VITAMIN A DEFICIENCY

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INTRODUCTION

Food Components

- **"What Do We Eat" & "Why Do We Eat"**

- **Nutrition** – (nutrients) foods needed for health supplied from environment.
- **Macronutrients** – carbohydrates, proteins & fats.
- **Micronutrients** – vitamins & minerals (needed in small amounts)
- **Essential Nutrients** – substances cannot be synthesized by cells & needed by body (e.g. amino acids)
- **Water** – essential & must be added to diet

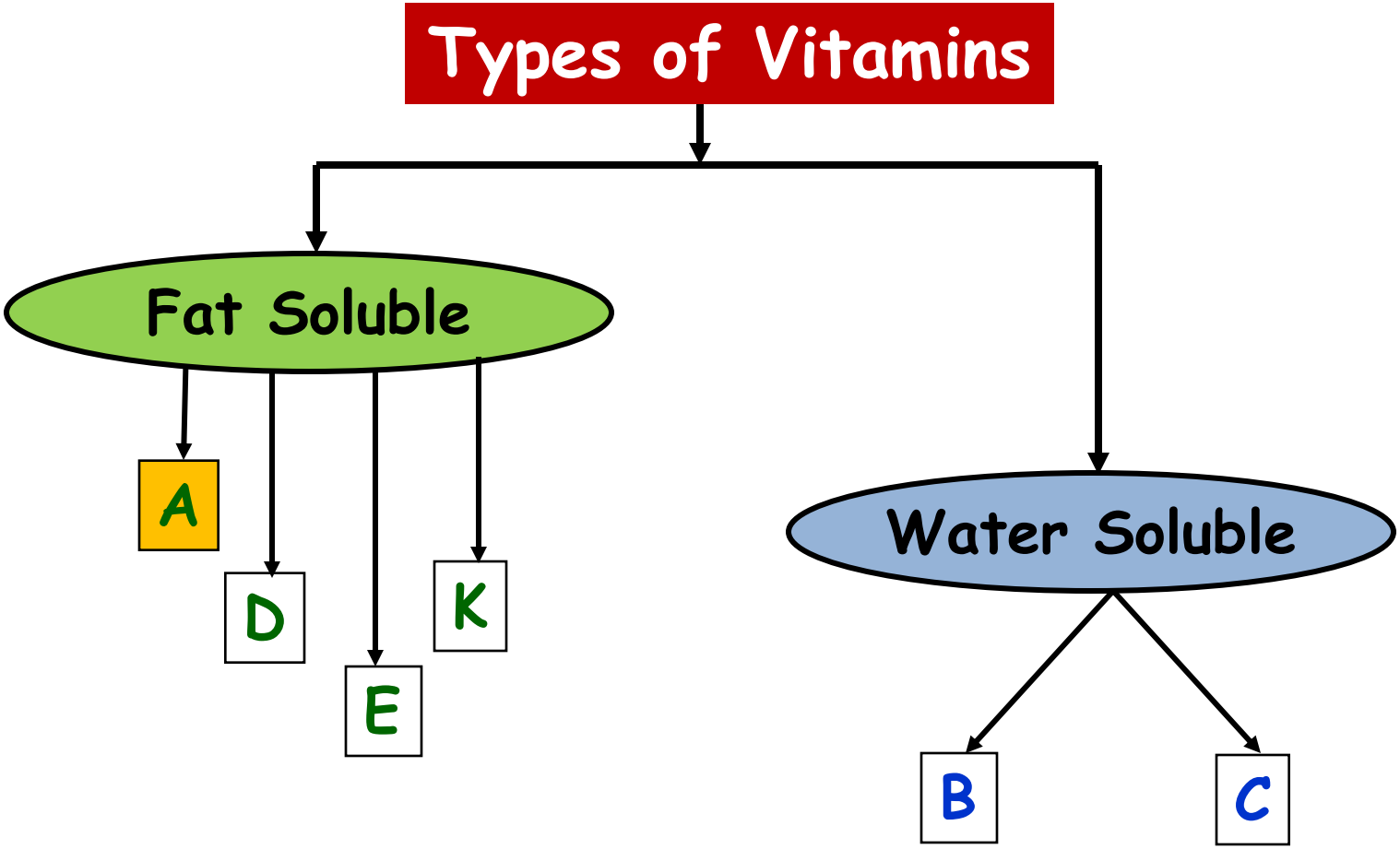
Definition of Vitamin

- "**VITAMIN**" means "vita = life + amine"

- VITAMINS - organic compounds - trace amounts in diet - metabolic regulators - growth, development and reproduction.

- **Low** vitamin levels - deficiency symptoms & severe complications occur.

