Introduction

Introduction to symposium proceedings "Applying Vitamin A Isotope Dilution Techniques to Benefit Human Nutrition"

Janet R. Hunt[1] and Anura V. Kurpad[2]

[1]International Atomic Energy Agency, Vienna, Austria; [2]St. John's Research Institute (SJRI), Bangalore, Karnataka, India

The World Health Organization (WHO) estimates that vitamin A deficiency affects 190 million children under 6 years old, occurring most frequently in Africa and Southeast Asia [1]. Where vitamin A deficiency is a public health problem, the WHO recommends high-potency supplementation every 4–6 months from 6 to 59 month of age [1]. Vitamin A supplementation in such settings has been associated with reduced morbidity, mortality and blindness in young children [2; 3]. However, the effects of vitamin A supplementation may differ with setting and location, based on access to dietary or food fortification sources of Vitamin A [1; 4]. Efforts have begun to develop strategies for shifting away from universal vitamin A supplementation in situations where it may have become less effective because of other interventions or changes including dietary diversification [5]. High-potency supplementation in children with normal Vitamin A status is also not without risk [1].

Monitoring and evaluating the impact of vitamin A interventions is difficult because serum retinol is homeostatically regulated, is only affected by status in overt deficiency, and thus is limited in responsiveness to supplementation [6]. Sensitive indices of Vitamin A status are needed to evaluate alternative supplemental doses and frequencies, and sustainable interventions such as food fortification, horticultural or other dietary improvements, including the bioavailability of pro-vitamin A compounds from indigenous foods.

Given the obvious inaccessibility of liver vitamin A samples, isotope dilution techniques provide the most sensitive and accessible quantitative assessment of body retinol stores across a wide range of Vitamin A status, from deficient to adequate to excessive. With this method, the dilution of an oral dose of labelled retinol in blood is determined after equilibration within the body retinol stores. The isotope dilution technique has been developed and validated through studies with animals and humans since the 1970 s [7], including validations in comparison to liver retinol concentrations of surgery patients in the USA [8] and Bangladesh [9]. In collaboration with others, the International Atomic Energy Agency (IAEA) has sponsored training about and application of this stable isotope method (see http://nucleus.iaea.org/HHW/Nutrition/VitaminA/RefsVitaminA/index.html#publ) in studies involving international investigators in developing countries. Retinol or its metabolic precursors labelled with stable isotopes can be used to assess vitamin A status, the efficacy and effectiveness of interventions, human Vitamin A requirements, and the bioconversion efficiency of pro-vitamin A carotenoids from indigenous plant foods.

This symposium proceedings is from an IAEA technical meeting held in at the St. John's Research Institute in Bangalore, India from 7–9 October, 2013. The purpose of the meeting was to update progress in development and application of the vitamin A labelled isotope dilution (VALID) method, and to recommend further studies for improved application of the method to help evaluate public health interventions, while fostering interaction among international investigators.

In addition to technical papers from key speakers, the proceedings includes papers summarizing goals and experiences in applying the retinol dilution method internationally as well as recommendations for further research.

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Janet R. Hunt

International Atomic Energy Agency
Wagramer Strasse 5
PO Box 100
1400 Vienna
Austria
janetrhunt@gmail.com

Anura V. Kurpad

St. John's Research Institute (SJRI)
Sarjapur Road
Bangalore 560 034
Karnataka
India
a.kurpad@sjri.res.in

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