

Yahoo! Presentations, my favorite part of the class!!



BI 199 Discussion 9

- I. Announcements** Presentations tonight & next Mon.
Comments on drafts? **Final paper (hardcopy) due in Pat's box Main Biology Office (77 Klamath) prior to 5 pm on Friday, December 4th. Q?**
- II. Presentations**
- III. Overview of Vitamins, Minerals & Water** Sizer & Whitney
ch 7 & 8

Monday, November 23, 2015

Nutrition & Pathology

Matt Harvison, *Saturated fat & CVDs*

Kaley Vatalaro, *Plant-based diet & cancer risk*

Mikayla Watson, *Type II diabetes & nutrition*

Hannah Brody, *Dairy-free diet: pros & cons*

Katherine Savin, *Dairy-free diet & weight loss?*

Dani Torrey, *Gluten-free: fad or fact?*

Samantha Haehlens, *Eating disorders in adolescents*

Sports Physiology & Fluid Replacement

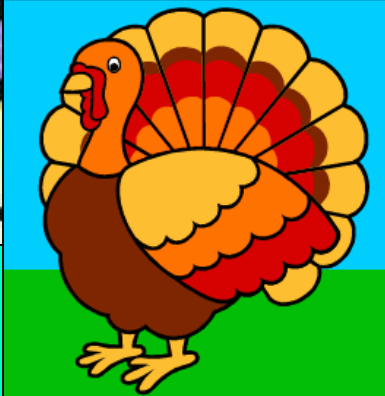
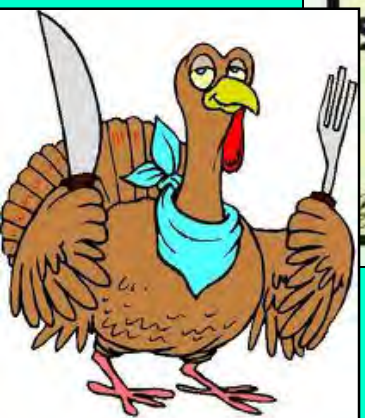
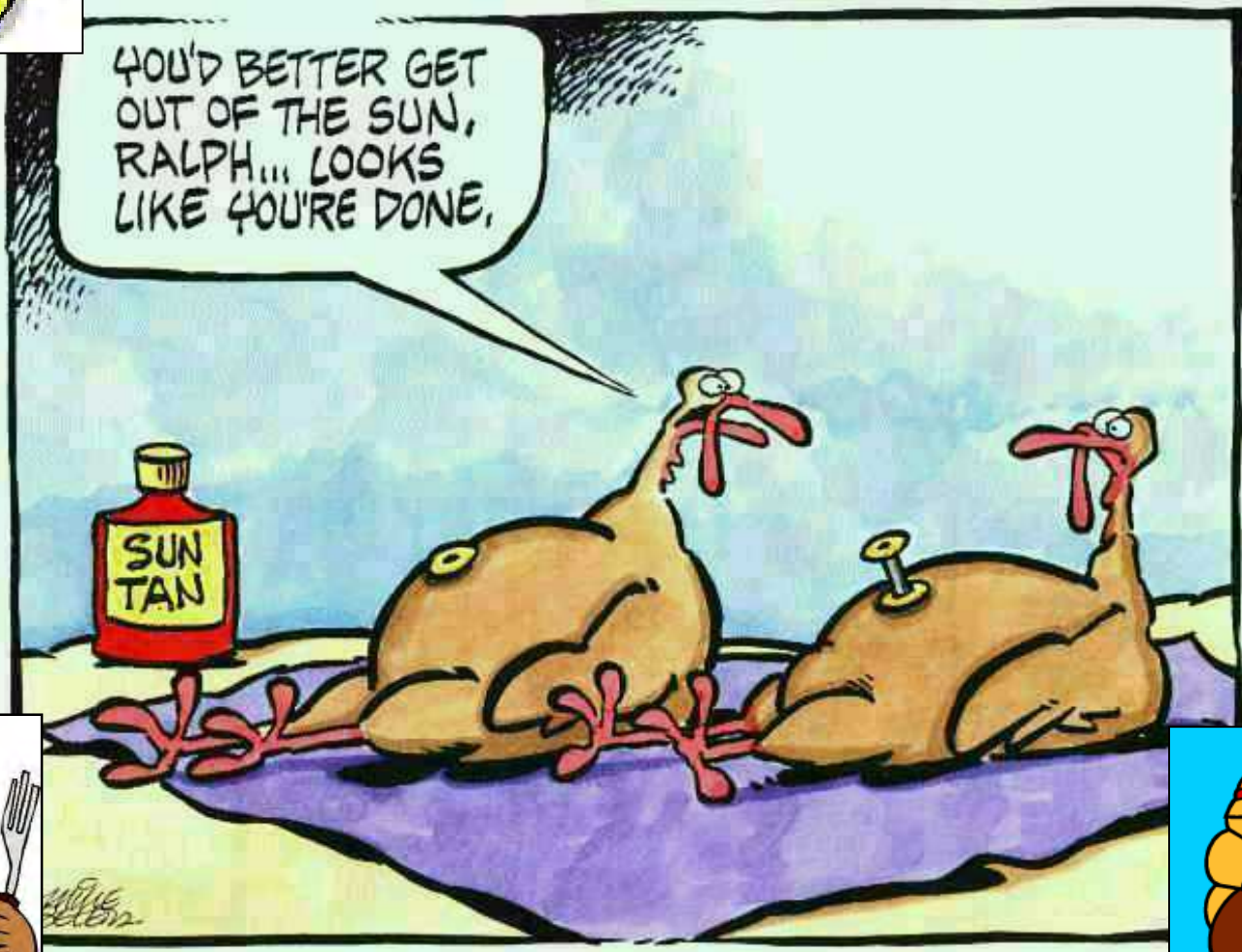
Dominique Chapman, *Female athlete triad*

Ryan Sindal, *Best replacement: water or sports drinks?*





Be safe in travel! Peace!
Have a Happy Turkey Day!!!



Vitamins: Essential, Noncaloric, Organic Nutrients

Fat-Soluble

Vitamin A

Vitamin D

Vitamin E

Vitamin K



Water-Soluble

B vitamins

Thiamin (B₁)

Riboflavin (B₂)

Niacin (B₃)

Folate (Folacin, Folic Acid)

Vitamin B₁₂

Vitamin B₆

Pantothenic Acid

Biotin

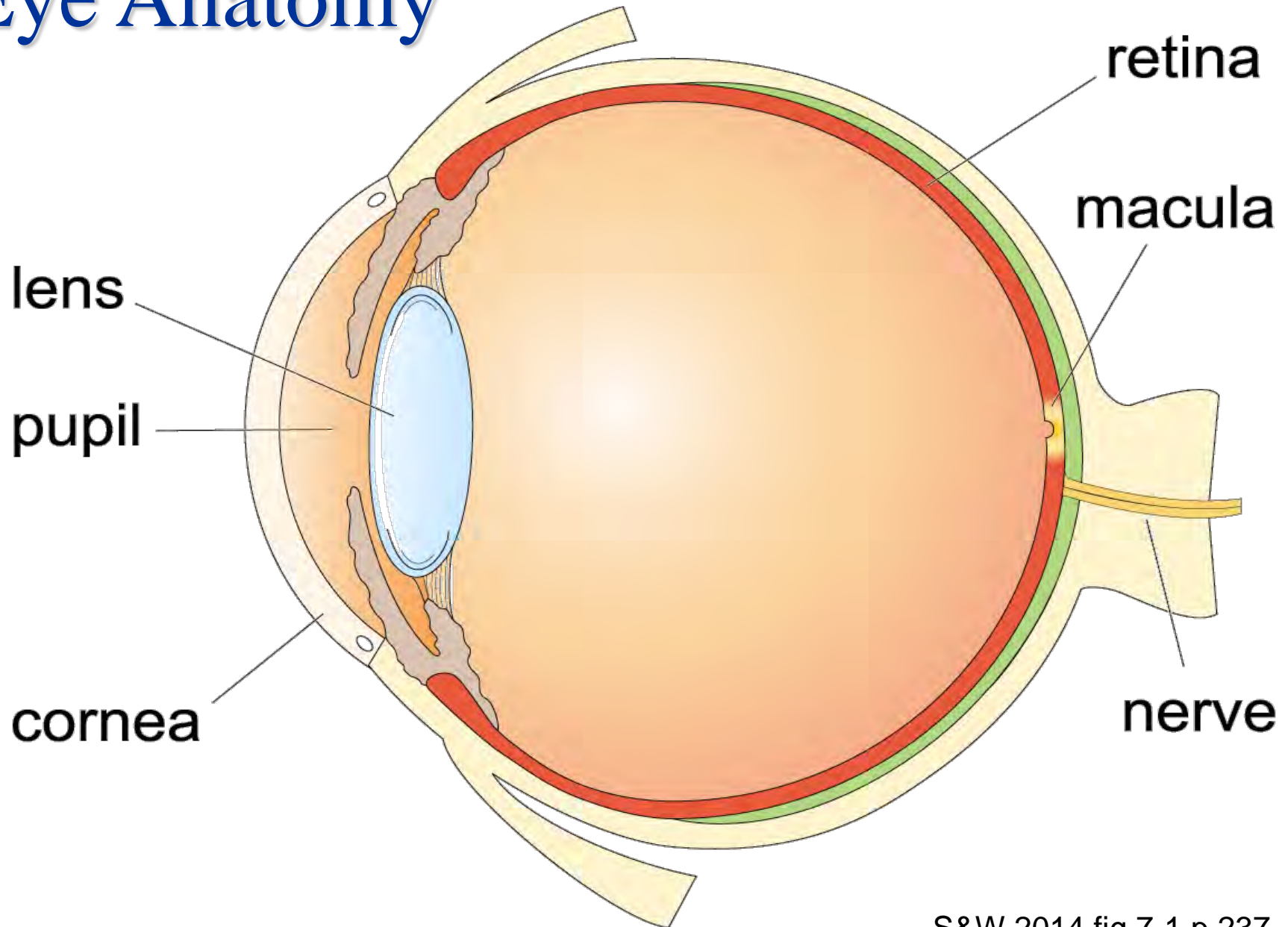
Vitamin C (Ascorbic Acid)



Fat-Soluble vs. **Water-Soluble** Characteristics

<u>Characteristic</u>	<u>Fat-Soluble</u>	<u>Water-Soluble</u>
Absorption	Lymphatics	Blood vessels
Transport	Protein carriers	Dissolve in H₂O
Storage	Liver or fatty tissues	Most not stored
Toxicity	Rarely from foods, likely from supplements	Unlikely, but possible from high doses of supplements
Requirements	Periodic doses ~weeks or months Body can draw from stores	Frequent doses ~1-3 days No storage to rely upon

Eye Anatomy



Night blindness implies Vitamin A deficiency



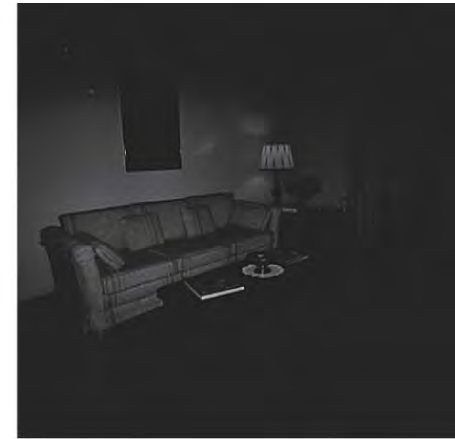
In dim light, you can make out the details in this room.



A flash of bright light momentarily blinds you as the pigment in the retina is bleached.



You quickly recover and can see the details again in a few seconds.



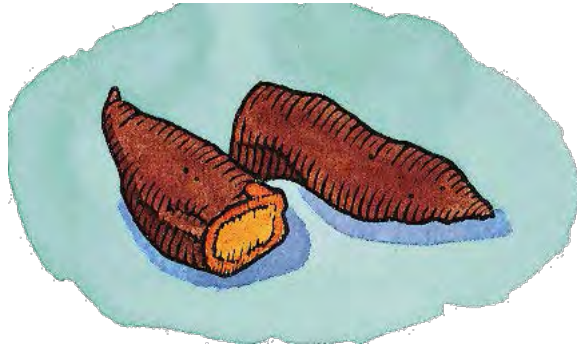
With inadequate vitamin A, you do not recover but remain blind for many seconds; this is night blindness.

The image is a high-magnification micrograph of skin tissue. The left side shows a thick, disorganized layer of keratinized cells (hyperkeratosis) with many small, dark, clotted keratin masses (follicular plugging) within the hair follicles. The right side shows the underlying epidermal and dermal layers, which appear relatively normal but are partially obscured by the thickened surface layer.

***Skin & Severe
Vitamin A
Deficiency***

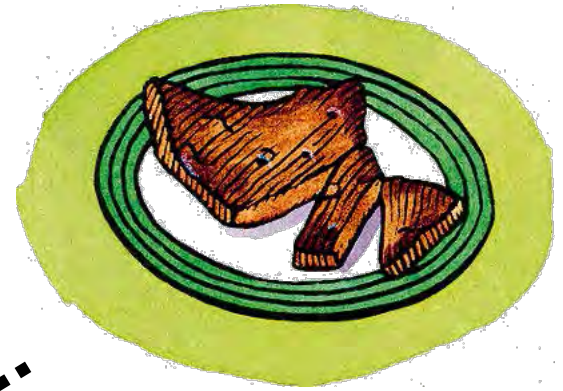
Vitamin A & Beta Carotene

107% DRI



Sweet Potato

732% DRI !

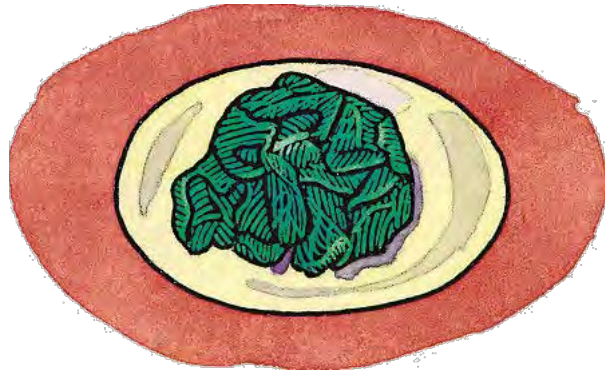


Beef Liver

75% DRI



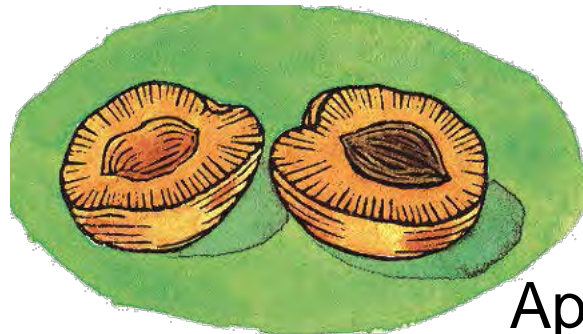
Carrots



Spinach



Milk



Apricots

TABLE 7-2 FORTIFICATION SOURCES OF VITAMIN A

Vitamin A from highly fortified foods and other rich sources can add up. The UL for Vitamin A is 3,000 μg per day.

High-potency vitamin pill	3,000 μg
Calf's liver, 1 oz. cooked	2,300 μg
Regular multivitamin pill	1,500 μg
Vitamin gumball, 1	1,500 μg
Chicken liver, 1 oz cooked	1,400 μg
"Complete" liquid supplement drink, 1 serving	350–1,500 μg
Instant breakfast drink, 1 serving	600–700 μg
"Diet" low-carbohydrate drink, 1 serving	500–700 μg
Cereal breakfast bar, 1	350–400 μg
"Energy" candy bar, 1	350 μg
Milk, 1 c	150 μg
Vitamin-fortified cereal, 1 serving	150 μg
Margarine, 1 tsp	55 μg

cf. S&W 2014
tab 7-3 p 232



**Excess Beta
Carotene!!**

**Rickets:
Vitamin D
deficiency
in children**



***The sunshine vitamin, D! But be careful
to avoid overexposure!***

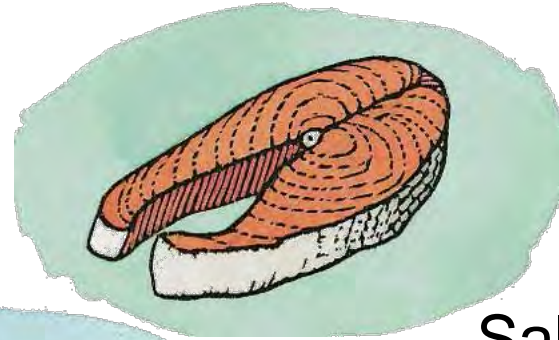


Vitamin D

10-15 min



43% DRI



Salmon

30% DRI



Shrimp

25% DRI



Milk (fortified)

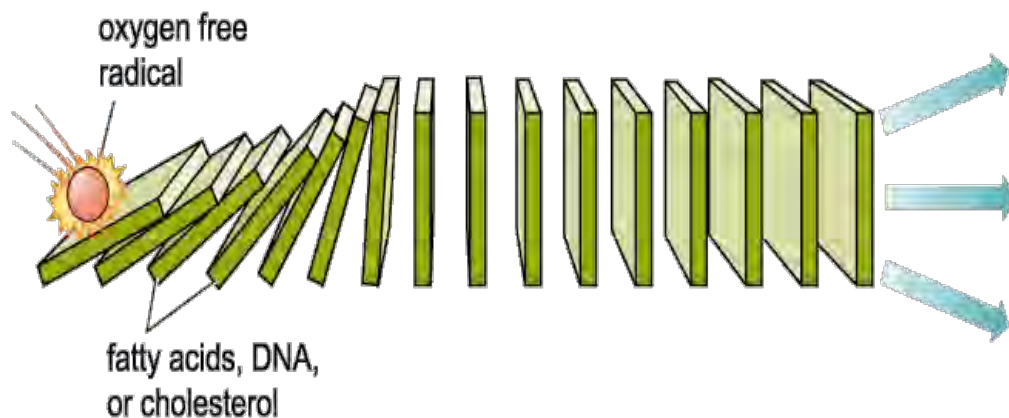
Free Radicals and Diseases

1 A chemically reactive oxygen free radical attacks fatty acid, DNA, protein, or cholesterol molecules forming other free radicals.

