Activity 3-F: Micronutrient Activity Station
Vitamin A deficiency
Instructions

• Please read through this Vitamin A information package and discuss amongst your group.
• You have 15 minutes to review this package.
• Answer the questions related to the specific micronutrient given in their manuals.
• At the end of the 15 minutes please move on to the next station till you have completed all four.
Vitamin A: DIETARY SOURCES

Provitamin A Carotenoids
These come from plant sources such as fruits & vegetables. The most important of these - beta carotene - is found in leafy green vegetables and in bright yellow and orange fruits & vegetables. Absorption from plant sources is lower than animal sources.

Preformed Vitamin A
This is found in animal sources such as organ meats (liver), red meat and fish.

Breastmilk is a critical source of preformed vitamin A for the infant
The underlying cause of VAD is a diet chronically insufficient in vitamin A. Reasons for an inadequate level of vitamin A include:

1. Inadequate breastfeeding – the first critical source of vitamin A.
2. Diet lacking in vitamin A-rich foods (especially liver and full-fat dairy products).
3. Vegetarian diets with modest amounts of vitamin A-rich fruits and vegetables.

An inadequate diet and infections usually co-exist in vitamin A deficient populations. VAD increases the severity of infections, which in turn adversely affect intake, giving rise to a ‘vicious cycle’ of VAD and infections.
Prevention Strategies to prevent Vitamin A Deficiency

- Improving diet
- Consumption of vitamin A -fortified foods
- Vitamin A supplementation programs
High-Dose Supplementation
Periodic, targeted high doses of vitamin A supplementation (VAS) to populations at risk is a proven, low-cost intervention.

Vitamin A Deficiency (VAD) : Prevention Strategies
- Vitamin A Supplementation Programs
- Fortified Foods
- Dietary Diversification

Consumption of Foods Rich in Vitamin A
Breastfeeding is included in this strategy - it is the first best source of vitamin A for infants.

Vitamin A fortification of staple foods such as oil, flour, milk powder or sugar is a cost-effective strategy.

* VAS = Vitamin A Supplementation
Vitamin A Supplementation - For Children

The WHO recommends periodic VAS in children 6 - 59 months only in populations at risk.

*Priority countries for national vitamin A supplementation programs are identified as those having high under-5 mortality rates (over 70 per 1,000 live births), and/or evidence of vitamin A deficiency among this age group, and/or a history of vitamin A supplementation programs.

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Infants 6–11 months of age (including HIV+)</th>
<th>Children 12–59 months of age (including HIV+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Once</td>
<td>Every 4 – 6 months</td>
</tr>
<tr>
<td>Dose</td>
<td>100 000 IU (30 mg RE) vitamin A</td>
<td>200 000 IU (60 mg RE) vitamin A</td>
</tr>
<tr>
<td>Route of Administration</td>
<td>Oral liquid, oil-based preparation of retinyl palmitate or retinyl acetate</td>
<td></td>
</tr>
<tr>
<td>Settings</td>
<td>Populations where the prevalence of night blindness is 1% or higher in children (24 to 59 months of age) or where the prevalence of vitamin A deficiency (serum retinol 0.70 µmol/l or lower) is 20% or higher in infants and children (6 to 59 months of age)</td>
<td></td>
</tr>
</tbody>
</table>
For Mothers

In regions where vitamin A deficiency is a severe public health problem as in East Africa, supplementation in pregnancy is recommended to avoid night blindness.

Adequate nutrition through a balanced diet is recommended for mothers in the postpartum period, especially during breastfeeding.

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Pregnant Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Daily or Weekly</td>
</tr>
<tr>
<td>Dose</td>
<td>Up to 10 000 IU vitamin A (daily dose) OR Up to 25 000 IU vitamin A (weekly dose)</td>
</tr>
<tr>
<td>Route of Administration</td>
<td>Oral liquid, oil-based preparation of retinyl palmitate or retinyl acetate</td>
</tr>
<tr>
<td>Duration</td>
<td>A minimum of 12 weeks during pregnancy until delivery</td>
</tr>
<tr>
<td>Settings</td>
<td>Populations where the prevalence of night blindness is 5% or higher in pregnant women or 5% or higher in children (24–59 months of age)</td>
</tr>
</tbody>
</table>
Supplementation in MEASLES

Measles & Vitamin A
Measles, a viral infection, infects and damages epithelial tissues of the body. It can reduce vitamin A levels in the body.

