

Rubidium Concentrations in Amniotic Fluid as a Predictor of Newborn Birthweight Indices: Results from a Pilot Study

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The developmental phase of pregnancy is a crucial time for fetal growth and represents a highly susceptible period with significant consequences for child and adult morbidity and mortality. The scientific literature often describes "programming" events during fetal growth where changes in fetal nutrition and endocrine status lead to developmental adaptations that alter the structure, physiology, and metabolism of the individual, predisposing them to cardiovascular, metabolic, and endocrine disease in later life. Amniotic fluid (AF) is a complex fluid that surrounds the fetus during pregnancy and is vital to fetal growth and development. Due to bidirectional diffusion between the AF and the fetus across fetal skin, placenta, and umbilical cord from 10 to 20 weeks of gestation, it has been suggested that AF composition becomes similar to fetal plasma during this period. Amniocentesis is commonly performed between weeks 16 and 20 and is the earliest, relatively large-scale, and practically sole "sampling point" of AF. Amniotic fluid composition depends on maternal environmental exposure and may serve as a valuable indicator of prenatal mineral exposure. In this context, the trace element rubidium (Rb) is present in all human tissues, including amniotic fluid, but its biogeochemical functions and possible role in fetal development are largely unknown. Animal studies have shown that low dietary Rb levels are associated with reduced prenatal and postnatal growth, suggesting that Rb may be an essential ultra-trace element. This presentation reports the results of a pilot study that measured Rb concentrations in AF during the second trimester of pregnancy. AF samples were obtained from 99 pregnant women with a median gestational age of 19 weeks. The Rb measurements revealed that median concentrations were significantly lower in preterm newborns compared to term newborns. Similarly, median Rb concentrations were significantly lower in small-for-gestational-age newborns compared to appropriate-for-gestational-age newborns. Significantly, amniotic fluid Rb was identified as a significant contributing factor to appropriate-for-gestational-age birthweight. Our findings suggest that Rb concentration in AF may represent a strong predictor of newborn birthweight indices.