



Optimizing Nutrition and Protein Metabolism with GLP-1 Medications

Hawley Evilsizer, MS, RDN, LD

Disclosures

- Texas Academy of Nutrition and Dietetics
- Texas Public Health Coalition
- Partnership for a Healthy Texas Steering Committee
- Texas Obesity Action Coalition
- Speakers Bureau for Texas Beef Council and National Cattlemen's Beef Association - a Contractor to the Beef Checkoff



LEARNING OBJECTIVES

- Review history of GLP-1 medications
- Translate GLP-1 mechanisms into nutrition counseling strategies
- Design lean tissue preservation protocols
- Build maintenance strategies during pharmacotherapy



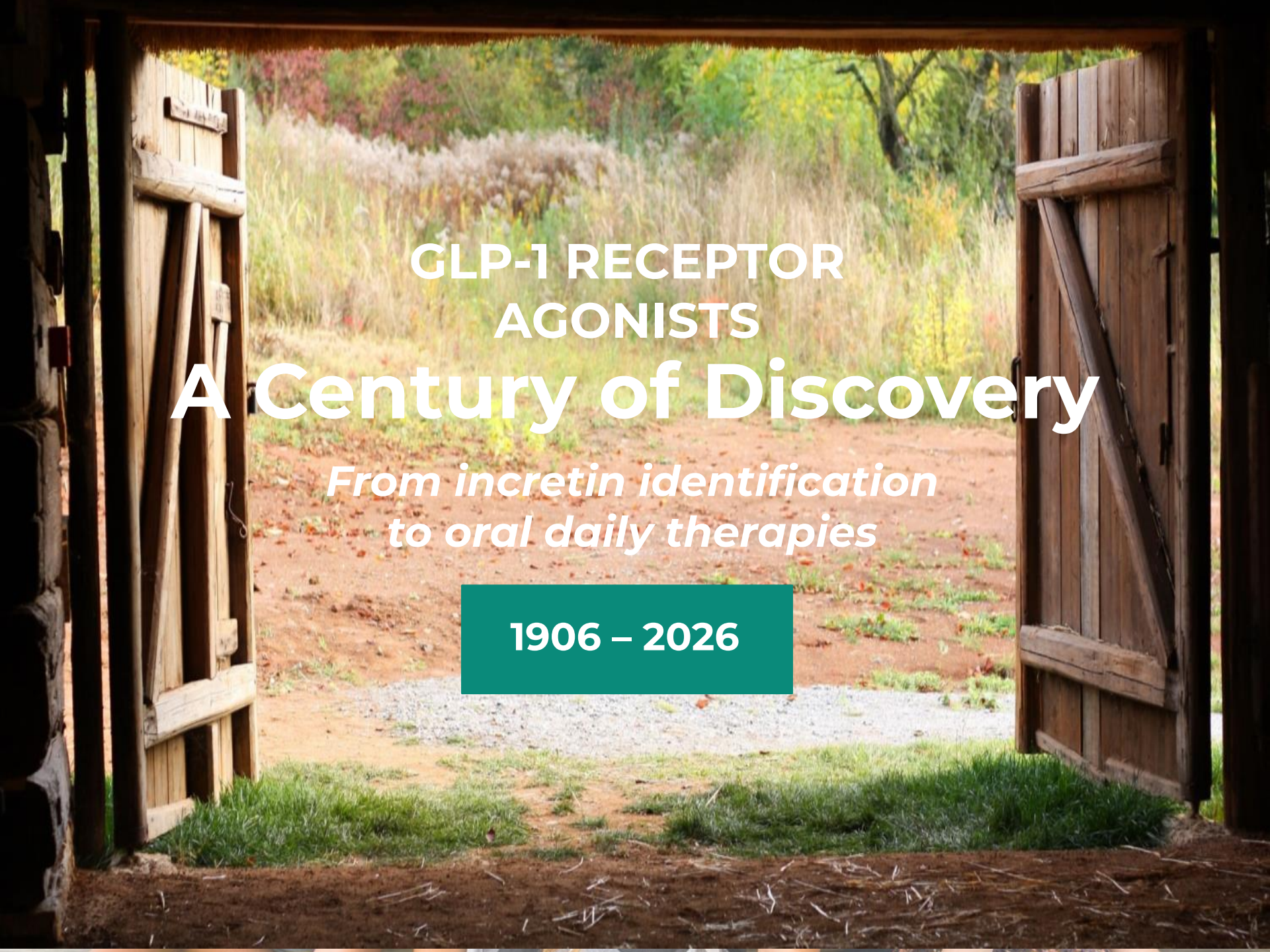
OBESITY PREVALENCE - 1 IN 4 ADULTS

In 2024:

