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# NUTRITION NOW

# Dietary Reference Intakes (DRI)

The Dietary Reference Intakes (DRI) include two sets of nutrient intake goals for individuals—the Recommended Dietary Allowance (RDA) and Adequate Intake (AI). The RDA reflects the average daily amount of a nutrient considered adequate to meet the needs of most healthy people. If there is insufficient evidence to determine an RDA, an AI is set. In addition, the Estimated Energy Requirement (EER) represents the average dietary energy intake considered adequate to maintain energy balance in healthy people.

The DRI also include the Tolerable Upper Intake Level (UL) that represents the estimated maximum daily amount of a nutrient that appears safe for most healthy people to consume on a regular basis. Turn the page for a listing of the UL for selected vitamins and minerals. Note that the absence of a UL for a nutrient does not indicate that it is safe to consume in high doses, but only that research is too limited to set a UL. Chapter 1 describes these DRI values in detail.

## Estimated Energy Requirements (EER), Recommended Dietary Allowances (RDA), and Adequate Intakes (AI) for Water, Energy, and the Energy Nutrients

Age (yr)	Reference BMI (kg/m <sup>2</sup> )	Reference Height cm (in)	Reference Weight kg (lb)	Water <sup>a</sup> AI (L/day)	Energy EER <sup>b</sup> (kcal/day)	Carbohydrate RDA (g/day)	Total Fiber AI (g/day)	Total Fat AI (g/day)	Linoleic Acid AI (g/day)	Linolenic Acid AI (g/day)	Protein RDA (g/day) <sup>c</sup>	Protein RDA (g/kg/day)
<b>Males</b>												
0–0.5	—	62 (24)	6 (13)	0.7 <sup>a</sup>	570	60	—	31	4.4	0.5	9.1	1.52
0.5–1	—	71 (28)	9 (20)	0.8 <sup>f</sup>	743	95	—	30	4.6	0.5	11	1.20
1–3 <sup>g</sup>	—	86 (34)	12 (27)	1.3	1046	130	19	—	7	0.7	13	1.05
4–8 <sup>g</sup>	15.3	115 (45)	20 (44)	1.7	1742	130	25	—	10	0.9	19	0.95
9–13	17.2	144 (57)	36 (79)	2.4	2279	130	31	—	12	1.2	34	0.95
14–18	20.5	174 (68)	61 (134)	3.3	3152	130	38	—	16	1.6	52	0.85
19–30	22.5	177 (70)	70 (154)	3.7	3067 <sup>h</sup>	130	38	—	17	1.6	56	0.80
31–50	22.5 <sup>i</sup>	177 (70) <sup>i</sup>	70 (154) <sup>i</sup>	3.7	3067 <sup>h</sup>	130	38	—	17	1.6	56	0.80
>50	22.5 <sup>i</sup>	177 (70) <sup>i</sup>	70 (154) <sup>i</sup>	3.7	3067 <sup>h</sup>	130	30	—	14	1.6	56	0.80
<b>Females</b>												
0–0.5	—	62 (24)	6 (13)	0.7 <sup>a</sup>	520	60	—	31	4.4	0.5	9.1	1.52
0.5–1	—	71 (28)	9 (20)	0.8 <sup>f</sup>	676	95	—	30	4.6	0.5	11	1.20
1–3 <sup>g</sup>	—	86 (34)	12 (27)	1.3	992	130	19	—	7	0.7	13	1.05
4–8 <sup>g</sup>	15.3	115 (45)	20 (44)	1.7	1642	130	25	—	10	0.9	19	0.95
9–13	17.4	144 (57)	37 (81)	2.1	2071	130	26	—	10	1.0	34	0.95
14–18	20.4	163 (64)	54 (119)	2.3	2368	130	26	—	11	1.1	46	0.85
19–30	21.5	163 (64)	57 (126)	2.7	2403 <sup>j</sup>	130	25	—	12	1.1	46	0.80
31–50	21.5 <sup>i</sup>	163 (64) <sup>i</sup>	57 (126) <sup>i</sup>	2.7	2403 <sup>j</sup>	130	25	—	12	1.1	46	0.80
>50	21.5 <sup>i</sup>	163 (64) <sup>i</sup>	57 (126) <sup>i</sup>	2.7	2403 <sup>j</sup>	130	21	—	11	1.1	46	0.80
<b>Pregnancy</b>												
1st trimester				3.0	+0	175	28	—	13	1.4	46	0.80
2nd trimester				3.0	+340	175	28	—	13	1.4	71	1.10
3rd trimester				3.0	+452	175	28	—	13	1.4	71	1.10
<b>Lactation</b>												
1st 6 months				3.8	+330	210	29	—	13	1.3	71	1.30
2nd 6 months				3.8	+400	210	29	—	13	1.3	71	1.30

