REPUBLIC OF YEMEN
21September UMAS

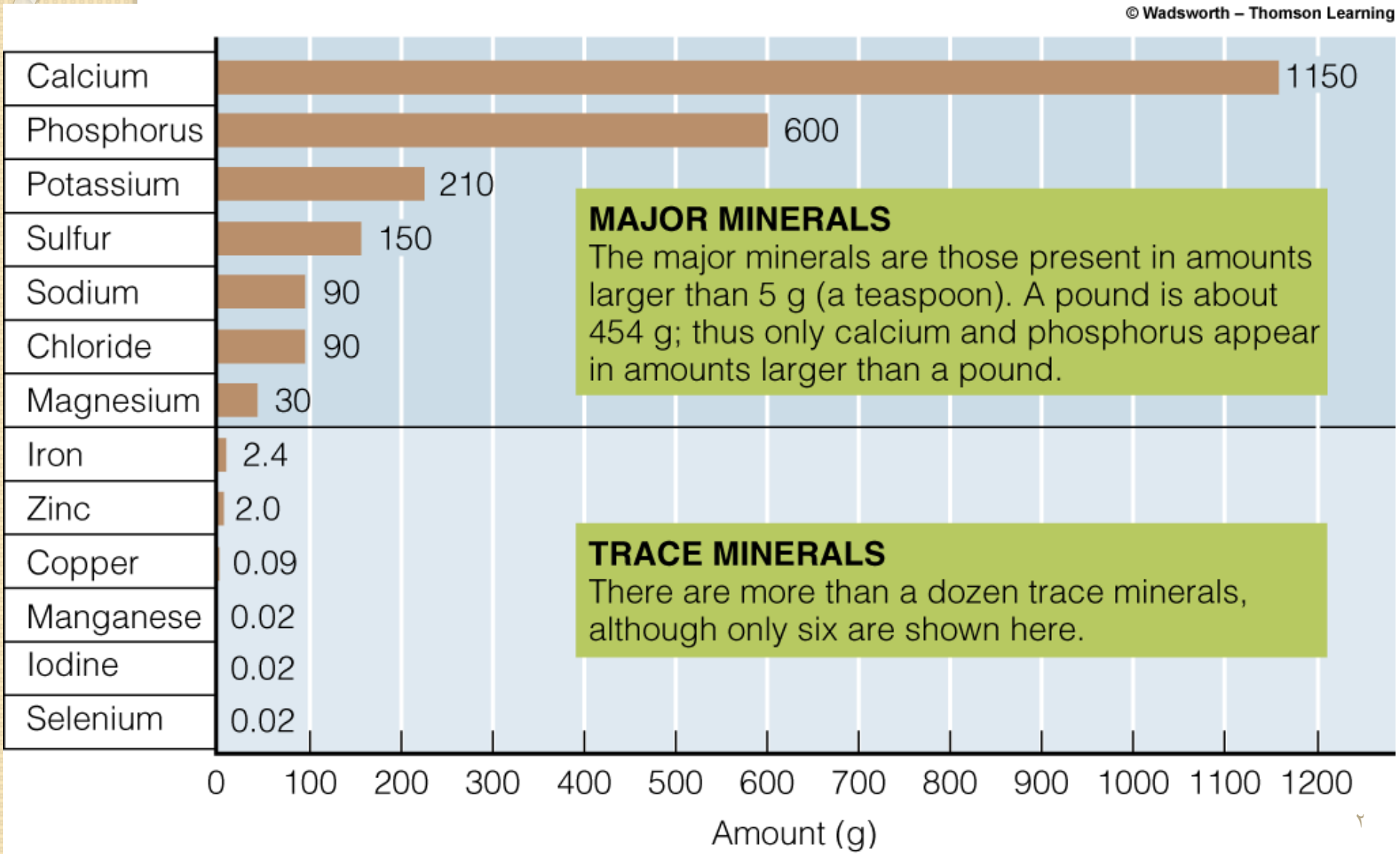
الجمهوريـــة اليمنيـة
جـــامعـــة 21 سبتمبر للعلوم
الطبية والتطبيقية

General Nutrition

L7: Minerals 1

Dr. Samah Al-Sufi

The Minerals - An Overview



1- Major minerals

- Major minerals: essential mineral nutrients found un human body in amounts larger than 5 g; sometimes called macronutrients
- The main major minerals are:

