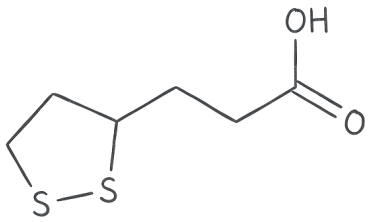
CLINICAL MONOGRAPH · ANTIOXIDANT & MITOCHONDRIAL

Alpha-Lipoic Acid (ALA)

Mitochondrial cofactor and antioxidant

Alpha-lipoic acid (ALA), also called thioctic acid, is a small sulfur-containing molecule the body makes naturally. It is a cofactor for energy-producing enzymes in mitochondria and acts as an antioxidant in both water-soluble and fat-soluble compartments. In the US it is sold only as a dietary supplement; there is no FDA-approved alpha-lipoic acid drug [nih_ods_lipoic]. In Germany and several other European countries it is an approved prescription medicine for the painful nerve damage of diabetes.

The strongest evidence is for symptomatic diabetic polyneuropathy, the burning, tingling, and shooting pain that can develop in the feet and hands in people with long-standing diabetes [ziegler2006_sydney2; ziegler2011_nathan1; ziegler2004_meta]. Multi-center randomized trials known as ALADIN, SYDNEY, and NATHAN have shown that 600 mg of ALA, given either by IV infusion for a few weeks or by mouth for months, can reduce neuropathy symptoms [ziegler1995_aladin1; ziegler1999_aladin3; ametov2003_sydney]. Other uses, including burning mouth syndrome, polycystic ovary syndrome, weight loss, and Hashimoto's thyroiditis, are studied in smaller trials with mixed results.



EVIDENCE POSTURE WELL STUDIED EMERGING

REVIEWED **2026-05-11**

State-licensed 503A | Pharmacist reviewed | Doctor led | Cold-chain ready | Patient choice preserved

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FOR CLINICIANS

Alpha-lipoic acid (1,2-dithiolane-3-pentanoic acid; thioctic acid) is an endogenous disulfide that functions as an enzyme-bound cofactor for the mitochondrial α-ketoacid dehydrogenases, pyruvate dehydrogenase, α-ketoglutarate dehydrogenase, branched-chain α-ketoacid dehydrogenase, and the glycine cleavage system, and, in its free reduced form (dihydrolipoic acid, DHLA), as a low-molecular-weight thiol antioxidant [femiano2002_bms; femiano2004_bms; carbone2009_bms]. The ALA/DHLA redox couple recycles oxidized vitamin C, vitamin E, glutathione, and CoQ10 [packer1995_review, shay2009_review], chelates redox-active transition metals, and activates AMP-activated protein kinase (AMPK) [park2008_ampk] with downstream effects on hepatic lipogenesis, skeletal-muscle glucose uptake [estrada1996_glut], and hypothalamic energy balance.

Clinical evidence is concentrated in symptomatic diabetic polyneuropathy. The German-led ALADIN program established the IV (ALADIN I [ziegler1995_aladin1], 3 weeks 1200/600/100 mg/d vs placebo) and longer-term oral (ALADIN II [reljanovic1999_aladin2], 2 years 600/1200 mg/d) and oral after IV induction (ALADIN III [ziegler1999_alading3]) regimens. The SYDNEY trial [ametov2003_sydney] (IV 600 mg/d for 14 infusions) and SYDNEY 2 [ziegler2006_sydney2] (oral 600/1200/1800 mg/d for 5 weeks) demonstrated symptom reduction with 600 mg/d as the inflection of benefit vs adverse events. NATHAN 1 [ziegler2011_nathan1] (4 years, oral 600 mg/d) reported improvement in Neuropathy Impairment Score and physician assessment, without significant change in the predefined primary composite. The DEKAN study [ziegler1997_dekan] demonstrated improvement in heart-rate variability indices of cardiac autonomic neuropathy [bms_review2025]. Two independent meta-analyses [ziegler2004_meta, han2012_meta] and a clinical review [mijnhout2010_review] support short-course IV 600 mg/d for symptom relief, with longer-term oral 600 mg/d a reasonable continuation strategy. Other indications, burning mouth syndrome, PCOS adjunct [cianci2015_pcos, fruzzetti2019_pcos, pcos_meta2024], obesity adjunct [koh2011_obesity, carbonelli2010_review], hepatic and hepatitis-C support [berkson1999_hepc, park2008_ampk], inner-ear/vestibular disorders [quaranta2012_tts, libonati2022_bppv], have smaller or conflicting evidence. The R-(+) enantiomer is the eukaryotic biologically active form and shows higher Cmax/AUC and lower variability than racemate in healthy human PK studies [carlson2007_rlipoate, hermann2014_pk] [femiano2008_bms].

Why Personalized Alpha-Lipoic Acid (ALA)

The 600 mg dose that runs through ALADIN, SYDNEY, and NATHAN was the inflection point where symptom relief in diabetic neuropathy beat side effects across the average enrolled patient. It was not calibrated for your neuropathy severity, your renal function, your fasting state, the racemate-versus-R-isomer pharmacokinetics you absorb, or the thiamine status that ALA can unmask in a poorly nourished diabetic. The molecule is also pH-sensitive and oxidation-prone, so the gap between a label-claim OTC supplement capsule and a reproducible exposure curve is wider here than it is for most small molecules.

That gap is the work a compounding pharmacy does. RonanRx can prepare oral capsules at custom strengths off the standard 300 and 600 mg, switch a patient to the R-(+) enantiomer when the racemate is not tolerated or the pharmacokinetic variability matters, and prepare sterile IV ALA at near-neutral pH in saline, protected from light, with documented stability and a beyond-use date, for the IV induction regimen that has no FDA-approved US equivalent. The starting material is pharmaceutical-grade API with a certificate of analysis, not a supplement-grade powder whose oxidation state and label claim are not verified.

This is what pharmacy looked like before mass manufacturing arrived. A prescriber wrote the order, a pharmacist prepared it for the named patient, and the inspection trail kept it honest. Compounded ALA is that older arrangement under modern oversight.

Quick Facts About Alpha-Lipoic Acid (ALA)

Category: Disulfide cofactor / thiol antioxidant

Active ingredient: (R,S)-α-lipoic acid (racemic thioctic acid) or R-(+)-α-lipoic acid (the biologically active enantiomer); reduced form is dihydrolipoic acid (DHLA)

FDA-approved branded forms (US): None. ALA is sold in the US only as an OTC dietary supplement and is not an FDA-approved drug for any indication.

Approved as a drug elsewhere: Germany and several European markets approve racemic thioctic acid (e.g. Thioctacid, neurium) as an oral or intravenous prescription product for symptomatic diabetic polyneuropathy.

Route: Oral capsule (typically 300 or 600 mg); intravenous infusion (typically 600 mg in saline over 30, 40 min); topical and IM preparations less common

Evidence posture: Symptomatic diabetic polyneuropathy is the only well-studied indication (multiple RCTs and meta-analyses, ALADIN I, III, SYDNEY 1, 2, NATHAN 1, DEKAN). Burning mouth syndrome, PCOS adjunct, weight loss, Hashimoto's, and inner-ear/vestibular disorders are emerging or limited.

Compounded under: 503A, patient-specific prescription only. RonanRx prepares oral capsules and sterile IV preparations on pharmaceutical-grade racemic or R-isomer API.

Important compounding caution: ALA is pH-sensitive: solutions below approximately pH 5 risk precipitation and stability loss, and IV ALA is conventionally diluted in 0.9% sodium chloride and protected from light. Compounded IV preparations require documented stability data and BUD assignment per USP <797>.

SPECIALS: PATIENT-SPECIFIC PRESCRIPTION ONLY

Alpha-Lipoic Acid (ALA) described in this monograph is a 503A compounded preparation. Every dose is made on a prescription, for a named patient, by a licensed pharmacist. It is not a stocked, mass-manufactured product.

- **Made to order, not off a shelf.** No batch sits in a warehouse waiting for buyers. Your prescription triggers the prep.
- **Named-patient label.** The bottle carries one patient's name. The batch records carry one prescription.
- **Dose, strength, and route chosen for the patient.** A prescriber decides what gets compounded, not a manufacturer who set the strength for a trial population.
- **Licensed pharmacist on the hook.** A real person, with a license that can be pulled, signs off on every prep. State inspectors check the facility.
- **Compounded drugs are not FDA-approved.** They should not be evaluated using branded-drug trial data alone. Availability varies by state and prescribed medication.

How This Differs from a Research-Use-Only Website

A research-use-only website ships a vial from a warehouse. There is no prescription, no pharmacist, no facility inspection, and no way to recall the product if something is wrong with it. If the vial is mislabeled, contaminated, or under-potent, there is nobody whose license is at stake.

A 503A compounding pharmacy is the other thing. The doctor writes the prescription. A licensed pharmacist, whose name is on the label, prepares the medicine in a facility the state inspects. If something goes wrong, there is a person and a license on the hook, and a documented chain of custody on every lot. That accountability is what makes it safe.

What is Alpha-Lipoic Acid (ALA)?

Alpha-lipoic acid is a sulfur-containing octanoic-acid derivative, chemically 1,2-dithiolane-3-pentanoic acid, also called thioctic acid. The molecule contains a cyclic disulfide (the dithiolane ring) that can be reversibly reduced to a dithiol (dihydrolipoic acid, DHLA). This redox-active disulfide pair is the basis of both its enzymatic and antioxidant biology. ALA has one chiral center; the naturally occurring and biologically relevant form is the R-(+) enantiomer. Pharmaceutical and most supplement preparations contain the

racemic (R,S) mixture; pure R-(+)-α-lipoic acid is also available, including as the sodium salt for improved aqueous solubility [carlson2007_rlipoate].

ALA was isolated and structurally characterized in the 1950s. It is synthesized de novo in mitochondria of mammalian cells from octanoic acid and cysteine and is covalently bound (as lipoamide) to specific lysine residues of α-ketoacid dehydrogenase complexes, pyruvate dehydrogenase, α-ketoglutarate dehydrogenase, branched-chain α-ketoacid dehydrogenase, and the glycine cleavage system. Free ALA in plasma comes almost entirely from the diet and from exogenous administration; endogenous ALA is bound and not in pharmacologically meaningful equilibrium with the free pool [packer1995_review].