Treatment
Studies have shown that vitamin A supplementation given in measles reduces morbidity due to the disease. Thus, the WHO recommends vitamin A to be given to all children with measles in vitamin A deficient areas.

<table>
<thead>
<tr>
<th>AGE</th>
<th>DOSE</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 6 months</td>
<td>50,000 IU</td>
<td>2 doses, 24 hours apart</td>
</tr>
<tr>
<td>6 months - 1 year</td>
<td>100,000 IU</td>
<td>2 doses, 24 hours apart</td>
</tr>
<tr>
<td>greater than 1 year</td>
<td>200,000 IU</td>
<td>2 doses, 24 hours apart</td>
</tr>
</tbody>
</table>
# Treatment of VAD & Xerophthalmia

Xerophthalmia literally means ‘dry eyes’. It is the term that is used to describe the ocular (eye) manifestations of vitamin A deficiency.

## Children

<table>
<thead>
<tr>
<th>Vitamin A orally on days 1, 2 and 14:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• aged less than 6 months - 50 000 IU</td>
</tr>
<tr>
<td>• older children - 200 000 IU</td>
</tr>
<tr>
<td>• aged 6–12 months - 100 000 IU</td>
</tr>
</tbody>
</table>

If the eyes show signs of corneal clouding or ulceration, the following care is given to the affected eye:

1. Chloramphenicol or tetracycline eye drops, 4 X daily as required for 7–10 days  
2. Atropine eye drops, 1 drop 3 X daily for 3–5 days  
3. Saline-soaked eye pads  
4. Bandages for the eye  
5. A specialist referral, if necessary

## Women of Reproductive Age

Vitamin A orally, 5000 – 10,000 IU daily or 25,000 IU weekly for at least 4 weeks. Management of eyes as in children.
Iodine Deficiency
Instructions

• Please read through this Iodine information package and discuss amongst your group.
• You have 15 minutes to review this package.
• Answer the questions related to the specific micronutrient given in their manuals.
• At the end of the 15 minutes please move on to the next station till you have completed all four.
Iodine is important for the production of thyroid hormones. Thyroid hormones regulate many reactions within the body and are required for skeletal and central nervous system development in fetuses and infants.

- Seaweed is one of the best food sources of iodine, though depending on the species, iodine content is highly variable.

- Other good sources include fish, shrimp, and other seafood. Foods of marine origin usually have a higher content because iodine in sea-water becomes concentrated in marine life.

- Iodine is also present in vegetables (e.g. green peas, corn, beans) and fruits (e.g. dried prunes, strawberries, bananas).

- Few foods contain iodine naturally - of those that do iodine content is generally low. Iodine content varies depending on:
  - soil content
  - fertilizer use
  - irrigation practices
Strategies to Prevent Iodine Deficiency

- Consumption of iodized salt
- Iodine supplementation
CONTROL of Iodine Deficiency Disorders

There are two key global strategies to control iodine deficiency disorders:

Salt Iodization
Families and patients should be recommended to consume iodized salt only. Iodized salt should be kept away from heat to protect its iodine content.

Supplementation
Supplementation of vulnerable populations with iodine is an alternative strategy if salt iodization is not feasible.
Prevention Strategies

• WHO and UNICEF recommend **iodine supplementation** as a temporary strategy, when salt iodization is not possible.

• Iodine supplementation is particularly recommended for pregnant or lactating women, women of child-bearing age and children aged 0-24 months, in iodine-deficient regions.
Zinc Deficiency
Instructions

• Please read through this Zinc information package and discuss amongst your group.
• You have 15 minutes to review this package.
• Answer the questions related to the specific micronutrient given in their manuals.
• At the end of the 15 minutes please move on to the next station till you have completed all four.
Zinc is an important mineral for the body’s immune system, growth and development. Dietary diversification strategies, especially for households with predominant plant-based diets:

• Increase production and use of animal source foods (e.g. beef and poultry).
• Employ household phytate reducing techniques such as soaking cereals and legumes and leavening of grains.
• Encourage breastfeeding and complementary feeding as per WHO recommendations. Breastfeeding is sufficient for meeting an infant’s zinc requirements up to 6 months of age, after which appropriate complementary feeding should be initiated.
Dietary Sources of Zinc
Liver, beef, veal, lamb, pork, chicken, soy products and seeds, especially pumpkin and squash seeds.