* Sodium
* Chloride
* Potassium
* Calcium
* Phosphorus
* Magnesium
* Sulfate

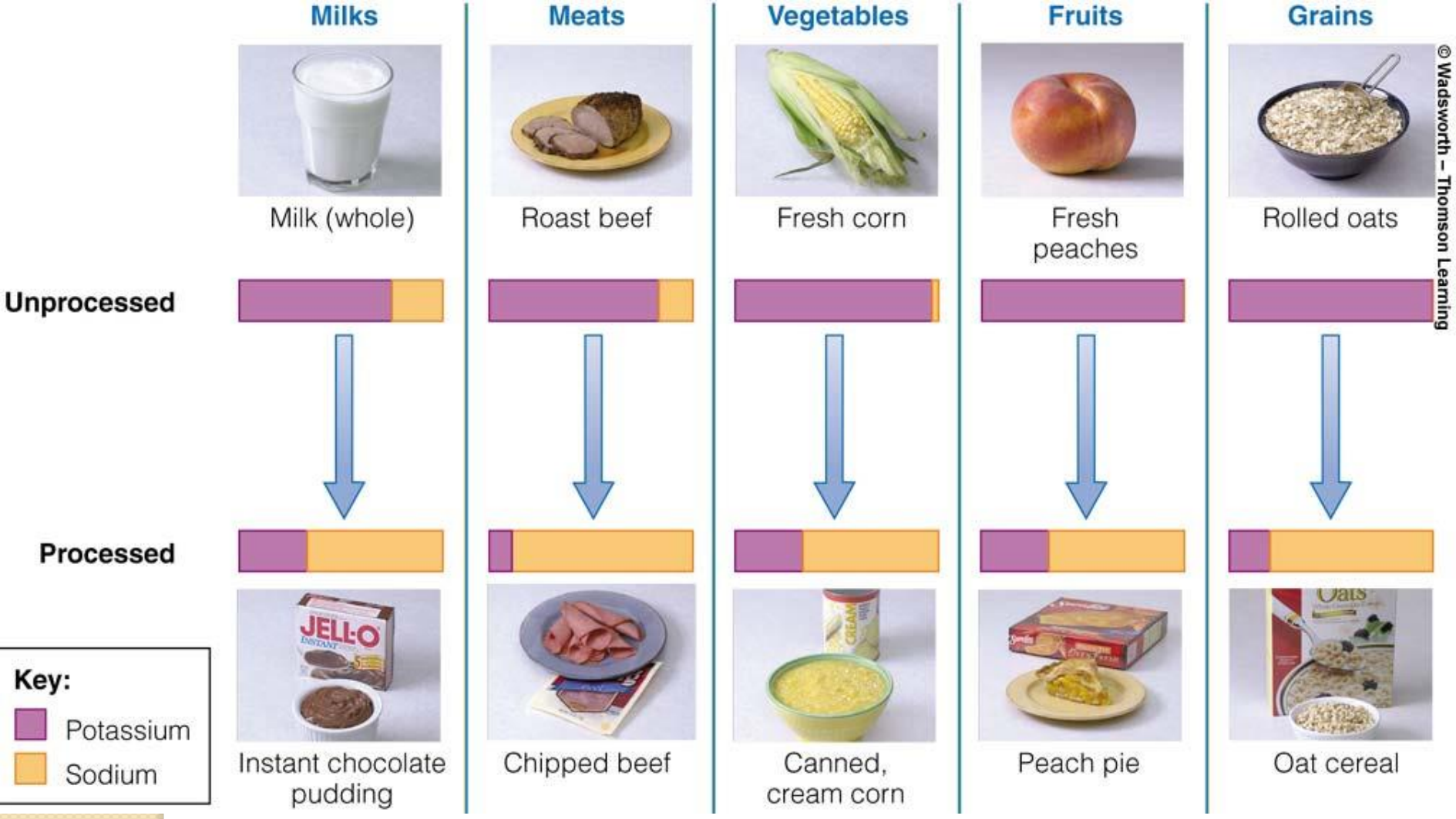
1- Sodium

- Roles in the body
  - Principal cation in the extracellular fluids of the body
  - AI for Na+ is 1500 mg/day
  - Upper intake is 2300 mg/day

Sodium

- estimated minimum requirement for adults: 500 mg/day
- Chief functions in the body
  - Maintains normal fluid and electrolyte balance
  - Assists in nerve impulse transmission and muscle contraction

Sodium in Foods



Sodium

- Deficiency symptoms
  - Muscle cramps, mental apathy, loss of appetite
- Toxicity symptoms
  - Edema, acute hypertension
- Significant source
  - Table salt, soy sauce
  - Moderate amounts in meats, milks, breads, and vegetables
  - Large amounts in processed foods

Sodium Restriction

- Hypertension
  - Salt sensitivity
- Osteoporosis

2- Chloride

- Chlorine (Cl_2) vs. chloride ion (Cl^-)

- Roles in body
  - Principal extracellular anion

  - AI is 2300 mg/day
  - Upper intake is 3600 mg/day

Chloride

- estimated minimum requirement for adults: 750 mg/day
- Chief functions in the body
  - Maintains normal fluid and electrolyte balance
  - Part of hydrochloric acid found in the stomach, necessary for proper digestion

Chloride

- Deficiency symptoms
  - Do not occur under normal circumstances
- Toxicity symptom
  - Vomiting
- Significant sources
  - Table salt, soy sauce
  - Moderate amounts in meats, milks, eggs
  - Large amounts in processed foods

3- Potassium

- Principal intracellular cation
- Potassium is recommended for hypertension patients
- AI is 4600 mg/day

Potassium

- estimated minimum requirement for adults: 2000 mg/day
- Chief functions in the body
  - Maintains normal fluid and electrolyte balance
  - Facilitates many reactions
  - Supports cell integrity
  - Assists in nerve impulse transmission and muscle contractions

Potassium

- Significant sources
  - All whole foods
  - Meats, milks, fruits, vegetables, grains, legumes

