# VITAMINS

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# Plan for today

- Introduce Vitamins
- Classification
- Role of vitamins
- Let’s start with Vitamin A

# Vitamins !!, What are they ??

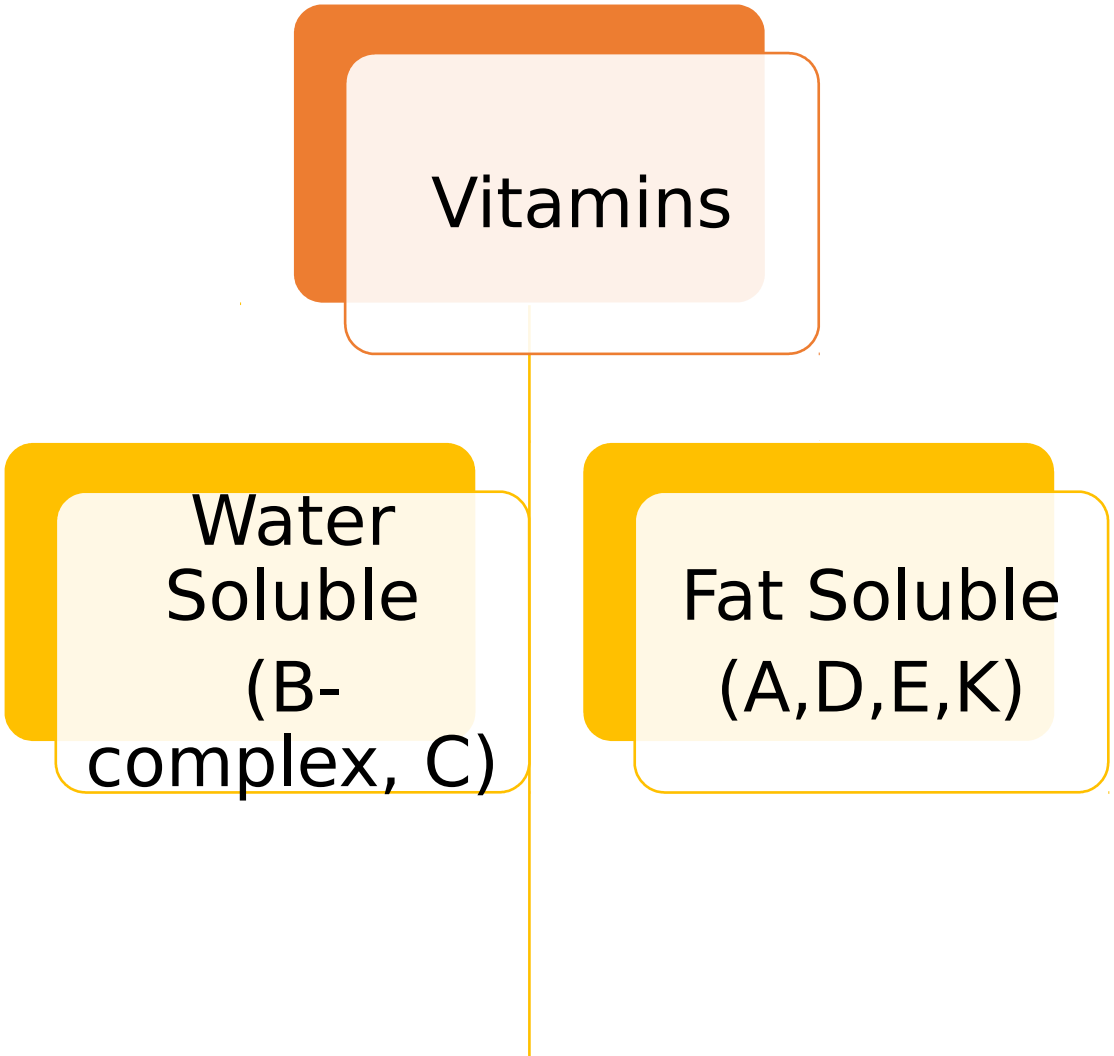
- Micronutrients
- Organic; diverse group of compounds
- Body depends on outside source, cannot synthesize internally
- Diverse Biochemical functions
- Deficiency causes a specific disease, prevented or cured only by adding Vitamin to diet

