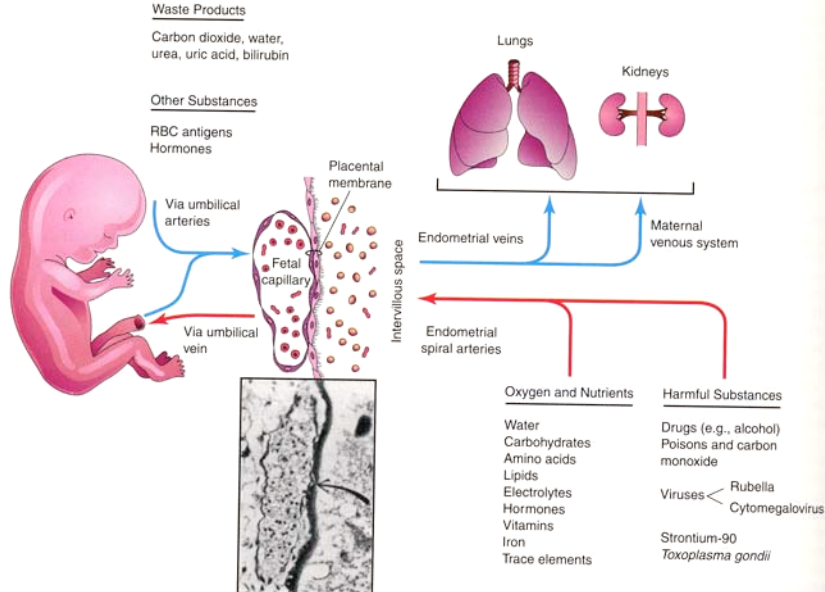
# HISTOLOGY: VILLOUS ARCHITECTURE



Moore & Persaud: The developing human- Clinically oriented embryology



# FUNCTIONS OF THE PLACENTA



Moore & Persaud: The developing human- Clinically oriented embryology

# PLACENTAL HORMONES



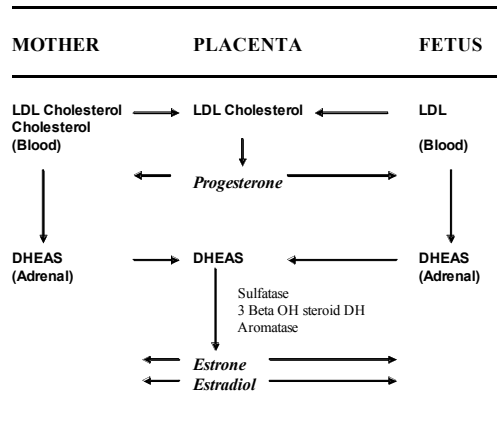
## Human Chorionic Gonadotropin (HCG)

- 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

## PLACENTA IN STEROID HORMONE BIOSYNTHESIS

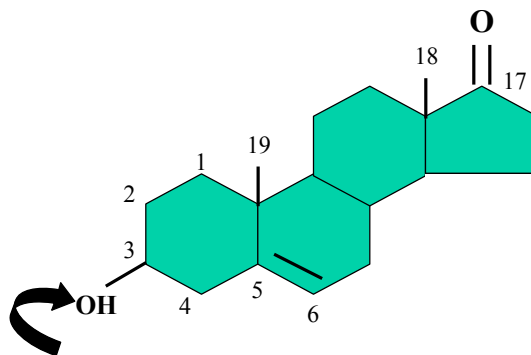


Key:  
DHEAS : Dehydroepiandrosterone sulfate  
3 Beta OH steroid DH : 3 beta hydroxy steroid dehydrogenase

Figure modified from: Carr, BR, The maternal -fetal -placental unit. In: Becker KL, ed. Principles and Practice of Endocrinology and Metabolism, 3<sup>rd</sup> ed. Lippincott Williams & Wilkins, Philadelphia. 2001: 1061.

## Dehydroepiandrosterone

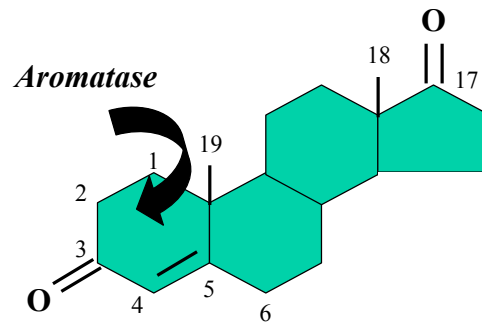
(C<sub>19</sub>)



*3 beta-hydroxy steroid dehydrogenase*

## Androstenedione

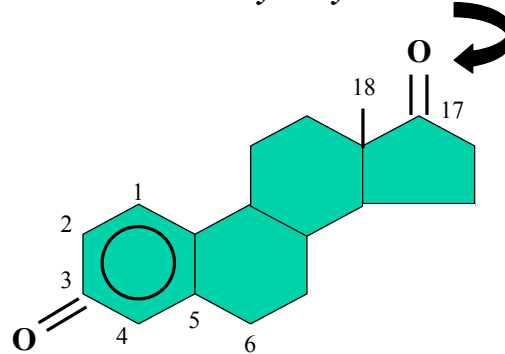
(C<sub>19</sub>)



## Estrone

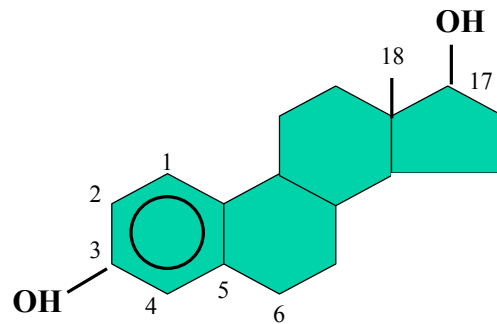
(C<sub>18</sub>)

*17 beta-hydroxy steroid oxidoreductase*



## Estradiol

(C<sub>18</sub>)



## OTHER PLACENTAL HORMONES

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

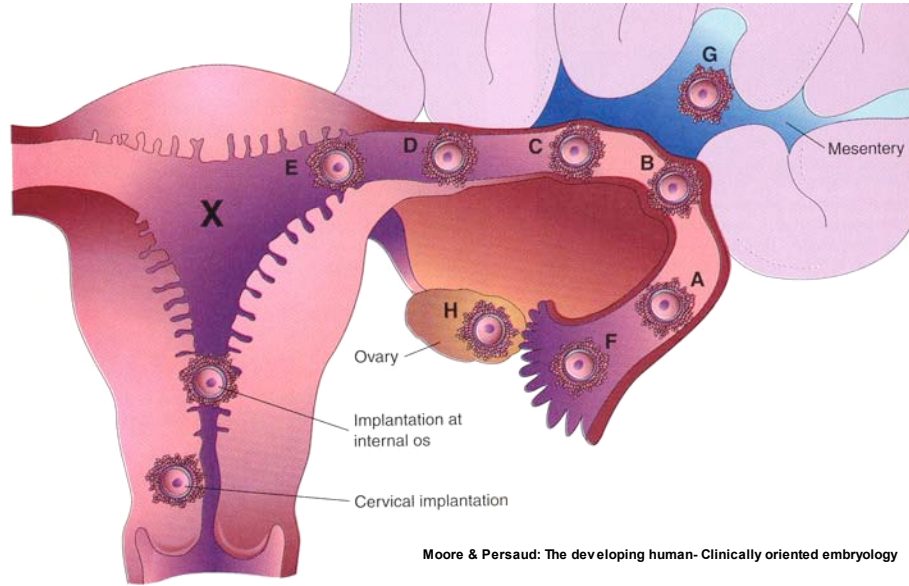
## **Fetoplacental hormones and peptides in prenatal screening**

<b>HCG</b>	<b>Elevated in Tri 21</b>
<b>uE3</b>	<b>Decreased in Tri 21</b>
<b>AFP</b>	<b>Decreased in Tri 21</b>
<b>Inhibin A</b>	<b>Elevated in Tri 21</b>