NOTE: For all nutrients, values for infants are AI. Dashes indicate that values have not been determined.  
<sup>a</sup>The water AI includes drinking water, water in beverages, and water in foods; in general, drinking water and other beverages contribute about 70 to 80 percent, and foods, the remainder. Conversion factors: 1 L = 33.8 fluid oz; 1 L = 1.06 qt; 1 cup = 8 fluid oz.  
<sup>b</sup>The Estimated Energy Requirement (EER) represents the average dietary energy intake that will maintain energy balance in a healthy person of a given gender, age, weight, height, and physical activity level. The values listed are based on an “active” person at the reference height and weight and

at the midpoint ages for each group until age 19. Chapter 8 and Appendix F provide equations and tables to determine estimated energy requirements.  
<sup>c</sup>The linolenic acid referred to in this table and text is the omega-3 fatty acid known as alpha-linolenic acid.  
<sup>d</sup>The values listed are based on reference body weights.  
<sup>e</sup>Assumed to be from human milk.  
<sup>f</sup>Assumed to be from human milk and complementary foods and beverages. This includes approximately 0.6 L (~2½ cups) as total fluid including formula, juices, and drinking water.  
<sup>g</sup>For energy, the age groups for young children are 1–2 years and 3–8 years.

<sup>h</sup>For males, subtract 10 kcalories per day for each year of age above 19.  
<sup>i</sup>Because weight need not change as adults age if activity is maintained, reference weights for adults 19 through 30 years are applied to all adult age groups.  
<sup>j</sup>For females, subtract 7 kcalories per day for each year of age above 19.

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## Recommended Dietary Allowances (RDA) and Adequate Intakes (AI) for Vitamins

Age (yr)	Thiamin RDA (mg/day)	Riboflavin RDA (mg/day)	Niacin RDA (mg/day) <sup>a</sup>	Biotin AI (µg/day)	Pantothenic acid AI (mg/day)	Vitamin B <sub>6</sub> RDA (mg/day)	Folate RDA (µg/day) <sup>b</sup>	Vitamin B <sub>12</sub> RDA (µg/day)	Choline AI (mg/day)	Vitamin C RDA (mg/day)	Vitamin A RDA (µg/day) <sup>c</sup>	Vitamin D RDA (IU/day) <sup>d</sup>	Vitamin E RDA (mg/day) <sup>e</sup>	Vitamin K AI (µg/day)
<b>Infants</b>														
0–0.5	0.2	0.3	2	5	1.7	0.1	65	0.4	125	40	400	400 (10 µg)	4	2.0
0.5–1	0.3	0.4	4	6	1.8	0.3	80	0.5	150	50	500	400 (10 µg)	5	2.5
<b>Children</b>														
1–3	0.5	0.5	6	8	2	0.5	150	0.9	200	15	300	600 (15 µg)	6	30
4–8	0.6	0.6	8	12	3	0.6	200	1.2	250	25	400	600 (15 µg)	7	55
<b>Males</b>														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	600 (15 µg)	11	60
14–18	1.2	1.3	16	25	5	1.3	400	2.4	550	75	900	600 (15 µg)	15	75
19–30	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	600 (15 µg)	15	120
31–50	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	600 (15 µg)	15	120
51–70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	600 (15 µg)	15	120
>70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	800 (20 µg)	15	120
<b>Females</b>														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	600 (15 µg)	11	60
14–18	1.0	1.0	14	25	5	1.2	400	2.4	400	65	700	600 (15 µg)	15	75
19–30	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	600 (15 µg)	15	90
31–50	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	600 (15 µg)	15	90
51–70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	600 (15 µg)	15	90
>70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	800 (20 µg)	15	90
<b>Pregnancy</b>														
≤18	1.4	1.4	18	30	6	1.9	600	2.6	450	80	750	600 (15 µg)	15	75
19–30	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	600 (15 µg)	15	90
31–50	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	600 (15 µg)	15	90
<b>Lactation</b>														
≤18	1.4	1.6	17	35	7	2.0	500	2.8	550	115	1200	600 (15 µg)	19	75
19–30	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	600 (15 µg)	19	90
31–50	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	600 (15 µg)	19	90

NOTE: For all nutrients, values for infants are AI. The glossary on the inside back cover defines units of nutrient measure.

