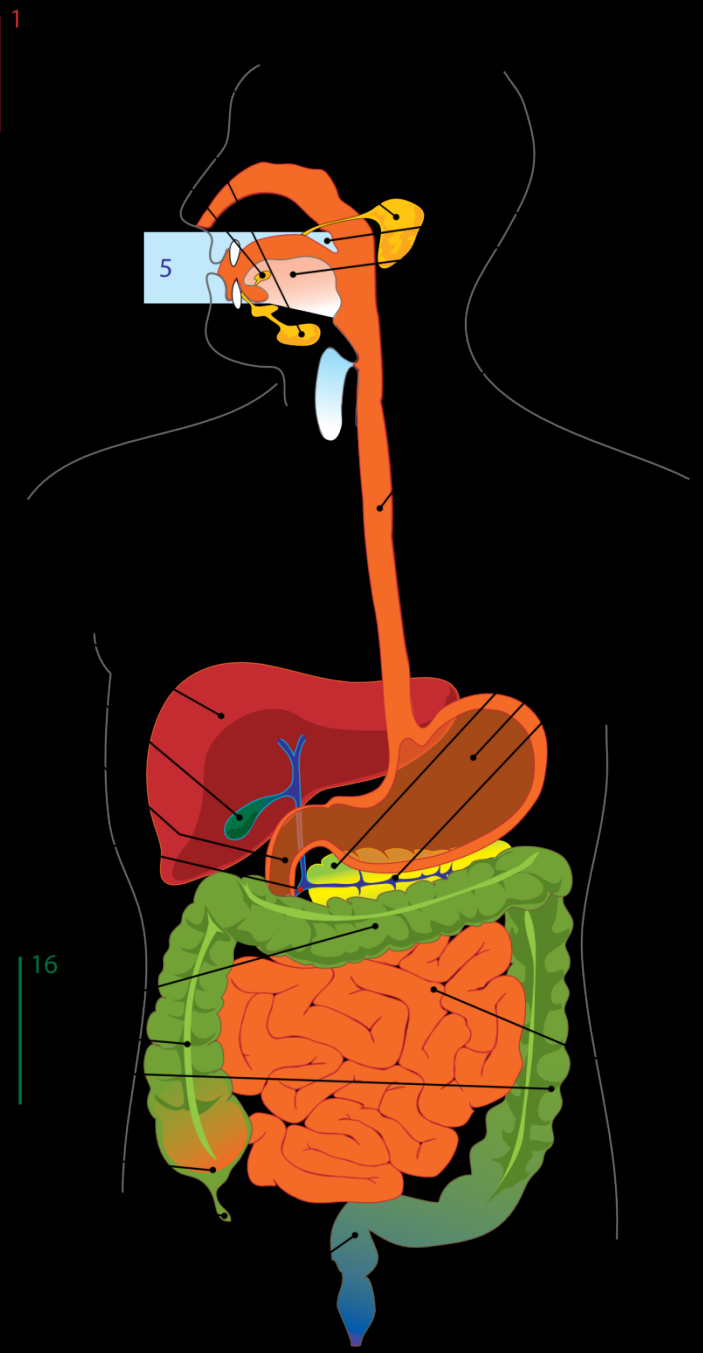
Digestive System

Digestive System



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Digestive System

Table 31.1

Minerals Required by the Human Body

Mineral	Sources	Functions	Symptoms of Deficiency
Major Minerals			
Calcium (Ca)	Dairy products, leafy green vegetables	Maintenance of bones, muscle contraction, nerve signal transmission	Retarded growth in children; osteoporosis in adults
Chloride (Cl)	Table salt	Water balance, digestion	Very rare
Magnesium (Mg)	Broccoli, leafy green vegetables, whole-grain wheat products	Component of bones, teeth; nerve signaling, muscle contraction	Irregular heartbeat, muscle spasms, seizures
Phosphorus (P)	Dairy products, meat, whole grains	Component of bone, nucleic acids, ATP	Bone loss in older women
Potassium (K)	Numerous fruits and vegetables, dairy products	Nerve signal transmission, fluid balance	Muscle cramps, irregular heartbeat, paralysis
Sodium (Na)	Table salt	Nerve signal transmission, fluid balance	In rare instances, muscle cramps, shock
Sulfur (S)	Protein-rich foods (eggs, meat)	Detoxification of drugs; component of some amino acids, vitamins	Unknown when dietary protein is adequate
Trace Minerals			
Chromium (Cr)	Liver, nuts, whole grains	Helps activate insulin	Elevated glucose, insulin levels
Copper (Cu)	Liver, seafood, nuts, legumes	Enzyme activation, hemoglobin synthesis	Ricketts-like skeletal problems, anemia
Fluorine (F)	Fluorinated tap water, toothpaste	Resistance to tooth decay	Increased tooth decay
Iodine (I)	Iodized table salt, seafood, dairy products	Synthesis of thyroid hormones	Goiter, mental retardation in children of iodine-deficient mothers
Iron (Fe)	Whole grains, beef, fish, beans, nuts	Synthesis of hemoglobin	Iron deficiency anemia
Manganese (Mn)	Whole grains, nuts, leafy green vegetables	Enzyme activation	Never observed in humans
Molybdenum (Mo)	Dairy products, grains, legumes	Enzyme activation	Increased heart rate, night blindness, edema
Selenium (Se)	Seafood, liver, eggs	Enzyme activation	Muscle pain, weakness, vascular deterioration
Zinc (Zn)	Meat, poultry, fish, eggs, beans	Enzyme activation in many processes	Stunted growth, diarrhea

