Health Canada Santé Canada

MULTI-VITAMIN/MINERAL SUPPLEMENTS MONOGRAPH

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MULTI-VITAMIN/MINERAL SUPPLEMENTS MONOGRAPH

- This monograph is intended to serve as a guide to industry for the preparation of Product Licence Applications (PLA) forms and labels for natural health product market authorization. It is not intended to be a comprehensive review of the medicinal ingredients.

- This monograph includes specific information for each vitamin and mineral as well as combination rules and may be used to support single ingredient or multi-ingredient products containing any medicinal ingredient from Tables 1, 2 and/or 3.

- The medicinal ingredients boron, inositol, nickel, PABA, tin and vanadium are complementary ingredients that must be combined with at least one other medicinal ingredient listed in Tables 1, 2 and/or 3. No claim can be supported based on these medicinal ingredients. The product claim must be supported by another medicinal ingredient from Tables 1, 2 and/or 3.

- Sodium is not permitted as a medicinal ingredient on this monograph due to health concerns associated with chronic supplemental use, namely hypertension, which remains the most common and most important risk factor for cardiovascular disease. However, the use of sodium as a counter-ion in medicinal or non-medicinal ingredients (e.g. sodium salts of minerals) is acceptable where warranted.

- Chlorine, fluorine and sulfur are not included as medicinal ingredients on this monograph.

- The PLA form and label must declare all active components (i.e. vitamin and mineral) of a source material as medicinal ingredients and provide their quantity per dosage unit if the total daily dose of that vitamin or mineral exceeds the monograph's minimum dosage value. For example, if calcium ascorbate is cited as a source material for calcium and also provides vitamin C (ascorbic acid) at medicinal levels (i.e. $\geq$ 6 mg/day for adults), then the PLA form and label must include vitamin C as a medicinal ingredient and its quantity per dosage unit. See Appendix I for additional information.

Notes

- Text in parentheses is additional optional information which can be included on the PLA form and label at the applicant's discretion.
- The solidus (/) indicates that the terms and/or statements are synonymous. Either term or statement may be selected by the applicant.

1.0 Proper names, Common names and Source materials

Notes

- The terms chromic, cupric, ferrous, ferric and manganous are not available on the electronic Product License Application form and will not be added; however, these synonyms may be used on the marketed label for chromium (III), copper (II), iron (II), iron (III) and manganese (II) respectively.

- Any hydrated form of a source material listed in Tables 1, 2 and 3 would be acceptable on the marketed label as long as it is included in the Natural Health Products Ingredients Database.

1.1 Vitamin proper names, common names and source materials

Table 1. Vitamin proper names, common names and source materials

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]
		Common name(s)
Biotin	Biotin	Biocytin Biotin
Folate[5]	Folate Folic acid[5] Vitamin B_9	Folic acid[5] L-5-Methyltetrahydrofolate L-5-Methyltetrahydrofolate, calcium salt L-5-Methyltetrahydrofolic acid, glucosamine salt
Niacin	Niacin Vitamin B_3	Niacinamide Nicotinic acid Inositol hexanicotinate
Niacinamide	Niacinamide Nicotinamide Vitamin B_3	Niacinamide Niacinamide ascorbate
Pantothenic acid	D-Pantothenic acid Pantothenic acid Vitamin B_5	Calcium D-pantothenate Calcium DL-pantothenate Dexpanthenol DL-Panthenol DL-Pantothenic acid D-Pantethine D-Pantothenic acid
Riboflavin	Riboflavin Vitamin B_2	Riboflavin Riboflavin 5’-phosphate Riboflavin 5’-phosphate sodium
Thiamine	Thiamine Vitamin B_1	Benfotiamine Thiamine Thiamine diphosphate Thiamine hydrochloride Thiamine mononitrate Thiamine monophosphate

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]
		Common name(s)
Vitamin A	Vitamin A	All-*trans* retinol Vitamin A acetate Vitamin A palmitate
Vitamin B_6	Vitamin B_6	Pyridoxal Pyridoxal 5'-phosphate Pyridoxal 5'-phosphate, calcium salt Pyridoxal hydrochloride Pyridoxamine Pyridoxamine 5'-phosphate Pyridoxine Pyridoxine 5'-phosphate Pyridoxine hydrochloride
Vitamin B_{12}	Vitamin B_{12}	Cobamamide Cyanocobalamin Hydroxocobalamin Methylcobalamin
Vitamin C	Vitamin C Ascorbic acid	Ascorbic acid Ascorbyl palmitate Calcium ascorbate Calcium ascorbate, dihydrate Magnesium ascorbate Manganese (II) ascorbate Niacinamide ascorbate Potassium ascorbate Sodium ascorbate Zinc ascorbate
Vitamin D	Vitamin D Vitamin D_2	Ergocalciferol
	Vitamin D Vitamin D_3	Cholecalciferol
Vitamin E	Vitamin E	d-alpha Tocopherol d-alpha Tocopheryl acetate d-alpha Tocopheryl acid succinate dl-alpha Tocopherol dl-alpha Tocopheryl acetate dl-alpha Tocopheryl acid succinate
Vitamin K_1	Vitamin K_1	Vitamin K_1 Phylloquinone Phytomenadione Phytonadione
Vitamin K_2	Vitamin K_2	Vitamin K_2 Menaquinones Menatetrenone

[1,2] At least one of the following references was consulted per name: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013; IOM 2006.

[3] At least one of the following references was consulted per source material: NIH 2015a; FAO 2012; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013; EFSA 2009a; FSANZ 2008; IOM 2006; Van Der Kuy et al. 2002; Chalmers et al. 2000; EC 2000; Zeitlin et al. 1985.
[4] For source materials providing two active components (e.g. calcium ascorbate which provides calcium and ascorbic acid), see Appendix I for additional information about acceptable doses.
[5] **Folic acid**: Folic acid is only acceptable as a common name if the source material is folic acid. All three common names could be used is the source material is folic acid; however, other source materials should be associated with folate or vitamin B9 as common name.

1.2 Mineral proper names, common names and source materials

Table 2. Mineral proper names, common names and source materials

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
Calcium[5]	Calcium	Bone meal[5] Calcium acetate Calcium amino acid chelate Calcium ascorbate Calcium aspartate Calcium bisglycinate Calcium carbonate Calcium chloride Calcium chloride, dihydrate Calcium chloride, hexahydrate Calcium citrate Calcium citrate malate Calcium citrate, tetrahydrate Calcium diglutamate Calcium fumarate Calcium glubionate Calcium glubionate, monohydrate Calcium gluceptate Calcium gluconate Calcium gluconate, monohydrate Calcium glutarate Calcium glycerophosphate Calcium hydrolyzed animal protein (HAP) chelate Calcium hydrolyzed vegetable protein (HVP) chelate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Calcium hydroxide Calcium hypophosphite Calcium lactate Calcium lactate gluconate Calcium lactate, monohydrate Calcium lactate, pentahydrate Calcium lactate, trihydrate Calcium lactobionate, dihydrate Calcium levulinate Calcium levulinate, dihydrate Calcium malate Calcium orotate Calcium oxide Calcium phosphate, dibasic Calcium phosphate, dibasic, dihydrate Calcium phosphate, monobasic Calcium phosphate, tribasic Calcium pidolate Calcium pyrophosphate Calcium pyruvate Calcium silicate Calcium sodium lactate Calcium succinate Calcium sulfate Calcium sulfate, dihydrate Calcium sulfate, hemihydrate Calcium threonate Dolomite Durapatite			
			Coral Oyster		

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
Chromium[6]	Chromium	Chromium amino acid chelate Chromium (III) bisglycinate Chromium (III) chloride Chromium (III) chloride, hexahydrate Chromium (III) citrate Chromium (III) dinicotinate Chromium (III) dinicocysteinate Chromium (III)-enriched yeast Chromium (III) fumarate Chromium (III) glutarate Chromium (III) hydrolyzed animal protein (HAP) chelate Chromium (III) hydrolyzed vegetable protein (HVP) chelate Chromium (III) lactate, trihydrate Chromium (III) malate Chromium (III) nicotinate Chromium (III) nicotinate glycinate Chromium (III) nitrate Chromium (III) picolinate[6] Chromium (III) pidolate Chromium (III) potassium sulfate, dodecahydrate Chromium (III) succinate Chromium (III) sulfate			
Cobalt	Cobalt	Hydroxocobalamin Methylcobalamin Vitamin B_{12}			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
Copper	Copper	Calcium copper edetate Copper (II) acetate Copper (II) aspartate Copper (II) bisglycinate Copper (II) carbonate Copper (II) chloride Copper (II) chloride, dihydrate Copper (II) citrate Copper (II) fumarate Copper (II) gluconate Copper (II) glutarate Copper (II) hydrolyzed animal protein (HAP) chelate Copper (II) hydrolyzed vegetable protein (HVP) chelate Copper (II) malate Copper (II) sebacate Copper (II) succinate Copper (II) sulfate Copper (II) sulfate, monohydrate Copper (II) sulfate, pentahydrate			
Iodine[7]	Iodine	Potassium iodate Potassium iodide Sodium iodide			
				▸ *Fucus vesiculosus*[7] ▸ *Fucus serratus*[7] ▸ *Ascophyllum nodosum*[7] ▸ *Laminaria digitata*[7] ▸ *Laminaria japonica*[7]	▸ Thallus ▸ Whole