Potassium

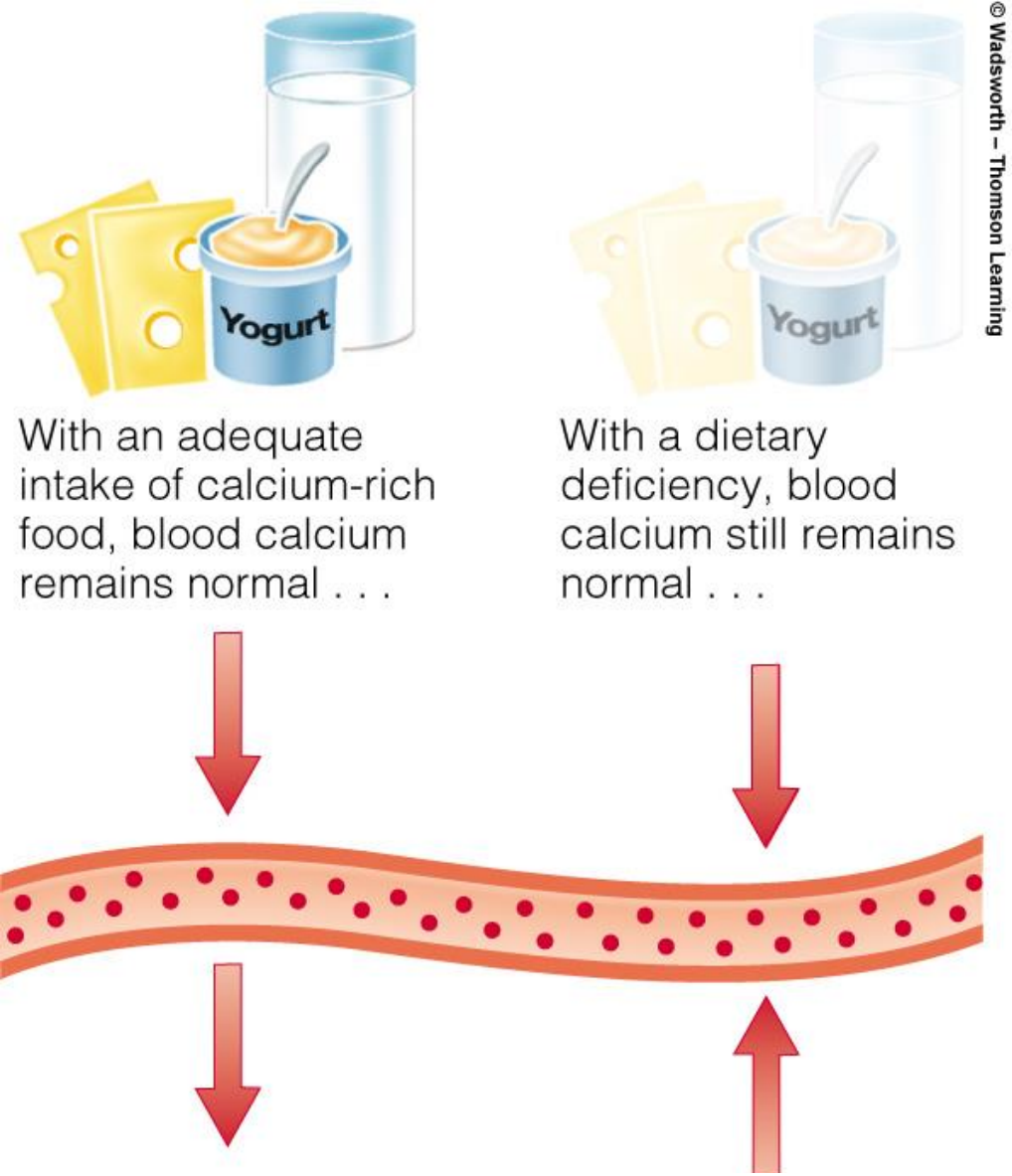
- Deficiency symptoms
  - Muscular weakness
  - Paralysis
  - Confusion

- Toxicity symptoms
  - Vomiting
  - If given into a vein, can stop the heart

4- Calcium

- Calcium is the most abundant mineral in the body; found primarily in the body's bones and teeth

Calcium


Yogurt
Yogurt
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With an adequate intake of calcium-rich food, blood calcium remains normal . . .
With a dietary deficiency, blood calcium still remains normal . . .
. . . and bones deposit calcium. The result is strong, dense bones.
. . . because bones give up calcium to the blood. The result is weak, osteoporotic bones.

Calcium

- adequate intake (AI)
  - Adults 19-50 years: 100 mg/day
  - Adults 51 and older: 1200 mg/day
- Upper level for adults: 2500 mg/day