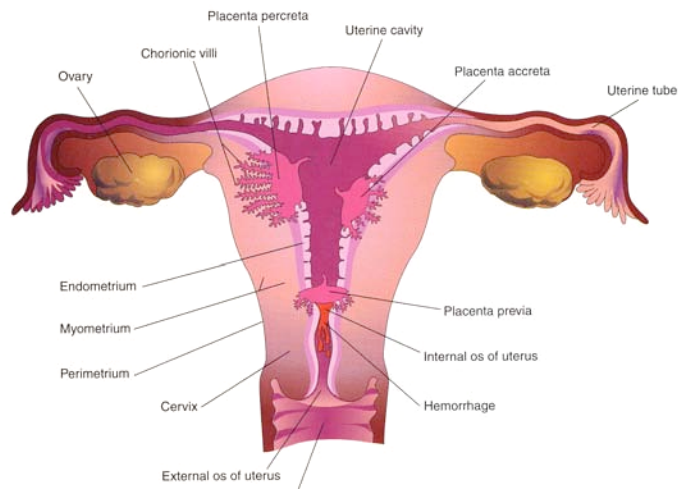
**AFP is elevated in Neural Tube Defects**

## **DEVELOPMENTAL PATHOPHYSIOLOGY**

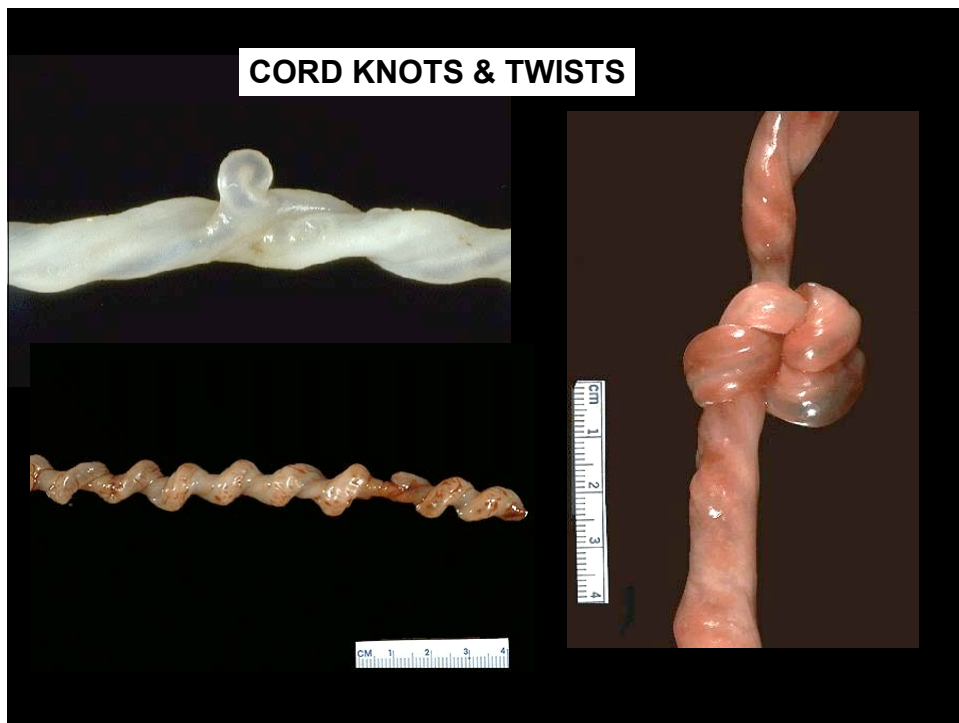
## ECTOPIC IMPLANTATION



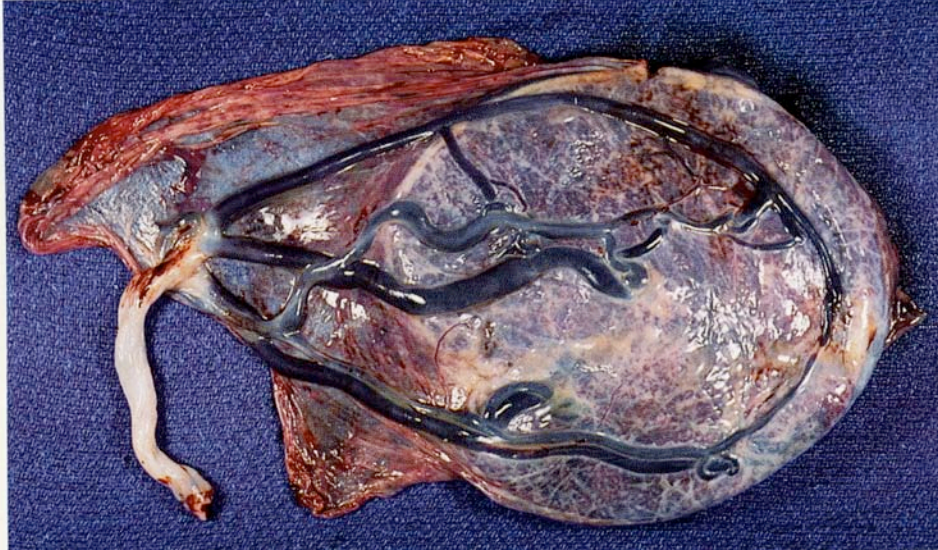
## PLACENTA PREVIA & PLACENTA ACCRETA



# MECHANICAL PATHOPHYSIOLOGY

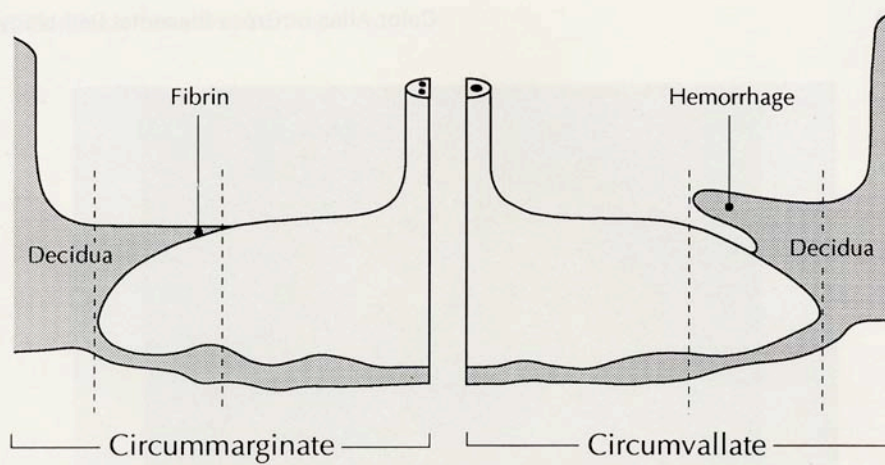


## CORD: VELAMENTOUS INSERTION



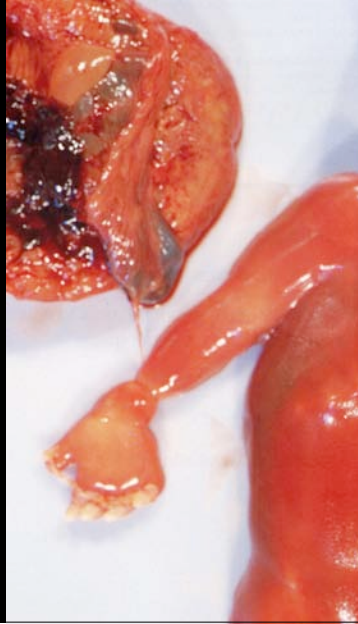
Kaplan: Color atlas of gross placental pathology.

