

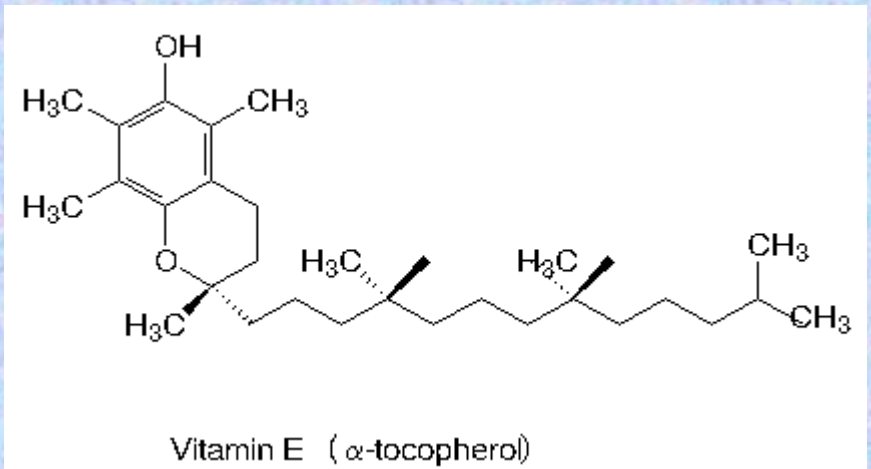
In the name of God



vitamin E

Presented by:

Mohamad Rahmati



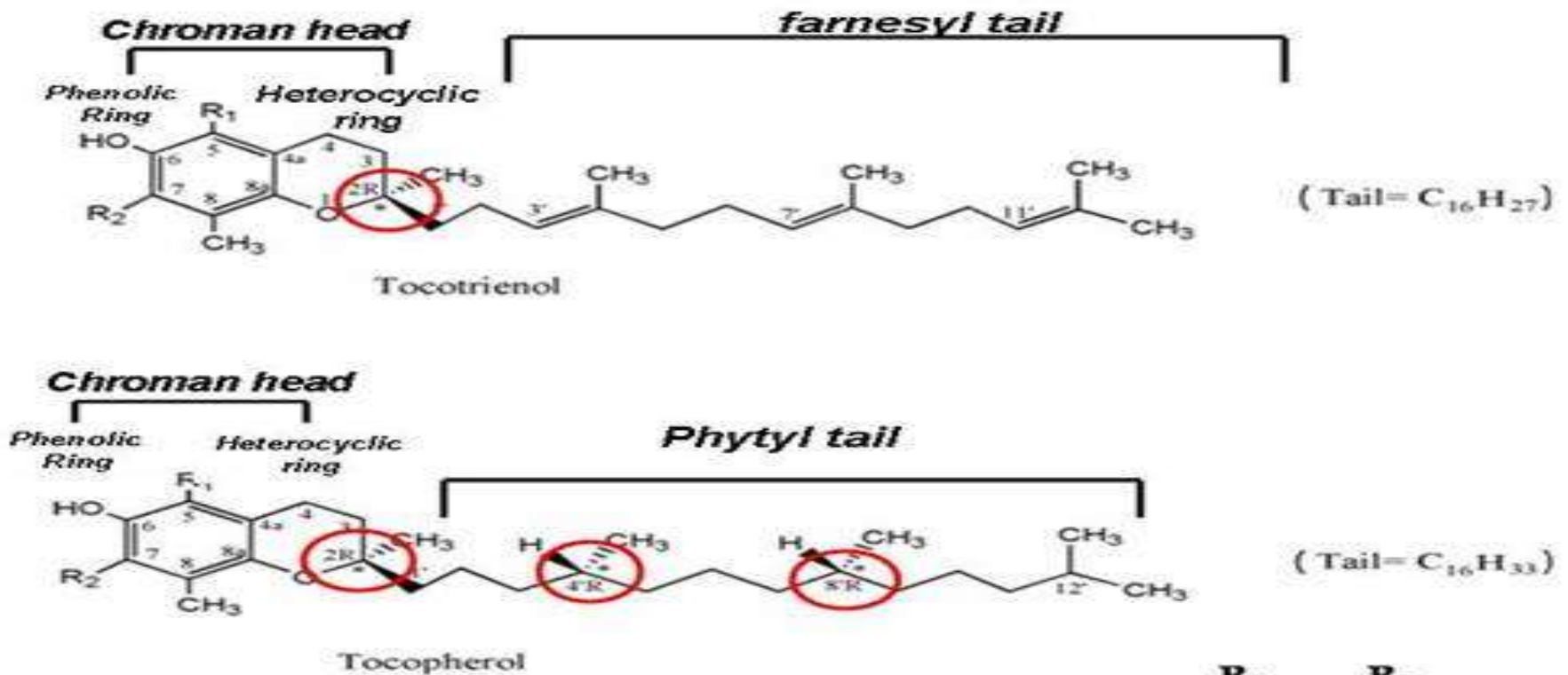
Vitamin E

- Extracted from wheat germ oil
- An important biological antioxidant (scavenger for free radicals and O)
- Protects cell membranes
- Enhances immune response
- Regulates platelet aggregation
- Regulates protein kinase C activation
- An antifertilization agent
- Soluble in fat solvents but insoluble in aqueous solvents.

Chemistry of vitamin E

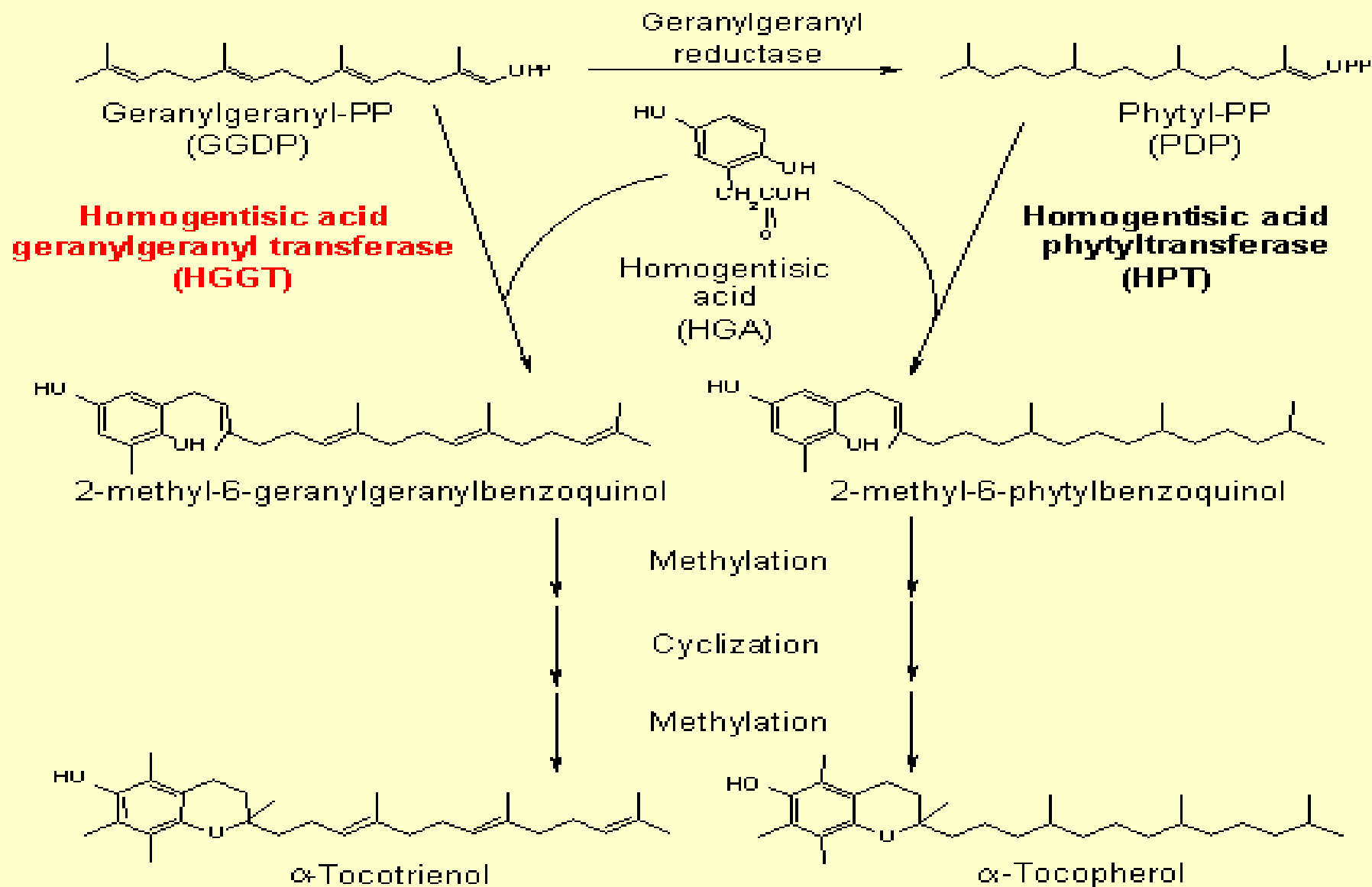
- From tocopherols and tocotrienols (formly α -tocopherol): a chroman nucleus with methyl groups at 2 and 8 position, phytyl tail of isoprenoids at 2 position.
- **Diversity:** α , β , γ , δ , ... (presence or absence of methyl group at 5 and 7 position)
- Have 8 optical isomers (3 asymmetric carbon), RRR-form is usual
- Viscous oils at room temperature
- Stable in acid and heat in the absence of oxygen.