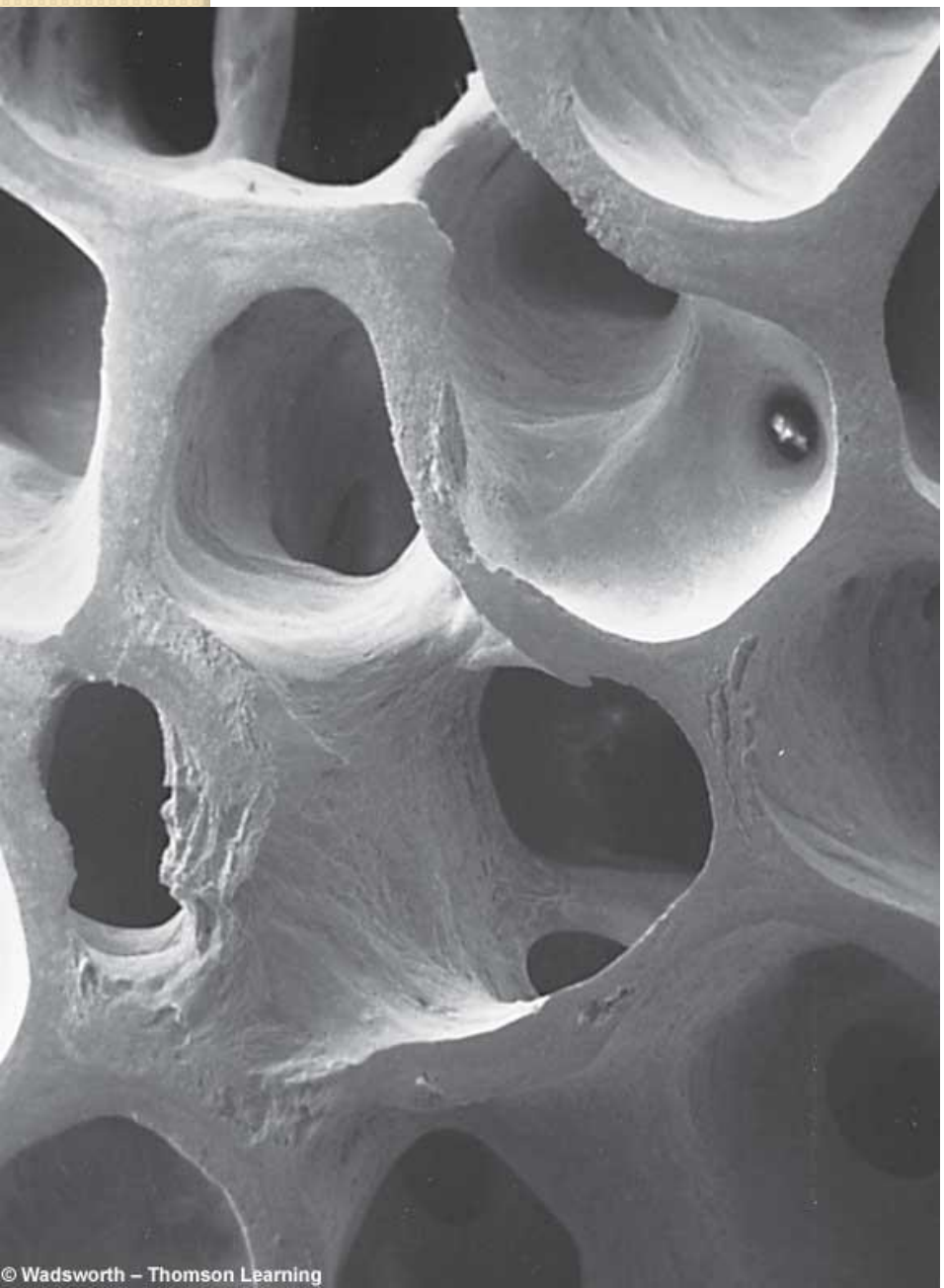
Calcium

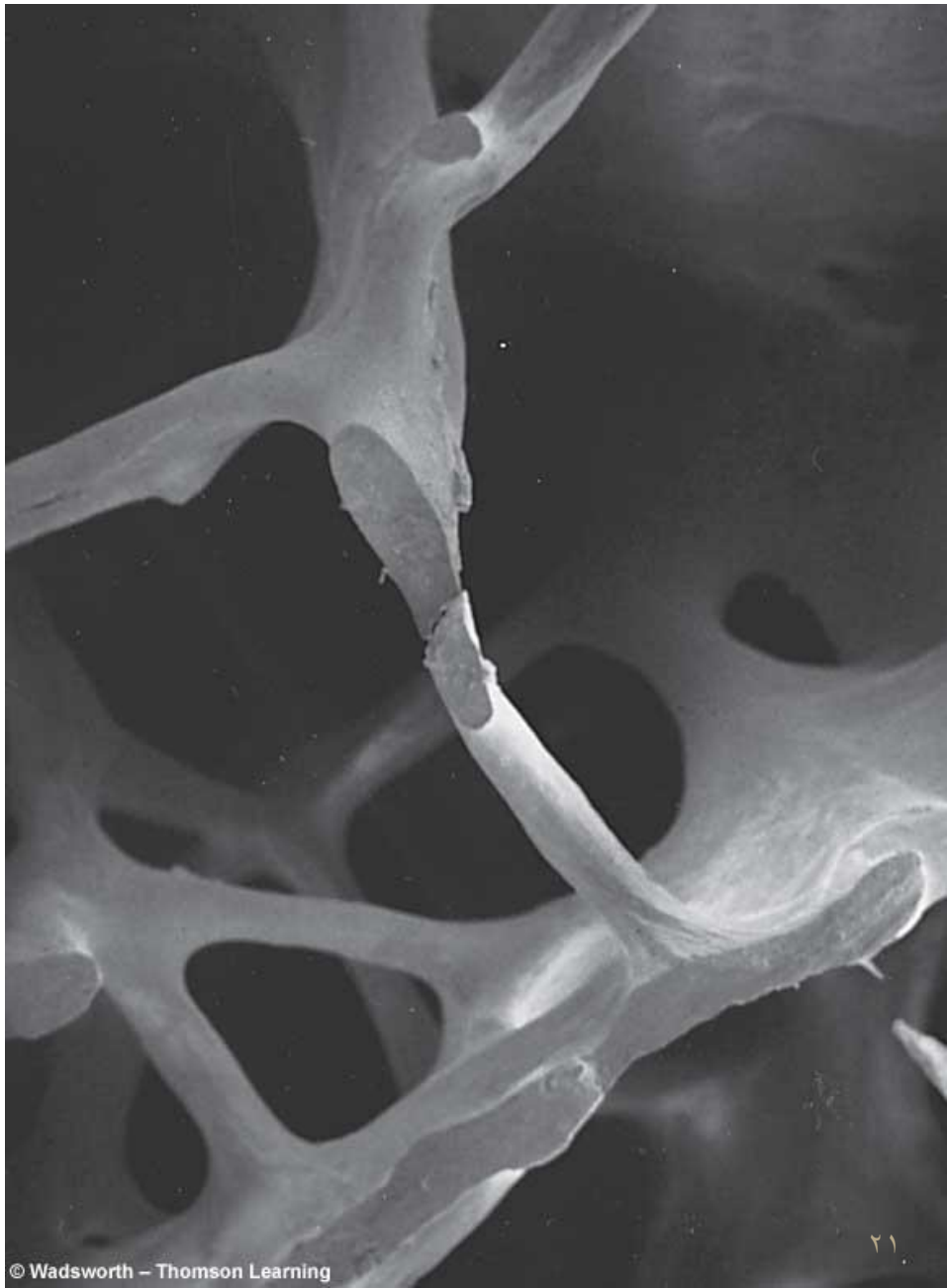
- Chief functions in the body
  - Mineralization of bones and teeth
  - Involved in muscle contraction and relaxation, nerve functioning, blood clotting
  - Blood pressure, immune defenses

