

RESEARCH MONOGRAPH . COMPOUND PROFILE

Melatonin

An endogenous pineal hormone synthesized from serotonin, the master circadian regulator and a widely-used sleep supplement.

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COMPOUND CLASS	Endogenous indolamine hormone

ABSTRACT

Melatonin (N-acetyl-5-methoxytryptamine; CAS 73-31-4; molecular formula $C_{13}H_{16}N_2O_2$; molecular weight 232.28) is an endogenous indolamine synthesized in the pineal gland from serotonin via N-acetylation and 5-methoxylation. Endogenous melatonin secretion peaks during darkness and is the principal hormonal signal of biological night. Supplementation is widely used for sleep onset, jet lag, and shift work sleep. Mechanism is MT1 and MT2 melatonin receptor agonism; the compound also has direct antioxidant activity. Pharmacokinetics: plasma half-life 30 to 50 minutes; oral bioavailability variable (15 to 50 percent). Doses for sleep are 0.3 to 5 mg orally 30 to 60 minutes before bedtime; lower doses (0.3 to 1 mg) may be more physiologically appropriate but commercial supplements typically provide higher doses.

1. Compound Identification

Melatonin is described as endogenous indolamine hormone. An endogenous pineal hormone synthesized from serotonin, the master circadian regulator and a widely-used sleep supplement.

1.1 Class summary

Endogenous indolamine hormone

1.2 Subtitle

An endogenous pineal hormone synthesized from serotonin, the master circadian regulator and a widely-used sleep supplement.

2. Abstract

Melatonin (N-acetyl-5-methoxytryptamine; CAS 73-31-4; molecular formula $C_{13}H_{16}N_2O_2$; molecular weight 232.28) is an endogenous indolamine synthesized in the pineal gland from serotonin via N-acetylation and 5-methoxylation. Endogenous melatonin secretion peaks during darkness and is the principal hormonal signal of biological night. Supplementation is widely used for sleep onset, jet lag, and shift work sleep. Mechanism is MT1 and MT2 melatonin receptor agonism; the compound also has direct antioxidant activity. Pharmacokinetics: plasma half-life 30 to 50 minutes; oral bioavailability variable (15 to 50 percent). Doses for sleep are 0.3 to 5 mg orally 30 to 60 minutes before bedtime; lower doses (0.3 to 1 mg) may be more physiologically appropriate but commercial supplements typically provide higher doses.

3. Mechanism of Action

MT1/MT2 melatonin receptor agonist. Direct antioxidant. Master circadian phase regulator.

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

0.3 to 5 mg orally before bedtime.

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. Brzezinski A. Melatonin in humans. N Engl J Med 1997.

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