

# Carnitine, L-

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L-CARNITINE Help on accessing alternative formats, such as Portable Document Format ( PDF ), Microsoft Word and PowerPoint ( PPT ) files, can be obtained in the alternate format help section. (PDF Version - 78.6 KB) This monograph is intended to serve as a guide to industry for the preparation of Product Licence Applications (PLAs) and labels for natural health product market authorization. It is not intended to be a comprehensive review of the medicinal ingredient. Notes Text in parentheses is additional optional information which can be included on the label at the applicant's discretion. The solidus (/) indicates that either term and/or statement may be selected on the label. Restrictions when this monograph is combined with other monographs (Class II and III applications): When combining L-Carnitine with Acetylcarnitine, the total quantity of these ingredients cannot exceed 4 grams per day and 2 grams per single dose. Date July 25, 2025 Proper name(s), Common name(s), Source information Table 1. Proper name(s), Common name(s), Source information Proper name(s) Common name(s) Source information Source ingredient(s) (L-3-Carboxy-2-hydroxypropyl)trimethylammonium hydroxide, inner salt (R)-3-Carboxy-2-hydroxy-N,N,N-trimethyl-1-propanaminium hydroxide, inner salt L-Carnitine Levocarnitine L-Carnitine Levocarnitine L-Carnitine L-Carnitine fumarate L-Carnitine tartrate References: Proper name: RSC 2024; USP-NF 2024; Common name: RSC 2024; USP-NF 2024; Source information: EFSA 2012; Wall et al. 2011; EFSA 2003. Route of Administration Oral Dosage Form(s) This monograph excludes foods or food-like dosage forms as indicated in the Compendium of Monographs Guidance Document. Acceptable dosage forms for oral use are indicated in the dosage form drop-down list of the web-based Product Licence Application form for Compendial applications. Use(s) or Purpose(s) L-Carnitine fumarate; L-Carnitine tartrate; L-Carnitine Source of (an) antioxidant(s)/Provides (an) antioxidant(s) (Cao et al. 2011; Arkadeb et al. 2008; Gomez-Amores et al. 2007). Source of (an) antioxidant(s)/Provides (an) antioxidant(s) that help(s) fight/protect (cell) against/reduce (the oxidative effect of/the oxidative damage caused by/cell damage caused by) free radicals (Cao et al. 2011; Arkadeb et al. 2008; Gomez-Amores et al. 2007). Workout support/supplement (Wall et al. 2011; Cha et al. 2001; Arenas et al. 1994; Huertas et al. 1992; Arenas et al. 1991; Vecchiet et al. 1990; Marconi et al. 1985). Athletic support/supplement (Wall et al. 2011; Cha et al. 2001; Arenas et al. 1994; Huertas et al. 1992; Arenas et al. 1991; Vecchiet et al. 1990; Marconi et al. 1985). L-Carnitine tartrate; L-Carnitine Aids in the muscle recovery process by reducing muscle tissue damage associated with a resistance training regimen (Ho et al. 2010; Spiering et al. 2008; Spiering et al. 2007; Kraemer et al. 2006; Kramer et al. 2003; Volek et al. 2002). Helps support muscle tissue repair in individuals involved in resistance training (Ho et al. 2010; Spiering et al. 2008; Spiering et al. 2007; Kraemer et al. 2006; Kramer et al. 2003; Volek et al. 2002). Helps improve physical performance when used in conjunction with a training regimen (Wall et al. 2011; Cha et al. 2001; Arenas et al. 1994; Huertas et al. 1992; Arenas et al. 1991; Vecchiet et al. 1990; Marconi et al. 1985). Helps delay fatigue during physical activity (Cha et al. 2011; Wall et al. 2011; Karahan et al. 2010). Helps support fat metabolism (Stephens et al. 2007; Karlic and Lohninger 2004; Müller et al. 2002). Helps support fat oxidation (Wall et al. 2011; Stephens et al. 2007; Wutzke and Lorenz 2004; Müller et al. 2002). Notes: The above uses can be combined on the product label (e.g., L-carnitine from L-carnitine tartrate: Workout supplement that helps support fat metabolism and fat oxidation). The terms 'Helps' or 'Helps to' can be used interchangeably on the label. If L-carnitine is combined with other medicinal ingredients with antioxidant properties at Class II and III, there is an option to use the claim in plural. The singular should be used when the product only contains one chemical substance as the medicinal ingredient associated with this claim. Dose(s) Subpopulation(s) Adults 18 years and older Quantity(ies) Antioxidant Not to exceed 4 grams of L-carnitine per day and 2 grams per single dose (Karlic and Lohninger 2004; Benvenega et al. 2001; Ahmet et al. 2000; Harper et al. 1988). Muscle recovery, Muscle tissue repair, Workout/Athletic support/supplement 1 - 4 grams of L-carnitine, per day; Not to exceed 2 grams per single dose (Ho et al. 2010; Spiering et al. 2008; Spiering et al. 2007; Kraemer et al. 2006; Kramer et al. 2003; Volek et al. 2002; Benvenega et al. 2001; Ahmet et al. 2000; Harper et al. 1988). Physical performance, Fatigue 2 - 4 grams of L-carnitine, per day; Not to exceed 2 grams per single dose (Wall et al. 2011; Benvenega et al. 2001; Cha et al. 2001; Ahmet et al. 2000; Arenas et al. 1994; Huertas et al. 1992; Arenas et al. 1991; Vecchiet et al. 1990; Harper et al. 1988; Marconi et al. 1985). Fat metabolism, Fat oxidation 3 - 4