2 This initiates a rapid, destructive chain reaction.

3 The result is injury to tissues and the formation of more free radicals:

4 And ultimately, diseases and tissue aging:



damage to cell membrane lipids and proteins, disabling them

precancerous changes in DNA

oxidation of blood cholesterol initiating steps leading to heart disease



cancer

heart disease

macular degeneration

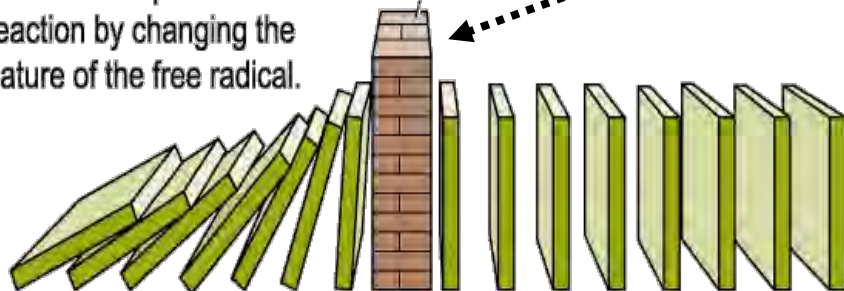
other diseases

aging

Vitamin E stops the chain reaction by changing the nature of the free radical.

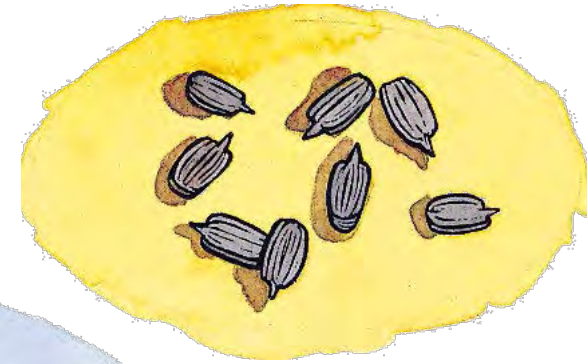
vitamin E

Anti-oxidant eg, Vitamin E



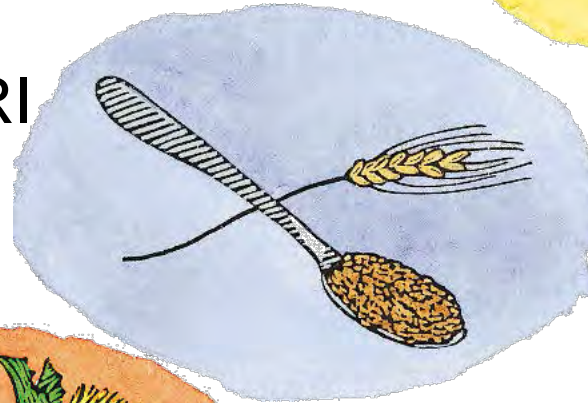
Vitamin E

60% DRI



Sunflower

40% DRI



Wheat Germ

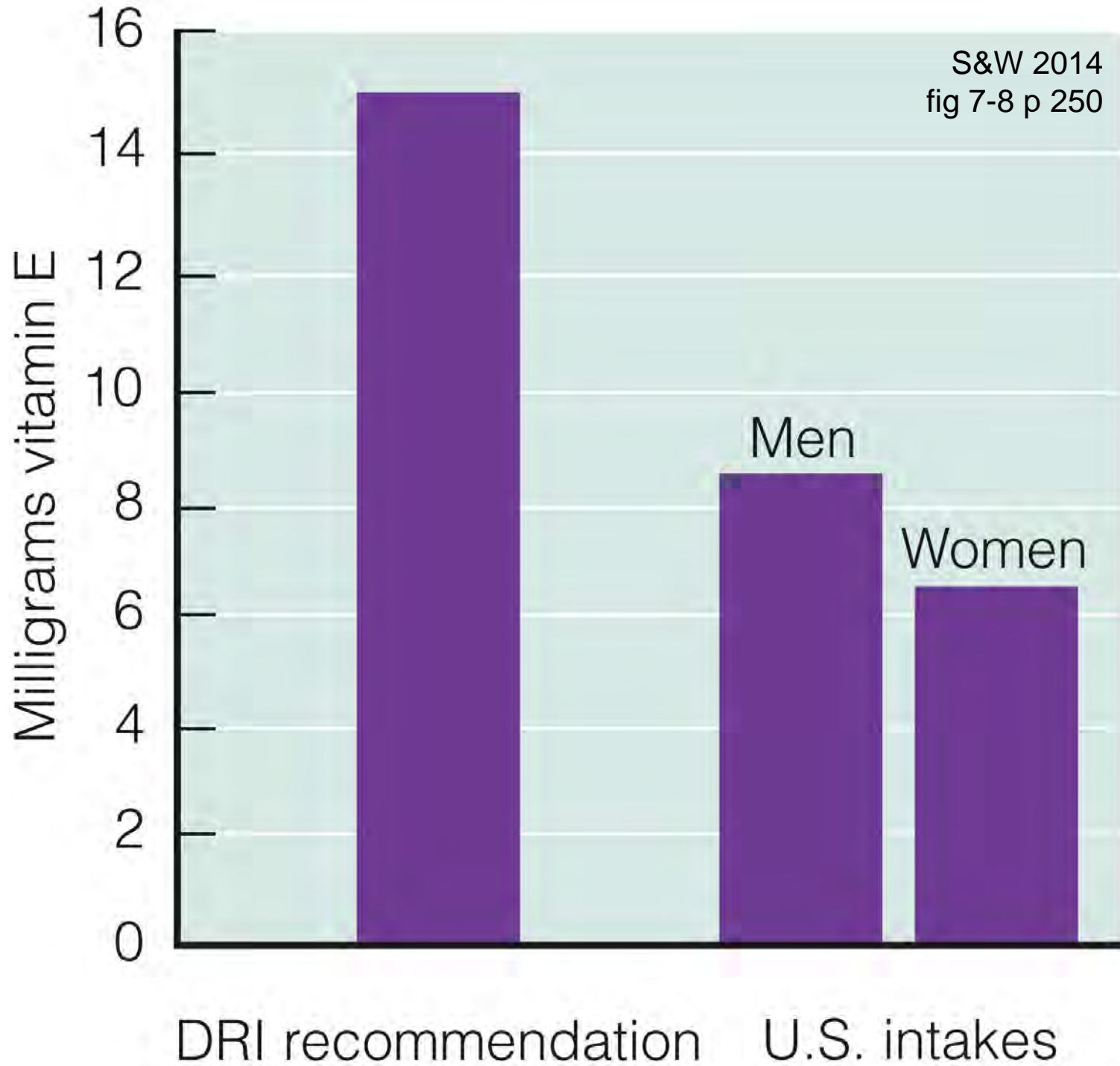
31% DRI



Safflower Oil



Canola



Raw vegetable oils contain much Vitamin E, but high temperatures destroy it!



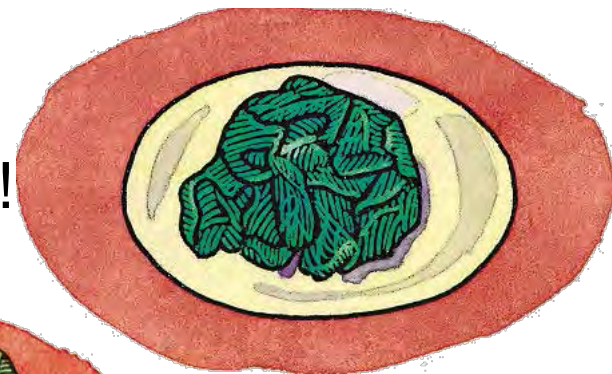
**Vitamin K
supplementation for
newborns!**



Vitamin K

S&W 2008 Snapshot 7-4 p 242

300% DRI!!!



Spinach

85% DRI



Cabbage

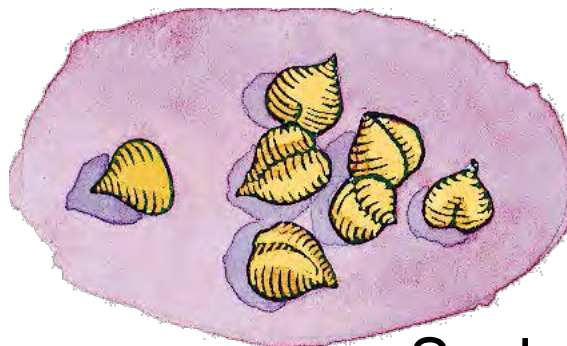
50% DRI



Lettuce



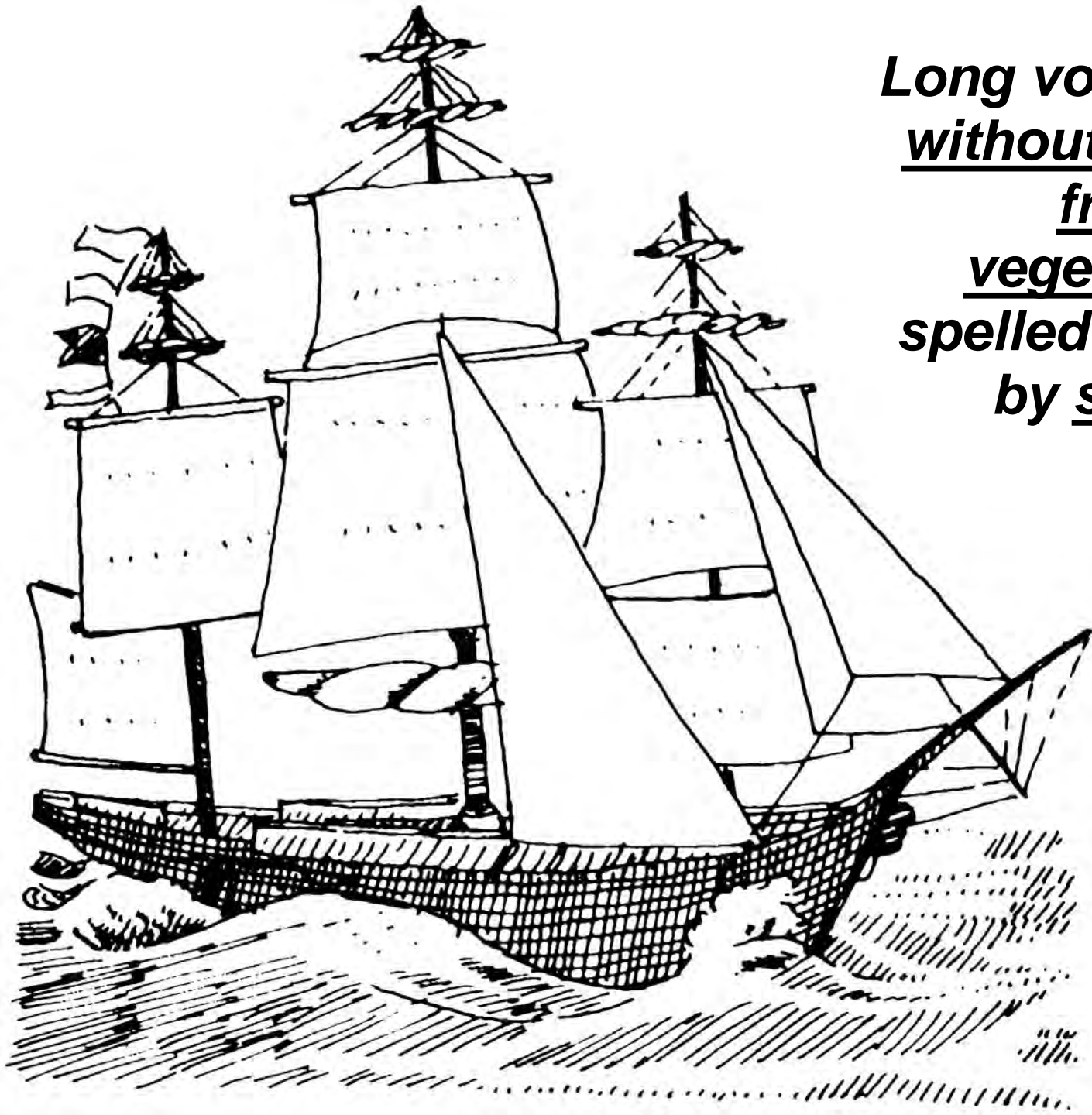
Canola



Soybeans



Cauliflower



**Long voyages
without fresh
fruits &
vegetables
spelled death
by scurvy**

One cure for scurvy!



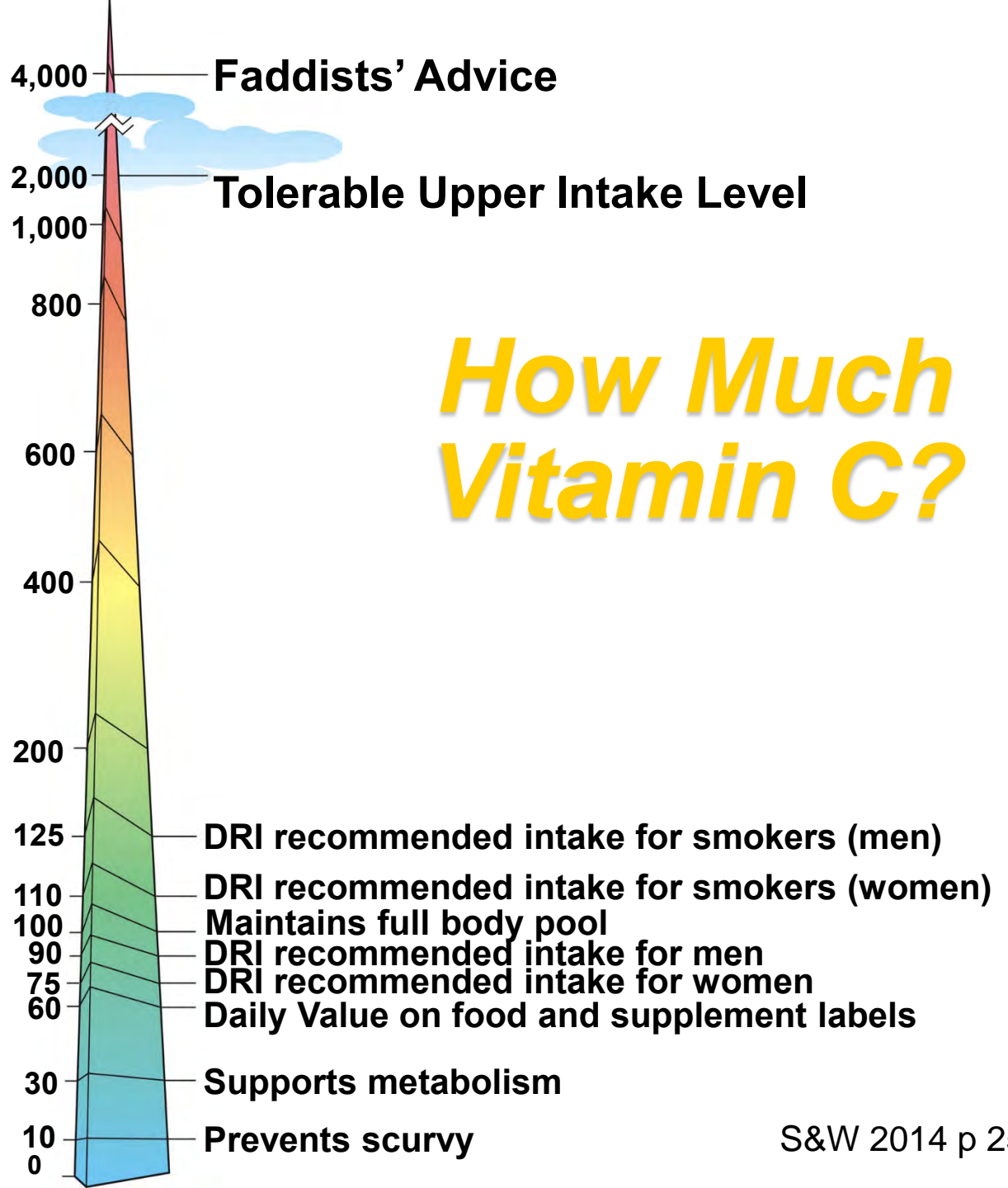




© 2006 Wadsworth - Thomson

Scurvy!!!

S&W 2014 fig 7-9a p 245



***30 trials of > 11,350 subjects
reported no relationship
between routine Vitamin C
supplementation & prevention
of the common cold***



TABLE
7-5

Minimizing Nutrient Losses

Each of these tactics saves a small percentage of the vitamins in foods, but repeated each day this can add up to significant amounts in a year's time.

Prevent enzymatic destruction:

- Refrigerate most fruits, vegetables, and juices to slow breakdown of vitamins.

Protect from light and air:

- Store milk and enriched grain products in opaque containers to protect riboflavin.
- Store cut fruits and vegetables in the refrigerator in airtight wrappers; reseal opened juice containers before refrigerating.

Prevent heat destruction or losses in water:

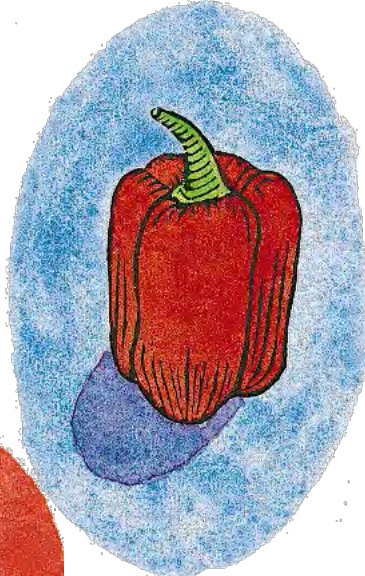
- Wash intact fruits and vegetables before cutting or peeling to prevent vitamin losses during washing.
- Cook fruits and vegetables in a microwave oven, or quickly stir fry, or steam them over a small amount of water to preserve heat-sensitive vitamins and to prevent vitamin loss in cooking water. Recapture dissolved vitamins by using cooking water for soups, stews, or gravies.
- Avoid high temperatures and long cooking times.

Vitamin C

69% DRI



158% DRI



Sweet Red!