Table 31.1

Digestive System

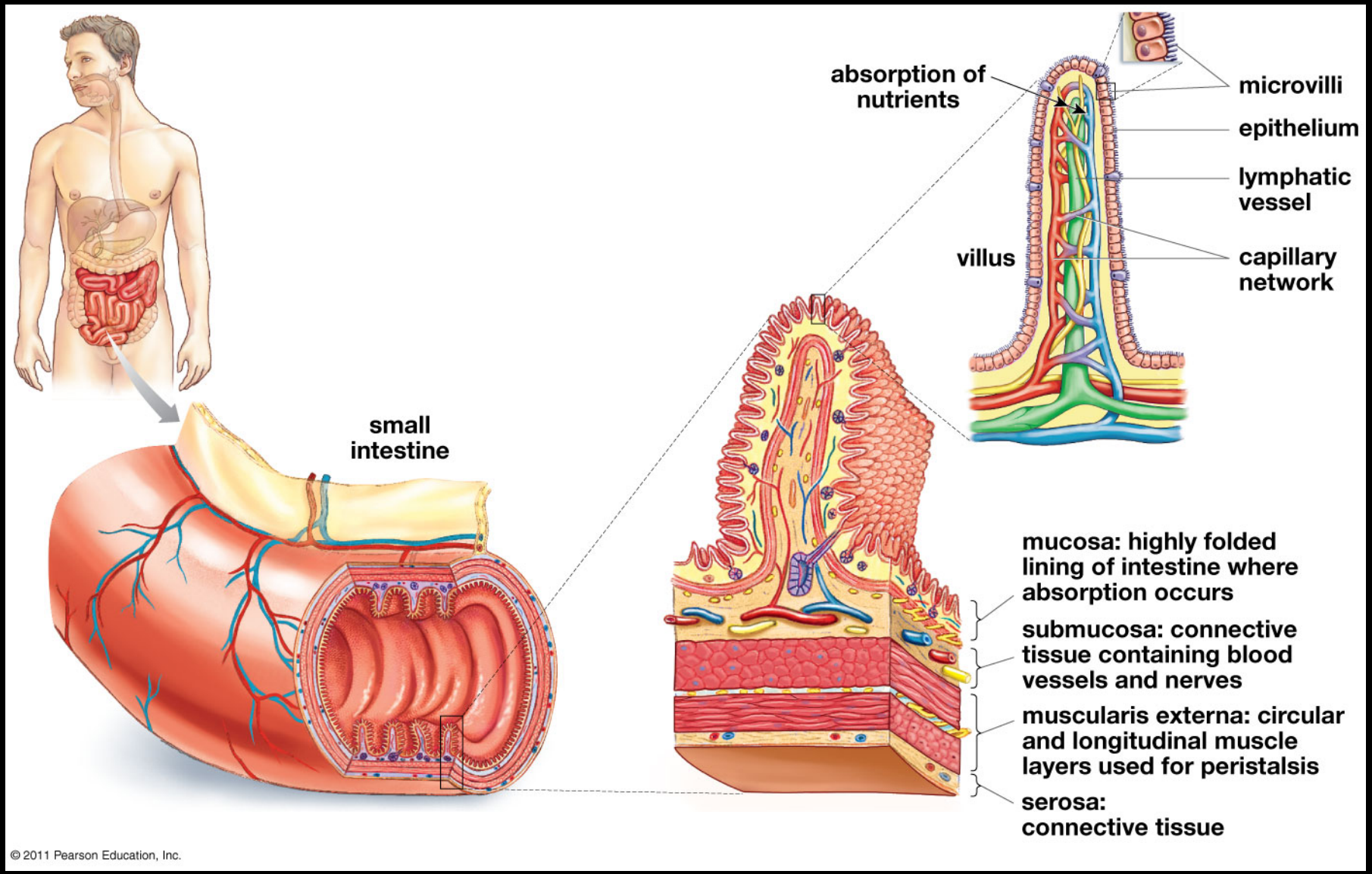

Fig. 31.2

Digestive System

Table 31.2

Vitamins in the Human Diet

Vitamins	Sources	Functions	Symptoms of Deficiency
Water-Soluble Vitamins			
Thiamin (B_1)	Whole grains, legumes, nuts	Coenzyme in cellular respiration	Beriberi
Riboflavin (B_2)	Dairy products, leafy green vegetables	Coenzyme in cellular respiration	Skin lesions; blurred vision
Niacin	Peanuts, poultry, beans	Part of cellular respiration enzyme	Pellagra, mental disorders
Vitamin B_6	Whole grains, dairy products, nuts, leafy green vegetables	Part of coenzyme in amino acid synthesis	Anemia, twitching, skin disorders
Pantothenic acid	Nuts, beans, dairy products, eggs	Coenzyme in fat synthesis	Numbness, fatigue
Folic acid	Leafy green vegetables, beans, orange juice	Coenzyme in hemoglobin production, DNA formation	Spina bifida in mothers deficient in folic acid
Vitamin B_{12}	Dairy products, eggs, meat	Coenzyme in nucleic acid formation, red blood cell maturation	Pernicious anemia
Biotin	Eggs, fish, poultry	Coenzyme in synthesis of fat, amino acids	Scaly, inflamed skin, poor growth
Vitamin C	Citrus fruits, green peppers, cauliflower, broccoli	Promotes collagen synthesis in bone, cartilage; antioxidant	Scurvy, poor wound healing
Fat-Soluble Vitamins			
Vitamin A	Liver, fish, eggs, fortified dairy products	Critical to vision	Night blindness, complete blindness in severe cases
Vitamin D	Can be produced by skin exposed to sunlight; fatty fish, fortified dairy products	Regulates bone metabolism; serves as transcription factor	Possible role in many diseases
Vitamin E	Vegetable oils, asparagus, eggs, almonds	Antioxidant; helps protect cell membranes	In infants, hemolytic anemia (rare)
Vitamin K	Liver, leafy green vegetables; some production by bacteria in gut	Production of compounds used in blood clotting	Blood-clotting problems in newborns

