The Fortification of Staple Foods
An Investment in the Future
The Way to a Permanent Nutrition Solution
A Commitment to the Coming Generation
Investment in the Future

A Contribution to a Healthy Future
Micronutrient Deficiencies

Strategies for Combating Vitamin A Deficiency
Acute Actions

Methods of Dispensing Vitamin A
The Way to a Permanent Nutrition Solution
A Commitment to the Coming Generation

BASF is the world’s leading chemical company: The Chemical Company. BASF is a leading global provider of nutrition solutions. Food fortification is a flagship corporate social responsibility initiative that offers BASF the opportunity to address a humanitarian challenge in an economically sustainable fashion. Through its product solutions, technical assistance, scientific capacities and partnerships with academic and public-interest organizations, BASF is engaged in programs in more than 30 developing countries that are helping local producers, the public sector and civil society to reduce Vitamin A deficiency. In particular, BASF is committed to combating Vitamin A deficiency and improving child survival by:

- Exploring partnership opportunities to increase the intake of Vitamin A and increase child survival in targeted populations
- Collaborating with partners to establish sustainable delivery systems which integrate Vitamin A with maternal and child health programs in developing countries
- Collaborating with partners to identify areas of mutual interest in research and technology development
- Collaborating with partners to promote policies and programs, overcome barriers and develop strategies to establish or expand the distribution of Vitamin A capsules, fortified foods and Vitamin A-rich foods that will contribute to the health, development and economic prosperity of populations worldwide.

BASF has therefore set up facilities, backed up by a dedicated team, to provide general and technical support for your fortification project. When developing new products, we cooperate with the food industry concerned to ensure that their requirements can be fulfilled as closely as possible. In these ways we contribute, together with our partners, to a healthy future for the world’s children.

All of them.

OUR CHILDREN ARE OUR FUTURE. THEY ARE CURIOUS, WIDE OPEN TO LIFE’S OPPORTUNITIES AND FULL OF HOPE. THEY NEED SURROUNDINGS THAT OFFER THEM THE CHANCE TO LEARN, PLAY AND DEVELOP INTO HEALTHY ADULTS.

Investment in the Future
Micronutrient Deficiencies

For example, malnourished children compared to their well-nourished counterparts have impaired growth, more severe illnesses, an increased mortality risk or a lower performance at school. The most frequent forms of malnutrition are protein-energy malnutrition (PEM) and micronutrient deficiencies, such as Vitamin A, iron and iodine deficiency. Other micronutrients of concern are B vitamins, Vitamin C and zinc. Often micronutrient deficiencies are combined. For example, in northern Morocco the prevalence of Vitamin A deficiency in children is as high as 50%. Many of those children are iodine deficient too, indicated by a goiter rate of more than 80%. Similarly, there is a high prevalence of iron deficiency in Moroccan children, with 35-40% of children affected. Vitamin A is a fat-soluble vitamin. Vitamin A plays a pivotal role in reproduction and supports growth and immune function. It is important for the skin, the integrity of mucosal surfaces and normal wound healing. Vitamin A is also essential for visual function as a component of visual purple. The liver can often compensate for considerable daily and seasonal variations in Vitamin A supply. However, the liver stores of young children and mothers are often very low.

Vitamin A deficiency (VAD) is the most common form of vitamin deficiency in the world. It is estimated that VAD exists in more than 70 developing countries. VAD primarily occurs in infants and young children. VAD is also increasingly recognized in women, and may account for most maternal deaths. Initial symptoms of VAD include increased sensitivity to light, dry eyes (xerophthalmia) and impaired adaptation to the dark (nightblindness). In advanced stages, ulcerations of the conjunctiva occur and eventually lead to complete blindness, particularly in small children.
Over 250 million children of pre-school age are affected by VAD. VAD is the cause of a million child deaths every year and 500,000 Vitamin A deficient children go blind annually. VAD increases the susceptibility and severity of infections. Consequently, common diseases in disadvantaged countries, such as measles, tuberculosis, malaria and HIV-infection are more severe. Therefore, interventions using Vitamin A are highly encouraged to reduce the negative outcomes of these ailments. VAD impairs iron metabolism. For example, in children with marginal Vitamin A status, iron fortification is barely effective to treat anemia. It is well established that anemia negatively affects performance at work.

Periodic supplementation.
The first step is the acute action that can be taken. In areas with VAD supplementation, given Vitamin A capsules twice a year has proven to be an effective measure. Supplementation of a high dose of preformed Vitamin A (e.g. Vitamin A-Palmitate) or retinol in capsules is usually combined with immunization programs. The capsules are dispensed to infants and pre-school children. The dose recommended by WHO is 100,000 IU for infants between 6 and 12 months of age. Pre-school children and postpartum mothers are given 200,000 IU.

This intervention is only effective if all individuals in the target group do indeed receive the Vitamin A. Finally, this intervention demands careful control of capsule administration to avoid overdosing or underdosing.

Vitamin A deficiency is not just a cause of blindness – it also causes:
- Impaired immune function
- Diseases of lung, intestines (e.g. pneumonia, tuberculosis, diarrhea)
- Complications from other diseases (e.g. AIDS, malaria, measles)
- Anemia

Strategies for combating Vitamin A deficiency
1. Periodic supplementation
2. Fortification of staple foods
3. Nutrition education and home gardening
Methods of Dispensing Vitamin A

**Fortification of staple foods**
Supplementation is often followed by fortification of staple foods and should substitute supplementation over time. This intervention entails adding Vitamin A to one or more widely consumed staple foods. Fortification is justified when wide-spread or blanket coverage is desired. This implies that VAD is extensive and not limited to specific groups or isolated communities. Coverage can include whole country or a region.

Fortification does not require people to change their dietary habits. Thus, the target population continues to eat the fortified food as a vehicle. The Vitamin A added provides low but constant amounts, so there is little risk that intake become undesirably high.

A large proportion of the population should consume the food vehicle, especially those at major risk of VAD. There should be little day-to-day and inter-individual variation in the amount of the food vehicle (staple) consumed. The food vehicle should go through central processing where Vitamin A can be added under controlled conditions.

Rice, sorghum, maize, roots or tubers are the major source of energy in many countries, but these foods lack Vitamin A. In theory, these staple foods could be perceived as appropriate due to their widespread use. However, they are usually processed and cooked at home, thus making it impractical or impossible to fortify them centrally under controlled conditions. Hence, the most common vehicles for food fortification are wheat flour, sugar, vegetable oil and salt. These staple foods are normally produced in large factories.

**Nutrition education and home gardening**
The permanent and logical solution to eliminating Vitamin A deficiency should be through modifications in patterns of food production, consumption and distribution. These can be done through the application of agricultural or horticultural and educational alleviation strategies. This is a longterm part of the strategy and should be started along with the interventions mentioned above.
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Further information can be found at:
www.human-nutrition.basf.com
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