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Vitamin A requirements are likely overestimated but many US adults do not have optimal status

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Vitamin A is a fat soluble vitamin essential for growth, reproduction, and immune function. The US has mandated skimmed and low fat milk to be fortified with retinyl palmitate since 1978 and other products are voluntarily fortified. We evaluated the vitamin A requirements of young women in the US using the $^{13}\text{C}_2$ -retinol isotope dilution ($^{13}\text{C}_2$ -RID) test at baseline and follow-up after daily supplements. No prior research has evaluated the estimated average requirement (EAR) in this age and gender group as defined in the dietary reference intakes of the US. Women consumed food containing 175 μg retinol activity equivalents (RAE) daily for 12 wk. For the middle 6 wk, women ($n = 41$) were randomized to take a daily supplement of 0, 175 μg , or 525 μg retinol as retinyl palmitate. Dietary vitamin A intake decreased from baseline in the groups given supplements with 0 and 175 μg retinol ($P=0.005$ and 0.018 , respectively) but not in the group given the 525 μg supplement ($P=0.25$). Mean baseline liver reserves $132 \pm 92 \mu\text{g}$ ($0.46 \pm 0.32 \mu\text{mol}$) retinol/g liver were $>0.1 \mu\text{mol/g}$, the cut-off for deficiency ($P<0.05$). Liver reserves and total body vitamin A did not change in any group during the intervention ($P>0.05$). An estimate for daily RAE intake to maintain the total body vitamin A pool and liver concentrations was approximately 300 μg RAE/d. The EAR (500 μg RAE) for vitamin A for well-nourished women aged 19 – 30 y provides robust liver stores and may be higher than necessary. Furthermore, in a recent study with US adult cadavers ($n = 27$; 49-101 y), six subjects (22%) had vitamin A deficiency

and nine subjects (33%) had hypervitaminosis A ($>1 \mu\text{mol/g}$ liver); histology corroborated hypervitaminosis A. In conclusion, the vitamin A requirements of US adults need reevaluation and the causes of hypervitaminosis A should be determined.

Speaker Biography

SA Tanumhardjo manages a progressive research team in Nutritional Sciences. She serves as the Director of the Undergraduate Certificate in Global Health and is on the Executive Board for the Global Health Institute. She teaches at the undergraduate and graduate level including international field experiences. She has more than three decades of experience with vitamin A and carotenoids. Her multidisciplinary research approach is enhanced by her educational background in chemistry, biochemistry, and nutrition. She has authored >160 research publications and chapters. Her research group works with animal models and outcomes often applied to humans. She has been an invited speaker at >250 meetings. Her research efforts were recognized as an endowed chair at University of Wisconsin-Madison (Friday Chair for Vegetable Processing Research; 2009). Other awards include membership on WHO's Expert Advisory Panel on Nutrition (2012), G Malcolm Trout Visiting Scholar Award for lectureship at Michigan State University (2011), Ruth Pike Lectureship Award at Pennsylvania State University (2007), Alex Malaspina ILSI Future Leader Award (2004), and Dannon Institute Creative Leadership training (2001).

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