DINH DƯỠNG cho NGƯỜI BỆNH THẬN/LỌC MÁU

Prof Pham Van Bui
ĐHYK Pham Ngoc Thach
BV Nguyen Tri Phuong
Chủ tịch Hội Thận học-Lọc máu Tp HCM
Chủ tịch Hội Lọc máu Quốc tế
GS Thỉnh giảng ĐHYK Liege, Vương Quốc Bỉ

Kidneys are Involved in Maintaining Nutrient Homeostasis

- Elimination of Na, K & PO4
- Excretion of Waste Nitrogen(Urea), Creatinine & Ammonia
- Homeostasis of the Amino Acid Pool
- Homeostasis of Glucose Metabolism
- Catabolism & Clearance of Low Molecular Weight Plasma Peptides & Hormones , eg Insulin,GH, Leptin,…

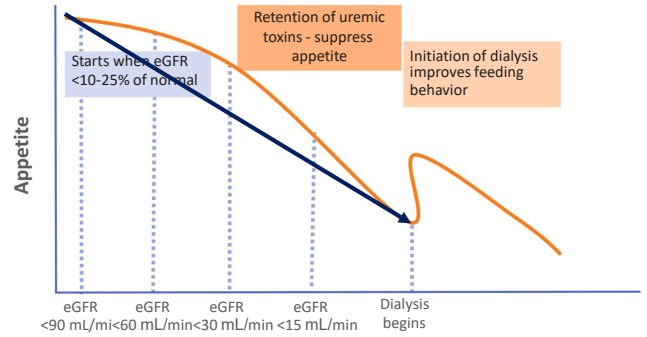
Ikizler. American Society of Nephrology Congress, Oct, 2024, San Diego, USA

KDOQI CLINICAL PRACTICE GUIDELINE for NUTRITION in CKD: 2020 UPDATE

During **progression of CKD**, the requirements & utilization of different nutrients change significantly. → ultimately place patients with kidney disease at **higher risk for nutritional & metabolic abnormalities.**

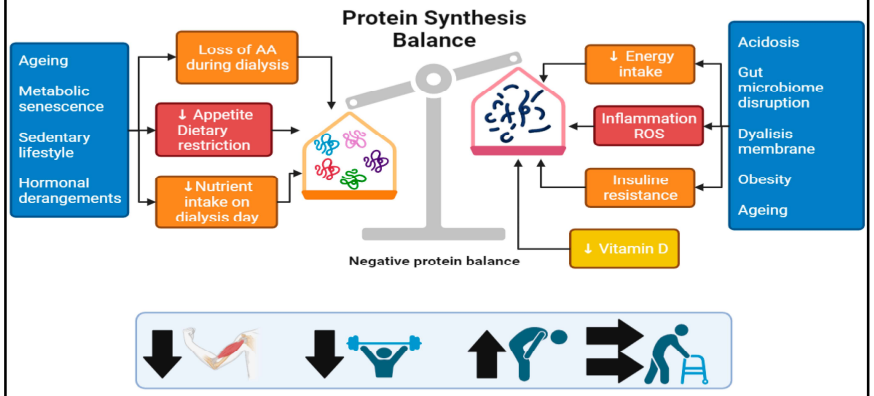
AJKD Vol 76 | Iss 3 | Suppl 1 | September 2020

Appetite decreases as CKD progresses



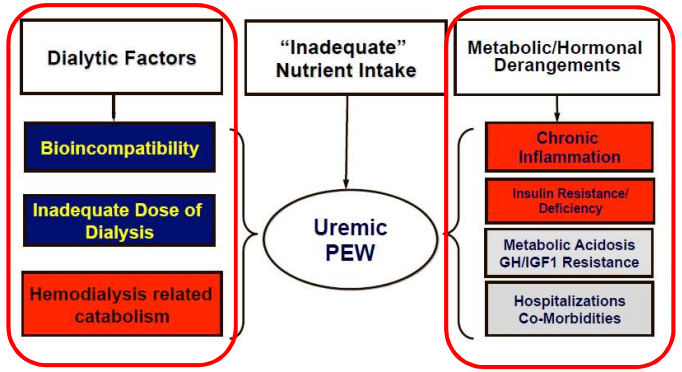
Carrero JJ. *J Ren Nutr*. 2009;19:10-15.

Cause of Muscle Loss and Sarcopenia in CKD Patients

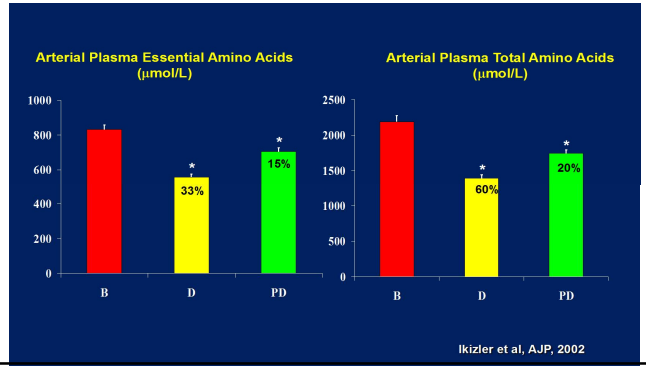


Massini, G.; et al (2023). Nutritional Strategies to Prevent Muscle Loss and Sarcopenia in Chronic Kidney Disease: What Do We Currently Know? *Nutrients* **2023**, *15*, 3107. https://doi.org/10.3390/nu15143107

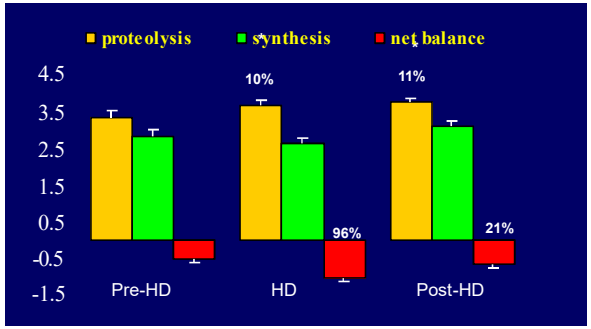
Factors Contributing to Abnormal Protein Balance in CKD Patients Are Multiple



