

#55: Vitamin A supplementation only transiently increases retinol concentrations in extrahepatic organs of neonatal rats raised under vitamin A-marginal conditions
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Vitamin A (VA, retinol) supplementation is recommended for children > 6 mo old in countries with high rates of malnutrition, based on the positive results of clinical trials conducted in the 1990s. However, the results of studies on the benefits of supplementing neonates < 5 mo old are inconsistent. The objective of this study was to determine the body distribution of VA in neonatal rats raised under VA-marginal conditions (control group) and the effect of VA supplementation on the concentration and mass of retinol in plasma, liver, and lungs, as well as several understudied extrahepatic organs, such as brain, brown adipose tissue, and skin. Methods: Neonatal rats (n = 103), nursed by mothers fed a VA-marginal diet, were randomized and treated on postnatal day 4 (P4) with an oral dose of either VA (6 µg retinyl palmitate/g body weight) or canola oil as control. Subsequently, pups (n = 4/group/time) were euthanized at 13 time points from 30 min to 24 d after dosing and the following organs were collected: plasma, liver, lungs, kidneys, stomach, intestine, brain, white and brown adipose tissue, skin, and the remaining carcass. The total retinol concentration and mass in each organ was measured with ultra-performance liquid chromatography. Results: Control pups maintained a marginal plasma VA concentration, while the VA concentration in the liver was deficient. Despite its deficient status, the liver contained most (~77%) of the whole-body VA mass, similarly as in previous studies of adult rats with an adequate liver VA concentration. White adipose tissue, which was nearly absent prior to P12, contained only ~1% of the whole-body VA mass, compared to 10-20% reported in adult rats. The remaining extrahepatic, non-digestive organs together stored <10% of the whole-body retinol mass. VA supplementation significantly increased total retinol concentrations in all organs. However, this increase lasted for only 1 d in most extrahepatic organs, with the exception of white adipose tissue, where it lasted for 18 d. Conclusions: Our findings suggest that extrahepatic organs in neonatal rats may not be sufficiently developed to store VA at the adult capacity and that the scarcity of adipose tissue may predispose neonates to a low VA status. Moreover, given the transient effect of VA supplementation on extrahepatic organs, a more frequent supplementation schedule, along with other nutrition interventions, may be necessary to maintain a steady supply of retinol to the rapidly developing extrahepatic organs. Supported by NIH grant HD-066982