Dietary Reference Intakes: Macronutrients

Nutrient	Function	Life Stage Group	RDA/AI* g/d	AMDR	Selected Food Sources	Adverse effects of excessive consumption
Carbohydrate— Total digestible	RDA based on its role as the primary energy source for the brain; AMDR based on its role as a source of kilocalories to maintain body weight	Infants 0–6 mo 7–12 mo Children 1–3 y 4–8 y Males 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Females 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31–50 y	60* 95* **130** **130** **130** **130** **130** **130** **130** **130** **130** **130** **130** **130** **130** **130** **175** **175** **210** **210** **210**	ND[b] ND 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65 45-65	Starch and sugar are the major types of carbohydrates. Grains and vegetables (corn, pasta, rice, potatoes, breads) are sources of starch. Natural sugars are found in fruits and juices. Sources of added sugars are soft drinks, candy, fruit drinks, and desserts.	While no defined intake level at which potential adverse effects of total digestible carbohydrate was identified, the upper end of the adequate macronutrient distribution range (AMDR) was based on decreasing risk of chronic disease and providing adequate intake of other nutrients. It is suggested that the maximal intake of added sugars be limited to providing no more than 25 percent of energy.
Total Fiber	Improves laxation, reduces risk of coronary heart disease, assists in maintaining normal blood glucose levels..	Infants 0–6 mo 7–12 mo Children 1–3 y 4–8 y Males 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Females 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31–50 y	ND ND 19* 25* 31* 38* 38* 38* 30* 30* 26* 26* 25* 25* 21* 21* 28* 28* 28* 29* 29* 29*		Includes dietary fiber naturally present in grains (such as found in oats, wheat, or unmilled rice) and functional fiber synthesized or isolated from plants or animals and shown to be of benefit to health	Dietary fiber can have variable compositions and therefore it is difficult to link a specific source of fiber with a particular adverse effect, especially when phytate is also present in the natural fiber source. It is concluded that as part of an overall healthy diet, a high intake of dietary fiber will not produce deleterious effects in healthy individuals. While occasional adverse gastrointestinal symptoms are observed when consuming some isolated or synthetic fibers, serious chronic adverse effects have not been observed. Due to the bulky nature of fibers, excess consumption is likely to be self-limiting. Therefore, a UL was not set for individual functional fibers.

NOTE: The table is adapted from the DRI reports, see www.nap.edu. It represents Recommended Dietary Allowances (RDAs) in **bold type**, Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy breastfed infants, the AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all individuals in the group, but lack of data prevent being able to specify with confidence the percentage of individuals covered by this intake.

[a] Acceptable Macronutrient Distribution Range (AMDR)[a] is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individual consumes in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and/or insufficient intakes of essential nutrients.

[b] ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

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Dietary Reference Intakes: Macronutrients