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
Iron	Iron	Dried iron (II) sulfate Ferritin Ferrocholinate Iron, Carbonyl Iron, Electrolytic Iron, Reduced Iron amino acid chelate Iron hydrolyzed animal protein (HAP) chelate Iron hydrolyzed vegetable protein (HVP) chelate Iron (II) ascorbate Iron (II) aspartate Iron (II) aspartate, tetrahydrate Iron (II) bisglycinate Iron (II) carbonate Iron (II) carbonate mass Iron (II) chloride Iron (II) chloride, tetrahydrate Iron (II) citrate Iron (II) citrate, decahydrate Iron (II) citrate, monohydrate Iron (II) fumarate Iron (II) gluceptate Iron (II) gluconate Iron (II) gluconate, dihydrate Iron (II) glutarate Iron (II) glycine sulfate Iron (II) lactate Iron (II) lactate, trihydrate Iron (II) malate Iron (II) oxalate Iron (II) oxalate, dihydrate Iron (II) phosphate Iron (II) pidolate Iron (II) succinate Iron (II) sulphate Iron (II) sulphate, heptahydrate Iron (II) tartrate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Iron (II) taurate Iron (III) ammonium citrate Iron (III) citrate Iron (III) glycerophosphate Iron (III) glycinate Iron (III) phosphate Iron (III) pyrophosphate Polysaccharide-iron complex			
Magnesium	Magnesium	Magnesium acetate Magnesium acetate, tetrahydrate Magnesium amino acid chelate Magnesium ascorbate Magnesium aspartate Magnesium aspartate, dihydrate Magnesium aspartate hydrochloride, trihydrate Magnesium aspartate, tetrahydrate Magnesium bisglycinate Magnesium carbonate Magnesium chloride Magnesium chloride, hexahydrate Magnesium citrate Magnesium citrate, tribasic Magnesium fumarate Magnesium gluceptate Magnesium gluconate Magnesium gluconate, dihydrate Magnesium glutarate Magnesium glycerophosphate Magnesium glycinate Magnesium hydrolyzed animal protein (HAP) chelate Magnesium hydrolyzed vegetable protein (HVP) chelate Magnesium hydroxide			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Magnesium lactate Magnesium lysinate Magnesium malate Magnesium orotate Magnesium oxide Magnesium phosphate, dibasic Magnesium phosphate, dibasic, trihydrate Magnesium phosphate, monobasic Magnesium phosphate, tribasic Magnesium phosphate, tribasic, octahydrate Magnesium phosphate, tribasic, pentahydrate Magnesium phosphate, tribasic, tetrahydrate Magnesium pidolate Magnesium succinate Magnesium sulfate Magnesium sulfate, heptahydrate Magnesium sulfate, monohydrate Magnesium sulfate, trihydrate Magnesium taurate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
Manganese	Manganese	Manganese amino acid chelate Manganese (II) ascorbate Manganese (II) aspartate Manganese (II) bisglycinate Manganese (II) carbonate Manganese (II) chloride Manganese (II) chloride, tetrahydrate Manganese (II) citrate Manganese (II) gluconate Manganese (II) gluconate, dihydrate Manganese (II) glycerophosphate Manganese (II) hydrolyzed animal protein (HAP) chelate Manganese (II) hydrolyzed vegetable protein (HVP) chelate Manganese (II) pidolate Manganese (II) sulfate Manganese (II) sulfate, monohydrate Manganese (II) sulfate, tetrahydrate Manganese (IV) dioxide			
Molybdenum	Molybdenum	Ammonium molybdate (VI) Ammonium molybdate (VI), tetrahydrate Molybdenum amino acid chelate Molybdenum (VI) aspartate Molybdenum (VI) bisglycinate Molybdenum (VI) citrate Molybdenum (VI) fumarate Molybdenum (VI) glutarate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Molybdenum (VI) hydrolyzed animal protein (HAP) chelate Molybdenum (VI) hydrolyzed vegetable protein (HVP) chelate Molybdenum (VI) malate Molybdenum (VI) succinate Potassium molybdate (VI) Sodium molybdate (VI) Sodium molybdate (VI), dihydrate			
Phosphorus[5]	Phosphorus	Ammonium phosphate, dibasic Ammonium phosphate, monobasic Bone meal[5] Calcium glycerophosphate Calcium phosphate, dibasic Calcium phosphate, dibasic, dihydrate Calcium phosphate, monobasic Calcium phosphate, monobasic, monohydrate Calcium phosphate, tribasic Durapatite Magnesium phosphate, dibasic, mixed hydrates Magnesium phosphate, dibasic, trihydrate Magnesium phosphate, tribasic Potassium phosphate, dibasic Potassium phosphate, monobasic Potassium phosphate, tribasic Sodium glycerophosphate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Sodium phosphate, dibasic Sodium phosphate, dibasic, dihydrate Sodium phosphate, dibasic, monohydrate Sodium phosphate, dibasic, dodecahydrate Sodium phosphate, dibasic, heptahydrate Sodium phosphate, monobasic Sodium phosphate, monobasic, dihydrate Sodium phosphate, monobasic, monohydrate Sodium phosphate, tribasic Trisodium phosphate, dodecahydrate			
Selenium	Selenium	Selenious acid Selenium aspartate Selenium citrate Selenium dioxide, monohydrate Selenium fumarate Selenium glycinate Selenium hydrolyzed animal protein (HAP) chelate Selenium hydrolyzed vegetable protein (HVP) chelate Selenium malate Selenium succinate Selenium-enriched yeast Selenocysteine Selenomethionine Sodium hydrogen selenite Sodium selenate Sodium selenite			
Silicon[8]	Silicon	Calcium silicate Choline-stabilised orthosilicic acid Orthosilicic acid			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Silicic acid Silicon dioxide Silicon hydrolyzed animal protein (HAP) chelate Silicon hydrolyzed vegetable protein (HVP) chelate Sodium metasilicate			
				Equisetum arvense[8]	Herb top
Zinc[9]	Zinc	Zinc acetate Zinc acetate, dihydrate Zinc amino acid chelate Zinc arginate Zinc ascorbate Zinc aspartate Zinc bisglycinate Zinc carbonate Zinc chloride Zinc citrate Zinc citrate, dihydrate Zinc citrate, trihydrate Zinc fumarate Zinc gluconate Zinc gluconate glycine Zinc glutarate Zinc glycerate Zinc histidinate Zinc hydrolyzed animal protein (HAP) chelate Zinc hydrolyzed vegetable protein (HVP) chelate Zinc lactate Zinc lysinate Zinc malate Zinc methionine Zinc monomethionine Zinc oxide Zinc phosphate Zinc picolinate[9] Zinc pidolate Zinc succinate Zinc sulfate Zinc sulfate, heptahydrate			

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]			
		Common name(s)	Organism group(s)	Proper name(s)	Part(s)
		Zinc sulfate, monohydrate			

[1, 2] At least one of the following references was consulted per name: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013.
[3] At least one of the following references was consulted per source material: Albion 2015; BP 2015; NIH 2015a,b; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013; Jain et al. 2012; EFSA 2010a; Summers et al. 2010; EC 2009; EFSA 2009b,c,d,e,f,g,h,i,j; EFSA 2008a,b,c,d,e,f; Nowak et al. 2008; Richards 2008; EFSA 2007; Guiry and Guiry 2007; TGA 2007; EFSA 2006; Walsdorf and Alexandrides 2005; Albion 2004a,b; ANZFA 2004; Gruenwald et al. 2004; Albion 2003a,b; Allen 2002; ANZFA 2002; Ball et al. 2002; EC 2002; Van Der Kuy et al. 2002; Anderson et al. 2001; Hendler and Rorvik 2001; Albion 2000; Chalmers et al. 2000; EC 2000; Tsuboi et al. 2000; Ishitani et al. 1999; Patrick 1999; IPCS 1998; Albion 1997a,b; Grant et al. 1997; Albion 1996a,b; Fujita et al. 1996; Murray 1996; Albion 1995; Henderson 1994; Albion 1993a,b,c,d,e; Evans and Pouchnik 1993; Albion 1992; Zeitlin et al. 1985.
[4] For source materials providing two active components (e.g. calcium ascorbate which provides calcium and ascorbic acid), see Appendix I for additional information about acceptable doses.
[5] **Bone meal**: When bone meal is used as a source material for calcium or phosphorus, it must be sourced from a non-human animal that is not susceptible to Transmissible Spongiform Encephalopathy (TSE) diseases, including Bovine Spongiform Encephalopathy (BSE) (HC 2013).
[6] **Chromium Picolinate**: If chromium picolinate is indicated as a source of chromium, additional restrictions apply (refer to Tables 12, 13 and 14).
[7] If **iodine** is sourced from *Fucus vesiculosus, Fucus serratus, Ascophyllum nodosum, Laminaria digitata* or *Laminaria japonica*, it should be isolated and purified. This monograph does not support algal extracts.
[8] **Silicon from *Equisetum arvense***: Data (or certification) must be submitted to the Natural and Non-Prescription Health Products Directorate (NNHPD) upon request to show that thiaminase has been inactivated. If silicon is sourced from *Equisetum arvense* herb top, it should be isolated and purified. This monograph does not support *Equisetum* extracts.
[9] **Zinc Picolinate**: If zinc picolinate is indicated as a source of zinc, the product must be for Adults only and the maximum daily dose is restricted to 25 mg (refer to Table 9). In addition, additional restrictions apply (refer to Tables 12 and 14).

1.3 Other medicinal ingredient proper names, common names and source materials

Table 3. Other medicinal ingredient proper names, common names and source materials

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]		
		Common name(s)	Proper name(s)	Part(s)
All-trans-beta-carotene Beta-carotene	All-trans-beta-carotene Beta-carotene	Beta-carotene		
Choline 2-Hydroxy-N,N,N-trimethylethanaminium	Choline	Choline Choline bitartrate Choline chloride Choline citrate Choline dihydrogen citrate Choline orotate Lecithin Phosphatidylcholine		
Lutein[5]	Lutein	Lutein(USP)		

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]		
		Common name(s)	Proper name(s)	Part(s)
(3R,3'R,6'R)-beta,epsilon-Carotene-3,3'-diol			*Tagetes erecta*[5]	Herb flowering oleoresin
Lycopene[6] All-trans-lycopene	Lycopene	Lycopene		
			Solanum lycopersicum[6]	Fruit flesh
L-Methionine	L-Methionine Methionine	Calcium sodium caseinate DL-Methionine Hydrolyzed collagen N-Acetyl-L-methionine L-Methionine		
Potassium[7]	Potassium	Potassium acetate Potassium amino acid chelate Potassium ascorbate Potassium aspartate Potassium bicarbonate Potassium carbonate Potassium chloride Potassium citrate Potassium citrate, monohydrate Potassium gluconate Potassium glycerophosphate Potassium glycerophosphate, trihydrate Potassium lactate Potassium malate Potassium phosphate, dibasic Potassium phosphate, monobasic Potassium phosphate, tribasic Potassium pidolate Potassium sulfate Potassium tartrate Potassium tartrate, hemihydrate		

[1,2] At least one of the following references was consulted per name: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013.

[3] At least one of the following references was consulted per source ingredient/material: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013; EFSA 2009e; EFSA 2008d; EFSA 2007; FAO 2006.

[4] For source materials providing two active components (e.g. calcium ascorbate which provides calcium and ascorbic acid), see Appendix I for additional information about acceptable doses.
[5] If **Lutein** is sourced from *Tagetes erecta* herb flowering oleoresin, it should be isolated and purified. This monograph does not support *Tagetes erecta* extracts.
[6] If **Lycopene** is sourced from *Solanum lycopersicum* fruit flesh, it should be isolated and purified. This monograph does not support *Solanum lycopersicum* extracts.
[7] **Potassium**: At least 100 mg of potassium per day is required to support the uses or purposes listed in Section 4.2.3. Only general uses or purposes are permitted at daily doses below 100 mg of potassium.