grams of L-carnitine, per day; Not to exceed 2 grams per single dose (Wall et al. 2011; Stephens et al. 2007; Karlic and Lohninger 2004; Wutzke and Lorenz 2004; Müller et al. 2002). Direction(s) for use Muscle recovery, Muscle tissue repair, Workout/Athletic support/supplement, Physical performance, Fatigue Take 2-4 hours prior to exercise (Harper et al. 1988). Duration(s) of Use No statement required. Risk Information Caution(s) and warning(s) Ask a health care practitioner/health care provider/health care professional/doctor/physician before use if you are pregnant or breastfeeding (CPS 2008). Ask a health care practitioner/health care provider/health care professional/doctor/physician before use if you have a seizure disorder (CPS 2008). Contraindication(s) No statement required. Known adverse reaction(s) No statement required. Non-medicinal ingredients Must be chosen from the current Natural Health Products Ingredients Database (NHPID) and must meet the limitations outlined in the database. Storage conditions Must be established in accordance with the requirements described in the Natural Health Products Regulations. 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 must comply with the requirements outlined in the NHPID. EXAMPLE OF PRODUCT FACTS: Consult the Guidance Document, Labelling of Natural Health Products for more details. References Cited Ahmet U, Abdurrahman K, Sait B, Ahmet E, Salih D, Mendane S, Ates Y, Fatih B, Necmettin K, Kemal D. L-carnitine therapy in non-alcoholic steatohepatitis. *Turkish Journal of Pediatrics* 2000;11(3):196-201. 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EFSA 2012: Scientific Opinion: Scientific Opinion on the safety and efficacy of L- carnitine and L-carnitine L-tartrate as feed additives for all animal species based on a dossier submitted by Lonza Benelux BV. European Food Safety Authority (EFSA), Parma, Italy. [Accessed 2024 June 10]. Available from: <https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2012.2676> EFSA 2003: Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food (AFC) on a request from the Commission related to LCarnitine-L-tartrate for use in foods for particular nutritional uses (adopted on 3 November 2003 by written procedure). European Food Safety Authority (EFSA). Parma. Italy. [Accessed 2024 June 10]. 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2003;17(3):455-462. Marconi C, Sassi G, Carpinelli A, Cerretelli P. Effect of L-carnitine loading on the aerobic and anaerobic performance of endurance athletes. *European Journal of Applied Physiology* 1985;54:131-135. Müller DM, Seim H, Kiess W, Löster H, Richter T. Effects of oral L-carnitine supplementation on in vivo long-chain fatty acid oxidation in healthy adults. *Journal of Metabolism* 2002;51(11):1389-1391. RSC 2024: Royal Society of Chemistry: The Merck Index Online [Accessed 2024 June 3]. Available from: <https://merckindex.rsc.org/> Spiering BA, Kraemer WJ, Hatfield DL, Vingren JL, Fragala MS, Ho J-Y, Thomas GA, Hakkinen K, Volek JS. Effects of L-carnitine L-tartrate supplementation on muscle oxygenation responses to resistance exercise. *Journal of Strength and Conditioning Research* 2008;22(4):1130-1135. Spiering BA, Kraemer WJ, Vingren JL, Hatfield DL, Fragala MS, Ho J-Y, Maresh CM, Anderson JM, Volek JS. Responses of criterion variables to different supplemental doses of L-carnitine L-tartrate. *Journal of Strength and Conditioning Research* 2007;21:259-264. Stephens