

# Supplements in Hemodialysis



**Shiva Seyrafian**, Nephrologist  
IKRC, Isfahan University of Medical Sciences

1400/ 10/ 27- 1/17 /2022

# Introduction

- Dialysis Outcomes and Practice Patterns Study (DOPPS):  
>70% of MHD patients in the U.S. take supplements.
- Insufficient evidence whether micronutrients or multivitamin supplementation is beneficial or detrimental in this population.

AJKD Vol 76 | Iss 3 | Suppl 1 | September 2020

# Supplements in CKD

Supplements	
Folic acid	Vitamin E (fat- soluble)
Thiamine	Vitamin K (fat- soluble)
Riboflavin	Zinc
Vitamin B6	Selenium
Vitamin B12	Probiotics
Vitamin C	Ketoanaloges
Vitamin A (fat- soluble)	Omega-3
Vitamin D (fat- soluble)	Iron
L-carnitine	Calcium

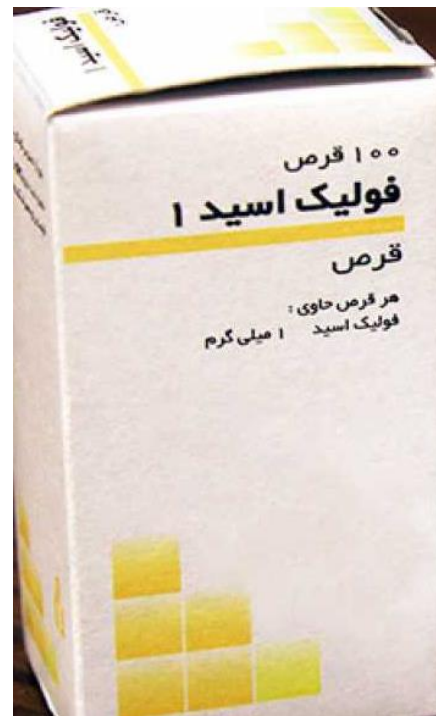
# FOLIC ACID- vitamin B complex

Dialysis patients may develop deficiencies of water-soluble vitamins

## **Causes of vitamin deficiency:**

- Poor intake,
- Interference with absorption by drugs
- Uremia
- Altered metabolism,
- Losses to the dialysate.

**All dialysis patients should receive supplementary folic acid and B vitamins in appropriate doses.**



# Vitamin C

## Vitamin C Supplementation:

- In adults with CKD 1-5D or posttransplantation who are at **risk of vitamin C deficiency**, it is reasonable to consider **supplementation** to meet the recommended intake of **at least 90 mg/d for men and 75 mg/d for women** (OPINION).

# Vitamin D

## **Vitamin D Supplementation for Vitamin D Deficiency and Insufficiency:**

**CKD 1-5D (2C)**, we suggest prescribing vitamin D supplementation in the form of **cholecalciferol or ergocalciferol** to correct 25-hydroxyvitamin D (25(OH)D) deficiency/insufficiency.

# Vitamin D





# Calcium

- Adjust calcium intake (dietary calcium, calcium supplements, or calcium-based binders) with consideration of concurrent use of vitamin D analogs and calcimimetics in order to avoid hypercalcemia or calcium overload (OPINION).
- Elemental daily calcium intake  $> 1.5$  g and were numerically more positive when patients are given active vitamin D analogues.
- Side effects: The extensive soft tissue calcification.
- Not treat asymptomatic and mild hypocalcemia ( $> 7.5$  mg/dl with normal serum albumin ). (uptodate®)

# Iron

- Hemodialysis patients loss 1-2 gm iron /year.
- **Indications:** Hb<10 g/dL and TSAT $\leq$  30%, ferritin <500 ng/dL
- **Allergic reactions:** abdominal pain, chest pain, shortness of breath, pruritus, rash, hypotension
- **Treatment:** iron sucrose 1000 mg total dose (100 mg after each dialysis session), maintenance every 2 week.
- Formula: iron sucrose (venofer), ferric carboxymaltose (ferinject)
- Not prescribe oral iron, iv iron is more effective.



# L-carnitine

- Carnitine is an amino acid with a primary role in fatty acid metabolism.
- Secondary carnitine deficiency: increased losses with dialysis.