1.4 Complementary medicinal ingredients proper names, common names and source materials.

The medicinal ingredients boron, inositol, nickel, PABA, tin and vanadium are complementary ingredients that must be combined with at least one medicinal ingredient listed in Tables 1, 2 and/or 3. No claim can be supported based on these ingredients. The product claim must be supported by another medicinal ingredient from Tables 1, 2 and/or 3.

Table 4. Complementary medicinal ingredients proper names, common names and source materials.

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]		
		Common name(s)	Proper name(s)	Part(s)
Boron	Boron	Borax Boric acid Boron aspartate Boron citrate Boron glycinate Boron hydrolyzed animal protein (HAP) chelate Boron hydrolyzed vegetable protein (HVP) chelate Calcium borate Calcium borogluconate Calcium fructoborate Magnesium borate Sodium borate		
Inositol	Inositol	Inositol Inositol dihydrate Inositol hexanicotinate Inositol monophosphate		
Nickel	Nickel	Nickel (II) sulfate Nickel (II) sulfate, heptahydrate Nickel (II) sulfate, hexahydrate		
para-Aminobenzoic	PABA para-Aminobenzoic	para-Aminobenzoic acid		

Proper name(s)[1]	Common name(s)[2]	Source material(s)[3,4]		
		Common name(s)	Proper name(s)	Part(s)
acid[5]	acid		*Saccharomyces cerevisiae*[5]	Whole
Tin	Tin	Stannous chloride		
Vanadium	Vanadium	Sodium metavanadate Vanadium citrate Vanadium fumarate Vanadium glutarate Vanadium hydrolyzed animal protein (HAP) chelate Vanadium hydrolyzed vegetable protein (HVP) chelate Vanadium malate Vanadium succinate Vanadyl sulfate Vanadyl sulfate, dihydrate		

[1,2] At least one of the following references was consulted per name: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013.
[3] At least one of the following references was consulted per source material: NIH 2015a; Sweetman 2015; USP 38 2015; FCC 9 2014; O'Neil 2013; EFSA 2009a,e; EFSA 2008d,g; EFSA 2007; O'Neil et al 2006, EFSA 2004.
[4] For source materials providing two active components (e.g. calcium ascorbate which provides calcium and ascorbic acid), see Appendix I for additional information about acceptable doses.
[5] If **PABA** is sourced from *Saccharomyces cerevisiae* whole, it should be isolated and purified. This monograph does not support *Saccharomyces cerevisiae* extracts.

2.0 Route of administration

Oral

3.0 Dosage forms

This monograph excludes foods or food-like dosage forms as indicated in the Compendium of Monographs Guidance Document.

Acceptable dosage forms by age group:

Infants 0-12 months, Children 1-2 years: The acceptable dosage forms are limited to emulsion/suspension and solution/ liquid preparations (Giacoia et al. 2008; EMEA/CHMP 2006).
Children 3-5 years: The acceptable dosage forms are limited to chewables, emulsion/ suspension, powders and solution/liquid preparations (Giacoia et al. 2008; EMEA/CHMP 2006).

Children 6-11 years, Adolescents 12-17 years, and Adults 18 years and older: The acceptable dosage forms for this age category and specified route of administration are indicated in the Compendium of Monographs Guidance Document.

4.0 Uses or Purposes

4.1 General use or purpose statements

The following use or purpose statements can be used in reference to any vitamin and/or mineral from Tables 1 and/or 2 and/or beta-carotene and potassium from Table 3.

They are not acceptable for other medicinal ingredients from Table 3 or medicinal ingredients listed in Table 4.

All products

- Source of vitamin(s)/mineral(s)/vitamin(s) and mineral(s), a factor/factors in the maintenance of good health.
- Source of vitamin(s)/mineral(s)/vitamin(s) and mineral(s), a factor/factors in normal growth and development.
- Source of vitamin(s)/mineral(s)/vitamin(s) and mineral(s) to support biological functions which play a key role in the maintenance of good health.
- Maintains good health.
- Supports good health.
- Contributes to maintaining general health.
- For maintaining general health.
- A factor in the maintenance of good health.

Products containing at least one vitamin or mineral (all vitamins and minerals in the product must be at minimum therapeutic dose as listed in tables 8 and 9)

- Vitamin supplement.
- Mineral supplement.
- Vitamin and mineral supplement.

Products containing at least two vitamins and/or minerals (all vitamins and minerals in the product must be at minimum therapeutic dose as listed in tables 8 and 9)

- Multi-vitamin supplement
- Multi-mineral supplement
- Multi-vitamin and multi-mineral supplement.

4.2 Specific use or purpose statements

Note
Refer to Appendix II for guidelines on using the specific uses or purposes outlined in this section.

4.2.1 Specific use or purpose statements for vitamins

Table 5. Specific uses or purposes statements for vitamins

Vitamin	Specific uses or purposes[1]
Biotin	Helps to maintain healthy hair, nail, mucous membranes and/or skin. Helps to prevent biotin deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Folate[4]	Helps to form red blood cells. Helps to prevent folate deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3] *Products providing 400 µg or more of folate per day:* • Helps to reduce the risk of neural tube defects when taken daily at least three months prior to becoming pregnant and during early pregnancy. • Helps to support normal early fetal development (brain and spinal cord).
Niacin/ Niacinamide[5]	Helps normal growth and development. Helps in energy metabolism and tissue formation. A factor in the maintenance of good health and normal growth and development Helps to prevent niacin/niacinamide/vitamin B_3 deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Pantothenic acid	Helps in energy metabolism and in tissue formation. Helps to prevent pantothenic acid deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3] Helps to maintain the body's ability to metabolize nutrients[3] and helps in tissue formation.

Vitamin	Specific uses or purposes[1]
Riboflavin	Helps in energy metabolism and in tissue formation. Helps to maintain healthy mucous membranes. Helps to maintain normal red blood cells. Helps to maintain normal metabolism of iron. Helps to prevent riboflavin deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3] Helps to maintain the body's ability to metabolize nutrients[3] and helps in tissue formation.
Thiamine	Helps in energy production. Supports energy production. Helps normal growth. Helps to prevent thiamine deficiency.[2] Helps to prevent thiamine deficiency[2] which helps supports normal growth. Helps to maintain the body's ability to metabolize nutrients.[3]
Vitamin A	Helps to maintain eyesight/skin/membranes/(and) immune function (health). Helps to provide eyesight/skin/membranes/(and) immune function support. Helps to support the immune system. (Helps) support eye/skin health. Maintains healthy skin. Helps in the development and maintenance of night vision. Helps to maintain eyesight and in the development and maintenance of night vision. Helps in the development and maintenance of bones and teeth. Helps to build strong bones and teeth. Helps to maintain normal metabolism of iron. Helps to maintain healthy skin and/or mucous membranes. Healthy skin and/or mucous membranes support. Helps to prevent vitamin A deficiency.[2]

Vitamin	Specific uses or purposes[1]
Vitamin B_6	Helps in energy metabolism and in tissue formation. Helps to form red blood cells. Helps to prevent vitamin B_6 deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Vitamin B_{12}	Helps to form red blood cells. Helps in the normal function of the immune system. Helps in energy metabolism in the body. Helps to maintain healthy metabolism. Helps to prevent vitamin B_{12} deficiency.[2] Helps to prevent vitamin B_{12} deficiency[2] and to form red blood cells. Helps to maintain the body's ability to metabolize nutrients.[3]
Vitamin C	Helps in the development and maintenance of bones, cartilage, teeth and/or gums. Helps in the development and maintenance of bones, cartilage, teeth and/or gums and in connective tissue formation. Helps in connective tissue formation. Helps in wound healing. Helps in wound healing and connective tissue formation. Source of/An antioxidant for the maintenance of good health. Antioxidant for good health. Source of/An antioxidant that helps fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals. Helps in collagen formation to maintain healthy bones, cartilage, teeth and/or gums. Helps (to) maintain/support immune function. Helps with immune function. Helps to prevent vitamin C deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]

Vitamin	Specific uses or purposes[1]
Vitamin D	Helps in the development and maintenance of bones and teeth. Helps in the absorption (and use) of calcium and phosphorus. Calcium intake, when combined with sufficient Vitamin D, a healthy diet, and regular exercise, may reduce the risk of developing osteoporosis. Helps to build strong bones and teeth. Helps (to) maintain/support immune function. Helps with immune function. Helps to prevent vitamin D deficiency.[2]
Vitamin E	Source of/An antioxidant for the maintenance of good health. Antioxidant for good health. Source of/An antioxidant that protects the fat in body tissues from oxidation. Source of/An antioxidant that helps fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals. Helps to prevent vitamin E deficiency.[2]
Vitamin K_1 and K_2	Helps in the maintenance of bones. Helps to prevent vitamin K deficiency.[2]

[1] At least two of the following references were consulted per use or purpose statement: CFIA 2015; EC 2015; IOM 2011; NIH 2011; HC 2009a,b; de Benoist 2008; IOM 2006; Shils et al. 2006; Bjørke Monsen and Ueland 2003; MacKay and Miller 2003; IOM 2001; Groff and Gropper 2000; IOM 2000; NIH 2000; IOM 1998; IOM 1997; Colombo et al. 1990.

[2] **For deficiency claims**: This use or purpose statement is only acceptable if the vitamin is present at dosages at or above the Recommended Dietary Allowance (RDA) or Adequate Intake (AI). See Appendix III for RDA and AI definitions and Appendix IV for detailed values according to life stage group. Note that most vitamin deficiencies are rare in North America.

[3] These vitamins are cofactors in specific biochemical reactions (e.g. inter-conversion of amino acids). This claim is not intended to convey that taking these vitamins helps to boost metabolism, upregulate a bodily system and/or directly convert food to energy. Inferring such claims would be misleading and is not permitted. In order to avoid any misinterpretation of this claim, the terms 'carbohydrates, fats, proteins, etc.' **must not** be used to further specify the term 'nutrients'.

[4] **Folate**: If a product is marketed specifically as a prenatal supplement (for pregnant women), it must have at least 400 µg of folate per day. Health Canada (HC 2009a,b) recommends that all women who could become pregnant take a daily multivitamin/mineral supplement containing 400 µg of folic acid per day. At a minimum, women who are planning to become pregnant should start taking this supplement 3 months before the pregnancy.

[5] **Niacin/niacinamide**: A specific use or purpose statement **must** be made for products providing > 35 mg niacin, niacinamide or a combination of the two, per day.

