VITAMINS-2

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Plan for today

- Review last lecture
- Start with Vitamin D & E
- Summarize what’s done

Pop Quiz !!

- Which Vitamin has a major role in vision

B

C

A

I Don’t know, too bored in the class

Pop Quiz !!

- Vitamin A forms a complex with which protein

trypsin

opsin

chopsin

I Don’t care

Pop Quiz !!

- Sever Vitamin A deficiency causes what

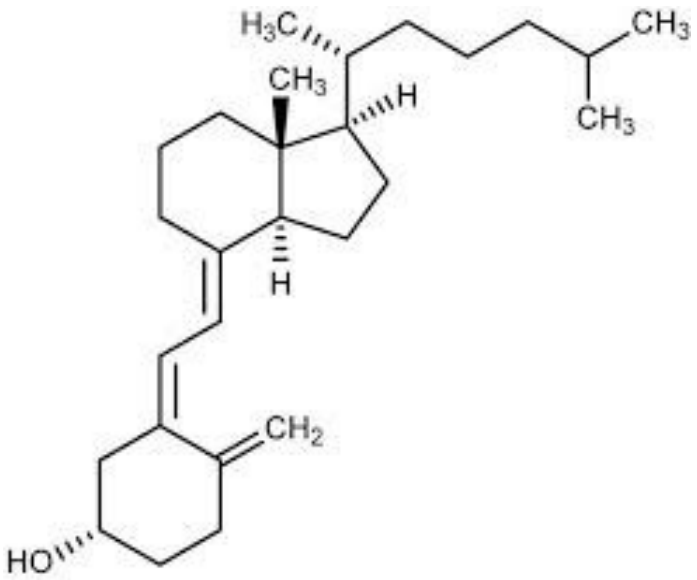
Heropthalmia

Ketophthalmia

Xerophthalmia

AIKTCthalmia

Vitamin D: Structure



Cholecalciferol
(calciol, Vitamin D3)