# Vitamins !!, Where are they ??

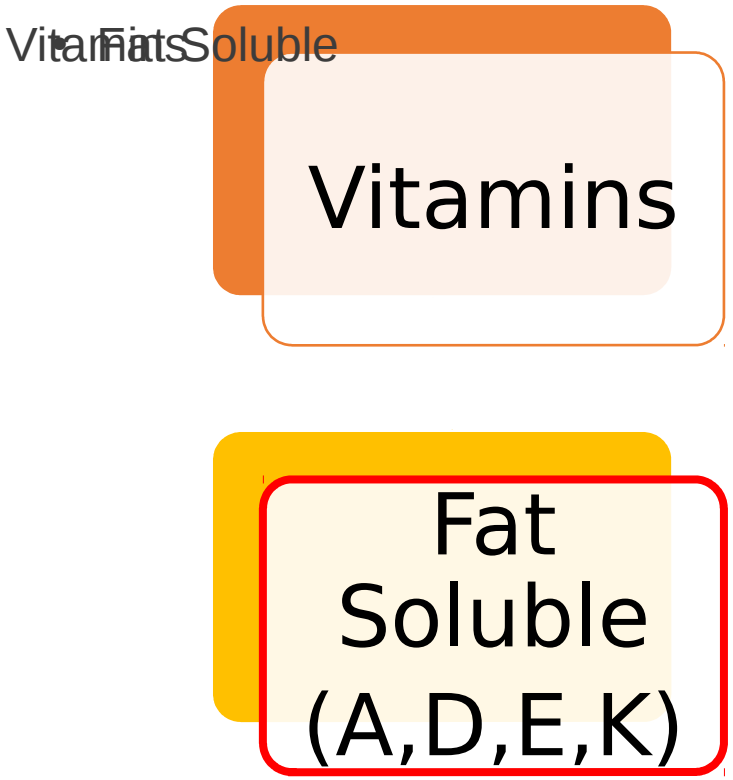
- Almost every food has some kind of vitamins in it
- Processing of food does affect vitamin content
- We can supplement our need using supplements

