

TABLE 15-8 Nutrient Requirements of Bitches for Late Gestation and Peak Lactation^a

Nutrient	Minimal Requirement			Adequate Intake			Recommended Allowance			Safe Upper Limit		
	Amt./ kg DM (=4,000 kcal) ^b	Amt./ 1,000 kcal ME ^c	Amt./ kg BW ^{0.75d}	Amt./ kg DM (=4,000 kcal) ^b	Amt./ 1,000 kcal ME ^c	Amt./ kg BW ^{0.75d}	Amt./ kg DM (=4,000 kcal) ^b	Amt./ 1,000 kcal ME ^c	Amt./ kg BW ^{0.75d}	Amt./ kg DM (=4,000 kcal) ^b	Amt./ 1,000 kcal ME ^c	Amt./ kg BW ^{0.75d}
Crude Protein				200	50	24.6	200	50	24.6			
Amino Acids												
Arginine (g) ^e				10.0	2.50	1.23	10.0	2.50	1.23			
Histidine (g)				4.4	1.10	0.54	4.4	1.10	0.54			
Isoleucine (g)				7.1	1.78	0.87	7.1	1.78	0.87			
Methionine (g)				3.1	0.78	0.38	3.1	0.78	0.38			
Methionine & Cystine (g)				6.2	1.55	0.76	6.2	1.55	0.76			
Leucine (g)				20.0	5.00	2.46	20.0	5.00	2.46			
Lysine (g)				9.0	2.25	1.11	9.0	2.25	1.11			
Phenylalanine (g)				8.3	2.08	1.02	8.3	2.08	1.02			
Phenylalanine & Tyrosine(g) ^f				12.3	3.08	1.51	12.3	3.08	1.51			
Threonine (g)				10.4	2.60	1.28	10.4	2.60	1.28			
Tryptophan (g)				1.2	0.30	0.15	1.2	0.30	0.15			
Valine (g)				13.0	3.25	1.60	13.0	3.25	1.60			
Total Fat (g)				85	21.3	10.5	85	21.3	10.5	330 ^b	82.5	40.6
Fatty Acids												
Linoleic Acid (g)				11	2.8	1.4	13	3.3	1.6	65 ^b	16.3	8.0
α-Linolenic Acid (g) ^g				0.7	0.18	0.09	0.8	0.2	0.10			
Arachidonic Acid (g)												
Eicosapentaenoic + Docosahexaenoic Acid (g) ^h				0.5	0.13	0.06	0.5	0.13	0.06	11 ^b	2.8	1.4
Minerals												
Calcium (g)				8.0	1.9	0.82	8.0	1.9	0.82			
Phosphorus (g)				5.0	1.2	0.58	5.0	1.2	0.58			
Magnesium (mg)				600	150	69	600	150	69			
Sodium (mg)				2,000	500	238	2,000	500	238			
Potassium (g)				3.6	0.9	0.430	3.6	0.9	0.43			
Chloride (mg)				3,000	750	358	3,000	750	358			
Iron (mg) ⁱ				70	17	8.67	70	17	8.67			
Copper (mg) ⁱ				12.4	3.1	1.52	12.4	3.1	1.52			
Zinc (mg)				96	24	11.7	96	24	11.7			
Manganese (mg)				7.2	1.8	.87	7.2	1.8	.87			
Selenium (µg)				350	87.5	43	350	87.5	43			
Iodine (µg)				880	220	108	880	220	108			
Vitamins												
Vitamin A (RE) ^j				1,212	303	149	1,515	379	186	15,000 ^j	3,750 ^j	1,846 ^j
Cholecalciferol (µg) ^k				11.0	2.75	1.35	13.8	3.4	1.70	80	20	9.8
Vitamin E (α- tocopherol) (mg) ^l				24	6.0	3.0	30	7.5	3.7			

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Vitamin K (Menadione)(mg) ^m				1.3	0.33	0.16	1.6	0.41	0.20			
Thiamin (mg)				1.8	0.45	0.22	2.25	0.56	0.28			
Riboflavin (mg)				4.2	1.05	0.52	5.3	1.3	0.64			
Pyridoxine (mg)				1.2	0.30	0.15	1.5	0.375	0.185			
Niacin (mg)				13.6	3.4	1.67	17	4.25	2.09			
Pantothenic Acid (mg)				12	3.0	1.48	15	3.75	1.84			
Cobalamin (μ g)				28	7	3.45	35	8.75	4.3			
Folic Acid (μ g)				216	54	26.6	270	67.5	33.2			
Biotin ⁿ												
Choline (mg)				1,360	340	167	1,700	425	209			

^aFew data could be found for the dietary concentrations for the minimal requirement for gestation for the bitch. The values for lactation relative to kg DM and 1,000 kcal ME may be taken as satisfactory for gestation.

^bThe values for Amt/kg DM have been calculated assuming a dietary energy density of 4,000 kcal ME/kg. (The term $\equiv$ signifies equivalence.) If the energy density of the diet is not 4,000 kcal ME/kg, then to calculate the Amt/kg DM for each nutrient, multiply the value for the nutrient in the column labeled Amt/kg DM by the energy density of the pet food (in kcal ME/kg) and divide by 4,000.

^cTo calculate the amount to feed of each nutrient multiply the value for Amt/1 000 kcal ME for each nutrient by the energy requirement in kcal (calculated from Tables 15-6 and 15-7) and divide by 1 000.

^dThe values for Amt/BW^{0.75} apply only to a 22-kg bitch in peak lactation with 8 puppies and consuming 5,000 kcal/day. To calculate the amount for bitches of different body weights or litter sizes, calculate the energy requirement from Table 15-7 and multiply this value by the nutrient Amt/1,000 kcal and divide by 1,000. To calculate the amount of a nutrient for gestating dogs, calculate the energy requirement from Table 15-6 and multi l this value b the nutrient Amt/1 000 kcal and divide b 1 000

^e0.01 g arginine should be added for every g of crude protein above 200.

^fThe quantity of tyrosine required to maximize black hair color may be about 1.5-2.0 times this quantity.

^gThe requirement for α -linolenic acid varies depending upon linoleic acid content of the diet. The ratio of linoleic acid to α -linolenic acid should be between 2.6 and 16. Note that 0.8 g/kg DM value shown is the minimum RA of α -linolenic acid at 13 g linoleic acid per kg DM, resulting in a ratio of linoleic acid to α -linolenic acid of approximately 16.

^h50-60% of the total amount should be eicosapentaenoic, acid and 40-50% should be docosahexaenoic acid.

ⁱSome oxides of iron and copper should not be used because of low bioavailability.

^jVitamin A requirements expressed as RE (retinol equivalents). One RE is equal to 1 μ g of all-*trans* retinol, and one IU of vitamin A is equal to 0.3 RE. Safe upper limit values expressed as μ g retinol.

^k1 μ g cholecalciferol = 40 IU vitamin D₃.

^lHigher concentrations of vitamin E are recommended for high PUFA diets. One international unit of vitamin E = 1 mg all-*rac*- α -tocopheryl acetate (see Chapter 8).

^mDogs have a metabolic requirement, but a dietary requirement has not been demonstrated when natural diets are fed. Adequate vitamin K is probably synthesized by intestinal microbes. The vitamin K allowance is expressed in terms of the commercially used precursor menadione that requires alkylation to the active vitamin K.

ⁿFor normal diets not containing raw egg white, adequate biotin is probably provided by microbial synthesis in the intestine. Diets containing antibiotics may need supplementation.