4.2.2 Specific use or purpose statements for minerals

Table 6. Specific uses or purposes statements for minerals

Mineral	Specific uses or purposes[1]
Calcium	Helps in the development and maintenance of bones and teeth (especially in children and young adults). Adequate calcium (and vitamin D) (throughout life) as part of a healthy diet, (along with physical activity) may reduce the risk of developing osteoporosis (in peri- and postmenopausal women) (in later life). Adequate calcium (and vitamin D) (throughout life) as part of a healthy diet, (along with physical activity) may help prevent bone loss/osteoporosis (in peri- and postmenopausal women) (in later life). As part of a healthy diet (when taken with Vitamin D) may help prevent bone loss/osteoporosis. Source of/An electrolyte (for the maintenance of good health). (Helps) (to) maintain(s) (normal) muscle function. Helps support bone health. Helps to prevent calcium deficiency.[2]
Chromium	Provides support for healthy glucose metabolism. Helps to maintain normal blood glucose levels. Helps to prevent chromium deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Cobalt	Cobalt is a structural component of vitamin B_{12} that helps form red blood cells. Cobalt is a structural component of vitamin B_{12} that helps prevent vitamin B_{12} deficiency.[2] Cobalt is a structural component of vitamin B_{12} that helps to maintain the body's ability to metabolize nutrients.[3]
Copper	Helps to produce and repair connective tissue. Helps to form red blood cells. Helps to maintain normal iron transport in the body. Helps to prevent copper deficiency.[2]
Iodine	Helps in the function of the thyroid gland. Helps to prevent iodine deficiency.[2]

Mineral	Specific uses or purposes[1]
Iron[4]	Helps to form red blood cells and helps in their proper function. Helps to prevent iron deficiency.[2] Helps to prevent iron deficiency anaemia.[2] Helps to prevent iron deficiency anemia and associated tiredness and fatigue.[2] Helps to prevent iron deficiency anaemia[2], form red blood cells and helps in their proper function. *Products providing 16 mg or more of iron, per day:* • Helps pregnant women meet (the) (Health Canada's) recommended intake for iron, when taken in conjunction with a healthy diet.
Magnesium[5]	Helps in the development and maintenance of bones and teeth. Helps in tissue formation. Helps to maintain (proper) muscle function. Helps in the development and maintenance of bones and teeth and maintain proper muscle function and tissue formation. Helps maintain proper muscle function and tissue formation. Helps to maintain proper muscle function, including the heart muscle. Helps to maintain heart muscle function. Provides/Source of/An electrolyte (for the maintenance of good health). Helps in energy metabolism, tissue formation and bone development. Helps to maintain normal electrolyte balance. Helps to prevent magnesium deficiency.[2,6] Helps to maintain the body's ability to metabolize nutrients.[3]
Manganese	Helps in the development and maintenance of bones. Helps to prevent manganese deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Molybdenum	Helps to prevent molybdenum deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]

Mineral	Specific uses or purposes[1]
Phosphorus	Helps in the development and maintenance of bones and teeth. Source of/An electrolyte (for the maintenance of good health). Helps to prevent phosphorus deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]
Selenium	A factor in the maintenance of good health and normal growth and development. Source of/An antioxidant for the maintenance of good health. Antioxidant for good health. Source of/An antioxidant that helps protect against oxidative stress. Source of/An antioxidant that helps fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals. Helps to maintain normal function of the thyroid gland. Helps to prevent selenium deficiency.[2] Helps to prevent selenium deficiency[2] to support biological functions which play a key role in the maintenance of good health. Helps to prevent selenium deficiency[2] to help maintain normal function of the thyroid gland.
Zinc[7]	Helps in connective tissue formation. Helps to maintain healthy skin. Helps maintain healthy skin and connective tissue formation. Helps (to) maintain/support immune function/system. Helps with immune function. Helps in energy metabolism and tissue formation. Helps to maintain healthy bones, hair, nail and/or skin. Maintains healthy hair, skin and nails. Helps to prevent zinc deficiency.[2] Helps to maintain the body's ability to metabolize nutrients.[3]

[1] At least two of the following references were consulted per use or purpose statement: CFIA 2015; EC 2015; IOM 2011; FDA 2008; Tang et al 2007; IOM 2006; Jackson et al 2006; NAMS 2006; Shils et al. 2006; Meisel et al. 2005; Schwartz et al. 2005; Brown and Josse 2002; IOM 2001; Groff and Gropper 2000; IOM 2000; NIH 2000; IOM 1997; Klimis-Tavantis 1994.

[2] **For deficiency claims**: This use or purpose statement is only acceptable if the mineral is present at dosages at or above the RDA or AI. See Appendix III for RDA and AI definitions and Appendix IV for detailed values according to life stage group. Note that most mineral deficiencies are rare in North America.
[3] These minerals are involved as cofactors in specific biochemical reactions (e.g. inter-conversion of amino acids). This claim is not intended to convey that taking these minerals helps to boost metabolism, upregulate a bodily system and/or directly convert food to energy. Inferring such claims would be misleading and is not permitted. In order to avoid any misinterpretation of this claim, the terms 'carbohydrates, fats, proteins, etc.' **must not** be used to further specify 'nutrients'.
[4] **Iron**: A specific use or purpose statement **must** be made for products providing > 35 mg iron per day.
[5] **Magnesium**: A specific use or purpose statement **must** be made for products providing > 350 mg magnesium per day.
[6] **Magnesium deficiency claim**: As the RDA for magnesium for children 1-3 years, children 4-8 years and adolescents 14-18 years exceeds the maximum dose, this claim is not permitted for these subpopulations.
[7] **Zinc**: A specific use or purpose statement **must** be made for products providing > 40 mg zinc per day.

4.2.3 Specific use or purpose statements for other medicinal ingredients

Table 7. Specific uses or purposes statements for other medicinal ingredients

Medicinal ingredient	Specific uses or purposes[1]
Beta-carotene	Provitamin A/Source of vitamin A for the maintenance of good health. Source of vitamin A. Provitamin A/Source of vitamin A to help/helps maintain eyesight, skin, membranes and immune function. Provitamin A/Source of vitamin A to help/helps in the development and maintenance of night vision. Provitamin A/Source of vitamin A to help/helps in the development and maintenance of bones and teeth. Provitamin A/Source of vitamin A to help/helps in the development and maintenance of night vision, bones and teeth. Provitamin A/Source of vitamin A to help/helps maintain eyesight, skin, membranes and immune function and helps in the development and maintenance of night vision, bones and teeth. Provitamin A/Source of vitamin A for the maintenance of good health and to prevent vitamin A deficiency.[2] Helps to prevent vitamin A deficiency.[2]
Choline[3]	Helps to support liver function.
L-Methionine[3]	Helps to support liver function. Source of/An essential amino acid for the maintenance of good health. Source of/An essential amino acid involved in protein synthesis.

Medicinal ingredient	Specific uses or purposes[1]
Lutein	Source of/An antioxidant for the maintenance of good health/eye health. Source of/An antioxidant that helps fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals. *Products providing 6 mg or more of lutein per day:* • Helps to maintain/support eyesight in certain conditions (associated with sunlight damage), such as cataracts and age-related macular degeneration. • Helps to reduce the risk of developing cataracts. • Helps to improve macular pigment optical density.
Lycopene	Source of/An antioxidant. Source of/An antioxidant that helps fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals. *Products providing 6.5 mg or more of lycopene per day:* • Helps to support prostate health.
Potassium	*Products providing 100 mg or more of potassium per day:* • Source of/An electrolyte (for the maintenance of good health).
Silicon	*Products providing 10 mg or more of silicon per day:* • Helps to maintain healthy hair, nails and/or skin.

[1]At least two of the following references were consulted per use or purpose statement: CNF 2015; EC 2015; Erdman et al. 2009; Christen et al. 2008; Fletcher et al. 2008; Johnson et al. 2008; Kristal et al. 2008; Moeller et al. 2008; Schwarz et al. 2008; Silaste et al. 2007; Wickett et al. 2007; IOM 2006; Miranda et al. 2006; Shao and Hathcock 2006; Shils et al. 2006; Zeisel 2006; Barel et al. 2005; IOM 2005a,b; Mohanty et al. 2005; Porrini et al. 2005; Alves-Rodrigues and Shao 2004; Richer et al. 2004; Blakely et al. 2003; Olmedilla et al. 2003; Giovannucci et al. 2002; IOM 2002; Kucuk et al. 2002; Dwyer et al. 2001; IOM 2001; Kucuk et al. 2001; Matos et al. 2001; Groff and Gropper 2000; Brown et al 1999; Gann et al. 1999; IOM 1998; Seyoum and Persaud 1991; Benevenga 1984.
[2] **Vitamin A deficiency claim**: See Appendix V (Determining dosage requirements for the claim "Helps to prevent vitamin A deficiency") for guidance on the appropriate use of this claim.
[3] The term "lipotropic factor" is not permitted to describe choline, methionine or inositol. This term may mislead consumers to perceive that the product is intended for the purpose of weight loss.

5.0 Doses

5.1 Subpopulations

The subpopulation "Adults" is the only acceptable subpopulation for the source materials HAP or HVP as well as for the following medicinal ingredients:

- Boron
- Chromium
- Lutein
- Lycopene
- Manganese

- Molybdenum
- Nickel
- PABA
- Potassium
- Selenium
- Silicon
- Tin
- Vanadium
- Zinc sourced from zinc picolinate

5.2 Background on dose

Notes

- The daily dose of each vitamin and/or mineral, listed in Tables 8, 9 and 10, must meet the minimum dosage value if a general or specific claim is being attributed to them. In addition, the minimum daily dose must be met for all vitamins and minerals in a product making a (multi-)vitamin and/or mineral supplement claim in the brand name or as part of the recommended uses or purposes.
- The daily dose of each medicinal ingredient must not exceed the maximum dosage value. Refer to Appendix III for definitions and derivations of dosage values.
- Refer to Appendix VI for conversion factors for pantothenic acid, vitamin A, beta-carotene, vitamin D and vitamin E.
- Dose information for adults includes pregnant and breastfeeding women. However, products containing PABA, vanadium, chromium sourced from chromium picolinate and/or zinc sourced from zinc picolinate require a mandatory risk statement for these subpopulations. See Section 7.0 - Risk Information.