## Indications:

- Erythropoietin-resistant anemia,
- Cardiomyopathy, and
- Muscle weakness.

## Administration:

- Dose: 10–20 mg/kg IV after each HD session,
- Oral is not recommended: limited bioavailability, toxic metabolites between dialysis (cognitive impairment, malodorous breath, CV events).

# L-carnitine



# Vitamins A and E

## **Vitamins A and E Supplementation and Toxicity:**

- High doses of **vitamin A** causes **anemia, abnormalities of lipid and calcium** metabolism. Daugirdas JT, handbook of dialysis, 2015
- **Vitamin E** is a fat-soluble nutrient recognized for **antioxidant** properties.
- Serum **vitamin E** levels provided **protection to erythrocyte survival.**

# Vitamins A and E...

## Vitamins A and E Supplementation and Toxicity:

- High doses of vitamin **E** increase the risk for hemorrhagic stroke and impair platelet aggregation.
- Vitamin **E** interacts with anticoagulant and antiplatelet medications.
- Oral doses  $\geq 400$  IU of vitamin E are not recommended.

# Vitamins A and E..

## Vitamins A and E Supplementation and Toxicity:

- CKD 5D on MHD or on PD, **not routinely supplement vitamin A or E** because of the potential for **vitamin toxicity**.



# Vitamin E, A



100 F.C Tablets

# Nephraheal<sup>®</sup>

Multivitamin for  
Chronic Kidney Disease (CKD)

**Each Tablet Contains :**

Vitamin B12	6 mcg
Vitamin B1	1.5 mg
Vitamin B2	1.7 mg
Vitamin B6	10 mg
Vitamin E	50 IU
Vitamin B5	10 mg
Ascorbic Acid	60 mg
Biotin	300 mcg
Zinc (as Zinc Oxide)	25 mg
Niacinamide	20 mg
Folic Acid	500 mcg



**هر قرص روکشدار حاوی :**

ویتامین ب ۱ ..... ۱.۵ میلی گرم  
ویتامین ب ۲ ..... ۱.۷ میلی گرم  
ویتامین ب ۳ (نیاسینامید) ..... ۲۰ میلی گرم  
ویتامین ب ۵ ..... ۱۰ میلی گرم  
ویتامین ب ۶ ..... ۱۰ میلی گرم  
ویتامین ب ۱۲ ..... ۶ میکرو گرم  
بیوتین ..... ۳۰۰ میکرو گرم  
ویتامین ای ..... ۵۰ میلی گرم  
اسید اسکوربیک ..... ۶۰ میلی گرم  
زینک ..... ۲۵ میلی گرم  
اسید فولیک ..... ۱ میلی گرم

- دارو را در دمای کمتر از ۳۰ درجه سانتیگراد، دور از نور و رطوبت و داخل جعبه اصلی نگهداری نمایید.
- قبل از مصرف ، برگه راهنمای درون جعبه را به دقت مطالعه نمایید .
- دارو را دور از دسترس کودکان نگهداری نمایید .
- اثربخشی درمانی این فرآورده به تایید سازمان غذا و دارو نرسیده است.

دستور پزشک :

قیمت برای مصرف کننده :

## Nephrotonic

# نفر و ویت<sup>®</sup>

مولتی ویتامین CKD (بیماریهای مزمن کلیوی)

مکمل تغذیه ای

بدون قند

۱۰۰ قرص روکش دار

هر قرص روکشدار حاوی

۶ میکرو گرم	ویتامین ب ۱۲
۱/۵ میلی گرم	ویتامین ب ۱
۱/۷ میلی گرم	ویتامین ب ۲
۱۰ میلی گرم	ویتامین ب ۶
۵۰ میلی گرم	ویتامین ای
۱۰ میلی گرم	ویتامین ب ۵
۶۰ میلی گرم	اسید اسکوربیک
۳۰۰ میکرو گرم	بیوتین
۲۵ میلی گرم	زینک (به صورت زینک اکساید)
۲۰ میلی گرم	نیکوتینامید
۵۰۰ میکرو گرم	اسید فولیک

