Conversations with Dr. Sherry Tanumihardjo, October 17 and 27, 2017

Participants

- Dr. Sherry Tanumihardjo – Professor of Nutritional Sciences and Director of Undergraduate Certificate in Global Health, College of Agricultural and Life Sciences, University of Wisconsin
- Andrew Martin – Research Analyst, GiveWell

Note: These notes were compiled by GiveWell and give an overview of the major points made by Dr. Sherry Tanumihardjo.

Summary

GiveWell spoke with Dr. Sherry Tanumihardjo of the University of Wisconsin as part of its investigation into rates of vitamin A deficiency (VAD) in countries in sub-Saharan Africa. Conversation topics included vitamin A biomarkers and vitamin A deficiency rates in sub-Saharan Africa.

Vitamin A status biomarkers

Several different biomarkers can be used to assess vitamin A status (i.e., whether an individual is vitamin A deficient, has adequate vitamin A reserves, or has excess vitamin A reserves). Liver reserves of vitamin A are the "gold standard" biomarker for assessing vitamin A status, but it would be difficult and expensive to measure liver reserves of vitamin A in a representative survey of a population group.

Serum retinol concentration, measured in blood samples, is the most commonly used vitamin A status biomarker. When serum retinol concentrations are below 0.7 μmol/L, individuals are considered to be vitamin A deficient, but the World Health Organization recommends that another biomarker be used to confirm deficiency.

Concentrations of retinol-binding protein (RBP) are sometimes used as a proxy for serum retinol concentrations, because tests measuring RBP are less expensive and easier to implement than serum retinol tests. But unlike serum retinol, there is not a commonly accepted deficiency cutoff for measures of RBP and it may differ depending on the assay used. In most populations, RBP and serum retinol concentrations are tightly correlated, but the ratio of the concentrations of the two substances is not always one-to-one, so it may not be appropriate to use the same deficiency cutoff of 0.7 μmol/L for RBP. In obese individuals or individuals with abnormal kidney function, serum retinol and RBP may not be closely correlated.

Serum retinol and RBP both have limitations as biomarkers for indicating vitamin A status:

- Both of these biomarkers are responsive to inflammation, such that a low level of the biomarker could indicate either VAD or an acute phase response to infection. It may be more accurate to think of serum retinol and RBP as biomarkers of inflammation rather than of VAD.
- In the beginning stages of VAD, levels of serum retinol and RBP may increase as the body attempts to "recycle" vitamin A.

The results of surveys of serum retinol or RBP are sometimes adjusted to account for inflammation. If no adjustments are used, serum retinol and RBP surveys would likely overestimate the prevalence of vitamin A deficiency, because some individuals' concentrations of serum retinol or RBP would be low due to inflammation, rather than chronic low vitamin A intake.

A better measure of VAD to use going forward would be the modified relative dose response (MRDR) test, because it is not as sensitive to inflammation. The Centers for Disease Control and Prevention (CDC) has completed a number of surveys of MRDR and is currently writing up the results. Dr. Tanumihardjo worked on a survey in Ghana that used the MRDR in a subsample, the results of which may be published relatively soon. The population-based survey in Ghana cost $600,000-$700,000 to implement.

Vitamin A deficiency rates in sub-Saharan Africa

Much of the available information on rates of VAD in sub-Saharan Africa is outdated and is based on surveys of serum retinol and/or RBP, which may not accurately reflect VAD. Many countries in sub-Saharan Africa have implemented mandatory fortification of vegetable oil or sugar with vitamin A, but we have limited information on whether food is being consistently fortified to an adequate level or whether it is reaching preschool-aged children. Without current data, it is difficult to determine whether to continue or scale back vitamin A supplementation (VAS) activities.

Despite the lack of data, Dr. Tanumihardjo thinks it is unlikely that oil fortification programs across sub-Saharan Africa are working well enough to render VAS programs unnecessary in most countries, given that many of the oil fortification programs are relatively new. Over the next few years, we may gain enough data on rates of VAD to make an informed decision about whether to continue or scale back VAS programs. If there were strong evidence that a country's vitamin A fortification program was effectively fortifying food and reaching target populations, it may be appropriate to scale back the programs. Dr. Tanumihardjo thinks it would be premature to start scaling back VAS programs before we have these data.

VAS may no longer be necessary in a small number of countries in sub-Saharan Africa including Malawi and Zambia. A recent survey in Malawi using the MRDR test found low rates of VAD, likely due to a combination of a successful fortification

program and frequent consumption of whole small fish. VAD is unlikely to be a major concern in Zambia because its vitamin A sugar fortification program seems relatively successful and consumption of whole small fish that include the liver is common there as well.

Countries in sub-Saharan Africa, including Burkina Faso and Mali, likely still have VAD in some areas, but this will need to be monitored because vitamin A fortified cooking oil use is on the rise.

All GiveWell conversations are available at http://www.givewell.org/conversations