5.3 Dose information for vitamins

Table 8. Daily doses for vitamins (Min = minimum; Max = maximum)

Life Stage Group		Biotin (µg/day)		Folate[1] (µg/day)		Niacin/niacinamide[2] (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	1.0	500	15	300	0.6	10
	4-8 years	1.0	500	15	400	0.6	15
Adolescents	9-13 years	1.0	500	15	600	0.6	20
	14-18 years	1.8	500	30	800	1.0	30
Adults	19 years and older	1.8	500	30	1,000	1.0	500

Life Stage Group		Pantothenic acid (mg/day)		Riboflavin (mg/day)		Thiamine (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	0.2	500	0.04	100	0.04	100
	4-8 years	0.2	500	0.04	100	0.04	100
Adolescents	9-13 years	0.2	500	0.04	100	0.04	100
	14-18 years	0.4	500	0.08	100	0.07	100
Adults	19 years and older	0.4	500	0.08	100	0.07	100

Life Stage Group		Vitamin A[3] (µg RAE/day)			
		Min	All-trans retinol - Max	All-trans retinyl acetate - Max	All-trans retinyl palmitate - Max
Infants	0-12 months	30	600	600	600
Children	1-3 years	30	600	600	600
	4-8 years	30	900	900	900
Adolescents	9-13 years	30	1,700	1,700	1,700
	14-18 years	65	2,800	2,800	2,800
Adults	19 years and older	65	3,003	3,000	3,022

Life Stage Group		Vitamin B_6 (mg/day)		Vitamin B_{12}[4] (µg/day)		Vitamin C (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	
Children	1-3 years	0.05	30	0.09	1,000	2.2	400
	4-8 years	0.05	40	0.09	1,000	2.2	650
Adolescents	9-13 years	0.05	60	0.09	1,000	2.2	1,200
	14-18 years	0.10	80	0.14	1,000	6.0	1,800
Adults	19 years and older	0.10	100	0.14	1,000	6.0	2,000

Life Stage Group		Vitamin D (µg/day)		Vitamin E[5] (mg AT/day)		
		Min	Max	Min	dl-alpha-Tocopherol - Max	d-alpha-Tocopherol - Max
Infants	0-12 months	0.5	25	-	-	-
Children	1-3 years	0.8	25	0.6	100	200
	4-8 years	0.8	25	0.6	150	300
Adolescents	9-13 years	0.8	25	0.6	300	600
	14-18 years	1.0	25	1.0	400	800
Adults	19 years and older	1.0	25	1.0	500	1,000

Life Stage Group		Vitamin K_1, vitamin K_2 and total vitamin $K_1 + K_2$ (µg/day)	
		Min	Max
Infants	0-12 months	-	-
Children	1-3 years	3	30
	4-8 years	3	55
Adolescents	9-13 years	3	60
	14-18 years	6	75
Adults	19 years and older	6	120

[1] **Folate**: If a product is marketed specifically as a prenatal supplement (for pregnant women), it must have at least 400 µg of folate per day. Health Canada (HC 2009a,b) recommends that all women who could become pregnant take a daily multivitamin/mineral supplement containing 400 µg of folic acid per day. At a minimum, women who are planning to become pregnant should start taking this supplement 3 months before the pregnancy.

[2] **Niacin/niacinamide:** A specific use or purpose statement **must** be made for products providing > 35 mg niacin, niacinamide, or a combination of the two per day.

[3] **Vitamin A:** There is a potential risk of hypervitaminosis A resulting from the use of products which combine high doses of vitamin A and beta-carotene. See Appendix V ("Mitigating the Risk of Hypervitaminosis A") for information on how to determine acceptable daily doses of each of these medicinal ingredients when used in combination.

[4] **Cobalt + Vitamin B_{12}**: As vitamin B_{12} is the source material for cobalt, the maximum dose for cobalt and vitamin B_{12} combined must not exceed 1000 µg vitamin B_{12} per day.

[5] **Vitamin E**: A combination of dl-alpha-tocopherol (synthetic form) and d-alpha-tocopherol (natural form) must not exceed the upper limit (UL) of 1000 mg of alpha-tocopherol from all sources (IOM 2006) with a maximum of 1500 IU/day of d-alpha-tocopherol and 1100 IU/day of dl-alpha-tocopherol.

1 IU = 0.67 mg for d-alpha-tocopherol

1 IU = 0.90 mg for dl-alpha-tocopherol which is equivalent to 0.45 mg of the biologically active alpha-tocopherol equivalent.

The total amount of vitamin E should be used to determine if additional risk statements are required (refer to Table 13).

5.4 Dose information for minerals

Table 9. Daily doses for minerals (Min = minimum; Max = maximum)

Life Stage Group		Calcium (mg/day)		Chromium (µg/day)		Cobalt[1] (µg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	65	1,500	-	-	0.004	44
	4-8 years	65	1,500	-	-	0.004	44
Adolescents	9-13 years	65	1,500	-	-	0.004	44
	14-18 years	65	1,500	-	-	0.006	44
Adults	19 years and older	65	1,500	2.2	500	0.006	44
Life Stage Group		Copper (µg/day)		Iodine (µg/day)		Iron[2] (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	0.6	40
Children	1-3 years	35	700	6	133	0.6	40
	4-8 years	35	2,500	6	200	0.6	40
Adolescents	9-13 years	35	4,000	6	400	0.6	40
	14-18 years	65	6,500	14	800	1.4	45
Adults	19 years and older	65	8,000	14	800	1.4	45
Life Stage Group		Magnesium[3] (mg/day)		Manganese (mg/day)		Molybdenum (µg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	12	65	-	-	-	-
	4-8 years	12	110	-	-	-	-
Adolescents	9-13 years	12	350	-	-	-	-
	14-18 years	20	350	-	-	-	-
Adults	19 years and older	20	500	0.13	9	2.5	2,000
Life Stage Group		Phosphorus (mg/day)		Selenium (µg/day)		Silicon (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	62	2,000	-	-	-	-
	4-8 years	62	2,000	-	-	-	-
Adolescents	9-13 years	62	2,000	-	-	-	-
	14-18 years	62	2,000	-	-	-	-
Adults	19 years and older	62	2,000	3.5	200	>0	84
Life Stage Group		Zinc (from non-picolinate sources)[4,5] (mg/day)		Zinc (from source zinc picolinate)[4,5] (mg/day)			
		Min	Max	Min	Max		
Infants	0-12 months	0.2	2	-	-		
Children	1-3 years	0.4	7	-	-		
	4-8 years	0.4	12	-	-		
Adolescents	9-13 years	0.4	23	-	-		
	14-18 years	0.7	34	-	-		
Adults	19 years and older	0.7	50	0.7	25		

[1] **Cobalt + Vitamin B_{12}**: As vitamin B_{12} is the source material for cobalt, the maximum dose for cobalt and vitamin B_{12} combined must not exceed 1000 µg of vitamin B_{12} per day.
[2] **Iron:** A specific use or purpose statement **must** be made for products providing > 35 mg iron per day.
[3] **Magnesium:** A specific use or purpose statement **must** be made for products providing > 350 mg magnesium per day.
[4] **Zinc**: A specific use or purpose statement **must** be made for products providing > 40 mg zinc per day.
[5] **Zinc**: As zinc supplementation can cause a copper deficiency, manufacturers of products providing high doses of zinc are encouraged to supplement with sufficient quantities of copper. Refer to Appendix VII to determine how much copper is sufficient to mitigate this risk and for information on how to determine if a risk statement might be necessary.

5.5 Dose information for other medicinal ingredients

Table 10. Daily doses for other medicinal ingredients (Min = minimum; Max = maximum)

Life Stage Group		Beta-carotene[1] (µg/day)		Choline[2] (mg/day)		L-Methionine[2] (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	180	3,600	-	-	-	-
Children	1-3 years	180	3,600	19	1,000	40	1,000
	4-8 years	180	5,400	19	1,000	40	1,000
Adolescents	9-13 years	180	10,200	19	1,000	40	1,000
	14-18 years	390	16,800	27	1,000	91	1,000
Adults	19 years and older	390	18,000	27	1,000	91	1,000
Life Stage Group		Lutein[2] (mg/day)		Lycopene[2] (mg/day)		Potassium[3] (mg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	-	-	-	-	-	-
	4-8 years	-	-	-	-	-	-
Adolescents	9-13 years	-	-	-	-	-	-
	14-18 years	-	-	-	-	-	-
Adults	19 years and older	>0	20	>0	30	>0	200

[1] **Beta-carotene**: There is a potential risk of hypervitaminosis A resulting from the use of products which combine high doses of vitamin A and beta-carotene. See Appendix V ("Mitigating the Risk of Hypervitaminosis A") for information on how to determine acceptable daily doses of each of these medicinal ingredients when used in combination.
[2] At least two of the following references were consulted: Christen et al. 2008; Fletcher et al. 2008; Johnson et al. 2008; Kristal et al. 2008; Moeller et al. 2008; Silaste et al. 2007; IOM 2006; Shao and Hathcock 2006; Shils et al. 2006; Porrini et al. 2005; WHO 2005; Alves-Rodrigues and Shao 2004; Richer et al. 2004; Olmedilla *et al*. 2003; Giovannucci et al. 2002; IOM 2002; Kucuk et al. 2002; Brown *et al*. 1999; Gann et al. 1999; IOM 1998; Giovannucci et al. 1995.
[3] **Potassium**: At least 100 mg of potassium per day is required to support the uses or purposes listed in Section 4.2.3. Only general uses or purposes are permitted at daily doses below 100 mg of potassium.

5.6 Dose information for complementary medicinal ingredients

Table 11. Daily doses for complementary medicinal ingredients (Min = minimum; Max = maximum)

Life Stage Group		Boron (µg/day)		Inositol (mg/day)		Nickel (µg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	-	-	>0	650	-	-
	4-8 years	-	-	>0	650	-	-
Adolescents	9-13 years	-	-	>0	650	-	-
	14-18 years	-	-	>0	650	-	-
Adults	19 years and older	>0	700	>0	650	>0	350
Life Stage Group		PABA[1] (mg/day)		Tin (mg/day)		Vanadium (µg/day)	
		Min	Max	Min	Max	Min	Max
Infants	0-12 months	-	-	-	-	-	-
Children	1-3 years	-	-	-	-	-	-
	4-8 years	-	-	-	-	-	-
Adolescents	9-13 years	-	-	-	-	-	-
	14-18 years	-	-	-	-	-	-
Adults	19 years and older	>0	1,200	>0	2	>0	182

[1] The following references were consulted: Weidner et al. 2005, Bardhan et al. 2000, Tisdale et al. 1995, Clegg et al. 1994.

5.7 Directions for use

*Products providing 500 mg of **nicotinic acid**, per day*

- Do not exceed the recommended dose except on the advice of a physician.

*Products providing 10 mg or more of **nicotinic acid**, per day*

- Take with food (IOM 2011; Sweetman 2015).

*Products providing **calcium, iron or zinc***

- Take with food, a few hours before or after taking other medications or natural health products (Sweetman 2015; IOM 2011; ASHP 2005).

In all other cases, optional statement(s), as appropriate

- Take with food, or
- Take on an empty stomach.

*Products providing 400 mcg or more of **folate,** per day (e.g. as a prenatal supplement) (optional statement)*

- 400 mcg of folate per day is adequate for most women (to reduce the risk of neural tube defects). Consult a health care practitioner/health care provider/health care professional/doctor/physician to determine if you would benefit from additional folate before taking this product.

