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In vivo kinetic study of the materno-fetal fatty acid transfer in obese and normal weight pregnant women

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Abstract

Introduction: Placental function can be modified by maternal obesity affecting the materno-fetal fatty acid transport process. We analyze for the first time the *in vivo* materno-fetal kinetic transfer of fatty acids (FA) labeled with stable isotopes in control and obese pregnant women.

Materials and Methods: Labelled FA with similar metabolism (stearic acid: ¹³C-SA, palmitic acid: ¹³C-PA and oleic acid: ¹³C-OA) were orally administered at -4 h, -8 h, and -12 h, respectively prior to elective caesarean section to 10 pregnant women with a body mass index (BMI) > 30 and 10 with BMI 25–30 (control). Placenta, venous and arterial cord blood were collected obtaining a wide range of FA enrichments. A combined experimental and computational modeling analysis was applied.

Results: FA Fractional synthesis rate (FSR) in placenta was 11–12% per hour. No differences were observed between control and normo-lipidemic obese pregnant women. It was not possible to estimate FA FSR in cord blood with this oral bolus dose approach. Computational modelling demonstrated a good fit to the data when all maternal plasma lipid classes were included but not with modelling based only on the non-esterified FA fraction (NEFA). The estimated materno-fetal ¹³C-FA transfer was around 1%.

Conclusions: Our approach using multiple ¹³C-FA tracers allowed us to estimate FSR in placental/maternal plasma but not in fetal/maternal compartments. Computational modelling showed a consistent time course of placental ¹³C-FA transfer and predicted total fetal FA accumulation during the experiment. We conclude that in addition to NEFA in the maternal circulation, maternal plasma VLDL and other lipoproteins are important contributors to placental FA transfer to the fetus.

Conflict of Interest

There is no conflict of interest