Table 31.2

Digestive System

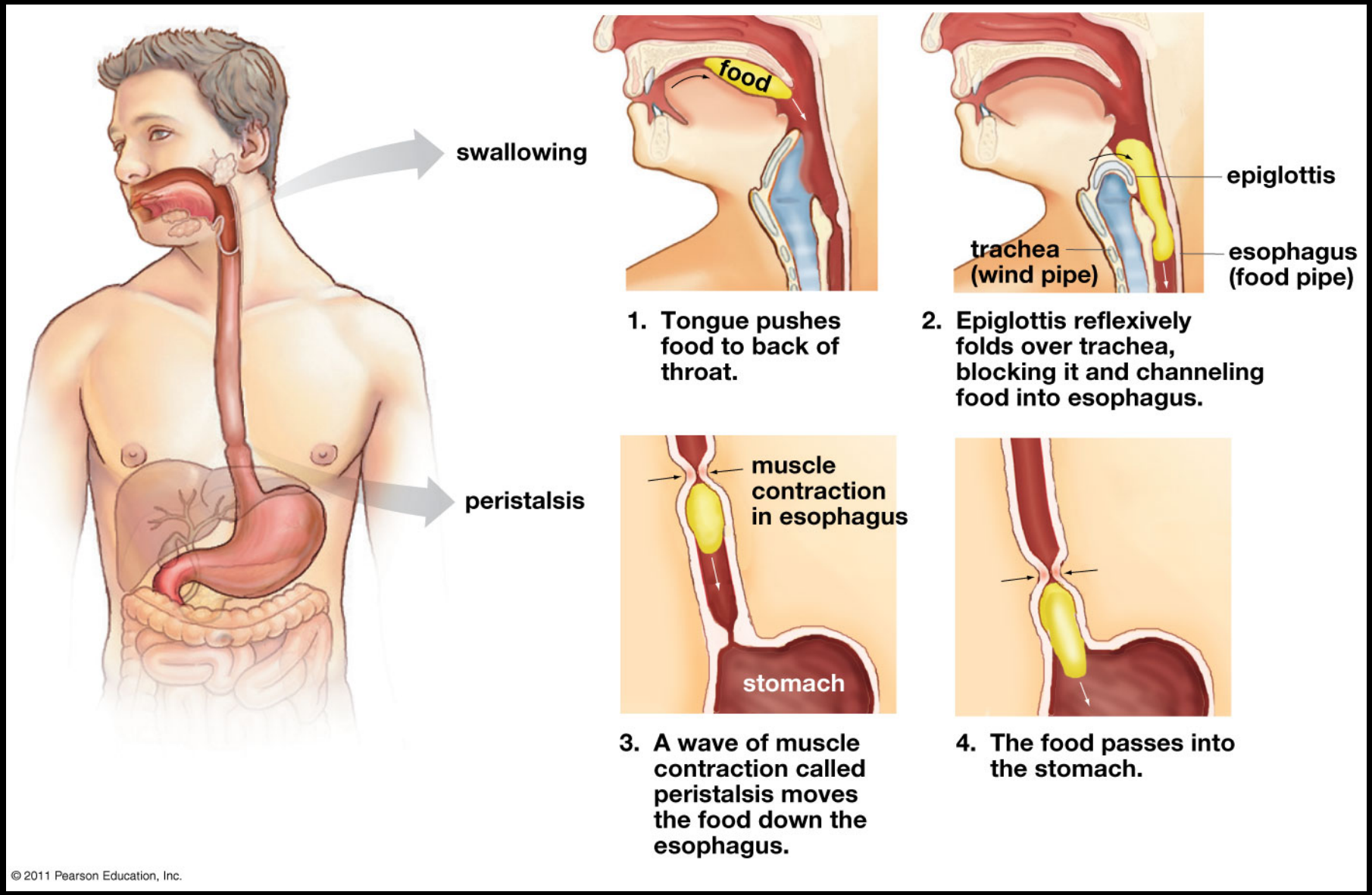

Fig. 31.3

Digestive System

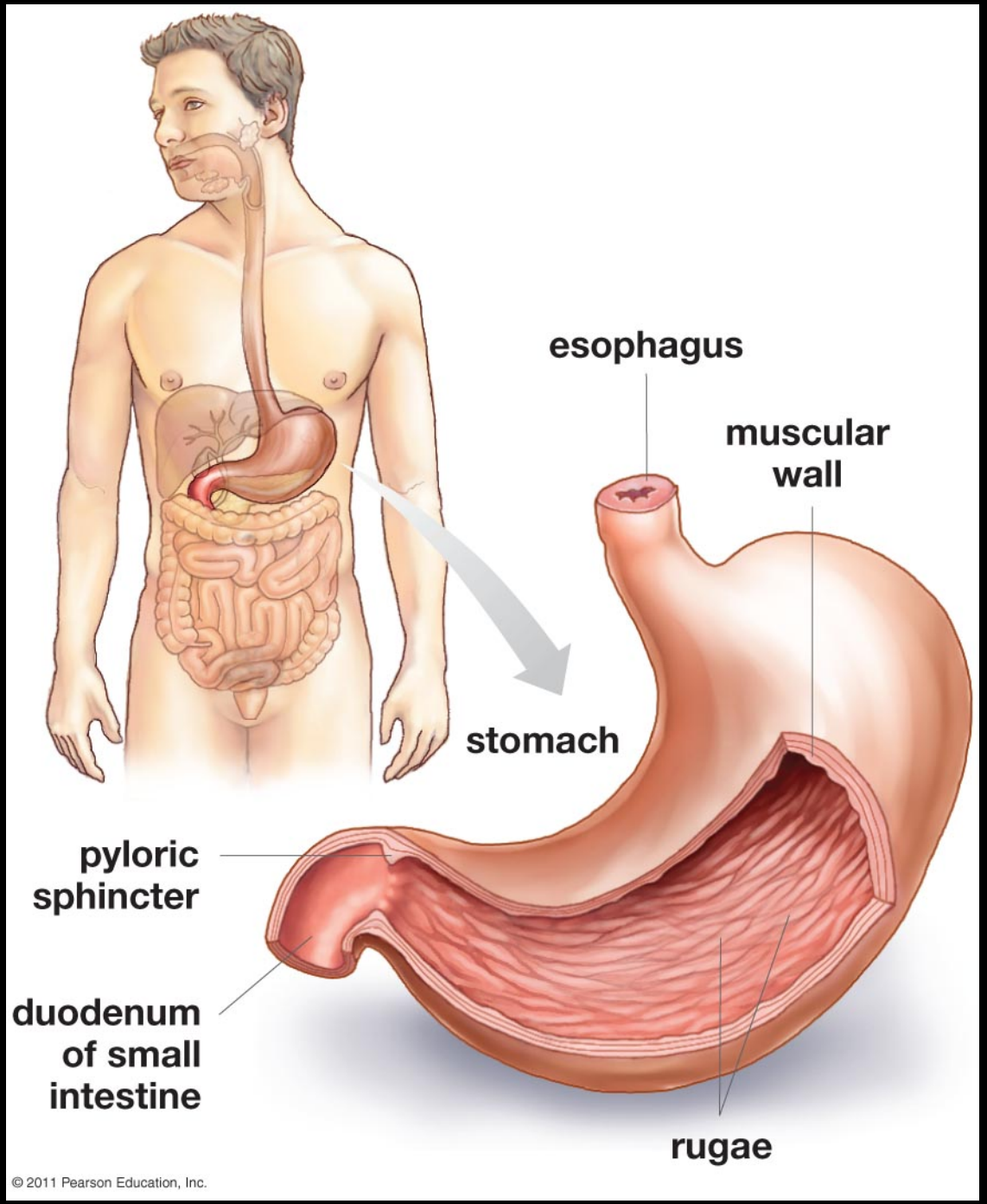

Fig. 31.4

Digestive System

