

**In the name of God**

# **Nutrition in older adults**

**Shima Jazayeri, MD, PhD**

**Department of Nutrition**

**School of Public Health**

**Iran University of Medical Sciences**

# Outline

- Nutrients of Concern in Older Adults
- Nutrient Supplements
- Dietary guidelines for Older Adults
- Protein Energy Malnutrition in older adults

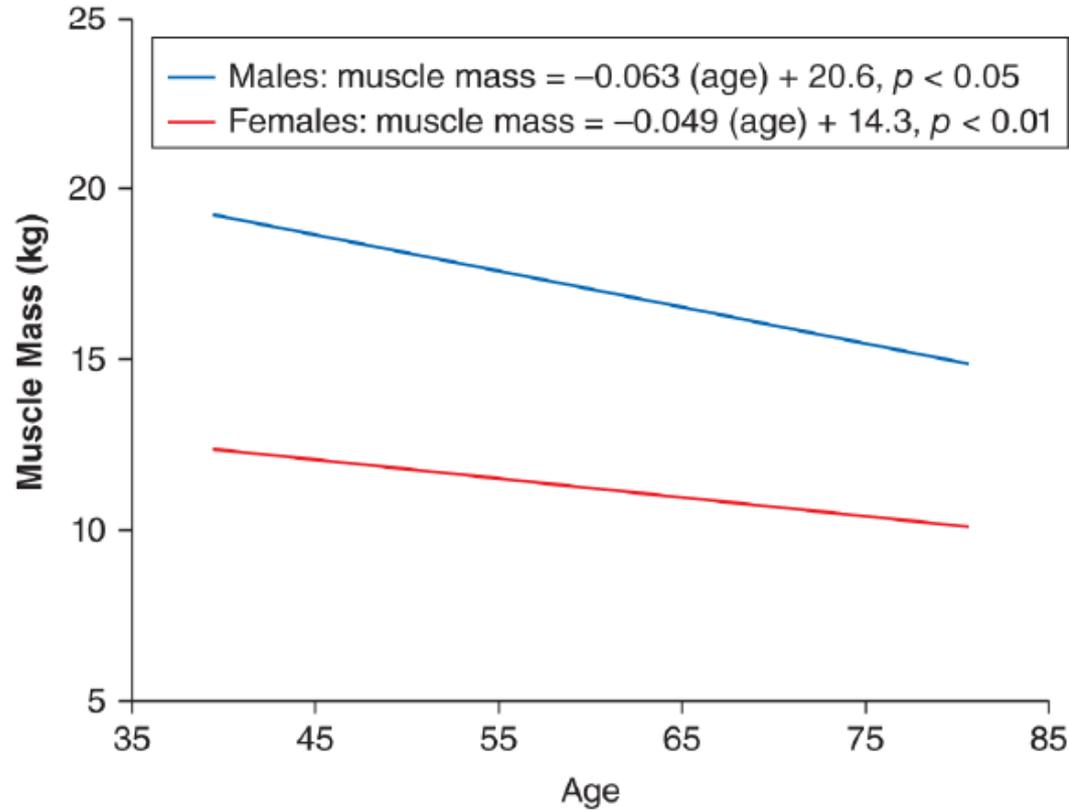
# Nutrients of concern

- **Vitamin D**
- **Calcium**
- **B12**
- **Protein**
- Folic acid
- Mg
- K
- Vitamin E
- Vitamin K
- Vitamin B6
- vitamin C
- Vitamin B1
- Iron
- Vitamin A

# Nutrients of concern: protein

- ❑ Advancing age is characterized by:
  - a progressive loss in lean body
  - a relative increase in fat mass
  - a redistribution of fat from peripheral to central locations within the body.