## ABNORMAL MEMBRANE ATTACHMENT



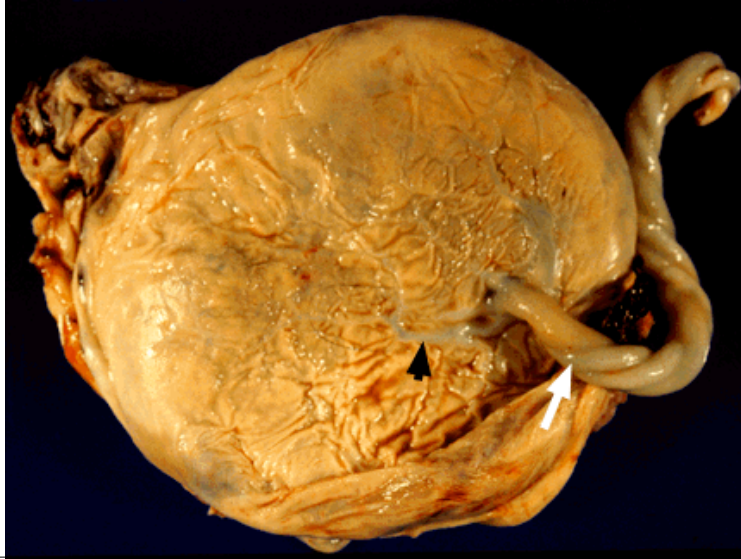


**MEMBRANE RUPTURE: AMPUTATIONS**

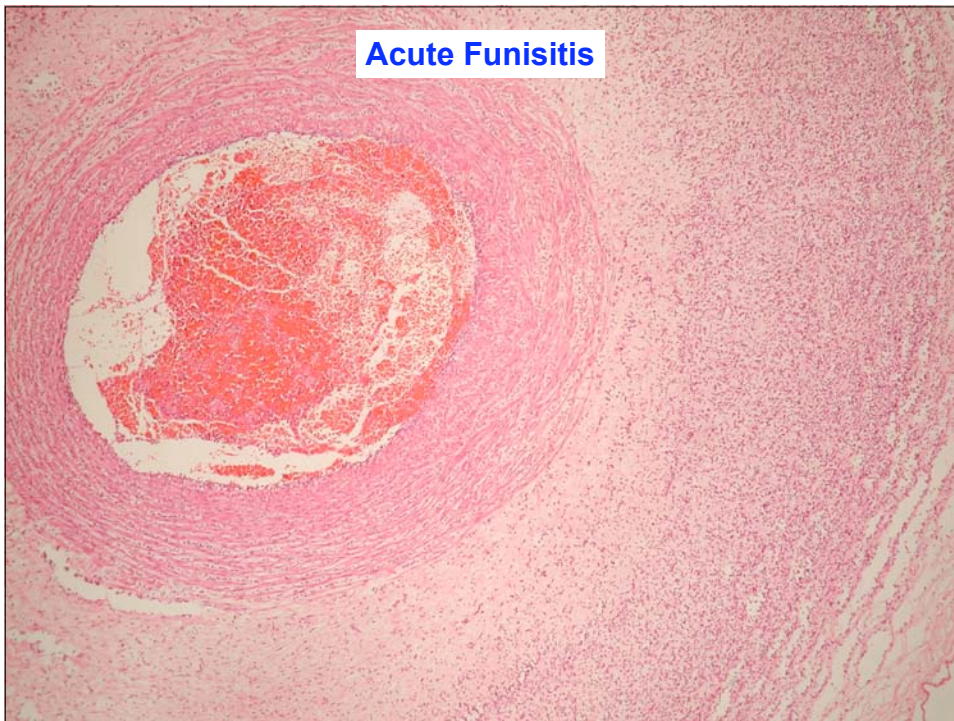


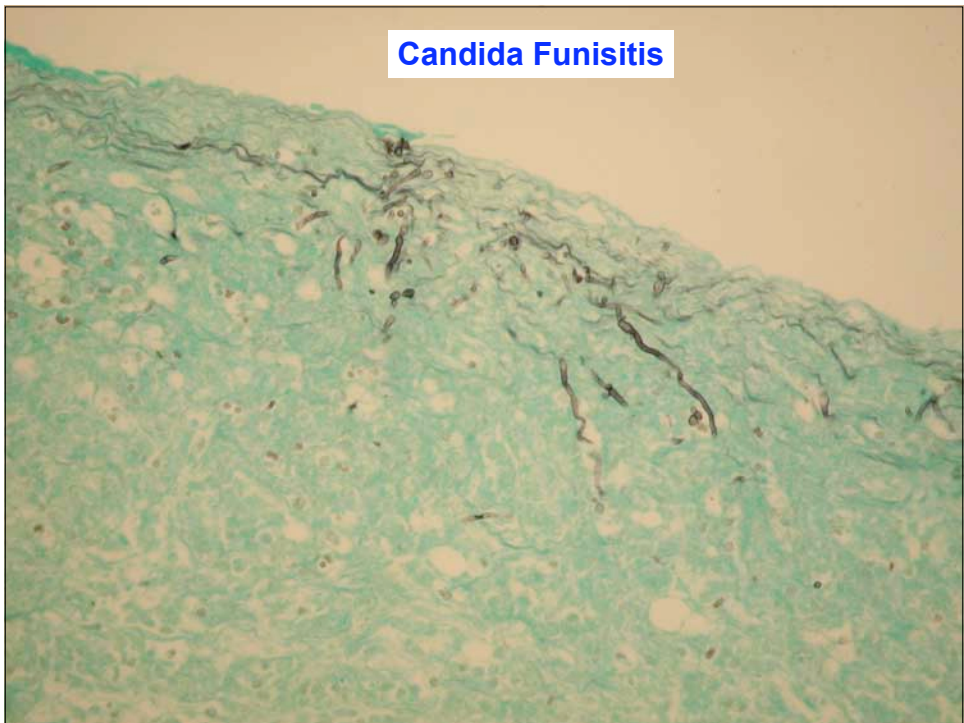
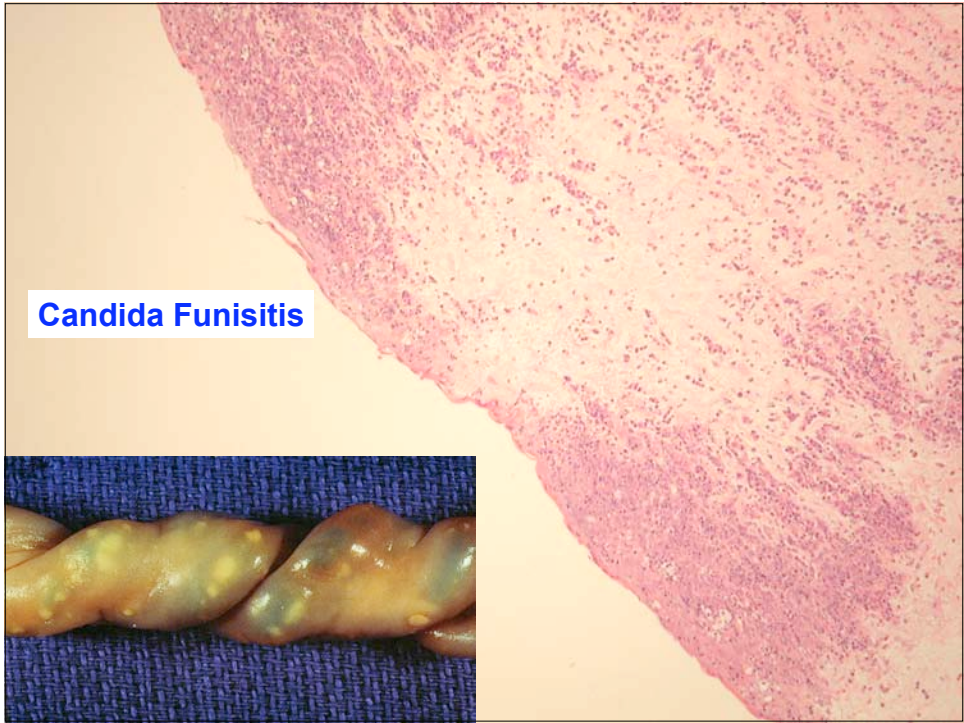
**INFLAMMATORY  
PATHOPHYSIOLOGY**