Plasma Amino Acid Concentrations Decrease During Hemodialysis

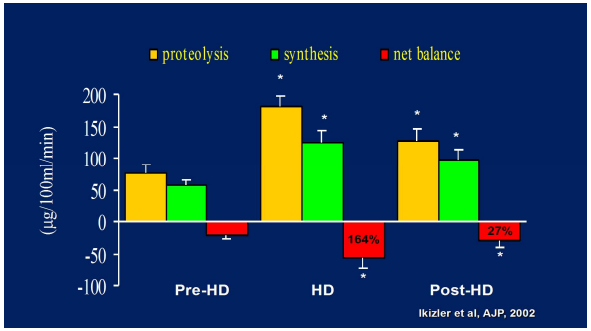


Hemodialysis Causes Net Whole-body Protein Loss



Ikizler et al, AJP, 2002

Hemodialysis Causes Net Skeletal Muscle Protein Loss

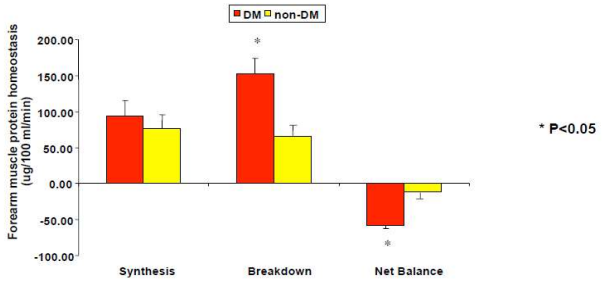


Intradialytic Protein Consumption May Benefit HD Patients

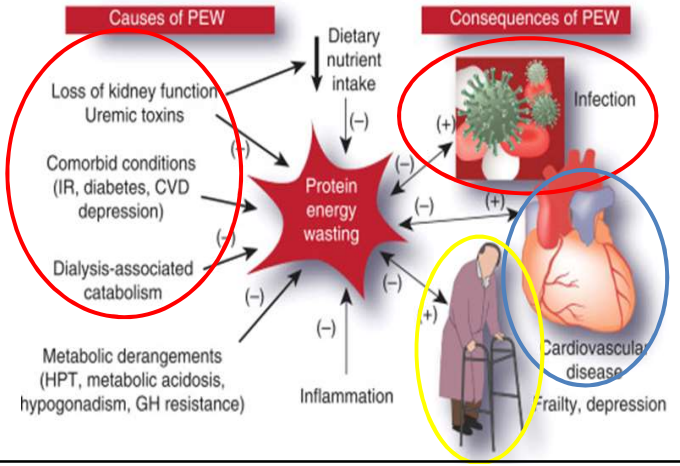
- **Acute protein loss may occur both during and immediately after dialysis** treatment due in part to inflammation, adding up to a **loss of lean muscle mass from 1 to 3 kg/year**.

Tomayko, EJ, et al. *Journal of Renal Nutrition*, May 2015;

Significant Negative Muscle Protein Balance in CHD Patients with DM



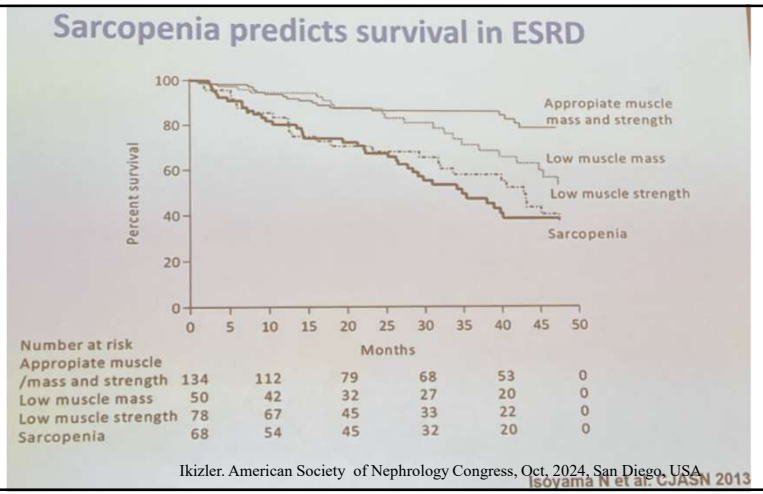
Pupim, Flakoll, Stenvinkel, Ikizler: *Kidney Int, 2005*



Wasting/Cachexia/Undernutrition

- AIDS: 5-15%
- Cancer: 20-50%
- Old age: 5-25%
- HD>CKD: 5-30%

>30% muscle loss
- **Risk of death**
- **Pneumonia**

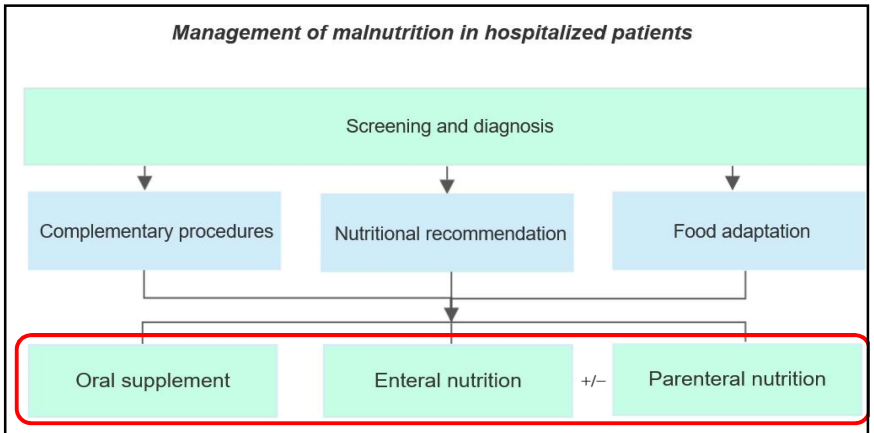


Ikizler. American Society of Nephrology Congress, Oct, 2024, San Diego, USA

Isoyama N et al. CJASN 2013

MANAGEMENT

15



Bellanti, F.; lo Buglio, A.; Quiete, S.; Vendemiale, G. Malnutrition in Hospitalized Old Patients: Screening and Diagnosis, Clinical Outcomes, and Management. *Nutrients* **2022**, *14*, 910. https://doi.org/10.3390/nu14040910