Tocopherol and tocotrienol



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

Structure of Vitamin E Isoforms.



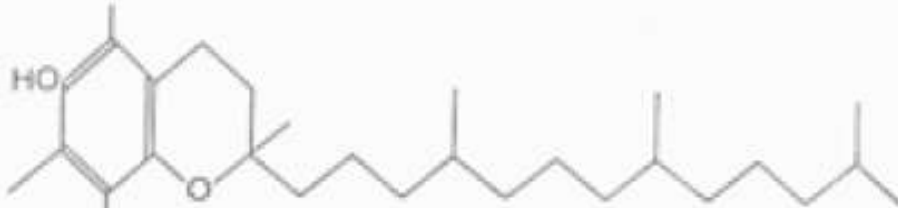
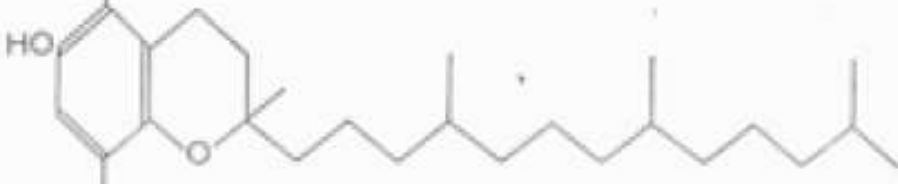
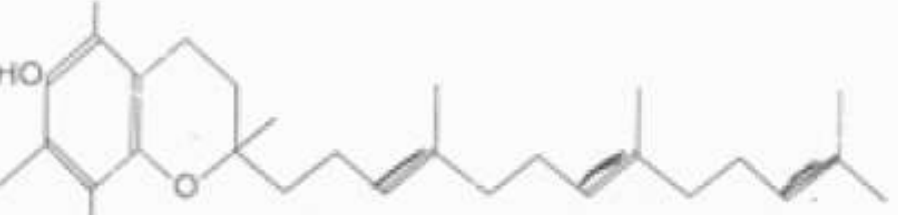
COMMON NAME	STRUCTURE	RELATIVE BIOLOGIC ACTIVITY
Alpha-Tocopherol		1
Beta-Tocopherol		0.4
Gamma-Tocopherol		0.1-0.3
Delta-Tocopherol		0.01
Alpha-Tocotrienol		0.3

Fig 2 Naturally occurring vitamin E compounds and their biologic activities relative to RRR- α -tocopherol, which is designated officially as having 1.49 IU/mg

Dietary source

- **Principle source**
- Wheat germ oil
- Sunflower oil
- Grains
- Nuts
- **Little source**
- Meats
- Fruits
- Vegetables