- **Excess** vitamin levels - toxic effect

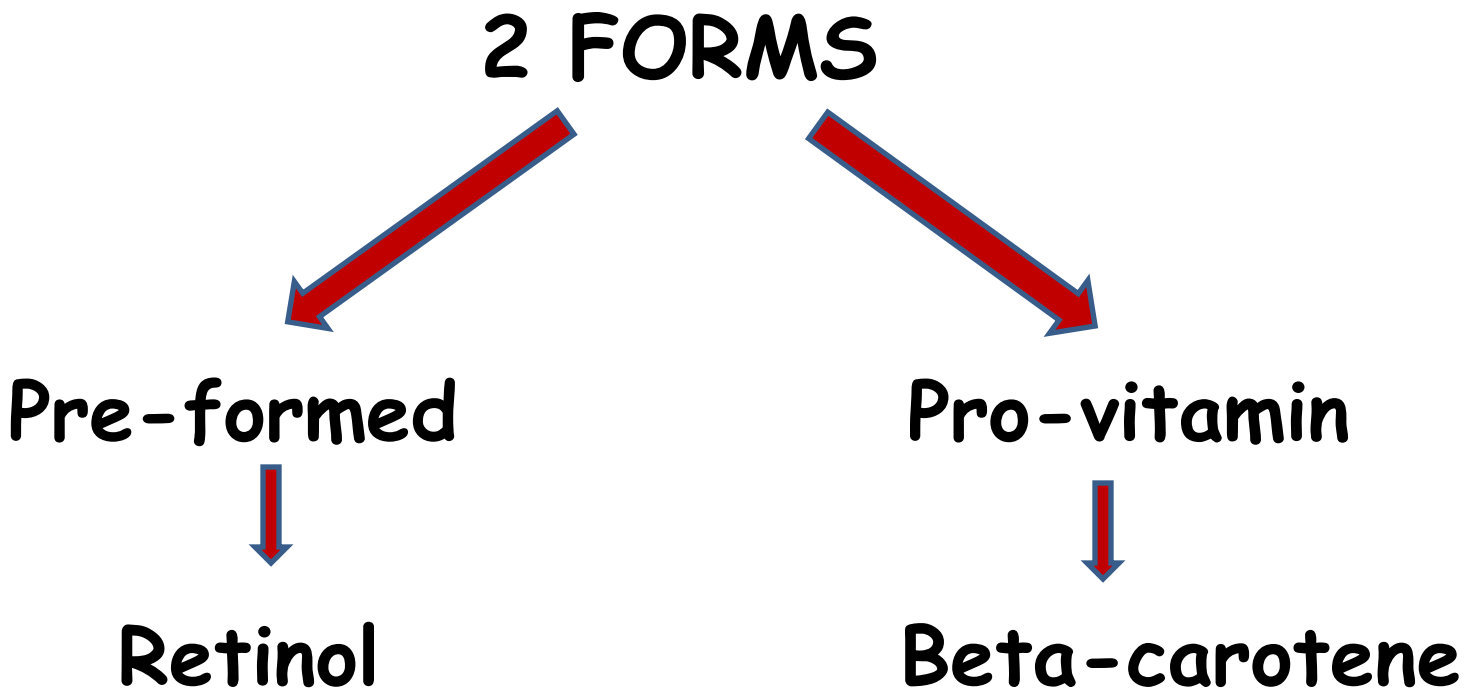

Types of Vitamins
Fat Soluble
A
D
E
K
Water Soluble
B
C

It is well known that Vitamin A deficiency can cause blindness.

- **A lesser known fact is :**

  *Vitamin A is crucial for **child survival.***

VITAMIN A



Vitamin A measured in International Unit(IU)

One IU of Vitamin A = 0.3 microgram of Retinol

FUNCTIONS

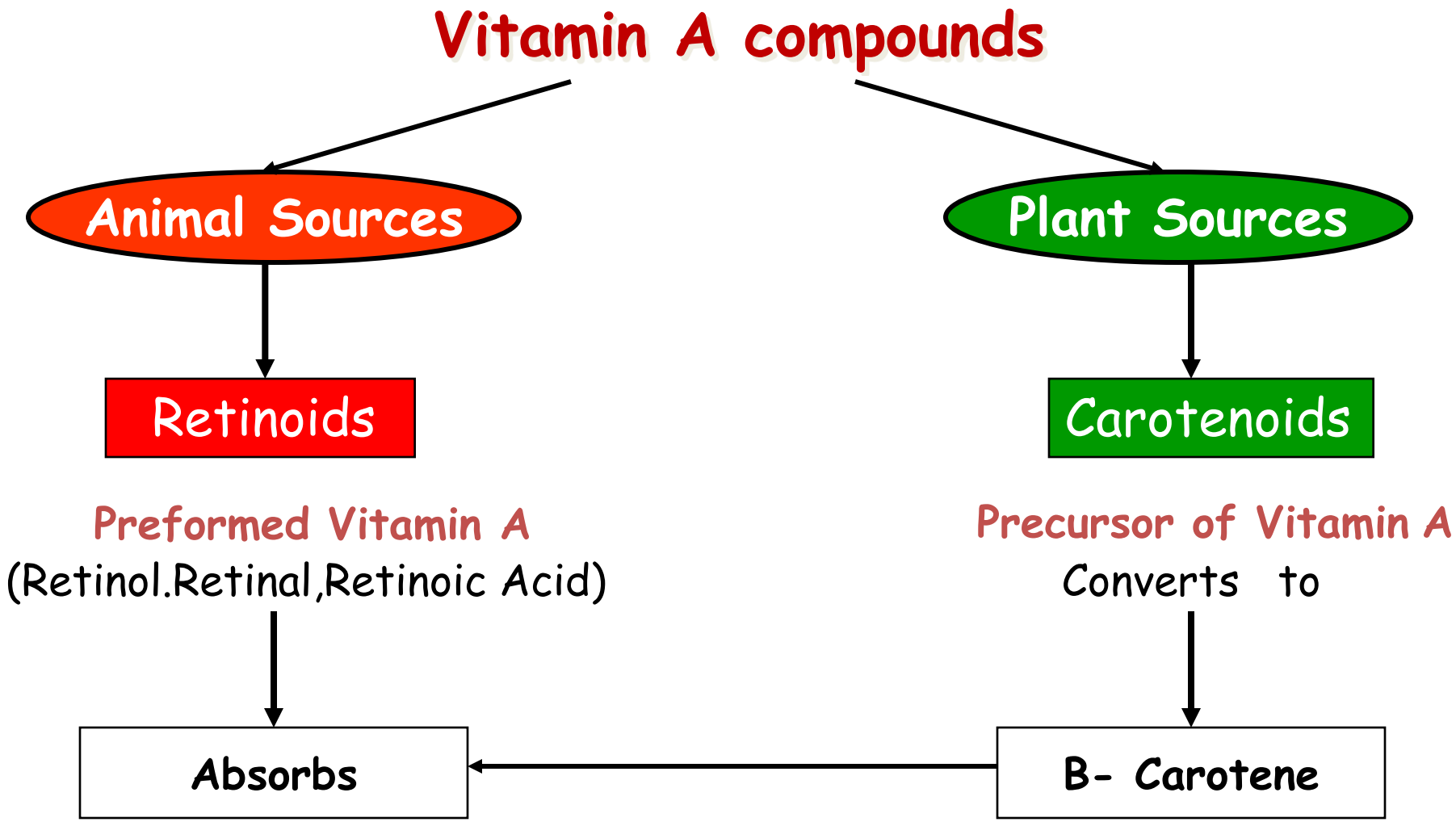
1. **Rhodopsin** (retinal + opsin)..pigment for dark adaptation

2. **Integrity** of the mucous membrane & healthy skin.