KDOQI CLINICAL PRACTICE GUIDELINE FOR NUTRITION IN CKD: 2020 UPDATE

- 1.1.9 In adults with **CKD 1-5**, it is reasonable to consider using **underweight status (based on BMI) as a predictor of higher †,** though the mortality risk associated with overweight or obesity status (based on BMI) is not clear (OPINION).
- 1.2.2 In adults with **CKD 5D** on MHD, **serum albumin may be used as a predictor of hospitalization and mortality,** with lower levels associated with higher risk (1A).

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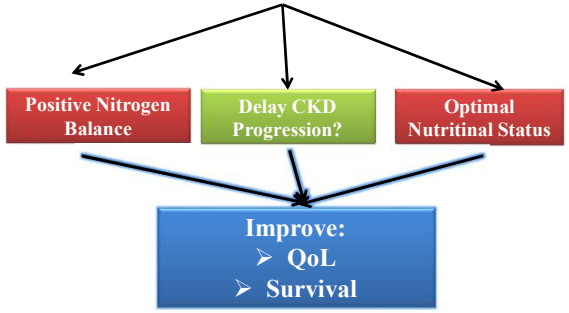
Goals
Nutritional intervention in CKD/Dialysis



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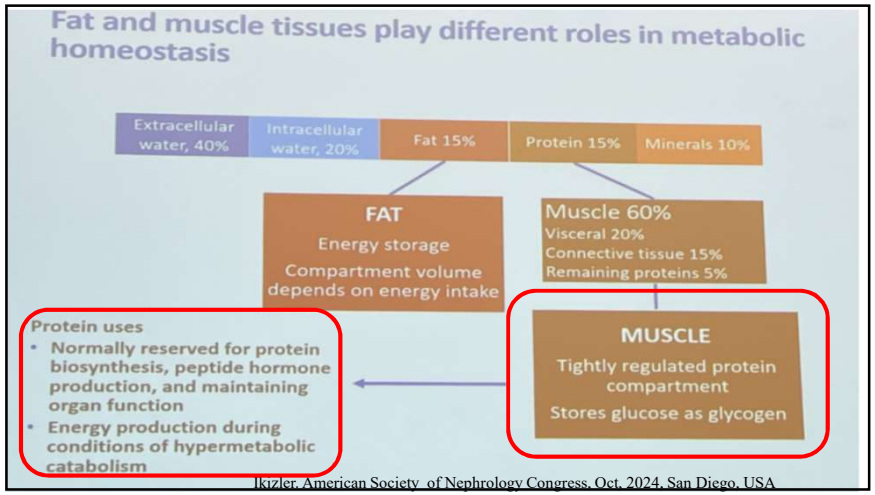
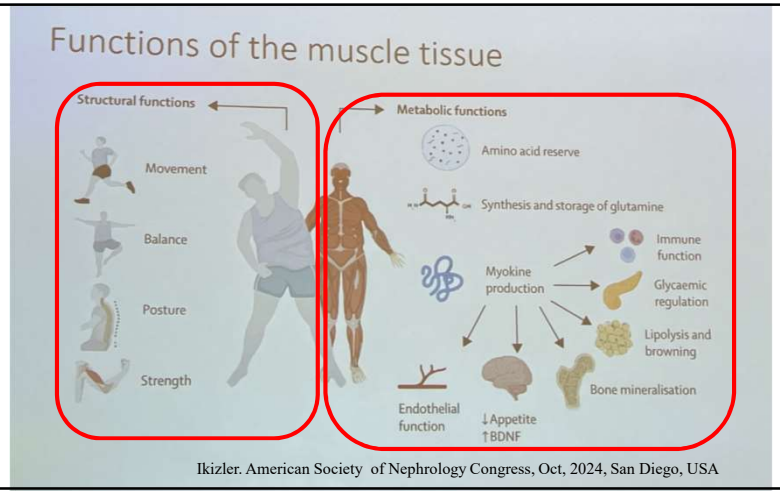


Ikizler. American Society of Nephrology Congress, Oct, 2024, San Diego, USA



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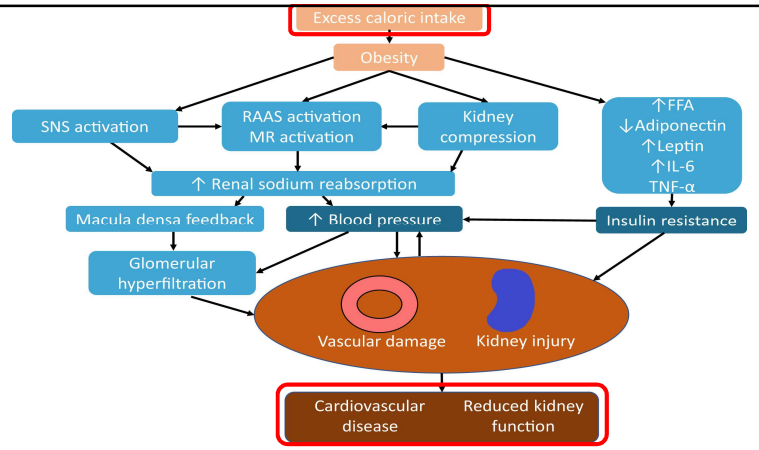