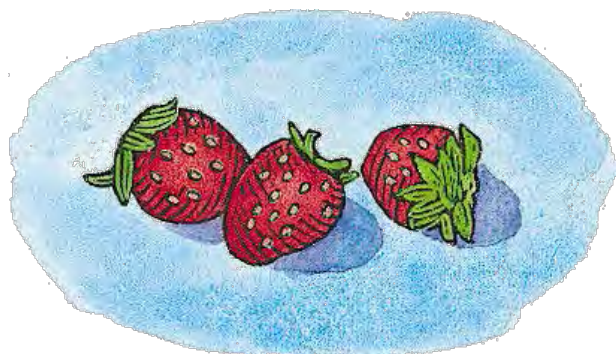
67% DRI



Green Pepper



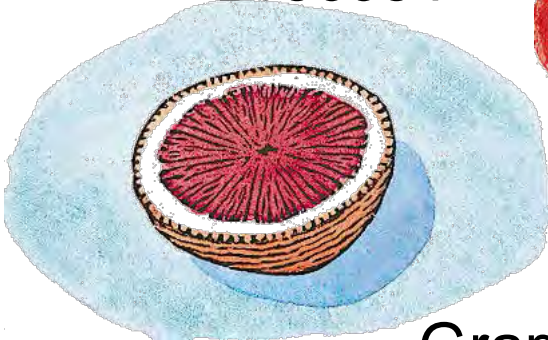
Broccoli



Strawberries



Brussel Sprouts



Grapefruit





Coenzyme name	Vitamin name
TPP	= thiamin
FAD	= riboflavin
FMN	= riboflavin
NAD	= niacin
NADP	= niacin
PLP	= vitamin B ₆
THF	= folate
CoA	= pantothenic acid
Bio	= biotin
B ₁₂	= vitamin B ₁₂

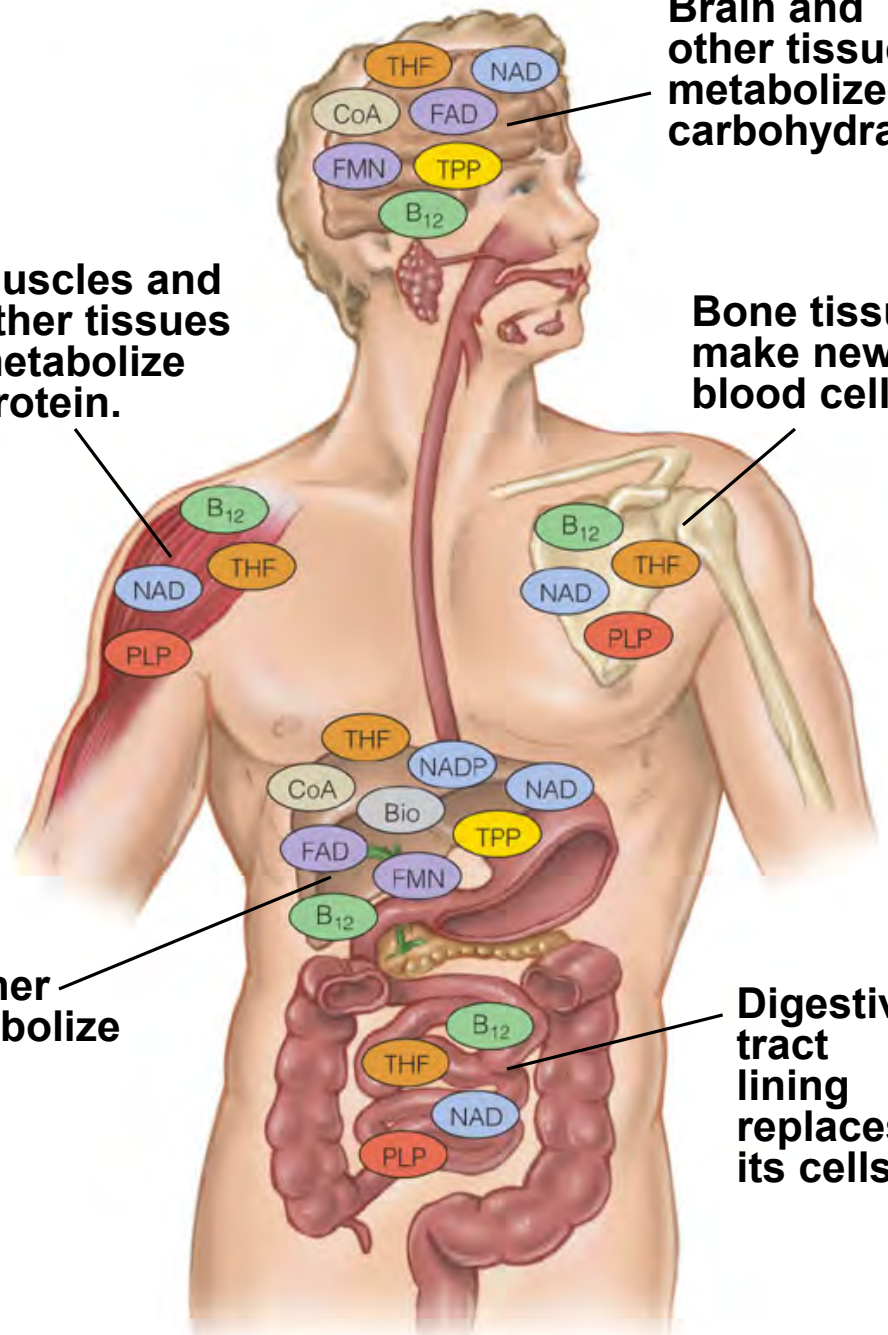
Muscles and other tissues metabolize protein.

Brain and other tissues metabolize carbohydrates.

Bone tissues make new blood cells.

Liver and other tissues metabolize fat.

Digestive tract lining replaces its cells.



B Vitamin Deficiency Symptoms of the Tongue & Mouth



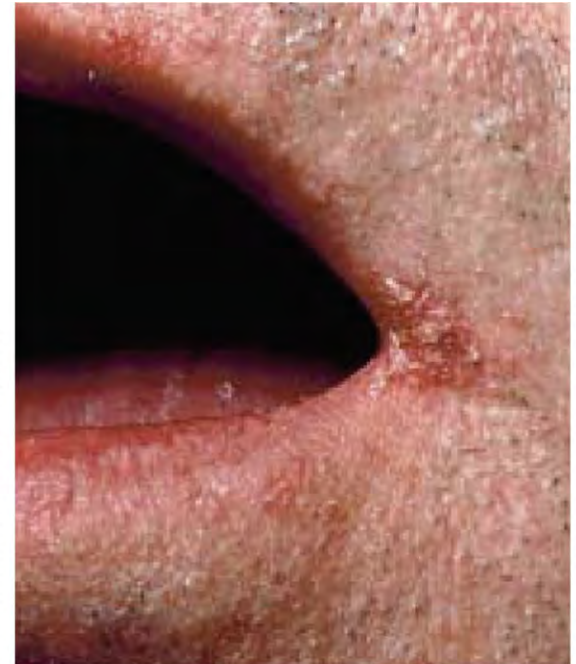
© Custom Medical Stock Photo

A healthy tongue has a rough and somewhat bumpy surface.



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Photo Researchers, Inc.

In a B vitamin deficiency, the tongue becomes smooth and swollen.



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All rights reserved.

In a B vitamin deficiency, the corners of the mouth become inflamed and cracked.

A close-up photograph of a person's mouth, focusing on the lips. The lips are significantly inflamed, appearing red, swollen, and cracked. There are visible white, scaly patches on the lower lip, characteristic of cheilitis. A white rectangular box with a black border is superimposed over the center of the image, containing the word "Cheilitis" in a bold, black, italicized serif font.

Cheilitis



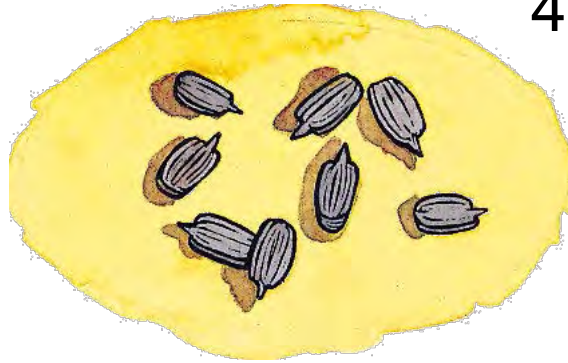
Beriberi



Pitting Edema!!

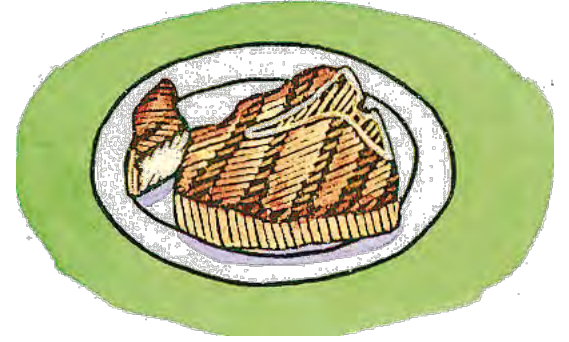
Thiamin

34% DRI



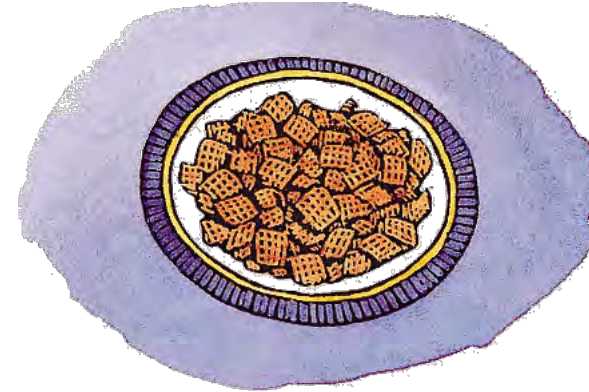
Sunflower Seeds

47% DRI

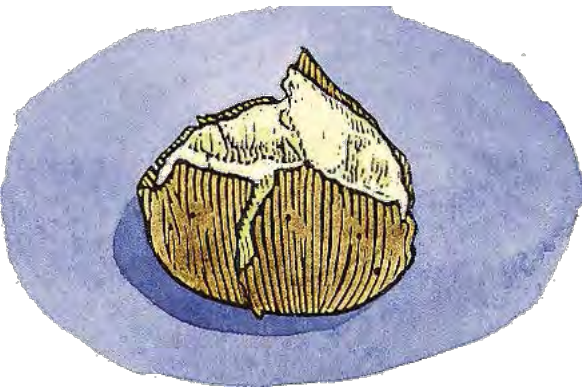


Pork Chop

32% DRI



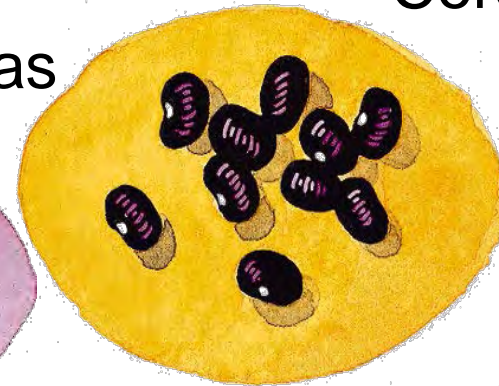
Cereal (enriched)



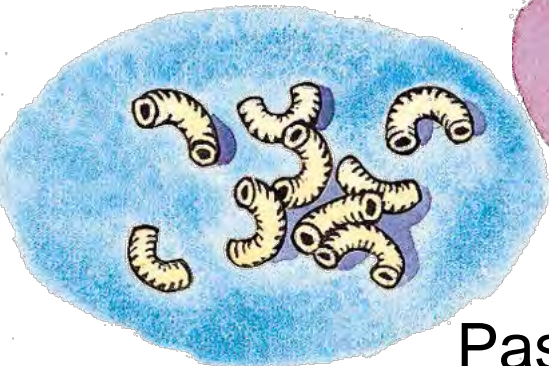
Potato



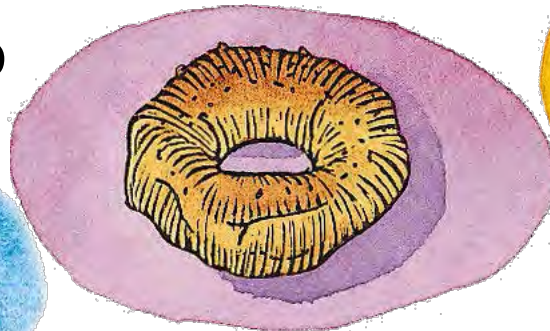
Green Peas



Black Beans



Pasta (enriched)



Bagel (whole grain)

RIBOFLAVIN

GOOD SOURCES*

BEEF LIVER (cooked)
3 oz = 2.9 mg



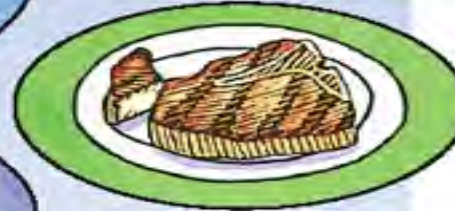
MILK
1 c = 0.45 mg

COTTAGE CHEESE
1 c = 0.38 mg



YOGURT (plain)
1 c = 0.60 mg

ENRICHED CEREAL
(ready-to-eat)
¾ = 0.43 mg



PORK CHOP (lean only)
3 oz = 0.23 mg

SPINACH (cooked)
½ c = 0.21 mg



MUSHROOMS (cooked)
½ c = 0.23 mg

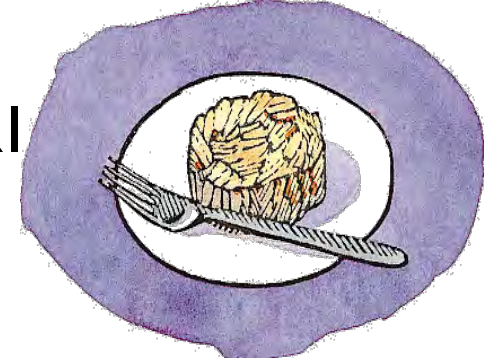
Pellagra

**NB: Typical flaky
paint dermatitis**



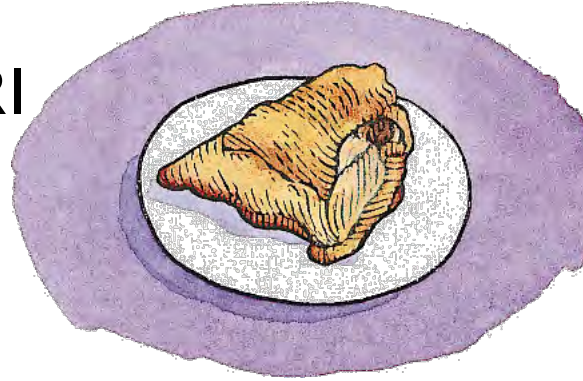
Niacin

71% DRI



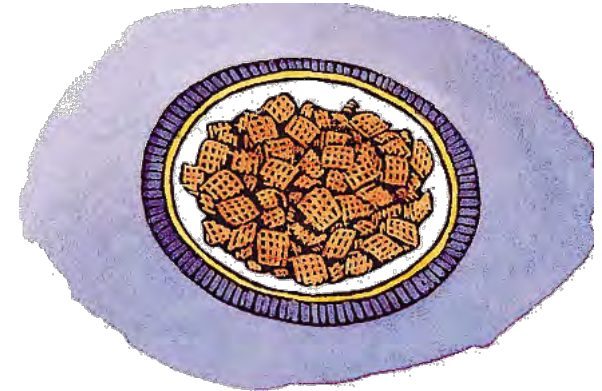
Tuna

56% DRI

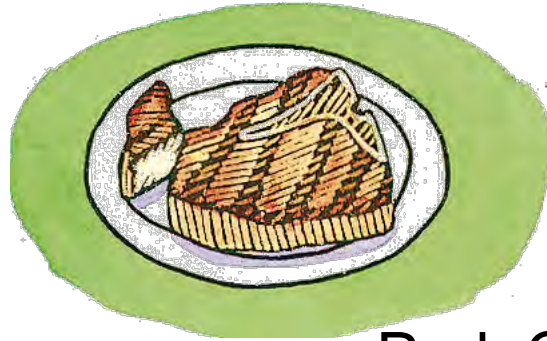


Chicken Breast

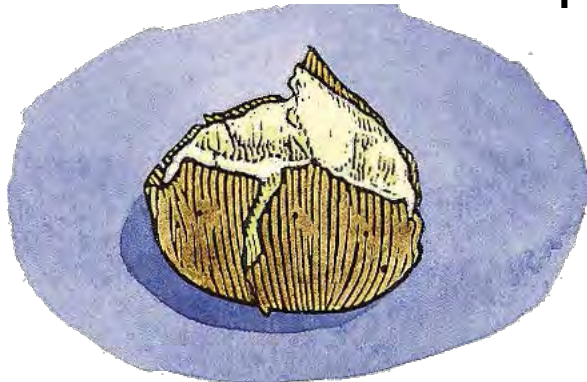
31% DRI



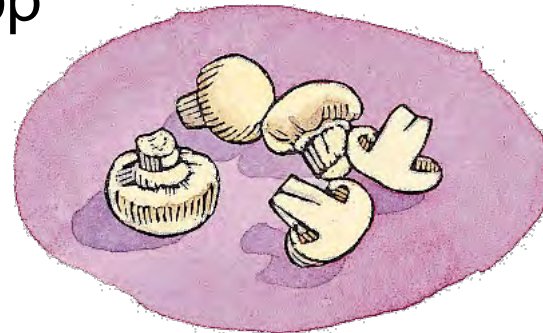
Cereal (enriched)