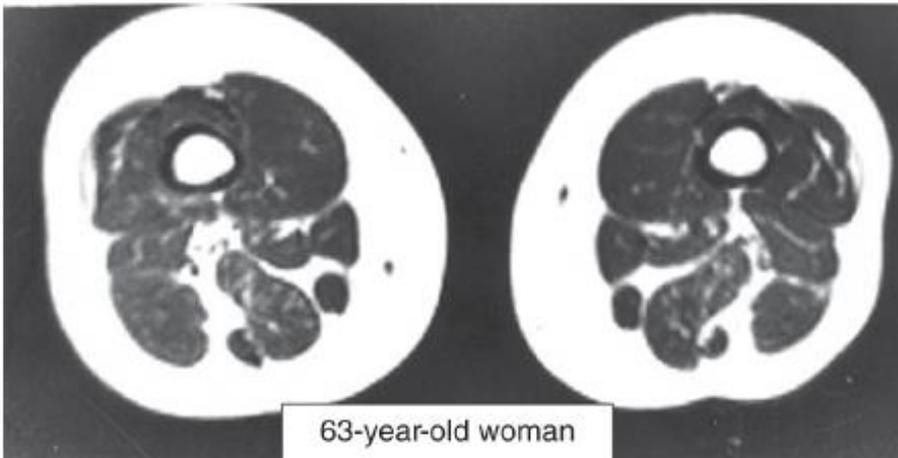
# Changes in Body Composition



21-year-old woman

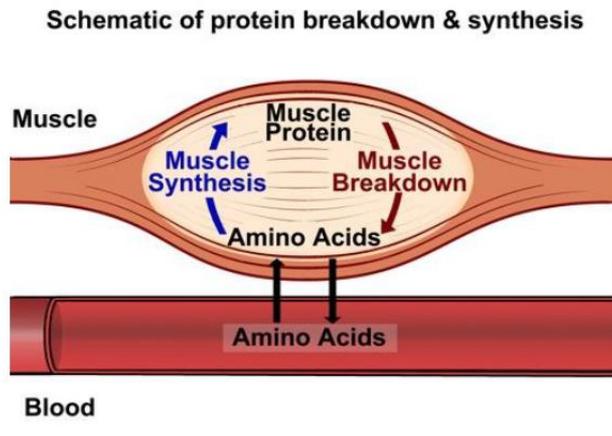


63-year-old woman



# Protein & amino acids

- **Balance** between anabolism and catabolism is important
- The major metabolic pathway to produce an anabolic response is the **mTOR pathway**
- This is regulated by the branched chain amino acid **leucine**



Traylor 2018

# Protein & amino acids

- ❑ the **threshold** concentration of circulating amino acids required to produce an anabolic response in skeletal muscle synthesis
- ❑ may be **increased in older muscle**
- ❑ **increasing** concentrations of **leucine** are required to maintain robust anabolic responses.

# PROT-AGE recommendations for dietary protein intake in *healthy* older adults

- ❑ To maintain and regain muscle **1.0 to 1.2 g/kg Body weight/d**.
- ❑ The **per-meal anabolic threshold** of dietary protein/amino acid intake is **25 to 30 g protein** per meal, containing about **2.5 to 2.8 g leucine**)
- ❑ Protein **source**, **timing** of intake, and **amino acid supplementation** may be considered when making recommendation for dietary protein intake by older adults.

# **Protein content of one serving of foods**

Dairy : 8 grams

Meat: 7 grams

Beans : 7 grams

Grain: 2-3 grams



**Whey Protein Isolate**  
23 g Protein  
2.5 g Leucine  
92 Calories



**Soy Protein Isolate**  
31 g Protein  
2.5 g Leucine  
125 Calories



**Skim Milk**  
3.7 Servings (874 mL)  
2.5 g Leucine  
333 Calories



**Top Round Beef**  
1.3 Servings (142 g)  
2.5 g Leucine  
391 Calories



**Whole Wheat Bread**  
12.8 Servings (641 g)  
2.5 g Leucine  
3462 Calories



**Raw Chicken Breast**  
1.3 Servings (142 g)  
2.5 g Leucine  
147 Calories



**Raw Peanuts**  
5 Servings (149 g)  
2.5 g Leucine  
876 Calories



**Greek Yogurt**  
1.1 Servings (250 g)  
2.5 g Leucine  
143 Calories



**Raw Eggs**  
4.6 eggs  
2.5 g Leucine  
321 Calories

# PROT-AGE recommendations for protein levels in geriatric patients with **diseases**

- its **severity**, the patient's **nutritional status** prior to disease, as well as the **disease impact on the patient's nutritional status**.
- Most older adults who have an **acute or chronic disease** need more dietary protein (ie, **1.2-1.5 g/kg BW/d**);
- people with **severe** illness or injury or with marked malnutrition may need as much as **2.0 g/kg BW/d**.
- Older people with **severe kidney disease** (ie, estimated glomerular filtration rate [GFR] < 30 mL/min/1.73m<sup>2</sup>) **who are not on dialysis** are **an exception to the high-protein rule**;

