Features of PLAP expression in placental structures during allogeniec pregnancy (surrogate maternity, oocyte donation) on the background of pre-eclampsia, as an indicator of exosomal trophoblast activity

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Allogeneic pregnancy

**Surrogate Maternity**

Age 29.4±3.19

- A history of successful pregnancies
- Somatically HEALTHY
- Threats and preterm birth (43.3% 54.3%)
- HIP and PE (15.4%)

**Egg Donation**

Age 42.7±3.91

- First birth or and first pregnancy
- Somatic history (including autoimmune and cardiovascular diseases)
- Threats and preterm birth (11.3% 45.4%)
- HIP and PE (24%)
The theory of pathogenesis of PE associated with exosomes

Placental exosomes in normal and complicated pregnancy

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The understanding of how cells communicate has undergone a paradigm shift with the recognition of the role of exosomes in intercellular signaling (Table 1). Exosomes are a subpopulation of extracellular vesicles that are distinct in size (~40-120 nm), density (1.13-1.19 g/mL⁻¹), content, and biogenesis. Exosomes are of endosomal origin, formed by the inward budding multivesicular bodies (MVB) (Figure 1). As such, they are enriched with late endosomal membrane markers, including Tsg101, CD63, CD9, and CD81. Exosomes are released into extracellular compartments by exocytosis, following the fusion of MVB with the plasma membrane. Although little is known about the mechanism of...
Exosomes

https://doi.org/10.3390/cells8060558
Aim of study

To Investigate the exosomal activity of trophoblast in the norm and with the preeclampsia in allogeneic pregnancy
Material

Inclusion criteria
• IVF with a donor egg
• Single pregnancy
• Gestational age > 20 weeks
• Clinically confirmed development of pre-eclampsia (all degrees of severity)

Exclusion criteria:
• Multiple pregnancy
• Severe extragenital pathology
• Gestational age < 20 weeks
• Complications of pregnancy with well-studied pathogenesis (APS, hereditary forms of thrombophilia, etc.)

pregnant women after IVF with donor egg
N=89

morphological verification placentas/placental bed
N=47 (SM)

IGH without PE
N=18

IGH with PE
N=8

morphological verification placentas/placental bed
N=42 (OD)

IGH without PE
N=21

IGH with PE
N=12
Methods

1. **Clinical and laboratory analysis (HLA II detection)**

2. **Morphological verification**
   - Histological study paraffin sections of placenta and placental bed, staining PAS, Orcein, hematoxylin and eosin.
   - Immunohistochemical study of placenta and placental bed paraffin sections
     - monoclonal mouse anti-human PLAP (Dako)
     - monoclonal mouse anti-human CD9 (Dako)
     - mouse anti-human CD81 (Dako)
   - **Morphometric analysis** of optical density (ImageM 2.0)
   - **Electron microscopy**
Results. Somatic history and obstetric complications

- Premature birth
- Premature placental abruption
- PE
- HIP
- GDM
- The threat in the III trimester
- The threat in the II trimester
- The threat in the I trimester
- Diseases of the hepatobiliary system
- Endocrine diseases
- Respiratory diseases
- Urinary system diseases
- Cardiovascular disease

OE (n=21)
SM (n=47)
OD (n=42)
Results. Morphological changes in placenta in AP with PE

Perivillous fibrioniod with LGI, H&E, x200

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Lymphoplasmacytic deciduitis, H&E, x400
Results. Morphological changes in placental bed in AP with PE

Massive deposits of fibrinoid in the uteroplacental region, HE, x400
Perivascular infiltration in placental bed, H&E, x400

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Complete remodeling of the spiral arteries (%)
Partial remodeling of the spiral arteries (%)
Lack of remodeling (%)

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Expression of exosome markers in villous trophoblast

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- CD81
- CD9
- PLAP
Expression of exosome markers in placental bed

- CD81
- CD9
- PLAP

[Graph showing expression levels of CD81, CD9, and PLAP in different regions of the placental bed]
↓ PLAP ↓ CD9 ↓ CD81
relate to ↓ exosome secretion, containing miRNA-127-5p and etc.

↑ Th1 \ ↓ Th2
↑ cytotoxic NK
↓ apoptosis of maternal T cells through FasL and TRAIL
↓ activation tTreg

disruption of immunological tolerance

damage to the trophoblast by the mother’s immune system

↓ PIGF

↑ proinflammatory cytokines

↓ sFLT
↓ sEng

Preeclampsia

Conclusions

- Placentas and placental beds in the allogeneic pregnancy are characterized by pronounced signs of immune alteration of the placenta. The pathology of the placental bed consists in chronic inflammation in the perivascular region and a violation of the remodeling of the spiral arteries.
- PLAP, CD9 and CD81 were found in the cells of the syncytiotrophoblast villi, parietal trophoblast and single cells of the extravillous trophoblast of the placental bed.
- The development of PE during allogeneic pregnancy is accompanied by a decrease in the content of exosome components in syncytiotrophoblast cells.
Thank you for attention!
References