Vitamin D: Synthesis in Skin

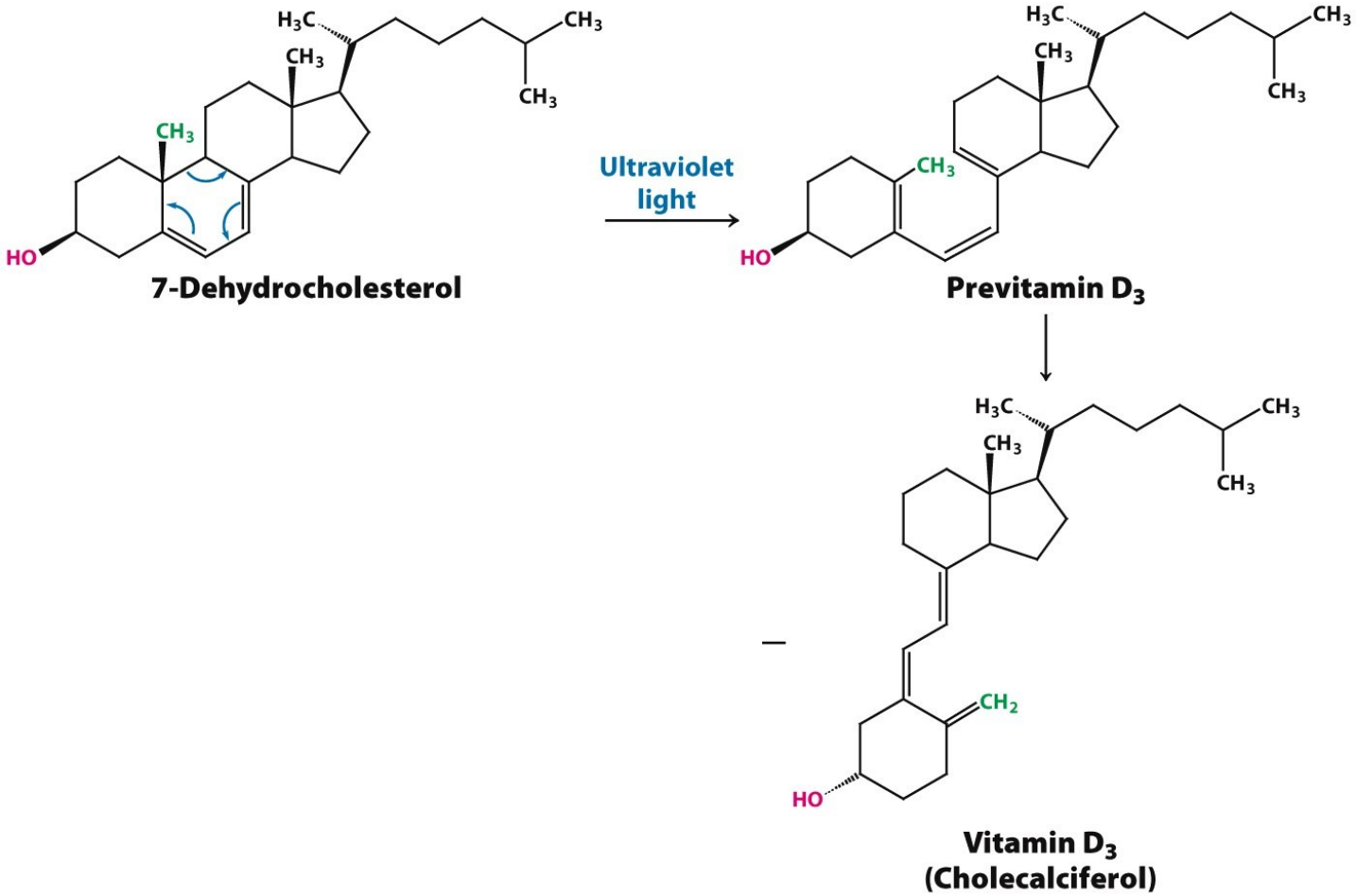
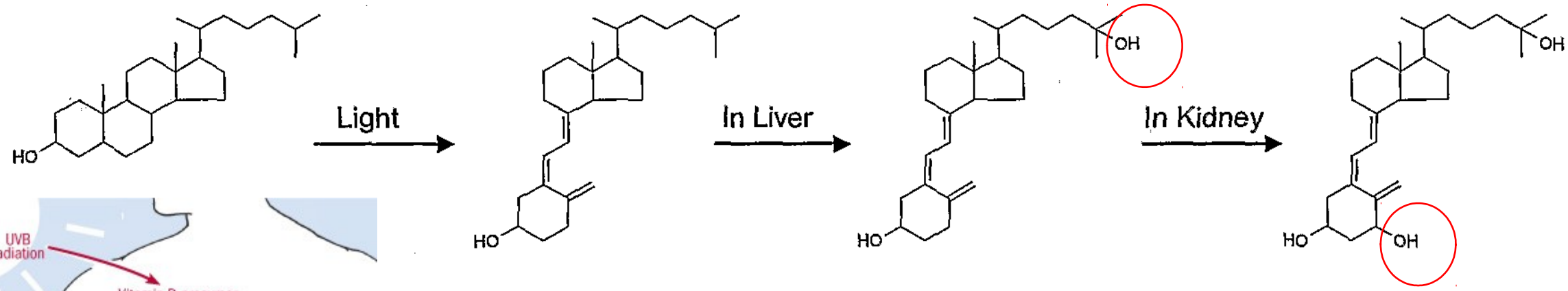
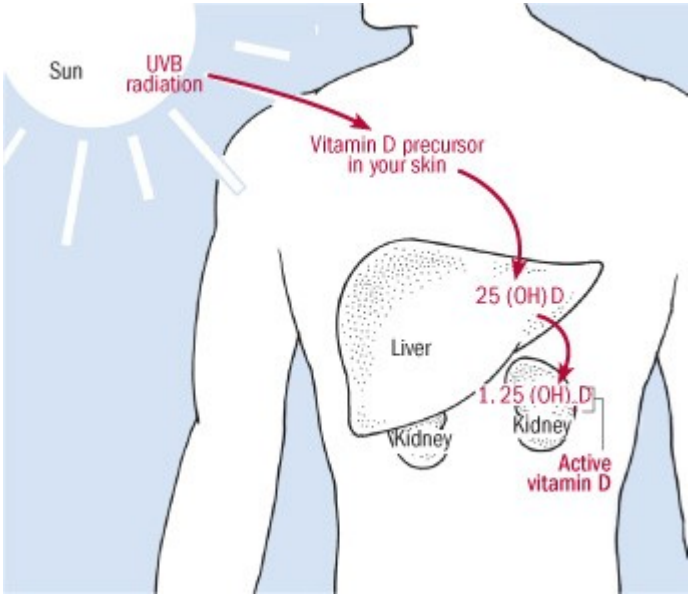