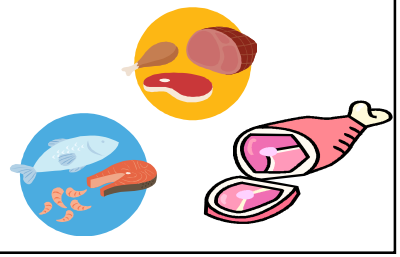
MacLaughlin, Helen L. et al..Nutrition in Kidney Disease: Core Curriculum 2022 American Journal of Kidney Diseases, Volume 79, Issue 3, 437 - 449

Protein

An **essential part** of the diet:

- **Is needed for good health**
- **Repairs and replaces tissues and cells.**

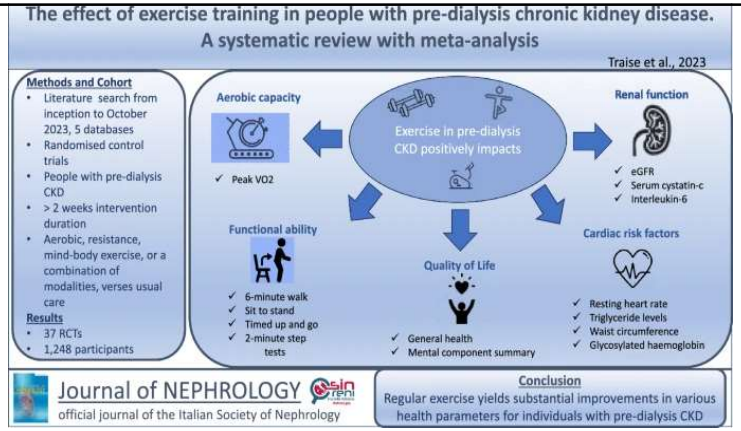
"BUILD BLOCKS of LIFE"



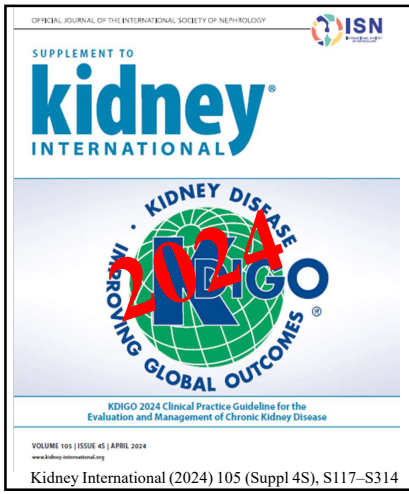
Nutritional Strategies to Prevent Muscle Loss and Sarcopenia in Chronic Kidney Disease

- It is important to note that **protein supplementation alone without exercise may be of limited benefit**; several studies suggest **anabolic benefits when supplementation is given immediately after exercise** due to synergistic effects

Massini, G.; et al (2023). Nutritional Strategies to Prevent Muscle Loss and Sarcopenia in Chronic Kidney Disease: What Do We Currently Know? *Nutrients* **2023**, *15*, 3107. https://doi.org/10.3390/nu15143107



Traise, A., Dieberg, G., Pearson, M.J. *et al.* The effect of exercise training in people with pre-dialysis chronic kidney disease: a systematic review with meta-analysis. *J Nephrol* **37**, 2063–2098 (2024). https://doi.org/10.1007/s40620-024-02081-9



Kidney International (2024) 105 (Suppl 4S), S117–S314

Recommendation 3.3.1.1: We suggest maintaining a protein intake of 0.8 g/kg body weight/d in adults with CKD G3–G5 *(2C)*.

Practice Point 3.3.1.1: Avoid high protein intake (>1.3 g/kg body weight/d) in adults with CKD at risk of progression.

Practice Point 3.3.1.2: In adults with CKD who are willing and able, and who are at risk of kidney failure, consider prescribing, under close supervision, a very low–protein diet (0.3–0.4 g/kg body weight/d) supplemented with essential amino acids or ketoacid analogs (up to 0.6 g/kg body weight/d).

Practice Point 3.3.1.3: Do not prescribe low- or very low–protein diets in metabolically unstable people with CKD.

ADA 2025 :

For people with **non–dialysis-dependent stage G3 or higher CKD, protein intake should be 0.8 g/kg body weight per day**, as for the general population. **A**

For individuals **on dialysis, protein intake of 1.0–1.2 g/kg/day should be considered** since protein energy wasting is a major problem for some individuals on dialysis. **B**

NUTRITION: Why protein intake of 0.8 g ?

- Patients who are in **advanced CKD** may naturally **decrease their oral intake → malnutrition**.
- Limiting protein intake < 0.8 g/kg/d in a person with diabetes, who also may have been counseled to limit carbohydrates, fat, and alcohol →↓ caloric content of the diet → significant weight loss →↓ quality of life
- **Protein intake** on a diabetic diet is especially crucial **to avoid episodes of hypoglycemia**

KDIGO Clinical Practice Guideline on Diabetes Management in Chronic Kidney Disease 2020

More Protein Is Advantageous for Elderly Patients With CKD

- In **old age →Protein requirement increases.**
- **Recommended protein intake is between 1.0 & 1.2 g** per kg of actual body weight per day.
- For **elderly patients with acute & chronic illnesses, injuries, or malnutrition, the protein requirement** may be **higher.**

Nadine Eckert. *More Protein Is Advantageous for Elderly Patients With CKD - Medscape - August 26, 2024.*

Protein Intake and Mortality in Older Adults With Chronic Kidney Disease

- **Question** What are the associations of total, animal, and plant protein intake with all-cause mortality in older adults with mild or moderate chronic kidney disease (CKD)?
- **Findings** In this **cohort study of 8543** community-dwelling adults **≥60 years → higher intake of total, animal, & plant protein associated with lower mortality** in participants **with mild or moderate CKD**. Associations were larger among participants without CKD.
- **Meaning** These findings suggest that the **benefits of proteins may outweigh the downsides in older adults with mild or moderate CKD**, in whom disease progression may play a more limited role in survival.