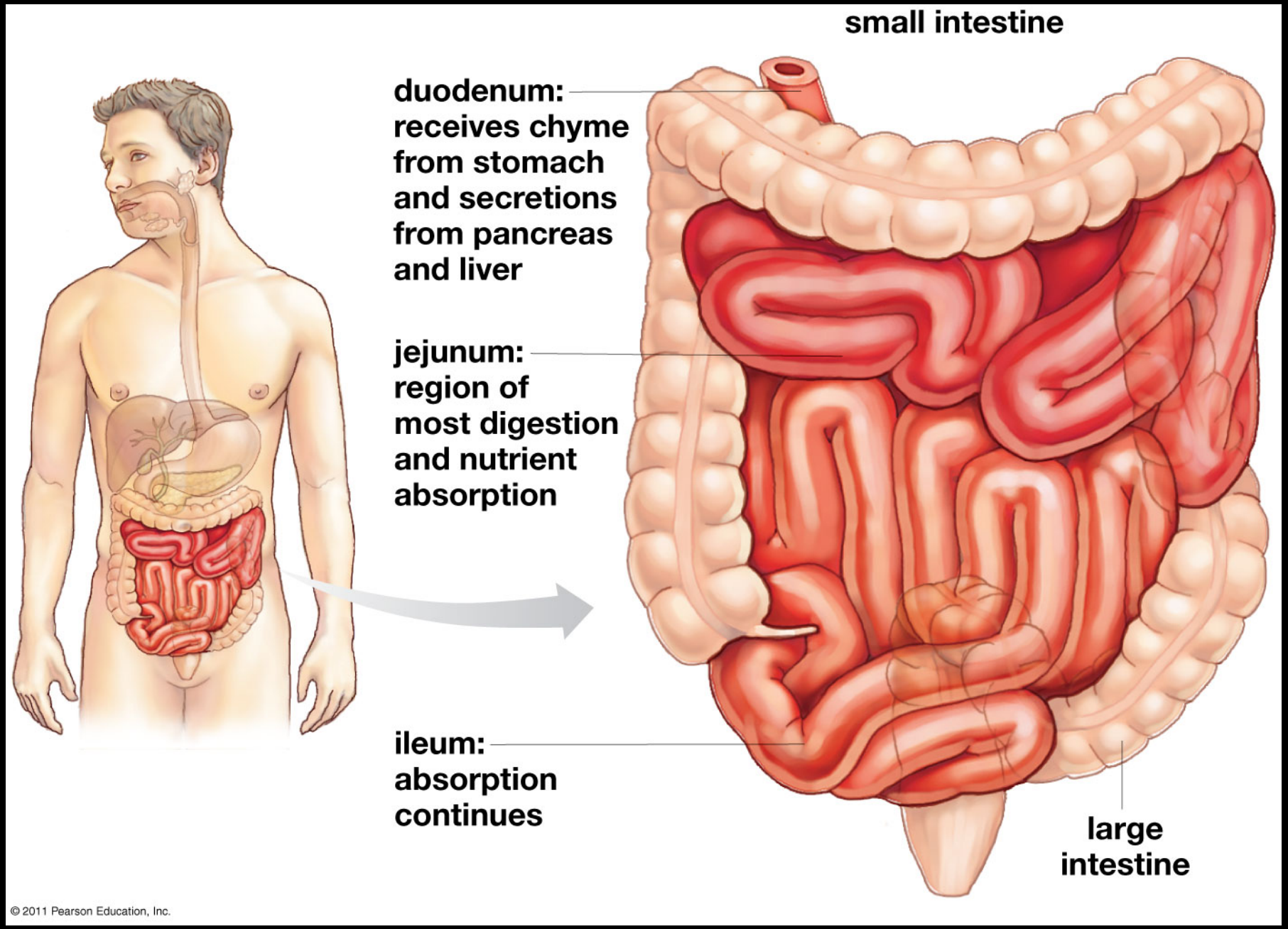

Fig. 31.5

Digestive System

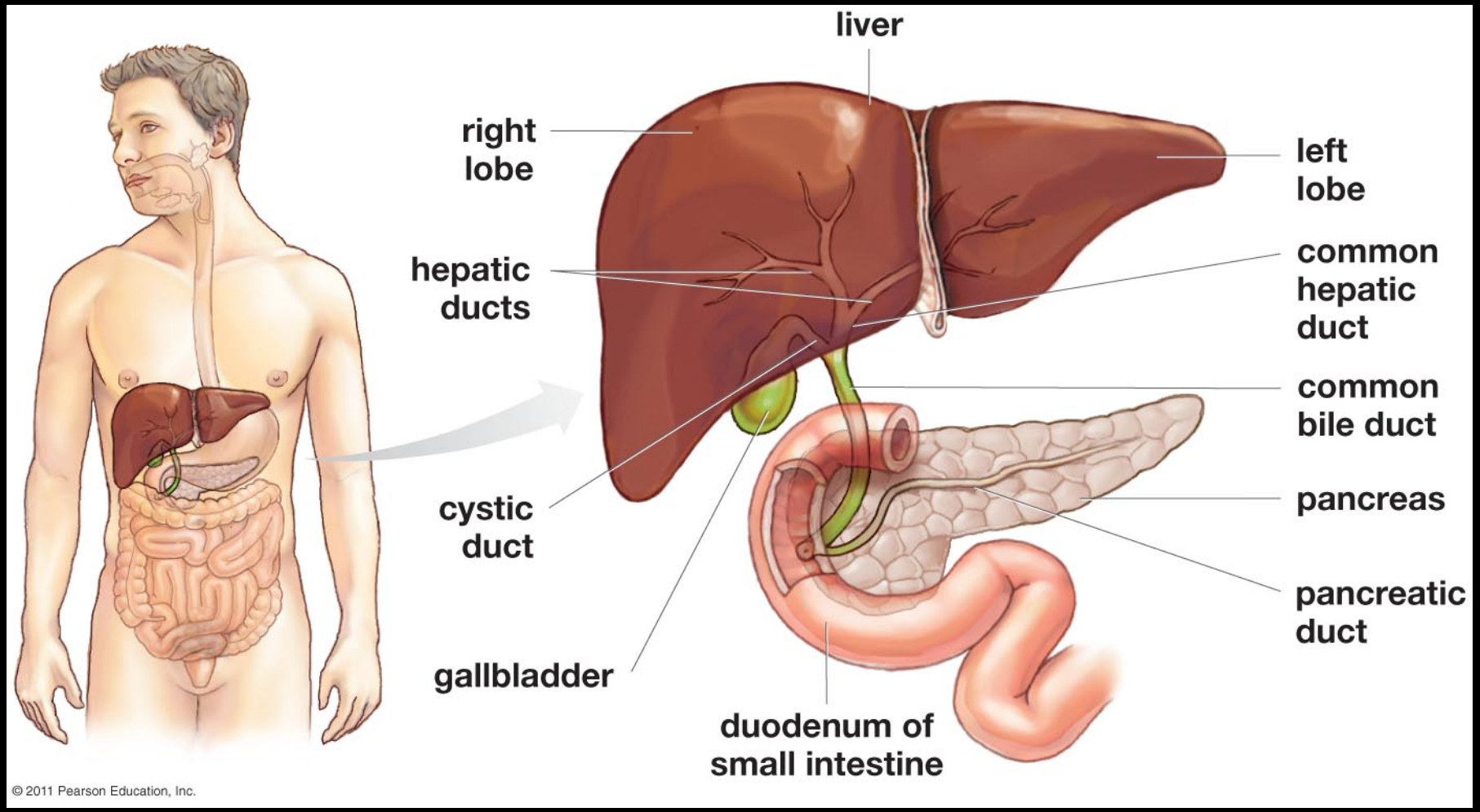

Fig. 31.6

Digestive System