<sup>a</sup>Niacin recommendations are expressed as niacin equivalents (NE), except for recommendations for infants younger than 6 months, which are expressed as preformed niacin.

<sup>b</sup>Folate recommendations are expressed as dietary folate equivalents (DFE).

<sup>c</sup>Vitamin A recommendations are expressed as retinol activity equivalents (RAE).

<sup>d</sup>Vitamin D recommendations are expressed as cholecalciferol and assume an absence of adequate exposure to sunlight.

<sup>e</sup>Vitamin E recommendations are expressed as α-tocopherol.

## Recommended Dietary Allowances (RDA) and Adequate Intakes (AI) for Minerals

Age (yr)	Sodium AI (mg/day)	Chloride AI (mg/day)	Potassium AI (mg/day)	Calcium RDA (mg/day)	Phosphorus RDA (mg/day)	Magnesium RDA (mg/day)	Iron RDA (mg/day)	Zinc RDA (mg/day)	Iodine RDA (µg/day)	Selenium RDA (µg/day)	Copper RDA (µg/day)	Manganese AI (mg/day)	Fluoride AI (mg/day)	Chromium AI (µg/day)	Molybdenum RDA (µg/day)
<b>Infants</b>															
0–0.5	120	180	400	200	100	30	0.27	2	110	15	200	0.003	0.01	0.2	2
0.5–1	370	570	700	260	275	75	11	3	130	20	220	0.6	0.5	5.5	3
<b>Children</b>															
1–3	1000	1500	3000	700	460	80	7	3	90	20	340	1.2	0.7	11	17
4–8	1200	1900	3800	1000	500	130	10	5	90	30	440	1.5	1.0	15	22
<b>Males</b>															
9–13	1500	2300	4500	1300	1250	240	8	8	120	40	700	1.9	2	25	34
14–18	1500	2300	4700	1300	1250	410	11	11	150	55	890	2.2	3	35	43
19–30	1500	2300	4700	1000	700	400	8	11	150	55	900	2.3	4	35	45
31–50	1500	2300	4700	1000	700	420	8	11	150	55	900	2.3	4	35	45
51–70	1300	2000	4700	1000	700	420	8	11	150	55	900	2.3	4	30	45
>70	1200	1800	4700	1200	700	420	8	11	150	55	900	2.3	4	30	45
<b>Females</b>															
9–13	1500	2300	4500	1300	1250	240	8	8	120	40	700	1.6	2	21	34
14–18	1500	2300	4700	1300	1250	360	15	9	150	55	890	1.6	3	24	43
19–30	1500	2300	4700	1000	700	310	18	8	150	55	900	1.8	3	25	45
31–50	1500	2300	4700	1000	700	320	18	8	150	55	900	1.8	3	25	45
51–70	1300	2000	4700	1200	700	320	8	8	150	55	900	1.8	3	20	45
>70	1200	1800	4700	1200	700	320	8	8	150	55	900	1.8	3	20	45
<b>Pregnancy</b>															
≤18	1500	2300	4700	1300	1250	400	27	12	220	60	1000	2.0	3	29	50
19–30	1500	2300	4700	1000	700	350	27	11	220	60	1000	2.0	3	30	50
31–50	1500	2300	4700	1000	700	360	27	11	220	60	1000	2.0	3	30	50
<b>Lactation</b>															
≤18	1500	2300	5100	1300	1250	360	10	13	290	70	1300	2.6	3	44	50
19–30	1500	2300	5100	1000	700	310	9	12	290	70	1300	2.6	3	45	50
31–50	1500	2300	5100	1000	700	320	9	12	290	70	1300	2.6	3	45	50

NOTE: For all nutrients, values for infants are AI. The glossary on the inside back cover defines units of nutrient measure.