Pork Chop

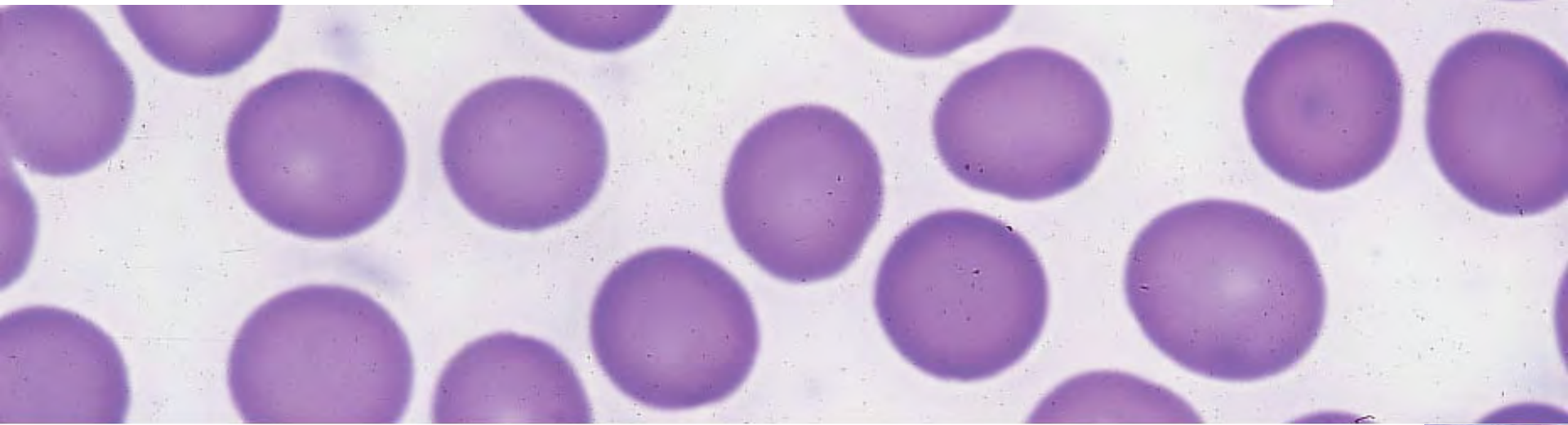


Baked Potato

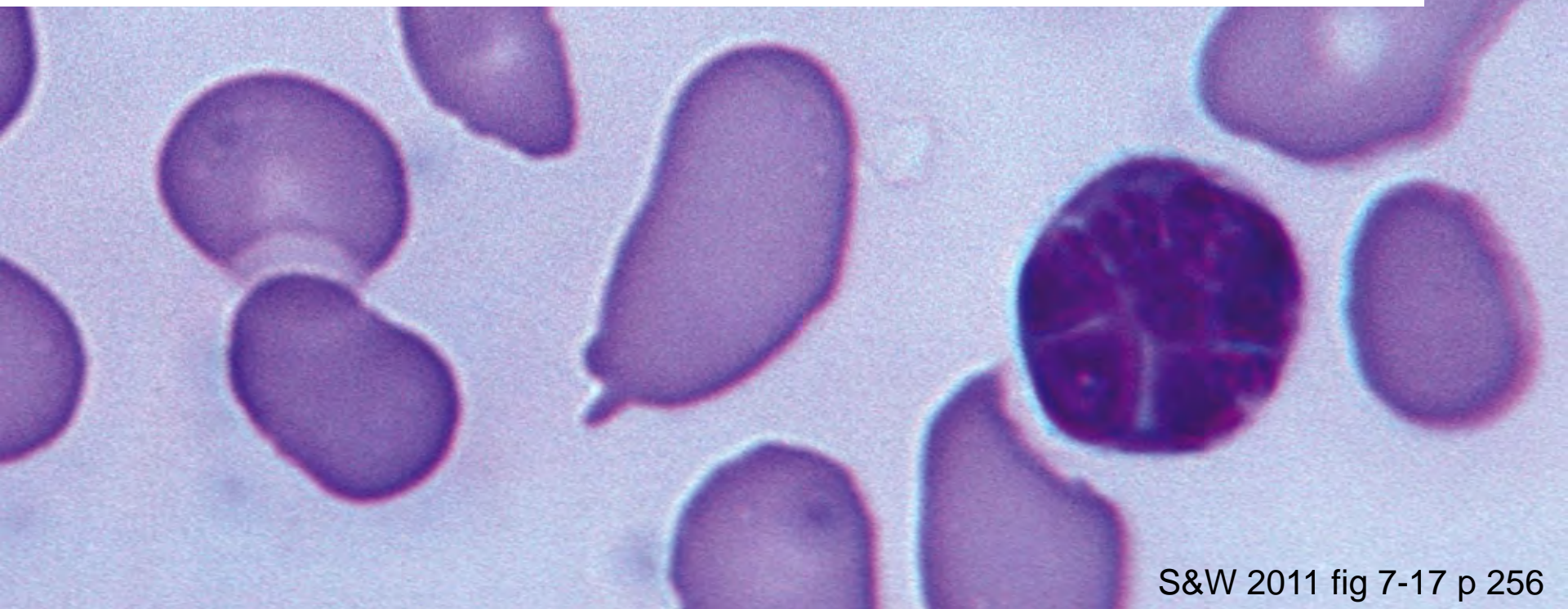


Mushrooms

Normal Red Blood Cells/Erythrocytes

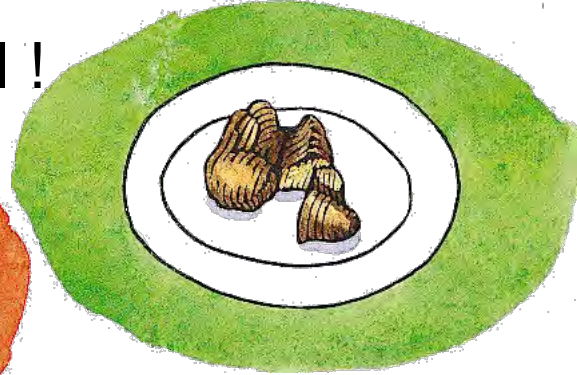


Abnormal w/Pernicious Anemia, Large & Irregular RBCs



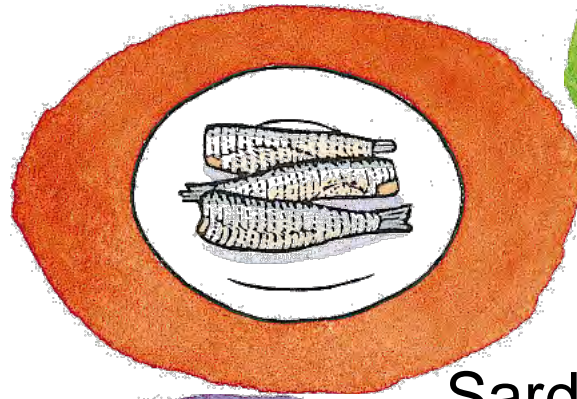
Vitamin B₁₂

583% DRI!



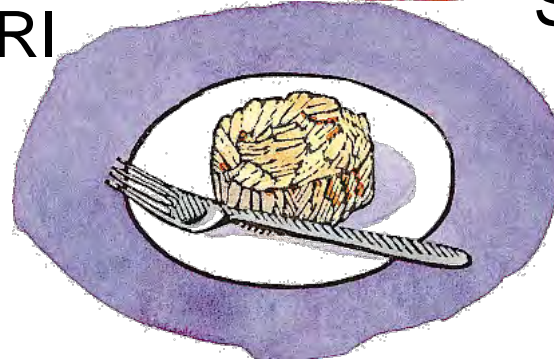
Chicken Liver

313% DRI

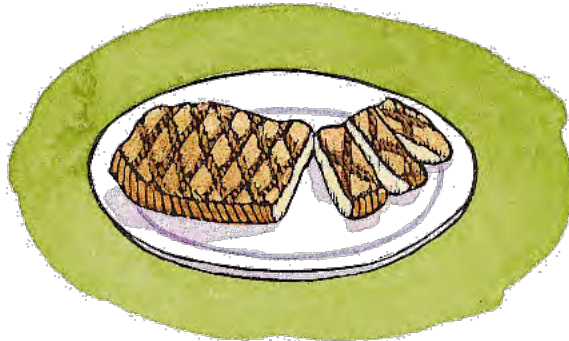


Sardines

125% DRI



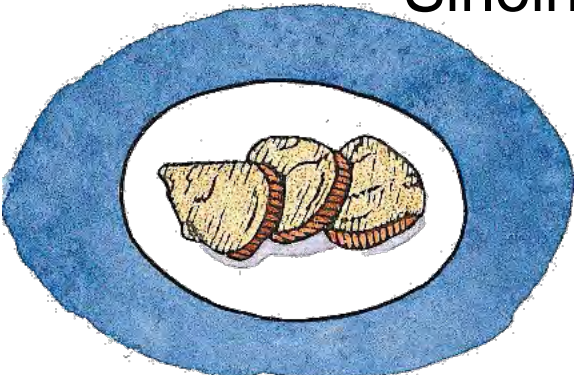
Tuna



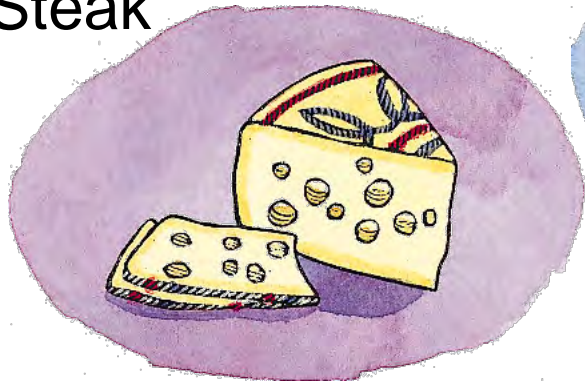
Sirloin Steak



Cottage Cheese



Pork Roast



Swiss Cheese

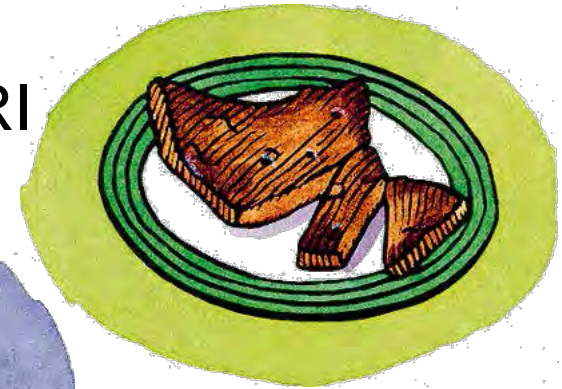
A black and white microscopic image of skin tissue. The image shows a cross-section of the epidermis and dermis. There is a prominent layer of dark, flaky material on the surface, which is characteristic of greasy, flaky dermatitis. The underlying skin layers appear somewhat disorganized and thickened.

***Greasy, Flaky
Dermatitis →
Vitamin B₆
Deficiency***

S&W 2014 fig 7-18 p 268

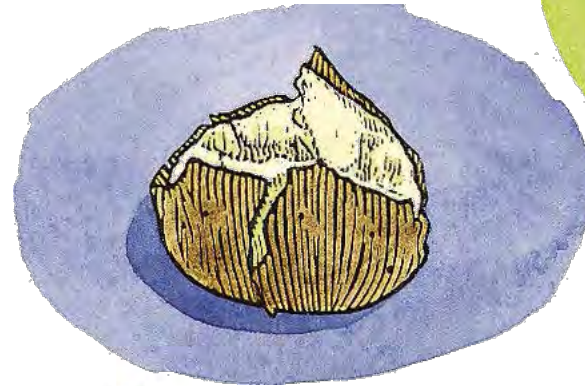
Vitamin B₆

67% DRI



Beef Liver

54% DRI

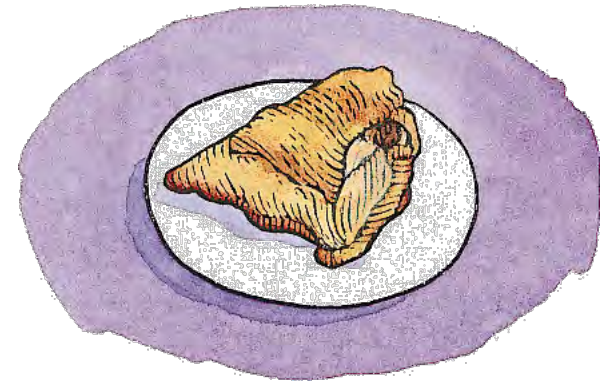


Baked Potato

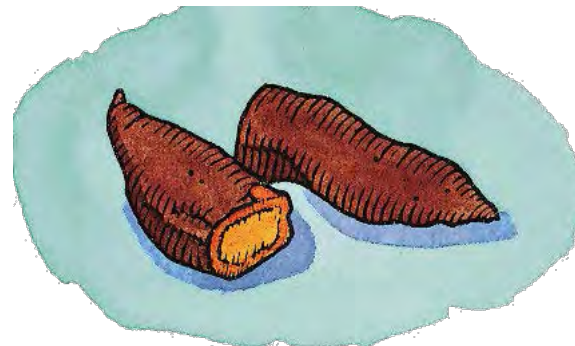
51% DRI



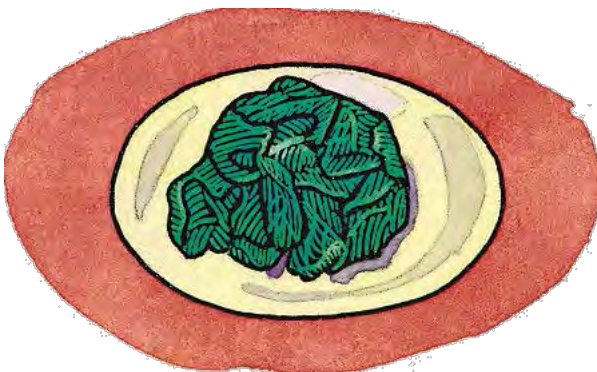
Banana



Chicken Breast

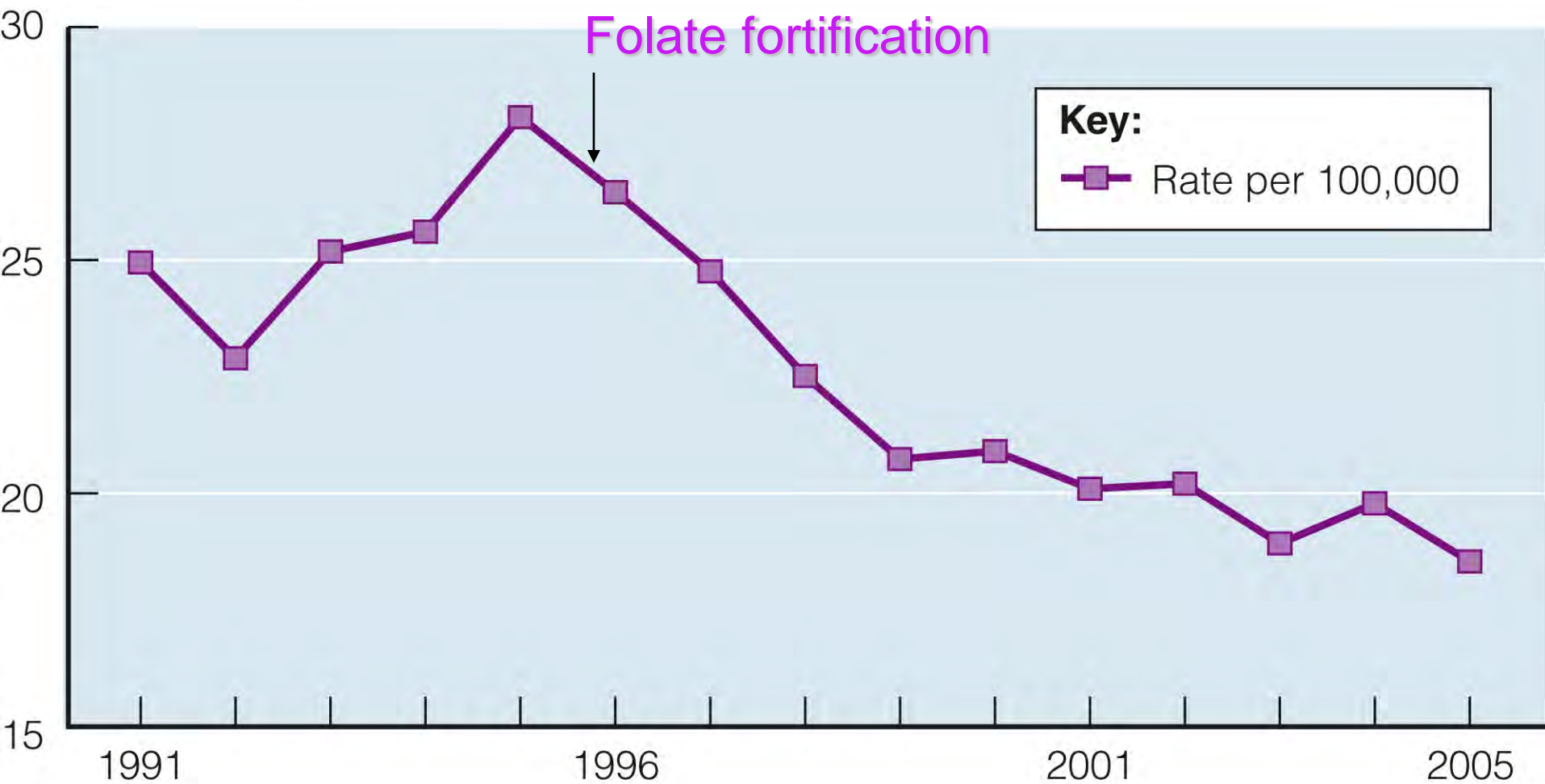


Sweet Potato



Spinach

Spina Bifida 1991–2005



Source: National Vital Statistics System, National Center for Health Statistics, Centers for Disease Control, December 2007.

Folate

Think foliage
leafy greens!



45% DRI

55% DRI



Beef Liver

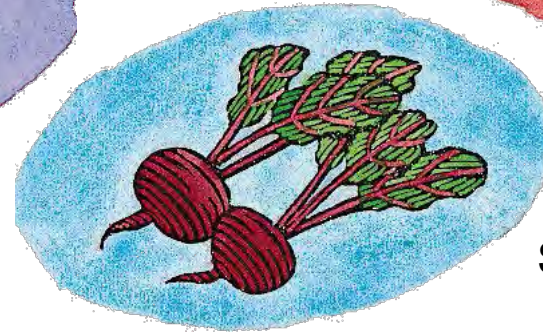
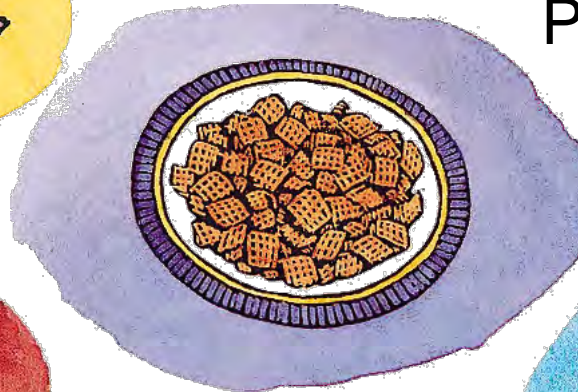
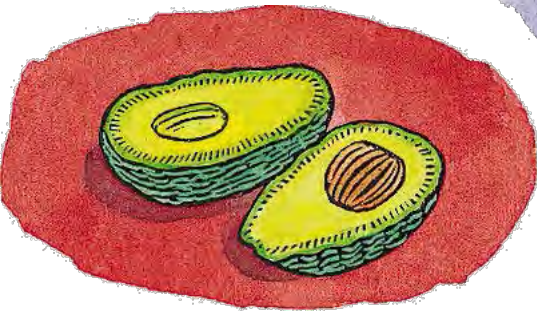
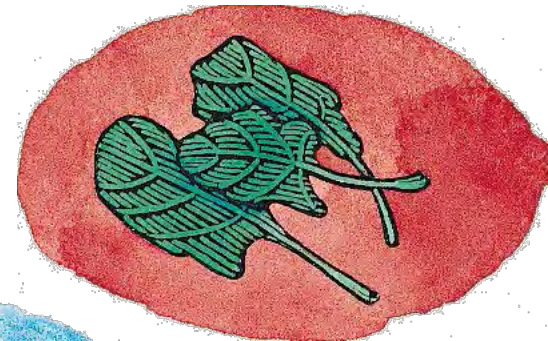
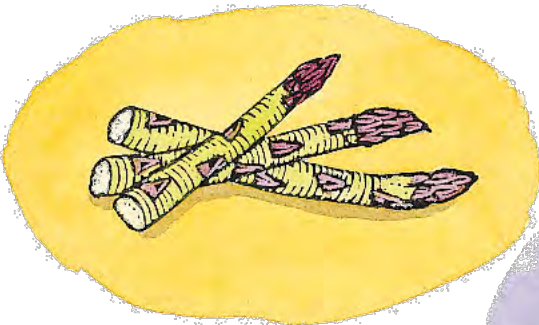


Lentils

37% DRI



Pinto Beans



Which is the best source of vitamins & minerals to support good health?



