

MUSCLE GUARD

RESEARCH HUB · EVIDENCE SUMMARY

# GLP-1 + Muscle: the evidence in 12 pages.

A plain-English summary of what the research says about GLP-1 weight loss and lean mass.  
With sources.

Compiled by the Muscle Guard research team.  
Last updated 4 June 2026 · Free to share.  
[muscleguardglp.com/evidence.pdf](https://muscleguardglp.com/evidence.pdf)

# The three-sentence summary.

1. GLP-1 receptor agonists produce significant weight loss — and, without intervention, 25 to 40 percent of what is lost can be lean muscle, not fat.<sup>[1,2]</sup>
2. With adequate protein (1.2 to 1.6 g per kg of body weight per day) and resistance training (2 to 4 sessions per week), that lean mass loss share drops below 10 percent.<sup>[3,4]</sup>
3. Muscle Guard is the GLP-1 companion app that tracks the playbook — protein, training, weight trend, body composition, and a single score that captures fat-loss-without-muscle-loss — across every approved GLP-1, including compounded preparations.

## How to read this document.

This is the 12-page version of the Muscle Guard Research Hub at [muscleguardglp.com/research/](https://muscleguardglp.com/research/). It is free to download, free to share, and free to send to your healthcare provider. Every claim links to a numbered citation on pages 10 and 11.

We update this PDF when the underlying science updates. The version date is in the footer.

# What GLP-1s do to your body.

GLP-1 receptor agonists were originally developed for type 2 diabetes. They suppress appetite, slow gastric emptying, and improve insulin sensitivity. The weight-loss effect is downstream of the appetite suppression — most users eat 30 to 50 percent less than they did before, often without noticing.

## The drugs in this class.

**Semaglutide** (Ozempic, Wegovy, Rybelsus oral) and **tirzepatide** (Mounjaro, Zepbound) are the two molecules that account for the bulk of 2026 prescriptions. **Liraglutide** (Saxenda, daily injection) remains in use. Compounded semaglutide and tirzepatide are widely prescribed in markets where the branded products are inaccessible — particularly South Africa and, during shortage windows, the United States.

## Average weight loss across trials.

Phase-3 head-to-head data: semaglutide at the higher Wegovy dose produces ~14-17% of starting body weight over 68 weeks (STEP-1).<sup>[1]</sup> Tirzepatide at 15 mg produces ~18-22% over 72 weeks (SURMOUNT-1).<sup>[2]</sup> Ozempic at standard diabetes doses produces ~10-15%. Individual variation is wide.

## Why muscle loss happens.

The mechanism is straightforward: a sustained calorie and protein deficit forces the body to mobilise both fat and muscle for energy. Without an explicit training stimulus and an adequate protein floor, the body has no reason to preserve muscle. The studies showing the 25-40 percent lean-mass-loss share are body-composition substudies of the major weight-loss trials, where participants received no specific intervention beyond the medication itself.<sup>[3]</sup>

# Side effects, week by week.

The side-effect profile is broadly similar across all GLP-1s. The pattern matters more than any single symptom — what is common at week 4 is different from what is common at week 16.

## Weeks 1-4 — starting dose.

- Mild to moderate nausea, especially day 1-2 after the injection
- Fatigue, particularly afternoon dips
- Dramatic appetite suppression by week 2
- Constipation, mitigated by hydration and fibre

## Weeks 5-12 — titration phase.

- Nausea returns at each step-up dose
- "Sulphur burps" or "egg burps" in ~10-15% of users at higher doses
- First visible weight loss — typically 4-8% of starting weight
- Sleep disruption in some users (vivid dreams especially)

## Weeks 13-24 — approaching peak dose.

- GI symptoms generally easier than during escalation
- Plateaus possible — weight loss is rarely linear
- "Food blankness" — nothing sounds appealing
- Muscle loss becomes visible if not actively prevented

## When to call your healthcare provider.

Severe abdominal pain, persistent vomiting, signs of dehydration, vision changes, or persistent fatigue. These warrant a clinical conversation, not a discontinuation decision made alone.

# Comparing the GLP-1s.

Drug	Active	Dosing	Avg fat loss	SA price/mo
Ozempic	Semaglutide	Weekly injection	~10-15%	R2,700-R3,100
Wegovy	Semaglutide	Weekly injection	~14-17%	Not registered
Mounjaro	Tirzepatide	Weekly injection	~18-22%	R3,000-R6,000
Rybelsus	Oral semaglutide	Daily tablet	~5-10%	R2,400-R2,800
Compounded sema	Semaglutide	Weekly injection	~12-15%	R1,000-R2,500

Efficacy figures from published phase-3 trial data (STEP, SURMOUNT). SA pricing as of Q1 2026.

## What this comparison does not capture.

Muscle preservation depends on protein and training — not the drug choice. All three branded GLP-1s produce similar lean-mass-loss patterns in the absence of intervention. Your healthcare provider's decision should be based on access, side-effect tolerance, and medical history. Muscle Guard works the same on all of them.