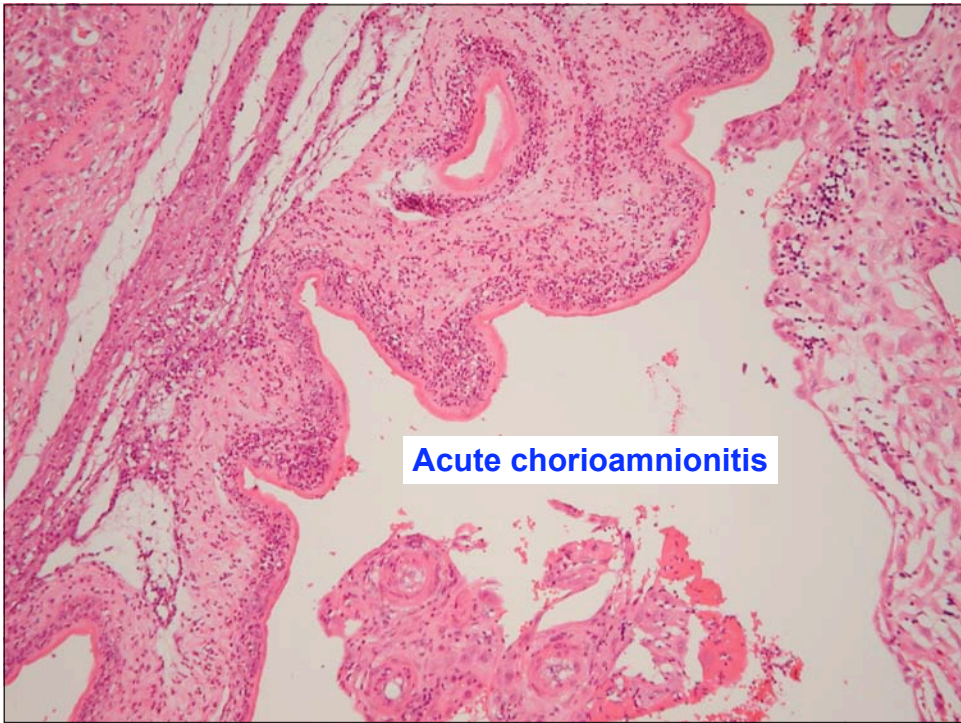
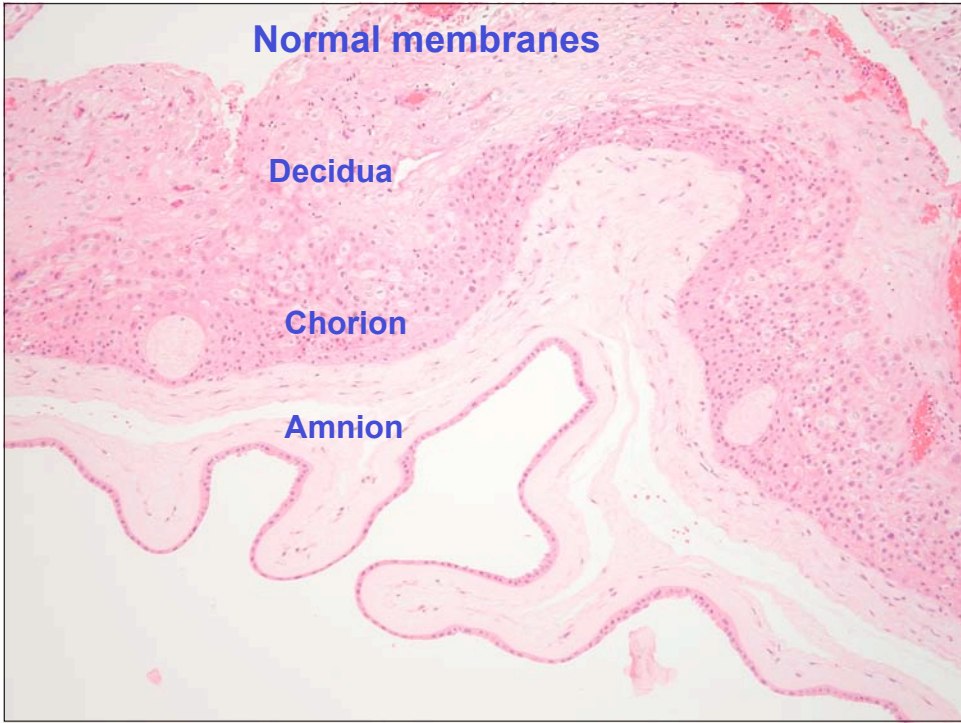
**INFLAMMATION: CHORIOAMNIONITIS**

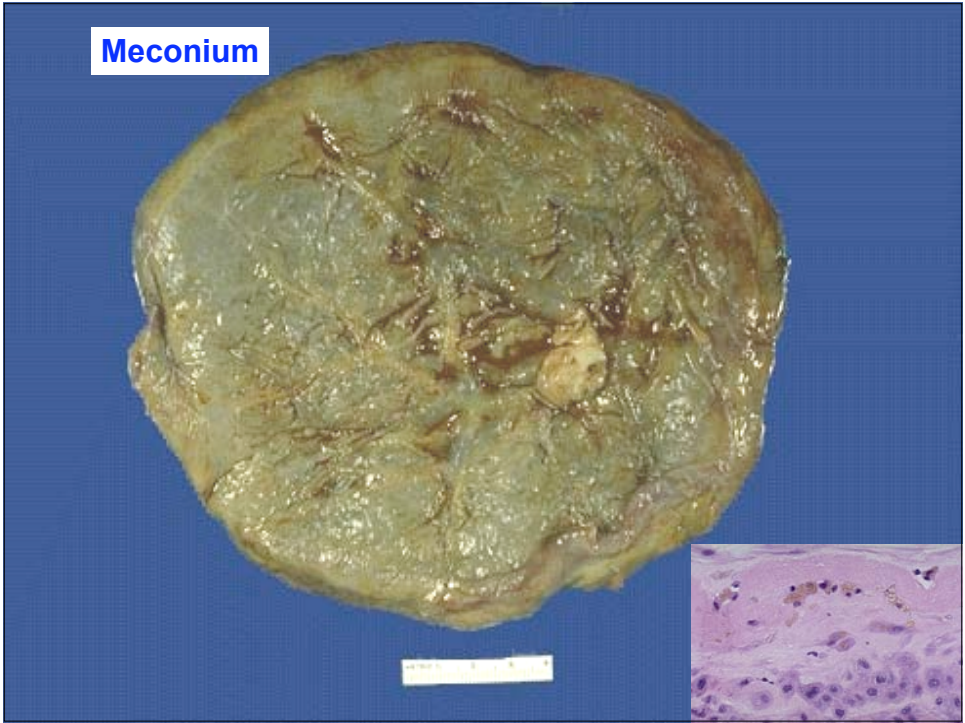


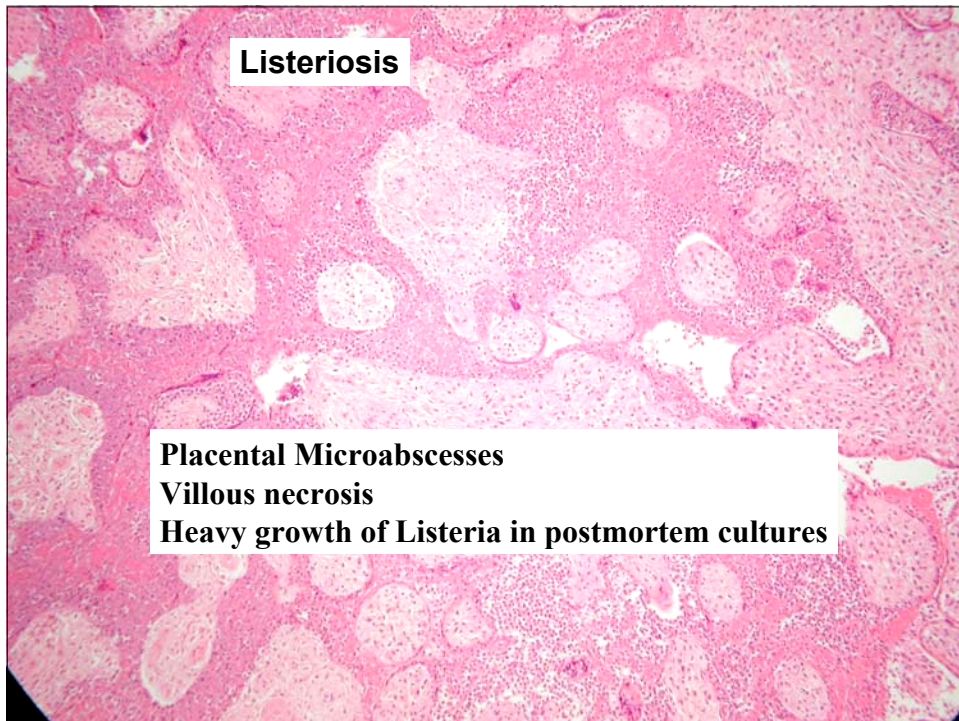
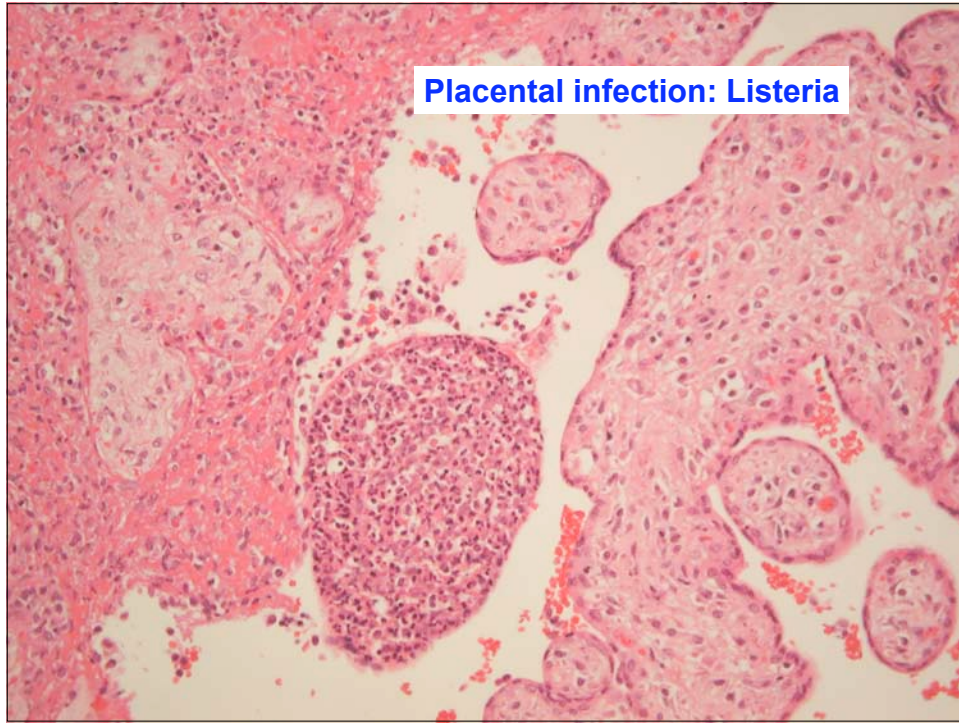
**Acute Funisitis**