3. **Normal growth and cell differentiation:** bone, soft tissues, reproduction, immunity, RBC.

4. β-carotene is an **antioxidant.**

SOURCES



Precursor of vitamin A converts into the preformed vitamin A. This conversion depends on the bio-availability and bio-conversion from carotenoids to B-Carotene.

SOURCES

Animal Sources

- **Fish,** Liver, Eggs And Meat
- **Milk and Milk products**

Plant Sources

- **Green leafy vegetables** : Spinach, Amaranth,
- **Other vegetables** : Carrots, Pumpkin, Sweet potatoes, Tomatoes
- **Fruits** : Papaya, Orange, Mango, Watermelon, Plums

વિટામિન - 'એ' શા માંથી મળે ?

છ માસ સુધી ફક્ત ધાવણ અને સાતમાં માસથી વિટામિન 'એ' સભર ઉપરનો ખોરાક

ફક્ત ધાવણ
બાળક છ માસનું થાય
ત્યાં સુધી <u>ફક્ત</u> ધવડાવો

લીલાં પાંદડાવાળા
શાકભાજી

: યાદ રાખો :

શરૂઆતનું પીળું ઘટ્ટ દુધ વિટામિન 'એ' સભર હોઈ બાળકોને ચેપ તથા રોગો સામે લડવામાં મદદ કરે છે.

છ માસ સુધી ધાવણ બાળકને તમામ પોષક દ્રવ્યો તેમજ ઉનાળામાં પાણી પુરુ પાડે છે.

પીળાં ફળ
તેમજ શાકભાજી

દૂધ અને દૂધની
બનાવટો તેમજ
ઇંડા વગેરે

Source :National Vitamin A prophylaxis programme

Retinol content of some foods

Retinol equivalents (RE) (mcg / 100g)			
Cod liver oil	6500	**Carrot**	835
Butter	684	Sweet potato	709
Cheese	265	Spinach	469
Egg	140	Pumpkin	400
Milk, Cow	28	Apricot	96
Broccoli	31	Papaya	55
		Mango	38

Source: http://www.nal.usda/fnic/foodcomp/search

REQUIREMENT

Three important types of reference values:

1. Recommended Dietary Allowances (RDA)

2. Adequate Intakes (AI)

3. Tolerable Upper Intake Levels (UL)

- Recommended Dietary Allowances (RDA) :

recommends the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all **(97-98%) healthy individuals** (age & gender-wise) .

- Adequate Intakes (AI) :

is set when there are **insufficient scientific data** to establish a **RDA**.

AIs meet or exceed the amount needed to maintain nutritional adequacy in nearly all people.

- Tolerable Upper Intake Levels (UL) :

is the **maximum daily intake** unlikely to result in **adverse health effects** .

Daily Requirements of Vitamin A

Group		Retinol (mcg)	b-Carotene (mcg)
Adult	Man	600	4800
	Woman	600	4800
	Pregnancy	800	6400
	Lactation	950	7600
Infants	0-12 months	350	2800
Children	1-6 years	400	3200
	7-9years	600	4800
Adolescents	10-17 years	600	4800

Source : ICMR (2010), Nutrient Requirement and Recommended Dietary Allowances for Indians, A Report of the Expert Group of the ICMR.

EPIDEMIOLOGY

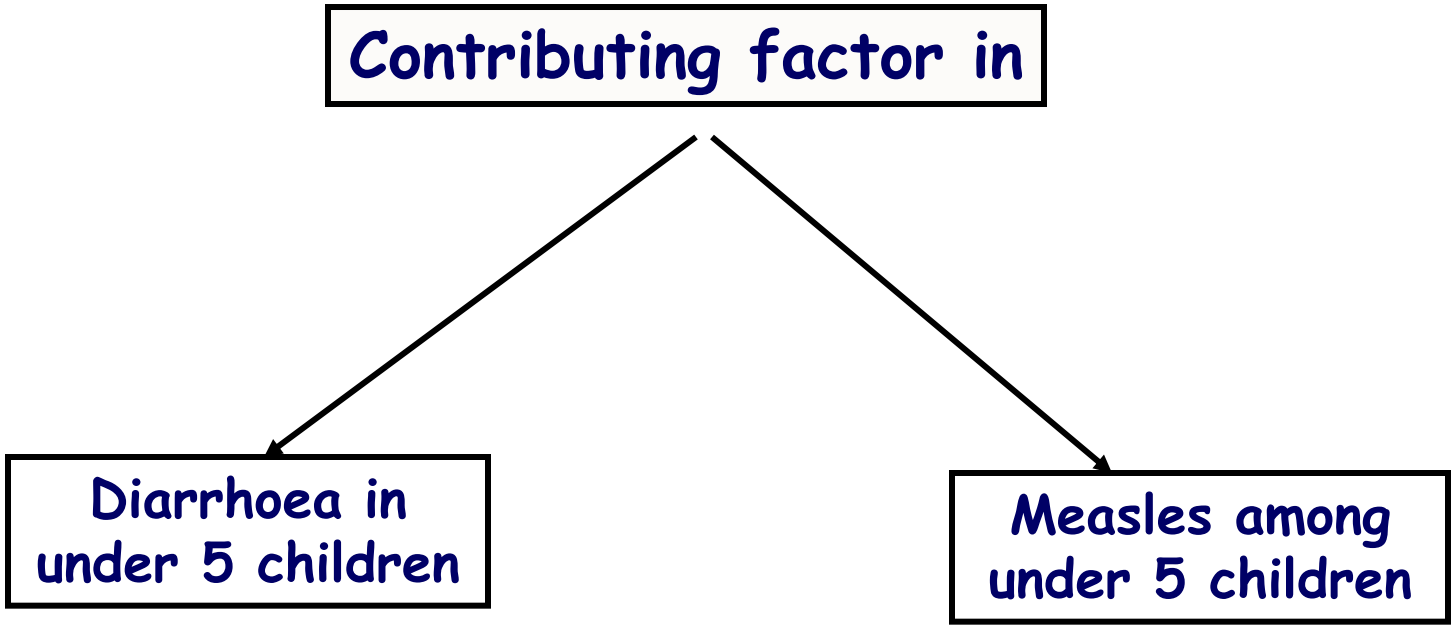
Scenario of VAD in developing countries

- Approximately 2.5 to 5 lacs malnourished children in the developing world go **blind** each year from a deficiency of vitamin A…. approximately **half of which die within a year of becoming blind**.