TABLE C7-1 SOME VALID REASONS FOR TAKING SUPPLEMENTS

These People May Need Supplements:

- People with nutrient deficiencies.
- Women in their childbearing years (supplemental or enrichment sources of folic acid are recommended to reduce risk of neural tube defects in infants).
- Pregnant or lactating women (they may need iron and folate).
- Newborns (they are routinely given a vitamin K dose).
- Infants (they may need various supplements, see Chapter 13).
- Those who are lactose intolerant (they need calcium to forestall osteoporosis).

- Habitual dieters (they may eat insufficient food).
- Elderly people often benefit from some of the vitamins and minerals in a balanced supplement; (they may choose poor diets, have trouble chewing, or absorb or metabolize less efficiently; see Chapter 14).
- Victims of AIDS or other wasting illnesses (they lose nutrients faster than foods can supply them).
- Those addicted to drugs or alcohol (they absorb fewer and excrete more nutrients; nutrients cannot undo damage from drugs or alcohol).
- Those recovering from surgery, burns, injury, or illness (they need extra nutrients to help regenerate tissues).
- Strict vegetarians (they may need vitamin B₁₂, vitamin D, iron, and zinc).
- People taking medications that interfere with the body's use of nutrients.



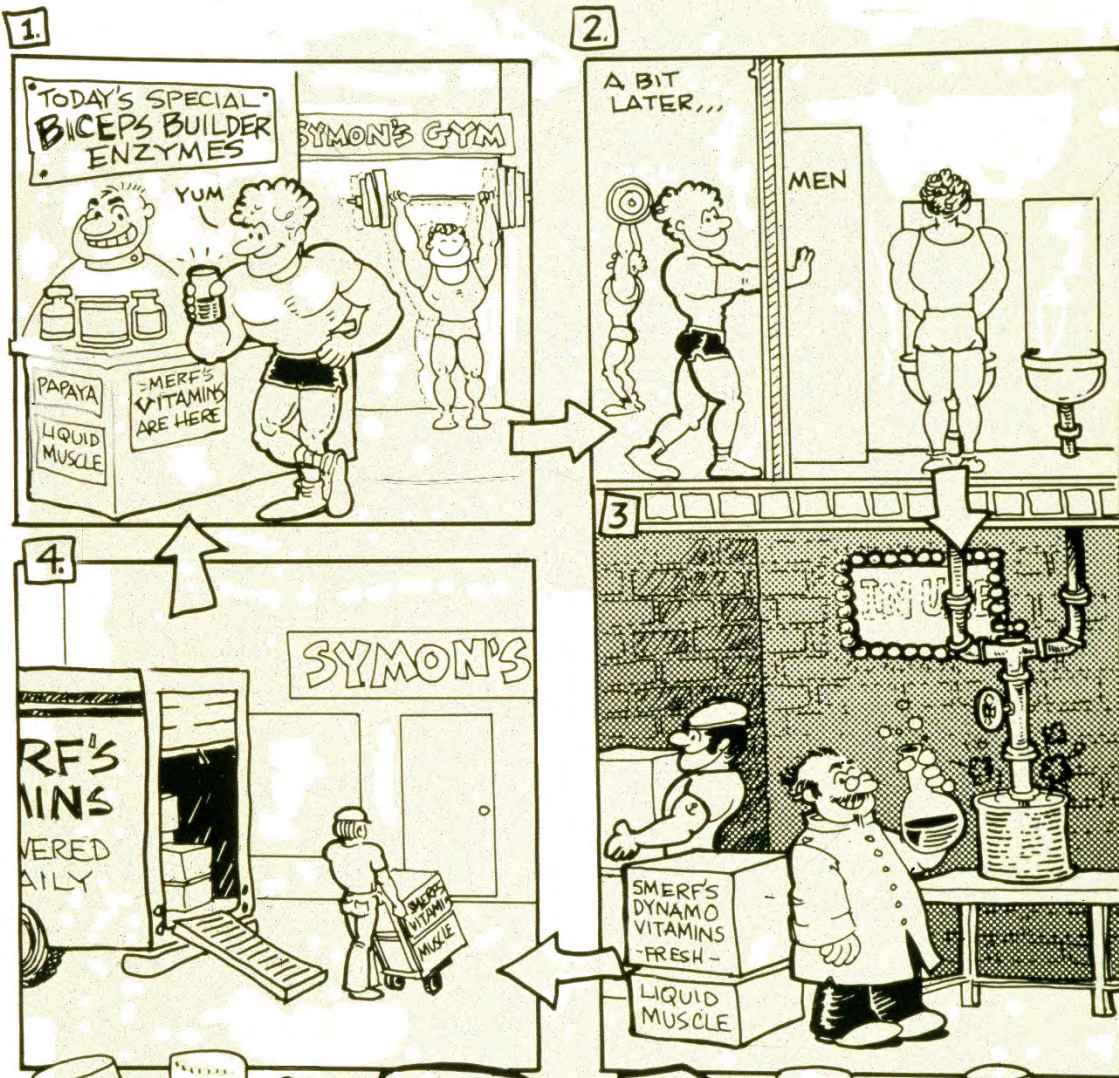


TABLE C7-5 SOME INVALID REASONS FOR TAKING SUPPLEMENTS

Watch out for plausible-sounding, but false reasons given by marketers trying to convince you, the consumer, that you need supplements. The invalid reasons listed below have gained strength by repetition among friends, on the Internet, and by the media:

- You fear that foods grown on today's soils lack nutrients (a common false statement made by sellers of supplements).
- You feel tired and falsely believe that supplements can provide energy.
- You hope that supplements can help you cope with stress.
- You wish to build up your muscles faster or without physical exercise.
- You want to prevent or cure self-diagnosed illnesses.
- You hope excess nutrients will produce unnamed mysterious beneficial reactions in your body.

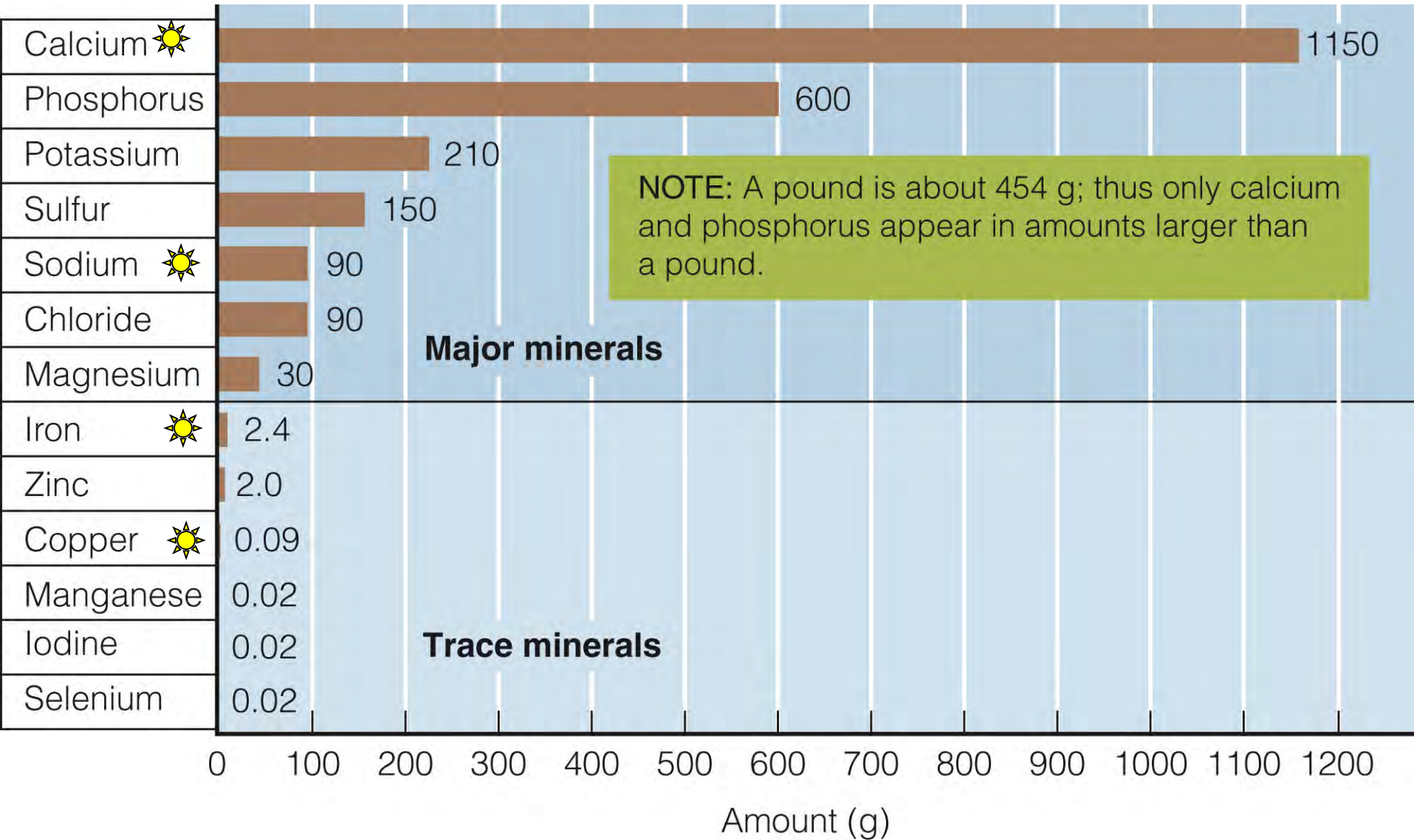
People who should never take supplements without a physician's approval include those with kidney or liver ailments (they are susceptible to toxicities), those taking medications (nutrients can interfere with their actions), and smokers (who should avoid products with beta-carotene).

TABLE C7-3 PROBLEMS IMPEDING THE FDA'S OVERSIGHT OF SUPPLEMENTS

The FDA currently faces four major problems with regard to supplement oversight strategies:

1. The volume of supplement sales and use is too high to ensure adequate post-marketing safety within the current legal structure.
2. The FDA's funding and staff are insufficient to allow identification of supplement hazards and implementation of appropriate actions against them.
3. The broad array of ingredients in the products sold impedes identification of hazards.
4. Failure to require manufacturers to report serious adverse effects associated with supplement use undermines FDA efforts to ensure supplement safety.

Major vs Minor/Trace Minerals





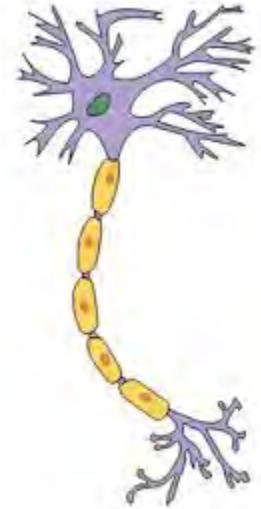
Bones & Teeth



**Muscle
Contraction &...**



Relaxation!!



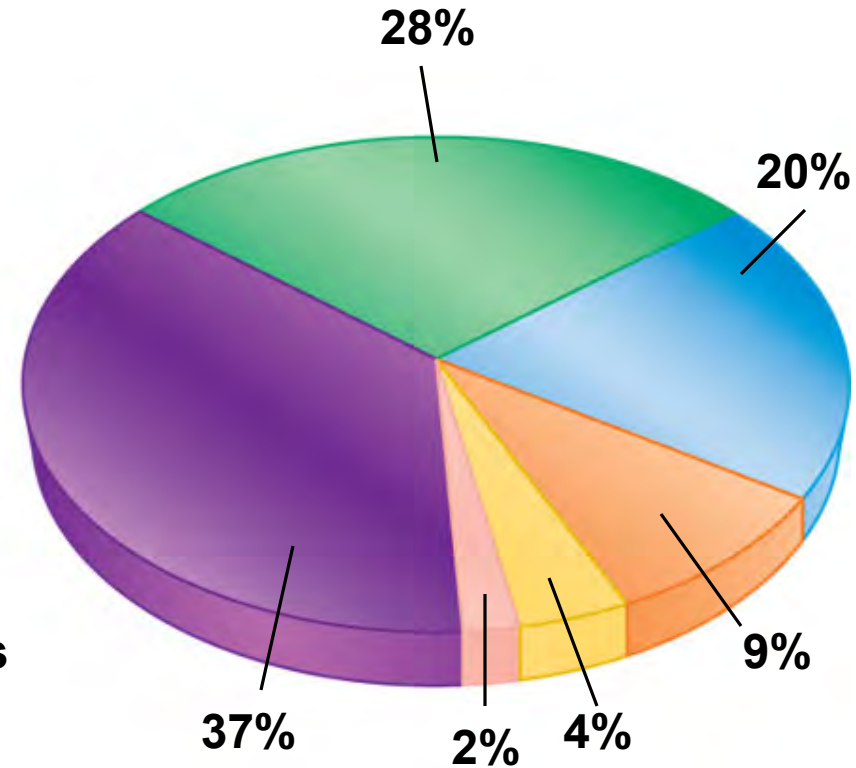
**&
Neurotransmission!!**

**Calcium is
crucial!!**

Calcium Sources in the US Diet

Key:

- Milk
- Cheese
- Yeast bread
- Ice cream, sherbert, frozen yogurt
- Cakes, cookies, quick breads, doughnuts
- Other sources

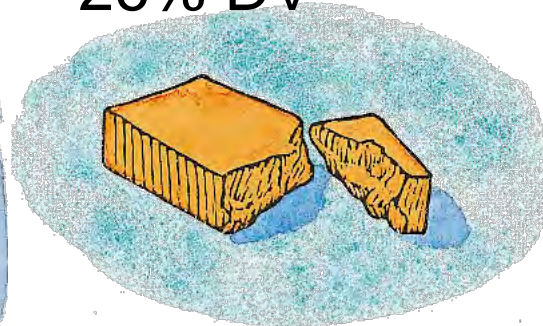


Calcium

25% DV

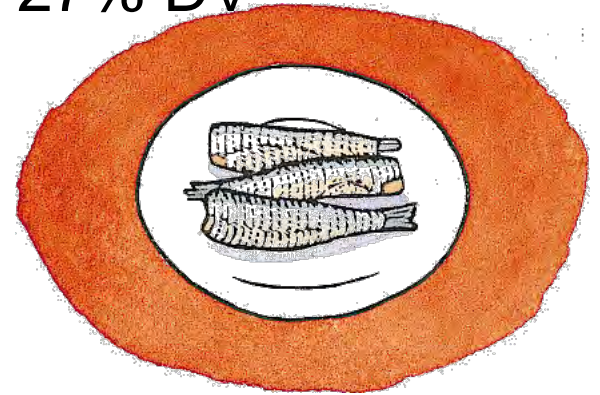


26% DV



Dairy products

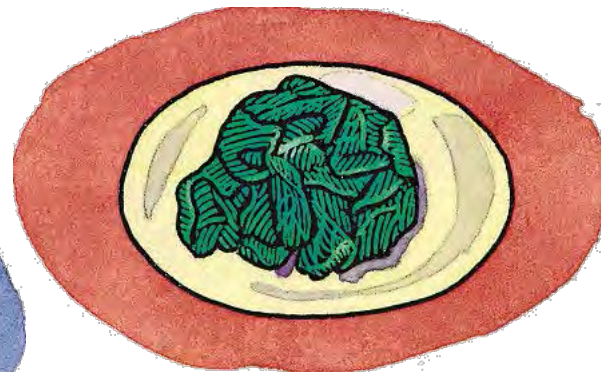
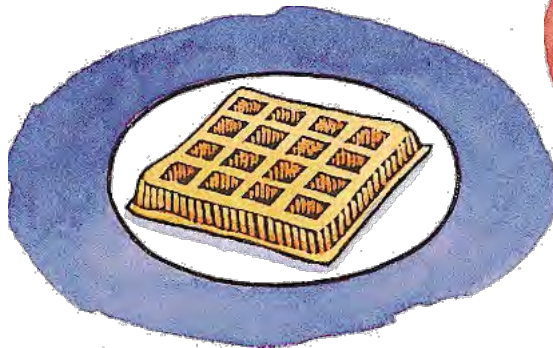
27% DV



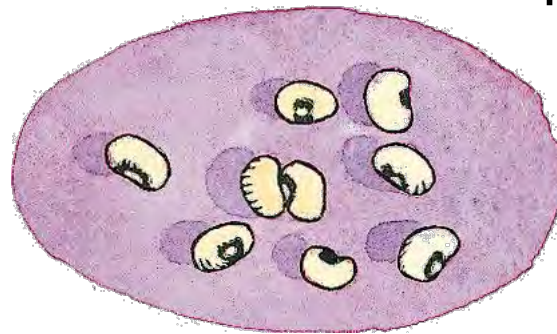
Sardines



Tofu
(calcium-set)



Turnip Greens



**≥ 50%
absorbed**

**cauliflower, watercress, Chinese cabbage,
head cabbage, brussels sprouts, rutabaga,
kolhrabi, kale, mustard greens, bok choy,
broccoli, turnip greens**

