REPUBLIC OF YEMEN
21September UMAS

الجمهوريـــة اليمنيـة
جـــامعـــة 21 سبتمبر للعلوم الطبية والتطبيقية

General Nutrition

L7: Minerals 2

Dr. Samah Al-Sufi

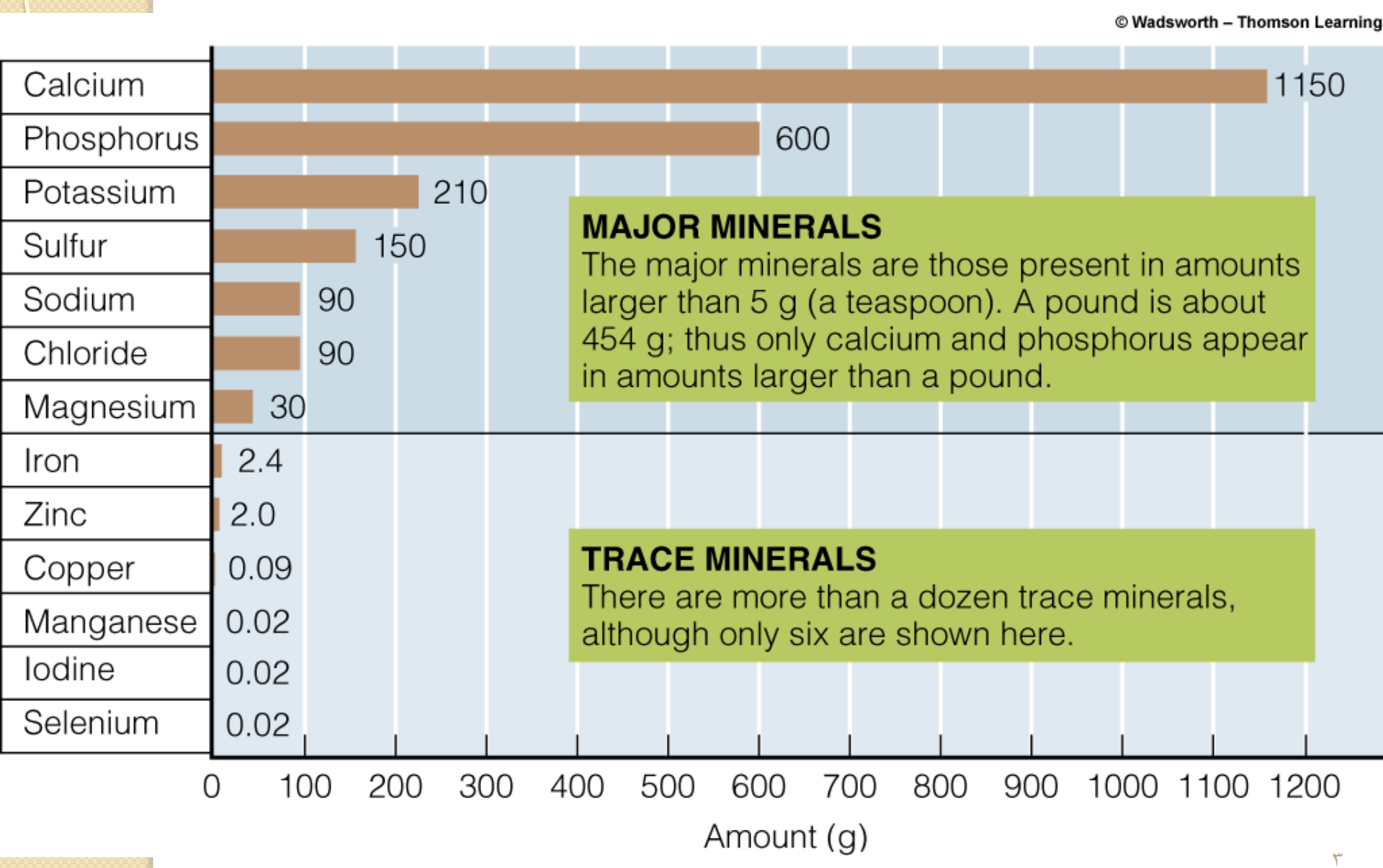
2- Trace minerals

- Trace minerals: essential mineral nutrients found in the human body in amounts smaller than 5 g; sometimes called micronutrients.