# Meal distribution

- To **equally distribute protein intake across the three daily** meals
- is based on the concept of reaching a **per-meal anabolic threshold**
- a desirable dose of **25–30 g** of **high-quality protein** per meal
- providing **15 g** of **essential amino acids**
- for stimulating **MPS**

# Nutrients of Concern: Vitamin D

Factors that put older adults at risk for deficiency:

- Limited exposure to sunlight
- Decreased skin ability
- Renal impairment
- Certain medications
- Vitamin D RDA: 800 IU/d
- UL: 4000IU/d

	19-70 y	≥71y
Vitamin D (IU/d)	600	800

# Nutrients of Concern: Vitamin B12

- Despite adequate intake, ~10-20% of older adults have ↓ serum B12 levels
- Atrophic gastritis & hypochlorhydria
- Vegetarians
- Medications: Metformin, Chronic antacid use

## Sources of vitamin B<sub>12</sub>



## Vitamin B<sub>12</sub>

Natural sources  
of vitamin B12:

Eggs, meat, poultry,  
sh  
mi

B12 is also added



# Nutrients of Concern: Calcium

- ✦ Insufficient intake dairy products
- ✦ Menopause
- ✦ Calcium malabsorption
- ✦ Lack of exercise
- ✦ Nutrient-nutrient interaction (sodium, caffeine)
- ✦ Medications
  
- ✦ RDA: 1200mg/d
- ✦ UL: 2000 mg/d

	19-50 y	≥51
Calcium (mg/d)	1000	F: 1200 M ≥ 70 y : 1200

# Vitamin K

- Vitamin K status has been positively associated with **higher bone mineral density** and better function of the lower extremities in elderly.
- Deficiency was highly prevalent in older adults with **hip fractures**.
- It has also shown independent antiinflammatory
- **Prolonged use of antibiotics** can lead to deficiency.
- **Intestinal malabsorption** is also a contributing factor.



# Nutrients of Concern: Vitamin E

- Insufficient intake
- Interaction with vitamin K
- Vitamins E & K: Same pathways metabolism and excretion
- antioxidant functions
- Vitamin E is associated with enhanced immune function and cognitive status



# Magnesium

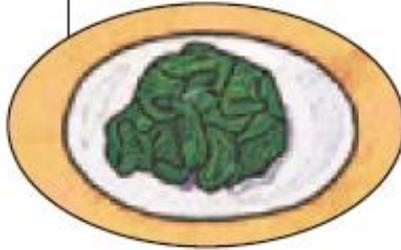
- Adequate magnesium intake is needed for **bone formation, nerve activity, glucose utilization, and synthesis of fat and proteins.**
- Older adult intake **is below the RDA.**
- Magnesium deficiency can result from **low intake, malabsorption, chronic alcoholism, and diabetes.**
- Signs of deficiency include **personality changes (irritability, aggressiveness), vertigo, muscle spasms, weakness, and seizures**

# Magnesium (cont.)

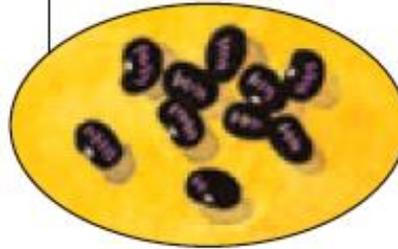
- **Drugs** used by older adults, such as magnesium hydroxide or citrate laxatives, may lead to **magnesium overdose**.
- Signs of magnesium toxicity are **diarrhea, dehydration, and impaired nerve activity**.
- Food sources do not result in toxicity.
- The **UL is 350** mg from nonfood (supplementary) sources.