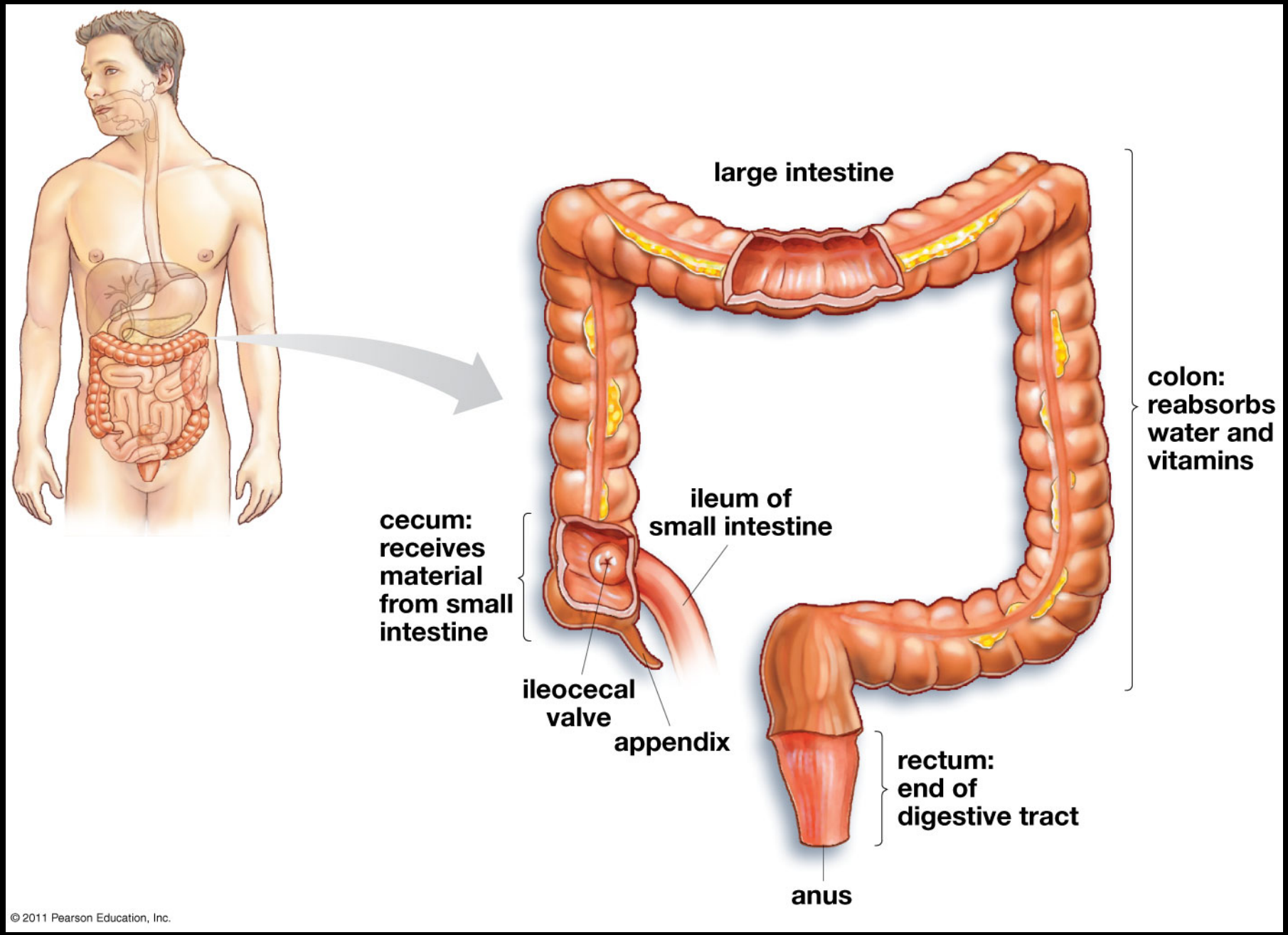

Fig. 31.7

Digestive System

Fig. 31.8

Digestive System

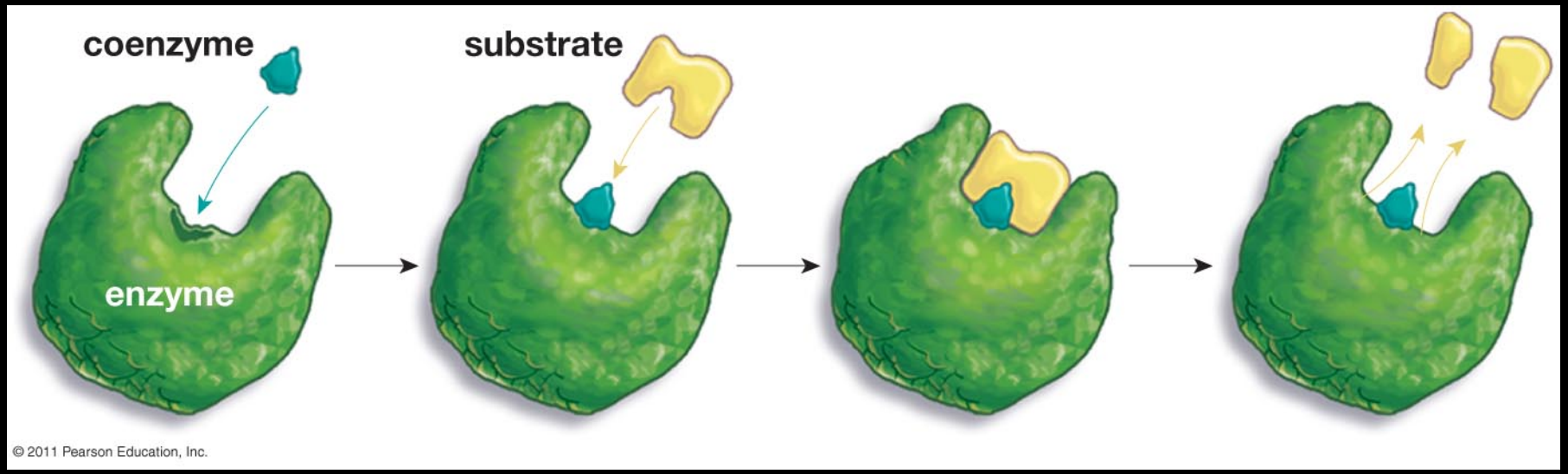

Fig. 31.9

Digestive System

Fig. 31.10