Vitamin A	None
β-carotene	None
Retinol	None
Thiamine (mg)	1.5
Riboflavin (mg)	1.7
Vitamin B6 (mg)	10
Vitamin B12 (mg)	0.006
Niacin (mg)	20
Folic acid (mg)	>1.0
Pantothenic acid (mg)	10
Biotin (mg)	0.3
Vitamin C (mg)	60–100
Vitamin E	None
Vitamin D	See Chapter 36
Vitamin K	See text

Daily dietary recommended for dialysis patients (handbook of dialysis-2015)

# Vitamin K

- In maintenance hemodialysis patients, **vitamin K intake and serum vitamin K levels** are often **low or undetectable**.
- Vitamin K also enables **normal calcification processes in bone and soft tissues**.
- Patients **receiving antibiotics** who have **poor intake** and are at higher **risk for bleeding** (eg, **surgical patients**) may be considered for **vitamin K supplements**.

# Vitamin K

Large doses of vitamin E may induce vitamin K deficiency. (Mol Nutr Food Res. 2014;58(8):1590-1600)

- ویتامین K1 یا phytonadione: آمپول 10 و 1 میلیگرم - قرص 10 میلیگرم



# Selenium and Zinc

- CKD 1-5D, we suggest to **not routinely supplement selenium or zinc.**
- **Selenium:** trace element, **antioxidant properties.**
- **Zinc:** component of biomembranes, antioxidant and anti-inflammatory.
- **Zinc deficiency** has been suggested to **impair insulin secretion** and decrease leptin levels.
- **A high prevalence of zinc deficiency in HD** patients.



# Selenium and Zinc..

(50 میلیگرم) 100 عدد = 24.000 تومان

(15 میلیگرم) 100 عدد = 29.000 تومان



# KETOANALOGS

- Ketoacids (KAs) used for > 40 years to supplement low protein diets (LPDs) for CKD patients.

Am J Kidney Dis. 2015;65(5):659-673

- **Low protein diets** (0.6-0.8 g/kg/day), sometimes supplemented with non-nitrogen **ketoanalogs**, **slow GFR decline**.
- **Animal-based dietary protein**: production of **high levels of gut-derived substances** which are putative **kidney toxins**.

Brenner and Rector's the kidney-2018- ch 60



# ketoanalogs

## Potential benefits of KA/EAA supplemented LPDs:

1. Enables protein-energy status to be maintained with very low protein diets.
2. Possible phosphate binding by the calcium salt of the KA.
3. **Preserve kidney function** in patients with stages 3-5 CKD.
4. **Reduced acid load** from the lower protein intake.
5. **Decrease** serum **phosphate**
6. **Improve** serum **lipid** profiles.

Am J Kidney Dis. 2015;65(5):659-673



عدد 100 = 280.000-370.000 T

# PROBIOTICS

**Probiotics:** live microorganisms could provide the nutrients for colonic epithelial cells and help to maintain the intestinal microbial balance.

In CKD:

1. Active secretion of uric acid and oxalate into colon
2. Increased generation of toxic solutes,
3. Decreased production of beneficial micronutrients,

H. J. ZHENG ET AL , CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION, 2020 Taylor & Francis Group, LLC

# Prebiotics

## Prebiotics: nonliving indigestible fibers

- Favor the **proliferation** of bacteria such as **bifidobacteria and lactobacilli**.

**Pro and prebiotics: Ameliorate the lipid profile (TC, HDL, and LDL) in CKD patients.**

# Omega-3

- Plant-based foods which contain omega 3 polyunsaturated fatty acids, **high intake** of which has been associated **with reduced CKD risk.**