- VAD affect approximately **one-third** of children under the age of 5 around the world

- Prevalence of night blindness due to VAD high among pregnant women.. also contributes to maternal mortality and other poor outcomes in pregnancy and lactation.

Vitamin A Deficiency is a …..



Vitamin A Supplementation – Effect on deaths

Can reduce

35-50 % Deaths from Diarrhoea

50 % Deaths from Measles

23 % U-5 Mortality

Saves thousands of children from Blindness

CAUSATIVE FACTORS OF VAD

Insufficient Intake:

-Inadequate breastfeeding

-Unaffordable Vit. A rich food

Reduced Absorption:

-Infections

-Zinc Deficiency in the body

-Protein Energy Malnutrition

*Pancreatitis, Cystic fibrosis, Tropical sprue , Biliary obstruction

Increased Requirement:

-During Pregnancy & Lactation

-Low birth weight

-Rapid growth condition

Excess Loss:

-Various Disease conditions *

Others:

-Widespread poverty

-Low literacy among women

Vitamin A deficiency

↓

Suppression of cell replication

↓

Decrease T-killer cells

↓

Lack of immune reaction

↓

Infection (eg. Measles)

(bcz retinol required for cell replication)

↓

Reduces intestinal absorption of vitamin A

↓

Depletion of Vitamin A level

(So it's a vicious cycle)

Protein Energy Malnutrition (PEM)

↓

↓ Synthesis of Retinol Binding Protein (RBP)

↓

↓ Uptake of Retinol

↓

Inability to utilize Vitamin A present in body

↓

No retinol transportation

↓

Aggravation of Vitamin A deficiency

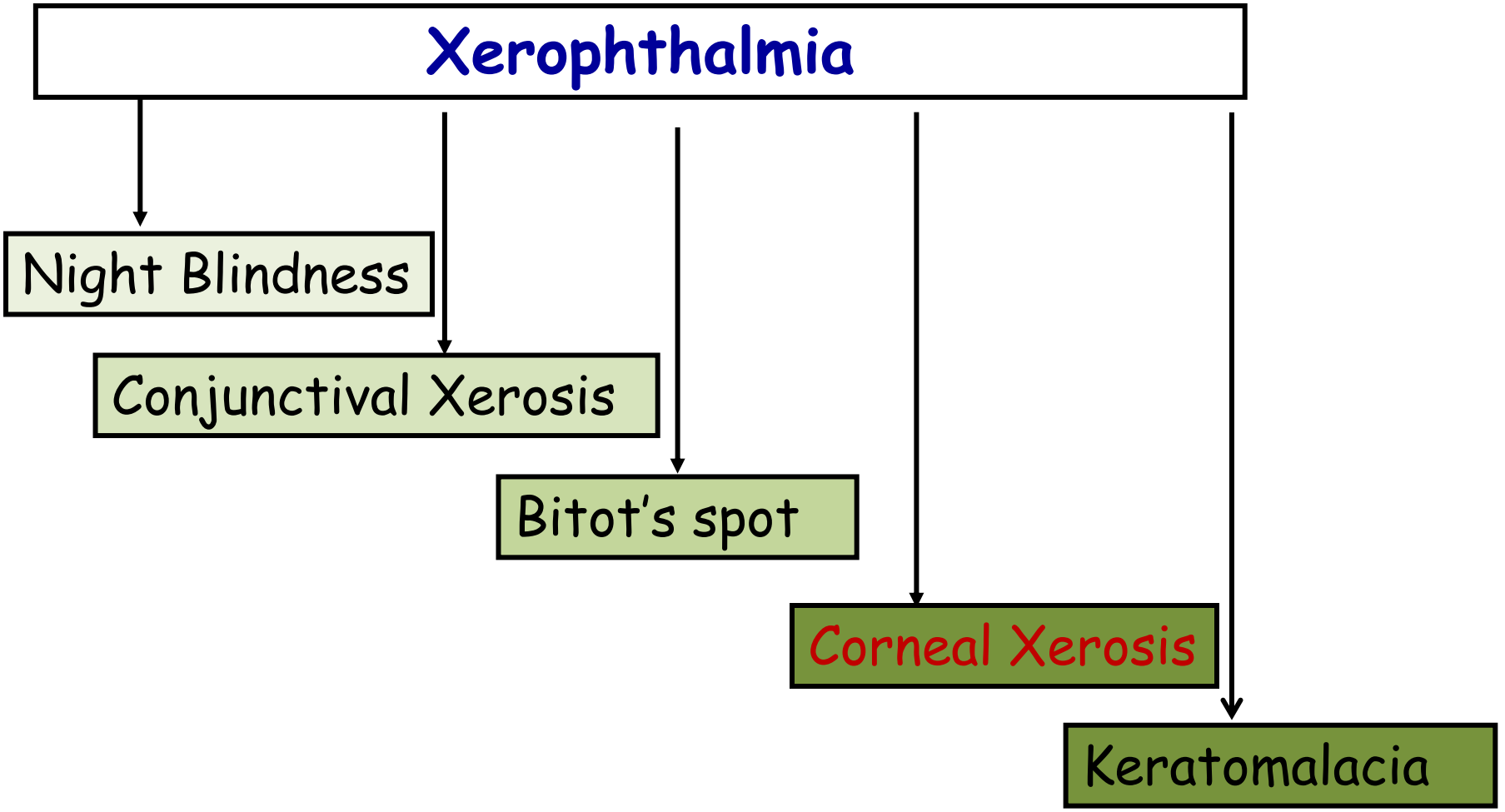
CLINICAL FEATURES

- **Night blindness (Nyctalopia)** - first **symptom** of vitamin A deficiency.