There is no FDA-approved alpha-lipoic acid drug in the United States. US ALA products are dietary supplements regulated under DSHEA [fda_supplement_guidance, nih_ods_lipoic]. In Germany and several other European countries, racemic thioctic acid is approved as an oral and intravenous prescription medicine for symptomatic diabetic polyneuropathy under brand names including Thioctacid; that European approval and the underlying ALADIN-program evidence are the basis for most off-label US clinical use.

How Alpha-Lipoic Acid (ALA) Works

Two distinct mechanisms drive ALA's biology. First, as a covalently bound cofactor in mitochondria, lipoyl groups shuttle electrons and acyl groups through the α-ketoacid dehydrogenase reaction cycles that bridge glycolysis, β-oxidation, and the citric acid cycle. Pyruvate dehydrogenase activity is rate-limiting for the entry of carbohydrate carbon into oxidative metabolism, and ALA is its essential prosthetic group [packer1995_review].

Second, exogenous (orally or intravenously administered) ALA is taken up by cells and rapidly reduced to dihydrolipoic acid, which is a strong low-molecular-weight thiol reductant. The ALA/DHLA couple is unusual among physiologic antioxidants in that both the oxidized and reduced forms have biologic activity, and the couple is active in both aqueous and lipid compartments. DHLA recycles vitamin C from its semidehydroascorbyl/dehydroascorbate forms, regenerates α-tocopherol (vitamin E) at the membrane interface, reduces oxidized glutathione, and supports CoQ10 redox cycling [packer1995_review, shay2009_review]. ALA also chelates redox-active iron and copper.

Downstream signaling effects of pharmacologic ALA include activation of AMP-activated protein kinase (AMPK), which suppresses hepatic lipogenesis and stimulates fatty-acid oxidation [park2008_ampk]; recruitment of GLUT4 to the skeletal-muscle plasma membrane, increasing insulin-independent and insulin-sensitive glucose uptake [estrada1996_glut]; and modulation of NF-κB-driven inflammatory transcription in vascular and neural tissue [packer1995_review, shay2009_review]. These effects together provide a mechanistic rationale for ALA's clinically observed effects in diabetic neuropathy, hepatic steatosis, and metabolic indications, although the in-vivo dose-response of each is incompletely characterized.

Biological Role of Alpha-Lipoic Acid (ALA)

Within mitochondria, lipoyl groups are essential for the function of the α-ketoacid dehydrogenase complexes that link glycolysis and amino-acid catabolism to the citric acid cycle. Loss of lipoyl-cofactor function (as in the rare inborn lipoyltransferase deficiencies) produces severe encephalopathy and lactic acidosis, illustrating that lipoyl cofactor sufficiency is not optional for mammalian oxidative metabolism. Endogenous synthesis of lipoic acid from octanoic acid and cysteine is sufficient to meet this cofactor requirement in healthy adults [packer1995_review] [shay2009_review].

The free (non-protein-bound) pool of dietary or supplemental ALA is what produces antioxidant and signaling effects at pharmacologic doses. Free ALA is found at trace concentrations in red meat, organ meats, spinach, and broccoli; dietary intake is well below the typical pharmacologic dose of 600, 1800 mg/d [shay2009_review]. Supplemental and pharmaceutical ALA therefore represents a substantial, and probably non-physiologic, increase in the free pool, on which clinical effects depend.

Detailed Mechanism of Alpha-Lipoic Acid (ALA)

The disulfide ring of α-lipoic acid is reduced to dihydrolipoic acid by both mitochondrial dihydrolipoamide dehydrogenase (E3 of the α-ketoacid dehydrogenase complexes) and cytosolic NADPH- and NADH-dependent reductases. The standard reduction potential of the ALA/DHLA couple is approximately −0.32 V, making DHLA a stronger reductant than glutathione ($E^{o'} \approx -0.24$ V) and capable of regenerating most physiologic antioxidants [shay2009_review]. The reduction, oxidation cycling supports the description of ALA as a 'universal antioxidant' [packer1995_review], a description that is qualitatively correct but does not predict pharmacologic effect sizes at typical clinical doses.

In skeletal muscle, ALA-stimulated glucose uptake involves both insulin signaling pathway elements and insulin-independent translocation of GLUT4 to the sarcolemma [shay2009_review]. Estrada and colleagues [estrada1996_glut] demonstrated in L6 myotubes that ALA-stimulated glucose uptake recruited IRS-1, PI3-kinase, and Akt/PKB, partially mimicking insulin signaling. AMPK activation by ALA, characterized in hepatic and hypothalamic models by Park et al. [park2008_ampk], accounts for the observed reductions in hepatic lipogenesis and food intake in animal studies and provides a candidate mechanism for the modest weight effects reported in human trials [koh2011_obesity, carbonelli2010_review].

In peripheral nerve, the rationale for use in diabetic neuropathy combines antioxidant scavenging of glucose-driven reactive oxygen species, restoration of endoneurial blood flow, and stabilization of nerve-membrane sodium-channel kinetics. The ALADIN program [ziegler1995_aladin1, reljanovic1999_aladin2, ziegler1999_aladin3] tested both short-course IV (1200 mg/d × 3 weeks, with 1200 mg/d showing similar efficacy and higher AE rates than 600 mg/d) and longer-term oral (600 and 1200 mg/d for up to 2 years)

regimens; the NATHAN 1 four-year extension [ziegler2011_nathan1] tested 600 mg/d oral and demonstrated improvement on Neuropathy Impairment Score components and physician global assessment despite a negative composite primary endpoint. Meta-analyses [ziegler2004_meta, han2012_meta] pooled the ALADIN, SYDNEY, and SYDNEY-2 IV trials and reported a clinically meaningful reduction in the Total Symptom Score with three weeks of IV 600 mg/d [ametov2003_sydney].

ALA is not metabolized by cytochrome P450 to any clinically relevant extent. The major elimination pathway is β-oxidation, like degradation in mitochondria to shorter-chain dicarboxylic acids; renal excretion of the parent and degradation products is rapid, and the plasma half-life is short (approximately 30 min for oral racemic ALA). Reaching the central nervous system in pharmacologically meaningful concentrations therefore requires either repeated oral dosing or IV administration [ziegler2006_sydney2]. Renal impairment does not require dose adjustment based on the dedicated PK study by Teichert and colleagues [teichert2005_renal].

Alpha-Lipoic Acid (ALA) Research History

Alpha-lipoic acid was isolated by Reed and colleagues in 1951 as an essential growth factor for Tetrahymena and structurally characterized as a cyclic disulfide [carbone2009_bms]. Its role as the prosthetic group of pyruvate and α-ketoglutarate dehydrogenase was established in the 1950s and 1960s, anchoring its place in mitochondrial biochemistry. Therapeutic interest emerged in the 1970s in Germany around its use as an antioxidant in heavy-metal poisoning and hepatic disease, leading to the formulation of racemic thioctic acid as a prescription product (Thioctacid and related brands) [packer1995_review] [femiano2002_bms; femiano2004_bms].

The diabetic-neuropathy program developed in the late 1980s and 1990s, motivated by the hypothesis that hyperglycemia-driven oxidative stress contributed to nerve dysfunction and that a thiol antioxidant active in both aqueous and lipid compartments might restore endoneurial redox balance. The ALADIN trial program, ALADIN I (3-week IV, 1995) [ziegler1995_aladin1], ALADIN II (2-year oral, 1999) [reljanovic1999_aladin2], and ALADIN III (3-week IV followed by 6 months oral, 1999) [ziegler1999_aladin3], was led by Dan Ziegler at the German Diabetes Center, Düsseldorf. The DEKAN study [ziegler1997_dekan] extended the program to cardiac autonomic neuropathy, and the SYDNEY [ametov2003_sydney] and SYDNEY-2 [ziegler2006_sydney2] trials replicated the IV and oral effects in Russian-led multinational populations. Meta-analyses by Ziegler (2004) [ziegler2004_meta] and Han (2012) [han2012_meta], and a clinical synthesis by Mijnhout (2010) [mijnhout2010_review], consolidated the IV 600 mg/d evidence base. NATHAN 1 [ziegler2011_nathan1] was the longest controlled exposure published, with 4-year oral 600 mg/d data [femiano2008_bms].

Pharmacokinetic work on enantiomer-specific behavior, Hermann and colleagues across multiple papers in the 1990s and 2010s, and the dedicated R-lipoate study by Carlson et al [bms_review2025]. [carlson2007_rlipoate], established that the R-(+) enantiomer accounts for the biologically active fraction,

that R-lipoate as the sodium salt achieves higher Cmax and AUC and lower inter-individual variability than the racemate, and that food substantially reduces oral bioavailability [hermann2014_pk]. Indication-expansion work in burning mouth syndrome, polycystic ovary syndrome [cianci2015_pcos, fruzzetti2019_pcos, pcos_meta2024], obesity [koh2011_obesity, carbonelli2010_review], hepatitis C [berkson1999_hepc], hepatic lipogenesis [park2008_ampk], and inner-ear and vestibular disorders [quaranta2012_tts, libonati2022_bppv] has continued since the early 2000s with smaller and methodologically heterogeneous trials.