Absorption, Transport, Metabolism and Excretion

- Absorbed nonselectively in the presence of bile in the small intestine.
- Transport in lymphatic system with chylomicron particles to peripheral tissues (mainly adipose tissue).
- α -tocopherol takes up with liver by remnant chylomicron, went to VLDL with α -TTP to further distribution
- Excrete via the bile, in urine as a tocopheronic acid

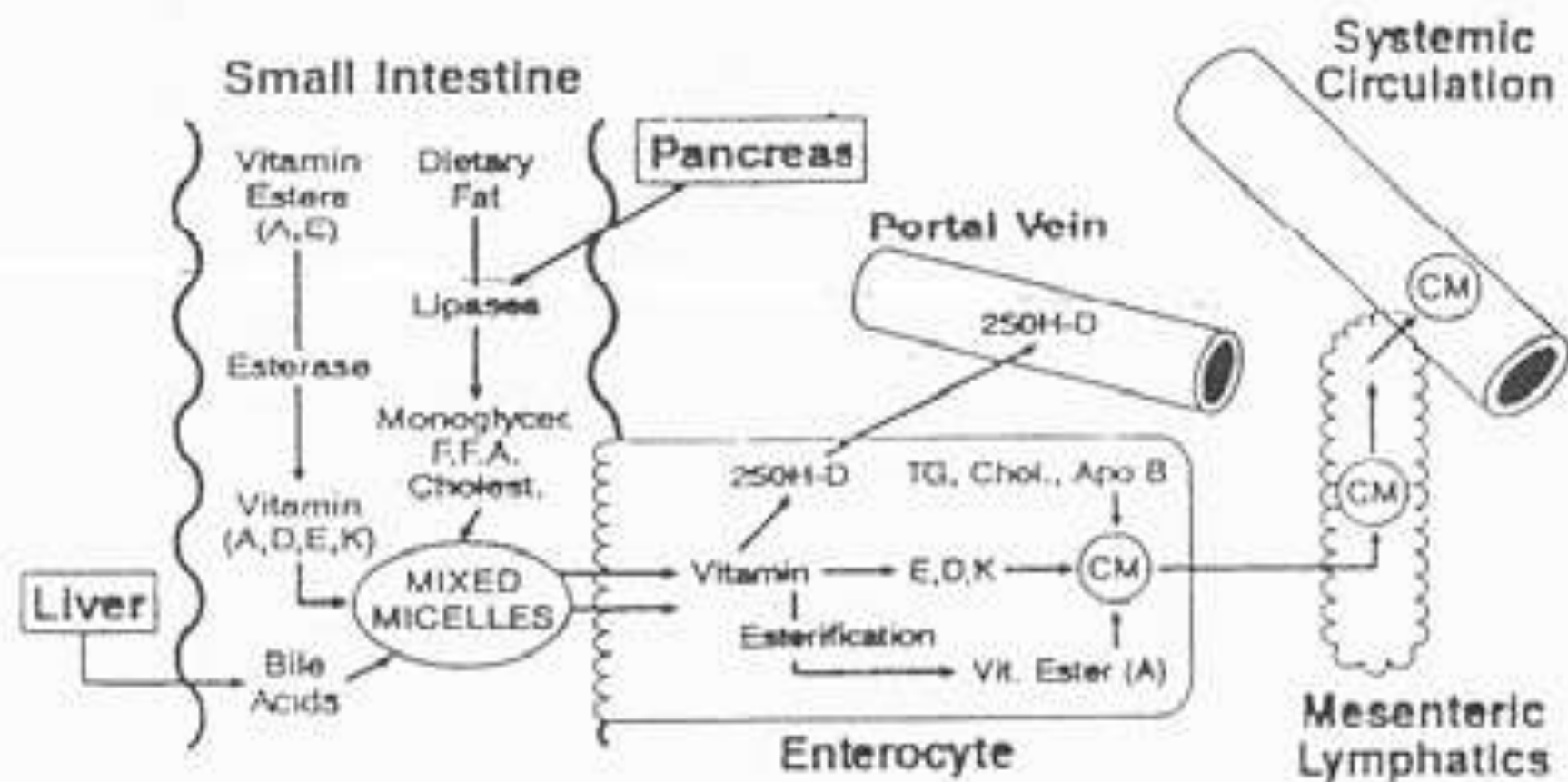


Fig 3 . Intestinal absorption of vitamin E (E) and how it compares with absorption of other fat-soluble vitamins [vitamin A (A), vitamin D (D), and vitamin K (K)]. TG, triacylglycerols; CM, chylomicrons; ApoB, apolipoprotein B.