- Night blindness and its worsened condition, Xerophthalmia , are **markers of VAD**, as VAD can also lead to impaired immune function, cancer, and birth defects.

DEFICIENCY OF VITAMIN A

Serum retinol concentrations continue to fall & signs of Xerophthalmia appear.



WHO Classification of Vitamin A Deficiency

X N	Night blindness
X1 A	Conjunctival Xerosis
X1 B	Bitot's spot
X 2	Corneal Xerosis / Ulceration
X3 A	Keratomalacia: melting or wasting of the cornea (on 1/3rd of the cornea)
X3 B	Keratomalacia: melting or wasting of the cornea (on 2/3rd of the cornea)
X S	Corneal scar
X F	Xerophthalmic fundus

Night Blindness :-

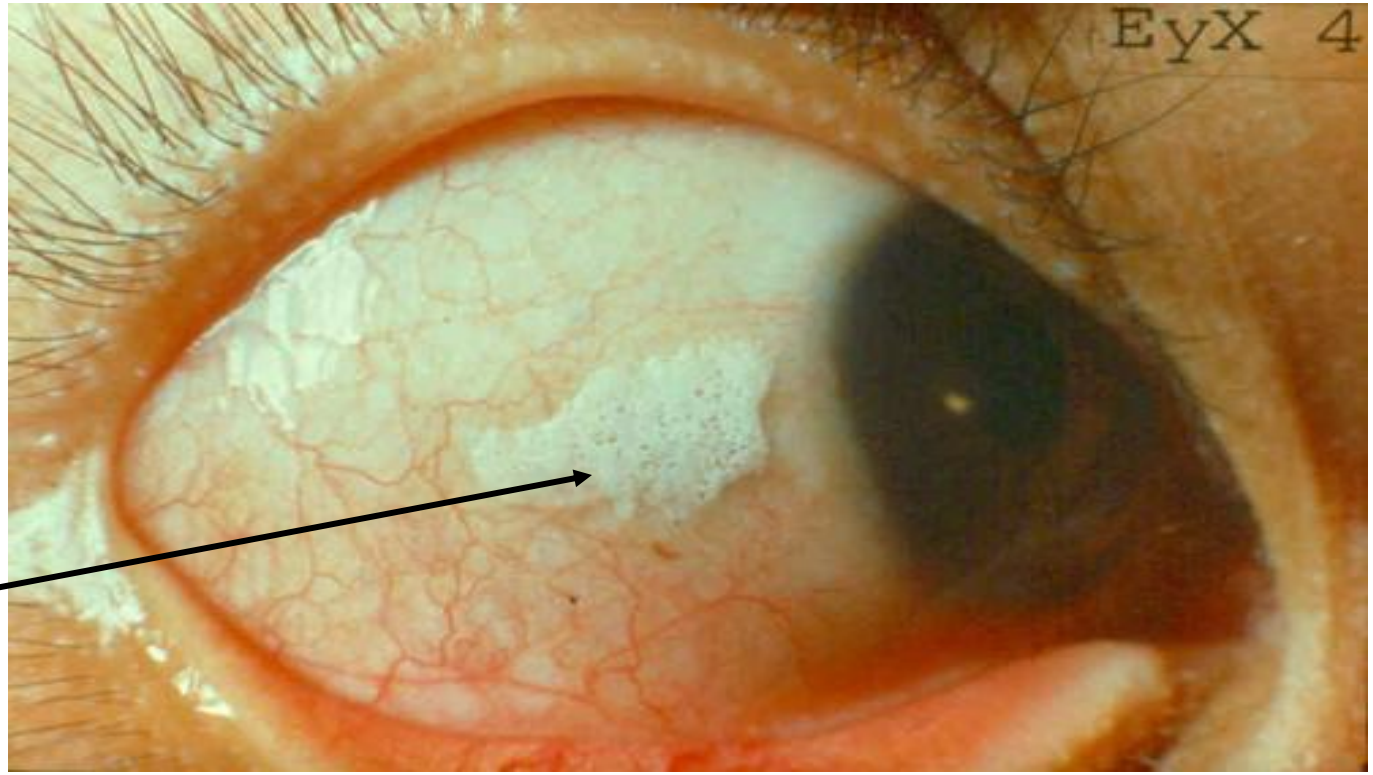
- It is the **first symptom** of Xerophthalmia.
- A child cannot see to get around in dim light (in evening & night)

Conjunctival Xerosis: (1st clinical sign)

- Conjunctiva becomes dry and non- wettable
- Instead of looking smooth and shiny, it appears **dry and wrinkled**.