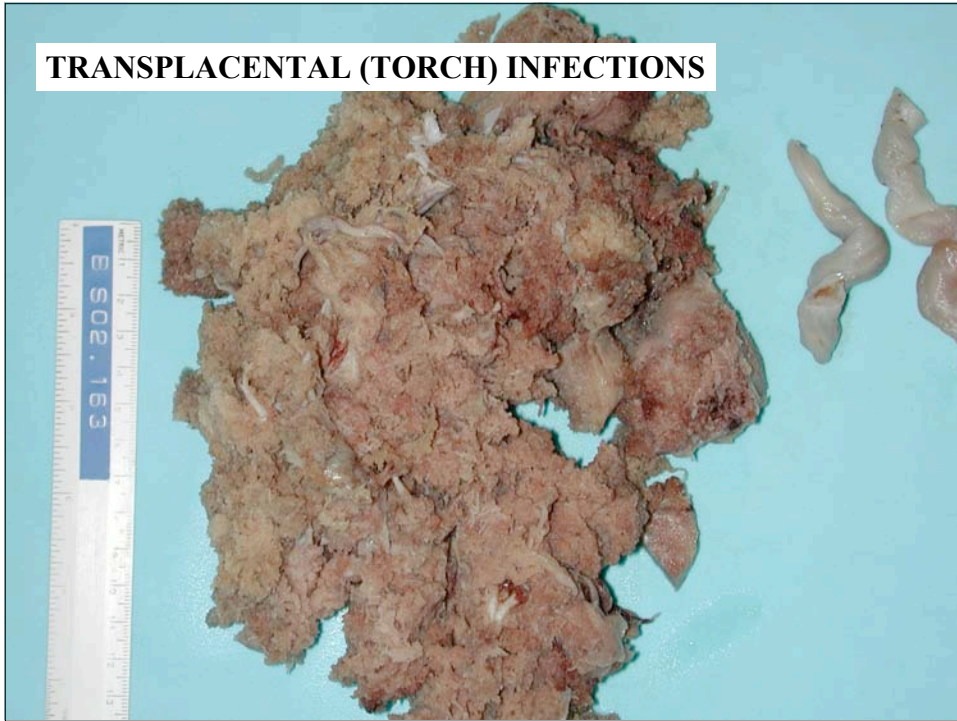








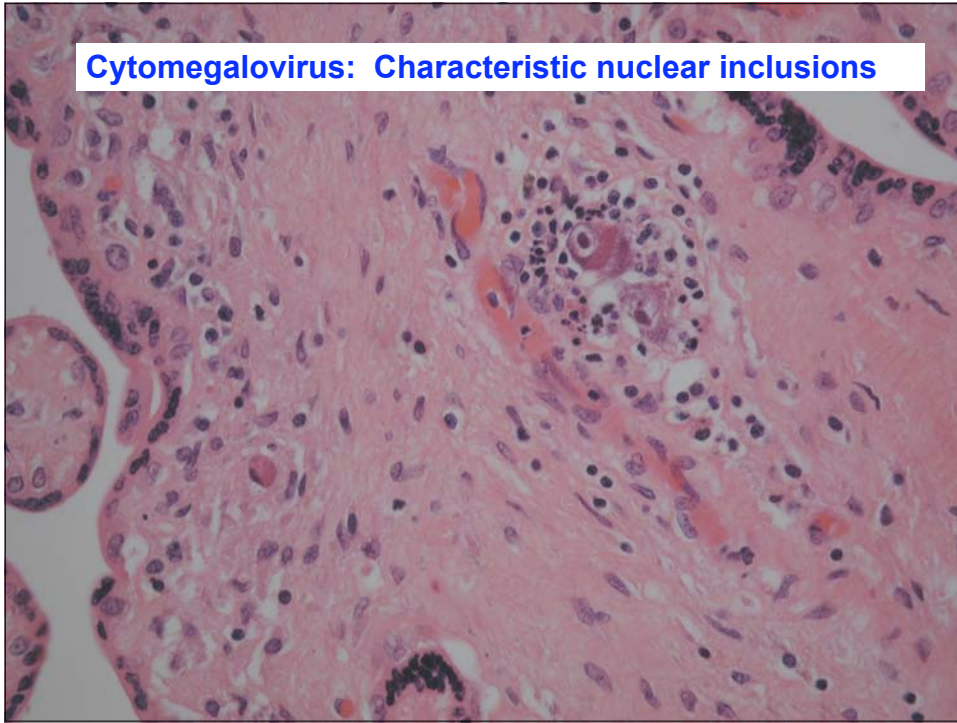
**TRANSPLACENTAL (TORCH) INFECTIONS**



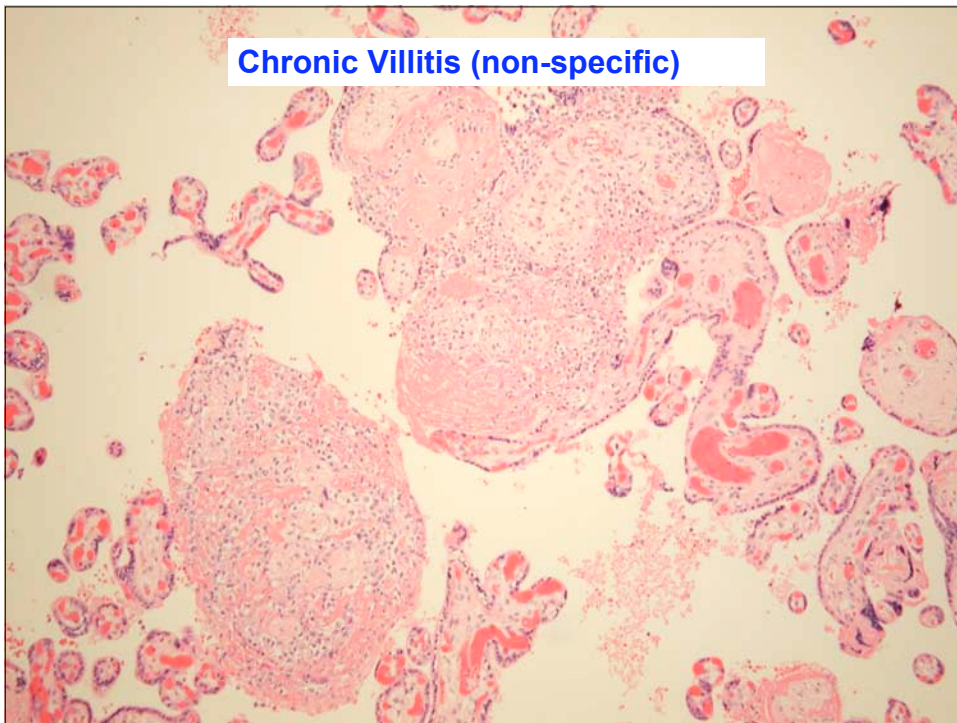
**Parvoviral inclusions in villi**



**Cytomegalovirus: Characteristic nuclear inclusions**



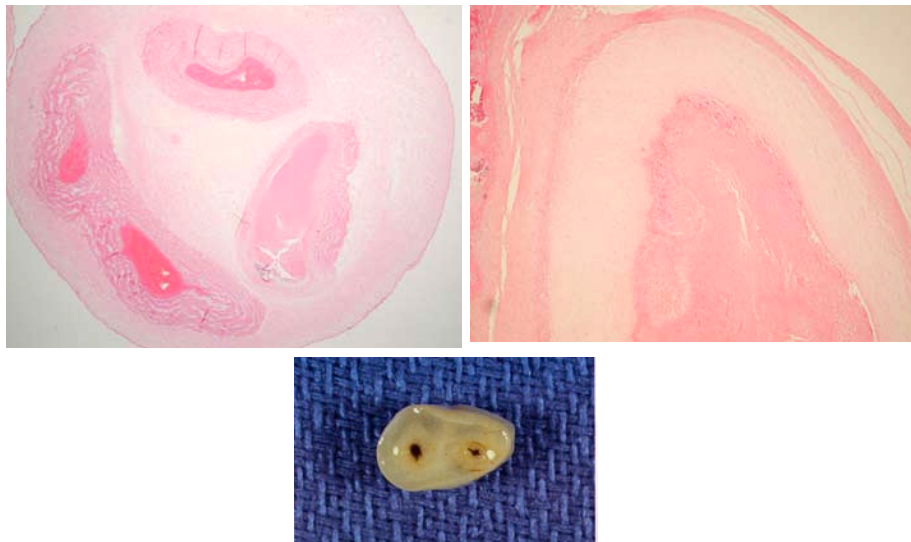
**Chronic Villitis (non-specific)**





# VASCULAR PATHOPHYSIOLOGY

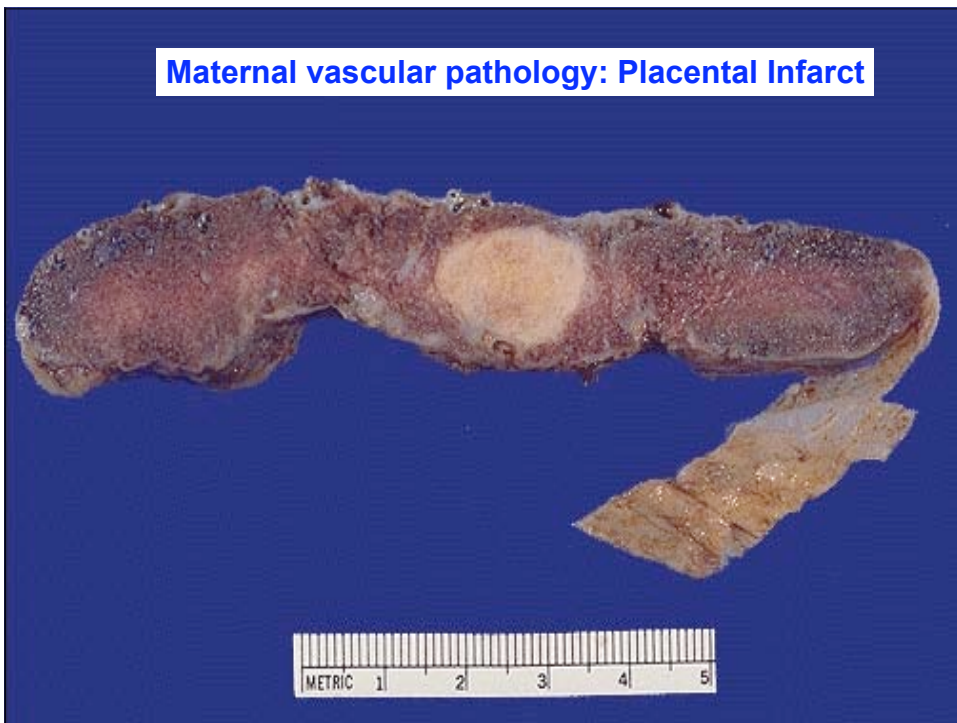
## FETAL VASCULAR PATHOLOGY



**Maternal Vascular Pathology: Pre-eclampsia**



**Maternal vascular pathology: Placental Infarct**



**Maternal vascular pathology: Placental