Calcium

- Deficiency symptoms
  - Stunted growth in children
  - Bone loss (osteoporosis) in adults

Healthy vs. osteoporotic trabecular bone



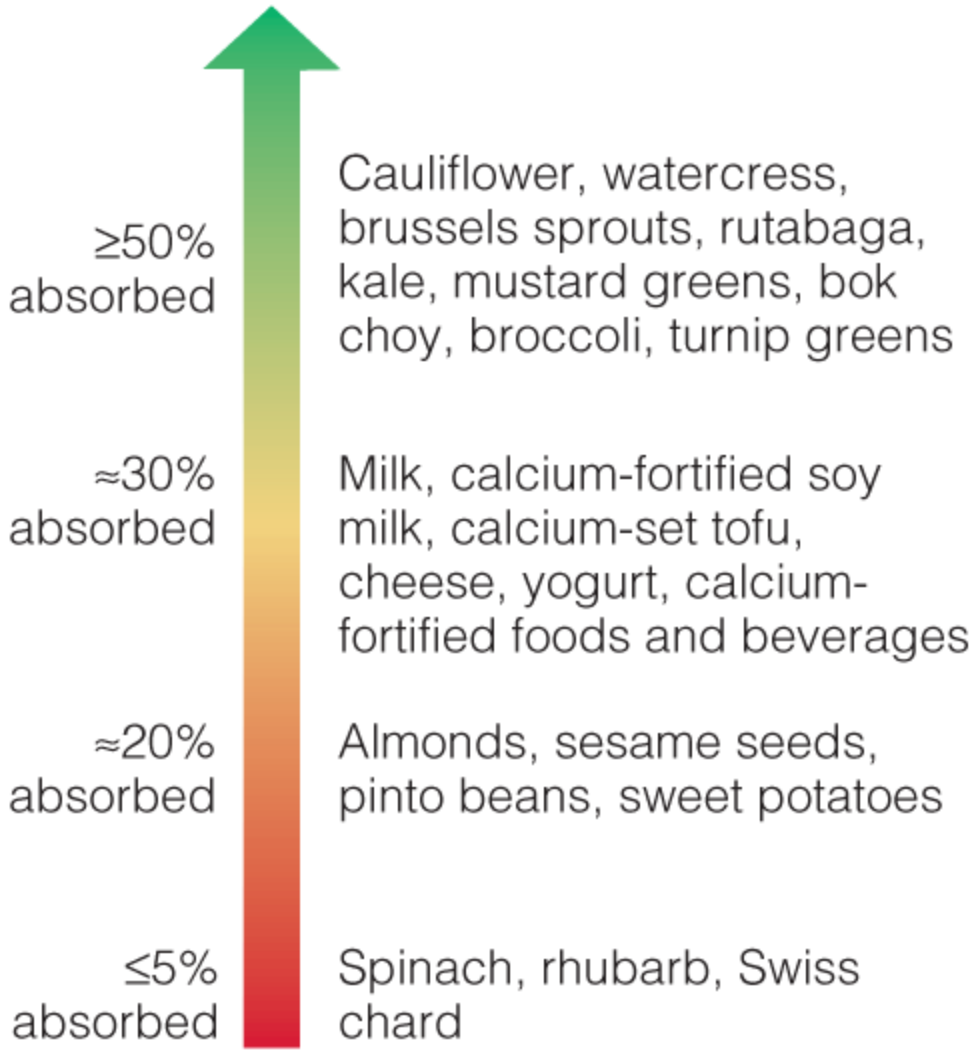


Calcium

- Toxicity symptoms
  - Constipation
  - Increased risk of urinary stone formation and kidney dysfunction
  - Interference with absorption of other minerals mainly iron

Calcium:

Bioavailability of Calcium from Selected Foods



- Significant sources
  - Milk and milk products
  - Small fish (with bones)
  - Tofu (bean curd), greens (broccoli, chard), legumes

Calcium

- Calcium bioavailability is reduced by binders.