Alpha-Lipoic Acid (ALA) Timeline

1951 • Reed and colleagues isolate α-lipoic acid as a growth factor for Tetrahymena and identify the cyclic-disulfide structure [packer1995_review]

1995 • ALADIN I (Ziegler et al., Diabetologia), first multicenter randomized IV ALA trial in symptomatic diabetic polyneuropathy: 3-week 1200/600/100 mg/d vs placebo; 600 mg/d emerges as the dose with optimal benefit/AE balance [ziegler1995_aladin1]

1995 • Packer, Witt, and Tritschler publish the foundational review of ALA as a 'universal antioxidant' in Free Radical Biology and Medicine [packer1995_review]

1996 • Estrada et al [estrada1996_glut]. (Diabetes) characterize ALA-stimulated glucose uptake in L6 myotubes through the insulin signaling pathway and GLUT4 translocation

1997 • DEKAN study (Ziegler et al., Diabetes Care), 4-month oral 800 mg/d ALA in cardiac autonomic neuropathy improves heart-rate variability vs placebo [ziegler1997_dekan]

1999 • ALADIN III (Ziegler et al., Diabetes Care), 7-month sequence of IV induction followed by oral ALA in symptomatic diabetic polyneuropathy [ziegler1999_aladin3]

1999 • ALADIN II (Reljanovic et al., Free Radical Research), 2-year oral 600 or 1200 mg/d ALA vs placebo in diabetic polyneuropathy [reljanovic1999_aladin2]

1999 • Berkson (Med Klin), three-case series of alpha-lipoic acid plus silymarin and selenium for chronic hepatitis C with normalization of transaminases [berkson1999_hepc]

2002 • Femiano et al [femiano2002_bms]. (Minerva Stomatol), open trial of α-lipoic acid for burning mouth syndrome

2003 • SYDNEY trial (Ametov et al., Diabetes Care), 14 IV infusions of 600 mg ALA over 3 weeks in Russian and Israeli patients with symptomatic diabetic polyneuropathy [ametov2003_sydney]

2004 • Ziegler et al [ziegler2004_meta]. (Diabetic Medicine), patient-level meta-analysis of ALADIN I, ALADIN III, SYDNEY, and NATHAN II demonstrates symptom reduction with 3-week IV 600 mg/d

2004 • Femiano et al [femiano2004_bms]. (JEADV), burning mouth syndrome subgroup analysis of ALA efficacy

2005 • Teichert et al [teichert2005_renal]. (J Clin Pharmacol), PK study of ALA in subjects with severe renal impairment and ESRD: no dose adjustment required

2006 • SYDNEY 2 (Ziegler et al., Diabetes Care), oral 600, 1200, or 1800 mg/d for 5 weeks in symptomatic DPN; 600 mg/d is the dose at which benefit plateaus and AE rate increases [ziegler2006_sydney2]

2007 • Carlson et al [carlson2007_rlipoate]. (Altern Med Rev), sodium R-(+)-lipoate PK in healthy human subjects: higher Cmax and AUC and lower variability than racemate at equivalent doses

2008 • Park et al [park2008_ampk]. (Hepatology), ALA decreases hepatic lipogenesis through AMPK-dependent and -independent pathways

2008 • Femiano (Oral Surg Oral Med Oral Pathol Oral Radiol Endod), diagnostic and therapeutic protocol for burning mouth syndrome incorporating ALA [femiano2008_bms]

2009 • Carbone et al [carbone2009_bms]. (Eur J Pain), double-blind RCT of ALA for burning mouth syndrome: no benefit over placebo, contrasting with earlier open trials

2009 • Shay et al [shay2009_review]. (Biochimica et Biophysica Acta), comprehensive mechanistic review of α-lipoic acid as a therapeutic and nutritional antioxidant

2010 • Mijnhout et al. (Neth J Med), clinical review of ALA for diabetic neuropathic pain; Carbonelli et al [mijnhout2010_review; carbonelli2010_review]. (Curr Pharm Des), narrative review of ALA in obesity

2011 • NATHAN 1 (Ziegler et al., Diabetes Care), 4-year oral 600 mg/d ALA vs placebo in mild-to-moderate diabetic polyneuropathy; improvement in Neuropathy Impairment Score components and physician global assessment despite a negative composite primary endpoint [ziegler2011_nathan1]

2011 • Koh et al [koh2011_obesity]. (Am J Med), randomized trial of 1800 mg/d oral ALA vs placebo for body weight in obese subjects

2012 • Han et al [han2012_meta]. (Eur J Endocrinol), systematic review and meta-analysis of IV ALA in diabetic peripheral neuropathy: confirmed symptom-score reduction with 600 mg/d for 3 weeks

2012 • Quaranta et al [quaranta2012_tts]. (Acta Otorhinolaryngol Ital), pilot study of ALA on temporary threshold shift in humans after noise exposure

2014 • Hermann et al [hermann2014_pk]. (Clin Pharmacol), enantiomer-selective PK, oral bioavailability, and sex effects of various ALA dosage forms

2015 • Cianci et al [cianci2015_pcos]. (Gynecol Endocrinol), d-chiro-inositol and ALA combination in PCOS metabolic and menstrual abnormalities

2019 • Fruzzetti et al [fruzzetti2019_pcos]. (Gynecol Endocrinol), d-chiro-inositol and ALA combination in PCOS management

2022 • Libonati et al [libonati2022_bppv]. (Audiol Res), combined vitamin D and antioxidant (including ALA) supplementation reduces recurrence of benign paroxysmal positional vertigo

2024 • PCOS systematic review and meta-analysis (Obstet Gynecol Sci), ALA supplementation effects on anthropometric, glycemic, lipid, oxidative stress, and hormonal parameters [pcos_meta2024]

2025 • Burning mouth syndrome systematic review (Clin Oral Investig), ALA included in pooled analyses of therapeutic options [bms_review2025]

Clinical Contexts for Alpha-Lipoic Acid (ALA)

Symptomatic diabetic polyneuropathy WELL STUDIED

Well-studied off-label indication in the US (no FDA-approved ALA drug); approved as a prescription medicine for this indication in Germany and several other European markets. Most evidence-supported ALA use overall.

Multiple multicenter randomized trials and two independent meta-analyses support ALA for reduction of pain, paresthesia, and burning in symptomatic diabetic polyneuropathy. The IV regimen, 600 mg in 250 mL normal saline infused over 30, 40 minutes daily for 3 weeks, is the best-characterized protocol, supported by ALADIN I [ziegler1995_aladin1], SYDNEY [ametov2003_sydney], and the patient-level meta-analysis by Ziegler et al. [ziegler2004_meta] and the systematic review by Han et al. [han2012_meta]. The oral 600 mg/d regimen, supported by SYDNEY 2 [ziegler2006_sydney2] (5 weeks) and NATHAN 1 [ziegler2011_nathan1] (4 years), produces smaller but still clinically meaningful improvements on Neuropathy Impairment Score components. ALADIN II [reljanovic1999_aladin2] (2 years oral) and ALADIN III [ziegler1999_aladin3] (IV induction then oral) reported mixed primary endpoints in the original analyses, consistent with the pattern that IV induction has the most reliable symptom-score effect and oral maintenance has a smaller, slower-developing benefit. Mijnhout [mijnhout2010_review] synthesizes the clinical use case.

Cardiac autonomic neuropathy in diabetes EMERGING

Studied in a dedicated multicenter trial; not an FDA-approved indication.

The DEKAN study [ziegler1997_dekan] randomized 73 adults with type 2 diabetes and cardiac autonomic neuropathy to oral ALA 800 mg/d or placebo for 4 months. Heart-rate variability indices (CV of R-R intervals at rest and during deep breathing) improved on ALA vs placebo. Replication evidence is limited and the indication has not been pursued in large outcome trials.

Burning mouth syndrome EMERGING

Studied in multiple small RCTs and open trials with mixed results; not an FDA-approved indication.

Early Italian work by Femiano and colleagues [femiano2002_bms, femiano2004_bms, femiano2008_bms] reported symptom improvement with oral ALA 600 mg/d for 2 months. The double-blind RCT by Carbone et al. [carbone2009_bms] did not find a significant benefit over placebo, illustrating the heterogeneity in this literature. A 2025 systematic review [bms_review2025] pooled the available trials and treated ALA as one of several reasonable empirical options with limited evidence quality.

Polycystic ovary syndrome (adjunct) EMERGING

Studied as a metabolic adjunct, often in combination with myo-inositol or d-chiro-inositol; emerging evidence.

Small Italian trials [cianci2015_pcos, fruzzetti2019_pcos] reported improvements in insulin resistance, menstrual regularity, and lipid parameters with ALA, typically 400, 800 mg/d, combined with inositol isomers. A 2024 systematic review and meta-analysis [pcos_meta2024] reported modest improvements in anthropometric, glycemic, lipid, oxidative-stress, and hormonal parameters with ALA supplementation, with substantial heterogeneity across included trials.

Weight loss adjunct EMERGING

Studied in small RCTs with statistically significant but clinically small effects.

Koh et al. [koh2011_obesity] randomized 360 obese adults to oral ALA 1200, 1800 mg/d, or placebo for 20 weeks. The 1800 mg/d arm achieved an additional 1.5 kg of weight loss vs placebo and a small reduction in BMI. The Carbonelli narrative review [carbonelli2010_review] summarized similar small effects in earlier trials. AMPK activation [park2008_ampk] is the mechanistic candidate. Effect size is modest and does not approach the magnitude of incretin therapies.

Hepatic and hepatitis-C support EMERGING

Case reports and small case series only; not a controlled-trial indication.

Berkson [berkson1999_hepc] reported a three-case series in which combined ALA, silymarin, and selenium were associated with transaminase normalization and clinical improvement in chronic hepatitis C. Mechanistic work in animal hepatic steatosis models [park2008_ampk] supports AMPK-mediated reduction of hepatic lipogenesis. Controlled human trials specifically for hepatic indications remain limited.

Hashimoto thyroiditis and thyroid-autoimmunity adjunct EMERGING

Mechanistic rationale plus very limited human trial data; not an FDA-approved indication and not a generally recommended use.

Mechanistic rationale rests on oxidative-stress pathways in autoimmune thyroiditis and on ALA's regeneration of glutathione [packer1995_review, shay2009_review]. Published controlled trials specifically for Hashimoto thyroiditis are sparse and underpowered; effects on thyroid peroxidase or thyroglobulin antibody titers and on thyroid function tests are inconsistent. ALA should not substitute for levothyroxine where indicated.

Inner-ear and vestibular disorders EMERGING

Limited evidence; pilot trials in temporary threshold shift and benign paroxysmal positional vertigo recurrence; vestibular neuritis claims rest on small uncontrolled series and antioxidant rationale.

Quaranta and colleagues [quaranta2012_tts] reported reduced noise-induced temporary threshold shift in healthy subjects pre-treated with ALA. Libonati et al. [libonati2022_bppv] reported lower recurrence of benign paroxysmal positional vertigo with combined vitamin D plus antioxidant supplementation including ALA after canal-repositioning maneuvers. Use specifically for vestibular neuritis has been described in small uncontrolled clinical series and is supported by general antioxidant rationale rather than a dedicated RCT.

Off-Label Uses of Alpha-Lipoic Acid (ALA)

Insulin sensitivity / impaired carbohydrate tolerance EMERGING

Mechanistic and small-trial evidence; off-label.