FB, Constantin-Teodosiu D, Greenhaff PL. New insights concerning the role of carnitine in the regulation of fuel metabolism in skeletal muscle. *Journal of Physiology* 2007;581.2:431-444. USP-NF 2024: United States Pharmacopeia and the National Formulary. Rockville (MD): United States Pharmacopeial Convention, Inc.; 2024. Vecchiet L, Di Lisa F, Pieralisi G, Ripari P, Menabo R, Giamberardino MA, Siliprandi N. Influence of L-carnitine administration on maximal physical exercise. *European Journal of Applied Physiology* 1990;61:486-490. Volek JS, Kraemer WJ, Rubin MR, Gomez AL, Ratamess NA, Gaynor P. L-carnitine L-tartrate supplementation favorably affects markers of recovery from exercise stress. *American Journal of Physiology-Endocrinology and Metabolism* 2002;282:E474-E482. Wall BT, Stephens FB, Constantin-Teodosiu D, Marimuthu K, Macdonald IA, Greenhaff PL. Chronic oral ingestion of L-carnitine and carbohydrate increases muscle carnitine content and alters muscle fuel metabolism during exercise in humans. *The Journal of Physiology* 2011;589.4:963-973. Wutzke KD, Lorenz H. The effect of L-carnitine on fat oxidation, protein turnover; and body composition in slightly overweight subjects. *Metabolism* 2004;53(8):1002-1006. References Reviewed Brass EP, Hiatt WR. The role of carnitine and carnitine supplementation during exercise in man in individuals with special needs. *Journal of the American College Nutrition* 1998;17(3):207-215. Broad EM, Maughan RJ, Galloway S. Carbohydrate, protein, and fat metabolism during exercise after oral carnitine supplementation in humans. *International Journal of Sport Nutrition and Exercise Metabolism* 2008;18:567-584. Colombani P, Wenk C, Kunz I, Kraehenbul S, Kuhnt M, Arnold M, Frey-Rindova P, Frey W, Langhans W. Effects of L-carnitine supplementation on physical performance and energy metabolism of endurance-trained athletes: a double-blind crossover field study. *European Journal of Applied Physiology* 1996;73:434-439. Flanagan JL, Simmons PA, Vehige J, Willcox M, Garrett Q. Role in carnitine in disease. *Nutrition and Metabolism* 2010;7(30):1-14. Hathcock JN, Shao A. Risk assessment for carnitine. *Regulatory Toxicology and Pharmacology Journal* 2006;46(1):23-28. Malaguarnera M, Cammalleri L, Gargante MP, Vacante M, Colonna V, Motta M. L-carnitine treatment reduces severity of physical and mental fatigue and increases cognitive functions in centenarians : a randomized and controlled clinical trial. *The American Journal of Clinical Nutrition* 2007;86:1738-1744. Rubin MR, Volek JS, Gomez AL, Ratamess NA, French DN, Sharman MJ, Kraemer WJ. Safety measures of L-carnitine L-tartrate supplementation in healthy men. *Journal of Strength and Conditioning Research* 2001;15(4):486-490. Stuessi C, Hofer P, Meir C, Boutellier U. L-carnitine and the recovery from exhaustive endurance exercise: a randomized, double-blind, placebo-controlled trial. *European Journal of Applied Physiology* 2005;95:431-435. Tabibi H, Hakeshzadeh M, Malakoutian T. Effects of L-carnitine supplement on serum amyloid A and vascular inflammation markers in hemodialysis patients: a randomized controlled trial. *Journal of Renal Nutrition* 2011;21(6):485-491. Wyss V, Ganzit GP, Rienzi A. Effects of L-carnitine administration on VO2max and the aerobicanaerobic threshold in normoxia and acute hypoxia. *European Journal of Applied Physiology* 1990;60:1-6. Report a problem on this page Date modified: 2019-03-01