Carballo-Casla A, Avesani CM, Beridze G, et al. Protein Intake and Mortality in Older Adults With Chronic Kidney Disease. *JAMA Netw Open*. 2024;7(8):e2426577. doi:10.1001/jamanetworkopen.2024.26577

Recommendation 3.1.1: We suggest maintaining a **protein intake of 0.8 g protein/kg (weight)/d** for those with diabetes and CKD not treated with dialysis (2C).

- Practice Point 3.1.2: Patients treated with **hemodialysis, and particularly peritoneal dialysis,** should consume between **1.0 and 1.2 g protein/kg (weight)/d**.
- Recommendation 3.1.2: We suggest that **sodium intake be <2 g of sodium per day (or <90 mmol of sodium per day, or <5 g of sodium chloride per day)** in patients with diabetes and CKD (2C).
- Practice Point 3.1.3: Shared decision-making should be a cornerstone of patient-centered nutrition management in patients with diabetes and CKD.
- Practice Point 3.1.5: Health care providers should **consider cultural differences, food intolerances, variations in food resources, cooking skills, comorbidities, and cost when recommending dietary options to patients and their families.**

Is Low protein Diet suitable for all patients with CKD?

Not for all…

- Not for patients with PEW
- Not for ICU patients
- Not for patients developing PEW in follow ups
- Only when energy intake is sufficient and according to the guidelines

KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease

VOLUME 105 | ISSUE 4S | APRIL 2024

K DIGO 2024

3.3 Diet

Practice Point 3.3.1: Advise people with CKD to adopt healthy and diverse diets with a higher consumption of plant-based foods compared to animal-based foods and a lower consumption of ultraprocessed foods.

Practice Point 3.3.2: Use renal dietitians or accredited nutrition providers to educate people with CKD about dietary adaptations regarding sodium, phosphorus, potassium, and protein intake, tailored to their individual needs, and severity of CKD and other comorbid conditions.

3.3.1 Protein intake

Recommendation 3.3.1.1: We suggest maintaining a protein intake of 0.8 g/kg body weight/d in adults with CKD G3–G5 *(2C)*.

Practice Point 3.3.1.1: Avoid high protein intake (>1.3 g/kg body weight/d) in adults with CKD at risk of progression.

Practice Point 3.3.1.2: In adults with CKD who are willing and able, and who are at risk of kidney failure, consider prescribing, under close supervision, a very low–protein diet (0.3–0.4 g/kg body weight/d) supplemented with essential amino acids or ketoacid analogs (up to 0.6 g/kg body weight/d).

Practice Point 3.3.1.3: Do not prescribe low- or very low–protein diets in metabolically unstable people with CKD.

K DIGO 2024

Special considerations

Pediatric considerations.

Practice Point 3.3.1.4: Do not restrict protein intake in children with CKD due to the risk of growth impairment. The target protein and energy intake in children with CKD G2–G5 should be at the upper end of the normal range for healthy children to promote optimal growth.

Older adults.

Practice Point 3.3.1.5: In older adults with underlying conditions such as frailty and sarcopenia, consider higher protein and calorie dietary targets.

- The Work Group considers that the **evidence does not support a recommendation to follow low-protein diets alone** (i.e.,0.4–0.6 g/kg of body weight/d) **as a strategy to slow the progression of CKD.**
- In a **meta-analysis** of people with CKD without diabetes: **a low-protein diet compared with a normal-protein diet in participants with CKD G3a and G3b** (9 studies) or **CKD G4** (1 study) **found little or no difference in mortality or eGFR**

Kidney International (2024) 105 (Suppl 4S), S117–S314

Key Aspects in Nutritional Management of COVID-19 Patients

- Besides **quantity, the quality of proteins (protein with high biologic value)** is also an **important factor** with regard to the **relationship of this macronutrient with immune system.**

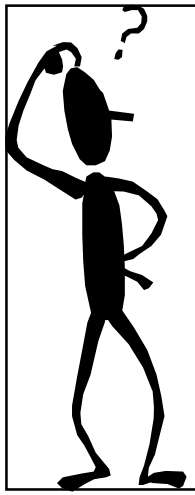
Fernández-Quintela A, et al.(2020) Key aspects in nutritional management of COVID-19 patients. Journal of clinical medicine. 2020 Aug;9(8):2589.

- Để **tổng hợp protein**, cơ thể cần phải có **đầy đủ các loại axit amin(thiết yếu + không thiết yếu) với tỉ lệ cân đối**:
- Trong đó, có **8 loại axit amin thiết yếu không thể tổng hợp** trong cơ thể, **rất cần cung cấp từ nguồn dinh dưỡng bên ngoài.**

Key Aspects in Nutritional Management of COVID-19 Patients

- **Proteins of high biological value** (those present in eggs, lean meat, fish, & dairy) **containing all the essential amino acids may exert an anti-inflammatory effect**.
- In addition, some amino acids, such as **arginine & glutamine are well known for their ability to modulate the immune system**

Fernández-Quintela A, Milton-Laskibar I, Trepiana J, Gómez-Zorita S, Kajarabille N, Léniz A, González M, Portillo MP. Key aspects in nutritional management of COVID-19 patients. Journal of clinical medicine. 2020



Protein Synthesis

Requires 20 Amino Acids

ESSENTIAL (Cannot be synthesized in the body; must be supplied from the diet)

- **Leucine**
- **Valine**
- **Isoleucine**
- **Methionine**
- **Phenylalanine**
- **Lysine**
- **Threonine**
- **Tryptophan**
- **Histidine**

Provided from out-of-body sources

NON-ESSENTIAL (Can be synthesized through intermediary metabolism)

- Alanine
- Aspartic Acid
- Cysteine
- Serine
- Asparagine
- Tyrosine
- Glutamic Acid
- Glycine
- Proline