**30%
absorbed**

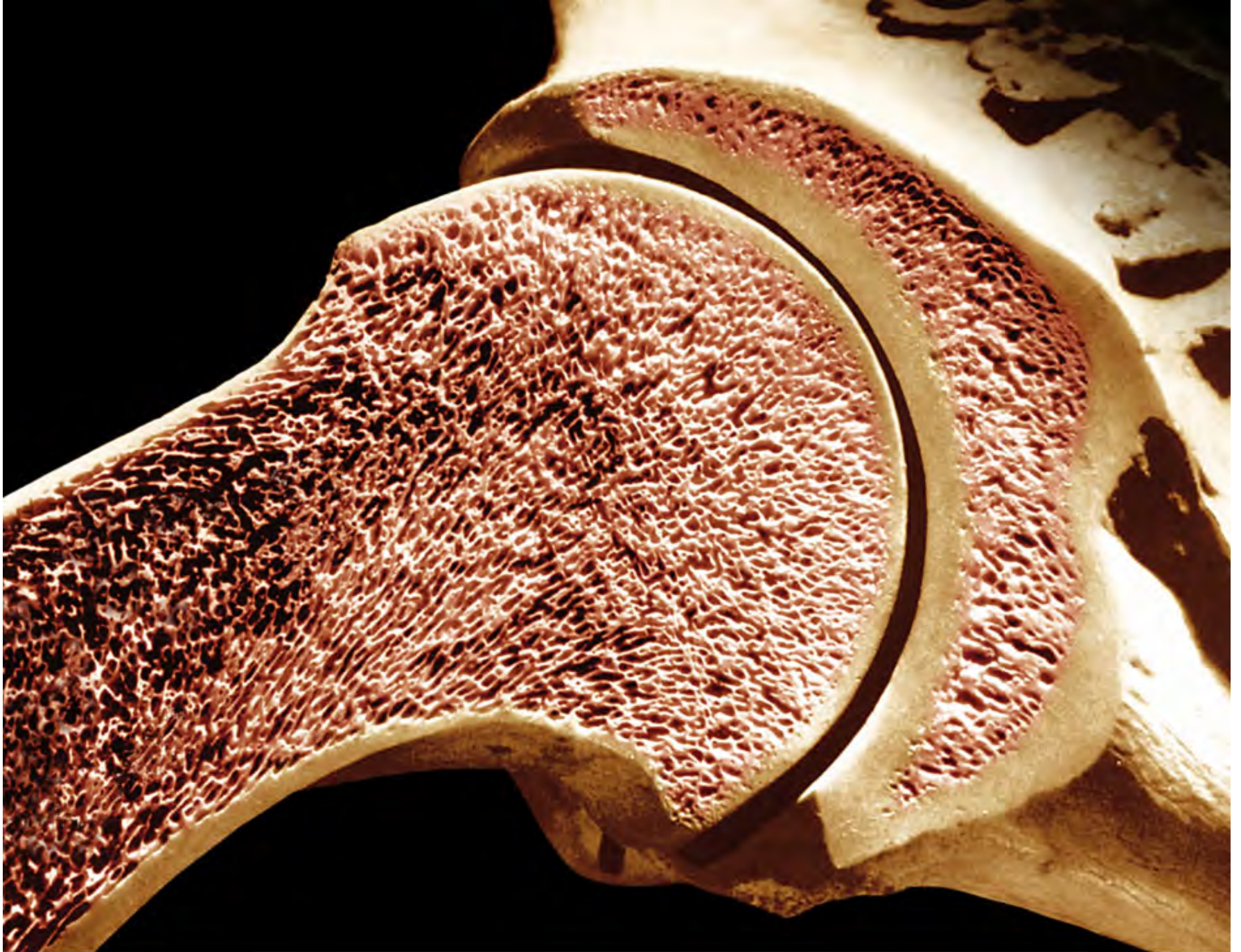
**milk, yogurt, cheese,
calcium-fortified soy milk, calcium-
set tofu, calcium-fortified juices &
drinks.**

**20%
absorbed**

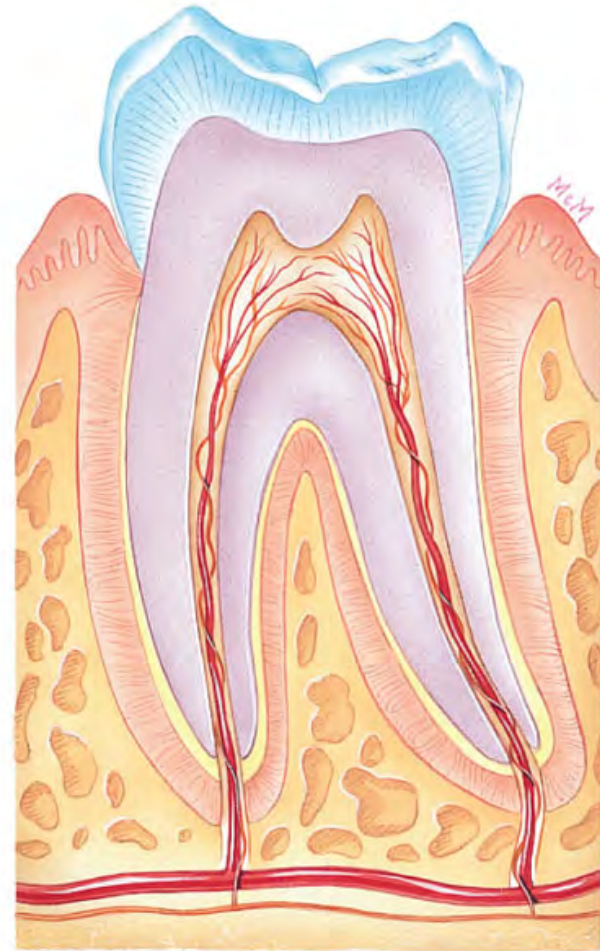
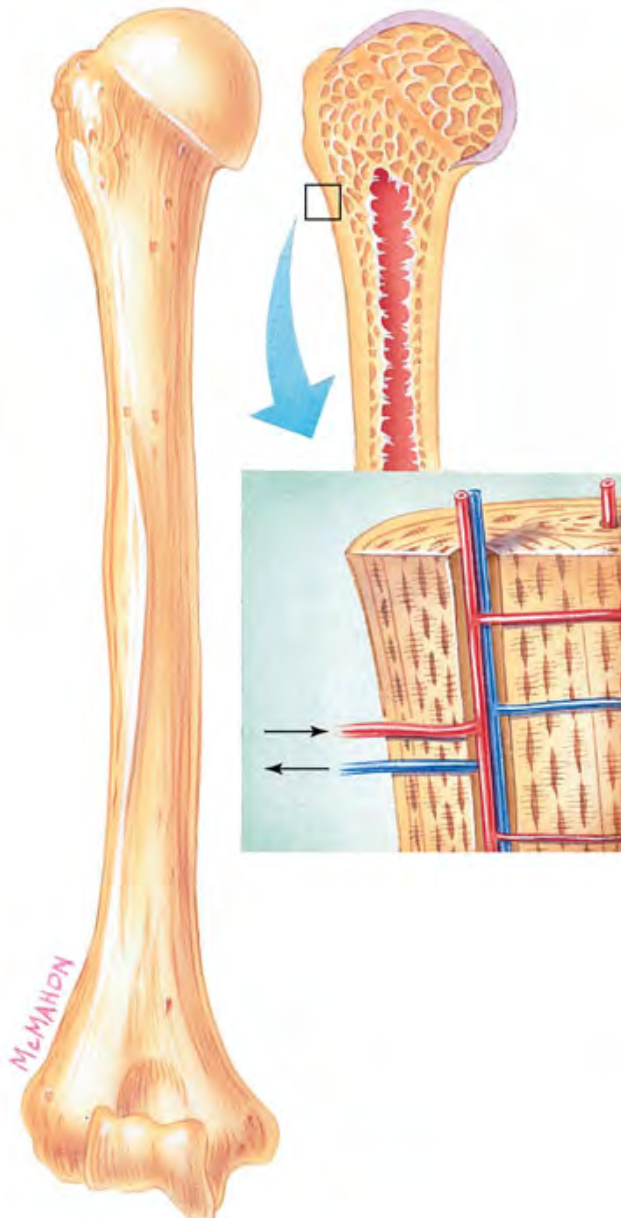
**almonds, sesame seeds,
beans (pinto, red, & white)**

**≤ 5%
Absorbed**

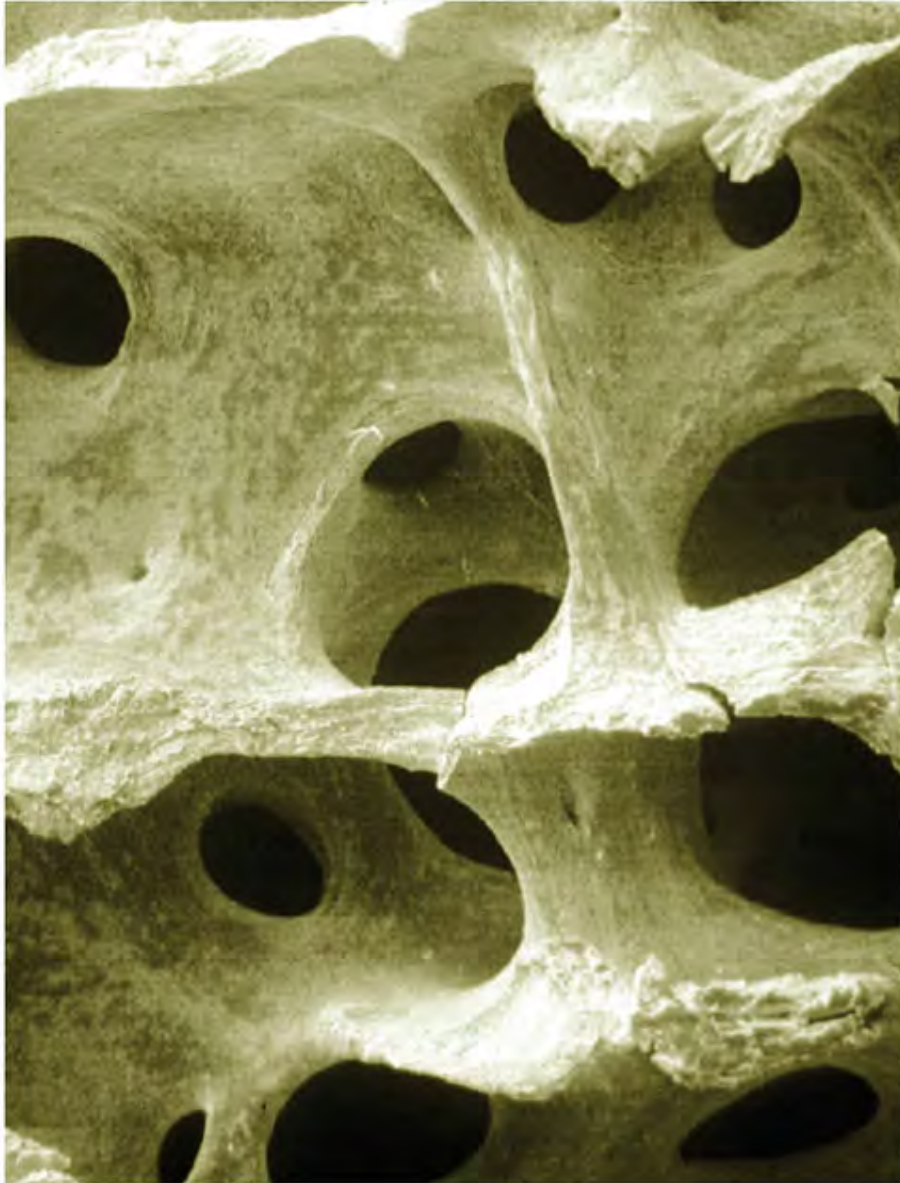
spinach, rhubarb, Swiss chard



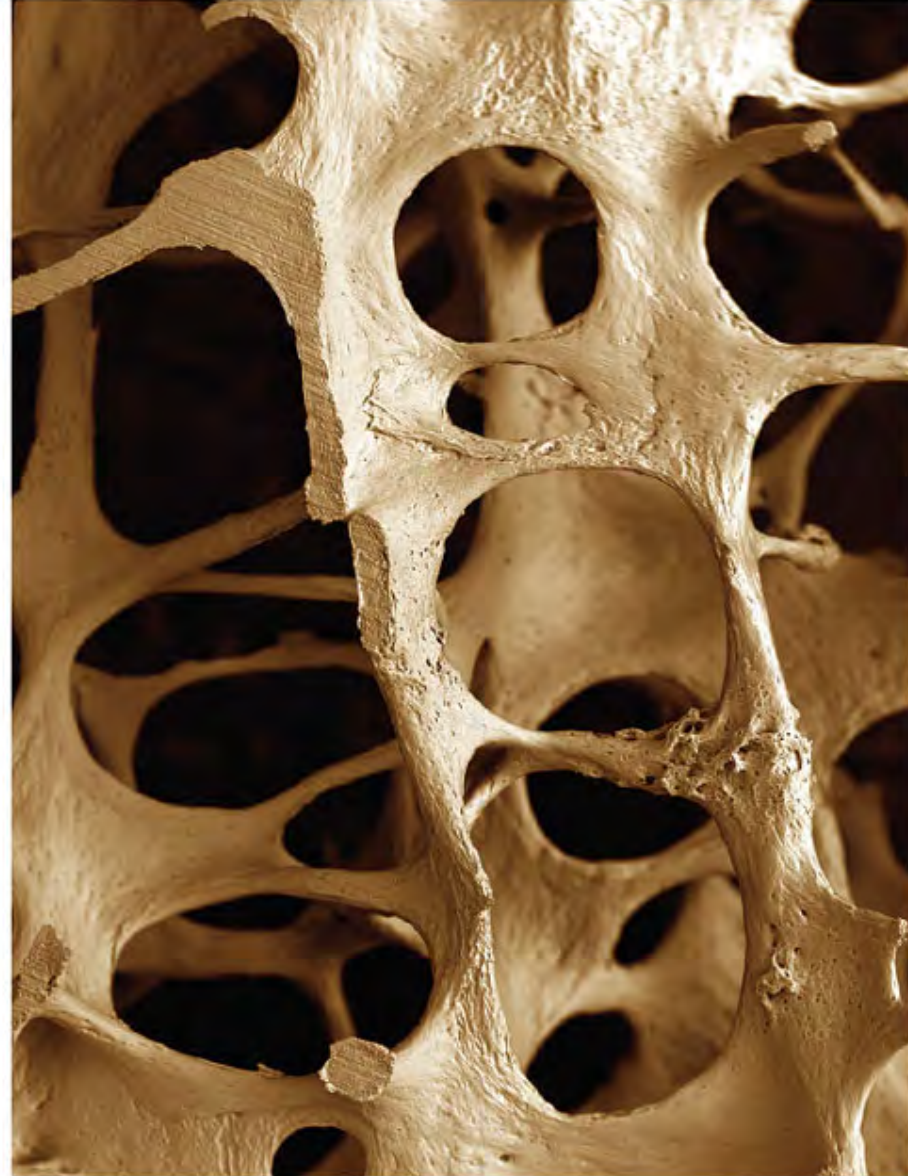
Bone is active, dynamic living tissue!!



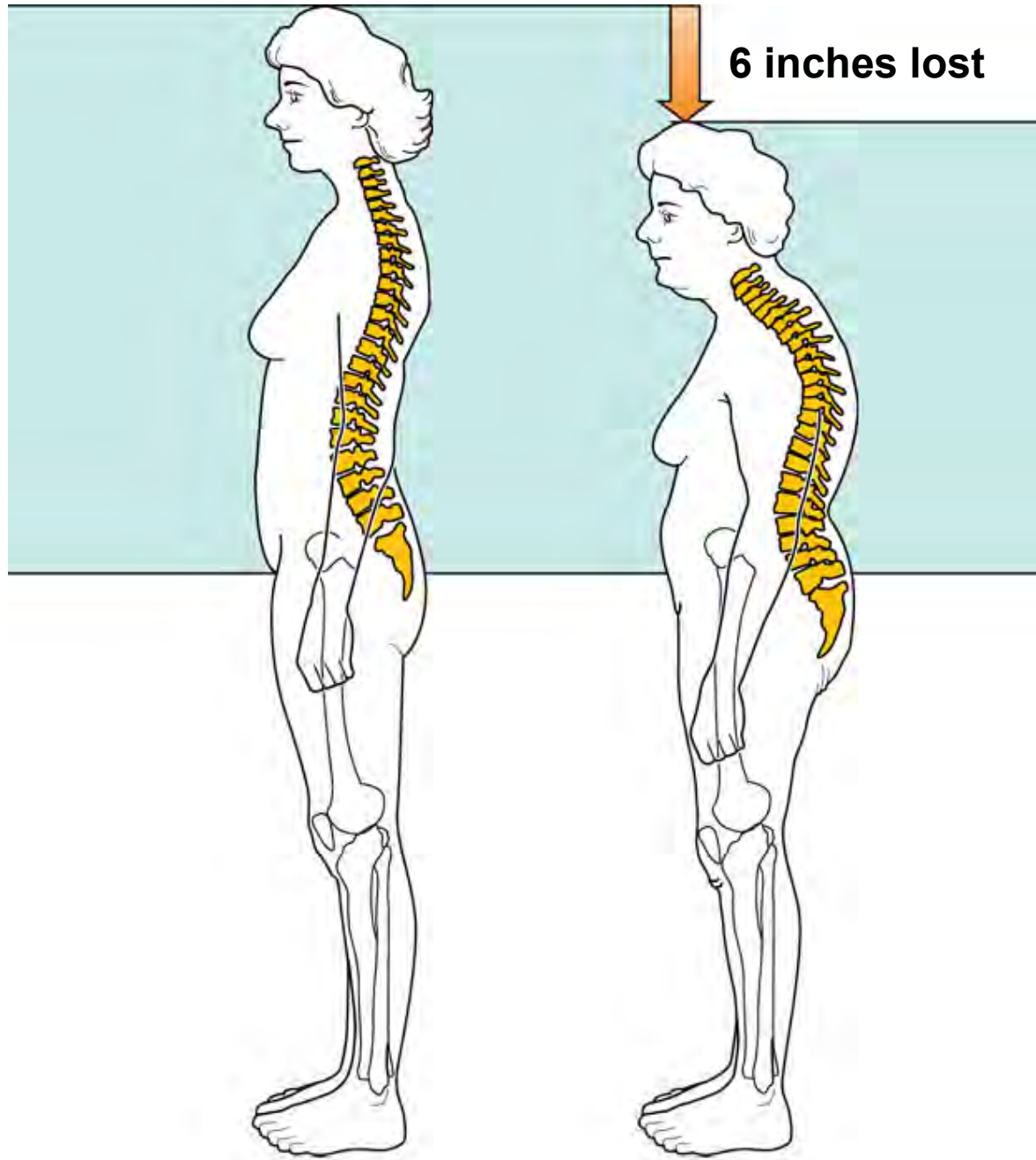
cf. S&W 2014 fig 8-6, 8-7 p 300



Electron micrograph of healthy trabecular bone.