## Tolerable Upper Intake Levels (UL) for Vitamins

Age (yr)	Niacin (mg/day) <sup>a</sup>	Vitamin B <sub>6</sub> (mg/day)	Folate (µg/day) <sup>a</sup>	Choline (mg/day)	Vitamin C (mg/day)	Vitamin A (IU/day) <sup>b</sup>	Vitamin D (IU/day)	Vitamin E (mg/day) <sup>c</sup>
<b>Infants</b>								
0–0.5	—	—	—	—	—	600	1000 (25 µg)	—
0.5–1	—	—	—	—	—	600	1500 (38 µg)	—
<b>Children</b>								
1–3	10	30	300	1000	400	600	2500 (63 µg)	200
4–8	15	40	400	1000	650	900	3000 (75 µg)	300
9–13	20	60	600	2000	1200	1700	4000 (100 µg)	600
<b>Adolescents</b>								
14–18	30	80	800	3000	1800	2800	4000 (100 µg)	800
<b>Adults</b>								
19–70	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
>70	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
<b>Pregnancy</b>								
≤18	30	80	800	3000	1800	2800	4000 (100 µg)	800
19–50	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
<b>Lactation</b>								
≤18	30	80	800	3000	1800	2800	4000 (100 µg)	800
19–50	35	100	1000	3500	2000	3000	4000 (100 µg)	1000

<sup>a</sup>The UL for niacin and folate apply to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

<sup>c</sup>The UL for vitamin E applies to any form of supplemental α-tocopherol, fortified foods, or a combination of the two.

<sup>b</sup>The UL for vitamin A applies to the preformed vitamin only.

## Tolerable Upper Intake Levels (UL) for Minerals

Age (yr)	Sodium (mg/day)	Chloride (mg/day)	Calcium (mg/day)	Phosphorus (mg/day)	Magnesium (mg/day) <sup>d</sup>	Iron (mg/day)	Zinc (mg/day)	Iodine (µg/day)	Selenium (µg/day)	Copper (µg/day)	Manganese (mg/day)	Fluoride (mg/day)	Molybdenum (µg/day)	Boron (mg/day)	Nickel (mg/day)	Vanadium (mg/day)
<b>Infants</b>																
0–0.5	—	—	1000	—	—	40	4	—	45	—	—	0.7	—	—	—	—
0.5–1	—	—	1500	—	—	40	5	—	60	—	—	0.9	—	—	—	—
<b>Children</b>																
1–3	1500	2300	2500	3000	65	40	7	200	90	1000	2	1.3	300	3	0.2	—
4–8	1900	2900	2500	3000	110	40	12	300	150	3000	3	2.2	600	6	0.3	—
9–13	2200	3400	3000	4000	350	40	23	600	280	5000	6	10	1100	11	0.6	—
<b>Adolescents</b>																
14–18	2300	3600	3000	4000	350	45	34	900	400	8000	9	10	1700	17	1.0	—
<b>Adults</b>																
19–50	2300	3600	2500	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
51–70	2300	3600	2000	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
>70	2300	3600	2000	3000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
<b>Pregnancy</b>																
≤18	2300	3600	3000	3500	350	45	34	900	400	8000	9	10	1700	17	1.0	—
19–50	2300	3600	2500	3500	350	45	40	1100	400	10,000	11	10	2000	20	1.0	—
<b>Lactation</b>																
≤18	2300	3600	3000	4000	350	45	34	900	400	8000	9	10	1700	17	1.0	—
19–50	2300	3600	2500	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	—

<sup>d</sup>The UL for magnesium applies to synthetic forms obtained from supplements or drugs only.  
NOTE: An upper Limit was not established for vitamins and minerals not listed and for those age groups listed with a dash (—) because of a lack of data, not because these nutrients are safe to consume at any level of intake. All nutrients can have adverse effects when intakes are excessive.

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# Nutrition Now

# About the Author

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# Nutrition Now

Judith E. Brown



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Jose Luis Pelaez, Inc./Blend Images/Corbis

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## nutrition timeline

1621

First Thanksgiving feast at Plymouth colony



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1702

First coffeehouse in America opens in Philadelphia

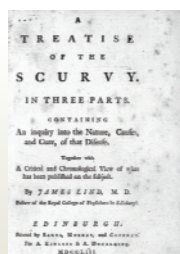


PhotoDisc

1734

Scurvy recognized

Courtesy of Wellcome Library, London



1744

First record of ice cream in America at Maryland colony



PhotoDisc

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Alistair Berg/Digital Vision/Getty Images