- all U.S. states and territories had an obesity prevalence of 25% or higher (at least 1 in 4 adults)
- OK 36.8%

**WE ARE MOVING IN THE
WRONG DIRECTION!**

Source: https://www.cdc.gov/obesity/data-and-statistics/adult-obesity-prevalence-maps.html#cdc_data_surveillance_section_15-map-overall-obesity

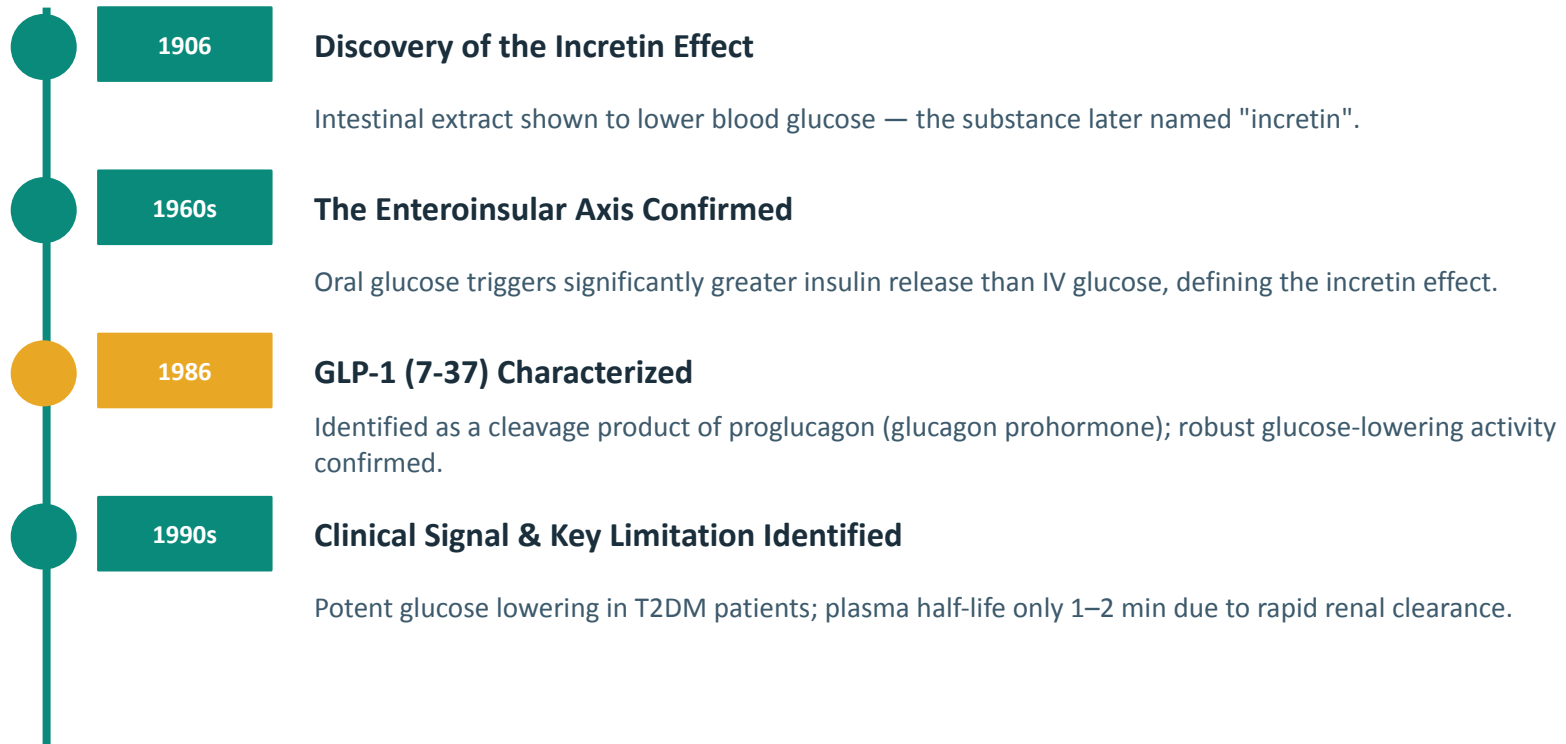


GLP-1 RECEPTOR AGONISTS A Century of Discovery

*From incretin identification
to oral daily therapies*

1906 – 2026