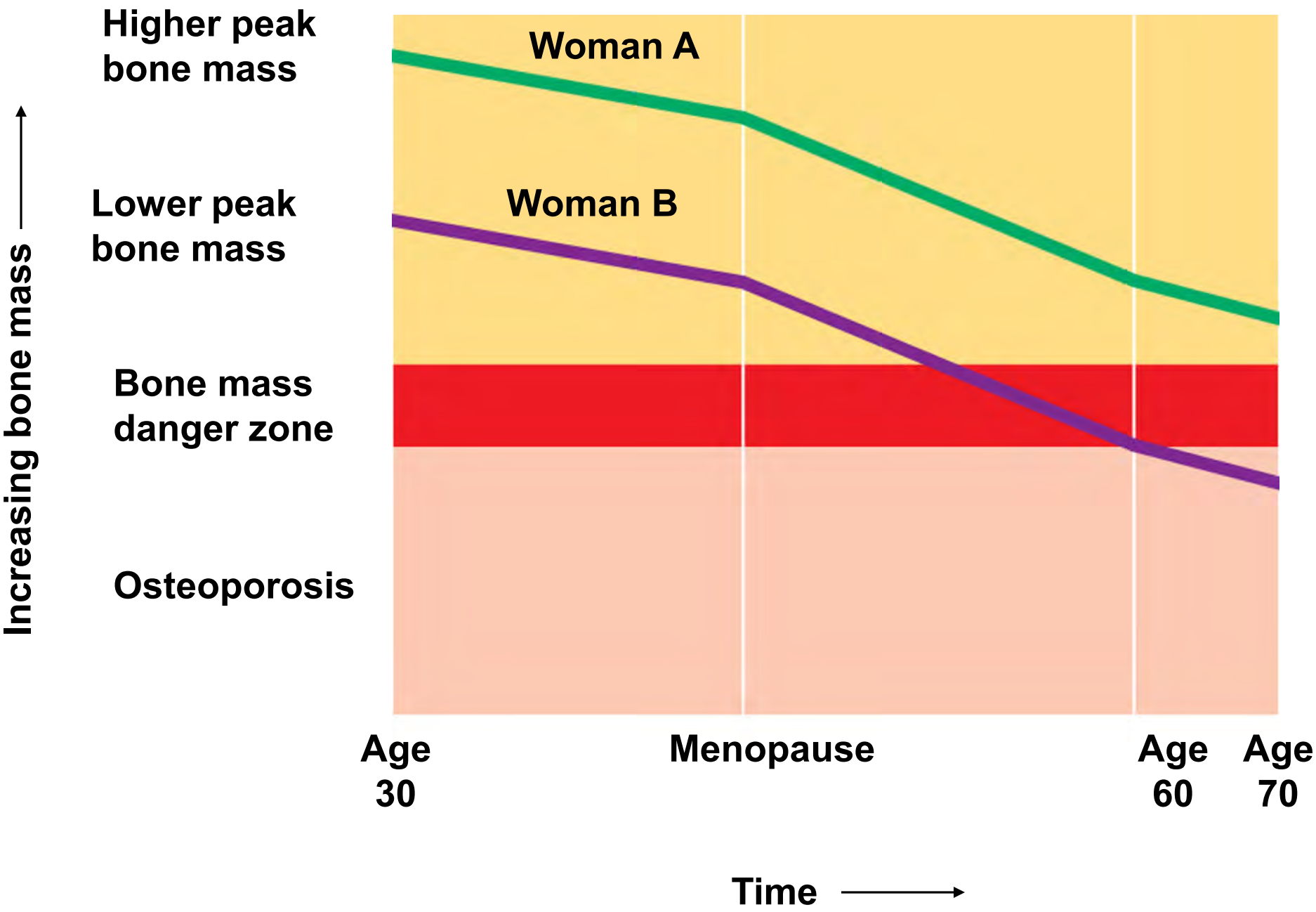


Electron micrograph of trabecular bone affected by osteoporosis.



50 years old

80 years old

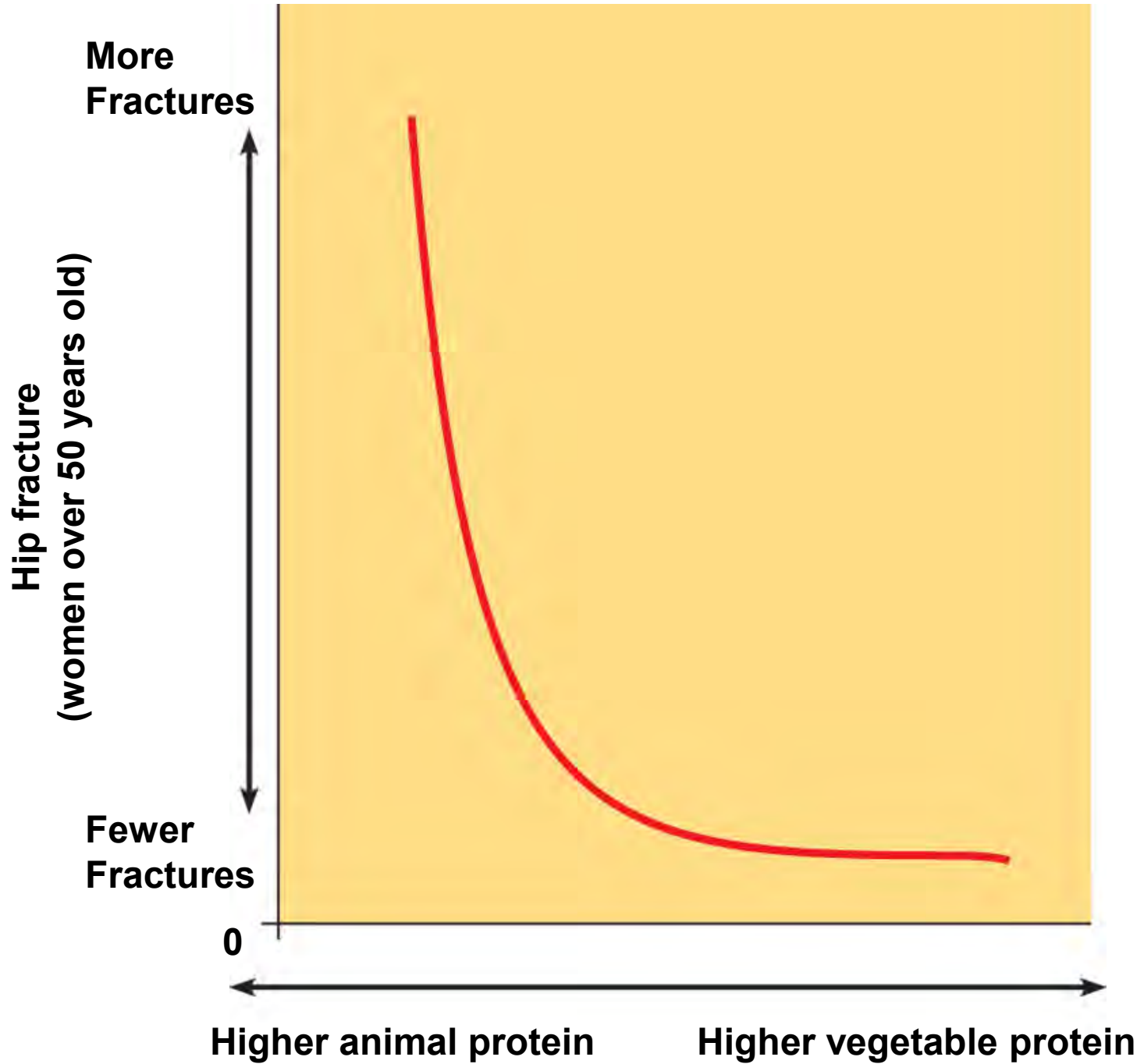


Calcium + Estrogen ...

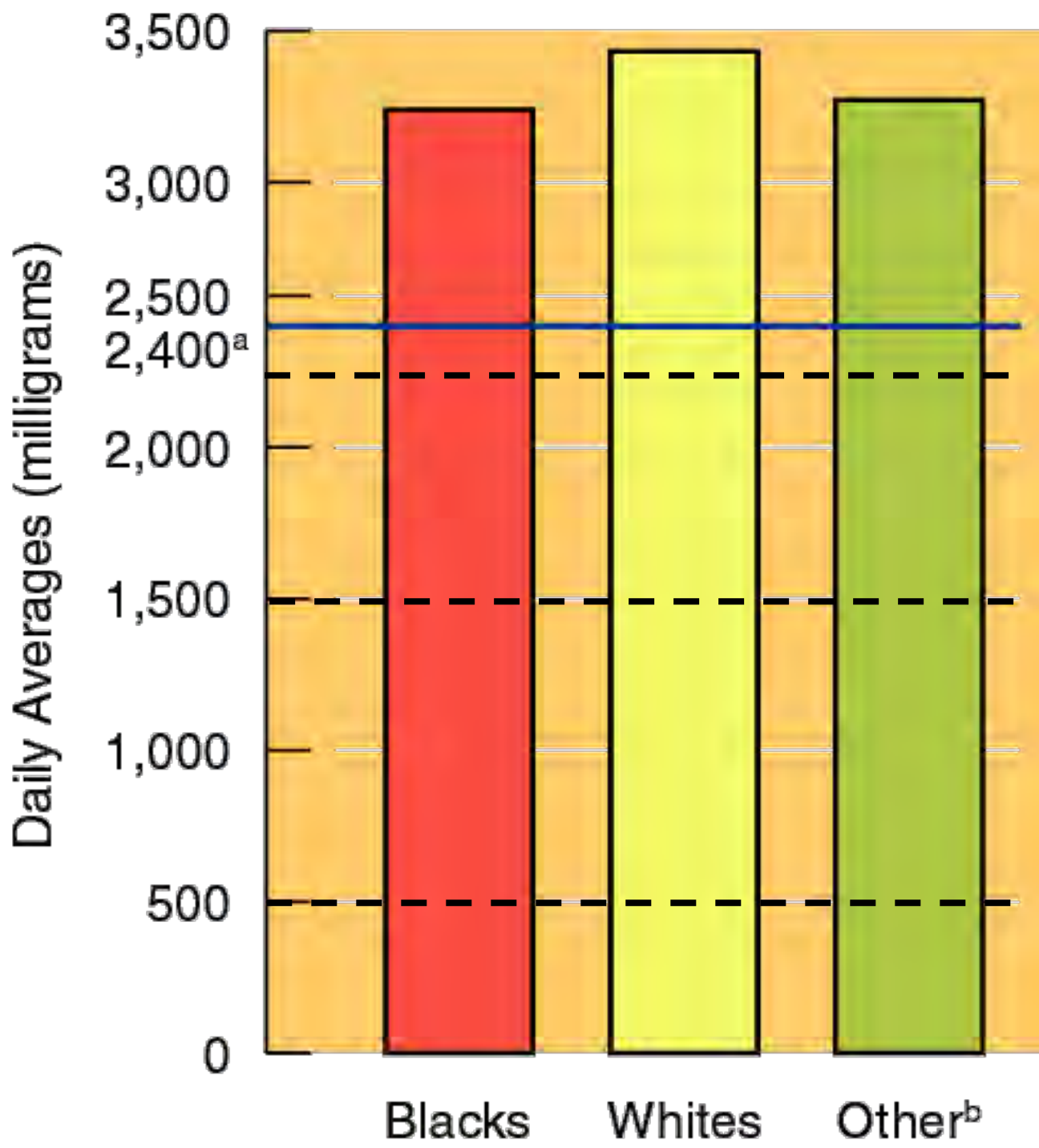


+ Bone-loading exercise





Sodium (Na) Intakes of U.S. Adults



**< 2400 mg ↓ BP
= 1 tsp of Salt
(NaCl \cong 40% Na)**

< 1500 mg ↓ BP

**< 500 mg/d =
1/4 tsp Salt/d!**

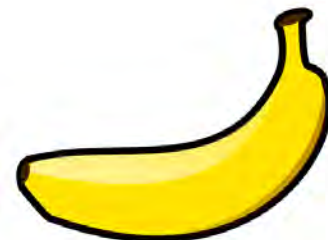
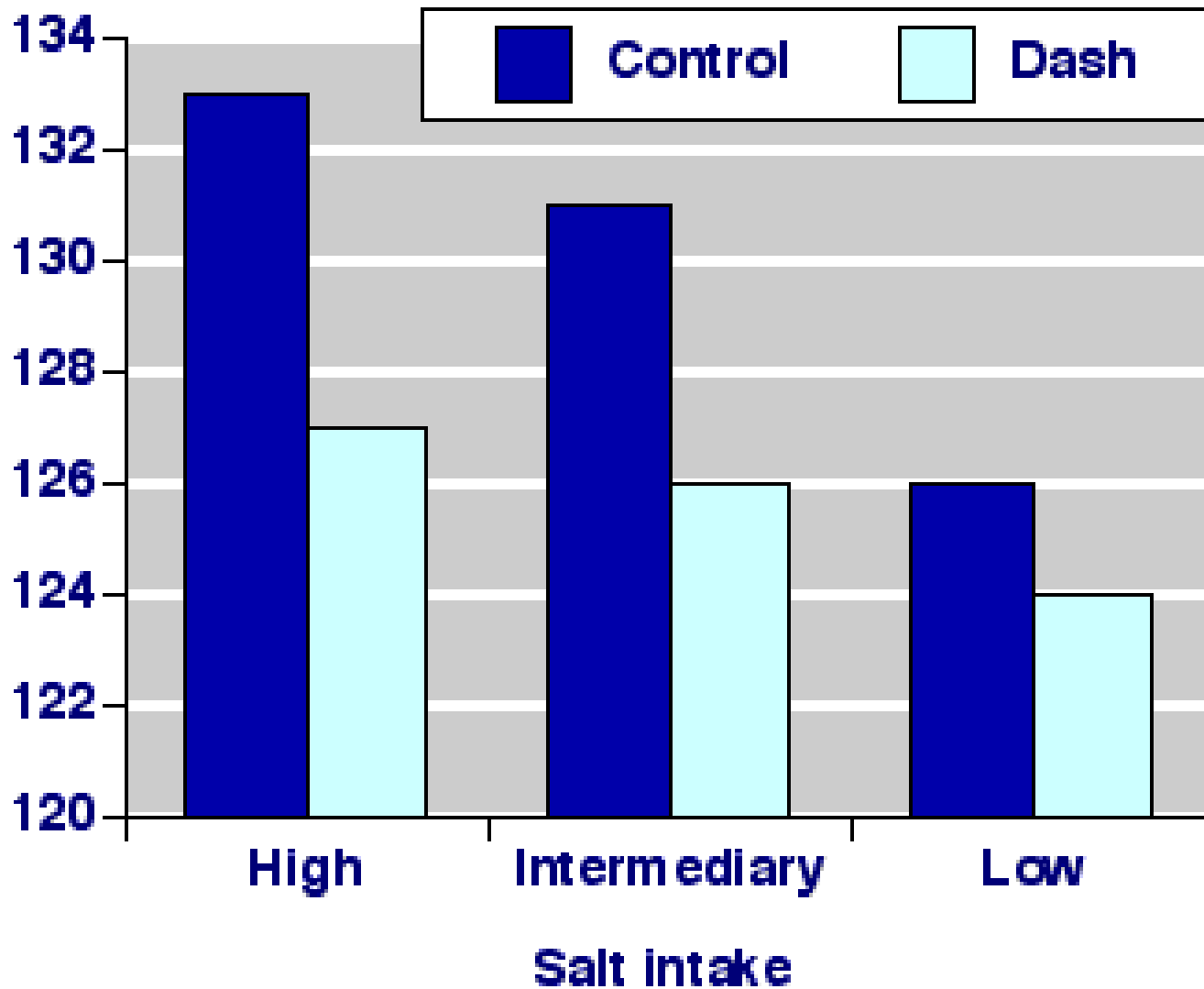
Body requirement



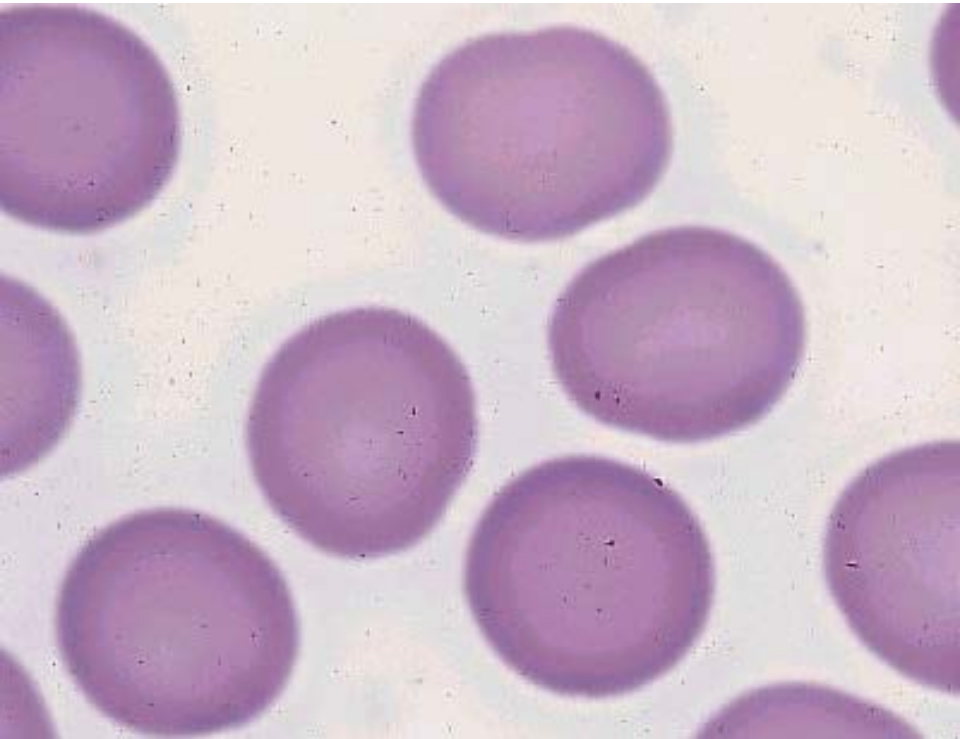
Salt (NaCl) & Sodium (Na) Sources in US Diet



