

RESEARCH MONOGRAPH . COMPOUND PROFILE

# Propranolol

*A non-selective beta-adrenergic antagonist; the first beta-blocker, repurposed for performance anxiety and migraine prophylaxis.*

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| AUTHOR         | Kodiac bioLabs Research                  |
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## ABSTRACT

Propranolol (1-(naphthalen-1-yloxy)-3-(propan-2-ylamino)propan-2-ol; CAS 525-66-6; molecular formula  $C_{16}H_{21}NO_2$ ; molecular weight 259.34) is a non-selective beta-adrenergic antagonist developed by James Black at ICI and approved by the FDA in 1967 under the trade name Inderal. The compound is the first commercially successful beta-blocker, foundational to modern cardiovascular pharmacology. Beta-1 affinity is approximately equal to beta-2 affinity (non-selective). Plasma half-life is 3 to 6 hours; the lipophilic structure produces high CNS penetration, distinguishing propranolol from hydrophilic beta-blockers (atenolol, nadolol) for indications requiring central effect. Approved indications include hypertension, angina, atrial fibrillation, migraine prophylaxis, essential tremor, and hypertrophic cardiomyopathy. Off-label use is extensive: performance anxiety (most common psychiatric indication), PTSD memory reconsolidation, akathisia, hyperthyroid tachycardia. The 5-HT receptor partial agonism (weak) was a former curiosity but is not clinically meaningful at standard doses. Used as the canonical non-selective beta-blocker reference compound.

# 1. Compound Identification

**Propranolol** is described as non-selective beta-adrenergic antagonist. A non-selective beta-adrenergic antagonist; the first beta-blocker, repurposed for performance anxiety and migraine prophylaxis.

## 1.1 Class summary

Non-selective beta-adrenergic antagonist

## 1.2 Subtitle

A non-selective beta-adrenergic antagonist; the first beta-blocker, repurposed for performance anxiety and migraine prophylaxis.

## 2. Abstract

Propranolol (1-(naphthalen-1-yloxy)-3-(propan-2-ylamino)propan-2-ol; CAS 525-66-6; molecular formula C<sub>16</sub>H<sub>21</sub>NO<sub>2</sub>; molecular weight 259.34) is a non-selective beta-adrenergic antagonist developed by James Black at ICI and approved by the FDA in 1967 under the trade name Inderal. The compound is the first commercially successful beta-blocker, foundational to modern cardiovascular pharmacology. Beta-1 affinity is approximately equal to beta-2 affinity (non-selective). Plasma half-life is 3 to 6 hours; the lipophilic structure produces high CNS penetration, distinguishing propranolol from hydrophilic beta-blockers (atenolol, nadolol) for indications requiring central effect. Approved indications include hypertension, angina, atrial fibrillation, migraine prophylaxis, essential tremor, and hypertrophic cardiomyopathy. Off-label use is extensive: performance anxiety (most common psychiatric indication), PTSD memory reconsolidation, akathisia, hyperthyroid tachycardia. The 5-HT receptor partial agonism (weak) was a former curiosity but is not clinically meaningful at standard doses. Used as the canonical non-selective beta-blocker reference compound.

### 3. Mechanism of Action

Non-selective beta-1 and beta-2 adrenergic antagonism. Lipophilic with high CNS penetration; weak 5-HT receptor partial agonism (clinically minor).

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

Clinical 10 to 320 mg per oral administration daily, in divided doses. Performance anxiety 10 to 40 mg PRN. Rodent studies 1 to 30 mg/kg/day.

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. Black JW, et al. A new adrenergic beta-receptor antagonist. Lancet 1964.
2. Brunet A, et al. Effect of post-retrieval propranolol on psychophysiologic responding during subsequent script-driven traumatic imagery in post-traumatic stress disorder. J Psychiatr Res 2008.
3. Tindall RS. Propranolol in essential tremor. Drugs 1981.

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