Function of vitamin E

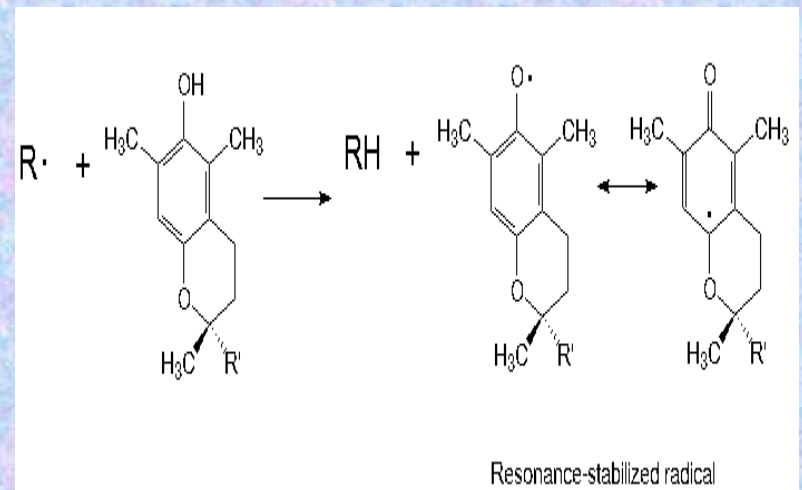
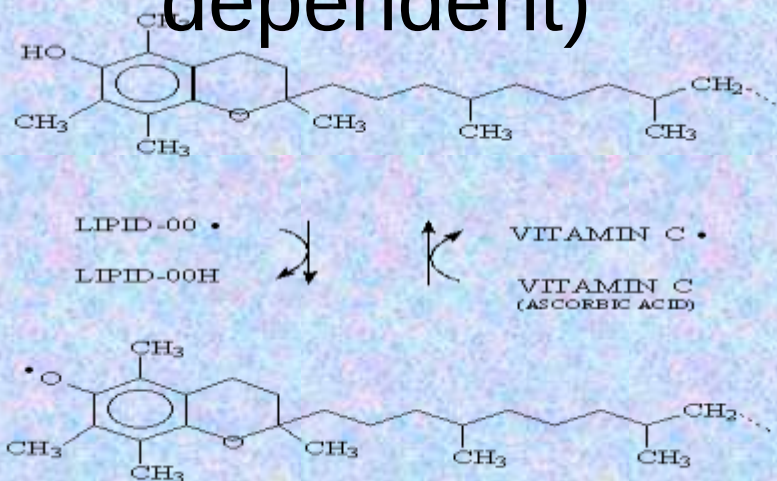
- **Efficacy of Natural-Source vs Synthetic Vitamin E**
- Natural-source is a single isomer (d-alpha-tocopherol)
- Synthetic is a mixture of eight isomers
- Natural-source has twice the bioavailability of synthetic

Function of vitamin E

- Necessary for neurological and reproductive function
- Protecting red cell from hemolysis
- Prevention of retinopathy in premature infants.
- Inhibition of chain reaction lipid-proxidation with free radicals

Function of vitamin E

- Transfer electron from free radicals to vitamin C (synergically of E & C effect)
- Reduce chronic disease incidence, cardiovascular and cancer (dose-dependent)



Function of vitamin E

- Inhibition of PKC and 5-lipoxygenase
- Activation of protein phosphatase 2A and diacyl glycerol kinase

Postranslational level

- α -tocopherol inhibit cell proliferation, platelet aggregation and monocyte adhesion
- γ -tocopherol inhibit cyclooxygenase

Requirement and reference nutrient intakes

- requirement is related to the PUSF content
- Minimum adult requirement is not certain but no more than 3-4 mg/d.
- Reference interval for plasma and all tissue is 0.5 – 1.2 mg/dl.