Abruption**



## **NEOPLASTIC PATHOPHYSIOLOGY**

## VASCULAR TUMOR- CHORANGIOMA



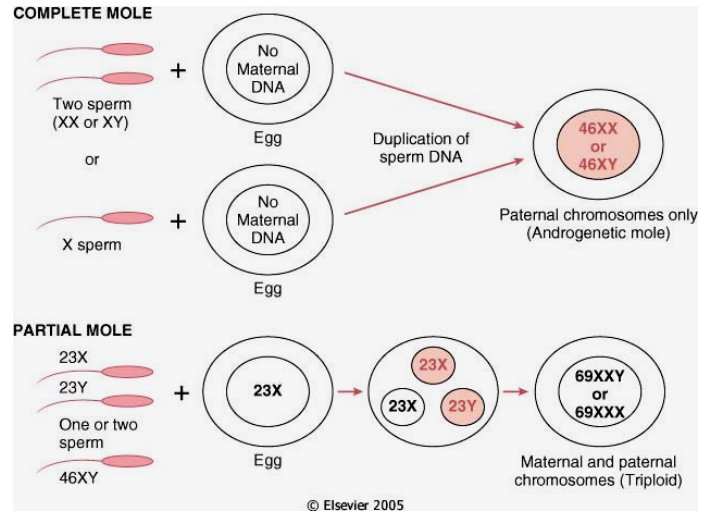
## TROPHOBLASTIC TUMORS HYDATIDIFORM MOLES



**COMPLETE = Diploid**  
**2 Pat, 0 Mat.**

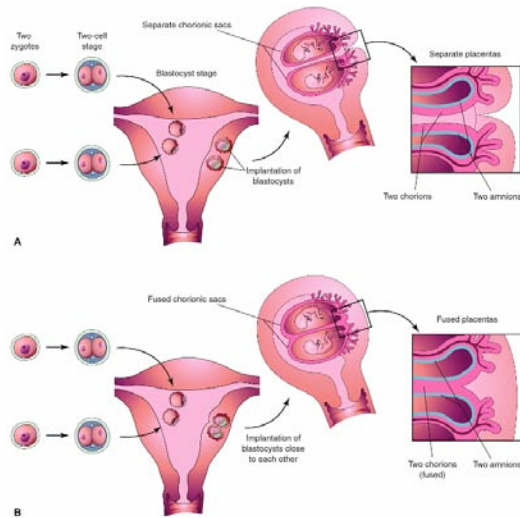
**PARTIAL = Triploid**  
**2 Pat, 1 Mat**

## HYDATIDIFORM MOLES- GENETICS



## MULTIPLE GESTATIONS

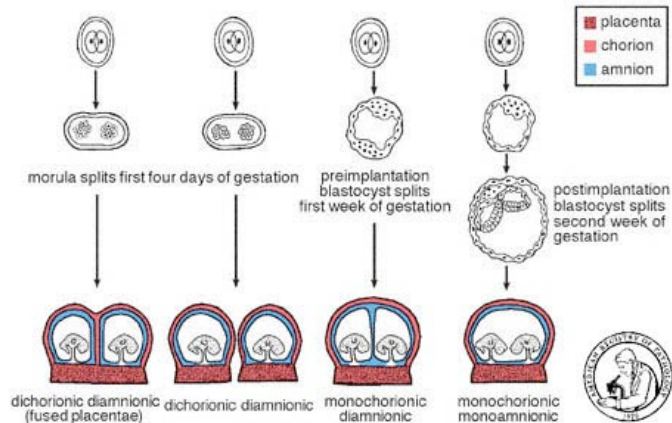
## TWINS- Dizygotic



**TWO AMNIONS  
TWO CHORIONS  
(fused or separate)**

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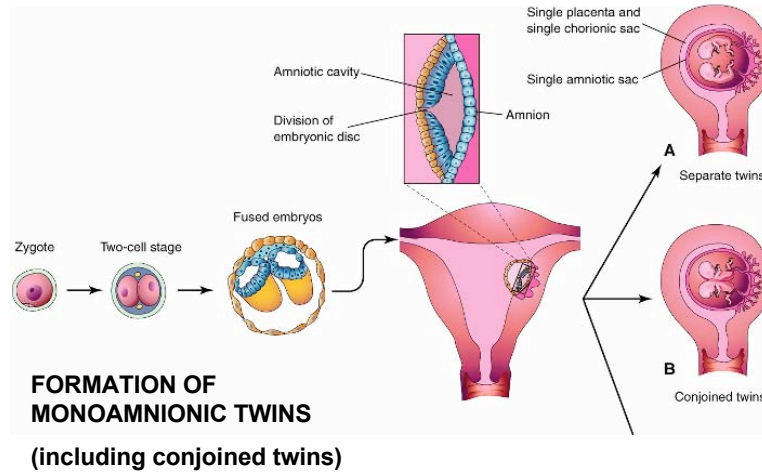
## TWINS- Monozygotic



