

Special Issue

Molecular Pathology of the Placenta in Pregnancy Complications

Message from the Guest Editors

Trophoblast invasion is essential in early pregnancy for remodeling maternal spiral arteries and ensuring adequate placental blood flow to support fetal development. Many placental proteins and molecular factors—such as inflammatory cytokines (TNF- α , IL-6), angiogenic modulators (angiopoietins), extracellular matrix proteins, and oxidative stress markers—are underexplored in maternal serum. Environmental factors like hypoxia, metabolic status, immune interactions, epigenetic regulation, and signaling pathways (Notch, Wnt, TGF- β) also affect trophoblast function. The limited profiling of these molecules presents a research gap in early prediction of complications like GDM and hypertensive disorders. New insights addressing these gaps are awaited to enhance biomarker discovery, diagnosis, and therapeutic strategies for improved maternal-fetal outcomes. This Special Issue also focuses on new technical tools in this field: organoids/assembloids, spatial transcriptomics, spatial proteomics, single-cell epigenomics/transcriptomics and targeted delivery to the placenta.

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