Bitot's Spot

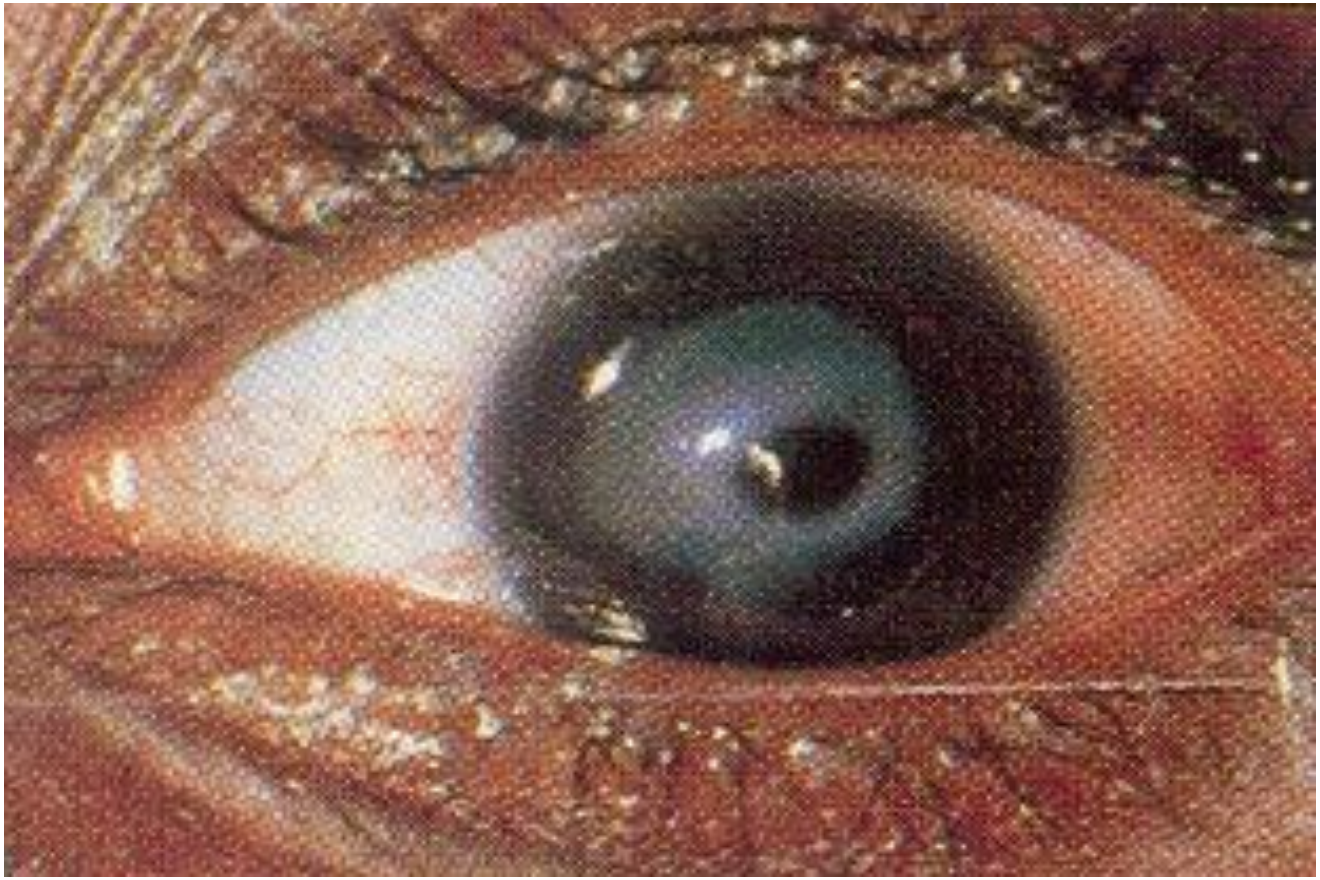
- Bitot's spots are accumulations of keratin & Saprophytic bacilli which form **foamy, cheesy material** on the bulbar conjunctiva.
- They may differ in size, shape and location, they have a similar appearance.



Bitot's Spot

Corneal Xerosis / Ulceration

Cornea becomes dry (Xerosis) , if the disease is not treated , the Xerosis can progress within hours to an **ulcer** of the cornea. **Irreversible stage….**