Mechanistic work in skeletal muscle [estrada1996_glut] and the hepatic AMPK pathway [park2008_ampk] supports a glucose-uptake and insulin-sensitization role for pharmacologic ALA. Small clinical trials in adults with type 2 diabetes and metabolic syndrome have reported modest improvements in insulin sensitivity that are smaller than effects of established hypoglycemics. ALA is not a substitute for guideline-directed diabetes therapy.

FDA-Approved Uses of Alpha-Lipoic Acid (ALA)

There is no FDA-approved alpha-lipoic acid drug in the United States. Alpha-lipoic acid is regulated as a dietary supplement under the Dietary Supplement Health and Education Act of 1994 [fda_supplement_guidance, nih_ods_lipoic] [ziegler2006_sydney2]. As such, the US OTC supplement market does not have pre-market efficacy review, GMP compliance is held to the dietary-supplement standard rather than the drug-product standard, and clinical claims on US OTC labels are restricted to structure-function language.

Outside the US, racemic thioctic acid is approved as an oral and intravenous prescription medicine for symptomatic diabetic polyneuropathy in Germany (e.g [ziegler1995_aladin1; ziegler1999_aladin3; ametov2003_sydney]. Thioctacid) and several other European markets, with regulatory approval supported by the ALADIN and SYDNEY trial programs. This is the regulatory context most relevant to clinically meaningful US off-label and compounded use.

Compounded Alpha-Lipoic Acid (ALA) (503A)

Compounded alpha-lipoic acid is dispensed under 503A on a patient-specific prescription written by a licensed prescriber for an identified patient [fda_supplement_guidance]. The most common compounded forms are oral capsules at 300 or 600 mg (racemic ALA, or R-(+)-α-lipoic acid for patients prioritizing the enantiomer-specific PK profile [carlson2007_rlipoate, hermann2014_pk]) and sterile intravenous solutions, typically 600 mg in 250 mL 0.9% sodium chloride for infusion over 30, 40 minutes [ziegler1995_aladin1, ametov2003_sydney].

Pharmaceutical-grade compounded preparations differ meaningfully from OTC supplement ALA. Compounding pharmacies prepare ALA from API with documented certificates of analysis, gravimetric and where applicable analytical verification, and lot traceability. OTC supplements are not subject to USP <797> or <795> compounding standards and have documented quality variability, including label-claim variance and oxidation of the active to inactive degradation products [fda503a]. For patients whose clinical context requires reproducible exposure (for example documented diabetic neuropathy under structured monitoring, or candidates for IV induction), this difference is clinically relevant.

Compounded sterile IV ALA preparation has specific stability constraints. The lipoic acid carboxylate is light-sensitive and oxidatively unstable; conventional pharmaceutical IV thioctic acid products are presented as the trometamol or ethylenediamine salt at near-neutral pH and protected from light during infusion. Acidification of the solution below approximately pH 5 promotes precipitation and degradation. Compounded IV preparations therefore require documented stability data, appropriate salt form selection, protected-from-light handling, and beyond-use date assignment per USP <797> [usp_797]. Oral capsule compounding follows USP <795> [usp_795] [fda503a].

The 503A framing for ALA differs from the 503A framing for FDA-approved peptides such as tirzepatide or semaglutide: there is no FDA-approved US drug to be 'a copy of', so the essentially-a-copy restrictions [fda_essentially_a_copy] do not apply in the same way [fda503a; fda_supplement_guidance]. The 503A rationale here is patient-specific dosing (custom strengths, IV dosing not commercially available as an FDA-approved product in the US) and pharmaceutical-grade quality of preparation.

Alpha-Lipoic Acid (ALA) Formulations and Routes

Form	Concentration	Description
Oral capsule (compounded)	Typically 300 mg or 600 mg per capsule; custom strengths available	Compounded under USP <795> from pharmaceutical-grade racemic or R-(+)-α-lipoic acid. Often dispensed as enteric-coated or delayed-release capsules to reduce gastrointestinal irritation; light- and moisture-protective packaging used because of the molecule's oxidative sensitivity.
Sterile intravenous infusion (compounded)	Typically 600 mg in 250 mL 0.9% sodium chloride; custom strengths available	Compounded under USP <797> as a near-neutral-pH solution, protected from light, infused over 30, 40 minutes through a peripheral IV. Conventional pharmaceutical IV thioctic acid is presented as the trometamol or ethylenediamine salt; compounded preparations follow the same salt-form considerations to avoid acidic precipitation.
OTC dietary supplement (reference, not compounded)	Commonly 100, 600 mg per capsule or tablet	Sold under DSHEA as a dietary supplement; not FDA-approved, not subject to USP <797>/<795>, label-claim and oxidation-state variability documented. Clinicians distinguish between OTC supplement ALA and compounded pharmaceutical-grade ALA when reproducible exposure matters.

Routes used in published literature: oral, intravenous.

Alpha-Lipoic Acid (ALA) Dosing

Route	Population	Range	Duration	Study type
Intravenous	Adults with symptomatic diabetic polyneuropathy	600 mg in 0.9% sodium chloride infused over 30, 40 minutes once daily for approximately 3 weeks (typically 14, 20 infusions), followed by oral maintenance	3-week induction; oral maintenance variable	Multicenter RCT regimen used in ALADIN I and SYDNEY

Route	Population	Range	Duration	Study type
Oral	Adults with symptomatic diabetic polyneuropathy	600 mg once daily on an empty stomach (food substantially reduces bioavailability)	5 weeks demonstrated in SYDNEY 2; up to 4 years in NATHAN 1	Multicenter RCT regimen
Oral	Adults with cardiac autonomic neuropathy in diabetes	800 mg/d in divided doses	4 months	DEKAN multicenter RCT
Oral	Adults with obesity (adjunct)	1800 mg/d in three divided doses	20 weeks	Single RCT (Koh 2011)
Oral	Adults with burning mouth syndrome (emerging indication)	600 mg/d in two divided doses	2 months	Open and double-blind trials with conflicting results
Oral	Women with polycystic ovary syndrome (adjunct)	400, 800 mg/d, often combined with inositol isomers	3, 6 months in published trials	Small RCTs

Doctor-prescribed and titrated to indication. For symptomatic diabetic polyneuropathy, the best-characterized regimen is IV 600 mg/d for approximately 3 weeks followed by oral 600 mg/d maintenance; oral-only 600 mg/d is a reasonable alternative when IV access is impractical, with the recognition that onset of effect is slower and effect size somewhat smaller [ziegler2006_sydney2, ziegler2011_nathan1] [ziegler1995_aladin1]. Doses above 600 mg/d do not produce greater symptom benefit in published trials and increase nausea and gastrointestinal AE rates [ziegler2006_sydney2].

Oral ALA bioavailability is significantly reduced by food; clinical protocols specify administration on an empty stomach, typically 30 minutes before a meal [hermann2014_pk]. When R-(+)-α-lipoic acid (as the sodium salt) is used, the higher Cmax and AUC at equivalent total-ALA dose support a lower nominal dose for equivalent exposure, although clinical outcome data are dominated by racemic-ALA trials [carlson2007_rlipoate] [ziegler1995_aladin1]. Compounded preparations should specify enantiomeric composition (racemic vs R-isomer) and salt form.

Alpha-Lipoic Acid (ALA) Safety

Alpha-lipoic acid has a favorable overall safety profile in the dose ranges studied [2] [13]. Across ALADIN I, III, SYDNEY, SYDNEY 2, NATHAN 1, and DEKAN, the most common adverse events were gastrointestinal,

nausea, vomiting, and abdominal discomfort, concentrated at oral doses ≥1200 mg/d and in the IV induction period [4][5][7]. Headache, rash, and pruritus are reported at lower frequency. Serious adverse events were uncommon and not consistently elevated over placebo in the major trials.

Hypoglycemia is a clinically relevant concern in patients with diabetes who are concurrently taking insulin or insulin secretagogues; ALA's insulin-sensitizing effect [13][14] can lower glucose by a clinically meaningful amount, particularly during IV induction [2]. Glucose monitoring and proactive antidiabetic dose adjustment are appropriate. Rare reports of insulin autoimmune syndrome (Hirata disease) in association with ALA in Asian populations with specific HLA haplotypes have been described in the literature; this is a small but defined safety signal worth disclosing to predisposed patients [6].

ALA chelates redox-active transition metals and reduces oxidized thiols; theoretical interactions with thyroid hormone (binding/transport), with chemotherapeutic agents whose mechanism depends on oxidative damage, and with metallodrugs (cisplatin, cyclophosphamide) have been described but are inconsistently characterized in human studies [2]. Clinicians should disclose ALA use to oncology and endocrinology teams. Pharmacokinetic data in renal impairment [17] do not show clinically meaningful accumulation, and no dose adjustment is required.

Contraindications

Documented hypersensitivity to alpha-lipoic acid or to any excipient of the compounded preparation [13][14]. Caution in patients with thiamine deficiency (including chronic alcohol use disorder), where high-dose ALA can precipitate Wernicke encephalopathy by accelerating thiamine consumption in pyruvate dehydrogenase; thiamine repletion before ALA initiation is appropriate.

Caution in patients with poorly controlled diabetes on insulin or sulfonylureas because of additive hypoglycemia risk, in patients with known insulin autoimmune syndrome susceptibility, and in patients with significant hepatic impairment where data are limited. Use in pregnancy and lactation is not supported by adequate human data.

Drug interactions

Pharmacodynamic interaction with insulin and insulin secretagogues (additive hypoglycemia). Pharmacodynamic interaction with thyroid hormone replacement has been described inconsistently; clinical monitoring rather than empirical dose change is appropriate. ALA may reduce the cytotoxicity of oxidative-mechanism chemotherapeutics (e.g. cisplatin, cyclophosphamide) in preclinical models; concurrent use should be coordinated with oncology. Chelation of redox-active metals may theoretically reduce absorption of co-administered iron, magnesium, and calcium supplements; separating administration by at least 2 hours is conventional [3][4]. ALA is not a cytochrome P450 substrate or inhibitor at clinically relevant exposures, and CYP-mediated drug interactions are not expected [17][16].

Adverse events

Gastrointestinal events, nausea, vomiting, abdominal pain, and dyspepsia, are the most common adverse events in the ALADIN, SYDNEY, NATHAN, and DEKAN trials [4][5][6]. Frequency is dose-related, with substantially higher rates at 1200 and 1800 mg/d than at 600 mg/d, one of the empirical reasons 600 mg/d became the consensus dose. AE-driven discontinuation in the ALADIN and SYDNEY trials was generally 4, 10% in the 600 mg/d arms vs lower rates on placebo [2] [13].