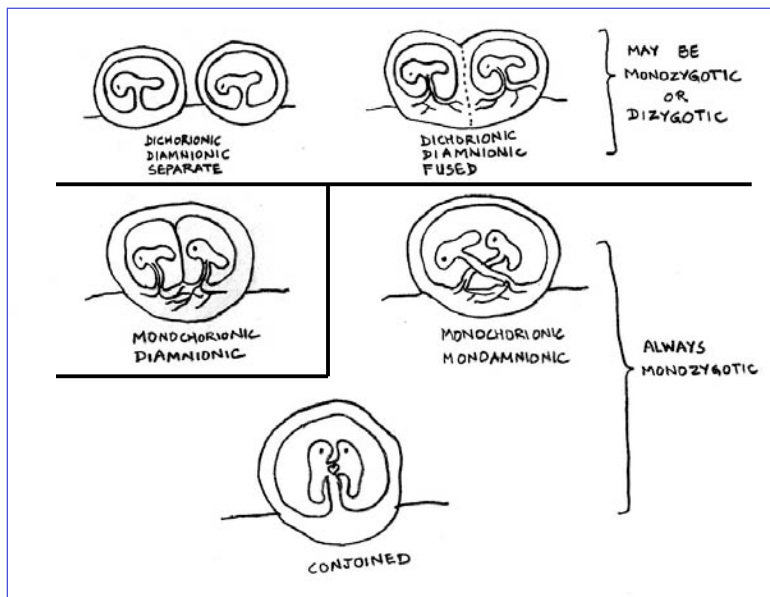
**TWO AMNIONS  
TWO CHORIONS  
(fused or separate)**