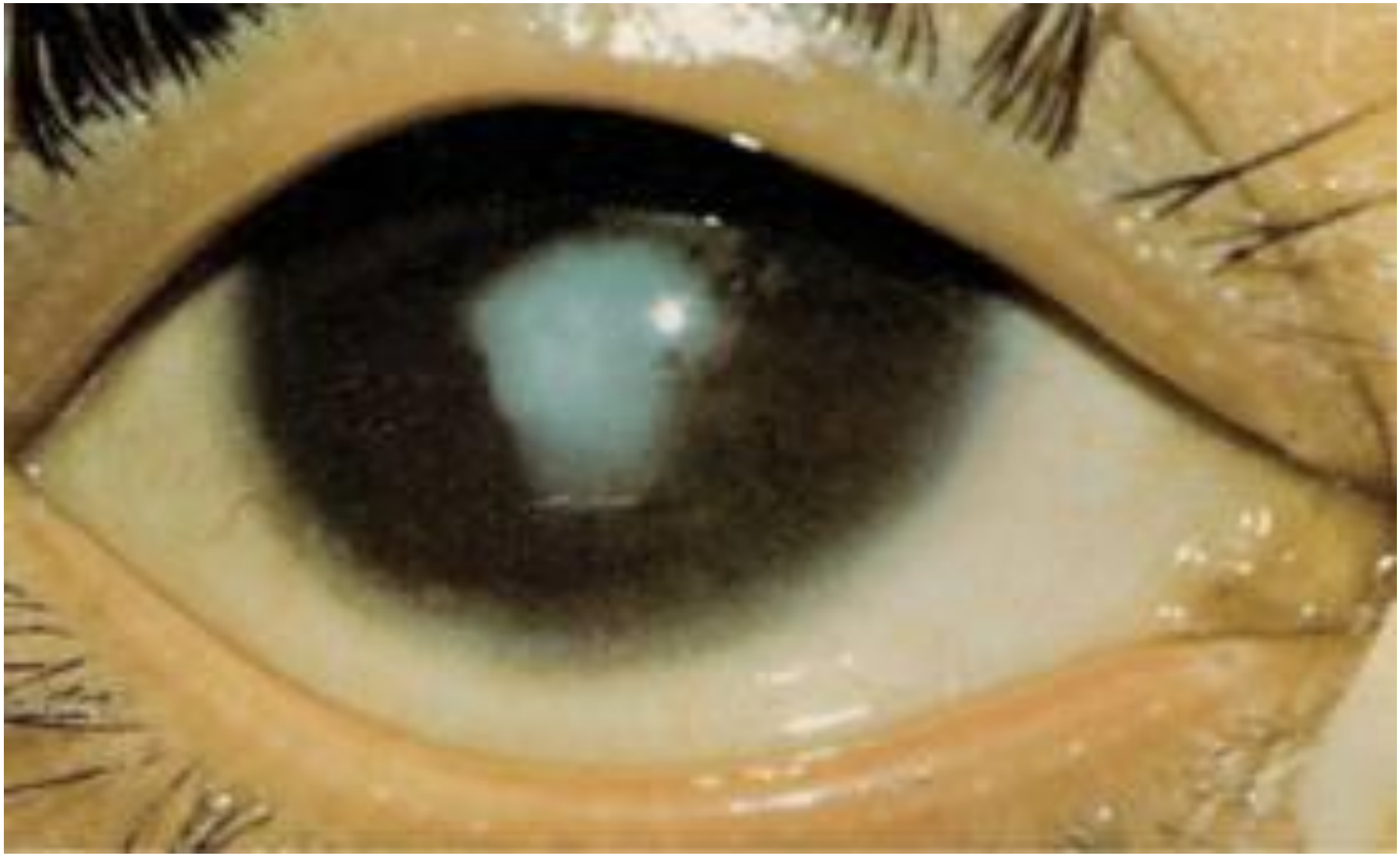
Keratomalacia

•If the disease is not treated , a corneal ulcer can lead to "**melting**" or "**wasting**" of the cornea (Keratomalacia)

Corneal scar

- Perforation of the cornea.
- If the scar is treated early, blindness can be prevented.

Corneal opacity



Other Manifestations of Vitamin A deficiency

- **Dried skin and mucous membranes**
- **Fail to secrete mucus, causing:**
  - a) Drying and hardening of salivary glands...
  - b) Changes in GI tract lining…
  - c) Urinary and respiratory tract…
  - d) Skin (epithelial cells) and hair follicles plugged with keratin (follicular hyperkeratosis).
- Abnormal bone growth
- Anemia
- Disordered reproductive function (failure of the spermatozoa to fertilize).

• Assessment of Vitamin A level:

- Measurement of **retinol level** in the circulation.

- **Retinol** : High Performance Liquid Chromatography (HPLC).

- **Toxicity** : **Retinyl ester level** in serum rather than retinol, using HPLC

Diagnosis

- **Clinically**

- Measurement of **dark adaptation** by
  1. Rod scotometry
  2. Electro-retinography (expensive & need training)

- **Bio chemistry test :**
  - Plasma retinol & Plasma retinol – binding proteins ⬇

*Secondary eye infection may mask VAD

***Every malnourished child must be examined**

Serum Retinol level

Normal	1.0 to 1.4 µmol/l
Sub-clinical deficiency	0.3 to 0.7 µmol/l
Clinical deficiency	< 0.3 µmol/l

Source :
http://www.who.int/nutrition/publications/micronutrions/vitamin_a_deficiency/WHO_TRS_590/en/index.html

PREVENTION AND CONTROL

When Vit.A Deficiency become Public Health Problem ?

Children 6 months to 6 years	
Night Blindness	> 1.00%
Bitot's spot	> 0.50%
Corneal Xerosis and Corneal ulcers	> 0.01%
Corneal scar	> 0.05%
Serum Retinol (< 10mcg/dl)	> 5.00%

As per WHO & IVACG criteria : International Vitamin A Consultative Group. Prevalence in at risk group

Prevention & Control of Vit.A Deficiency

Direct

- Vitamin A Supplementation
- Food Fortification Programme
- Promotion of consumption of Vit. A rich food
- Improvement of Dietary Intake

Indirect

- Promotion of BF
- Control of Infections
- Immunization
- Hygiene & Safe Drinking water

SHORT TERM ACTION

National Vitamin Vitamin A prophylaxis		
Group	**Retinol palmitate**	**Time**
Children < 12 months	55.0 mg (1 lac IU)	6 monthly
Children >12 months	110.0 mg (2 lac IU)	6 monthly
Newborn	27.5 mg (50,000 IU)	
Woman of child bearing age	165.0 mg (3 lac IU)	within 1 month of giving birth
Pregnant & lactating mother	27.5 mg (50,000 IU) **or** 110.0 mg (2 lac IU)	daily Once /wk

Vitamin A

To **improve** Vit.A status immediately

To **prevent** Vit. A deficiency

Acute Xerophthalmia

High Dose Vit. A Supp. at regular intervals

High Risk Individuals:

Measles, Diarrhoea, Respiratory disease, Chickenpox , Other severe infection, Severe Protein Malnutrition

NATIONAL PROGRAM FOR PROPHYLAXIS AGAINST BLINDNESS IN CHILDREN CAUSED DUE TO VIT A. DEFICIENCY

Immediately on diagnosis : (1st dose)

6-12 months- 1,00,000 IU
> 1 Year - 2,00,000 IU

Next Day : Same age specific Dose (2nd dose)

After 1 month : Same age specific Dose (3rd dose)

Curative measures (As per WHO)

- **Oral** – oil based preparation
- **Injectable** –water miscible preparation

On the day of diagnosis - 1st dose

On 2nd day - 2nd dose

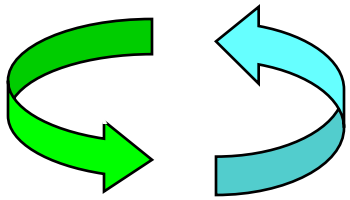
After 4 weeks - 3rd dose

(1 lac IU for <1 year or < 8kg children)

(2 lac IU for children 1-6 year & above)

NATIONAL PROGRAM FOR PROPHYLAXIS AGAINST BLINDNESS IN CHILDREN CAUSED DUE TO VIT A. DEFICIENCY

Routine immunization	Biannual Round (Feb. & Aug.)
9 months to 12 months	1 to 5 years
Dose 1	Dose 2, Dose 3, Dose 4, Dose 5
	Dose 6, Dose 7, Dose 8, Dose 9



Vitamin A supplementation programs may be the single most cost effective child survival intervention .