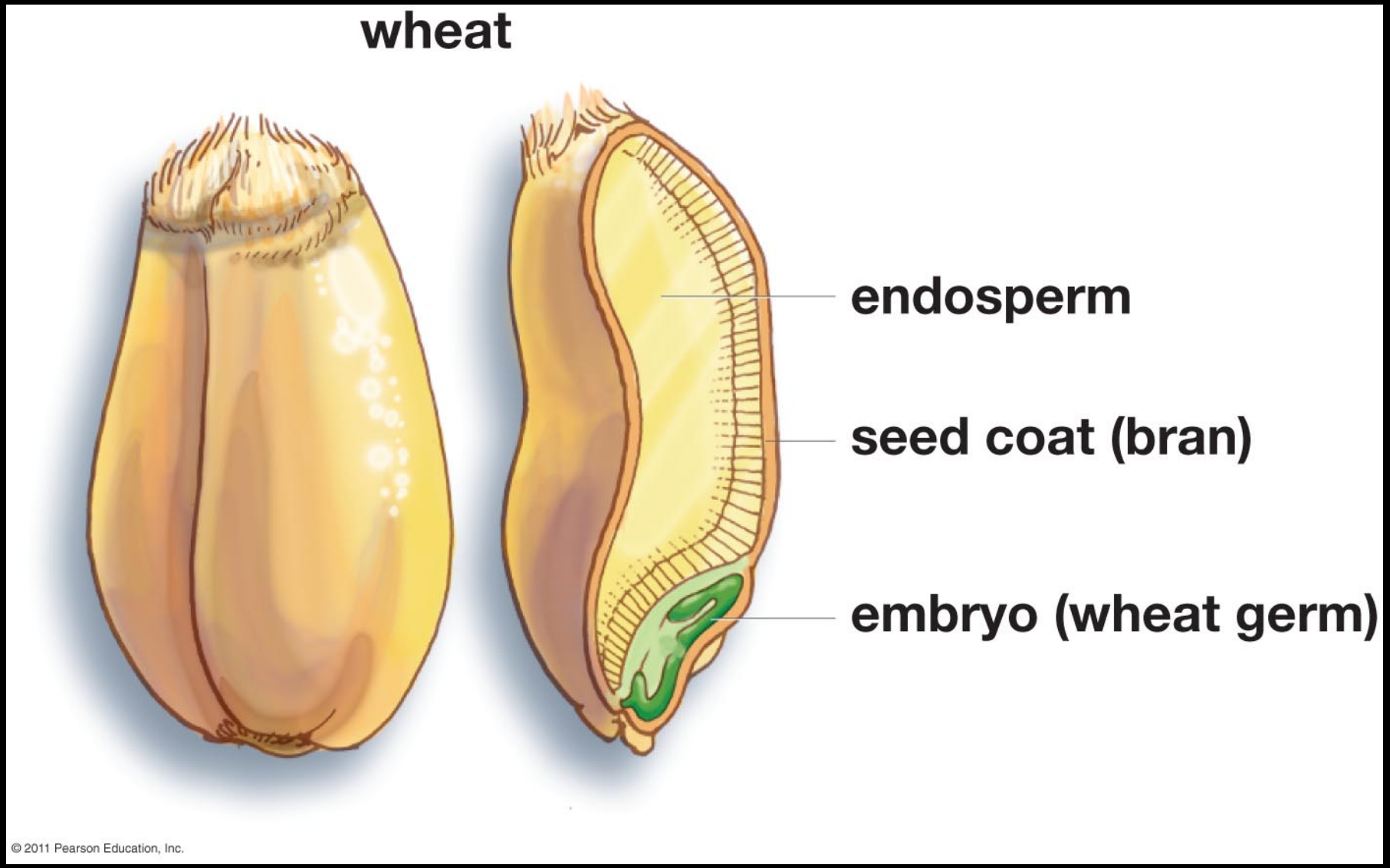
wheat
endosperm
seed coat (bran)
embryo (wheat germ)
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Fig. 31.11