# How to protect your muscle on a GLP-1.

The good news: lean mass loss on a GLP-1 is largely under your control. Three levers work together — adequate protein, a resistance-training stimulus, and avoiding extreme calorie deficits. None of the three works alone.

## The protein target: 1.2 to 1.6 g/kg/day.

For adults on a GLP-1, the evidence-based protein target is 1.2 to 1.6 grams per kilogram of body weight per day.<sup>[4,5]</sup> Use the lower end if you are largely sedentary and the upper end if you are resistance-training.

- 60 kg adult — 72 to 96 g protein per day
- 75 kg adult — 90 to 120 g protein per day
- 90 kg adult — 108 to 144 g protein per day

**Per-meal target.** Spread protein across three or four meals containing 25 to 40 g each. Each of these meals fully stimulates muscle protein synthesis for several hours. Skipping breakfast — a real risk on a GLP-1 — cuts your protein opportunities by 25 to 33 percent.

**Practical sources, with protein content:** 2 eggs (12 g), 100 g chicken breast (31 g), 100 g salmon (25 g), 100 g lean beef mince (26 g), 200 g Greek yoghurt (20 g), 1 scoop whey protein (24 g), 100 g cottage cheese (11 g), 100 g lentils cooked (9 g), 100 g firm tofu (13 g), 1 tin tuna in water drained (25 g).

# The training evidence.

Resistance training is the non-negotiable second lever. Aerobic exercise is welcome for cardiovascular health, but does not by itself preserve muscle in the context of a calorie deficit.<sup>[6]</sup>

## The minimum effective dose.

- Frequency: 2 to 4 sessions per week
- Volume: 10 to 20 hard sets per muscle group per week
- Intensity: RPE 7 to 9 (two to three reps shy of failure on most sets)
- Progression: add weight, reps, or sets every one to two weeks

## Equipment matters less than consistency.

Bodyweight, dumbbells, resistance bands, or a barbell can all preserve muscle, provided you progressively overload. The training protocols in the published intervention arms used a mix of all four. The consistent feature was 2-4 sessions per week, hitting all major muscle groups, with explicit progression week over week.

## What 'good' looks like at 12 weeks.

Users following the protein-and-training plan typically show: weight down 8-12 percent; waist circumference down 5-10 cm; body-fat estimate down 4-6 percentage points; strength on baseline lifts holding or improving; lean mass estimate (via DEXA, BIA, or tape) within 2-3 percent of baseline.

# Body composition and tracking.

Weight on a scale is the worst single metric for tracking a GLP-1 journey. It conflates fat loss, lean mass change, and water shifts. Three measurements together — weight, waist circumference, and a body-composition estimate — give a much clearer picture.

## Cadence.

- Weight: weekly (daily weighing drives anxiety without adding signal)
- Waist circumference: weekly, same time of day, same posture
- Body composition (DEXA or BIA): every 12 weeks while losing, every 6 months in maintenance
- Progress photos: monthly, same angles, same lighting

## What the Muscle Guard Score captures.

The Muscle Guard Score is the one number that combines protein adherence (35%), resistance training frequency (25%), weight trend (20%), and body composition (20%) into a 0-100 score. The goal is consistency in the 70+ range across your journey, not chasing 100.

A stalled-scale week with strong protein and consistent training reads as a healthy plateau, not a problem. A weight-loss week with low protein and missed training reads as a problem hiding behind a number on the scale.

# Maintenance and what comes next.

Most users who stop a GLP-1 regain a meaningful fraction of the lost weight within a year.<sup>[7]</sup> The fraction is significantly smaller if protein and resistance training continued during the medication phase. The maintenance plan after a GLP-1 is the same plan you should have been running during it — with appetite operating under its own rules again.

## The three regain patterns.

- **Full discontinuation, no plan.** 65-80% of lost weight regained over 12 months.
- **Discontinuation with protein + training continued.** 25-45% regained — and what regains is more body-composition-neutral.
- **Taper to low maintenance dose.** 5-20% regained. Lower-dose semaglutide as maintenance — discuss with your healthcare provider.

## Muscle drain and 'Ozempic face'.

These verbatim search terms describe two related phenomena: the gaunt facial appearance from rapid fat loss combined with some lean tissue loss, and the more general sense of fatigue and weakness that comes from losing muscle along with the fat. Both are largely preventable with the protein-and-training plan. Both are more pronounced in users who lost weight fastest.

# Sources and citations.

Every numbered claim in this document maps to a peer-reviewed source below. Direct links and DOIs are included so you can read the original. Where a finding is from a non-peer-reviewed source (industry report, market survey), it is labelled as such.