NATIONAL PROGRAM FOR PROPHYLAXIS AGAINST BLINDNESS IN CHILDREN CAUSED DUE TO VIT A. DEFICIENCY

Initiated in India (**1970**) : National Program for prevention of nutritional blindness (1-5 yrs)

↓

Modified in **1992** (9mths to 3yrs)

↓

Modified in **2006** (10th FYP, RCH→NRHM)
(9mths to 5yrs)

↓

Program focuses on :

Promotion of consumption of Vit A rich food

Administration of massive dose of Vit A (Biannual round)

In sick children – 1 additional dose of Vit A (MR, PEM)

MEDIUM TERM ACTION

FOOD FORTIFICATION

e.g. Dalda ghee

- Other : sugar, salt, tea, margarine & dried skimmed milk
- Challenge is choosing a food that is likely to be consumed by groups at risk in sufficient amounts.

LONG TERM ACTION

NUTRITIONAL EDUCATION

- Create Awareness regarding consumption of **yellow-orange fruits & vegetables** rich in carotenoids, specifically beta carotene in community
- Promotion of breast feeding for as long as possible

LONG TERM ACTION

- **Indirect**
  - Ensure sanitation
  - Proper disposal of effluents
  - Safe and adequate water supply
  - Immunization
  - Better complementary feeding practices
  - Prompt Rx of diarrhea & other infection
  - Improved health services
  - Social and health education

Vision 2020 – for control & prevention of blindness

વિટામીન-એ

સપ્લીમેન્ટેશન (૬ માસિક) દ્વિવાર્ષિક રાઉન્ડ

આ ધ્યાનમાં રાખો

બાળકને વિટામીન-એ ના ડોઝ કયારે આપવા

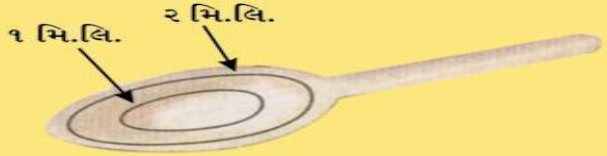
પહેલો ડોઝ

૯ મહીને ઓરીની રસી સાથે

બીજા થી પાંચમો ડોઝ

૬ માસિક રાઉન્ડ દરમ્યાન

- વિટામીન-એ સીરપને તડકાથી દૂર, ઠંડકમાં અંધારી જગ્યામાં રાખો (પણ ફ્રીઝમાં રાખવું નહીં)
- બાટલી ખોલતાં પહેલા તેની ઉપર લખેલી સીરપ વાપરવાની છેલ્લી તારીખ ચકાસી લેવી.
- બાળકને વિટામીન-એ નો ડોઝ બાટલીની સાથે આપવામાં આવતી ચમચી, જેમાં ૨ મિ.લિ. અને ૧ મિ.લિ. નુ નિશાન કરવામાં આવ્યું છે, તેથી જ પીવડાવવું.



- વિટામીન-એ નો પૂરક ડોઝ જે બાળકને છેલ્લા ૪ મહિનામાં પીવડાવ્યો હોય એને વધારાનો ડોઝ પીવડાવવો નહીં.
- વિટામીન-એ સીરપ ની બાટલી એક વખત ખોલ્યા પછી ૬ થી ૮ અઠવાડીયામાં વાપરી નાખવી, ત્યાર બાદ નહી વપરાયેલ સીરપ સાથે બોટલ પ્રાથમિક/શહેરી આરોગ્ય કેન્દ્રને પરત કરવી.
- બાળકને વિટામીન-એ નો ડોઝ બાટલીના ઢાંકણથી અથવા અંદાજ થી પીવડાવવો નહી, સાથે આપેલ ચમચી થી જ પીવડાવવું.
- કોઈ ગંભીર રોગથી પીડાતા બાળકને વિટામીન-એ આપવું નહીં, તેમજ યોગ્ય સારવાર માટે ડોકટર અથવા આરોગ્ય કાર્યકરનો સંપર્ક કરવો.

આરોગ્ય અને પરિવાર કલ્યાણ વિભાગ, ગુજરાત રાજ્ય.

Vitamin A : Supplementation (Six monthly) Biannual Round

KEEP THIS IN MIND

- Keep syrup away from **Sunlight**
- Keep in **cold and dark place** (But not in freeze)
- Before opening the bottle, please check the **last date** for its use **(validity)**
- Please give the child vitamin A with the **spoon** given with the bottle in which exact marking for 1 **ml and 2 ml** is made

Vitamin A :Supplementation (6 monthly) Biannual Round

KEEP THIS IN MIND

- One who is given vitamin A in last **4 months** should not be given this dose.
- Once opened, the bottle should be used up in **6-8 weeks**. Un used bottles beyond this time should be returned to PHC/CHC.
- Plz do not give vitamin A with the other spoon or top lead of the bottle. Always use the **given spoon** for giving vitamin A
- If there is serious illness to the child, do not give vitamin A and refer the child to doctor or health worker

ACUTE TOXICITY

Increased intracranial pressure.

Drowsiness,

Irritability,

Abdominal pain,

Nausea, and vomiting are common.

Sometimes the skin subsequently peels.

Found in 1.5-7% of the children.

Side-effects disappear within 24-48 hours & **require no special treatment.**

CHRONIC TOXICITY

- Sparsely distributed, coarse hair;
- Alopecia of the eyebrows;
- Dry, rough skin; dry eyes; and cracked lips.
- Later.. severe headache…generalized weakness
- Cortical hyperostosis of bone and arthralgia may occur, especially in children.
-In children, toxicity can cause pruritus, anorexia, Hepatomegaly and splenomegaly may occur.

Roles & Responsibilities of MOs,& BHOs

- Ensure **Correct target** for Biannual round
- Check **stock register** at the PHCs & SCs
- Ensure **Minimum gap of 4 months** between 2 doses
- Check the **expiry date** and when it was opened
- **Check Storage place** of Vitamin A stock at PHC and SCs

Roles & Responsibilities of MOs , & BHOS

- Ensure that Bottle of Vitamin A Solution should not be given to AWW. Vitamin A solution should be given to child by **FHW** only.
- **Used bottles** should be returned to PHC from the immunization site
- Ensure Coverage of child with **2 doses of Vitamin A** six months apart (1-5 Yrs)
- **Utilization of funds** provided by the project

THANK YOU