

A conversation with Dr. Sherry Tanumihardjo, March 26, 2018

Participants

- Dr. Sherry Tanumihardjo – Professor of Nutritional Sciences, University of Wisconsin-Madison
- 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. Tanumihardjo of the University of Wisconsin-Madison as part of its investigation into rates of vitamin A deficiency (VAD) in countries in sub-Saharan Africa. Conversation topics included methods of measuring vitamin A levels, recent VAD surveys in sub-Saharan Africa, and the logistics of running VAD surveys.

Measuring vitamin A status

Difficulties in using surveys to determine if vitamin A supplementation (VAS) should be discontinued

Recently, researchers have been conducting surveys to determine whether or not VAS needs to be continued in particular populations. However, if a population has been receiving VAS for several years, it may be difficult to isolate the effects of VAS from vitamin A that the population consumes from other sources, such as fortified foods or liver.

This introduces a concern that researchers may decide to discontinue VAS in a population if they find low rates of VAD, without knowing whether the low rates of VAD are caused by the supplementation itself.

Solutions

This problem can be partially mitigated by using multiple methods to measure the vitamin A levels of any given population. It can also be helpful to wait a few months after supplementation has occurred to take measurements – for a serum retinol survey, for example, the effects of VAS fade within two months, so any survey conducted more than two months after supplementation should reflect the population's serum retinol levels independent of the effect of vitamin A supplementation.

Methods of measuring vitamin A levels

Serum retinol

Serum retinol is currently the indicator recommended by the World Health Organization (WHO) for measuring vitamin A status. This is problematic because a

serum retinol test alone cannot be used to determine whether a population still needs VAS, since it does not effectively distinguish sources of vitamin A and is sensitive to inflammation. Fortunately, WHO now knows that this recommendation is not appropriate, and as of February it has begun the process of changing this guideline, which will take several years.

Modified relative dose response (MRDR)

An MRDR test measures liver vitamin A stores by measuring the response to an oral dose of vitamin A₂, a naturally occurring analog of vitamin A₁. MRDR can only indicate whether a child's vitamin A levels are adequate or deficient; it does not provide information on vitamin A toxicity.

Using a combination of biomarkers and other types of data

In order to be useful for determining whether it is appropriate to discontinue a VAS program, a VAD survey needs to look at more than one vitamin A biomarker, since this allows researchers to distinguish the effects of VAS on vitamin A status from other sources of vitamin A. A good general method is to use both serum retinol and a supporting biomarker that directly measures liver stores of vitamin A.

For example, in a VAD survey in South Africa, researchers were able to isolate what effect each source of vitamin A had on the cohort by using a combination of:

- **Surveys measuring vitamin A status.**
- **Dietary intake data**, including supplement use over the child's lifetime and over the past 12 months.
- **Retinol isotope dilution (RID)**, which directly measures the body's stores of vitamin A.

Dr. Tanumihardjo recommends that if a government is conducting a VAD survey, donors should consider providing the government with additional funding to look at more sensitive biomarkers such as MRDR or RID, in order to more accurately determine the children's vitamin A status.

Vitamin A and bone development

An excess of vitamin A can interfere with bone development in children. This issue arises when children receive vitamin A from multiple programs simultaneously, or when they have adequate dietary intake but also receive supplementation. This is particularly a problem when VAS is mandated for the entire population, because children who do not need additional vitamin A will receive supplements anyway.

Dr. Tanumihardjo hopes that as fortification programs ramp up, supplementation programs will work to avoid causing bone development issues by either scaling back their distributions or decreasing the amount of vitamin A in each supplement.

Recent and ongoing vitamin A surveys

Population surveys for VAD

Nationally representative population surveys are used to recommend continuation or discontinuation of VAS in certain countries. This type of study is not generalizable across countries, because each country has its own unique fortification and supplementation schemes, which means that different countries in West Africa have different rates of coverage and are likely to have quite different rates of VAD.

Burkina Faso

A nationally representative population survey for VAD is expected to take place in Burkina Faso later this year. The study was originally going to be funded by the International Atomic Energy Agency (IAEA) and the Centers for Disease Control and Prevention (CDC). The IAEA will move forward this year with a combination of biomarkers to measure vitamin A status.

Dr. Tanumihardjo expects the results of this survey to indicate that VAS is still providing benefits, because Burkina Faso's vitamin A fortification programs have likely not yet been very successful.

Other population surveys in sub-Saharan Africa

Dr. Tanumihardjo is not aware of any other population surveys for VAD that are planned to take place in sub-Saharan Africa in the near future.

Small-scale studies

Some small-scale VAD studies are expected to take place soon in Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Morocco, Senegal, South Africa, Tanzania, Tunisia, and Zambia. Except for Tunisia, all of the countries involved in the study distribute high-dose vitamin A capsules to their children under five years old.

Selection of study subjects

These small surveys were not nationally representative, but instead targeted specific populations. The study in South Africa, for instance, focused on a group that the researchers knew was consuming liver frequently, because the researchers suspected that that group no longer needed VAS after the age of three years. In other studies, researchers studied groups of children who either only had access to vitamin A through VAS, or who were receiving vitamin A from more than one intervention (e.g. both VAS and fortified cooking oil).

Though they do not take a fully representative sample of the population, studies of this type help researchers to understand in which contexts VAS is still appropriate.

Survey logistics

Costs of conducting a vitamin A survey

Dr. Tanumihardjo estimates that any country can run a nationwide VAD survey for ~\$1 million, with the right support systems.

Planning a VAD survey

If GiveWell is interested in starting the planning process for a VAD survey, Dr. Tanumihardjo suggests working with GroundWork, an organization that conducts population surveys for nutrition and public health. Dr. Tanumihardjo would be able to provide additional assistance to GiveWell for such a study.

Dr. Tanumihardjo also suggests that GiveWell check for other micronutrient deficiencies in addition to vitamin A, if it conducts a survey. It is standard practice for VAD surveys to look at several different micronutrients, since it is far cheaper and easier to aliquot multiple samples from each subject than to conduct multiple surveys.

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