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MATERNAL-FETAL TRANSPORT KINETICS OF 3-O-METHYL GLUCOSE IN DIABETIC MODEL PERFUSED HUMAN PLACENTA: *IN VITRO* STUDY

Previous studies from our laboratory had shown that maternal-fetal transport kinetics of model amino acids such as alpha-aminoisobutyric acid and L-Leucine and model fatty acid, palmitic acid were compromised in diabetic model placental lobules perfused *in vitro*. This study was meant to explore whether transport kinetics of a model hexose, 30-methyl glucose were altered in diabetic model human placental perfusions in in vitro conditions. Human placentae were collected immediately after delivery and perfused with NCTC culture medium buffered with Earles salt solution perfusate. After wash-out period of about ten minutes, 14-C labeled 3-0-methyl glucose (specific activity: 59 mCi/mmol, Amersham, UK) along with tritiated water (specific activity 5 mCi/mmol, Amersham, UK) as reference marker were then injected as a single bolus (100 µl) into the maternal arterial circulation of perfused placental lobules and perfusate samples collected from maternal and fetal circulations over a period of 5 minutes. In another series of experiments, glucose concentration in maternal arterial perfusate was doubled to about 11 mmol/L to mimic a moderate hyperglycemic diabetic state and prefusions were done for five minutes in the control euglycemic series. Concentration of 14C and 3H labeled study and control substances in perfusate samples in control and diabetes model perfusions was assessed by scintillation spectrometry. Transport kinetics of 3-O-methyl glucose and tritiated water were computed using established permeation parameters. Differential transport rates of 3-O-methyl glucose and tritiated water in 8 perfusions differed significantly (Student's t-test; $p<0.05$) for all transport fractions studied in control perfusions and in perfusions from five diabetic model perfusions. Transport fraction index of 3-O-methyl glucose compared to reference marker averaged 29.9% in control perfusions (n=8) and 33.90% in diabetic model perfusions pregnancies (n=5), respectively. The difference observed in TF index of 3-O-methyl glucose compared to tritiated water in control and diabetic groups were not statistically significant (Student's t-test, $p>0.05$). Our studies show for the first time that transport behavior of a model hexose, 3-O-methyl glucose is not significantly different or compromised in diabetic model perfusions. We are unable to speculate whether transport kinetics of hexoses could be altered in diabetic pregnant women *in vivo* state with moderate hyperglycemia as in this study or in diabetic state with greater glucose load than 11 mmol/L as in severe diabetic state.

Biography

Moorkath Nandakumaran obtained his Doctorate degree in Reproductive Physiology from University of Paris VI in 1979 and has done his specialization in maternal-fetal transport of nutrients and drugs across the human placenta as well as experimentally induced diabetic rats for the past many years. He has been an Invited Speaker for more than six international conferences and has developed human placental perfusion models for study of pregnancy related conditions such as pre-eclampsia and diabetes. He has published nearly 40 papers in international journals related to the area of maternal-fetal transport in health and disease states.

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