# Mg food sources

SPINACH (cooked)  
1/2 c = 78 mg



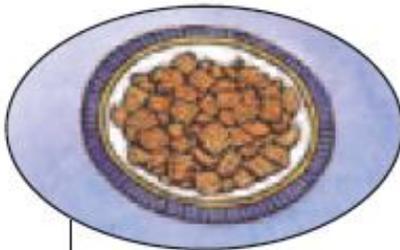
BLACK BEANS (cooked)  
1/2 c = 60 mg



SOY MILK  
1 c = 46 mg



BRAN CEREAL<sup>b</sup>  
(ready-to-eat)  
1 c = 80 mg

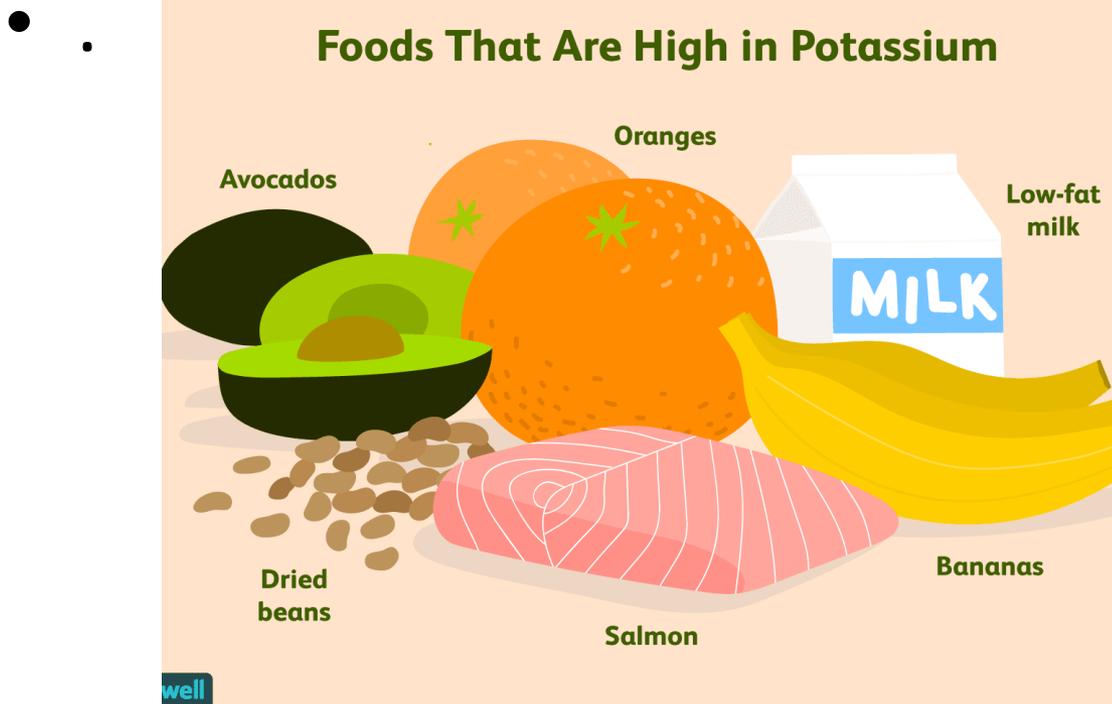


YOGURT (plain)  
1 c = 43 mg



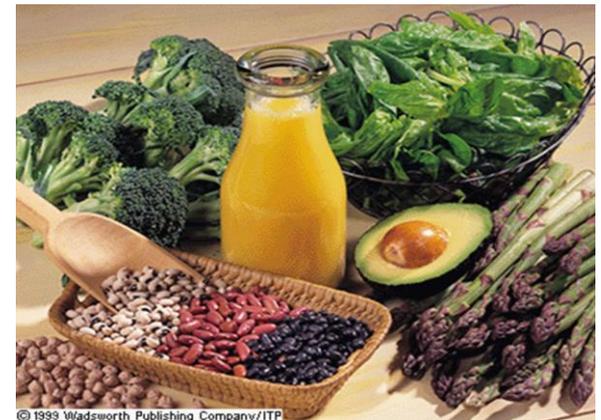
# Potassium

- Fruits and vegetables are excellent sources, especially potatoes, sweet potatoes, greens, beans, bananas, and tomatoes.