Nutrient	Function	Life Stage Group	RDA/AI* g/d	AMDR[a]	Selected Food Sources	Adverse effects of excessive consumption
Total Fat	Energy source and when found in foods, is a source of *n*-6 and *n*-3 polyunsaturated fatty acids. Its presence in the diet increases absorption of fat soluble vitamins and precursors such as vitamin A and pro-vitamin A carotenoids.	Infants			Butter, margarine, vegetable oils, whole milk, visible fat on meat and poultry products, invisible fat in fish, shellfish, some plant products such as seeds and nuts, and bakery products.	While no defined intake level at which potential adverse effects of total fat was identified, the upper end of AMDR is based on decreasing risk of chronic disease and providing adequate intake of other nutrients. The lower end of the AMDR is based on concerns related to the increase in plasma triacylglycerol concentrations and decreased HDL cheolesterol concentrations seen with very low fat (and thus high carbohydrate) diets.
		0–6 mo	31*			
		7–12 mo	30*			
		Children				
		1–3 y		30-40		
		4–8 y		25-35		
		Males				
		9–13 y		25-35		
		14–18 y		25-35		
		19–30 y		20-35		
		31-50 y		20-35		
		50-70 y		20-35		
		> 70 y		20-35		
		Females				
		9–13 y		25-35		
		14–18 y		25-35		
		19–30 y		20-35		
		31-50 y		20-35		
		50-70 y		20-35		
		> 70 y		20-35		
		Pregnancy				
		≤ 18 y		20-35		
		19-30y		20-35		
		31-50 y		20-35		
		Lactation				
		≤ 18 y		20-35		
		19-30y		20-35		
		31–50 y		20-35		
n-6 polyunsaturated fatty acids (linoleic acid)	Essential component of structural membrane lipids, involved with cell signaling, and precursor of eicosanoids. Required for normal skin function.	Infants			Nuts, seeds, and vegetable oils such as soybean, safflower, and corn oil.	While no defined intake level at which potential adverse effects of *n*-6 polyunsaturated fatty acids was identified, the upper end of the AMDR is based the lack of evidence that demonstrates long-term safety and human in vitro studies which show increased free-radical formation and lipid peroxidation with higher amounts of n-6 fatty acids. Lipid peroxidation is thought to be a component of in the development of atherosclerotic plaques.
		0–6 mo	4.4*	ND[b]		
		7–12 mo	4.6*	ND		
		Children				
		1–3 y	7*	5-10		
		4–8 y	10*	5-10		
		Males				
		9–13 y	12*	5-10		
		14–18 y	16*	5-10		
		19–30 y	17*	5-10		
		31-50 y	17*	5-10		
		50-70 y	14*	5-10		
		> 70 y	14*	5-10		
		Females				
		9–13 y	10*	5-10		
		14–18 y	11*	5-10		
		19–30 y	12*	5-10		
		31-50 y	12*	5-10		
		50-70 y	11*	5-10		
		> 70 y	11*	5-10		
		Pregnancy				
		≤ 18 y	13*	5-10		
		19-30y	13*	5-10		
		31-50 y	13*	5-10		
		Lactation				
		≤ 18 y	13*	5-10		
		19-30y	13*	5-10		
		31–50 y	13*	5-10		

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[a] Acceptable Macronutrient Distribution Range (AMDR)[a] is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individuals consumed in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and insufficient intakes of essential nutrients.

[b]ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

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Dietary Reference Intakes: Macronutrients

Nutrient	Function	Life Stage Group	RDA/AI* g/d	AMDR[a]	Selected Food Sources	Adverse effects of excessive consumption
n-3 polyunsaturated fatty acids (α-linolenic acid)	Involved with neurological development and growth. Precursor of eicosanoids.	Infants 0–6 mo 7–12 mo Children 1–3 y 4–8 y Males 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Females 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31–50 y	 0.5* 0.5* 0.7* 0.9* 1.2* 1.6* 1.6* 1.6* 1.6* 1.6* 1.0* 1.1* 1.1* 1.1* 1.1* 1.1* 1.1* 1.4* 1.4* 1.4* 1.3* 1.3* 1.3*	 ND[b] ND 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2 0.6-1.2	Vegetable oils such as soybean, canola, and flax seed oil, fish oils, fatty fish, with smaller amounts in meats and eggs.	While no defined intake level at which potential adverse effects of *n*-3 polyunsaturated fatty acids was identified, the upper end of AMDR is based on maintaining the appropriate balance with n-6 fatty acids and on the lack of evidence that demonstrates long-term safety, along with human in vitro studies which show increased free-radical formation and lipid peroxidation with higher amounts of polyunsaturated fatty acids. Lipid peroxidation is thought to be a component of in the development of atherosclerotic plaques.
Saturated and *trans* fatty acids, and cholesterol	No required role for these nutrients other than as energy sources was identified; the body can synthesize its needs for saturated fatty acids and cholesterol from other sources.	Infants 0–6 mo 7–12 mo Children 1–3 y 4–8 y Males 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Females 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31–50 y	 ND ND		Saturated fatty acids are present in animal fats (meat fats and butter fat), and coconut and palm kernel oils. Sources of cholesterol include liver, eggs, and foods that contain eggs such as cheesecake and custard pies. Sources of *trans* fatty acids include stick margarines and foods containing hydrogenated or partially-hydrogenated vegetable shortenings.	There is an incremental increase in plasma total and low-density lipoprotein cholesterol concentrations with increased intake of saturated or *trans* fatty acids or with cholesterol at even very low levels in the diet. Therefore, the intakes of each should be minimized while consuming a nutritionally adequate diet.