6.0 Durations of use

Table 12. Durations of use for specific medicinal ingredients and associated daily doses

Medicinal ingredient	Daily dose	Contraindication(s)
Chromium sourced from chromium picolinate	All doses	Consult a health care practitioner/health care provider/health care professional/doctor/physician for use beyond 6 months (Anton et al. 2008; Campbell et al. 2002; Campbell et al. 1999; Cefalu et al. 1999; Kato et al. 1998; Anderson et al. 1997; Pasman et al. 1997; Lee et al. 1994).
Zinc sourced from zinc picolinate	All doses	Consult a health care practitioner/health care provider/health care professional/doctor/physician for use beyond 3 months (Sakai et al. 2002)

7.0 Risk information

7.1 Cautions and warnings

Table 13. Cautions and warnings for specific medicinal ingredients and associated daily doses

Medicinal ingredient	Daily dose	Caution(s) and warning(s)
Beta-carotene	> 6,000 µg	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you are a tobacco smoker (Touvier et al. 2005; Omenn et al. 1996; ATBC 1994).
Chromium sourced from chromium picolinate	≥ 200 µg	Consult a health care practitioner/health care provider/health care professional/doctor/physician if you have a kidney disorder and/or diabetes (Wani et al. 2006; Cupp et al. 2003; Bunner and McGinnis 1998; Cerulli et al. 1998; McCarty et al. 1997; Wasser et al. 1997).
Iron	Where the package contains more than the equivalent of 250 mg of elemental iron	Keep out of reach of children. There is enough iron in this package to seriously harm a child. (Note: this must be preceded by a prominently displayed symbol that is octagonal in shape, conspicuous in colour and on a background of a contrasting colour) [As per Section 97 of the *Natural Health Products Regulations*, citing Sections C.01.029 and C.01.031 of the *Food and Drug Regulations* (JC 2011, 2008)].
Manganese	> 5 mg	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you have a liver disorder (IOM 2006; IOM 2001; Krieger et al. 1995).
PABA	All doses	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you are pregnant or breastfeeding or if you are taking sulfonamides (Maren 1976).

Medicinal ingredient	Daily dose	Caution(s) and warning(s)
Selenium	> 70 µg	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you have a history of non-melanoma skin cancer (Duffield-Lillico et al. 2003).
Vanadium	All doses	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you are pregnant or breastfeeding (IOM 2006; IOM 2001).
Vitamin E	≥ 180 mg AT	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you have cancer (Meyer et al. 2008; Bairati et al. 2006; Bairati et al. 2005).
	≥ 268 mg AT	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you have cardiovascular disease or diabetes (Ward et al. 2007; Winterbone et al. 2007; Lonn et al. 2005).
	≥ 360 mg AT	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you are taking blood thinners (CPS 2012; IOM 2006; Booth et al. 2004; Corrigan and Marcus 1974).
Vitamin K_1 and/or K_2	All doses	Consult a health care practitioner/health care provider/health care professional/doctor/physician prior to use if you are taking blood thinners (ASHP 2005; Franco et al. 2004; IOM 2001; Hansten et al. 1997).

7.2 Contraindications

Table 14. Contraindications for specific medicinal ingredients and associated daily doses

Medicinal ingredient	Daily dose	Contraindication(s)
Chromium sourced from chromium picolinate	All doses	Do not use this product if you are pregnant or breastfeeding (EFSA 2009k; IOM 2001).
Potassium	≥ 100 mg	Do not use this product with other potassium-containing supplements or with potassium-containing salt-substitutes (Sweetman 2015).
Zinc sourced from zinc picolinate	All doses	Do not use this product if you are pregnant or breastfeeding (EFSA 2009k; IOM 2001).

7.3 Known adverse reactions

Table 15. Known adverse reactions for specific medicinal ingredients and associated daily doses

Medicinal ingredient	Daily dose		Known adverse reaction(s)
Iron	> 35 mg		Some people may experience constipation, diarrhoea and/or vomiting (IOM 2006; IOM 2001).
	All doses		Stop use if hypersensitivity occurs (de Barrio et al. 2008).
Magnesium	> 350 mg		Some people may experience diarrhoea (IOM 2006; IOM 1997).
Nicotinic acid	≥ 10 mg		People sensitive to nicotinic acid may experience flushing of the skin that is generally mild and transient (IOM 2006; IOM 1998).
PABA	All doses		Stop use if hypersensitivity occurs (Maren 1976).
Zinc[1]	Infants 0-12 months	≤ 2 mg	Zinc supplementation can cause a copper deficiency (IOM 2006; IOM 2001). If you are unsure whether you are taking enough copper, consult a health care practitioner prior to use.
	Children 1-3 years	5-7 mg	
	Children 4-8 years	8-12 mg	
	Adolescents 9-13 years	16-23 mg	
	Adolescents 14-18 years	25-34 mg	
	Adults 19 years and older	31-50 mg	

[1] **Zinc**: Statement required if the product does not meet the minimum copper requirements outlined in Appendix VII, Table 24.

8.0 Storage conditions

No statement required.

9.0 Non-medicinal ingredients

Must be chosen from the current Natural Health Products Ingredients Database (NHPID) and must meet the limitations outlined in the database.

10.0 Specifications

- The finished product specifications must be established in accordance with the requirements described in the Natural and Non-prescription Health Products Directorate (NNHPD) Quality of Natural Health Products Guide.
- The medicinal ingredient(s) must comply with the requirements outlined in the NHPID.

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12.0 Appendices

Appendix I

Source materials with two active components

A source material may provide more than one active component in this monograph. For example, calcium ascorbate provides both calcium and ascorbic acid (vitamin C). The PLA form and label must declare all active components of a source material as medicinal ingredients and provide their quantity per dosage unit if the total daily dose of that active component (i.e. vitamin or mineral) exceeds the monograph's minimum dosage value.

For certain source materials that provide more than one active component, when one of the components is used within its acceptable dosage range it could result in the other component exceeding its acceptable dosage range.

For example, a product formulated to provide the maximum dosage value of calcium for adults (i.e. 1500 mg) from the source material calcium ascorbate would provide 13.2 g of vitamin C. This exceeds vitamin C's adult maximum dosage value of 2000 mg; and therefore, such a product would not be supported for safety. Based on the calculation described below, the maximum dosage value of calcium from the source material calcium ascorbate would be 228 mg as this dose provides 2000 mg of vitamin C.

The following table outlines dose restriction information for calcium ascorbate. It provides the maximum dosage values for calcium and its corresponding source ingredient. Below this table is a sample calculation which demonstrates how these values were derived.

Table 16. Dose restrictions for calcium from the source material calcium ascorbate

Life Stage Group		Maximum dosage value of calcium from calcium ascorbate (mg Ca/day) (mg/day calcium ascorbate)
Infants	0-12 months	-
Children	1-3 years	46 (443)
	4-8 years	74 (720)
Adolescents	9-13 years	137 (1,330)
	14-18 years	205 (1,995)
Adults	19 years and older	228 (2,216)

Sample Calculation

Question: What is the maximum quantity of calcium (maximum dosage value for adults ≥19 y) from the source material calcium ascorbate that can be used in a formulation?

Solution: In order to make this determination, the quantity of calcium from calcium ascorbate that provides the maximum dosage value for adults ≥19 y of ascorbic acid (vitamin C) must be calculated.

Source material: calcium ascorbate (calcium di-ascorbate): $Ca\ (C_6H_7O_6)_2$
There are 2 molecules of ascorbate ($C_6H_7O_6$) for every one of calcium (Ca)

Molecular weight = MW
Maximum dosage value (for adults, ≥19 y) = M
Number of molecules = N

Calcium = Ca
MW_{Ca} = 40.1 g/mol
M_{Ca} = ?

Ascorbic acid = Aa
MW_{Aa} = 176.1 g/mol
M_{Aa} = 2 g

$$\frac{M_{Ca}}{MW_{Ca} \times n} = \frac{M_{Aa}}{MW_{Aa} \times n}$$

$$\frac{M_{Ca}}{40.1\ g/mol \times 1} = \frac{2\ g}{176.1\ g/mol \times 2}$$

$$M_{Ca} = \frac{2\ g \times 40.1\ g/mol \times 1}{176.1\ g/mol \times 2}$$

$$M_{Ca} = \frac{80.2\ g^2/mol}{352.2\ g/mol}$$

M_{Ca} = 0.228 g or 228 mg

Appendix II

Guidelines for use or purpose statements

It is mandatory for all natural health products to cite at least one use or purpose statement.

Specific use or purpose statements:
Ingredient specific use or purpose statements can be used for **any** or **all** of the medicinal ingredients contained in a multi-ingredient product, as applicable (see Section 4.2 - Specific use or purpose statements).

A specific use or purpose statement **must** be made for products providing magnesium (> 350 mg per day), niacin (> 35 mg per day), iron (> 35 mg per day), or zinc (> 40 mg per day).

Inclusion of medicinal ingredient names in a specific use or purpose statement is optional; for example, the specific use or purpose statement can be applied to the whole product. However, if medicinal ingredient names are specified in a use or purpose statement, the statement must be valid for all medicinal ingredients specified.

Appendix III

Definitions and dosage value derivations

1) Definitions:

Adequate Intake (AI): The recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate. An AI is used when a RDA cannot be determined (IOM 2006).

Maximum dosage value: The highest medicinal ingredient quantity which a product can supply in a daily dose to support its safe use.

Minimum dosage value: The lowest medicinal ingredient quantity which a product can supply in a daily dose to support recommended claims.

Recommended Dietary Allowance (RDA): The average daily dietary nutrient intake level sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a particular life stage and gender group (IOM 2006).

Tolerable Upper Intake Level (UL): The highest average daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all individuals in the general population. As intake increases above the UL, the potential risk of adverse effects may increase (IOM 2006).

2) Derivations:

AI, RDA and UL values:

These values were established by the Food and Nutrition Board of the Institute of Medicine in collaboration with Health Canada (IOM 2006).

Maximum dosage value:

The method used to set maximum dosage values varied for each medicinal ingredient depending on numerous factors. The method used to derive maximum dosage levels for vitamins and minerals with established physiological functions was different from the method used for those with unestablished physiological functions.

1. Maximum dosage values for vitamins and minerals with established physiological functions were developed based on the following criteria:
   a) Is there an established UL?
      - If there is an established UL, does it apply to supplements only or to food and supplements?
      - If there is an established UL, how was it derived (i.e. what was the critical adverse reaction on which it was based? was it serious or non-serious? if non-serious, could it be mitigated?)?
   b) What is the average dietary intake?
   c) What doses have previously been marketed in Canada?
   d) What do other regulatory agencies and expert groups recommend as their maximum daily dose?
   e) What doses have been used in clinical trials and have demonstrated evidence for safety and efficacy?