Foundational Science | 1906 – Early 1990s



GLP-1 Receptor Agonists: Historical Development

From Molecule to Medicine | 1990s – 2026



GLP-1 Receptor Agonists: Historical Development

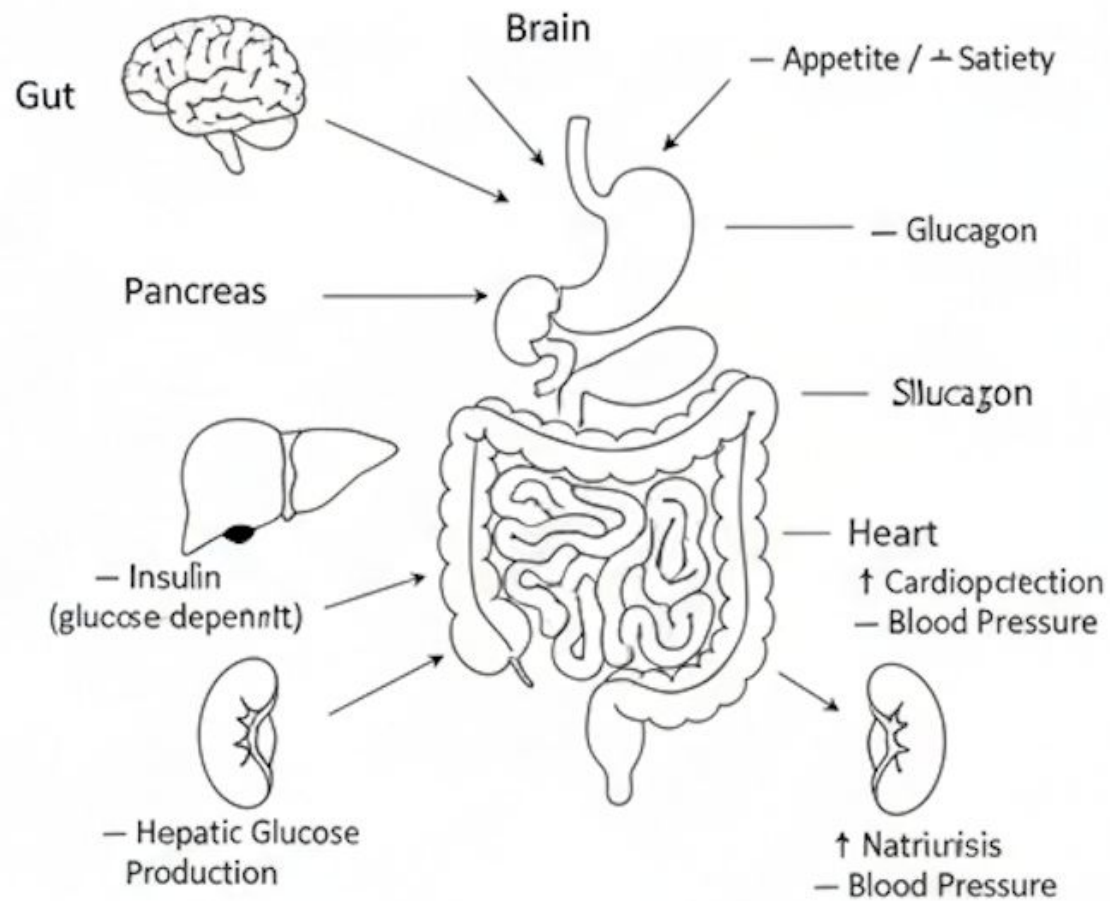
Why RDs Are Essential in the GLP-1 Era

- Appetite suppression $\neq$ nutrition adequacy
- Lean mass is vulnerable during weight loss
- Micronutrient risk increases under reduced intake
- Withdrawal is associated with regain risk