Skin reactions (rash, urticaria, pruritus) are reported at lower frequency [2]. Headache and dizziness are reported during IV infusion and are typically mild and self-limited. Hypoglycemia is reported in patients on concurrent insulin or sulfonylureas, supporting the recommendation for proactive glucose monitoring at initiation. Rare insulin autoimmune syndrome (Hirata disease) has been associated with ALA in Asian patients with specific HLA haplotypes; clinically meaningful hypoglycemia in this syndrome can occur without exogenous insulin and warrants endocrinology consultation [7].

Monitoring Alpha-Lipoic Acid (ALA) Therapy

Baseline assessment for diabetic neuropathy use should include the indication-specific symptom score (Total Symptom Score, Neuropathy Impairment Score, or equivalent), HbA1c, renal function, and a documented review of insulin and sulfonylurea regimens [ziegler2011_nathan1]. For patients with diabetes on insulin or insulin secretagogues, blood glucose monitoring should be intensified during the IV induction period and the first weeks of oral therapy because of additive hypoglycemia risk.

On therapy: re-evaluate the indication-specific symptom score at the end of IV induction (~3 weeks) and again at 3 months on oral maintenance [ziegler2006_sydney2]. Discontinue ALA if no meaningful improvement is observed after a documented adequate course (typically 3 months of 600 mg/d). For non-diabetic indications, monitoring is indication-specific (BMS symptom scores, PCOS metabolic and menstrual parameters, weight) and should follow the same logic of pre-defined response criteria and a documented decision point at 3 months.

Alpha-Lipoic Acid (ALA) in Special Populations

Alpha-Lipoic Acid (ALA) Evidence Quality

Evidence for symptomatic diabetic polyneuropathy is strong by the standards of the indication and by historical pharmaceutical-development standards: six multicenter randomized trials (ALADIN I [ziegler1995_aladin1], ALADIN II [reljanovic1999_aladin2], ALADIN III [ziegler1999_aladin3], SYDNEY [ametov2003_sydney], SYDNEY 2 [ziegler2006_sydney2], NATHAN 1 [ziegler2011_nathan1]) plus DEKAN [ziegler1997_dekan] in cardiac autonomic neuropathy, supported by two independent meta-

analyses [ziegler2004_meta, han2012_meta] and a clinical synthesis [mijnhout2010_review]. Effect sizes are clinically meaningful, typically a Total Symptom Score reduction of approximately 1.7, 2.5 points (on a 0, 14.6 scale) with 3-week IV 600 mg/d vs placebo in the pooled IV analysis, and dose-response saturates at 600 mg/d. The German and European regulatory approval of racemic thioctic acid for symptomatic diabetic polyneuropathy reflects this evidence base [estrada1996_glut; carlson2007_rlipoate; hermann2014_pk].

Evidence for other indications is substantially weaker. Burning mouth syndrome trials are split between early Italian open studies showing benefit [femiano2002_bms, femiano2004_bms, femiano2008_bms] and a more rigorous double-blind RCT showing no significant benefit over placebo [carbone2009_bms]; the 2025 systematic review [bms_review2025] treats ALA as one of several reasonable options with limited evidence quality. PCOS [cianci2015_pcos, fruzzetti2019_pcos, pcos_meta2024], obesity adjunct [koh2011_obesity, carbonelli2010_review], hepatic and hepatitis-C use [berkson1999_hepc, park2008_ampk], Hashimoto thyroiditis [packer1995_review, shay2009_review], and inner-ear/vestibular conditions [quaranta2012_tts, libonati2022_bppv] are supported by smaller, methodologically heterogeneous trials. Mechanistic and PK evidence is consistent with these clinical patterns [teichert2005_renal].

ALA is therefore well-studied for one indication (symptomatic diabetic polyneuropathy) and emerging for several others [estrada1996_glut]. The compounded-503A clinical role is anchored to the diabetic-neuropathy evidence base and to pharmaceutical-grade quality of preparation relative to OTC supplement ALA.

Major Alpha-Lipoic Acid (ALA) Clinical Studies

Study	Design	Participants	Duration	Finding
ALADIN I (Ziegler 1995, Diabetologia)	Multicenter, randomized, double-blind, placebo-controlled, parallel-group; IV ALA 1200, 600, or 100 mg/d vs placebo daily over 3 weeks	328	3 weeks	Total Symptom Score reduced more by 1200 and 600 mg/d ALA than by 100 mg/d or placebo; 1200 mg/d and 600 mg/d showed comparable efficacy with higher AE rate at 1200 mg/d, established 600 mg/d as the consensus IV induction dose [ziegler1995_aladin1]
ALADIN II (Reljanovic 1999, Free Radical Research)	Multicenter, randomized, double-blind, placebo-controlled; oral ALA	65	2 years	Improvement in nerve conduction parameters on oral ALA vs placebo over 2 years; trial under-powered for clinical

Study	Design	Participants	Duration	Finding
	600 or 1200 mg/d vs placebo for 2 years			symptom endpoints [reljanovic1999_aladin2]
ALADIN III (Ziegler 1999, Diabetes Care)	Multicenter, randomized, double-blind, placebo-controlled; IV ALA 600 mg/d for 3 weeks followed by oral 600 mg three times daily, vs placebo	509	7 months	Trend toward improvement in Neuropathy Impairment Score on ALA; primary symptom-score endpoint did not reach significance, interpreted in the context of trial design and population [ziegler1999_aladin3]
SYDNEY (Ametov 2003, Diabetes Care)	Multicenter, randomized, double-blind, placebo-controlled; IV ALA 600 mg/d for 14 infusions over 3 weeks vs placebo	120	3 weeks	Statistically significant reduction in Total Symptom Score on ALA vs placebo; supports the 3-week IV 600 mg/d induction protocol [ametov2003_sydney]
SYDNEY 2 (Ziegler 2006, Diabetes Care)	Multicenter, randomized, double-blind, placebo-controlled, dose-ranging; oral ALA 600, 1200, or 1800 mg/d vs placebo	181	5 weeks	All three ALA doses reduced Total Symptom Score vs placebo; no incremental benefit beyond 600 mg/d, with substantially higher AE rates at 1200 and 1800 mg/d, established 600 mg/d as the oral maintenance dose [ziegler2006_sydney2]
NATHAN 1 (Ziegler 2011, Diabetes Care)	Multicenter, randomized, double-blind, placebo-controlled; oral ALA 600 mg/d vs placebo for up to 4 years in mild-to-moderate diabetic polyneuropathy	460	4 years	Improvement on Neuropathy Impairment Score components (lower limbs and total) and physician global assessment on ALA vs placebo; predefined composite primary endpoint not statistically significant [ziegler2011_nathan1]. Longest controlled exposure of oral ALA
DEKAN (Ziegler 1997, Diabetes Care)	Multicenter, randomized, double-blind, placebo-	73	4 months	Heart-rate variability indices (CV of R-R intervals at rest and during deep breathing)

Study	Design	Participants	Duration	Finding
	controlled; oral ALA 800 mg/d vs placebo in adults with type 2 diabetes and cardiac autonomic neuropathy			improved on ALA vs placebo [ziegler1997_dekan]
Ziegler 2004 meta-analysis (Diabetic Medicine)	Patient-level meta-analysis of IV ALA in symptomatic diabetic polyneuropathy across ALADIN I, ALADIN III, SYDNEY, and NATHAN II	1258	3-week IV exposures	3-week IV 600 mg/d ALA reduced Total Symptom Score by approximately 1.7 points more than placebo; supports the IV 600 mg/d induction protocol [ziegler2004_meta]
Han 2012 meta-analysis (European Journal of Endocrinology)	Systematic review and meta-analysis of RCTs of IV ALA in diabetic peripheral neuropathy	—	Pooled 3-week IV exposures	Pooled reduction in Total Symptom Score and individual symptom components on IV ALA vs placebo, consistent with the Ziegler 2004 analysis [han2012_meta]
Mijnhout 2010 review (Netherlands Journal of Medicine)	Clinical review of ALA for neuropathic pain in diabetes	—	—	Synthesizes the trial evidence and clinical use case for ALA in painful diabetic neuropathy [mijnhout2010_review]
Carlson 2007 R-(+)-lipoate PK (Alternative Medicine Review)	Open PK study of sodium R-(+)-lipoate in healthy human subjects	—	—	Sodium R-(+)-lipoate achieves higher Cmax and AUC and lower inter-individual variability than racemic ALA at equivalent total-ALA doses [carlson2007_rlipoate]
Hermann 2014 enantiomer-PK (Clinical Pharmacology)	Randomized open PK comparison of various ALA dosage forms including racemic and R-isomer	—	—	Characterized enantiomer-selective PK, oral bioavailability, food effect, and sex differences; informed dosage-form selection for clinical use [hermann2014_pk]
	PK study of ALA in subjects with severe	—	—	No clinically meaningful accumulation; no dose

Study	Design	Participants	Duration	Finding
Teichert 2005 renal-impairment PK (J Clin Pharmacol)	renal impairment and end-stage renal disease			adjustment recommended on PK grounds [teichert2005_renal]
Estrada 1996 glucose-uptake mechanism (Diabetes)	In vitro mechanistic study in L6 myotubes	—	—	ALA stimulates glucose uptake by recruiting elements of the insulin signaling pathway and promoting GLUT4 translocation [estrada1996_glut]
Park 2008 AMPK/ hepatic lipogenesis (Hepatology)	In vivo animal and in vitro hepatocyte study	—	—	ALA decreases hepatic lipogenesis through AMPK-dependent and -independent pathways; mechanistic basis for hepatic and metabolic effects [park2008_ampk]
Packer 1995 'Universal antioxidant' review (Free Radical Biology and Medicine)	Comprehensive mechanistic review	—	—	Established the framework of ALA as a redox-active disulfide with antioxidant activity in both aqueous and lipid compartments and regeneration of vitamin C, vitamin E, glutathione, and CoQ10 [packer1995_review]
Shay 2009 therapeutic-antioxidant review (BBA)	Mechanistic review of ALA biology and therapeutic context	—	—	Updated synthesis of the ALA/ DHLA redox couple, signaling effects, and clinical evidence base [shay2009_review]
Koh 2011 obesity RCT (American Journal of Medicine)	Multicenter, randomized, double-blind, placebo-controlled; oral ALA 1200 or 1800 mg/d vs placebo in obese adults	360	20 weeks	Modest additional weight loss (approximately 1.5 kg) and BMI reduction on ALA 1800 mg/d vs placebo; effect size small compared with incretin therapies [koh2011_obesity]
Femiano 2002 BMS open trial (Minerva Stomatologica)	Open comparative trial of ALA vs other therapies for burning mouth syndrome	—	—	Symptom improvement with ALA 600 mg/d for 2 months; provided the index Italian-school result that motivated