Foods Inhibiting Absorption of Zinc
Whole grains, legumes, cereals and nuts are phytate-containing foods which inhibit zinc absorption. Non-heme iron intake can also reduce zinc absorption which is a cause of concern for individuals on iron supplementation.

People on phytate-rich diets might have zinc requirements up to 50% higher than the normal population.
Strategies to Prevent Zinc Deficiency

- Improving diet
- Zinc supplementation
- Zinc fortification
Zinc Therapy in Diarrhea

The World Health Organization and UNICEF recommend zinc supplementation for children under-5 to treat all forms of diarrhea.

- Recommended dose: 20 mg/day for 10-14 days (10 mg/day for infants <6 months)

- Oral Rehydration Salts (ORS) are given along with zinc. Both are essential and not a substitute for the other.

- Severely dehydrated children are given zinc once intravenous rehydration is no longer required and vomiting, if any, has stopped.

Known Benefits

Research has shown that zinc therapy reduces:

- diarrhea-related admissions to hospital by 23%
- duration of the episode (acute diarrhea by 10 hours and persistent diarrhea by 16 hours)
- diarrhea-related mortality
Vitamin D Deficiency
Instructions

• Please read through this Vitamin D information package and discuss amongst your group.
• You have 15 minutes to review this package.
• Answer the questions related to the specific micronutrient given in their manuals.
• At the end of the 15 minutes please move on to the next station till you have completed all four.
Vitamin D: Sources

Vitamin D is an important micronutrient required for strong bones (by helping calcium absorption), muscle and nerve function, as well as helping the immune system.

Endogenous Skin Synthesis

Exposure of uncovered skin to sunlight leads to vitamin D synthesis in the skin.

Dietary Sources of Vitamin D

- Fish liver oils (e.g. cod and halibut)
- Fatty fish (e.g. salmon, tuna, sardine)
- Egg yolks
- Fortified foods (e.g. milk, cheese, cereals, margarine)
Vitamin D is synthesized by the skin when exposed to sunlight. Moreover it is also available in certain foods. Most commonly vitamin D deficiency can be due to:

• Inadequate exposure to sunlight – due to reduced outdoor exposure time, air pollution, skin coverings or sunscreen use
• Diet poor in vitamin D
• High amounts of melanin (skin pigment)
### Vitamin D Deficiency: Vulnerable Groups

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnant and Lactating Females</strong></td>
<td>Need vitamin D to ensure adequate stores in the baby and sufficient vitamin D in breast milk.</td>
</tr>
<tr>
<td><strong>Neonates and Infants</strong></td>
<td>Neonates are born with low vitamin D stores and the breast milk vitamin D content is dependent on the mother’s vitamin D status (which is often not adequate).</td>
</tr>
<tr>
<td><strong>Older Adults (&gt; 65 Year of Age)</strong></td>
<td>Skin of older adults does not synthesize vitamin D as efficiently as that of younger people.</td>
</tr>
<tr>
<td><strong>Inadequate Sun Exposure</strong></td>
<td>Inadequate exposure to sun leads to inadequate synthesis of vitamin D.</td>
</tr>
</tbody>
</table>
Strategies to Prevent Vitamin D Deficiency

• Adequate exposure to sun
• Vitamin D-rich diet
• Vitamin D supplements
Vitamin D Deficiency Treatment

In many settings, vitamin D deficiency (and rickets in children) is treated with supplementation. However there is no global consensus on doses given to adults and children.
An example of commonly followed treatment includes:

1. 300,000-600,000 IU orally or intramuscularly divided into 2-4 doses (observed) over 1 day
2. 2000-5000 IU vitamin D daily orally for 4-6 weeks

**Maintenance Therapy**
Follow either strategy by vitamin D intake of 400 IU/day if <1 yr old or 600 IU/day if >1 yr old with adequate dietary intake of calcium and phosphorus.
An example of commonly followed treatment for adults includes:

**Endocrine Society - USA**

The Endocrine Society in the USA recommends adults with vitamin D deficiency be treated with either of the following two protocols:

1. 50,000 IU weekly for 8 weeks
2. 6000 IU daily for 8 weeks

**Maintenance Therapy**

Either protocol should be followed by 1500-2000 IU/day.