# Nutrients of Concern: Folate

- ✦ Diet insufficiency: ↓ Fruits & vegetables
- ✦ Absorption may be impaired
- ✦ B12 deficiency is a more common problem in elderly
- ✦ Alcohol
- ✦ Medications: Methotrexate



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# Vitamin B1

- ❑ Thiamin occurs in **small quantities in virtually all nutritious foods**
- ❑ It is concentrated in only a few foods:
  - legumes, sunflower seeds, and enriched and whole-grain breads are valuable sources of thiamin.



# vitamin B6

- ❑ The richest food sources of vitamin B6 are
- protein-rich meat, fish, and poultry



	19-50 y	≥ 51 y
B6 (mg/d)	1.3	M: 1.7 F: 1.5

# Vitamin C

- Citrus fruit
- Cantaloupe
- strawberries
- broccoli and brussels sprouts

SWEET RED PEPPER  
(chopped, raw)  
1/2 c = 95 mg



BRUSSELS SPROUTS  
(cooked)  
1/2 c = 48 mg



GRAPEFRUIT  
1/2 c = 43 mg



SWEET POTATO  
1/2 c = 20 mg



ORANGE JUICE  
1/2 c = 62 mg



GREEN PEPPERS  
(chopped, raw)  
1/2 c = 60 mg



BROCCOLI (cooked)  
1/2 c = 51 mg



STRAWBERRIES  
1/2 c = 43 mg



BOK CHOY  
1/2 c = 22 mg

# Nutrients of Concern: Vitamin A

- Plasma levels & liver stores  $\uparrow$  with age
- May be linked to  $\downarrow$  clearance from the blood
- Older adults more vulnerable to **toxicity** & possible **liver damage** than deficiency



# Vitamin A (cont.)

- The UL for vitamin A is 3000 mcg (3 mg) for adults aged 19 and older,
- which could be reached if fish liver oils are taken in addition to daily vitamin supplements.
- Excess vitamin A would hair loss, dry skin, nausea, irritability, blurred vision, or weakness

# Vitamin A (cont.)

- Vitamin A's plant precursor, beta-carotene, will not damage the liver,
- although **supplements** used as antioxidants to prevent cardiovascular disease have been linked to **higher all-cause mortality**.
- Excess dietary beta-carotene, because it is water-soluble, may give old **skin a yellow-orange tint**

# Nutrients of Concern: Iron

- ☀ Iron needs ↓ after menopause
- ☀ Most older adults consume more iron than needed
- ☀ Excess iron contributes to oxidative stress
- ☀ Reasons that some older adults may have iron deficiency include:
  - Iron loss from disease or medications

## Iron Requirements

<50 years		>50 years	
Women	<b>18</b>	Women	<b>8</b>
Men	8	Men	8

# Changes in micronutrient requirements in older adults

	19-50 y	≥51
Calcium (mg/d)	1000	F: 1200 M≥ 70 y : 1200
Iron(mg/d)	M: 8 F: 18	M: 8 F: 8
Vitamin D (IU)	600	≥71y : 800
B6 (mg/d)	1.3	M: 1.7 F: 1.5

# Drugs commonly prescribed to older patients that influence micronutrient status

Drug	Nutrient
PPI	B12, Zn Vitamin C, Ca, Mg
Metformin	B12↓
Laxative	K, Mg
NSAID	Vitamin C, Fe
Diuretics	K, Mg, B1 Folate
ACE inhibitors	Zn
Statins	Vit E, Betacarotene
Glucocorticoids	Vitamin D , Ca Na retention , K excretion

# Micronutrients in older people

- Special attention to **Vitamin B6, folic acid and B12** in relation to **cognitive performance** and neuronal functions.
- **Calcium, vitamin D, vitamin K** role in **bone health**.

# Supplements vs Foods



# Vitamin mineral supplementation

- Many older adults, including those who are healthy and living independently as well as those who are frail, ill, or institutionalized, are at risk for micronutrient deficiencies.
- Risk factors for poor intake, adverse drug nutrient interactions, and nutrition-related diseases all increase as a function of age, and clinical (and subclinical) deficiencies of vitamins and minerals become more likely, particularly once frailty and the need for institutionalization occurs.