- The main trace minerals are:

* Iron * Selenium * Fluoride
* Zinc * Copper * Chromium
* Iodine * Manganese * Molybdenum

The Trace Minerals



I- Iron

- RDA
  - Men: 8 mg/day
  - Women (19-50 years): 18 mg/day
  - Women (51+ years): 8 mg/day
- Upper level for adults: 45 mg/day

Iron

- Chief functions in the body
  - Part of the protein hemoglobin, which carries oxygen in the blood
  - Part of the protein myoglobin in muscles, which makes oxygen available for muscle contraction
  - Necessary for the utilization of energy as part of the cells' metabolic machinery

Iron

- Significant sources
  - Red meats, fish, poultry, shellfish, eggs
  - Legumes, dried fruits

Iron

- Deficiency symptoms
  - Anemia: weakness, fatigue, headaches
  - Impaired work performance and cognitive function
  - Impaired immunity
  - Inability to regulate body temperature

Iron

- Toxicity symptoms
  - GI distress
  - Iron overload: infections, fatigue, joint pain, skin pigmentation, organ damage

Iron

- Factors enhance iron absorption
  - Vitamin C
  - Citric acid from foods
  - Lactic acid from foods
  - HCl from stomach
  - Sugars

Iron

- Factors inhibit iron absorption
  - Phytates
  - Fibers
  - Oxalates
  - Calcium
  - Phosphorus
  - Tannic acid

Iron

- High risk for iron deficiency
  - Women in their reproductive years
  - pregnant women
  - Infants and young children
  - Teenagers