  - Binders: chemical compunds in foods that combine with nutrients (minerals) to form complexs the body cannot absorb. Such as:
    - Phytates: in whole grains
    - Oxalates: in spanich

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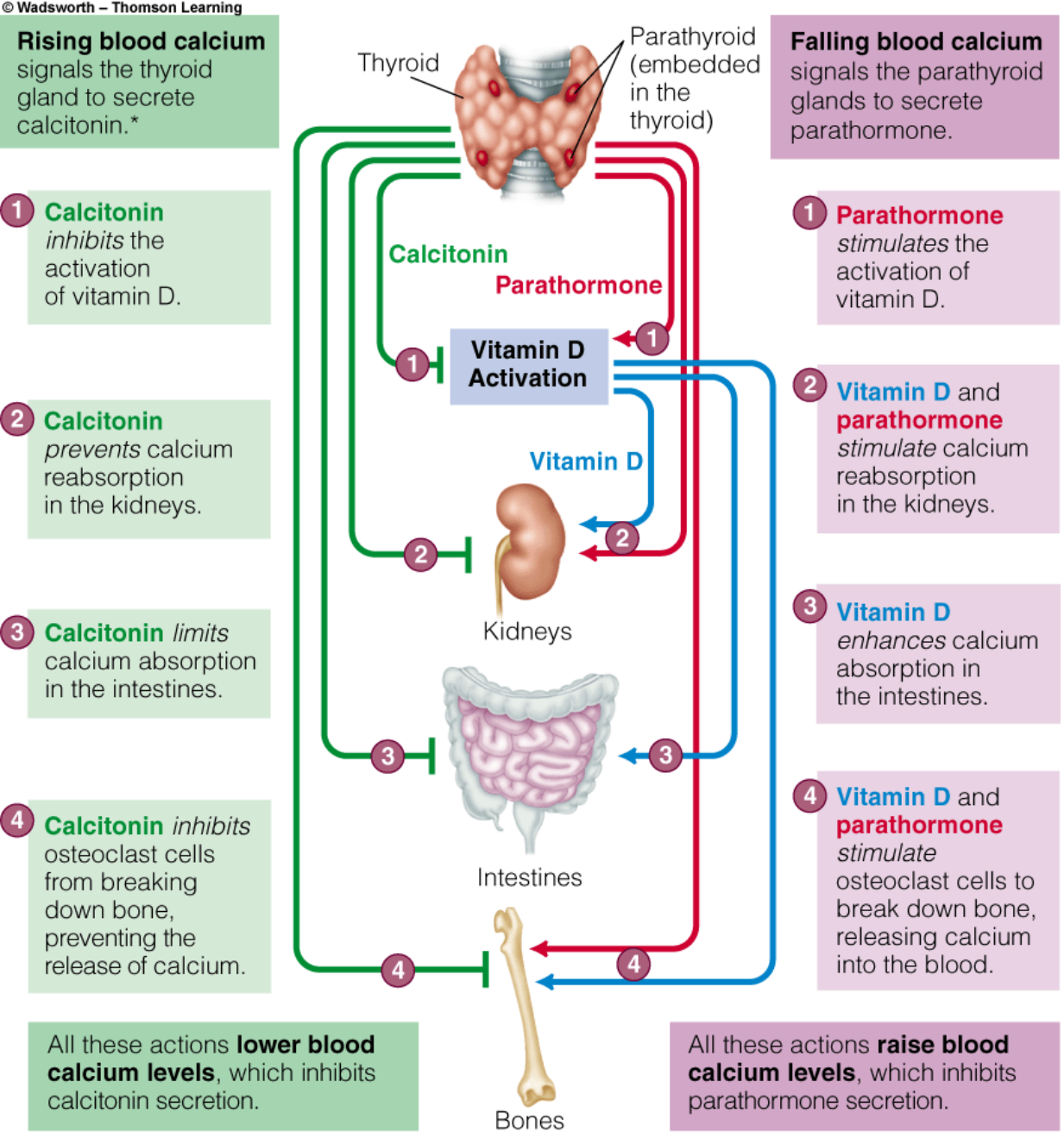
Calcium-Balance



*Calcitonin plays a major role in defending infants and young children against the dangers of rising blood calcium that can occur when regular feedings of milk deliver large quanities of calcium to a small body. In contrast, calcitonin plays a relatively minor role in adults because their absorption of calcium is less efficient and their bodies are larger, making elevated blood calcium unlikely.

5- Phosphorus

- RDA for adults: 700 mg/day
- Upper level for adults (19-70 years): 4000 mg/day
- Chief functions in the body
  - Mineralization of bones and teeth
  - Part of every cell
  - Important in genetic material, part of phospholipids