CONDITIONALLY ESSENTIAL (During hypermetabolic catabolism)

- Glutamine
- Arginine

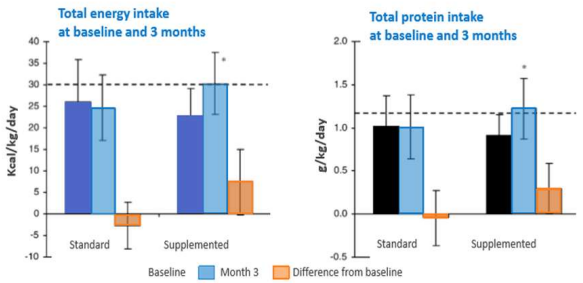
Borum PR. Nutrient metabolism. In *The Science and Practice of Nutrition Support. A Case-Based Core Curriculum.* Silver Spring, MD. *ASPEN* 2001; pp 17-30.

Nutrient Needs of CKD Patients as Defined by ESPEN Guidelines*

Condition	Protein (Essential and Non-essential Amino Acids)	Macronutrients Energy (non-protein calories)
Non-dialysis CKD patients		
GFR = 25-70 mL/min	0.55-0.60[b] (2/3 HBV)	30-40 kcal/kg/d[a]
GFR < 25 mL/min	0.55-0.60 (2/3 HBV) or 0.28+EAA or EAA+KA	
Hemodialysis	1.2-1.4 (>50% HBV)	35 kcal/kg/day
CAPD	1.2-1.5 (>50% HBV)	-

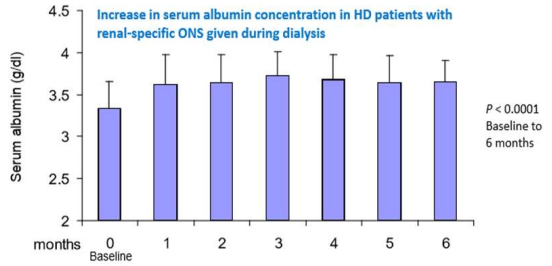
GFR = glomerular filtration rate; HBV = high biological value; EAA = essential amino acids; KA = ketoanalogues. CAPD=Continuous ambulatory peritoneal dialysis.
[a]Adapted to catabolism levels and to individual needs in case of underweight or obesity.
[b]Adjust as necessary for obese patients.
Cano NJ, et al. *Clin Nutr.* 2009;28(4):401–414.

Renal-specific ONS increased intake energy and protein intake



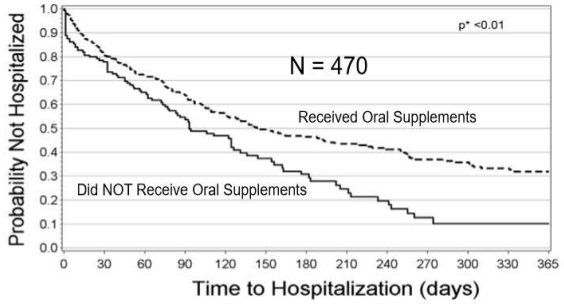
Fouque D, et al. *Nephrol Dial Transplant.* 2008;23:2902-2910.

Serum albumin, prealbumin, and SGA scores increase with renal-specific ONS



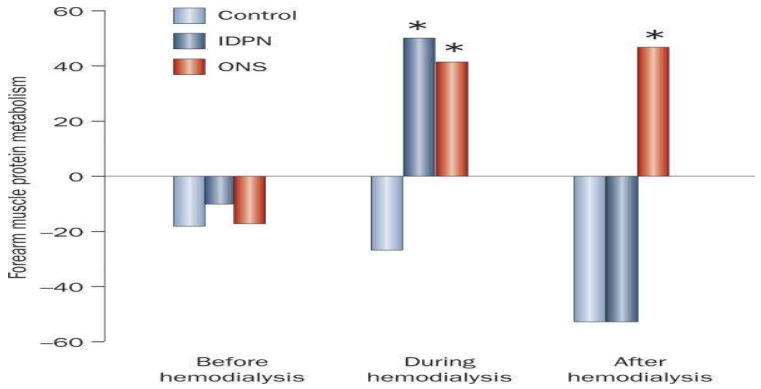
Caglar K, et al. *Kidney Int.* 2002;62:1054-1059.

Receipt of Oral Supplements is Associated with Improved Hospitalization in MHD Patients



Cheu C et al. CJASN 2012

Diets and enteral supplements for improving outcomes in CKD



Ikizler TA.Clin J Am Soc Nephrol. 2013 Dec;8(12):2174-82. doi: 10.2215/CJN.04630513. Epub 2013 Aug

Otsuka
Thương hiệu Nhật Bản

ONCE Dialyze®

Lợi điểm khác biệt

1. Chất lượng protein (đạm whey cô lập)
2. Carbohydrate có GI thấp (Isomaltulose, không sucrose) → Người tiểu đường
3. Hàm lượng thấp vit A → Ngưỡng an toàn
4. Chất xơ hoà tan (FOS, fibersol-2) → Dễ tiêu hoá
5. Không lactose → Người bất dung nạp lactose

45

Tóm tắt ONCE Dialyze®

ĐẶC ĐIỂM	✓ Giàu đạm (4,6g/100 kcal) ✓ Năng lượng cao (1,5 kcal/ml)	Đạm Whey cô lập & casein	Lượng tối ưu Na, K, P & Vitamin A	Chất xơ hoà tan Fibersol & FOS	Isomaltulose & Không chứa sucrose
LỢI ÍCH	BN có nhu cầu cao về đạm và năng lượng, BN hạn chế sử dụng chất lỏng	Cung cấp BCAA và acid amin thiết yếu khác, giúp tăng cường khối cơ	Phù hợp cho bệnh nhân lọc máu	Duy trì cân bằng hệ tiêu hoá	Phù hợp cho bệnh nhân tiểu đường có đường huyết ổn định