   The only vitamins which were excluded from the method outlined above were:
   - Vitamin D [due to its listing on the Prescription Drug List at 1,000 IU or 25 µg/day (HC 2015)];
   - Vitamin K_1 and K_2 [adult dose was set as per the listing on the Prescription Drug List at 120 µg/day (HC 2015) and children's doses were set at the AI level (IOM 2006)].

2. Maximum dosage values for minerals with unestablished physiological functions (i.e. boron, nickel, silicon, tin and vanadium) were calculated from the No Observed Adverse Effect Level (NOAEL) divided by an uncertainty factor (UF). The UF chosen was based on the following: 10 for extrapolation of animal data to humans, 10 for intra-species variation, and 10 for chronic use in humans. If applicable, (i.e. NOAEL was based on animal data) the final value was multiplied by an average adult body weight of 70 kg.

With the exception of beta-carotene and potassium, the maximum dosage value for non-vitamin and non-mineral ingredients was set based on doses demonstrated to be safe in clinical trials. For beta-carotene the maximum dosage value was set as per the vitamin A UL (applying the following conversion factor: 6 µg beta-carotene = 1 µg RAE) (HC 1990; FAO/WHO 1967). For

potassium, the maximum dosage value was set as per Schedule II of the National Association of Pharmacy Regulatory Authorities (NAPRA 1999).

Minimum dosage value:

For medicinal ingredients which did not have an RDA or AI, the minimum dose was set at >0. For the remaining medicinal ingredients (with the exception of potassium), the minimum was set using the following method:

- 5% of the RDA and/or AI was calculated for each life stage group [This method was modelled after the vitamin and mineral minimum dose requirements of the *Food and Drug Regulations*, Sections D.01.004 and D.02.002 (JC 2011)].
    a) The highest value derived for children (1-13 years) was applied to all children within this age category;
    b) the highest value derived for adolescents (≥ 14 years) and adults (including pregnant and breastfeeding women) was applied;
    c) The highest value derived for infants (0-12 months) was applied (if applicable).

For potassium, the AI was inappropriate for setting a minimum dosage value; therefore, the minimum was set at >0.

Appendix IV

Recommended Dietary Allowance (RDA) and Adequate Intake (AI)

The AI (as indicated by an asterisk) and RDA values are provided below. For the purpose of this monograph, these values are intended to:

- provide targets for setting appropriate supplement dosage levels;
- provide the minimum dose for the use or purpose statement: “Helps to prevent (appropriate vitamin or mineral) deficiency”; and
- facilitate the optional labelling of % RDA and AI values.

Notes:

- RDA and AI values have not been provided for those life stage groups where the vitamin or mineral dosage is outside the scope of this monograph.
- For certain minerals, a RDA or AI value has not been established.

Table 17. Recommended Dietary Allowance (RDA) and Adequate Intake* (AI) for vitamins (IOM 2011; IOM 2006)

Life Stage Group		Biotin (µg/day)	Folate (µg/day)	Niacin/ niacinamide (mg/day)	Panto-thenic acid (mg/day)	Riboflavin (mg/day)
Infants	0-6 months	-	-	-	-	-
	7-12 months	-	-	-	-	-
Children	1-3 years	8*	150	6	2*	0.5
	4-8 years	12*	200	8	3*	0.6
Adolescent males	9-13 years	20*	300	12	4*	0.9
	14-18 years	25*	400	16	5*	1.3
Adult males	19-30 years	30*	400	16	5*	1.3
	31-50 years	30*	400	16	5*	1.3
	51-70 years	30*	400	16	5*	1.3
	More than 70 years	30*	400	16	5*	1.3
Adolescent females	9-13 years	20*	300	12	4*	0.9
	14-18 years	25*	400	14	5*	1.0
Adult females	19-30 years	30*	400	14	5*	1.1
	31-50 years	30*	400	14	5*	1.1
	51-70 years	30*	400	14	5*	1.1
	More than 70 years	30*	400	14	5*	1.1
Pregnancy	14-18 years	30*	600	18	6*	1.4
	19-50 years	30*	600	18	6*	1.4
Breastfeeding	14-18 years	35*	500	17	7*	1.6
	19-50 years	35*	500	17	7*	1.6

Life Stage Group		Thiamine (mg/day)	Vitamin A (µg RAE/day)	Vitamin B_6 (mg/day)	Vitamin B_{12} (µg/day)	Vitamin C (mg/day)
Infants	0-6 months	-	400*	-	-	-
	7-12 months	-	500*	-	-	-
Children	1-3 years	0.5	300	0.5	0.9	15
	4-8 years	0.6	400	0.6	1.2	25
Adolescent males	9-13 years	0.9	600	1.0	1.8	45
	14-18 years	1.2	900	1.3	2.4	75
Adult males	19-30 years	1.2	900	1.3	2.4	90
	31-50 years	1.2	900	1.3	2.4	90
	51-70 years	1.2	900	1.7	2.4	90
	Older than 70 years	1.2	900	1.7	2.4	90
Adolescent females	9-13 years	0.9	600	1.0	1.8	45
	14-18 years	1.0	700	1.2	2.4	65
Adult females	19-30 years	1.1	700	1.3	2.4	75
	31-50 years	1.1	700	1.3	2.4	75
	51-70 years	1.1	700	1.5	2.4	75
	More than 70 years	1.1	700	1.5	2.4	75
Pregnancy	14-18 years	1.4	750	1.9	2.6	80
	19-50 years	1.4	770	1.9	2.6	85
Breastfeeding	14-18 years	1.4	1,200	2.0	2.8	115
	19-50 years	1.4	1,300	2.0	2.8	120

Life Stage Group		Vitamin D (µg/day)	Vitamin E (mg AT/day)	Vitamin K[1] (µg/day)
Infants	0-6 months	10*	-	-
	7-12 months	10*	-	-
Children	1-3 years	15	6	30*
	4-8 years	15	7	55*
Adolescent males	9-13 years	15	11	60*
	14-18 years	15	15	75*
Adult males	19-30 years	15	15	120*
	31-50 years	15	15	120*
	51-70 years	15	15	120*
	More than 70 years	20	15	120*
Adolescent females	9-13 years	15	11	60*
	14-18 years	15	15	75*
Adult females	19-30 years	15	15	90*
	31-50 years	15	15	90*
	51-70 years	15	15	90*
	More than 70 years	20	15	90*
Pregnancy	14-18 years	15	15	75*
	19-50 years	15	15	90*
Breastfeeding	14-18 years	15	19	75*
	19-50 years	15	19	90*

[1] The AI for vitamin K is based on median dietary intakes. Vitamin K_1 is the predominant form of vitamin K in the diet (IOM 2006; IOM 2001); however this AI applies to vitamin K_1, vitamin K_2 and total vitamin K_1 + K_2.

Table 18. Recommended Dietary Allowance (RDA) and Adequate Intake* (AI) for minerals (IOM 2011; IOM 2006)

Life Stage Group		Boron (mg/day)	Calcium (mg/day)	Chromium (µg/day)	Cobalt[1] (µg/day)	Copper (µg/day)
Infants	0-6 months	-	200*	-	-	-
	7-12 months	-	260*	-	-	-
Children	1-3 years	-	700	-	0.04	340
	4-8 years	-	1000	-	0.05	440
Adolescent males	9-13 years	-	1,300	-	0.08	700
	14-18 years	-	1,300	-	0.10	890
Adult males	19-30 years	-	1,000	35*	0.10	900
	31-50 years	-	1,000	35*	0.10	900
	51-70 years	-	1,000	30*	0.10	900
	More than 70 years	-	1,200	30*	0.10	900
Adolescent females	9-13 years	-	1,300	-	0.08	700
	14-18 years	-	1,300	-	0.10	890
Adult females	19-30 years	-	1,000	25*	0.10	900
	31-50 years	-	1,000	25*	0.10	900
	51-70 years	-	1,200	20*	0.10	900
	More than 70 years	-	1,200	20*	0.10	900
Pregnancy	14-18 years	-	1,300	-	0.11	1,000
	19-50 years	-	1,000	30*	0.11	1,000

Breastfeeding	14-18 years	-	1,300	-	0.12	1,300
	19-50 years	-	1,000	45*	0.12	1,300

Life Stage Group		Iodine (µg/day)	Iron (mg/day)	Magnesium (mg/day)	Manganese (mg/day)	Molyb-denum (µg/day)
Infants	0-6 months	-	0.27*	-	-	-
	7-12 months	-	11	-	-	-
Children	1-3 years	90	7	80	-	-
	4-8 years	90	10	130	-	-
Adolescent males	9-13 years	120	8	240	-	-
	14-18 years	150	11	410	-	-
Adult males	19-30 years	150	8	400	2.3*	45
	31-50 years	150	8	420	2.3*	45
	51-70 years	150	8	420	2.3*	45
	More than 70 years	150	8	420	2.3*	45
Adolescent females	9-13 years	120	8	240	-	-
	14-18 years	150	15	360	-	-
Adult females	19-30 years	150	18	310	1.8*	45
	31-50 years	150	18	320	1.8*	45
	51-70 years	150	8	320	1.8*	45
	More than 70 years	150	8	320	1.8*	45
Pregnancy	14-18 years	220	27	400	-	-
	19-50 years	220	27	355	2.0*	50
Breastfeeding	14-18 years	290	10	360	-	-
	19-50 years	290	9	315	2.6*	50

Life Stage Group		Nickel (mg/day)	Phosphorus (mg/day)	Selenium (µg/day)	Silicon (mg/day)	Tin (mg/day)
Infants	0-6 months	-	-	-	-	-
	7-12 months	-	-	-	-	-
Children	1-3 years	-	460	-	-	-
	4-8 years	-	500	-	-	-
Adolescent males	9-13 years	-	1,250	-	-	-
	14-18 years	-	1,250	-	-	-
Adult males	19-30 years	-	700	55	-	-
	31-50 years	-	700	55	-	-
	51-70 years	-	700	55	-	-
	More than 70 years	-	700	55	-	-
Adolescent females	9-13 years	-	1,250	-	-	-
	14-18 years	-	1,250	-	-	-
Adult females	19-30 years	-	700	55	-	-
	31-50 years	-	700	55	-	-
	51-70 years	-	700	55	-	-
	More than 70 years	-	700	55	-	-
Pregnancy	14-18 years	-	1,250	-	-	-
	19-50 years	-	700	60	-	-
Breastfeeding	14-18 years	-	1,250	-	-	-
	19-50 years	-	700	70	-	-

Life Stage Group		Vanadium (mg/day)	Zinc (mg/day)
Infants	0-6 months	-	2*
	7-12 months	-	3
Children	1-3 years	-	3
	4-8 years	-	5
Adolescent males	9-13 years	-	8
	14-18 years	-	11
Adult males	19-30 years	-	11
	31-50 years	-	11
	51-70 years	-	11
	More than 70 years	-	11
Adolescent females	9-13 years	-	8
	14-18 years	-	9
Adult females	19-30 years	-	8
	31-50 years	-	8
	51-70 years	-	8
	More than 70 years	-	8
Pregnancy	14-18 years	-	12
	19-50 years	-	11
Breastfeeding	14-18 years	-	13
	19-50 years	-	12

[1] Calculated from the vitamin B_{12} RDA (IOM 2006).