# Vitamin mineral supplementation

- The micronutrients most commonly deficient include vitamins C, D, E, B12, thiamine (B1), and folic acid, and the minerals calcium, magnesium, and zinc
- Most nutritionists recommend :
  - Iron –free
  - DRI
- Vitamin and mineral supplementation should not substitute for an overall program of healthy nutrition (eg, high fruit, vegetable and whole grain intake and reduced saturated and trans fat intake).

## Nutrient Supplements

### When to Consider Supplements?

- Lack appetite resulting from illness, loss of taste or smell, or depression
- Have diseases in GI tract, ...
- Have a poor diet due to food insecurity, loss of function, or disinterest
- Avoid specific food groups
- Take medication or other substances that affect absorption or metabolism

# Nutrient Supplements

## What to Take?

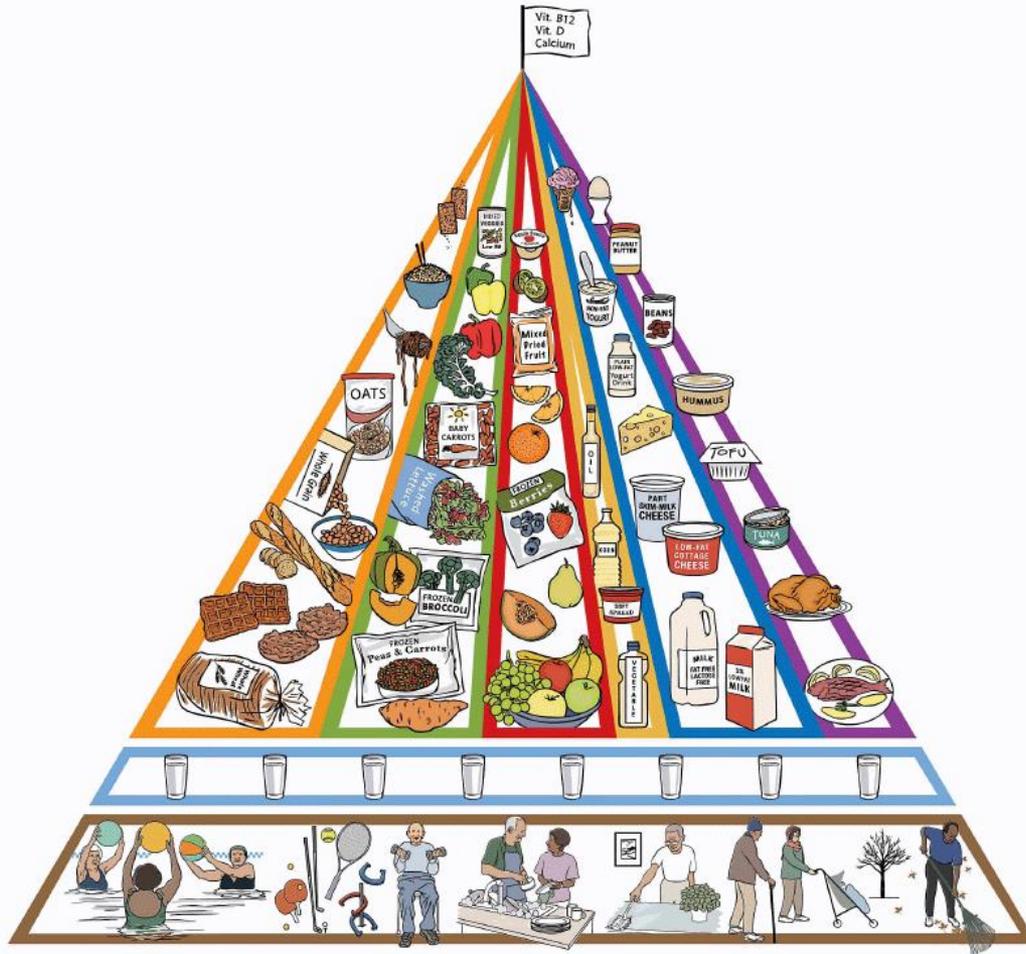
- ❖ Vitamin/mineral balance
- ❖ Safe dose when combined with foods
- ❖ Safety of product