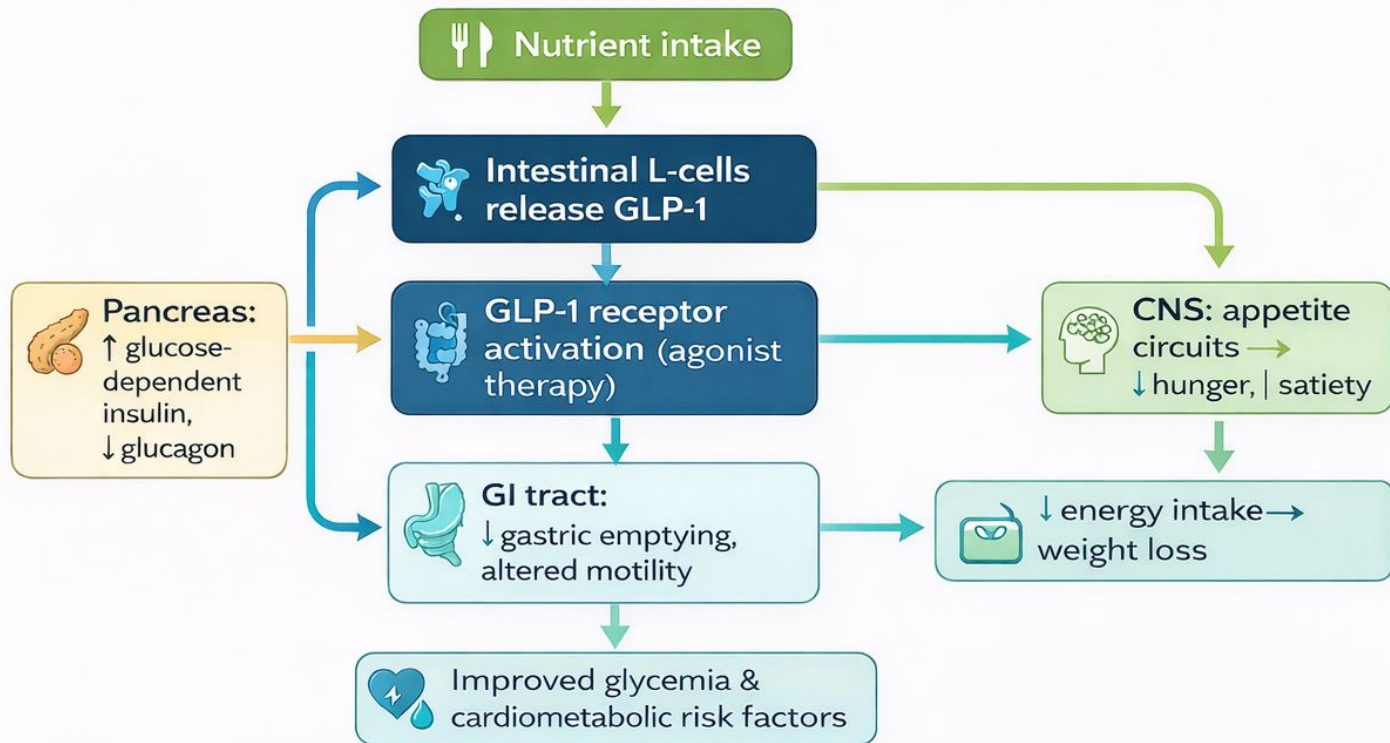
Source: STEP 1 Extension; SURMOUNT-4; Mozaffarian 2025



INTEGRATED PHYSIOLOGICAL ACTIONS OF GLP-1



Simplified Flow of Receptor Activation → Clinical Effects



Mechanistic grounding for the pancreas and GI/CNS effects is supported by physiologic reviews and GLP-1RA clinical safety/efficacy observations.

References: Knudsen LB, Lau J. Responsive and biased signaling of the GLP-1 receptor- therapeutic implications. *Biochem Pharmacol.* 2019;161:113761.