Figure 26.32

Vitamin D metabolism to active moiety in Kidney & liver





Cholecalciferol (calciol, Vitamin D3)

Undergoes two hydroxylation to form active

Calcidiol

Binds with proteins (globulin), main storage form of vitamin

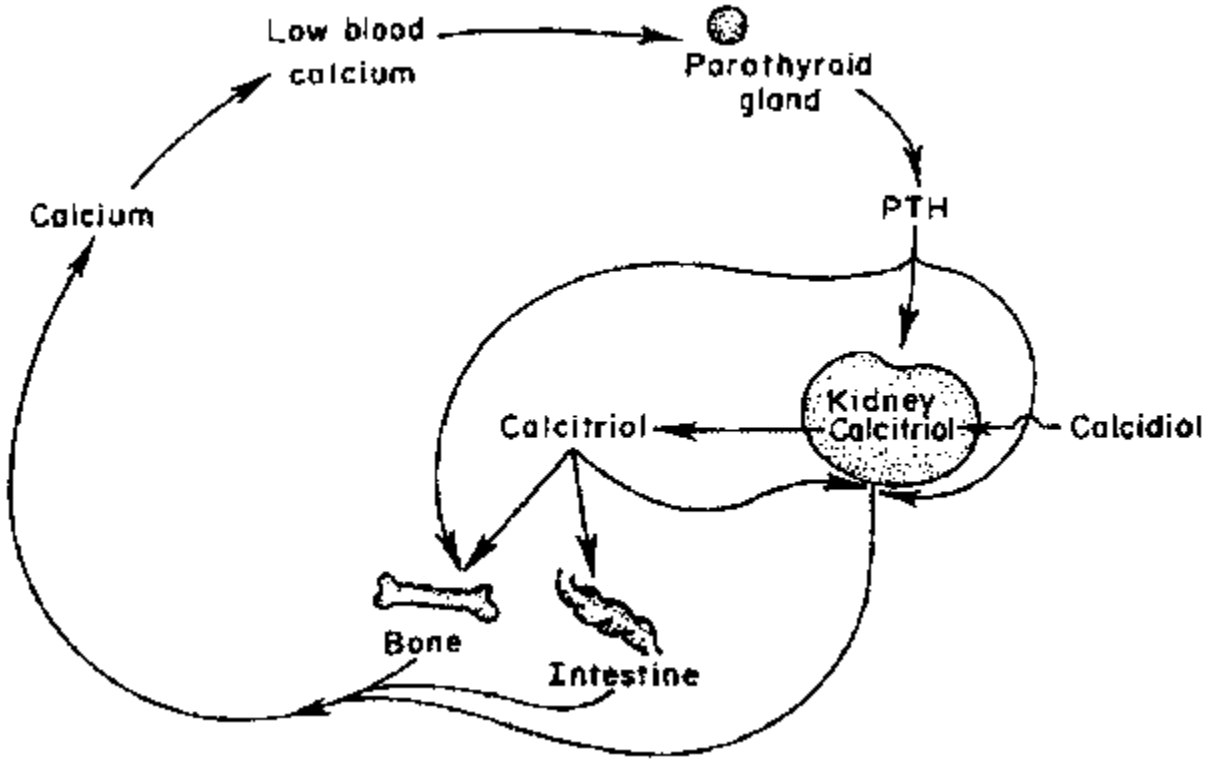
Calcitriol

Vitamin D: Role in Calcium Homeostasis

- Most important role :Control of Calcium homeostasis, maintain calcium concentration
- Calcitriol (Active form of Vitamin D) maintains Calcium conc in following ways