# Long Chain Omega-3 Polyunsaturated Fatty Acids (LC n-3 PUFA)

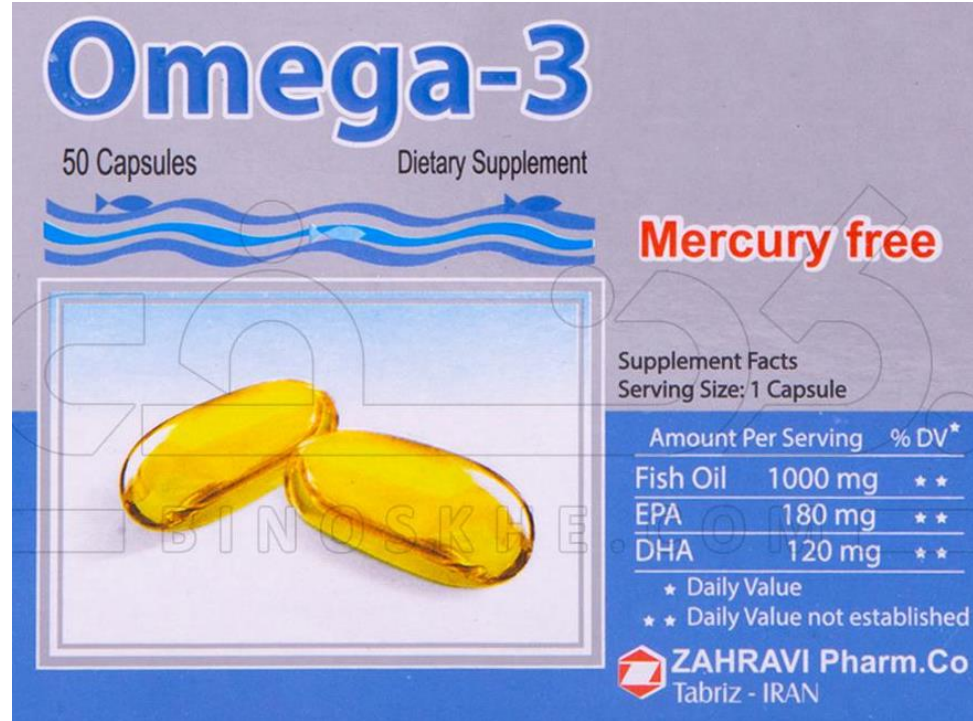
1. Long chain **omega-3 polyunsaturated fatty acids** (LC n-3 PUFAs) are obtained from **dietary sources** such as **cold-water fish** (ie, fish oil) or **linoleic acid**, which is derived from **flaxseed** or **certain other vegetable oils**.
2. Putative effects on **cardiac membrane stabilization**, leading to possible **reduction of malignant arrhythmias and sudden cardiac death**.

# Long Chain Omega-3 Polyunsaturated Fatty Acids (LC n-3 PUFA)..

## Lipid Profile:

- CKD 5D on MHD, we suggest that **1.3-4 g/d** LC n-3 PUFA may be prescribed to **reduce triglycerides and LDL cholesterol (2C) and raise HDL levels (2D)**.
- CKD 5D on PD, it is reasonable to consider prescribing **1.3-4 g/d LC** n-3 PUFA to **improve the lipid profile (OPINION)**.

50 عدد = 90.000 تومان



The image shows the packaging for Omega-3 Dietary Supplement. The top part of the box is light blue with the product name 'Omega-3' in large, bold, blue letters. Below the name, it says '50 Capsules' and 'Dietary Supplement'. There is a graphic of blue waves with two fish swimming in them. To the right of the waves, it says 'Mercury free' in red. Below the waves, there is a clear window showing two yellow capsules. To the right of the window, there is a 'Supplement Facts' table. At the bottom right, there is a logo for 'ZAHRAVI Pharm.Co' and 'Tabriz - IRAN'.

**Omega-3**  
50 Capsules Dietary Supplement

**Mercury free**

Supplement Facts  
Serving Size: 1 Capsule

	Amount Per Serving	% DV*
Fish Oil	1000 mg	**
EPA	180 mg	**
DHA	120 mg	**

\* Daily Value  
\*\* Daily Value not established

**ZAHRAVI Pharm.Co**  
Tabriz - IRAN

# Take home message

1. Folic acid and vitamin B complex recommended in all dialysis patients.
2. Vitamin D for vit. D deficient. Not treat mild hypocalcemia ( $>7.5$  mg/dl).
3. Vitamin C low dose 75 -100 mg/d.
4. Iron is used in Hb $<10$  and TSAT $<300$ .
5. Iv L-carnitine is more effective than oral.



## Take home message...

6. Vitamin A and E do not routinely prescribe, risk of bleeding and toxicity.
7. Vitamin K if poor intake or taking antibiotics.
8. Selenium and zinc not routinely prescribe.
9. Ketoanalogs in patients with very low protein diet.
10. Probiotics ameliorate lipid profile (LDL, HDL) and reduced serum urea level.
11. Omega-3 improved lipid profile.

# Very thanks for your patience

