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Project Title:

Placental derived exosomes as sensors for lipid mediators in the fetus

Background:

Exosomes are a subset of extracellular vesicles with an average diameter of ~100nm. Exosomes are released by all cells through an endosome-dependent pathway and carry nucleic acids, proteins, lipids, cytokines and metabolites, mirroring the state of the originating cells. The function of exosomes has been implicated in various reproduction processes, such as implantation, placentation and embryo development. Placental derived exosomes (pEXO) can be detected in the maternal and fetal blood and their levels increase with gestational age. Importantly, alternations in the molecular signatures of pEXO are observed in pregnancy-related complications. Hence, differentially expressed molecules could be potential triggers of pregnancy-associated diseases. Recent studies have demonstrated that pEXO may play a role in the communication to the mother but whether pEXO may act to the fetus as well is still unexplored.

Hypothesis and Objectives:

The aim of this project is to determine the properties and function of pEXOs of endothelial cells freshly-isolated from human placentas of women who delivered babies of normal or low birth weight. The studies will test the hypothesis that pEXO characteristics is a factor underlying intrauterine growth restriction which could be determining for the development of the offspring in the course of time.

The project will involve the student in an exciting collaborative project between basic scientists and medical doctors at our university.

Methodology:

- Isolation/characterization and cell culture of primary placental endothelial cells
- Isolation/characterization of extracellular vesicles of the human placenta
- miRNAome
- Molecular biology based functional assays including virus based manipulation of cells
- *Ex vivo* placental perfusion approach

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References:

Circulating Placental Extracellular Vesicles and Their Potential Roles During Pregnancy.
Nakahara A, Nair S, Ormazabal V, Elfeky O, Garvey CE, Longo S, Salomon C.
Ochsner J. 2020 Winter;20(4):439-445.