# Classification

- Vitamins
  - Water Soluble
  - Fat Soluble

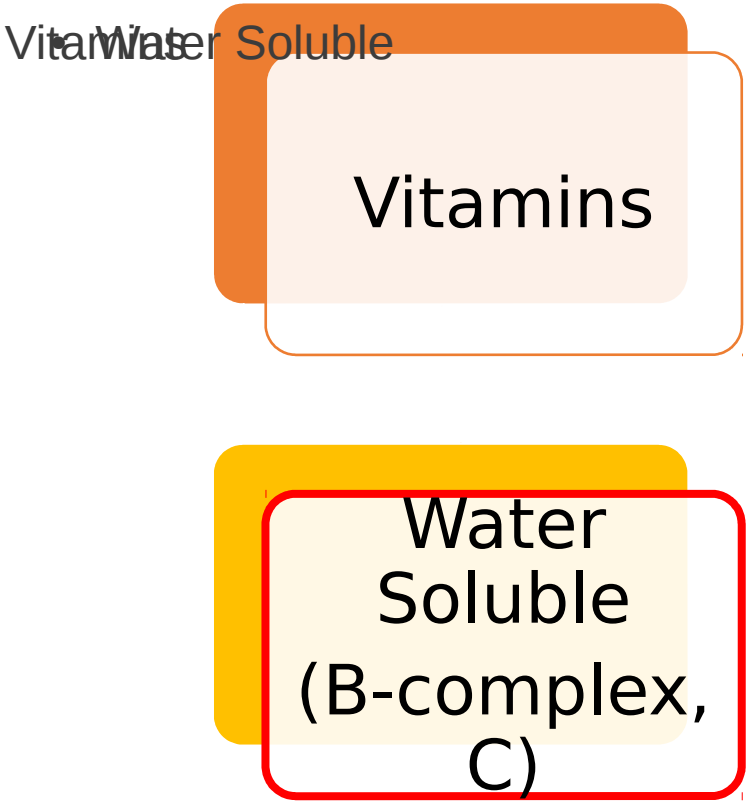


# Fat Soluble Vitamins




- Ingested in body with help of fats
- Body stores fat soluble vitamins in cells (Liver, adipose tissue)
- No need of frequent ingestion

# Water Soluble Vitamins




- Freely travel thought the body
- Unneeded quantities are flushed out of kidneys
- Frequent small doses required by the body and this type of vitamin is not as likely to approach toxic levels as fat-soluble vitamins are

# Vitamins !!, What do they do  ??

- DIVERSE BIOCHEMICAL FUNCTION :
  - Regulators/Hormone like  (Vitamin A)
  - Antioxidants  (Vitamin E & C)
  - Co-factors/ Co-enzymes (Best Known Function, Vitamin B Complex)

- Correct blood clotting
- Skin vision, bone growth, tooth
- Immune system
- Healthy mucous membranes

# Fat Soluble Vitamins, What do they do

| A | K | E | D |
|---|---|---|---|
| • Healthy mucous membranes<br>• Skin vision, bone growth, tooth<br>• Immune system | • Correct blood clotting | • Anti-oxidant<br>• Protect cell wall | • Stored in bones<br>• Required to properly absorb calcium |

- Energy Metabolism

# Water Soluble Vitamins, What do they do

| B1 (Thiamine) | B2 (Riboflavin) | B3 (Niacin) | B5 (Pantothenic Acid) | B6 (Pyridoxine) | B9 (Folic Acid) | B12 (Cobalamin) |
|---|---|---|---|---|---|---|
| • Energy metabolism<br>• Nerve function | • Energy metabolism<br>• Skin health, normal vision | • Energy Metabolism<br>• Skin health, digestive, Nervous | • Energy Metabolism | • Protein Metabolism<br>• RBC production | • RBC, DNA production | • New cell production<br>• Nerve Function |

- Energy metabolism

# Water Soluble Vitamins, What do they do

Biotin

Ascorbic Acid (C)

## Ascorbic Acid (C)

- Major Anti-oxidant
- Protein metabolism
- Iron absorption
- Immune system

## Biotin

- Energy metabolism

# Vitamins : How much do I need ??

- Vitamins are micronutrients, so we need them in very small quantities
- If you’re diet is balanced then your need is fulfilled
- Our age, gender, body size, activity levels and lifestyle can all affect our nutritional need
- Recommended intakes usually differ for men, women and children of different ages