## How Much to Take?

- ❖ Physiological doses
- ❖ Usually without Iron, less vitamin A , higher vit B12 and D

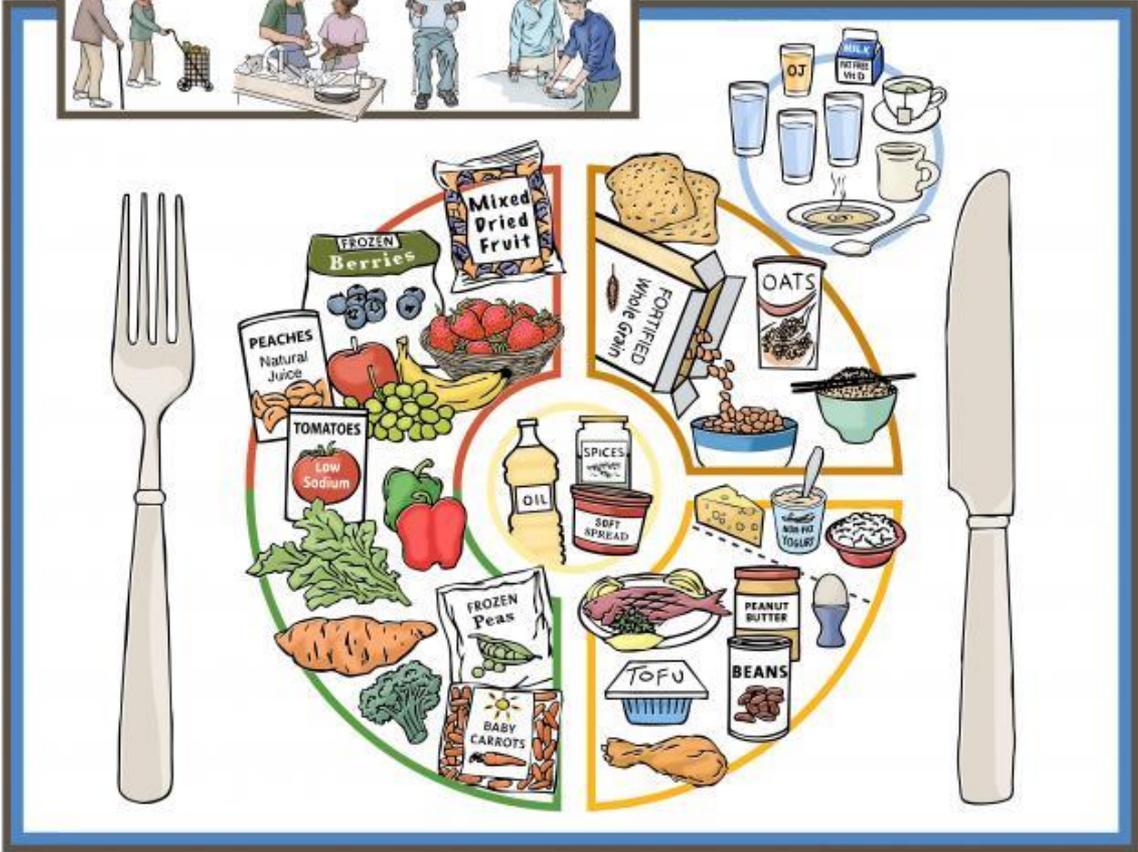
# Dietary guidelines for older adults

# Modified MyPyramid for Older Adults



2007

# MyPlate for Older Adults



2010

## MyPlate for Older Adults

### Fruits & Vegetables

Whole fruits and vegetables are rich in important nutrients and fiber. Choose fruits and vegetables with deeply colored flesh. Choose canned varieties that are packed in their own juices or low-sodium.

### Healthy Oils

Liquid vegetable oils and soft margarines provide important fatty acids and some fat-soluble vitamins.

### Herbs & Spices

Use a variety of herbs and spices to enhance flavor of foods and reduce the need to add salt.