**1747**

Lind publishes "Treatise on Scurvy," citrus identified as cure



PhotoDisc

**1750**

Ojibway and Sioux war over control of wild rice stands

**1762**

Sandwich invented by the Earl of Sandwich



PhotoDisc

**1771**

Potato heralded as famine food

**1774**

Americans drink more coffee in protest over Britain's tea tax



Digital Vision/Alamy

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**nutrition timeline**

**1775**

Lavoisier ("the father of the science of nutrition") discovers the energy-producing property of food



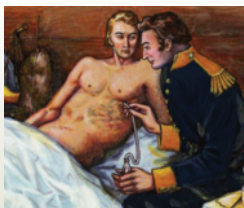
Stefano Bianchetti/CORBIS

**1816**

Protein and amino acids identified, followed by carbohydrates and fats in the mid-1800s

**1833**

Beaumont's experiments on a wounded man's stomach greatly expand knowledge about digestion



© Bettmann/Corbis

**1862**

U.S. Department of Agriculture founded by authorization of President Lincoln

**1871**

Proteins, carbohydrates, and fats determined to be insufficient to support life; there are other "essential" components

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Scott Goodwin Photography

**1895**

First milk station providing children with uncontaminated milk opens in New York City



Bettman/CORBIS

**1896**

Atwater publishes *Proximate Composition of Food Materials*

**1906**

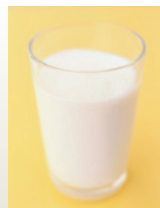
Pure Food and Drug Act signed by President Theodore Roosevelt to protect consumers against contaminated foods



Bettman/CORBIS

**1910**

Pasteurized milk introduced



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**1912**

Funk suggests scurvy, beriberi, and pellagra caused by deficiency of "vitamines" in the diet



John E. Kelly/Photolibary/Getty Images

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## nutrition timeline

1913

First vitamin discovered (vitamin A)



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1914

Goldberger identifies the cause of pellagra (niacin deficiency) in poor children to be a missing component of the diet rather than a germ as others believed

1916

First dietary guidance material produced for the public released; title is "Food for Young Children"

1917

First food groups published—the Five Food Groups: Milk and Meat; Vegetables and Fruits; Cereals; Fats and Fat Foods; Sugars and Sugary Foods

1921

First fortified food produced: iodized salt, needed to prevent widespread iodine-deficiency goiter in many parts of the United States



LunaseeStudios/Shutterstock.com



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Protein Quality 15-5

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ROSENFELD/AGE Fotostock

**1928**

American Society for Nutritional Sciences and the *Journal of Nutrition* founded

**1929**

Essential fatty acids identified



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**1930s**

Vitamin C identified in 1932, followed by pantothenic acid and riboflavin in 1933 and vitamin K in 1934

**1937**

Pellagra found to be due to a deficiency of niacin



PhotoDisc

**1938**

Health Canada issues nutrient intake standards

**1941**

First refined grain enrichment standards developed



Creatas/Photosearch

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## nutrition timeline

**1941**

First Recommended Dietary Allowances (RDAs) announced by President Franklin Roosevelt on radio



Franklin D. Roosevelt  
Presidential Library and  
Museum

**1946**

National School Lunch Act passed



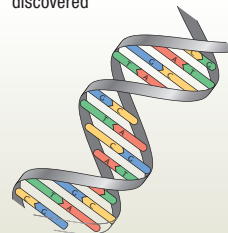
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**1947**

Vitamin B<sub>12</sub> identified

**1953**

Double helix structure of DNA discovered



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**1956**

Basic Four Food Groups released by the U.S. Department of Agriculture

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Functions of Phytochemicals in Humans 21-4  
Food Sources of Phytochemicals 21-8  
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**1965**

Food Stamp Act passed, Food Stamp program established

**1966**

Child Nutrition Act adds school breakfast to the National School Lunch Program



PHOTO/ISC

**1968**

First national nutrition survey in U.S. launched (Ten State Nutrition Survey)

**1970**

First Canadian national nutrition survey launched (Nutrition Canada National Survey)

**1972**

Special Supplemental Food and Nutrition Program for Women, Infants, and Children (WIC) established



Digital Vision/Getty Images

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# nutrition timeline

**1977**

Dietary Goals for the U.S. issued

**1978**

First Health Objectives for the Nation released

**1989**

First national scientific consensus report on diet and chronic disease published

**1992**

The Food Guide pyramid is released by the USDA



**1997**

RDAs expanded to Dietary Reference Intakes (DRIs)

USDA

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Bill Milne/StockFood/Creative/Getty Images