# Vitamin A  (Structure)

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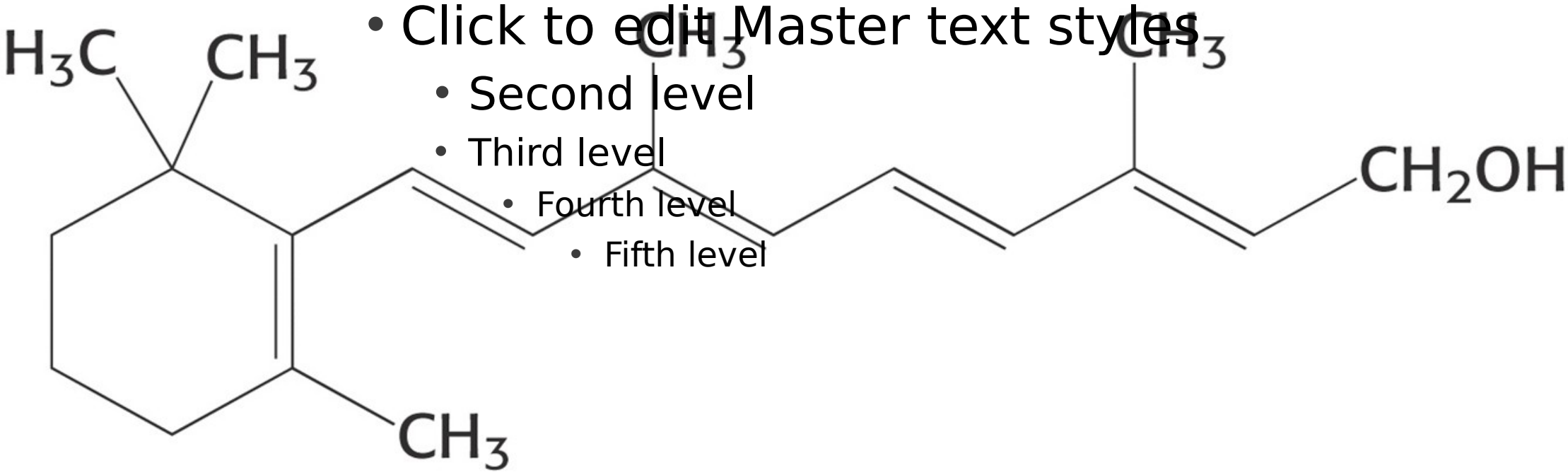
      - Fifth level

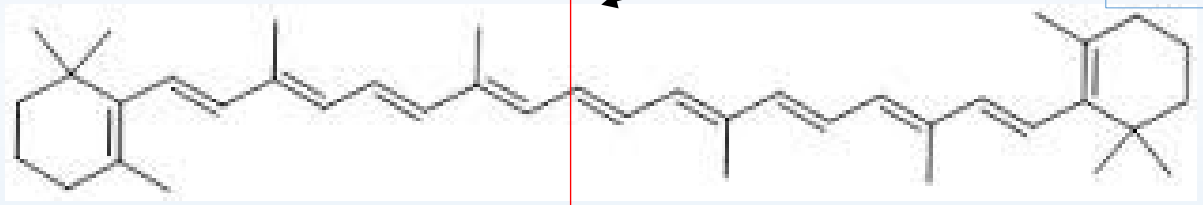



**Vitamin A (Retinol)**

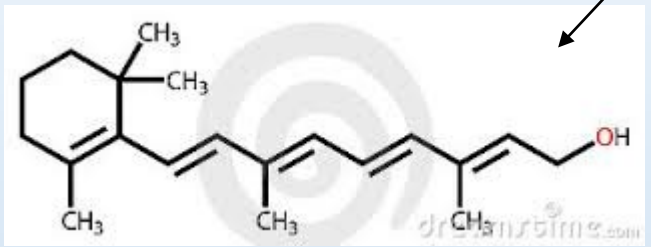
# Vitamin A  from carotenes

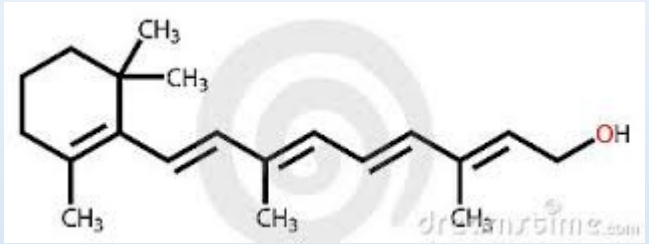
- Carotenes act as major source of Vitamin A

Enzymatic cleavage and oxidation



β-carotene




Retinol (Vit A)