### Fluids

Drink plenty of fluids. Fluids can come from water, tea, coffee, soups, and fruits and vegetables.

### Grains

Whole grain and fortified foods are good sources of fiber and B vitamins.

### Dairy

Fat-free and low-fat milk, cheeses and yogurts provide protein, calcium and other important nutrients.

### Protein

Protein rich foods provide many important nutrients. Choose a variety including nuts, beans, fish, lean meat and poultry.



Remember to Stay Active!

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HEALTHY  
FOODS  
FOR  
OLDER  
ADULTS

HRCA

AARP Foundation

2016



# MyPlate for Older Adults

STAY ACTIVE

60  
minutes  
each day



Choose  
bright colored  
VEGETABLES



Drink plenty of **FLUIDS**

- Water
- Milk
- 100% Juice
- Coffee
- Tea
- Soup



# هرم غذایی ایرانی

Vit B12, Ca  
Vit D

Vit D, B12, Ca

متفرقه

3

شیر و فرآورده‌ها  
حقال 3 واحد

گوشت و تخم مرغ  
حقال 1.5 واحد

1.5

حیوانات و مغزها  
1 واحد

سبزی‌ها  
حقال 3 واحد

میوه‌ها  
حقال 2 واحد

نان و غلات  
حقال 6 واحد



هرم و گروه های غذایی ویژه سالمندان

# DIAGNOSIS OF ADULT protein Energy MALNUTRITION

- Insufficient energy intake
- Weight loss
- Loss of muscle mass (eg, temporal wasting, reduced pectoralis, deltoid, quadriceps, other muscle)
- Loss of subcutaneous fat (eg, orbital, triceps, fat overlying ribs)
- Localized or generalized fluid accumulation (eg, extremity or genital edema, ascites)
- Decreased functional status as measured by reduced handgrip strength

Temporalis Muscles







# ASPEN

**Table 5.** Characteristics to Diagnose Nonsevere (Moderate) Malnutrition.<sup>4</sup>

Characteristic	Acute Illness or Injury Related Malnutrition	Chronic Disease Related Malnutrition	Social or Environmental Related Malnutrition
Weight loss	1%-2%/1 week 5%/1 month 7.5%/3 months	5%/1 month 7.5%/3 months 10%/6 months 20%/1 year	5%/1 month 7.5%/3 months 10%/6 months 20%/1 year
Energy intake	<75% for >7 days	<75% for ≥1 month	<75% for ≥3 months
Body fat	Mild depletion	Mild depletion	Mild depletion
Muscle mass	Mild depletion	Mild depletion	Mild depletion
Fluid accumulation	Mild	Mild	Mild
Grip strength	Not applicable	Not applicable	Not applicable

# Nutrition Interventions for PEM

- A first step is to determine what **caused** the weight loss so that proper intervention is administered.
- Refeeding and rehydration are done **gradually**.

# Nutrition Interventions (cont.)

- Calories: 30–35 kcal /kg
- Protein:
  - 1.0–1.5 grams of protein per kilogram body weight is adequate;
  - 1.5–2.0 g/kg/day in cases of severe depletion, balanced throughout the day.
- Exceptions are patients with renal or liver failure, who may need a protein restriction.
- Fluid: Drink 1 mL per kcal; rehydrate slowly

# AVAILABLE INTERVENTIONS FOR IMPLEMENTING NUTRITIONAL SUPPORT

- Enhance oral intake
  - Frequent meals, snacks
  - Provide favorite foods, fortified foods, nutrient-dense foods
  - minimize/remove dietary restrictions
  - Feeding assistance, company at meals
  - Protein-calorie supplements
  - Multivitamins
- Enteral nutrition
- Parenteral nutrition

# ONS: Oral nutritional supplements

- Oral nutritional supplements (ONS) are multi-nutrient products containing :
  - macronutrients (protein, carbohydrates, fat) and
  - micronutrients (vitamins, minerals) in a balanced composition.
- They are available in a wide range of flavors, mostly in liquid form but also as powder, dessert-style or bars.
- They have not been specifically developed with the intention to improve cognitive functioning.

- Thank you for your attention