46

SẢN PHẨM	ONCE Dialyze	NEPHRO 2	NEPHRO 2 GOLD
			
1 KHẨU PHẦN	80 g/ 250 ml	56 g/100 ml	57,6 g/120 ml
NĂNG LƯỢNG	370 kcal (1,5 kcal/ml)	200 kcal (2kcal/ml)	240 kcal (2 kcal/ml)
LIỀU DÙNG/ NGÀY	1 ly hoặc theo chuyên gia y tế	2 – 3 ly	2 – 3 ly
PROTEIN	16,98 g Calcium caseinate, Sodium caseinate, Đạm whey cô lập	9,55 g Đạm whey, đạm đậu nành	11,52 g Đạm sữa, Đạm đậu nành
FAT	16.45 g 40% MCT oil, Rice bran oil, Canola oil, Safflower Oil	4,7g Dầu thực vật, MCT	9,22 Dầu thực vật, MCT
CARBOHYDRATE	41,19 g 42% Isomaltulose, Maltodextrin Không sucrose, Không lactose	29,9 g Maltodextrin, đường sucrose	29,96 g Maltodextrin, Isomaltulose
CHẤT XƠ	5 g FOS, Fibersol-2	1,7 g FOS	2,3 g FOS, inulin
HƯƠNG VỊ	Vani sữa mật ong	Vani sữa	Vani sữa

Điểm khác biệt của ONCE DIALYZE so với NEPHRO 2

- *Đạm cao & là đạm whey cô lập*
- *Không chứa sucrose & không chứa lactose*
- *Chất xơ cao*
- *Chứa Isomaltulose*

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ORIGINAL RESEARCH

Nutritional status among peritoneal dialysis patients after oral supplement with ONCE dialyze formula

Bancha Satirapoj[1]
Pokkrong Limwannata[2]
Chadarat Kleebchaiyaphum[2]
Janjira Prapakorn[3]
Ussanee Yatinan[3]
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Background: Malnutrition is an important problem in patients treated with long-term dialysis, and most dialysis patients have lower dietary energy and protein intake. This study was undertaken to examine whether orally administered Otsuka Nutrition Pharmaceutical (ONCE) dialyze formula (ODF) supplement would improve energy intake without mineral and electrolyte disturbances in patients with continuous ambulatory peritoneal dialysis (CAPD).
Methods: The effects of ODF supplementation on nutrition markers including serum albumin and prealbumin concentrations and inflammatory stress in patients with chronic CAPD were evaluated. All patients received daily oral ODF supplements for 15 days. During follow-up, all patients were evaluated clinically and biochemically, and nutritional status was assessed.
Results: Thirty patients with mean age 61.9±12.3 years and weekly Kt/V_{urea} 2.2±0.4 were studied. The mean values for nutritional parameters included a body weight of 53.7±9.5 kg, a serum albumin level of 3.3±0.4 g/dL, a serum prealbumin level of 33.8±11.1 mg/dL, a dietary energy intake of 21.9±7.1 kcal/kg/day, and a dietary protein intake of 0.9±0.3 g/kg/day. After 15-day ODF treatment, these patients had significant dietary energy and protein, carbohydrate, fat, fiber, potassium, calcium, and magnesium intake from baseline ($P<0.05$). Furthermore, significant improvements were found in nutritional markers including body weight, blood urea nitrogen, and prealbumin levels, but no changes were observed in serum albumin and high-sensitivity C-reactive protein levels. At the end of follow-up, the frequency of patients with moderate malnutrition decreased from 24.2% to 18.2%, and no increased incidence was observed of hyperkalemia, hyperphosphatemia, and metabolic acidosis.
Conclusion: ODF supplementation ameliorates low dietary energy and nutrient intake as well as improves serum prealbumin and body weight in patients with long-term CAPD.

International Journal of Nephrology disease 2017:10

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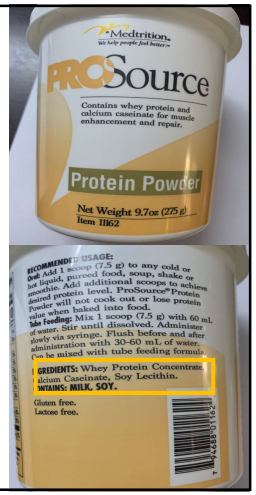
PROSOURCE

- Tiêu chuẩn **chất lượng axit amin PDCAAS100**
- Cung cấp lượng đạm tinh khiết và các axit amin trong :
  - Suy dinh dưỡng đạm
  - Suy nhược cơ thể
  - Có nguy cơ / suy giảm thể trọng do bệnh lý (vd: CKD)
  - Bổ sung đạm giúp nâng nồng độ Albumine
  - Nhu cầu bổ sung **hàm lượng đạm cao** trong **thể tích nước thấp**



- **Prosource** cung cấp 20 loại axit amin, **đặc biệt bổ sung đầy đủ 8 loại axit amin thiết yếu với tỉ lệ cân đối cần thiết cho cơ thể** Ngoài ra, đạm **Whey/Prosource còn đạt tiêu chuẩn PDCAAS 100 về bổ sung và hấp thu protein**

Characteristic

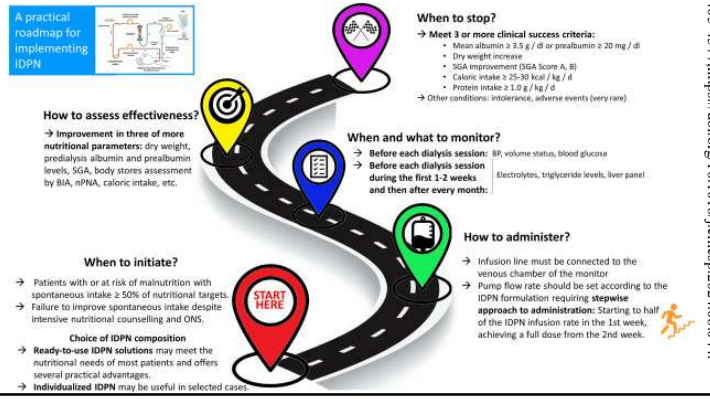
-Essential Amino Acids for Renal Failure-
AMIYU® Granules