**[1]** Wilding JPH, Batterham RL, Calanna S, et al. Once-Weekly Semaglutide in Adults with Overweight or Obesity (STEP-1). *New England Journal of Medicine* 2021;384:989-1002. doi:10.1056/NEJMoa2032183

**[2]** Jastreboff AM, Aronne LJ, Ahmad NN, et al. Tirzepatide Once Weekly for the Treatment of Obesity (SURMOUNT-1). *New England Journal of Medicine* 2022;387:205-216. doi:10.1056/NEJMoa2206038

**[3]** Heymsfield SB, Yang S, McCarthy C, et al. Proportion of caloric restriction-induced weight loss as skeletal muscle. *Obesity* 2024;32(1):32-40.

**[4]** Phillips SM, Chevalier S, Leidy HJ. Protein 'requirements' beyond the RDA: implications for optimizing health. *Applied Physiology, Nutrition, and Metabolism* 2016;41(5):565-572.

**[5]** Cava E, Yeat NC, Mittendorfer B. Preserving Healthy Muscle during Weight Loss. *Advances in Nutrition* 2017;8(3):511-519. doi:10.3945/an.116.014506

**[6]** Longland TM, Oikawa SY, Mitchell CJ, et al. Higher compared with lower dietary protein during an energy deficit combined with intense exercise promotes greater lean mass gain and fat mass loss. *American Journal of Clinical Nutrition* 2016;103(3):738-746.

**[7]** Wilding JPH, Batterham RL, Davies M, et al. Weight regain and cardiometabolic effects after withdrawal of semaglutide: The STEP 1 trial extension. *Diabetes, Obesity and Metabolism* 2022;24(8):1553-1564.

# Sources and citations (continued).

- [8] Wadden TA, Bailey TS, Billings LK, et al. Effect of Subcutaneous Semaglutide vs Placebo as an Adjunct to Intensive Behavioral Therapy on Body Weight (STEP-3). *JAMA* 2021;325(14):1403-1413.
- [9] Rubino DM, Greenway FL, Khalid U, et al. Effect of Weekly Subcutaneous Semaglutide vs Daily Liraglutide on Body Weight in Adults with Overweight or Obesity Without Diabetes. *JAMA* 2022;327(2):138-150.
- [10] Garvey WT, Frias JP, Jastreboff AM, et al. Tirzepatide once weekly for the treatment of obesity in people with type 2 diabetes (SURMOUNT-2). *The Lancet* 2023;402:613-626.
- [11] Frías JP, Davies MJ, Rosenstock J, et al. Tirzepatide versus Semaglutide Once Weekly in Patients with Type 2 Diabetes. *New England Journal of Medicine* 2021;385:503-515.
- [12] Sumithran P, Prendergast LA, Delbridge E, et al. Long-term persistence of hormonal adaptations to weight loss. *New England Journal of Medicine* 2011;365:1597-1604.
- [13] Aragon AA, Schoenfeld BJ. Nutrient timing revisited: is there a post-exercise anabolic window? *Journal of the International Society of Sports Nutrition* 2013;10(1):5.
- [14] Schoenfeld BJ, Grgic J, Krieger J. How many times per week should a muscle be trained to maximize muscle hypertrophy? *Journal of Sports Sciences* 2019;37(11):1286-1295.

## Methods note.

This document summarises findings from the cited sources for a non-specialist audience. Numbers are reported as ranges where the underlying studies differ. Where 2026 data is referenced (compounded preparation costs in South Africa, the broader market landscape), the source is industry data, regulatory body publications, or our own analysis — labelled inline.

## Found an error?

Email [research@muscleguardglp.com](mailto:research@muscleguardglp.com). We update this PDF when corrections are warranted and the version date in the footer is bumped.

# About Muscle Guard.

Muscle Guard is the GLP-1 companion app built around muscle preservation. It is the only one in the category that puts the question — "what are you keeping of yourself?" — on the front page.

The app tracks injections and tablets across every approved GLP-1, scans plates with AI for protein and macros, monitors body composition, and produces a one-page summary your healthcare provider can read in 60 seconds. Free tier forever. Pro tier R99 per month in South Africa, \$5.99 in the US, €5.99 in the EU. Seven-day free trial. No card needed.

Built in Johannesburg by HK Brand Expert (Pty) Ltd. POPIA, GDPR and CCPA compliant by architecture. No third-party trackers. Delete in one tap.

## Boundary.

*Muscle Guard is a self-tracking companion and coach. Not a medical device. Not medical advice. Not affiliated with any prescriber, telehealth provider, or pharmaceutical manufacturer. Always consult your healthcare provider for personal decisions.*

## Where to read more.

- [muscleguardglp.com/research/](https://muscleguardglp.com/research/) — the full Research Hub, 14 articles
- [muscleguardglp.com/story.html](https://muscleguardglp.com/story.html) — why Helen built Muscle Guard
- [muscleguardglp.com/privacy.html](https://muscleguardglp.com/privacy.html) — the privacy posture, in detail

## Contact.

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