NOTE: The table is adapted from the DRI reports, see www.nap.edu. It represents Recommended Dietary Allowances (RDAs) in **bold type**, Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy breastfed infants, the AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all individuals in the group, but lack of data prevent being able to specify with confidence the percentage of individuals covered by this intake.

[a] Acceptable Macronutrient Distribution Range (AMDR)[a] is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individuals consumed in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and insufficient intakes of essential nutrients.

[b] ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

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Dietary Reference Intakes: Macronutrients

Nutrient	Function	Life Stage Group	RDA/AI* g/d [a]	AMDR[b]	Selected Food Sources	Adverse effects of excessive consumption
Protein and amino acids	Serves as the major structural component of all cells in the body, and functions as enzymes, in membranes, as transport carriers, and as some hormones. During digestion and absorption dietary proteins are broken down to amino acids, which become the building blocks of these structural and functional compounds. Nine of the amino acids must be provided in the diet; these are termed indispensable amino acids. The body can make the other amino acids needed to synthesize specific structures from other amino acids.	Infants 0–6 mo 7–12 mo Children 1–3 y 4–8 y Males 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Females 9–13 y 14–18 y 19–30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31–50 y	9.1* **11.0** **13** **19** **34** **52** **56** **56** **56** **56** **34** **46** **46** **46** **46** **46** **71** **71** **71** **71** **71** **71**	ND[c] ND **5-20** **10-30** **10-30** **10-30** **10-35** **10-35** **10-35** **10-35** **10-30** **10-30** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35**	Proteins from animal sources, such as meat, poultry, fish, eggs, milk, cheese, and yogurt, provide all nine indispensable amino acids in adequate amounts, and for this reason are considered “complete proteins”. Proteins from plants, legumes, grains, nuts, seeds, and vegetables tend to be deficient in one or more of the indispensable amino acids and are called ‘incomplete proteins’. Vegan diets adequate in total protein content can be “complete” by combining sources of incomplete proteins which lack different indispensable amino acids.	While no defined intake level at which potential adverse effects of protein was identified, the upper end of AMDR based on complementing the AMDR for carbohydrate and fat for the various age groups. The lower end of the AMDR is set at approximately the RDA..

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[a] Based on 1.5 g/kg/day for infants, 1.1 g/kg/day for 1-3 y, 0.95 g/kg/day for 4-13 y, 0.85 g/kg/day for 14-18 y, 0.8 g /kg/day for adults, and 1.1 g/kg/day for pregnant (using pre-pregnancy weight) and lactating women.

[b] Acceptable Macronutrient Distribution Range (AMDR)[a] is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individuals consumed in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and insufficient intakes of essential nutrients.

[c] ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

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Nutrient	Function	IOM/FNB 2002 Scoring Pattern[a]	Mg /g protein	Adverse effects of excessive consumption
Indispensable amino acids:				
Histidine	The building blocks of all proteins in the body and some hormones. These nine amino acids must be provided in the diet and thus are termed indispensable amino acids. The body can make the other amino acids needed to synthesize specific structures from other amino acids and carbohydrate precursors.	Histidine	18	Since there is no evidence that amino acids found in usual or even high intakes of protein from food present any risk, attention was focused on intakes of the L-form of these and other amino acid found in dietary protein and amino acid supplements. Even from well-studied amino acids, adequate dose-response data from human or animal studies on which to base a UL were not available. While no defined intake level at which potential adverse effects of protein was identified for any amino acid, this does not mean that there is no potential for adverse effects resulting from high intakes of amino acids from dietary supplements. Since data on the adverse effects of high levels of amino acid intakes from dietary supplements are limited, caution may be warranted.
Isoleucine		Isoleucine	25	
Leucine		Leucine	55	
Lysine		Lysine	51	
Methionine & Cysteine		Methionine & Cysteine	25	
Phenylalanine & Tyrosine		Phenylalanine & Tyrosine	47	
Threonine		Threonine	27	
Tryptophan		Tryptophan	7	
Valine		Valine	32	

NOTE: The table is adapted from the DRI reports, see www.nap.edu.

[a] Based on the amino acid requirements derived for Preschool Children (1-3 y): (EAR for amino acid ÷ EAR for protein); for 1-3 y group where EAR for protein = 0.88 g/kg/d.

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