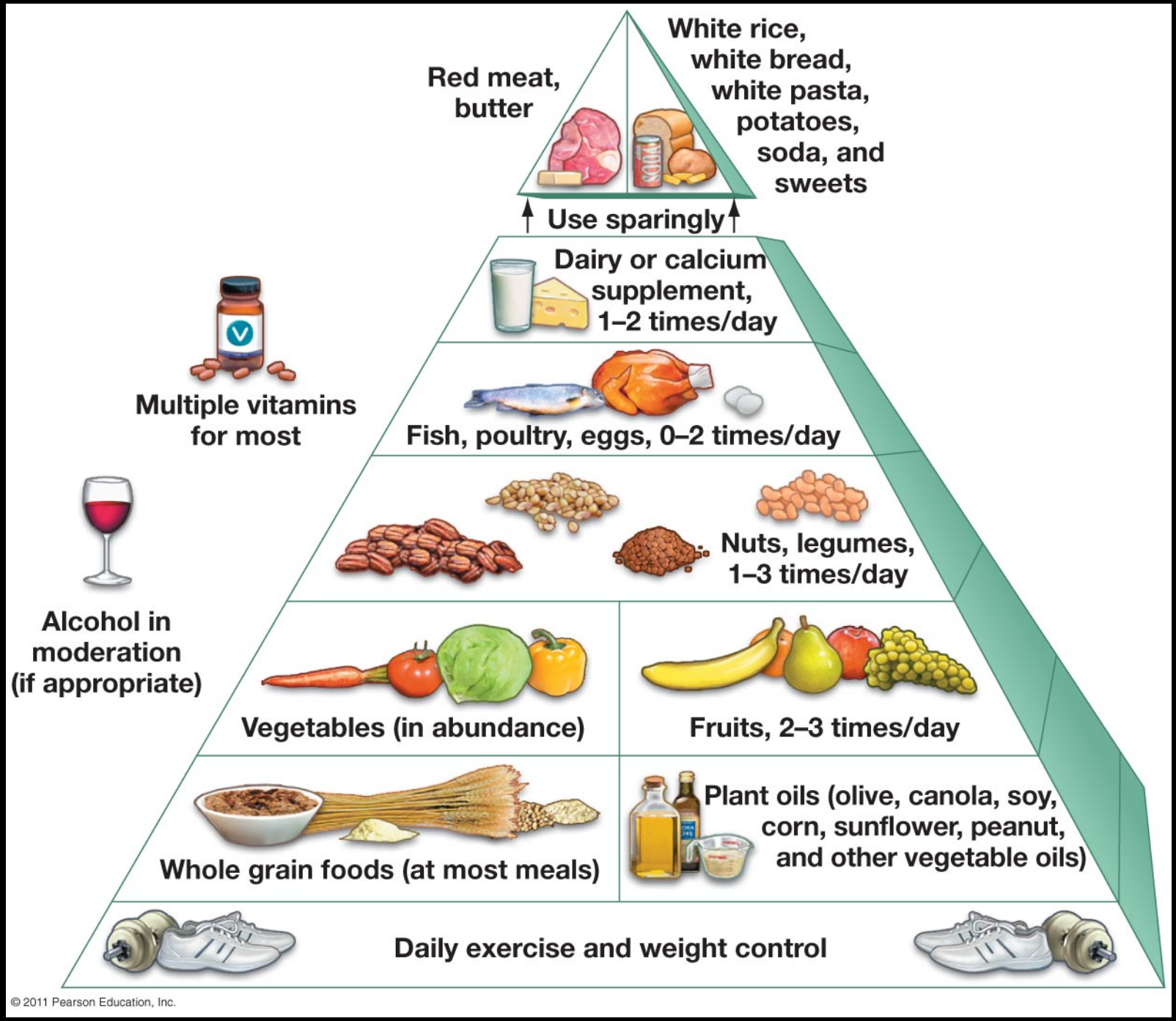
Red meat, butter
White rice, white bread, white pasta, potatoes, soda, and sweets
Use sparingly
Dairy or calcium supplement, 1–2 times/day
Multiple vitamins for most
Fish, poultry, eggs, 0–2 times/day
Nuts, legumes, 1–3 times/day
Alcohol in moderation (if appropriate)
Vegetables (in abundance)
Fruits, 2–3 times/day
Plant oils (olive, canola, soy, corn, sunflower, peanut, and other vegetable oils)
Whole grain foods (at most meals)
Daily exercise and weight control
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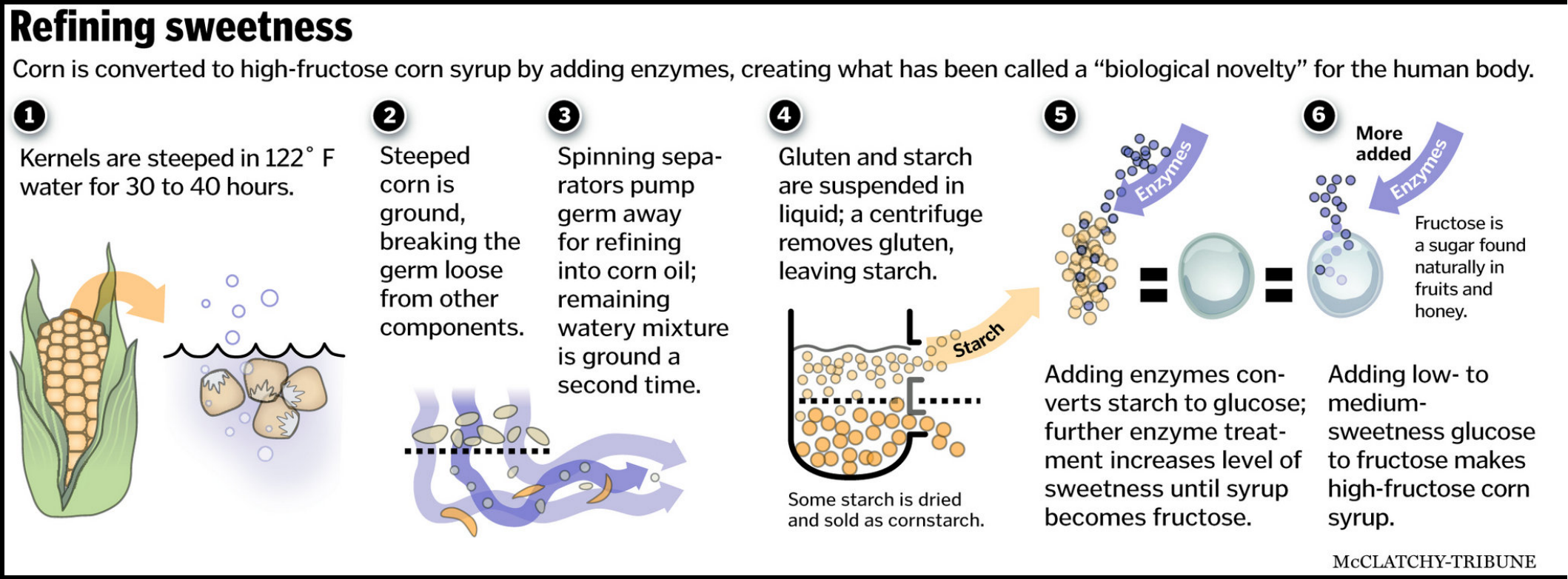
Fig. 31.13

Digestive System

High-fructose corn syrup (HFCS)