## 1998

Folic acid fortification of refined grain products begins



Richard Anderson

## 2003

Sequencing of DNA in the human genome completed; marks beginning of new era of research in nutrient–gene interactions

## 2015

Increasing rates of obesity and type 2 diabetes become global epidemics



Kablonk1/RF/Getty Images LLC/Alamy

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# Preface

*“Everything should be made as simple as possible. But not simpler.”*  
—ALBERT EINSTEIN

Welcome to the 8th edition of *Nutrition Now*, an introductory, science-based, and application-oriented textbook for your nutrition courses. The text contains multiple critical thinking and decision-making activities for students, organized around key nutrition concepts and specific learning objectives. It is part of a learning system that includes access to Cengage’s MindTap and its interactive and critical thinking activities, and many other resources for instructors and students.

This edition of *Nutrition Now* catches up with advances in the field of nutrition. We now have the 2015 Dietary Guidelines for Americans with its strong emphasis on healthy dietary patterns and physical activity, revised nutrition labels and labeling regulations, additional facts about nutrient–gene interactions in health and disease, and a better understanding of the influence of epigenetic factors on health risks related to dietary patterns. Realities about the usefulness of dietary supplements are becoming front-page news. Scientific consensus about dietary fat and health has taken a 180° turn, and new knowledge about the causes of obesity is changing approaches to its prevention and management. These and many other developments in nutrition knowledge are included in the 8th edition of *Nutrition Now* and its pedagogical features. *Nutrition Now* continues to be oriented toward enhancing instructors’ teaching experiences and helping students build a firm foundation of scientific knowledge and understanding about nutrition that will serve them well throughout their careers and life.

## Pedagogical Features

There are 33 units in *Nutrition Now*, and all but the first unit can be used in any order. Each unit begins with learning objectives, and content and review questions at the end of the units are organized around the learning objectives. Student group and individual activities based on real-life situations are presented online in MindTap, along with a variety of videos, review questions, and interactive learning activities. Activities include taste testing to identify genetically determined sensitivity to bitterness, developing a dietary behavioral change plan, anthropometry lab, designing fraudulent nutrition products, a physical activity assessment, and an assessment of three days of dietary intake.

Features presented in the text are updated and expanded in this edition:

- Nutrition Scoreboard, a first-page feature of each unit, pretests student knowledge and understanding of specific nutrition-related topics. The questions have been updated and now include at least four questions per unit. Answers for the Nutrition Scoreboard questions are located at the end of units.
- New photos, figures, tables, and graphs appear in the units.
- Take Action, Reality Check, and Nutrition Up Close features have been revised in a number of units to correspond to updated nutrition content.
- Review Questions have been updated and expanded. Units provide 15–20 review questions.
- The Glossary is expanded to include definitions for new terms introduced into the text.



# Content Changes in the Eighth Edition

To keep the list of changes appearing in this edition to a reasonable length, I have attempted to select and list the substantial changes.

## Unit 1: Key Nutrition Concepts and Terms

- A section on Food Security and Sustainable Diets has been added; content on Food Terrorism is reduced.
- Nutrition Concept #9 content is updated to reflect the 2015 Dietary Guidelines for Americans.

## Unit 2: The Inside Story about Nutrition and Health

- Content presented on chronic inflammation and oxidative stress is rewritten and reorganized.
- Content has been updated to reflect content from the 2015 Dietary Guidelines for Americans.
- Content on nutrient–gene interactions and the causes of obesity are updated.
- Information presented on diet and disease rates is revised.

## Unit 3: Ways of Knowing about Nutrition

- Many of the tables and Illustrations have been revised or updated.

## Unit 4: Understanding Food and Nutrition Labels

- Much of the content of this unit has changed due to new nutrition labeling regulations.
- Content addressed in the features is updated.
- Information on the labeling of GMO foods has been added.

## Unit 5: Nutrition, Attitudes, and Behaviors

- New content appears on the genetics of taste and food preferences.
- Content on trends in and drivers of food choices have been updated.
- An added section relates to strategies for improving diets in groups of people.

## Unit 6: Healthy Diets, Dietary Guidelines, MyPlate, and More

- Replaced content on the 2010 Dietary Guidelines with information from the 2015 Dietary Guidelines.
- Updated content on MyPlate materials.
- Multiple tables and the Take Action feature are updated.