1. Increase intestinal absorption of calcium
2. Binds to Vita D receptor (VDR)
3. This binding stimulates the production of proteins that carry Ca across the intestine (Calbindin)
4. Reduces excretion of calcium
5. Mobilize bone mineral, maintains Ca, Phosphate levels for bone formation

Vitamin D: Role in PTH Calcium Homeostasis



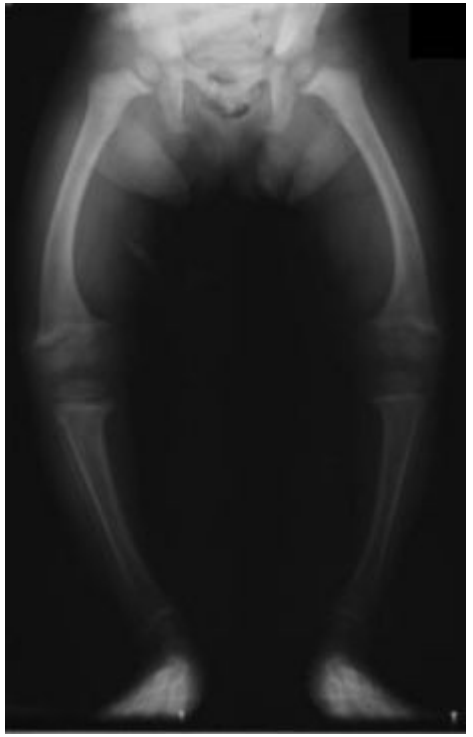
- PTH from parathyroid glands senses the low Ca levels
- Activates enzyme to convert Calcidiol to calcitriol
- As the levels of Ca normalize, the Ca receptor in PTG gland senses & lowers PTH production

Vitamin D: Additional Role

1. Binding to VDR leads to a role in cell differentiation and proliferation
2. Vitamin D also affects Immune system, VDR expressed in several WBC
3. Recent research has shown that Vitamin D modulates Immune response

Vitamin D: Deficiency in Adults & Children

1. Deficiency leads to “Rickets” in children, bones are undermineralised due to poor absorption of calcium
2. Similar problems during adolescent growth period deficiency
3. Defective bone mineralization leads to Osteomalacia (softening of bones) in adults esp in women due to poor sunlight (ultimately leading to low levels of calcium)

