

# Comprehension of Maternal-Fetal Exchange

## *A Route to Better Health*

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During the twentieth century, major scientific studies focused on a discovery the etiology and treatment of adult pathologies and, to a lesser extent, neonatal pathologies, in order to provide better health for our society. Newborns represent our future, so it is important to ameliorate fetal and newborn health. In fact, many studies in recent decades showed that the genetics, diet, and environment of newborns and infants are correlated with their adult health. Thus, it is important to develop the best tools of research possible to understand the maternal-fetal relationship.

Studies on the maternal-fetal relationship first focused on the influence of maternal intake on fetal output, usually by the administration of a substance to the mother, which was later searched for in the metabolites of the fetus. Fortunately, the rapid evolution of scientific and methodological knowledge allowed researchers to pass from global physiologic studies to cellular and genomic studies. In addition, the ethics of research are more defined, ensuring improved treatment of subjects without invasive approaches. In this context of maternal-fetal exchange, it is essential to reconsider our vision of the interaction between mother and fetus, by including the placenta (mother ↔ placenta ↔ fetus). Placenta represents a complex unit of study. It is considered a great multiple organ because it ensures essential functions of respiration, nutrition, and waste elimination, and it possesses many metabolic activities, such as hormone production, enzyme activities, and lipid synthesis.

Finally, we must keep in mind that the maternal-placental-fetal relationship represents a particular research domain, since it applies to two distinct, closely related persons. During pregnancy, multiple physiologic, genetic, and environment factors influence normal fetal growth and development. The mother is the essential vector of nutriment, toxic substances and pathogens by which any intervention can modulate fetal growth and development. Therefore, it is crucial to increase our knowledge about the role and implication of genetic, dietary, and environmental factors in order to provide the fetus with an appropriate environment.

Many expert researchers are therefore reunited in this special issue to discuss the maternal-fetal exchange, reviewing all recent discoveries in their respective domain, and increasing our knowledge of this important field of research.

It is well accepted that fetal development is influenced by at least three closely related factors: placental functions and the fetus's ability to use nutrients, internal factors (e.g., diseases, genetics), and external factors (e.g., diet, medication, environment). Thus, maternal, placental, and fetal physiology and biochemistry can be influenced by these factors. For example, gestational diabetes could induce fetal macrosomia and preeclampsia, both pathologies that could induce maternal and neonatal morbidity.

This special issue approaches the maternal-placental-fetal relationship under various topics. It discusses trophoblastic differentiation, leading to functional placenta, and the influence of maternal nutrition on fetal development, including placental exchange and transport mechanisms of glucose, amino acids, lipids, and calcium. These subjects are followed by the influence of the placental and fetal hormones on placental and fetal growth and development. Pathologies such as preeclampsia, gestational diabetes and intrauterine growth retardation are also reviewed. Finally, a potential biological marker for early detection of preeclampsia is presented.

I hope that this special issue will improve our knowledge of the maternal-placental-fetal relationship.

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