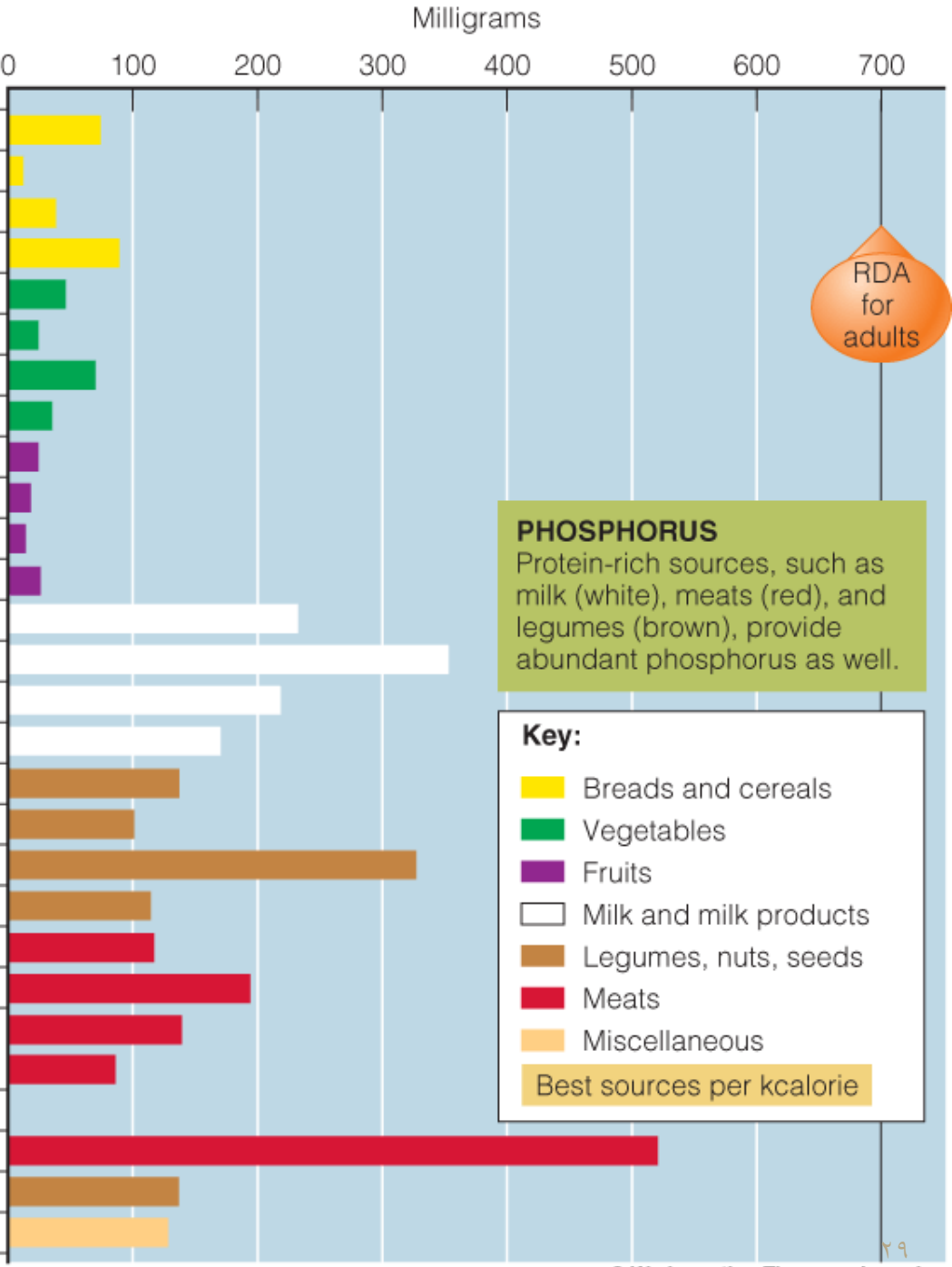
Phosphorus

- Chief functions in the body (continued)
  - Used in energy transfer and in buffer systems that maintain acid-base balance
- Deficiency symptoms
  - Muscular weakness, bone pain

Phosphorus

- Toxicity symptoms
  - Calcification of nonskeletal tissues, particularly the kidneys
- Significant sources
  - All animal tissues (meat, fish, poultry, eggs, milk)

Food	Serving size (kcalories)
Bread, whole wheat	1 oz slice (70 kcal)
Cornflakes, fortified	1 oz (110 kcal)
Spaghetti pasta	½ c cooked (99 kcal)
Tortilla, flour	1 10"-round (234 kcal)
Broccoli	½ c cooked (22 kcal)
Carrots	½ c shredded raw (24 kcal)
Potato	1 medium baked w/skin (133 kcal)
Tomato juice	¾ c (31 kcal)
Banana	1 medium raw (109 kcal)
Orange	1 medium raw (62 kcal)
Strawberries	½ c fresh (22 kcal)
Watermelon	1 slice (92 kcal)
Milk	1 c reduced-fat 2% (121 kcal)
Yogurt, plain	1 c low-fat (155 kcal)
Cheddar cheese	1½ oz (171 kcal)
Cottage cheese	½ c low-fat 2% (101 kcal)
Pinto beans	½ c cooked (117 kcal)
Peanut butter	2 tbs (188 kcal)
Sunflower seeds	1 oz dry (165 kcal)
Tofu (soybean curd)	½ c (76 kcal)
Ground beef, lean	3 oz broiled (244 kcal)
Chicken breast	3 oz roasted (140 kcal)
Tuna, canned in water	3 oz (99 kcal)
Egg	1 hard cooked (78 kcal)
Excellent, and sometimes unusual, sources:	
Liver	3 oz (184 kcal)
Almonds	1 oz (165 kcal)
Candy bar	2.2 oz (278 kcal)



NOTE: See p. 327 for more information on using this figure.