Study	Design	Participants	Duration	Finding
				subsequent RCTs [femiano2002_bms]
Carbone 2009 BMS RCT (European Journal of Pain)	Double-blind, randomized, placebo-controlled trial of ALA for burning mouth syndrome	—	—	No statistically significant benefit of ALA over placebo, contrast with earlier open trials and a cautionary note for the indication [carbone2009_bms]
Berkson 1999 hepatitis-C case series (Medizinische Klinik)	Three-case clinical series of combined ALA, silymarin, and selenium in chronic hepatitis C	—	—	Transaminase normalization and clinical improvement in all three cases; hypothesis-generating, not a controlled trial [berkson1999_hepc]
Cianci 2015 PCOS (Gynecological Endocrinology)	Trial of d-chiro-inositol plus α-lipoic acid in women with PCOS	—	—	Improvements in metabolic and menstrual parameters in PCOS with combined inositol/ALA therapy [cianci2015_pcos]
Fruzzetti 2019 PCOS (Gynecological Endocrinology)	Trial of d-chiro-inositol plus α-lipoic acid in management of PCOS	—	—	Improvements in metabolic and reproductive parameters consistent with the Cianci result [fruzzetti2019_pcos]
PCOS systematic review 2024 (Obstet Gynecol Sci)	Systematic review and meta-analysis of ALA supplementation RCTs in PCOS	—	—	Modest improvements in anthropometric, glycemic, lipid, oxidative-stress, and hormonal parameters with ALA in women with PCOS; substantial heterogeneity across included trials [pcos_meta2024]
Quaranta 2012 temporary threshold shift (Acta Otorhinolaryngologica Italica)	Pilot RCT of ALA pre-treatment on noise-induced temporary threshold shift	—	—	Reduced temporary threshold shift in ALA-pretreated subjects vs control; small pilot [quaranta2012_tts]
Libonati 2022 BPPV recurrence (Audiology Research)	Trial of combined vitamin D plus antioxidant (including ALA) supplementation on	—	—	Reduced BPPV recurrence with combined supplementation; ALA's individual contribution not separable from the

Study	Design	Participants	Duration	Finding
	recurrence of benign paroxysmal positional vertigo after canal-repositioning maneuvers			combination [libonati2022_bppv]
Burning mouth syndrome systematic review 2025 (Clinical Oral Investigations)	Systematic review of therapeutic options for pain relief and treatment of burning mouth syndrome	—	—	ALA included as one of several therapeutic options with limited evidence quality; cautious interpretation of pooled BMS literature [bms_review2025]

Alpha-Lipoic Acid (ALA) Pharmacokinetics & Pharmacodynamics

Pharmacokinetics

Alpha-lipoic acid is rapidly absorbed after oral dosing with time to maximum concentration of approximately 30, 60 minutes for racemic ALA. Absolute oral bioavailability is approximately 30%, with substantial first-pass hepatic extraction. Plasma half-life is short, approximately 30 minutes for the parent compound, and exposure (AUC) is dose-proportional in the 100, 1800 mg single-dose range [hermann2014_pk]. Food significantly reduces oral bioavailability (by approximately 30, 40%); clinical dosing protocols specify administration on an empty stomach.

Enantiomer-specific PK: the R-(+) enantiomer is preferentially absorbed and reaches higher Cmax and AUC than the S-(−) enantiomer at equivalent racemic-mixture doses. Carlson et al. [carlson2007_rlipoate] demonstrated that sodium R-(+)-lipoate achieves substantially higher exposure and lower inter-individual variability than equivalent racemic-ALA doses in healthy human subjects. Hermann et al. [hermann2014_pk] characterized PK across dosage forms, including effects of sex and food.

Elimination is primarily by mitochondrial β-oxidation-like degradation to shorter-chain dicarboxylic and dithiol metabolites, with renal excretion of degradation products. Cytochrome P450 metabolism is not a meaningful pathway. Dedicated PK in severe renal impairment and end-stage renal disease [teichert2005_renal] shows no clinically meaningful accumulation of the parent compound, supporting no PK-based dose adjustment in renal impairment.

Pharmacodynamics

Pharmacodynamic effects include thiol-redox balancing in plasma and tissue (reduction of oxidized glutathione, regeneration of ascorbate and α-tocopherol [packer1995_review]); skeletal-muscle GLUT4 translocation and glucose uptake [estrada1996_glut]; hepatic AMPK activation and reduced lipogenesis

[park2008_ampk]; reduction in peripheral-nerve oxidative-stress markers in diabetic models; and improvement in heart-rate variability indices of autonomic function in cardiac autonomic neuropathy [ziegler1997_dekan].

Clinically measured PD endpoints are indication-specific: Total Symptom Score and Neuropathy Impairment Score in diabetic polyneuropathy [ziegler2004_meta, han2012_meta]; cardiovascular autonomic function indices in DEKAN [ziegler1997_dekan]; BMS symptom scores and PCOS metabolic and menstrual parameters in their respective indications.

↓↑ Comparing Alpha-Lipoic Acid (ALA) Formulations

Three meaningful compositional distinctions: enantiomeric composition (racemic vs R-(+) isomer), salt form (free acid vs sodium, trometamol, or ethylenediamine salts), and dosage form (oral immediate-release vs delayed/enteric-release vs IV solution) [usp_795]. Most published clinical trials used racemic ALA as either the free acid (oral) or the trometamol/ethylenediamine salt (IV). The R-(+) isomer as the sodium salt achieves higher Cmax and AUC at equivalent total-ALA dose [carlson2007_rlipoate, hermann2014_pk], but clinical outcome trials are dominated by racemic-ALA data; clinicians should not assume identical clinical effect at identical nominal doses across forms.

Compounded pharmaceutical-grade ALA differs from OTC supplement ALA in API sourcing, certificate-of-analysis verification, USP <795>/<797> compliance, and lot traceability. For clinical use cases where reproducible exposure matters (documented diabetic neuropathy under structured monitoring, IV infusion preparations), compounded pharmaceutical-grade ALA is the appropriate choice; for general antioxidant supplementation outside a documented clinical indication, OTC supplement ALA is the typical context [usp_795; usp_797; fda_supplement_guidance].

🌡 Alpha-Lipoic Acid (ALA) Storage and Handling

Alpha-lipoic acid is oxidatively unstable and light-sensitive. Oral solid dosage forms are stored at controlled room temperature (15, 30°C) in light-protective and moisture-protective packaging; opened containers should be kept tightly closed. Compounded sterile IV preparations are stored per the pharmacy's stability data and beyond-use date assignment under USP <797>, typically refrigerated and protected from light. The dithiolane ring oxidizes on exposure to air, heat, and acidic pH, generating inactive degradation products; quality preparations specify the salt form and pH of the finished solution accordingly [usp_797].

Alpha-Lipoic Acid (ALA) Compounding & Operations

503A compounding

Compounded alpha-lipoic acid is prepared under 503A on patient-specific prescriptions in state-licensed compounding pharmacies. RonanRx prepares oral capsules under USP General Chapter <795> (nonsterile preparations) and sterile IV solutions under USP General Chapter <797> (sterile preparations), with pharmaceutical-grade racemic or R-(+) API sourced from FDA-registered facilities with documented certificates of analysis, gravimetric and where applicable analytical verification, sterility and endotoxin testing for IV preparations, and full lot traceability from API through dispensing [usp_795; usp_797].

Because there is no FDA-approved ALA drug in the US, the 503A rationale here is not 'cannot use the manufactured product' (as it is for tirzepatide or semaglutide) but rather patient-specific dosing (custom strengths, IV preparations not commercially available as an FDA-approved product in the US) and pharmaceutical-grade quality of preparation relative to OTC supplement ALA. The essentially-a-copy guidance [fda_essentially_a_copy] does not apply in the same way; the relevant regulatory frame is 503A patient-specific compounding for an unapproved drug substance with a documented clinical context [fda503a].

Pharmacist review

Each prescription for compounded alpha-lipoic acid undergoes pharmacist review prior to dispensing [fda503a] [han2012_meta]. The review confirms: a documented patient-specific clinical indication (most commonly symptomatic diabetic polyneuropathy under the evidence base summarized above) with a defined response endpoint and reassessment time; concurrent diabetes-medication review for hypoglycemia risk if the patient is on insulin or sulfonylureas; thiamine status review (with repletion if at-risk, particularly chronic alcohol use); pregnancy status; and an appropriate dose, formulation, route, and beyond-use date for the prescribed indication [ziegler2006_sydney2; ziegler2011_nathan1; ziegler2004_meta].

Compounded ALA is dispensed in the context of a documented clinical indication, not as a generalized supplement. Where the prescribing context is general antioxidant supplementation without an indication, OTC supplement ALA is the appropriate channel and the pharmacist may decline to dispense the compounded preparation [fda503a].

Quality and traceability

Active pharmaceutical ingredient is sourced from FDA-registered facilities with documented certificates of analysis specifying enantiomeric composition (racemic vs R-isomer), assay, and impurity profile. Each compounded batch is recorded with lot numbers traceable to API source, compounding date, beyond-use date, sterility test result (for IV preparations), endotoxin test result (for IV preparations), and dispensing

pharmacist of record. Finished product lot records are retained per state board of pharmacy retention requirements.

Cold chain

Oral ALA capsules are stored at controlled room temperature; cold chain is not required. Compounded sterile IV ALA preparations are typically refrigerated and protected from light in transport between the compounding pharmacy and the patient or infusion site; patients and clinicians are advised to inspect for temperature excursions and to contact the pharmacy if cold-chain integrity is in question [usp_797].

Frequently Asked Questions About Alpha-Lipoic Acid (ALA)

Is alpha-lipoic acid FDA-approved?

