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Vitamin E

Importance

- Dietary essential for all animals

History

Discovery

- 1922 (Evans & Bishop): UC-Berkeley
 - discovered an unidentified factor in vegetable oils (wheat germ oil) as an essential nutrient for reproduction of female rat (Factor X)
- 1924 (Sure)
- 1925 (Evans)
- Provided the name Vitamin E
- Isolated as α -tocopherol

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Vitamin E

History

Discovery

- Found in every single cell ()
- Name: Tocopherol
 - tocos (toko): childbirth or offspring
 - phero (pherein): to bear
 - ol: an alcohol

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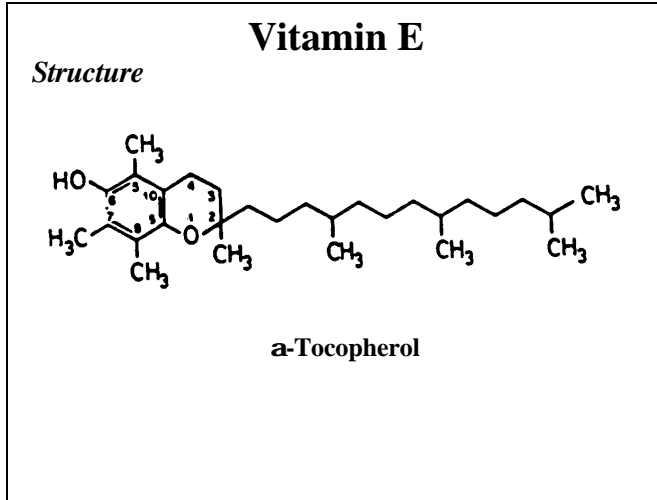
Vitamin E

Structure

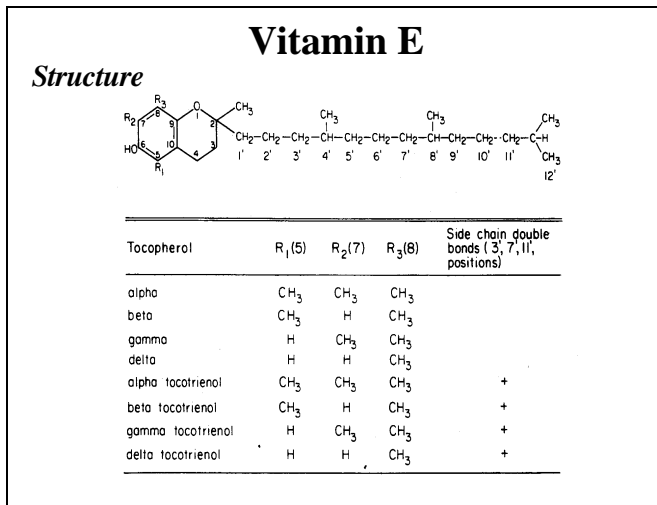
- Vitamin E includes two groups (produced in green plants):
 -
 -
- The active form is tocopherols ()
- They differ in the number of
- They differ in activity
- The most active form is α -Tocopherol:

Supplies

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Vitamin E

Structure & biological activity

<u>Tocopherol</u>	<u>Structure</u>	<u>Biological Activity</u>
a-Tocopherol	5,7,8-Trimethyltolcol	
b-Tocopherol	5,8-Dimethyltolcol	
g-Tocopherol	7,8-Dimethyltolcol	
d-Tocopherol	8-Methyltolcol	

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Vitamin E

Functions

1)
Protects cell membrane, polyunsaturated FA & vitamin A from oxidation

2)
- Essential for normal reproduction
- Fertility or anti-sterility vitamin
- Exact role: unclear

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Vitamin E

Deficiency

1) **Reproduction**

Female:
-
-

Males:
- (rats & poultry)

Treatment:
Practical diets for poultry [turkey] should contain vitamin E for normal

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Vitamin E

Deficiency

2) **Muscular dystrophy**

- young (1 to 5 week-old) growing ruminants (calves & lambs)
- white streaks in their muscles
- heart damage (cardiac muscle)
- range from mild stiffness to sudden death
- the same disease occurs by

Treatment:
-
-

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Vitamin E

Deficiency

3) Encephalomalacia

- head retraction
- loss of leg control

Sources

- (green plant & leafy feeds) are high
- of cereal grains

- μ -Tocopherol acetate is added to poultry diets for :
 - 1)
 - 2)(by inhibition of oxidation of unsaturated FA)
- Feeding more unsaturated FA vitamin E requirements

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Vitamin K

Importance

- Dietary essential for all animals
- Not required in the diet:
 - (rumen or colon) synthesize vitamin K
 - Exception:
- Required at a much level than any other fat-soluble vitamin

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Vitamin K

History

Discovery

- 1929 (Henrik Dam - Denmark): suspected the presence of a dietary antihemorrhagic factor

Fed chicks a fat-free diet:

- Anemia
- Subcutaneous & intramuscular hemorrhage
- Prolonged blood clotting

- 1935 (Dam): Proposed the name vitamin K: from the Danish word for coagulation (Koagulation)

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Vitamin K

Structure

- Several compounds (derivatives of naphthoquinone) with vitamin K activity:
 - Vitamin (phyloquinone)
in
 - Vitamin (menaquinone)
from
 - Vitamin (menadione)
more active

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Vitamin K

Structure

CC1=C(C)C(=O)C2=CC=CC=C2C1=O

Phylloquinone (Vitamin K₁)

$CH_2-C=C(CH_3)-CH_2-(CH_2-CH_2-CH(CH_3)-CH_2)_3-H$

CC1=C(C)C(=O)C2=CC=CC=C2C1=O

Menaquinone (Vitamin K₂)

$(CH_2-C=C-CH_2)_n-H$

CC1=C(C)C(=O)C2=CC=CC=C2C1=O

Menadione (Vitamin K₃)

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Vitamin K

Functions

Normal blood clotting

Enzyme

- Thrombin is made of
- Vitamin K is required for synthesis of prothrombin in the liver

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Vitamin K

Deficiency

- A decrease in
-

Chicks:

- Subcutaneous hemorrhage in breast, leg, and wing
- Deficient chicks can bleed to death (slight bruise)

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Vitamin K

Sources

-
-
-
-

(menadione)

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Vitamin K

Antagonists of vitamin K

- (produced by mold)
- Moldy hay (sweet clover):
 -
 - Only in cattle
 - Hemorrhage @ castration, dehorning, parturition & injury
 - Signs of vitamin K deficiency

Treatment:

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