Clinical Deficiency States

- Susceptible groups
 - Patients with malabsorption syndromes
 - Premature infants
 - Patients on total **parenteral nutrition** (TPN)
- Characterized by progressive neurological syndrome
 - Gait disturbances
 - Absent or altered reflexes
 - Limb weakness
 - Sensory loss in arms and legs
- Improved neurological function with vitamin E therapy
- Vitamin E is an essential **nutrient** necessary for the optimal **development** and **maintenance** of the **integrity** and **function** of the human nervous system and skeletal muscle

Ataxia with vitamin E deficiency

- **Mutations** in the **TTPA** gene cause **ataxia with vitamin E deficiency**. The **TTPA** gene expresses the α -tocopherol transfer protein (**α TTP**) in the liver and brain.
- α TTP controls **distribution** of vitamin E to cells and tissues.
- Vitamin E helps cells **prevent** damage that might be done by **free radicals**.
- As a result of **impaired α TTP**, vitamin E levels in the blood are greatly reduced and free radicals accumulate within cells.
- Nerve cells (**neurons**) in the **brain** and **spinal cord** (central nervous system) are particularly vulnerable to the damaging effects of free radicals.
- Nerve cell damage can lead to problems with **movement** and other features of **ataxia** with vitamin E deficiency.

Deficiency of vitamin E



- **Mostly in premature and low birth weight infants:**
 - placenta transfer is poor
 - adipose tissue is limited (normally stored)
- **Cause of deficiency:**
 - Fat malabsorption state such as cystic fibrosis, chronic cholestasis and selenium deficiency.
- **Signs of deficiency:**
 - Irritability, edema and hemolytic anemia

Cancer and vitamin E

- An inverse association between vitamin E status and subsequent risk of certain cancers
- Intervention trials have shown **mixed results**:
 - Reduced cancer incidence and decreased mortality rate from stomach and esophageal cancers in China
 - No decrease in recurring colorectal tumors in U.S.
 - Improvement in precancerous oral lesions in U.S.
 - Decreased incidence and mortality of prostate cancer but not lung cancer in Finland

Coronary Heart Disease and vitamin E

- Increased vitamin E intakes associated with decreased risk of coronary heart disease
- A central role for **lipid oxidation** in the development and progression of **atherosclerosis**
- Dose-dependent resistance of **LDL** to oxidation with vitamin E supplementation
- In prevention trials, vitamin E showed protective effects

Cataracts and vitamin E

- Vitamin E delayed or minimized cataract development in animal models
- by **reducing** photoperoxidation of lens lipids and **stabilizing** lens cell membranes
- A relationship between blood vitamin E levels and cataract risk
- Decreased cataract risk associated with vitamin E supplementation

Alzheimer's Disease and vitamin E

- Increased vitamin E intakes or blood levels associated with reduced risk of Alzheimer's disease
- Current practice guidelines recommend vitamin E or selegiline for patients with moderate disease
- **Selegiline**, also known as L-deprenyl and sold under the brand names Eldepryl and Emsam among others, is a medication which is used in the treatment of Parkinson's disease and major depressive disorder
- **Vitamin E** may be preferred from a **safety** standpoint

Toxicity of vitamin E

- In excess vitamin E intake
- Up to 1000mg/day is safe if be without hemorrhagic toxicity.
- Up to 3000mg/day is safe, side effects is gastrointestinal symptoms and creatinuria.
- Intakes more than 400 mg/day in long term cause increased mortality.

Laboratory assessment of status

- Protection of erythrocyte hemolysis
- Inhibition of lipid proxidation products
- **Measurement:**
- In tissue or plasma have done by photometric or flourometric
- Chromatographic methods (TLC & GLC)
- HPLC is presently choice method

Reference intervals

- For serum or plasma heparinized: 0.1 – 0.5 mg/dl
- Premature neonates: 0.3 – 0.9 mg/dl
- Children (13 – 19 years): 0.6 – 1 mg/dl
- Adult: 0.5 – 1.8 mg/dl

The End