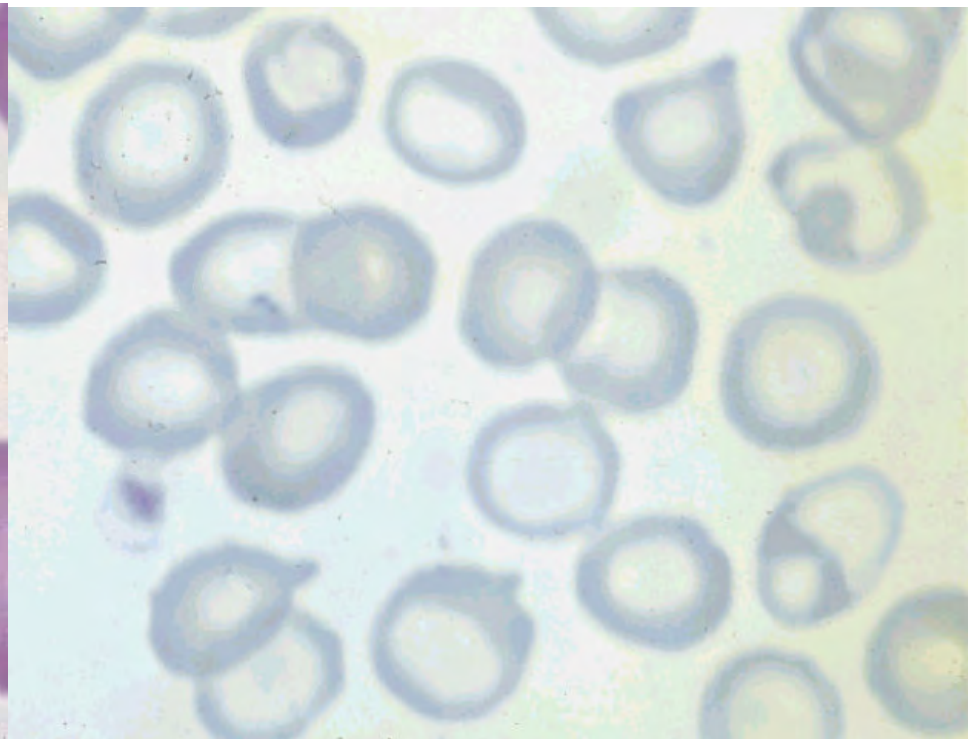
Systolic blood pressure (mmHg)



Iron Deficiency Anemia



Normal RBCs



**Iron-deficiency Anemia
(small, pale)**

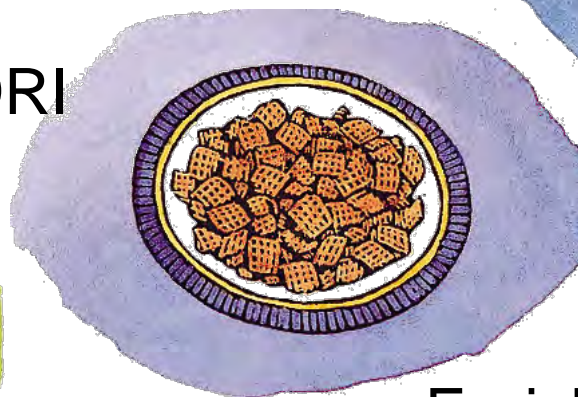
Iron

132% DRI



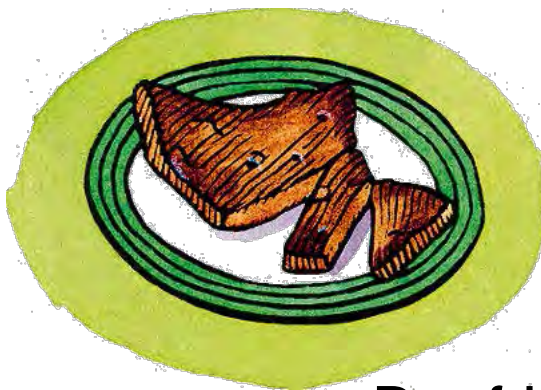
Steamed Clams

45% DRI

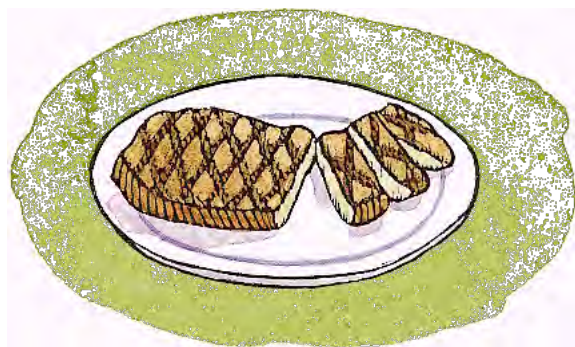


Enriched Cereal

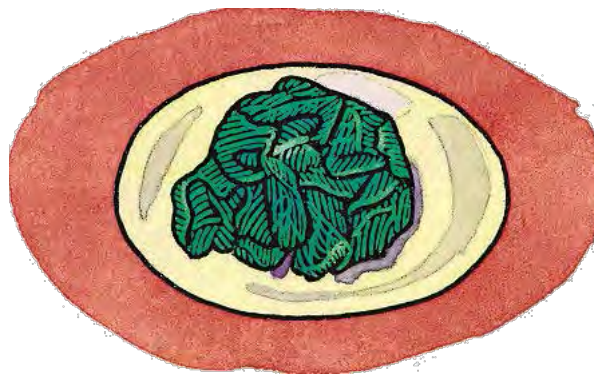
29% DRI



Beef Liver



Beef Steak



Spinach



Swiss Chard





Zinc Deficiency

17 year old male



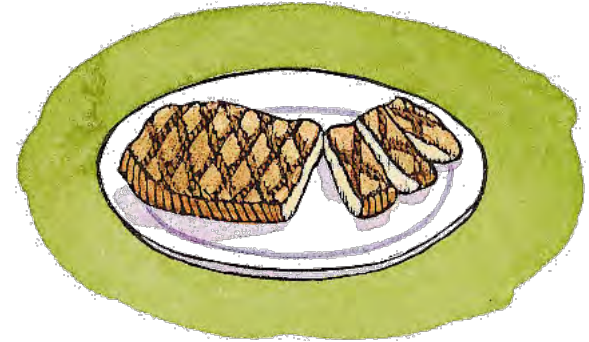
Zinc

655% DRI



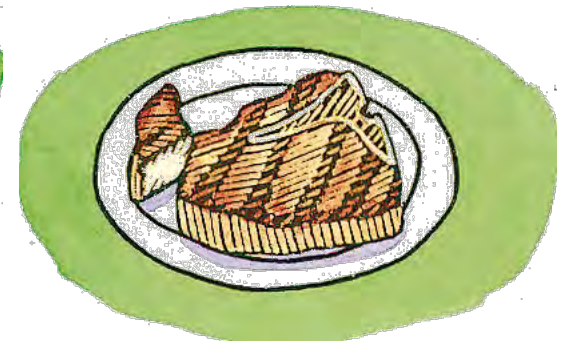
Steamed Oysters

45% DRI



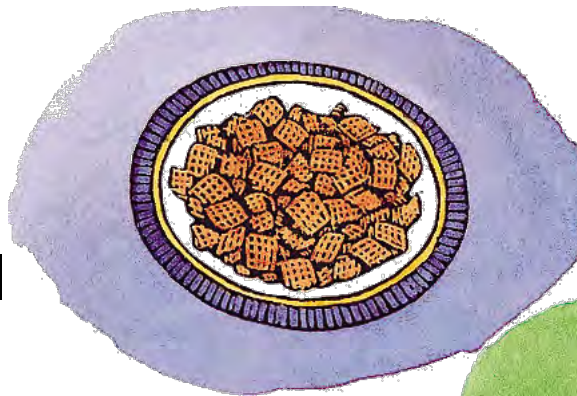
Beef Steak

Yogurt



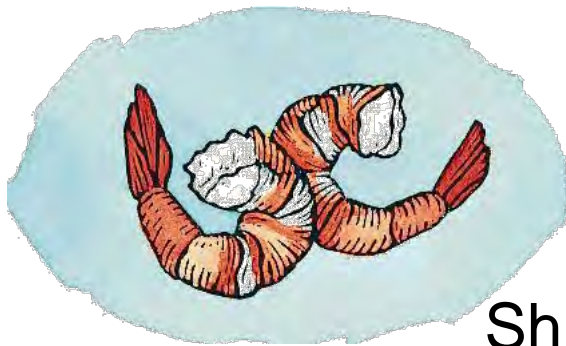
Pork Chop

35% DRI



Enriched Cereal

Shrimp



***What trace mineral
deficiency?***

Iodine!

Entirely

Preventable!

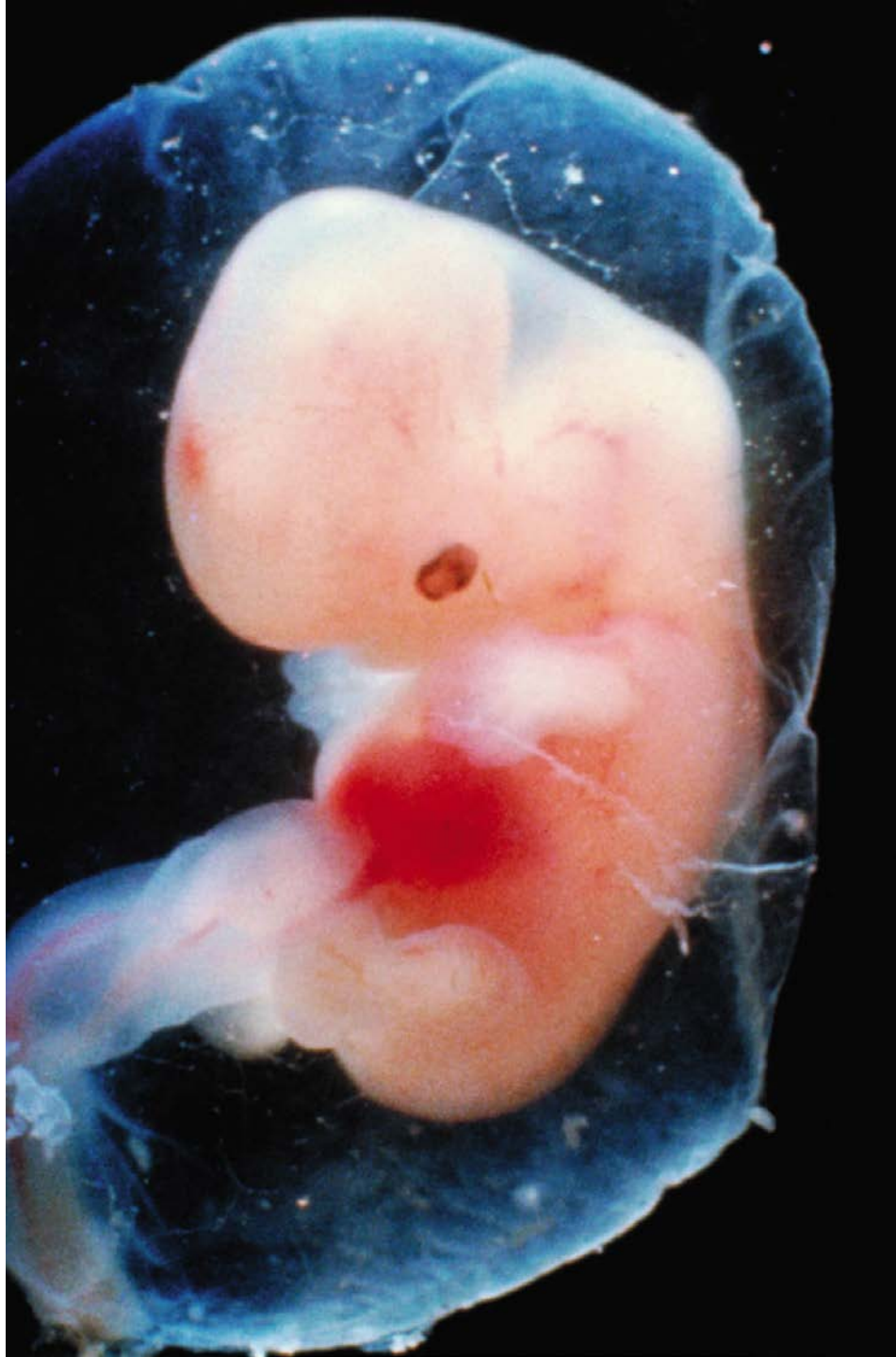
Iodized Salt

Seafood

Supplements







Nope!!!
About 67%



because
you're **98%**
water.



Bottled Water Facts:

- 1:15 Households in US
- 250-1000x \$ Cost of Tap!
- 1/3 Contaminated →
Bacteria
Arsenic
Synthetic Organic Chemicals



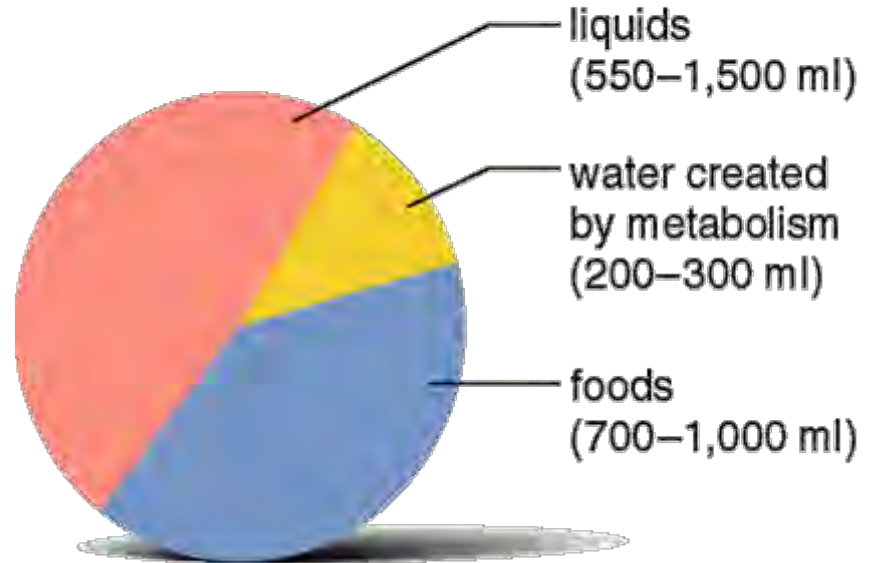
Water Balance

Water and You

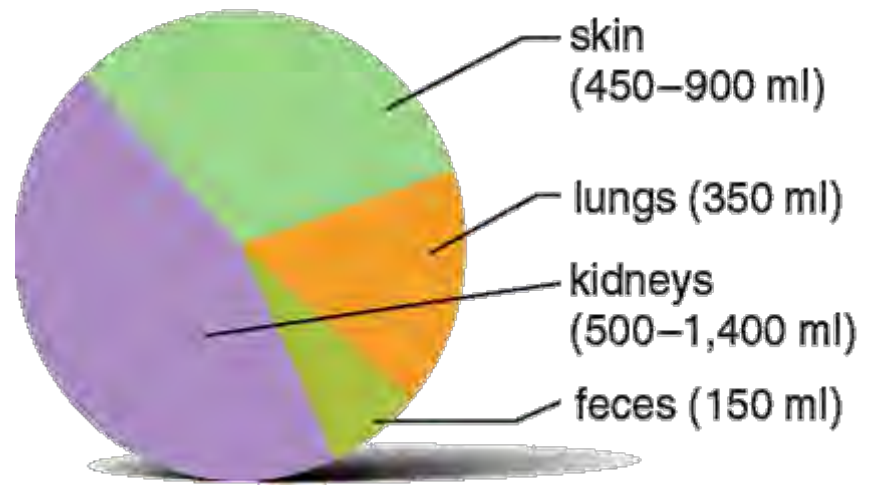


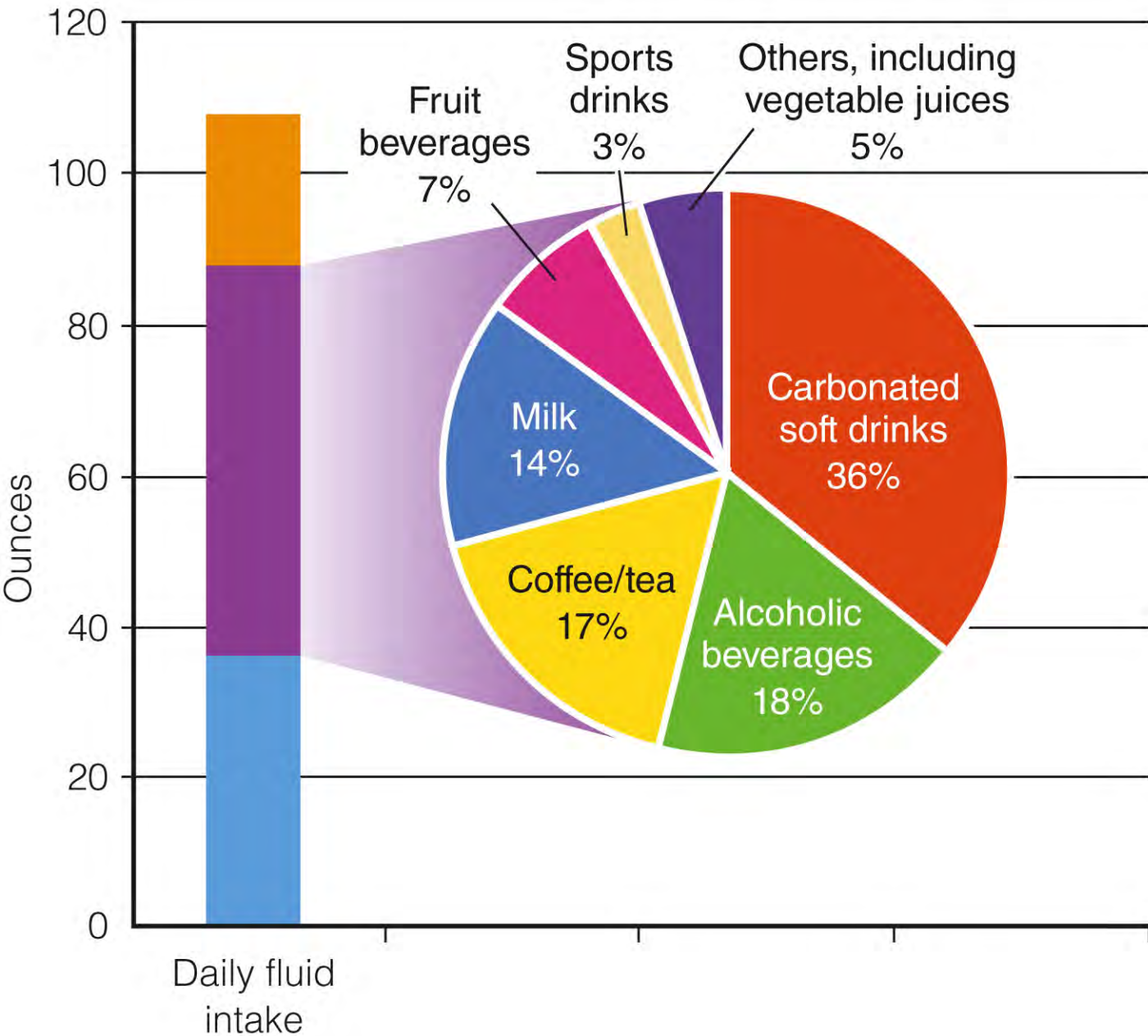
Nancy Clark + S&W

Water input (Total = 1,450–2,800 ml)



Water output (Total = 1,450–2,800 ml)





Key:

- Water in foods
- Water in beverages
- Plain drinking water (including carbonated and bottled water)