

RESEARCH MONOGRAPH . COMPOUND PROFILE

# Tirzepatide

*A dual GIP and GLP-1 receptor agonist  
FDA-approved as Mounjaro (T2DM, 2022)  
and Zepbound (obesity, 2023), producing  
greater weight loss than GLP-1-only  
agents.*

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| DOCUMENT       | KDC-MN-083                      |
| ISSUED         | 2026-05-09                      |
| REVISION       | 1.0                             |
| AUTHOR         | Kodiac biolabs Research         |
| COMPOUND CLASS | GIP/GLP-1 dual receptor agonist |

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## ABSTRACT

Tirzepatide (Mounjaro, Zepbound; CAS 2023788-19-2; molecular weight 4813.54) is a dual GIP (glucose-dependent insulintropic polypeptide) and GLP-1 receptor co-agonist developed by Eli Lilly and approved by the FDA for type 2 diabetes (2022) and chronic weight management (2023). The compound is a 39-amino-acid synthetic peptide based on the GIP scaffold with modifications at positions enabling GLP-1 receptor agonism alongside GIP receptor activity. Mechanism is dual GIP/GLP-1 receptor agonism producing complementary effects: GIP engagement adds to GLP-1's glucose-dependent insulin secretion and contributes to weight regulation through fat metabolism modulation; GLP-1 contributes the central satiety, gastric emptying, and glucagon suppression effects. The combination produces substantially greater weight loss than GLP-1 monotherapy: SURMOUNT trials showed 15 to 22 percent weight loss over 72 weeks at 5 to 15 mg weekly doses. Approved doses titrate to 5, 10, or 15 mg per week subcutaneous.

# 1. 1. Compound Identification

**Tirzepatide** is described as gip/glp-1 dual receptor agonist. A dual GIP and GLP-1 receptor agonist FDA-approved as Mounjaro (T2DM, 2022) and Zepbound (obesity, 2023), producing greater weight loss than GLP-1-only agents.

## 1.1. 1.1 Class summary

GIP/GLP-1 dual receptor agonist

## 1.2. 1.2 Subtitle

A dual GIP and GLP-1 receptor agonist FDA-approved as Mounjaro (T2DM, 2022) and Zepbound (obesity, 2023), producing greater weight loss than GLP-1-only agents.

## 2. 2. Abstract

Tirzepatide (Mounjaro, Zepbound; CAS 2023788-19-2; molecular weight 4813.54) is a dual GIP (glucose-dependent insulintropic polypeptide) and GLP-1 receptor co-agonist developed by Eli Lilly and approved by the FDA for type 2 diabetes (2022) and chronic weight management (2023). The compound is a 39-amino-acid synthetic peptide based on the GIP scaffold with modifications at positions enabling GLP-1 receptor agonism alongside GIP receptor activity. Mechanism is dual GIP/GLP-1 receptor agonism producing complementary effects: GIP engagement adds to GLP-1's glucose-dependent insulin secretion and contributes to weight regulation through fat metabolism modulation; GLP-1 contributes the central satiety, gastric emptying, and glucagon suppression effects. The combination produces substantially greater weight loss than GLP-1 monotherapy: SURMOUNT trials showed 15 to 22 percent weight loss over 72 weeks at 5 to 15 mg weekly doses. Approved doses titrate to 5, 10, or 15 mg per week subcutaneous.

### 3. Mechanism of Action

Dual GIP and GLP-1 receptor co-agonist; albumin-binding fatty acid extension for weekly dosing.

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. 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. 5. Reported Research Dose Ranges

2.5 to 15 mg weekly subcutaneous.

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. 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. 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. 9. References

1. Jastreboff AM, et al. Tirzepatide once weekly for the treatment of obesity (SURMOUNT-1). N Engl J Med 2022.
2. Frias JP, et al. Tirzepatide versus semaglutide once weekly in patients with type 2 diabetes (SURPASS-2). N Engl J Med 2021.

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