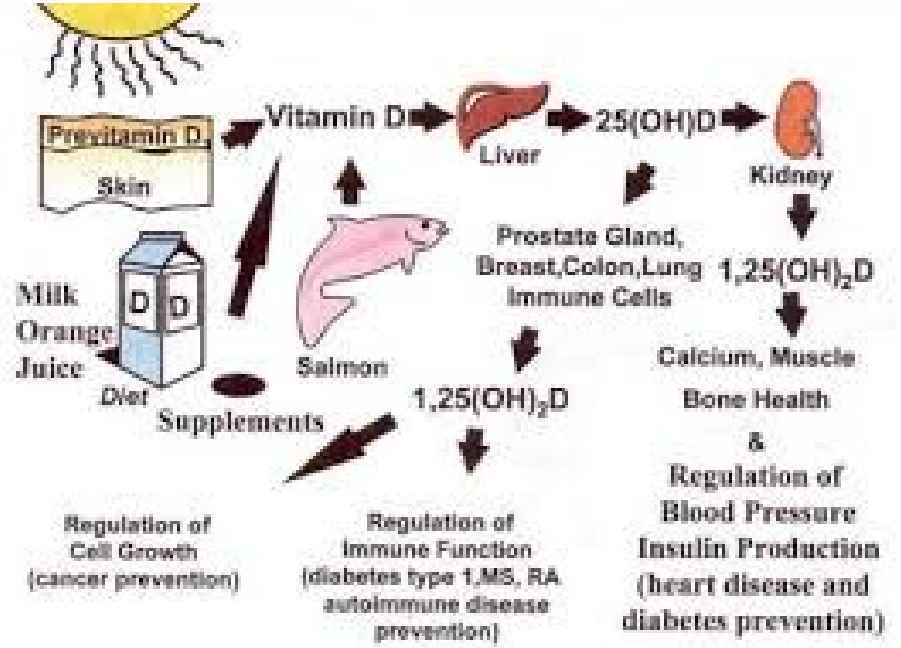


Vitamin D levels

1. Calcidiol is a good marker of Vitamin D in body
2. Long circulating half life
3. Reflects both made cutaneously & from food source

Conc (ng/ml)	Health status
< 12 ng/ml	Associated with vitamin D deficiency, leading to rickets in infants and children and osteomalacia in adults
12 – 20 ng/ml	Generally considered inadequate for bone and overall health in healthy individuals
>=20 ng/ml	Generally considered adequate for bone and overall health in healthy individuals
> 50 ng/ml	Emerging evidence links potential adverse effects to such high levels, particularly >150 nmol/L (>60 ng/mL)

Vitamin D Sources

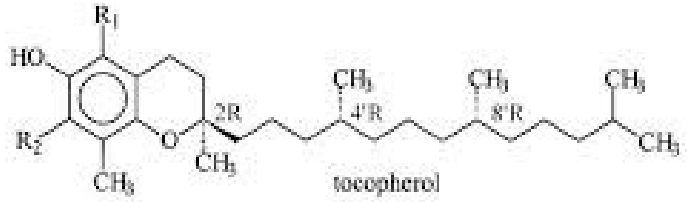


Vitamin D: How much do I need

- How much vitamin D you need depends on your age and risk factors
- The recommended dietary allowance is 600 IU per day for adults up to 70, and 800 IU for ages 71 or older
- Some researchers have suggested much larger doses of vitamin D for a variety of health benefits, but too much may harm you

Vitamin E: Introduction

1. In contrast to other vitamins, No unequivocal , unique function defined
2. Primarily acts as lipid soluble anti-oxidants (most of this role can be done by providing synthetic anti-oxidants
3. Poorly defined role in cell signaling

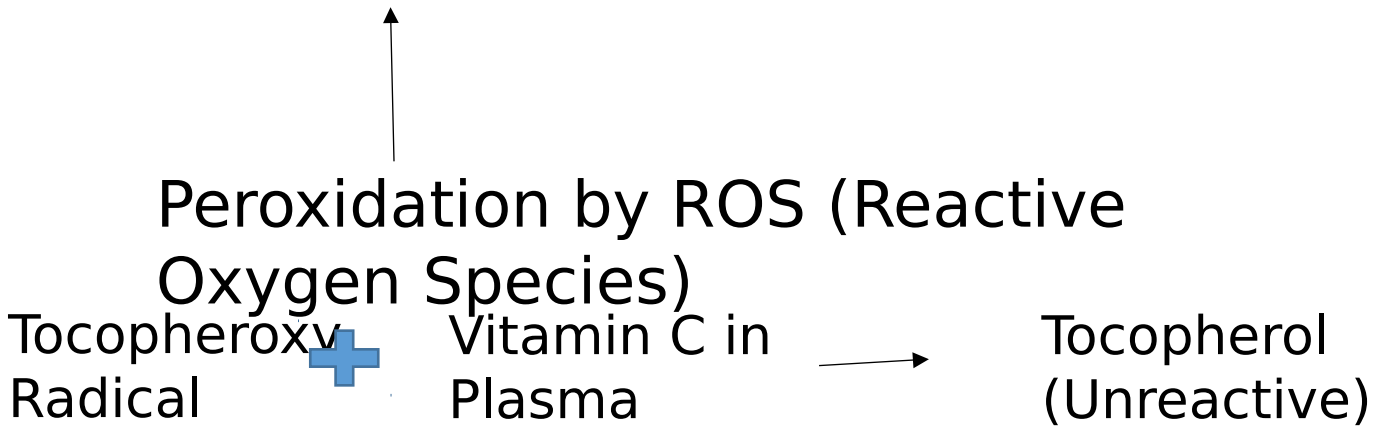


R_1	R_2	
CH_3	CH_3	α
CH_3	H	β
H	CH_3	γ
H	H	δ

- Vitamin E is generic descriptor of two families of compounds; tocopherols & tocotrienols (roughly 8)
- Most active among them is D-α-tocopherol