## **Unit 7: How the Body Uses Food: Digestion and Absorption**

- Added content on gut microbiota.

## **Unit 8: Calories! Food, Energy, and Energy Balance**

- Updated content on satiety and determination of total calorie need.

## **Unit 9: Obesity to Underweight: The Highs and Lows of Weight Status**

- Added content on obesity–environment interactions, dietary patterns and obesity development, added sugars and genetic susceptibility to obesity, and the influence of the microbiome on obesity development.

## **Unit 10: Weight Control: The Myths and Realities**

- Updated and revised content on causes and treatment of obesity, and on weight-loss diets.
- Updated content on calorie deficits needed for weight loss.

## **Unit 11: Disordered Eating: Anorexia Nervosa, Bulimia, and Pica**

- Updated content based on revised DMS-V standards.

## **Unit 12: Useful Facts about Sugars, Starches, and Fiber**

- Updated nutrition labeling standards and recommended intake level for added sugars.
- Modified content on dietary fiber based on the 2015 Dietary Guidelines report.
- Added table and expanded discussion on the glycemic index of carbohydrates.

## **Unit 13: Diabetes Now**

- Expanded content on prediabetes, insulin resistance, and metabolic syndrome.
- Updated content on healthy dietary patterns, glycemic index, and diabetes, and on standards of care for diets for people with diabetes.

## **Unit 14: Alcohol: The Positives and Negatives**

- Expanded presentation on fatty liver disease and steatohepatitis.
- Updated content on fetal alcohol spectrum disorder.

## **Unit 15: Proteins and Amino Acids**

- Added content on health effects of protein intake.

## **Unit 16: Vegetarian Diets**

- Added content on vegetarian-style healthy dietary patterns.
- Increased information on macrobiotic vegetarian diets, health implications of vegetarian dietary patterns, and meat and dairy analogs.

## **Unit 17: Food Allergies and Intolerances**

- Added/updated content on gluten-free foods, celiac disease, and non-celiac gluten sensitivity.
- Updated information on the causes and prevention of food allergies.

## **Unit 18: Fats and Cholesterol in Health**

- Added content on the functions of adipocytes and of body fat stores.
- Updated content on low-fat diets and health, and on dietary fat intake recommendations.
- Added content on white and brown adipose tissue.

## **Unit 19: Nutrition and Heart Disease**

- Updated content on dietary recommendations for the prevention and treatment of heart disease.
- Added content on lipoprotein particle size and function, and on non-HDL cholesterol.
- Added content on genetic factors related to heart disease risk.
- Added content on food sources of polyunsaturated fats and processed meats.

## **Unit 20: Vitamins and Your Health**

- Updated and revised tables on vitamin functions, deficiency, toxicity, and food sources. Returned vitamin K to Table 20.5.
- Updated content on the antioxidant vitamins.

## **Unit 21: Phytochemicals**

- Updated content on functions of phytochemicals.

## **Unit 22: Diet and Cancer**

- Revised and updated section on how cancer develops, including acquired gene mutations.
- Updated content on dietary factors associated with cancer development.

## **Unit 23: Good Things to Know about Minerals**

- Updated and reorganized content on osteoporosis.
- Updated diagnostic standards for hypertension.

## **Unit 24: Dietary Supplements**

- Deleted content on functional foods and cholestatin.
- Extensively modified content on effects of herbal remedies and benefits of vitamin and mineral supplements.
- Updated content on pre- and probiotics.

## **Unit 25: Water Is an Essential Nutrient**

- Modified content on water sources, deleted content on safety of bottled water.
- Expanded content on functions of water and water balance.
- Updated water intake recommendations based on the 2015 Dietary Guidelines report, and updated content on the safety of bisphenol A.

## **Unit 26: Nutrient–Gene Interactions in Health and Disease**

- Expanded presentation of epigenetics, gene variants, gene functions, phenotype, environmental triggers, and genetic tests.
- Added the example of sitosterolemia to Table 26.2.

## **Unit 27: Nutrition and Physical Fitness for Everyone**

- Revised information on calculation of maximum and target heart rates.
- Updated physical activity recommendations based on the 2015 Dietary Guidelines report.

## **Unit 28: Nutrition and Physical Performance**

- Updated content on protein and carbohydrate intake and muscle recovery and muscle cell synthesis, and on carbohydrate loading.
- Updated information on healthy dietary patterns and physical health and performance.
- Updated content on dehydration and water intoxication.
- Added content on anabolic steroids and caffeine, and updated functions of ergogenic aids.