- **Improvement clinical symptom and the delay of disease aggravation.**
- **Decreased blood urea nitrogen and the ratio of blood urea nitrogen/serum creatinine.**
- **Increased total protein and albumin.**
- **Increased red blood cells and hemoglobin.**
- **Elevated hematocrit level and improving anemia.**

Content

Active Ingredients	Content per 2.126g, EAA per sachet
L-isoleucine	203.9 mg
L-leucine	320.3 mg
L-lysine hydrochloride	291.0 mg
L-methionine	320.3 mg
L-phenylalanine	320.3 mg
L-threonine	145.7 mg
L-tryptophan	72.9 mg
L-valine	233.0 mg
L-histidine hydrochloride	216.2 mg
Amino acids total	2123.6 mg

A Roadmap for Implementing a Successful Clinical Experience with Intradialytic Parenteral Nutrition



Pablo Molina, et al. (2024)A roadmap for implementing a successful clinical experience with intradialytic parenteral nutrition.Clinical Nutrition ESPEN,olume 63, 2024:322-331, ISSN 2405-4577,https://doi.org/10.1016/j.clnesp.2024.06.044.

KIDMIN DUNG DỊCH ACID AMIN PHÙ HỢP CHO BỆNH NHÂN SUY THẬN

Hướng dẫn

ESPEN

National Kidney Foundation®

Arginine
Histidine
Tyrosine

BCAA: 45.8%

E/N = 2.6

EAA: 72%

Kidmin 7,2% Acid amin. Dung dịch tiêm truyền tĩnh mạch. [package insert]. Vietnam. OPV; 2017

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ĐẶC ĐIỂM & LỢI ÍCH

BCAA: 45.8%	EAA: 72%	Arginine Histidine Tyrosine
❑ Thúc đẩy tổng hợp protein ❑ Hạn chế dị hóa protein ❑ Tạo cảm giác ngon miệng ❑ Tăng khối cơ của cơ thể	❑ Đầy đủ nguyên liệu cho quá trình tổng hợp đạm	❑ Arginine: giảm NH_3/ máu ❑ Tyrosine: tổng hợp chất dẫn truyền thần kinh ❑ Histidine: tổng hợp Hb & điều hòa hấp thu sắt, nâng cao khả năng sống còn ở BN suy thận

From the clinical studies in this presentation. [slide number ….]

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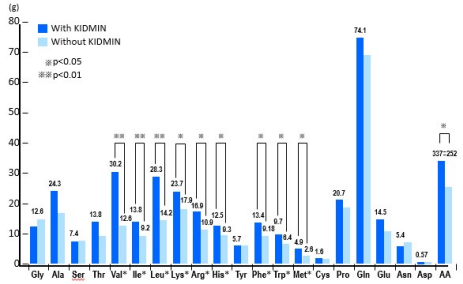
ĐÁNH GIÁ HIỆU QUẢ CỦA VIỆC BỔ SUNG ACID AMIN BẰNG PHƯƠNG PHÁP THẨM TÁCH SIÊU LỌC DỊCH BÙ TRỰC TIẾP TỪ DỊCH LỌC (HDF ONLINE)

高血流 on line HDF におけるアミノ酸輸液の効果

下門清志　山本裕美　河野真紀



BCAA & tổng AA bị mất đi nhiều hơn sau lọc máu HDF ở nhóm bệnh nhân không được truyền KIDMIN

Dung dịch dùng cho HDF: KIDMIN 7,2%

Kiyoshi Shimonado et al.: Kidney and Dialysis Separate Volume 2014 (77), 124-125, 2014

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BỔ SUNG AA TRONG QUÁ TRÌNH LỌC MÁU

IDPN GIÚP CẢI THIỆN DINH DƯỠNG: TĂNG HÀM LƯỢNG ALBUMIN & CẢI THIỆN CHỈ SỐ SGA

KẾT QUẢ

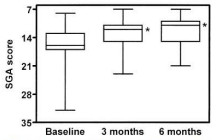

Figure 4. Changes of SGA score within observation period. Horizontal lines depict medians, boxes are $Q_{1/4}$ and $Q_{3/4}$; vertical symbols show highest and lowest values; *$P < .001$ versus baseline.

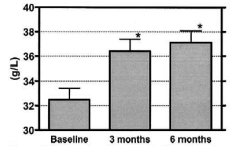

Figure 2. Serum albumin concentration at baseline and after 3 and 6 months of AA supplementation (means, 95% CI); *$P < .001$ versus baseline value.

Nghiên cứu quan sát, đa trung tâm, tiến cứu (không ngẫu nhiên, không nhóm chứng)

- **Bệnh nhân:** người lớn điều trị lọc máu (HD) ít nhất 6 tháng, 97 bn (54 nam + 43 nữ) đủ tư cách để phân tích.
- **Can thiệp:** Bổ sung AA trong lọc máu với dd 500ml 10% / chu kỳ HD, trong thời gian 6 tháng.

S Czekalski, *et al., J of Renal Nutr.*,2004;14(2):82-88

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KDOQI CLINICAL PRACTICE GUIDELINE FOR NUTRITION IN CKD: 2020 UPDATE

Oral Protein-Energy Supplementation

- 4.1.1 In adults with **CKD 3-5D (2D) or posttransplantation** (OPINION) at risk of or with protein-energy wasting, we suggest a **minimum of a 3-month trial of oral nutritional supplements to improve nutritional status** if dietary counseling alone does not achieve sufficient energy and protein intake to meet nutritional requirements.

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