No. There is no FDA-approved alpha-lipoic acid drug in the United States [nih_ods_lipoic]. ALA is sold in the US only as a dietary supplement, regulated under DSHEA rather than as an FDA-approved drug [fda_supplement_guidance]. In Germany and several other European countries, racemic thioctic acid (e.g. Thioctacid) is an approved prescription medicine for symptomatic diabetic polyneuropathy [ziegler1999_aladin3].

What is the best-supported use of ALA?

Symptomatic diabetic polyneuropathy [ziegler2006_sydney2; ziegler2011_nathan1; ziegler2004_meta]. Multiple multicenter randomized trials (ALADIN I, ALADIN II, ALADIN III, SYDNEY, SYDNEY 2, NATHAN 1) and two independent meta-analyses support 600 mg/d, given either as a 3-week IV induction followed by oral maintenance, or as oral 600 mg/d alone, for reduction of neuropathy symptoms [ziegler1995_aladin1; ametov2003_sydney; han2012_meta]. Doses above 600 mg/d do not produce greater benefit and have higher GI adverse-event rates.

R-lipoic acid vs racemic, does the enantiomer matter?

Pharmacokinetically yes: sodium R-(+)-lipoate achieves higher Cmax and AUC and lower inter-individual variability than equivalent racemic-ALA doses in healthy human subjects [carlson2007_rlipoate]. Clinically, however, the trial evidence base is dominated by racemic ALA, so clinical outcomes have not been directly compared head-to-head at equivalent doses. R-isomer is reasonable for patients prioritizing exposure consistency; racemic ALA matches the trial evidence base [hermann2014_pk].

Does ALA help with weight loss?

Modestly. The Koh 2011 RCT in 360 obese adults reported approximately 1.5 kg additional weight loss on ALA 1800 mg/d vs placebo over 20 weeks [koh2011_obesity]. AMPK activation provides a mechanistic

basis [park2008_ampk]. The effect size is small and does not approach the magnitude of incretin therapies. ALA is reasonable as an adjunct, not as a primary obesity treatment [carbonelli2010_review].

What are the most common side effects?

Gastrointestinal: nausea, vomiting, abdominal pain, and dyspepsia, concentrated at oral doses ≥1200 mg/d and during the IV induction period [ziegler2006_sydney2]. Skin rash, headache, and dizziness are less frequent. Clinically meaningful hypoglycemia can occur in patients on concurrent insulin or sulfonylureas. Rare insulin autoimmune syndrome has been described in Asian populations with specific HLA haplotypes [ziegler1995_aladin1; ziegler2011_nathan1].

Who should be careful with ALA?

Patients with poorly controlled diabetes on insulin or sulfonylureas (additive hypoglycemia), patients with thiamine deficiency including chronic alcohol use disorder (theoretical risk of precipitating Wernicke encephalopathy), pregnant and lactating patients (limited data), and patients on oxidative-mechanism chemotherapy (theoretical antagonism). Coordinate with oncology and endocrinology teams [nih_ods_lipoic].

How is compounded ALA different from the supplement at the pharmacy or online?

Compounded pharmaceutical-grade ALA differs from OTC supplement ALA in API sourcing (FDA-registered facilities with documented certificates of analysis), USP <795>/<797> quality standards, gravimetric and analytical verification, sterility and endotoxin testing for IV preparations, and full lot traceability [usp_795; usp_797]. For documented clinical indications under structured monitoring, particularly IV induction for diabetic neuropathy, pharmaceutical-grade preparation is the appropriate choice [fda_supplement_guidance].

Does RonanRx sell compounded ALA directly to patients?

No. Compounded ALA requires a patient-specific prescription written by a licensed prescriber for an identified patient with a documented clinical indication, plus pharmacist review before dispensing. RonanRx is not a direct-to-consumer storefront [fda503a].

References

1. *[ziegler1995_aladin1]* Ziegler D, Hanefeld M, Ruhnau KJ, Meissner HP, Lobisch M, Schütte K, Gries FA. *Treatment of symptomatic diabetic peripheral neuropathy with the anti-oxidant alpha-lipoic acid. A 3-week multicentre randomized controlled trial (ALADIN Study).* Diabetologia. 1995. PMID 8786016. (accessed 2026-05-11)
2. *[reljanovic1999_aladin2]* Reljanovic M, Reichel G, Rett K, Lobisch M, Schuette K, Möller W, Tritschler HJ, Mehnert H. *Treatment of diabetic polyneuropathy with the antioxidant thioctic acid (alpha-lipoic acid): a two year multicenter randomized double-blind placebo-controlled trial (ALADIN II). Alpha Lipoic Acid in Diabetic Neuropathy..* Free Radical Research. 1999. PMID 10499773. (accessed 2026-05-11)

3. *[ziegler1999_aladin3]* Ziegler D, Hanefeld M, Ruhnau KJ, Hasche H, Lobisch M, Schütte K, Kerum G, Malessa R. *Treatment of symptomatic diabetic polyneuropathy with the antioxidant alpha-lipoic acid: a 7-month multicenter randomized controlled trial (ALADIN III Study). ALADIN III Study Group. Alpha-Lipoic Acid in Diabetic Neuropathy.*. Diabetes Care. 1999. PMID 10480774. (accessed 2026-05-11)
4. *[ametov2003_sydney]* Ametov AS, Barinov A, Dyck PJ, Hermann R, Kozlova N, Litchy WJ, Low PA, Nehrdich D, Novosadova M, O'Brien PC, Reljanovic M, Samigullin R, Schuette K, Strokov I, Tritschler HJ, Wessel K, Yakhno N, Ziegler D; SYDNEY Trial Study Group. *The sensory symptoms of diabetic polyneuropathy are improved with alpha-lipoic acid: the SYDNEY trial*. Diabetes Care. 2003. PMID 12610036. (accessed 2026-05-11)
5. *[ziegler2006_sydney2]* Ziegler D, Ametov A, Barinov A, Dyck PJ, Gurieva I, Low PA, Munzel U, Yakhno N, Raz I, Novosadova M, Maus J, Samigullin R. *Oral treatment with alpha-lipoic acid improves symptomatic diabetic polyneuropathy: the SYDNEY 2 trial*. Diabetes Care. 2006. PMID 17065669. (accessed 2026-05-11)
6. *[ziegler2011_nathan1]* Ziegler D, Low PA, Litchy WJ, Boulton AJ, Vinik AI, Freeman R, Samigullin R, Tritschler H, Munzel U, Maus J, Schütte K, Dyck PJ. *Efficacy and safety of antioxidant treatment with α-lipoic acid over 4 years in diabetic polyneuropathy: the NATHAN 1 trial*. Diabetes Care. 2011. PMID 21775755. (accessed 2026-05-11)
7. *[ziegler1997_dekan]* Ziegler D, Schatz H, Conrad F, Gries FA, Ulrich H, Reichel G. *Effects of treatment with the antioxidant alpha-lipoic acid on cardiac autonomic neuropathy in NIDDM patients. A 4-month randomized controlled multicenter trial (DEKAN Study). Deutsche Kardiale Autonome Neuropathie.*. Diabetes Care. 1997. PMID 9051389. (accessed 2026-05-11)
8. *[ziegler2004_meta]* Ziegler D, Nowak H, Kempler P, Vargha P, Low PA. *Treatment of symptomatic diabetic polyneuropathy with the antioxidant alpha-lipoic acid: a meta-analysis*. Diabetic Medicine. 2004. PMID 14984445. (accessed 2026-05-11)
9. *[han2012_meta]* Han T, Bai J, Liu W, Hu Y. *A systematic review and meta-analysis of α-lipoic acid in the treatment of diabetic peripheral neuropathy*. European Journal of Endocrinology. 2012. PMID 22837391. (accessed 2026-05-11)
10. *[mijnhout2010_review]* Mijnhout GS, Alkhalaf A, Kleefstra N, Bilo HJ. *Alpha lipoic acid: a new treatment for neuropathic pain in patients with diabetes?*. Netherlands Journal of Medicine. 2010. PMID 20421656. (accessed 2026-05-11)
11. *[packer1995_review]* Packer L, Witt EH, Tritschler HJ. *Alpha-lipoic acid as a biological antioxidant*. Free Radical Biology and Medicine. 1995. PMID 7649494. (accessed 2026-05-11)
12. *[shay2009_review]* Shay KP, Moreau RF, Smith EJ, Smith AR, Hagen TM. *Alpha-lipoic acid as a dietary supplement: molecular mechanisms and therapeutic potential*. Biochimica et Biophysica Acta. 2009. PMID 19664690. (accessed 2026-05-11)
13. *[estrada1996_glut]* Estrada DE, Ewart HS, Tsakiridis T, Volchuk A, Ramlal T, Tritschler H, Klip A. *Stimulation of glucose uptake by the natural coenzyme alpha-lipoic acid/thioctic acid: participation of elements of the insulin signaling pathway*. Diabetes. 1996. PMID 8922368. (accessed 2026-05-11)
14. *[park2008_ampk]* Park KG, Min AK, Koh EH, Kim HS, Kim MO, Park HS, Kim YD, Yoon TS, Jang BK, Hwang JS, Kim JB, Choi HS, Park JY, Lee IK, Lee KU. *Alpha-lipoic acid decreases hepatic lipogenesis through adenosine monophosphate-activated protein kinase (AMPK)-dependent and AMPK-independent pathways*. Hepatology. 2008. PM ID 18972440. (accessed 2026-05-11)
15. *[carlson2007_rlipoate]* Carlson DA, Smith AR, Fischer SJ, Young KL, Packer L. *The plasma pharmacokinetics of R-(+)-lipoic acid administered as sodium R-(+)-lipoate to healthy human subjects*. Alternative Medicine Review. 2007. PMID 18069903. (accessed 2026-05-11)