## DOSAGE FORM(S)

Acceptable dosage forms for oral use are indicated in the dosage form drop-down list of the web-based Product Licence Application form for Compendial applications.

## DOSE(S)

Ho JY, Kraemer WJ, Volek JS, Fragala MS, Thomas GA, Dunn-Lewis C, Coday M, Hakkinen K, Maresh CM. L-carnitine L-tartrate supplementation favorably affects biochemical markers of recovery from physical exertion in middle-aged men and women. *Metabolism Clinical and Experimental Journal* 2010;59:1190-1199. Huertas R, Campos Y, Diaz E, Esteban J, Vechietto L, Montanari G, D'Iddio S, Corsi M, Arenas J. Respiratory chain enzymes in muscle of endurance athletes: Effect of L-carnitine. *Biochemical and biophysical research communications* 1992;188(1):102-107. Karahan M, Coksevim B, Artis S. The effect of L-carnitine supplementation on 1500 m running performance. *Science, Movement and Health Journal* 2010;10(2):504-507. Karlic H, Lohninger A. Supplementation of L-carnitine in athletes: Does it make sense? *Journal of Nutrition* 2004;20:709-715. Kraemer WJ, Spiering BA, Volek JS, Ratamess NA, Sharman MJ, Rubin MR, French DN, Silvestre R, Hatfield DL, Van Heest JC, Vingren JL, Judelson DA, Deschenes MR, Maresh CM. Androgenic responses to resistance exercise: Effects of feeding and L-Carnitine. *Official Journal of the American College of Sports Medicine* 2006;1288-1296. Kraemer WJ, Volek JS, French DN, Rubin MR, Sharman MJ, Gomez AL, Ratamess NA, Newton RU, Jemiole B, Craig BW, Hakkinen K. The effects of L-carnitine L-tartrate supplementation on hormonal responses to resistance exercise and recovery. *Journal of Strength and Conditioning Research* 2003;17(3):455-462. Marconi C, Sassi G, Carpinelli A, Cerretelli P. Effect of L-carnitine loading on the aerobic and anaerobic performance of endurance athletes. *European Journal of Applied Physiology* 1985;54:131-135. Müller DM, Seim H, Kiess W, Löster H, Richter T. Effects of oral L-carnitine supplementation on in vivo long-chain fatty acid oxidation in healthy adults. *Journal of Metabolism* 2002;51(11):1389-1391. RSC 2024: Royal Society of Chemistry: The Merck Index Online [Accessed 2024 June 3]. Available from: <https://merckindex.rsc.org/> Spiering BA, Kraemer WJ, Hatfield DL, Vingren JL, Fragala MS, Ho J-Y, Thomas GA, Hakkinen K, Volek JS. Effects of L-carnitine L-tartrate supplementation on muscle oxygenation responses to resistance exercise. *Journal of Strength and Conditioning Research* 2008;22(4):1130-1135. Spiering BA, Kraemer WJ, Vingren JL, Hatfield DL, Fragala MS, Ho J-Y, Maresh CM, Anderson JM, Volek JS. Responses of criterion variables to different supplemental doses of Lcarnitine L-tartrate. *Journal of Strength and Conditioning Research* 2007;21:259-264. Stephens FB, Constantin-Teodosiu D, Greenhaff PL. New insights concerning the role of carnitine in the regulation of fuel metabolism in skeletal muscle. *Journal of Physiology* 2007;581.2:431-444. USP-NF 2024: United States Pharmacopeia and the National Formulary. Rockville (MD): United States Pharmacopeial Convention, Inc.; 2024. Vecchiet L, Di Lisa F, Pieralisi G, Ripari P, Menabo R, Giamberardino MA, Siliprandi N. Influence of L-carnitine administration on maximal physical exercise. *European Journal of Applied Physiology* 1990;61:486-490. Volek JS, Kraemer WJ, Rubin MR, Gomez AL, Ratamess NA, Gaynor P. L-carnitine L-tartrate supplementation favorably affects markers of recovery from exercise stress. *American Journal of Physiology-Endocrinology and Metabolism* 2002;282:E474-E482. Wall BT, Stephens FB, Constantin-Teodosiu D, Marimuthu K, Macdonald IA, Greenhaff PL. Chronic oral ingestion of L-carnitine and carbohydrate increases muscle carnitine content and alters muscle fuel metabolism during exercise in humans. *The Journal of Physiology* 2011;589.4:963-973. Wutzke KD, Lorenz H. The effect of L-carnitine on fat oxidation, protein turnover; and body composition in slightly overweight subjects. *Metabolism* 2004;53(8):1002-1006.

## **RISK INFORMATION**

Caution(s) and warning(s) Ask a health care practitioner/health care provider/health care professional/doctor/physician before use if you are pregnant or breastfeeding (CPS 2008).Ask a health care practitioner/health care provider/health care professional/doctor/physician before use if you have a seizure disorder (CPS 2008). Contraindication(s) No statement required. Known adverse reaction(s) No statement required.

## **NON-MEDICINAL INGREDIENTS**

Must be chosen from the current Natural Health Products Ingredients Database (NHPID) and must meet the limitations outlined in the database. Storage conditions Must be established in accordance with the requirements described in the Natural Health Products Regulations.

STORAGE CONDITION(S)

Must be established in accordance with the requirements described in theNatural Health Products Regulations.

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 must comply with the requirements outlined in the NHPID. EXAMPLE OF PRODUCT FACTS:

REFERENCES

Route of Administration Oral

Proper name(s)	Common name(s)	Source information
Source ingredient(s)		
(L-3-Carboxy-2-hydroxypropyl)trimethylammonium chloride	Carbide	Carbide