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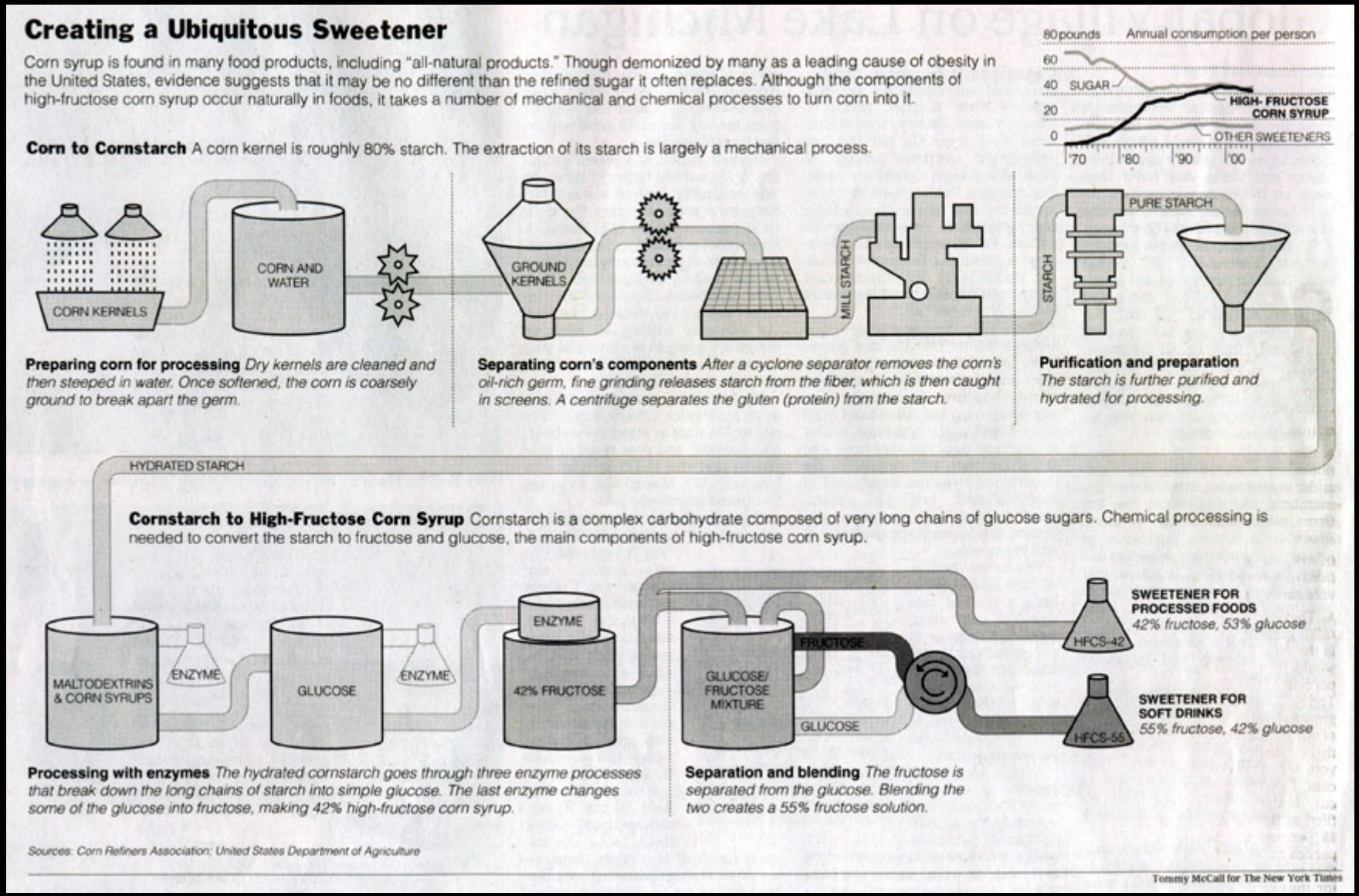
High-fructose corn syrup (HFCS)



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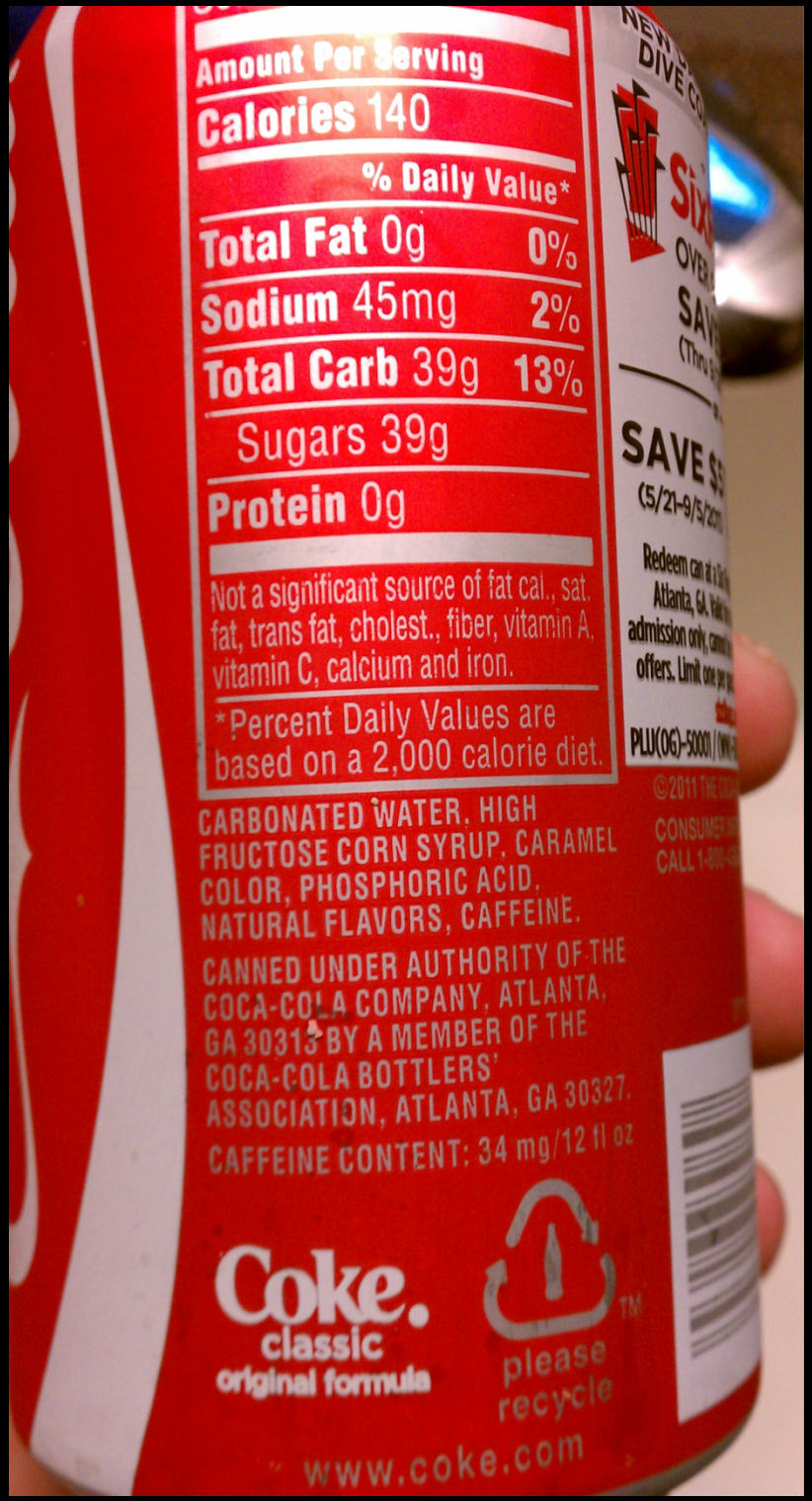
Is this food?



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Another way of teaching?

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Suwon, South Korea