16. *[hermann2014_pk]* Hermann R, Mungo J, Cnota PJ, Ziegler D. *Enantiomer-selective pharmacokinetics, oral bioavailability, and sex effects of various alpha-lipoic acid dosage forms*. Clinical Pharmacology. 2014. PMID 25506250. (accessed 2026-05-11)
17. *[teichert2005_renal]* Teichert J, Hermann R, Ruus P, Preiss R. *Pharmacokinetics of alpha-lipoic acid in subjects with severe kidney damage and end-stage renal disease*. Journal of Clinical Pharmacology. 2005. PMID 15703366. (accessed 2026-05-11)
18. *[koh2011_obesity]* Koh EH, Lee WJ, Lee SA, Kim EH, Cho EH, Jeong E, Kim DW, Kim MS, Park JY, Park KG, Lee HJ, Lee IK, Lim S, Jang HC, Lee KH, Lee KU. *Effects of alpha-lipoic acid on body weight in obese subjects*. American Journal of Medicine. 2011. PMID 21187189. (accessed 2026-05-11)
19. *[carbonelli2010_review]* Carbonelli MG, Di Renzo L, Bigioni M, Di Daniele N, De Lorenzo A, Fusco MA. *Alpha-lipoic acid supplementation: a tool for obesity therapy?*. Current Pharmaceutical Design. 2010. PMID 20388095. (accessed 2026-05-11)
20. *[femiano2002_bms]* Femiano F, Gombos F, Scully C. *Burning mouth syndrome (BMS): an open trial of comparative efficacy of alpha-lipoic acid (thioctic acid) with other therapies*. Minerva Stomatologica. 2002. PMID 12473978. (accessed 2026-05-11)
21. *[femiano2004_bms]* Femiano F, Gombos F, Scully C. *Burning mouth syndrome: the efficacy of lipoic acid on subgroups*. Journal of the European Academy of Dermatology and Venereology. 2004. PMID 15482293. (accessed 2026-05-11)
22. *[femiano2008_bms]* Femiano F, Gombos F, Esposito V, Nunziata M, Scully C. *Burning mouth syndrome and burning mouth in hypothyroidism: proposal for a diagnostic and therapeutic protocol*. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics. 2008. PMID 18155597. (accessed 2026-05-11)
23. *[carbone2009_bms]* Carbone M, Pentenero M, Carrozzo M, Ippolito A, Gandolfo S. *Lack of efficacy of alpha-lipoic acid in burning mouth syndrome: a double-blind, randomized, placebo-controlled study*. European Journal of Pain. 2009. PMID 18675569. (accessed 2026-05-11)
24. *[bms_review2025]* Multiple. *Efficacy of different therapeutic options for pain relief and treatment of burning mouth syndrome: a systematic review*. Clinical Oral Investigations. 2025. PMID 41193828. (accessed 2026-05-11)
25. *[cianci2015_pcos]* Cianci A, Panella M, Fichera M, Falduzzi C, Bartolo M, Caruso S. *d-chiro-Inositol and alpha lipoic acid treatment of metabolic and menses disorders in women with PCOS*. Gynecological Endocrinology. 2015. PMID 25893270. (accessed 2026-05-11)
26. *[fruzzetti2019_pcos]* Fruzzetti F, Capozzi A, Canu A, Lello S. *Treatment with d-chiro-inositol and alpha lipoic acid in the management of polycystic ovary syndrome*. Gynecological Endocrinology. 2019. PMID 30612488. (accessed 2026-05-11)
27. *[pcos_meta2024]* Multiple. *The effect of alpha-lipoic acid supplementation on anthropometric, glycemic, lipid, oxidative stress, and hormonal parameters in individuals with polycystic ovary syndrome: a systematic review and meta-analysis of randomized clinical trials*. Obstetrics and Gynecology Science. 2024. PMID 38044616. (accessed 2026-05-11)
28. *[berkson1999_hepc]* Berkson BM. *A conservative triple antioxidant approach to the treatment of hepatitis C. Combination of alpha lipoic acid (thioctic acid), silymarin, and selenium: three case histories*. Medizinische Klinik. 1999. PMID 10554539. (accessed 2026-05-11)
29. *[quaranta2012_tts]* Quaranta N, Dicorato A, Matera V, D'Elia A, Quaranta A. *The effect of alpha-lipoic acid on temporary threshold shift in humans: a preliminary study*. Acta Otorhinolaryngologica Italica. 2012. PMID 23349557. (accessed 2026-05-11)
30. *[libonati2022_bppv]* Libonati GA, Leone A, Martellucci S. *Prevention of Recurrent Benign Paroxysmal Positional Vertigo: The Role of Combined Supplementation with Vitamin D and Antioxidants*. Audiology Research. 2022. PMID 36004953. (accessed 2026-05-11)

31. *[fda503a]* U.S. Food and Drug Administration. *Compounding Laws and Policies — Section 503A of the Federal Food, Drug, and Cosmetic Act*. FDA Drug Compounding. 2024. https://www.fda.gov/drugs/human-drug-compounding/compounding-laws-and-policies (accessed 2026-05-11)
32. *[fda_essentially_a_copy]* U.S. Food and Drug Administration. *Compounded Drug Products That Are Essentially Copies of Approved Drug Products Under Section 503A of the Federal Food, Drug, and Cosmetic Act — Guidance for Industry*. FDA Guidance for Industry. 2018. https://www.fda.gov/media/98973/download (accessed 2026-05-11)
33. *[fda_supplement_guidance]* U.S. Food and Drug Administration. *Dietary Supplements — Overview of regulation under DSHEA*. FDA Dietary Supplements. 2024. https://www.fda.gov/food/dietary-supplements (accessed 2026-05-11)
34. *[nih_ods_lipoic]* NIH Office of Dietary Supplements. *Alpha-Lipoic Acid — Office of Dietary Supplements fact sheet reference*. NIH ODS Dietary Supplement Fact Sheets. 2024. https://ods.od.nih.gov/factsheets/list-all/ (accessed 2026-05-11)
35. *[usp_797]* United States Pharmacopeia. *USP General Chapter <797> Pharmaceutical Compounding — Sterile Preparations*. USP Compounding Compendium. 2023. https://www.usp.org/compounding/general-chapter-797 (accessed 2026-05-11)
36. *[usp_795]* United States Pharmacopeia. *USP General Chapter <795> Pharmaceutical Compounding — Nonsterile Preparations*. USP Compounding Compendium. 2023. https://www.usp.org/compounding/general-chapter-795 (accessed 2026-05-11)

How to Access Alpha-Lipoic Acid (ALA)

Compounded Alpha-Lipoic Acid (ALA) is dispensed under 503A on a patient-specific prescription. Depending on your role, the next step looks different.

FOR PRESCRIBING CLINICIANS

Offer this medication

A pharmacist will follow up within two business days. We'll cover state availability, supported formulations, and what integration looks like for your clinic.

ronanrx.com/request-partnership-call

PATIENT WITH A DOCTOR

Receive your prescription

If your doctor has prescribed Alpha-Lipoic Acid (ALA), sign up so we can prepare and ship your medication. The signup wizard collects intake and connects you to the prescribing workflow.

ronanrx.com/patients

PATIENT WITHOUT A DOCTOR

Find a partner clinic

RonanRx prescribes through partner clinics — we don't initiate prescriptions on this site. Read how the referral process works and how to find a partner clinic in your state.

ronanrx.com/find-clinic

Other compounds RonanRx makes

This monograph is one of many in the RonanRx formulary. Every compound below is prepared under 503A on a patient-specific prescription. Browse the full catalog at ronanrx.com/medications and ronanrx.com/peptides, or scan the codes at right for each index.

Medications

Peptides

MEDICATIONS (40)

Alpha-Lipoic Acid (ALA) — Antioxidant & mitochondrial
Coenzyme Q10 (CoQ10) — Antioxidant & mitochondrial
Glutathione — Antioxidant & mitochondrial
NAD+ / NMN — Antioxidant & mitochondrial
Compounded Topical Anesthetics (BLT, LET) — Dermatology
Topical Minoxidil — Dermatology
Topical Tretinoin — Dermatology
Compounded Magnesium — Energy & nutritional
Cyanocobalamin — Energy & nutritional
High-Dose Vitamin D — Energy & nutritional
Hydroxocobalamin — Energy & nutritional
Iron (Compounded) — Energy & nutritional
L-Carnitine — Energy & nutritional
Methylcobalamin (B12) — Energy & nutritional
Methylfolate — Energy & nutritional
Anastrozole — Hormone optimization
Clomiphene & Enclomiphene — Hormone optimization
DHEA — Hormone optimization
Estradiol — Hormone optimization
Estriol — Hormone optimization
Human Chorionic Gonadotropin (HCG) — Hormone optimization
Pregnenolone — Hormone optimization
Progesterone — Hormone optimization
Testosterone — Hormone optimization
Compounded Metformin — Metabolic & weight
Compounded Semaglutide — Metabolic & weight
Compounded Tirzepatide — Metabolic & weight
Lipotropic Injection (MIC, MICC) — Metabolic & weight
Low-Dose Naltrexone (LDN) — Metabolic & weight
Naltrexone-Bupropion Combination — Metabolic & weight
Topiramate — Metabolic & weight
Bremelanotide / PT-141 — Sexual health
Compounded Sildenafil — Sexual health
Compounded Tadalafil — Sexual health
Trimix Injection — Sexual health
Compounded Gabapentin — Sleep & recovery
Compounded Melatonin — Sleep & recovery
Compounded T3 (Liothyronine) — Thyroid
Compounded T3/T4 Combinations — Thyroid
Compounded T4 (Levothyroxine) — Thyroid

PEPTIDES (21)

Sermorelin — Available now

Tesamorelin — Available now

AOD-9604 — Growth-hormone axis (under FDA review)

CJC-1295 — Growth-hormone axis (under FDA review)

GHRP-2 / GHRP-6 — Growth-hormone axis (under FDA review)

Hexarelin — Growth-hormone axis (under FDA review)

Ipamorelin — Growth-hormone axis (under FDA review)

MK-677 / Ibutamoren — Growth-hormone axis (under FDA review)

5-Amino 1MQ — Metabolic & longevity (under FDA review)

Epitalon / Epithalon — Metabolic & longevity (under FDA review)

MOTS-C — Metabolic & longevity (under FDA review)

Thymosin Alpha-1 / Thymalin — Metabolic & longevity (under FDA review)

DSIP, Delta Sleep-Inducing Peptide — Neuro & cognitive (under FDA review)

Selank — Neuro & cognitive (under FDA review)

Semax — Neuro & cognitive (under FDA review)

Vasoactive Intestinal Peptide (VIP) — Neuro & cognitive (under FDA review)

BPC-157 — Tissue repair (under FDA review)

KPV — Tissue repair (under FDA review)

LL-37 — Tissue repair (under FDA review)

Pentadeca Arginate (PDA) — Tissue repair (under FDA review)

TB-500 / Thymosin Beta-4 — Tissue repair (under FDA review)