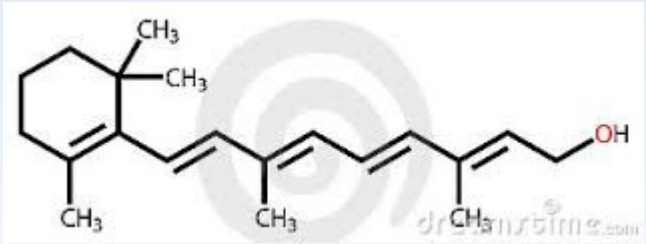
# Vitamin A  Role in our body

Vitamin A Role in our body

Vision

Regulation of gene expression and cell differentiation

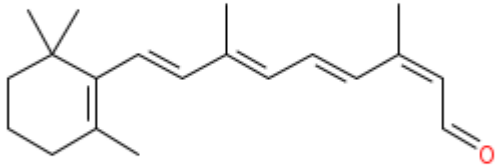
# Vitamin A  Role in Vision




Retinol (Vit A)

Forms complex with protein *Opsin* = Rhodopsin

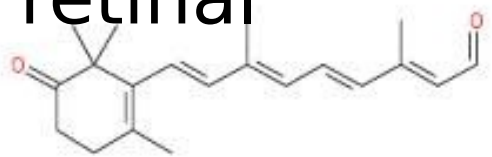
11-*cis*-retinal




Light

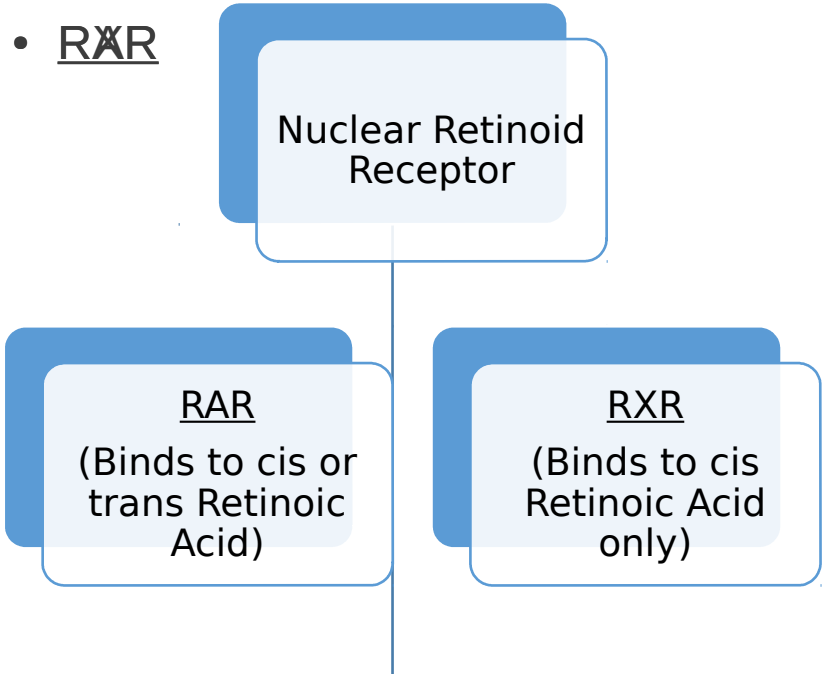
Enzymes

11-*trans*-retinal



# Vitamin A  role in regulating Gene expression and Tissue differentiation

- Retinoic acid has an important role in regulating gene expression and tissue differentiation
- Retinoic acid binds + nuclear receptors = regulate gene expression and tissue differentiation




- RXR forms a hetero-dimer with Vit D receptor after binding with *cis*-retinoic acid
- Deficiency or excess prevents formation of Dimer

# Vitamin A  Deficiency


- Most important preventable cause of blindne
- Loss of sensitivity to Green light
  - Impairment to adapt to darkness
  - Followed by complete blindness
- Prolonged deficiency leads to Xerophthalmia (Keratinization of cornea and blindness)
- Important role in development of Immune system, minor deficiency might to lead to susceptibility to infections

# Vitamin A : How much do I need ?

- Pediatric: <14

# Vitamin A : Where do I get it?

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