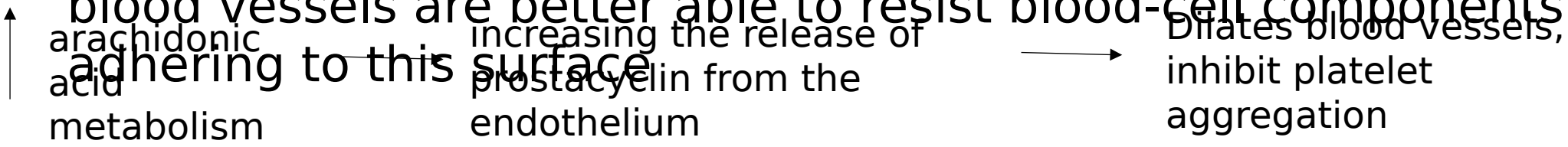
Vitamin E: Anti-Oxidant Role

Vitamin E acts as a chain breaking, free radical trapping anti-oxidant in cell membranes and plasma



Vitamin E: Additional Roles

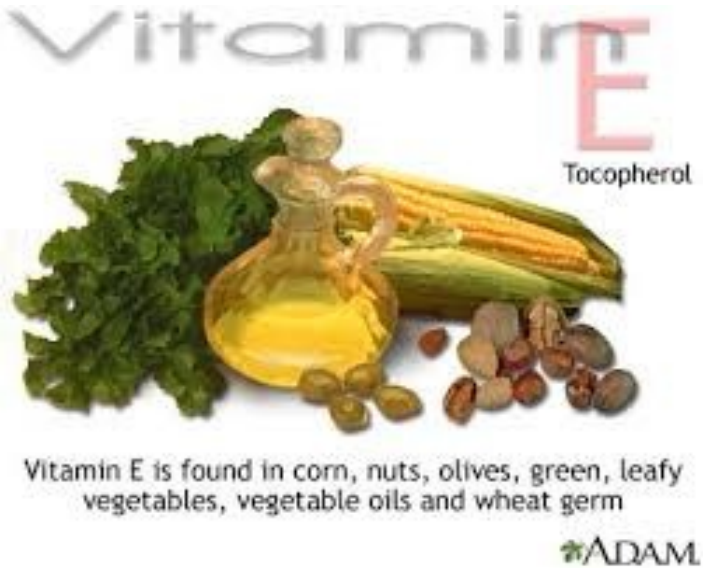
1. In addition to anti-oxidant role, in-vitro studies have suggested additional roles
2. Alpha-tocopherol inhibits the activity of protein kinase C, an enzyme involved in cell proliferation and differentiation in smooth muscle cells, platelets, and monocytes
3. Vitamin-E–replete endothelial cells lining the interior surface of blood vessels are better able to resist blood-cell components adhering to this surface



Vitamin E: Deficiency

1. Patients with severe fat malabsorption, chronic liver disease, cystic fibrosis suffer Vitamin E deficiency
2. Deficiency results in Nerve & Muscle damage
3. Premature infants are born with low levels of Vit E, leading to damage of RBC cell walls ultimately leading to anemia

Vitamin E Sources



- Numerous foods provide vitamin E
- Nuts, seeds, and vegetable oils are among the best sources of alpha-tocopherol
- Significant amounts are available in green leafy vegetables and fortified cereals

What did we learn today

- Vitamin D
  - Structure
  - Mechanism of action
  - Deficiency
  - Source
- Vitamin E
  - Structure
  - Mechanism of action
  - Deficiency
  - Source
- Next we will complete Fat-soluble vitamins (K) , start with water soluble