

RESEARCH MONOGRAPH . COMPOUND PROFILE

L-DOPA (Levodopa)

The immediate precursor of dopamine and the principal pharmacological treatment for Parkinson disease, FDA-approved in combination with carbidopa.

DOCUMENT	KDC-MN-147
ISSUED	2026-05-09
REVISION	1.0
AUTHOR	Kodiac bioLabs Research
COMPOUND CLASS	Dopamine precursor

RESEARCH USE ONLY

ABSTRACT

L-DOPA (levodopa, L-3,4-dihydroxyphenylalanine; CAS 59-92-7; molecular formula $C_9H_{11}NO_4$; molecular weight 197.19) is the immediate precursor of dopamine in the catecholamine biosynthesis pathway. The compound is FDA-approved in combination with carbidopa (Sinemet) or benserazide for Parkinson disease. Carbidopa inhibits peripheral DOPA decarboxylase (which would otherwise convert most administered L-DOPA to dopamine before reaching CNS), enabling effective central dopamine elevation at lower doses with reduced peripheral adverse events. L-DOPA is the principal symptomatic treatment for Parkinson disease and remains the gold standard despite long-term complications including motor fluctuations and dyskinesia. The compound is also extracted naturally from *Mucuna pruriens*. Doses are highly individualized; typical Sinemet dosing is 25/100 mg three to four times daily.

1. Compound Identification

L-DOPA (Levodopa) is described as dopamine precursor. The immediate precursor of dopamine and the principal pharmacological treatment for Parkinson disease, FDA-approved in combination with carbidopa.

1.1 Class summary

Dopamine precursor

1.2 Subtitle

The immediate precursor of dopamine and the principal pharmacological treatment for Parkinson disease, FDA-approved in combination with carbidopa.

2. Abstract

L-DOPA (levodopa, L-3,4-dihydroxyphenylalanine; CAS 59-92-7; molecular formula $C_9H_{11}NO_4$; molecular weight 197.19) is the immediate precursor of dopamine in the catecholamine biosynthesis pathway. The compound is FDA-approved in combination with carbidopa (Sinemet) or benserazide for Parkinson disease. Carbidopa inhibits peripheral DOPA decarboxylase (which would otherwise convert most administered L-DOPA to dopamine before reaching CNS), enabling effective central dopamine elevation at lower doses with reduced peripheral adverse events. L-DOPA is the principal symptomatic treatment for Parkinson disease and remains the gold standard despite long-term complications including motor fluctuations and dyskinesia. The compound is also extracted naturally from *Mucuna pruriens*. Doses are highly individualized; typical Sinemet dosing is 25/100 mg three to four times daily.

3. Mechanism of Action

Direct dopamine precursor; converted to dopamine by aromatic L-amino acid decarboxylase. Combined with peripheral DDC inhibitor (carbidopa) for clinical use.

The mechanistic profile described above represents the consensus position from peer-reviewed literature where available; for compounds with sparse formal characterization, this section reflects vendor-grade reports and structurally-related class pharmacology and should be interpreted with appropriate caution.

4. Pharmacokinetics and Routes of Administration

Pharmacokinetic data are summarized within the abstract for compounds with formal Phase 1 records. Compounds without published human pharmacokinetic studies are noted as such; investigators should treat the absence of data as a research limitation.

5. Reported Research Dose Ranges

Sinemet 25/100 to 50/200 three to four times daily; highly individualized.

Doses are scaled from clinical use where the compound is approved as a medicine, from Phase 2/3 trials where development advanced, or from rodent dose-response data scaled by allometric assumptions where the compound has no human clinical record. Investigators should treat dose ranges from research-chemical-grade vendors as starting points for their own pharmacokinetic and tolerability characterization rather than validated dosing recommendations.

6. Sourcing and Quality Verification

Investigators should obtain analytical confirmation of identity (mass spectrometry; for peptides, additionally amino acid analysis or N-terminal sequencing) and purity (HPLC area-percent, ideally greater than 95 percent) on every lot. Vendor certificates of analysis vary in quality; third-party analytical confirmation through independent laboratories (e.g., Janoshik Analytical, Anabolic Lab) is the gold standard for research-grade peptides and small molecules.

For compounds with established pharmaceutical-grade marketing in any jurisdiction, sourcing from the marketed product (where legal and accessible) provides the highest quality assurance.

7. Reconstitution and Handling

Peptides should be reconstituted in bacteriostatic water or sterile water for injection in the volume appropriate to the desired concentration; lyophilized peptides should be allowed to come to room temperature before reconstitution to minimize precipitation. Reconstituted peptides should be stored refrigerated and used within the timeframe specified by the manufacturer (typically 14 to 30 days for bacteriostatic water reconstitutions, shorter for sterile water).

Small molecules: storage conditions vary by compound; consult the certificate of analysis for the specific product. Most are stable at room temperature in dry, dark conditions; oxidation-sensitive compounds (e.g., catecholamine precursors) require cool storage and protection from light.

8. Stack Interaction Considerations

Investigators combining this compound with other research substances should consider receptor-level interactions (additive effects at shared targets), enzyme-level interactions (CYP-mediated drug-drug interactions where applicable), and pharmacodynamic interactions (additive sedation, additive serotonergic activity, additive hemodynamic effects).

The stack interaction section in published monographs of well-characterized compounds is necessarily incomplete for any specific combination; investigators should treat novel combinations with elevated caution and titrate gradually.

9. References

1. Cotzias GC, et al. Aromatic amino acids and modification of parkinsonism. N Engl J Med 1967.

This monograph is provided for research use only. Not for medical, diagnostic, or therapeutic purposes. Not for human consumption. Compound class generalizations are noted where compound-specific data are sparse; investigators should weight the evidence accordingly.