**ONE CHORION  
ONE OR TWO AMNIONS**

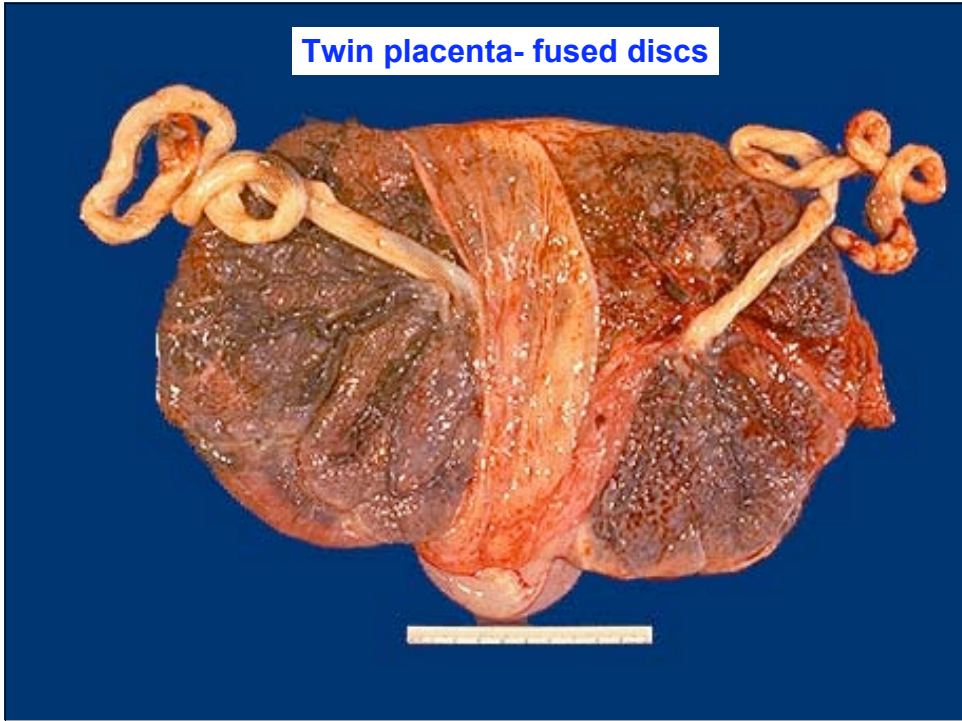
## TWINS- Monozygotic



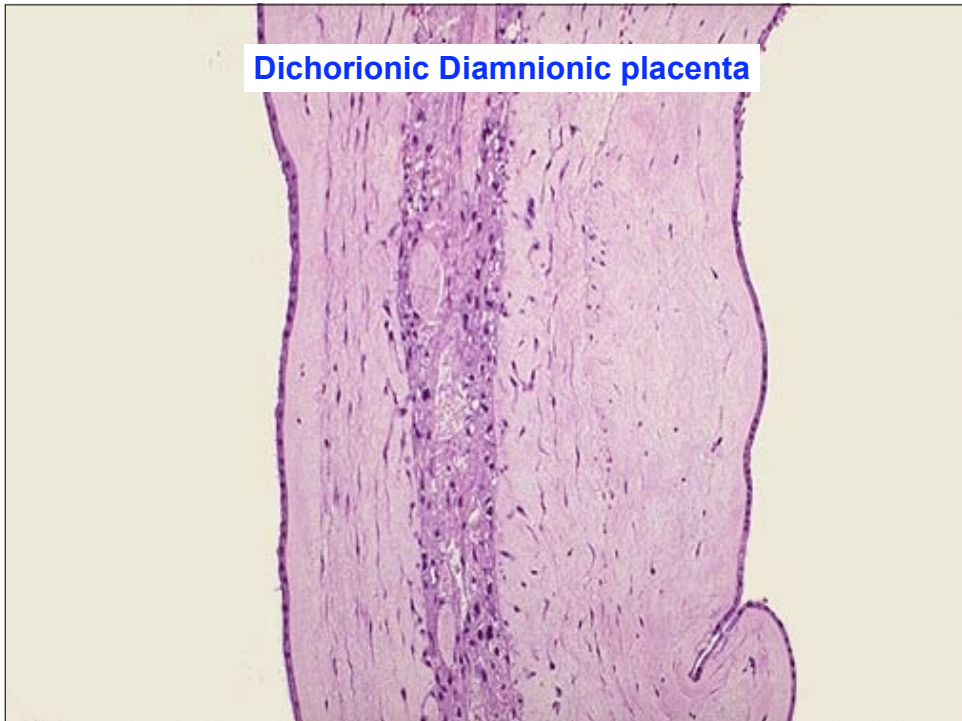
## TWIN ZYGOSITY AND CHORIONICITY



**Twin placenta- fused discs**

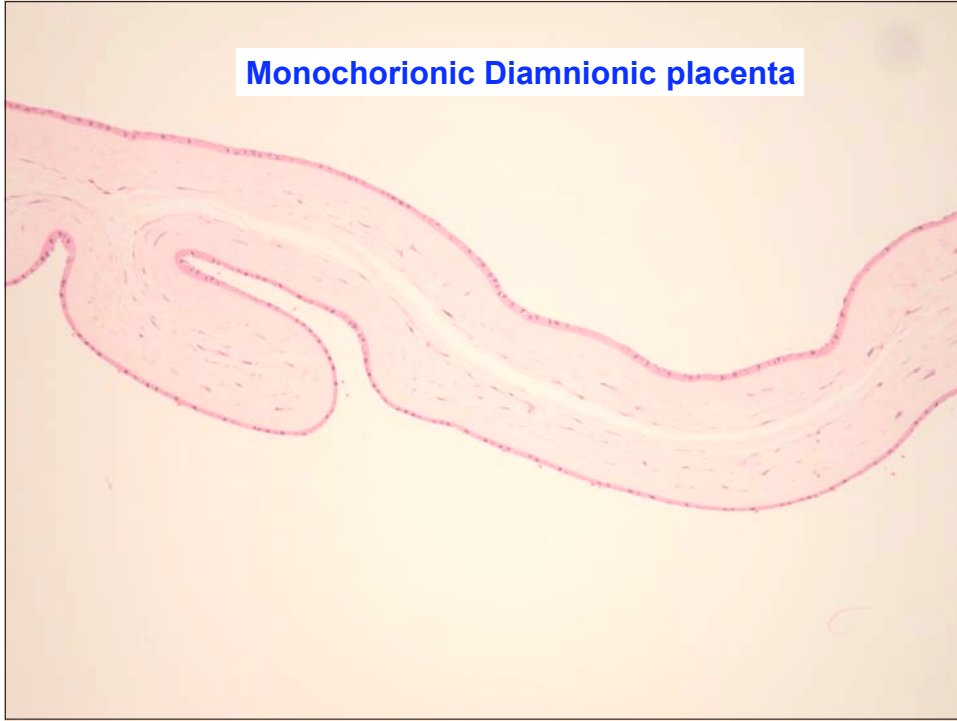


**Dichorionic Diamnionic placenta**





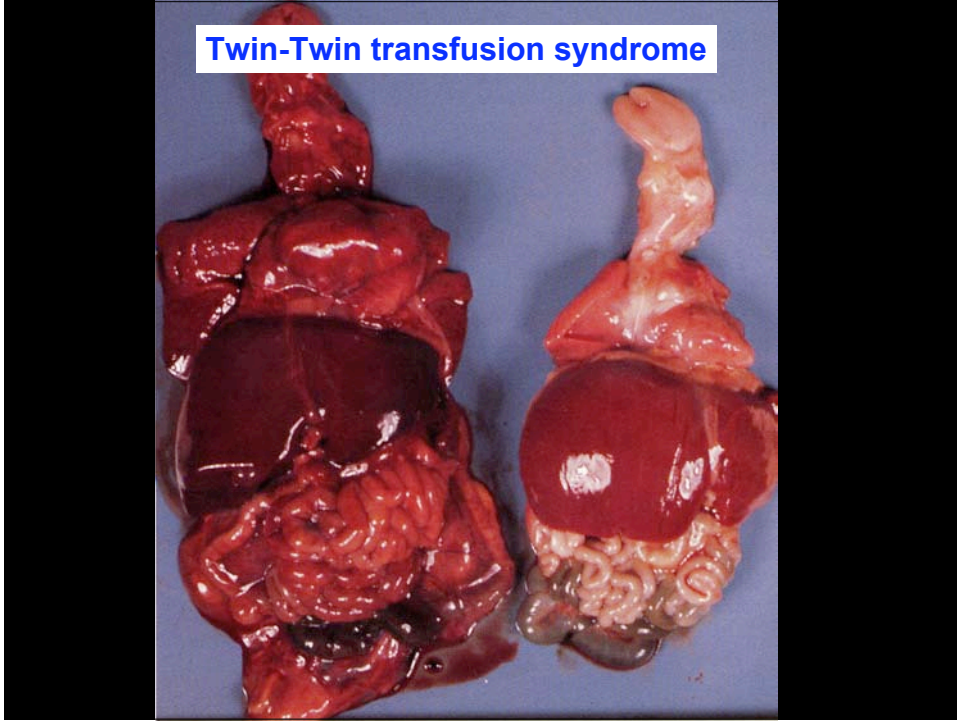
**Monochorionic Diamnionic placenta**



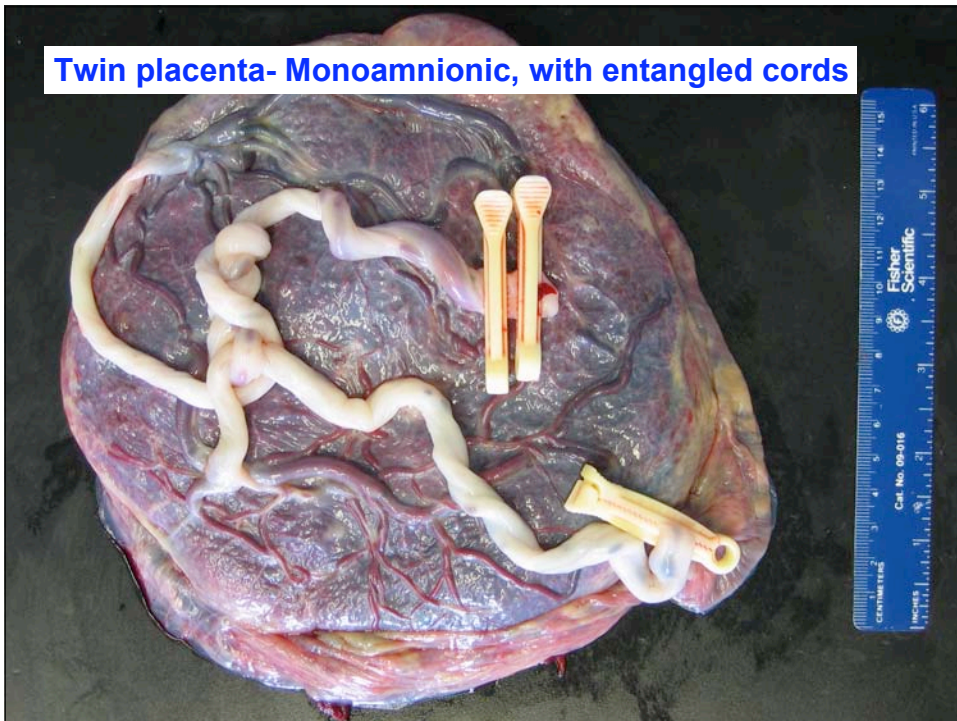
**Monochorionic twins with Vascular anastomosis**



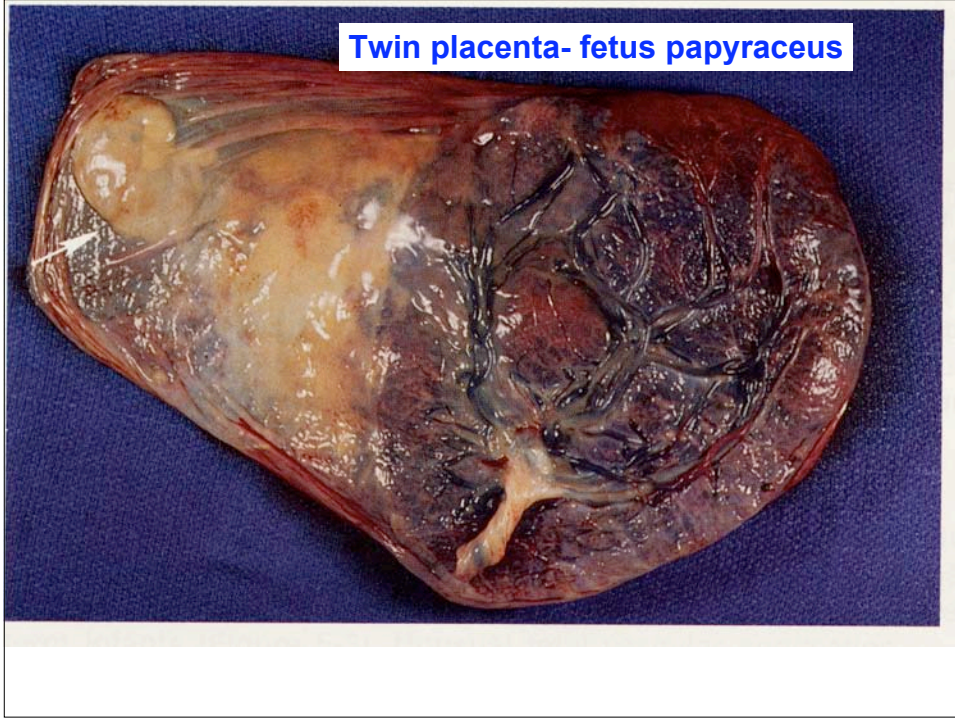
**Twin-Twin transfusion syndrome**



**Twin placenta- Monoamniotic, with entangled cords**



Twin placenta- fetus papyraceus



**ENJOY THE LAB!**