## **Unit 29: Good Nutrition for Life: Pregnancy, Breastfeeding, and Infancy**

- Modified presentation of infant mortality rates.
- Updated content on dietary recommendations for pregnancy, breastfeeding, and infancy, and on vitamin and mineral supplement recommendations.

## **Unit 30: Nutrition for the Growing Years: Childhood through Adolescence**

- Updated dietary recommendations and section on benefits of healthy dietary patterns.
- Expanded discussion of importance of portion size.

- Updated resources available from MyPlate.
- Updated content on obesity during childhood and adolescence, school-based programs for obesity prevention, current status of nutrient intake, and advice for developing good eating habits in children.
- Updated information on resources available from MyPlate.

## Unit 31: Nutrition and Health Maintenance for Adults of All Ages

- Updated content on protein need, nutrition and longevity, and healthy dietary patterns for adults.

## Unit 32: The Multiple Dimensions of Food Safety

- Updated information on antibiotic overuse, irradiation, bisphenol A, causes and symptoms of food-borne illnesses, botulism in Alaska, and food safety rules.

## Unit 33: Aspects of Global Nutrition

- Updated content to present information on levels of human development rather than economic development indicators.
- Expanded content on the nutrition transition.

## Appendices and Glossary

- Updated food composition tables.
- The Appendix containing the U.S. Food Exchange System has been replaced with an appendix presenting Aids to Calculations. This appendix includes examples of how to convert nonmetric to metric measurements, nutrient unit conversions, percentage calculations, volume equivalents, and weights and measures equivalents.
- Modified the Glossary to reflect additions and revisions made in the eighth edition of *Nutrition Now*.

## Resources for the Instructor

- **Nutrition MindTap for *Nutrition Now*.** Instant Access Code, ISBN-13: 9781305868304. MindTap is well beyond an e-book, a homework solution or digital supplement, a resource center website, a course delivery platform, or a learning management system. More than 70 percent of students surveyed said it was unlike anything they have seen before. MindTap is a new personal learning experience that combines all your digital assets—readings, multimedia, activities, and assessments—into a singular learning path to improve student outcomes.
- **Diet & Wellness Plus** The Diet & Wellness Plus app in MindTap helps you gain a better understanding of how nutrition relates to your personal health goals. It enables you to track your diet and activity, generate reports, and analyze the nutritional value of the food you eat! It includes more than 55,000 foods in the database, custom food and recipe features, the latest dietary references, as well as your goal and actual percentages of essential nutrients, vitamins, and minerals. It also helps you to identify a problem behavior and make a positive change. After completing a wellness profile questionnaire, Diet & Wellness Plus will rate the level of concern for eight different areas of

wellness, helping you determine the areas where you are most at risk. It then helps you put together a plan for positive change by helping you select a goal to work toward—complete with a reward for all your hard work.

The Diet & Wellness Plus app is accessed from the app dock in MindTap and can be used throughout the course for students to track their diet and activity and behavior change. There are activities and labs in the course that have students access the app to further extend learning and integrate course content.

- **Instructor Companion Site** Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via [www.cengage.com/login](http://www.cengage.com/login). Access and download PowerPoint presentations, images, instructor's manual, videos, and more.
- **Cengage Learning Testing Powered by Cognero** Cengage Learning Testing Powered by Cognero is a flexible online system that allows you to:
  - author, edit, and manage test bank content from multiple Cengage Learning solutions
  - create multiple test versions in an instant
  - deliver tests from your LMS, your classroom, or wherever you want
- **Global Nutrition Watch** Bring currency to the classroom with Global Nutrition Watch from Cengage Learning! This user-friendly website provides convenient access to thousands of trusted sources, including academic journals, newspapers, videos, and podcasts, for you to use for research projects or classroom discussion. Global Nutrition Watch is updated daily to offer the most current news about topics related to nutrition.

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It is said that instructors adopt a specific textbook but that students play a major role in instructors' decision to keep it. I am honored that you chose to adopt *Nutrition Now* and deeply pleased with the thought that students are helping you decide to keep it.

Reviewers' feedback is the lifeline of text writing, and the reviewers of the seventh edition conveyed very useful advice that was incorporated into the eighth edition. The advice led me to some very interesting places on specific topics that changed my thinking and writing. Thank you for the helpful information and please keep your comments coming.