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6- Magnesium

- RDA
  - Men (19-30 years): 400 mg/day
  - Women (19-30 years): 310 mg/day
- Upper level for adults: 350 mg nonfood magnesium/day
- Chief functions in the body
  - Bone mineralization, building of protein, enzyme action, normal muscle contraction, nerve impulse transmission, maintenance of teeth, and functioning of immune system

Magnesium

- Deficiency symptoms
  - Weakness
  - Confusion
  - If extreme, convulsions, bizarre muscle movements (especially of eye and face muscles), hallucinations, and difficulty in swallowing
  - In children, growth failure

Magnesium

- Toxicity symptoms
  - Diarrhea, alkalosis, dehydration
- Significant sources
  - Nuts, legumes
  - Whole grains
  - Dark green vegetables
  - Seafood
  - Chocolate, cocoa

Food	Serving size (kcalories)
Bread, whole wheat	1 oz slice (70 kcal)
Cornflakes, fortified	1 oz (110 kcal)
Spaghetti pasta	½ c cooked (99 kcal)
Tortilla, flour	1 10"-round (234 kcal)
Broccoli	½ c cooked (22 kcal)
Carrots	½ c shredded raw (24 kcal)
Potato	1 medium baked w/skin (133 kcal)
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Milk	1 c reduced-fat 2% (121 kcal)
Yogurt, plain	1 c low-fat (155 kcal)
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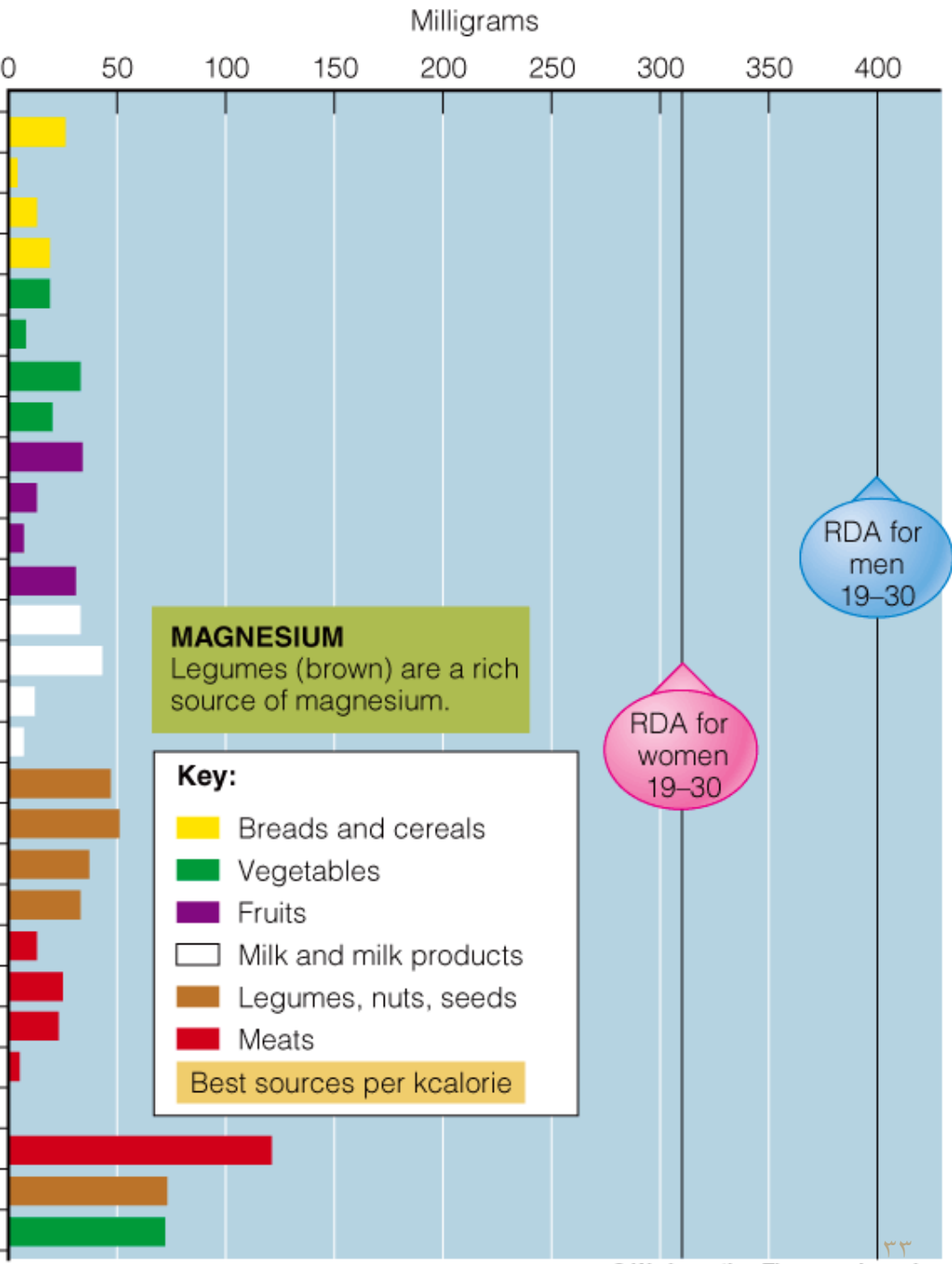
Peanut butter	2 tbs (188 kcal)
Sunflower seeds	1 oz dry (165 kcal)
Tofu (soybean curd)	½ c (76 kcal)
Ground beef, lean	3 oz broiled (244 kcal)
Chicken breast	3 oz roasted (140 kcal)
Tuna, canned in water	3 oz (99 kcal)
Egg	1 hard cooked (78 kcal)
Excellent, and sometimes unusual, sources:	
Halibut	3 oz baked (199 kcal)
Cashews	1 oz (161 kcal)
Artichoke	1 (60 kcal)

NOTE: See p. 327 for more information on using this figure.



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