

RESEARCH MONOGRAPH . COMPOUND PROFILE

Oxytocin

An endogenous nonapeptide produced in the hypothalamus and released by the posterior pituitary, with maternal, social bonding, and anxiolytic effects.

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COMPOUND CLASS	Endogenous nonapeptide neuropeptide/hormone

ABSTRACT

Oxytocin (CAS 50-56-6; molecular formula $C_{43}H_{66}N_{12}O_{12}S_2$; molecular weight 1007.19) is an endogenous nonapeptide hormone synthesized in the paraventricular and supraoptic nuclei of the hypothalamus and released systemically by the posterior pituitary. The compound is FDA-approved for labor induction and postpartum hemorrhage (intravenous). Beyond reproductive applications, intranasal oxytocin has been studied extensively for autism spectrum disorder, social anxiety, PTSD, and pair bonding research, with mixed clinical results. Mechanism is oxytocin receptor (OTR) agonism. Pharmacokinetics: plasma half-life ~3 to 6 minutes; central CNS penetration after intranasal administration is debated. Doses for research applications are typically 24 IU intranasally per administration.

1. Compound Identification

Oxytocin is described as endogenous nonapeptide neuropeptide/hormone. An endogenous nonapeptide produced in the hypothalamus and released by the posterior pituitary, with maternal, social bonding, and anxiolytic effects.

1.1 Class summary

Endogenous nonapeptide neuropeptide/hormone

1.2 Subtitle

An endogenous nonapeptide produced in the hypothalamus and released by the posterior pituitary, with maternal, social bonding, and anxiolytic effects.

2. Abstract

Oxytocin (CAS 50-56-6; molecular formula $C_{43}H_{66}N_{12}O_{12}S_2$; molecular weight 1007.19) is an endogenous nonapeptide hormone synthesized in the paraventricular and supraoptic nuclei of the hypothalamus and released systemically by the posterior pituitary. The compound is FDA-approved for labor induction and postpartum hemorrhage (intravenous). Beyond reproductive applications, intranasal oxytocin has been studied extensively for autism spectrum disorder, social anxiety, PTSD, and pair bonding research, with mixed clinical results. Mechanism is oxytocin receptor (OTR) agonism. Pharmacokinetics: plasma half-life ~3 to 6 minutes; central CNS penetration after intranasal administration is debated. Doses for research applications are typically 24 IU intranasally per administration.

3. Mechanism of Action

Oxytocin receptor agonist. Maternal, social bonding, anxiolytic effects (CNS); uterine contraction and lactation (peripheral).

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

24 IU intranasally per administration in research; IV for clinical labor indications.

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. Macdonald K, Macdonald TM. The peptide that binds: a systematic review of oxytocin and its prosocial effects in humans. Harv Rev Psychiatry 2010.

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