Appendix V

Guidance for Products Containing Beta-Carotene

Background:

Although all of the claims for beta-carotene are associated with its vitamin A activity, it is not acceptable to cite beta-carotene as a source of vitamin A. This is because the rate of conversion of beta-carotene to vitamin A in the human body depends on numerous factors (e.g. vitamin A status, dietary factors such as vegetable consumption and fat intake, genetic factors, etc.). In other words, the consumption of supplemental beta-carotene does not always result in a consistent rate of conversion to vitamin A. Nevertheless, products providing beta-carotene do contribute to vitamin A requirements; therefore, all of the health claims associated with beta-carotene are linked to its vitamin A activity. Furthermore, there is a potential risk of hypervitaminosis A associated with the consumption of combinations including both beta-carotene and vitamin A.

Determining dosage requirements for the claim "Helps to prevent vitamin A deficiency":

In order to make any prevention of deficiency health claims, a nutrient must be included in a product at a dose at or above its Recommended Dietary Allowance (RDA) or Adequate Intake

(AI). There are three potential scenarios in which a product would qualify for the claim: "Helps to prevent vitamin A deficiency":

i. The product could provide vitamin A on its own: See Appendix IV to determine vitamin A minimum dosage requirements;
ii. The product could provide beta-carotene on its own: See Table 19 below for minimum dosage requirements; or
iii. The product could provide both beta-carotene and vitamin A: See Appendix IV to determine vitamin A minimum dosage requirements and apply the conversion factor of 6 µg of beta-carotene = 1 µg all-*trans* retinol (HC 1990; FAO/WHO 1967).

Table 19. Daily dose in microgram (µg) of beta-carotene

Life Stage Group		Minimum dose of beta-carotene[1] (µg/day)
Infants	0-6 months 7-12 months	2,400* 3,000*
Children	1-3 years 4-8 years	1,800 2,400
Adolescent males	9-13 years 14-18 years	3,600 5,400
Adult males	19 years and older	5,400
Adolescent females	9-13 years 14-18 years	3,600 4,200
Adult females	19 years and older	4,200
Pregnancy	14-18 years 19-50 years	4,500 4,620
Breastfeeding	14-18 years 19-50 years	7,200 7,800

[1] These values are based on the RDA and AI values for vitamin A based on life stage group (IOM 2006) and were derived from the conversion factor of 6 µg of beta-carotene = 1 µg all-*trans* retinol; hence, a ratio of 6:1 beta-carotene:vitamin A, on a weight to weight basis (HC 1990; FAO/WHO 1967).

Example:
As per Appendix IV, the minimum dose for the vitamin A deficiency claim for adults (excluding breastfeeding women) is 900 µg per day. This is based on the highest RDA for all adult subpopulations (i.e. 900 µg for adult males). There are three potential ways this dose can be achieved:

i. Vitamin A alone (900 µg RAE (from vitamin A) per day);
ii. Beta-carotene alone (5400 µg beta-carotene per day); or
iii. Combinations of vitamin A plus beta-carotene (e.g. 500 µg RAE (from vitamin A) + 2400 µg beta carotene = 900 µg RAE per day).

Note: The depiction of beta-carotene in RAE is to demonstrate the efficacy of the combination of vitamin A and beta-carotene only and must not appear on the PLA form or label.

Mitigating the Risk of Hypervitaminosis A:

In products containing both vitamin A and beta-carotene, the risk of hypervitaminosis A is to be mitigated by ensuring that the combined doses of these two medicinal ingredients is not excessively high. Therefore, the combined dose of vitamin A plus beta-carotene must not exceed the maximum dosage value for vitamin A, measured in µg RAE (See Table 8). The conversion factor of 6 µg beta-carotene = 1 µg RAE (HC 1990; FAO/WHO 1967) can be applied for the specific purpose of ensuring safety of the combined dose. The example below illustrates how the 6:1 conversion factor can be used to determine the safety of combinations including beta-carotene and vitamin A:

Example:

The maximum dosage value of vitamin A for adults is 3000 µg RAE per day. If a product contained 2800 µg vitamin A (i.e. all-*trans* retinol, vitamin A acetate, vitamin A palmitate), then it could contain no more than 1200 µg beta-carotene. See calculation below:

2800 µg vitamin A + 1200 µg beta-carotene (200 µg RAE) = 3000 µg RAE.

Note: The value of 3000 µg RAE is to demonstrate the safety of the combination of vitamin A and beta-carotene only and must not appear on the PLA form or label.

Appendix VI

Conversion factors

1. Pantothenic Acid (USP 38):

Table 20. Conversion of pantothenic acid source material quantity into pantothenic acid quantity

Source material (1 mg)	Pantothenic acid quantity (mg)
Calcium-d-pantothenate	0.92
Calcium-dl-pantothenate	0.46
Dexpanthenol	1.07
dl-Panthenol	0.53
d-Pantothenic acid	1.00
dl-Pantothenic acid	0.50

2. Vitamin A (IOM 2006):

The quantity of vitamin A must always be provided in terms of retinol activity equivalents (RAE) (i.e. µg all-*trans* retinol), irrespective of the source ingredient used.

International Units (IU) may be provided as optional additional information on the PLA form in the "potency" field and on product labels.

Table 21. Conversion of vitamin A source material quantity into vitamin A quantity in terms of retinol activity equivalents (RAE) and vitamin A activity in terms of International Units (IU)

Source material (1 µg)	Vitamin A quantity (µg RAE)	Vitamin A activity (IU)
All-trans retinol	1.00	3.33
All-trans retinyl acetate	0.87	2.91
All-trans retinyl palmitate	0.55	1.82

Examples using the vitamin A conversion factors:

Converting vitamin A activity into quantity of RAE (µg)

Convert 500 IU of vitamin A activity from all-trans retinol into µg RAE:
= 500 IU x 1 µg RAE/3.33 IU vitamin A
= 150 µg RAE

or

= 3000 IU x 0.87 µg RAE/2.91 IU vitamin A
= 897 µg RAE

3. Beta-carotene:

1 IU beta-carotene = 0.6 µg beta-carotene (USP 38)

4. Vitamin D:

1 IU of vitamin D = 0.025 µg cholecalciferol (IOM 2006)
= 0.025 µg ergocalciferol

5. Vitamin E (IOM 2006)**:**

The quantity of vitamin E must always be provided in terms of alpha-tocopherol (AT) (i.e. mg 2R-alpha-tocopherol), irrespective of the source ingredient used.

IUs may be provided as optional additional information on the PLA form in the "potency" field and on product labels.

Table 22. Conversion of vitamin E source material quantity into vitamin E quantity in terms of alpha-tocopherol (mg AT) and vitamin E activity in terms of International Units (IU)

Source material (1 mg)	Vitamin E quantity (mg AT)	Vitamin E activity (IU)
d-alpha-tocopherol	1.00	1.49
d-alpha-tocopheryl acetate	0.91	1.36
d-alpha-tocopheryl succinate	0.81	1.21
dl-alpha-tocopherol	0.50	1.10
dl-alpha-tocopheryl acetate	0.45	1.00
dl-alpha-tocopheryl succinate	0.40	0.89

Table 23. Conversion of vitamin E source material activity (IU) into vitamin E quantity in terms of alpha-tocopherol (mg AT)

Source material (1 IU)	Vitamin E quantity (mg AT)
d-alpha-tocopherol	0.67
d-alpha-tocopheryl acetate	0.67
d-alpha-tocopheryl succinate	0.67
dl-alpha-tocopherol	0.45
dl-alpha-tocopheryl acetate	0.45
dl-alpha-tocopheryl succinate	0.45

Examples using the vitamin E conversion factors:

a) Converting vitamin E activity into quantity of AT (mg)

Convert 400 IU of d-alpha-tocopheryl succinate activity into mg AT:
= 400 IU x 0.67 mg AT/IU
= 268 mg AT

b) Converting vitamin E source ingredient quantity into quantity of AT (mg)

Convert 200 mg of dl-alpha-tocopheryl acetate into mg AT:
= 200 mg x 0.45 mg AT/mg
= 90 mg AT

Appendix VII

Zinc and Copper Relationship

Zinc supplements can cause a copper deficiency. In order to mitigate this risk, applicants are encouraged to supplement high dose zinc products with copper. Table 24 below outlines how much copper is sufficient to mitigate this risk based on both life stage group and zinc daily dosage. Products which do not fulfill the zinc and copper quantity guidelines require an additional risk statement. See Section 7.0 Risk Information.

Table 24. Daily dosage of copper required to mitigate the risk of copper deficiency in products containing high doses of zinc

Life Stage Group	Daily dosage range of zinc which requires added copper or a risk statement (mg/day)	Daily dosage range of copper required to avoid a risk statement (µg/day)
Infants 0-12 months	≤ 2	0
Children 1-3 years	5-7	280-700
Children 4-8 years	8-12	480-2,500
Adolescents 9-13 years	16-23	920-4,000
Adolescents 14-18 years	25-34	1,360-6,500
Adults 19 years and older	31-50	2,000-8,000

Examples using Table 24:

a) Question: Product A is targeted to adults only. The product provides a daily dose of zinc of 30 mg but does not contain copper. Is a risk statement necessary on this product?

Answer: No. According to Table 24, for an adult subpopulation, there is no need for copper supplementation at a dose of 30 mg zinc per day. Therefore, no risk statement is required.

b) Question: Product B is targeted to adults and adolescents ≥ 12 years. The product provides zinc and copper at daily dosages of 20 mg and 500 µg, respectively. Is a risk statement necessary on this product?

Answer: Yes. According to Table 24, for an adult subpopulation, there is no need for copper supplementation at a daily dose of 20 mg zinc. However, for adolescents ≥ 12 years, products providing daily doses of zinc between 16-23 mg need at least 920 µg copper per day. As the product in this example provides 500 µg of copper per daily dose, the following risk statement is required: “Zinc supplementation can cause a copper deficiency. If you are unsure whether you are taking enough copper, consult a health care practitioner prior to use”.