

RESEARCH MONOGRAPH . COMPOUND PROFILE

# Semaglutide

*A long-acting GLP-1 receptor agonist FDA-approved as Ozempic (T2DM) and Wegovy (obesity), with extended duration through albumin-binding and amino acid substitution.*

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## ABSTRACT

Semaglutide (Ozempic, Wegovy, Rybelsus; CAS 910463-68-2; molecular weight 4113.58) is a long-acting GLP-1 receptor agonist developed by Novo Nordisk and approved for type 2 diabetes (Ozempic, 2017; Rybelsus oral, 2019) and chronic weight management (Wegovy, 2021). The compound is structurally based on native GLP-1 with two amino acid substitutions (Aib at position 8 to resist DPP-4 cleavage; Arg<sup>34</sup>Lys) and a fatty acid chain (octadecanoic diacid) attached via a glutamic acid spacer that enables reversible albumin binding for extended plasma half-life (approximately 1 week). Mechanism is GLP-1 receptor agonism producing glucose-dependent insulin release, glucagon suppression, gastric emptying delay, and central satiety effects. The semaglutide STEP program demonstrated 14 to 18 percent weight loss over 68 weeks in obesity trials; cardiovascular outcomes trials demonstrated MACE reduction in T2DM. Approved doses titrate to 1 mg per week (Ozempic), 2.4 mg per week (Wegovy), or 14 mg per day (Rybelsus oral). Schedule status: prescription-only.

# 1. Compound Identification

**Semaglutide** is described as glp-1 receptor agonist (long-acting). A long-acting GLP-1 receptor agonist FDA-approved as Ozempic (T2DM) and Wegovy (obesity), with extended duration through albumin-binding and amino acid substitution.

## 1.1 Class summary

GLP-1 receptor agonist (long-acting)

## 1.2 Subtitle

A long-acting GLP-1 receptor agonist FDA-approved as Ozempic (T2DM) and Wegovy (obesity), with extended duration through albumin-binding and amino acid substitution.

## 2. Abstract

Semaglutide (Ozempic, Wegovy, Rybelsus; CAS 910463-68-2; molecular weight 4113.58) is a long-acting GLP-1 receptor agonist developed by Novo Nordisk and approved for type 2 diabetes (Ozempic, 2017; Rybelsus oral, 2019) and chronic weight management (Wegovy, 2021). The compound is structurally based on native GLP-1 with two amino acid substitutions (Aib at position 8 to resist DPP-4 cleavage; Arg34Lys) and a fatty acid chain (octadecanoic diacid) attached via a glutamic acid spacer that enables reversible albumin binding for extended plasma half-life (approximately 1 week). Mechanism is GLP-1 receptor agonism producing glucose-dependent insulin release, glucagon suppression, gastric emptying delay, and central satiety effects. The semaglutide STEP program demonstrated 14 to 18 percent weight loss over 68 weeks in obesity trials; cardiovascular outcomes trials demonstrated MACE reduction in T2DM. Approved doses titrate to 1 mg per week (Ozempic), 2.4 mg per week (Wegovy), or 14 mg per day (Rybelsus oral). Schedule status: prescription-only.

### 3. Mechanism of Action

GLP-1 receptor agonist with albumin-binding fatty acid extension for weekly dosing. Glucose-dependent insulin secretion, glucagon suppression, gastric emptying delay, satiety.

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

0.25 to 2.4 mg weekly (subcutaneous) or 3 to 14 mg daily (oral).

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. Wilding JPH, et al. Once-weekly semaglutide in adults with overweight or obesity (STEP 1). N Engl J Med 2021.
2. Marso SP, et al. Semaglutide and cardiovascular outcomes in patients with type 2 diabetes (SUSTAIN-6). N Engl J Med 2016.

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