2- Zinc

- RDA
  - Men: 11 mg/day
  - Women: 8 mg/day
- Upper level for adults: 40 mg/day

Zinc

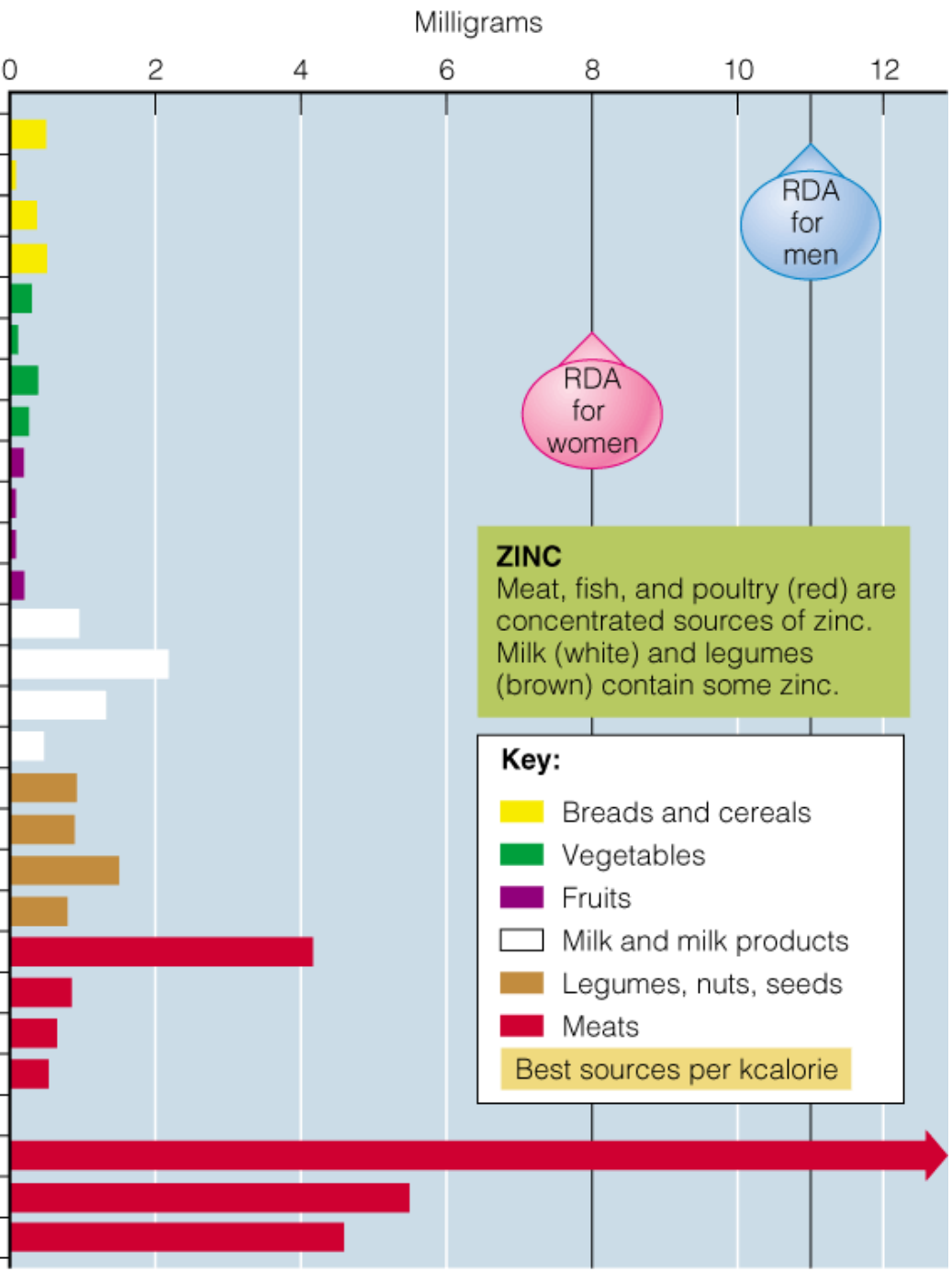
Chief functions in the body

- Part of many enzymes
- Associated with the hormone insulin
- Involved in making genetic material and proteins, immune reactions, transport of vitamin A, taste perception, wound healing, the making of sperm, and the normal development of the fetus

Zinc

- Significant sources
  - Protein-containing foods
  - Red meats, shellfish
  - Whole grains

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:	
Oysters	3 oz cooked (139 kcal)
Sirloin steak, lean	3 oz broiled (172 kcal)
Crab	3 oz cooked (94 kcal)



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

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Zinc

- Deficiency symptoms
  - Growth retardation (dwarfism) , delayed sexual maturation, impaired immune function, hair loss, eye and skin lesions.
- Toxicity symptoms
  - Loss of appetite, impaired immunity, low HDL, copper and iron deficiencies

3- Iodine

- RDA for adults: 150 μg/day
- Upper level: 1100 μg/day
- Chief functions in the body
  - A component of two thyroid hormones that help to regulate growth, development, mental, and metabolic rate

Iodine

- Significant sources
  - Iodized salt, seafood, bread, dairy products, plants grown in iodine-rich soil and animals fed those plants
- Deficiency disease
  - Simple goiter
  - Cretinism: mental and physical retardation in infants

4- Selenium

- RDA for adults: 55 μg/day
- Upper level for adults: 400 μg/day
- Chief functions in the body
  - Defends against oxidation (antioxidant)
  - Regulates thyroid hormone
- Significant sources
  - Seafood, meat
  - Whole grains, vegetables (depending on soil content)

Selenium

- Deficiency symptoms
  - Predisposition to heart disease characterized by cardiac tissue becoming fibrous (Keshan disease)
- Toxicity symptoms
  - Loss and brittleness of hair and nails
  - Skin rash, fatigue, irritability, and nervous system disorders
  - Garlic breath odor

5- Copper

- RDA for adults: 900 μg/day
- Upper level for adults: 10,000 μg/day (10 mg/day)
- Chief functions in the body
  - Necessary for absorption and use of iron in the formation of hemoglobin
  - Part of several enzymes

Copper

- Significant sources
  - Seafood
  - Nuts, whole grains, seeds, legumes
- Deficiency symptoms
  - Anemia, bone abnormalities
- Toxicity symptoms
  - Liver damage

6- Manganese

- AI
  - Men: 2.3 mg/day
  - Women: 1.8 mg/day
- Upper level for adults: 11 mg/day
- Chief functions in the body
  - Cofactor for several enzymes

Manganese

- Significant sources
  - Nuts, whole grains, leafy vegetables, tea
- Deficiency symptoms
  - Rare
- Toxicity symptoms
  - Nervous system disorders

7- Fluoride

- AI
  - Men: 3.8 mg/day
  - Women: 3.1 mg/day
- Upper level for adults: 10 mg/day
- Chief functions in the body
  - Involved in the formation of bones and teeth
  - Helps to make teeth resistant to decay

Fluoride

- Significant sources
  - Drinking water (if fluoride containing or fluoridated)
  - Tea, seafood
- Deficiency symptoms
  - Susceptibility to tooth decay
- Toxicity symptoms
  - Fluorosis (pitting and discoloration of teeth)

8- Chromium

- AI
  - Men: 35 μg/day
  - Women: 25 μg/day
- Chief functions in the body
  - Enhances insulin action
- Significant sources
  - Meats (especially liver)
  - Whole grains, brewer's yeast

Chromium

- Deficiency symptoms
  - Diabetes-like condition
- Toxicity symptoms
  - None reported

9- Molybdenum

- AI for adults: 45 μg/day
- Upper level for adults: 2 mg/day
- Chief functions in the body
  - Cofactor for several enzymes
- Significant sources
  - Legumes, cereals
  - Organ meats

Molybdenum

- Deficiency symptoms
  - Unknown
- Toxicity symptoms
  - None reported