- Improves postprandial glucose control
- Intake may drop before medication adjustments occur
- Hypoglycemia risk when combined with insulin or sulfonylureas

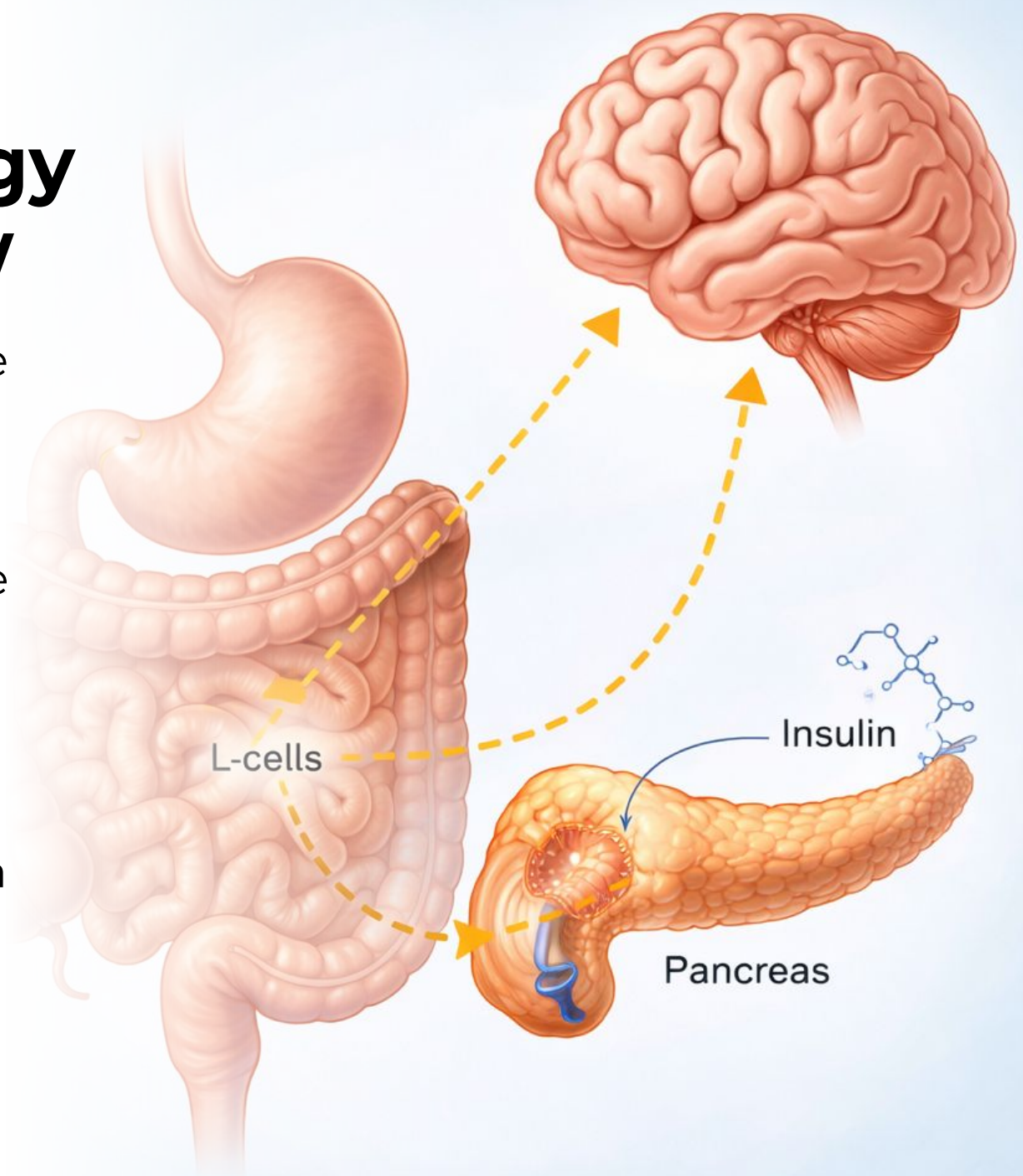
Glycemic Implications of GLP-1s

Source: ADA Standards of Care 2026

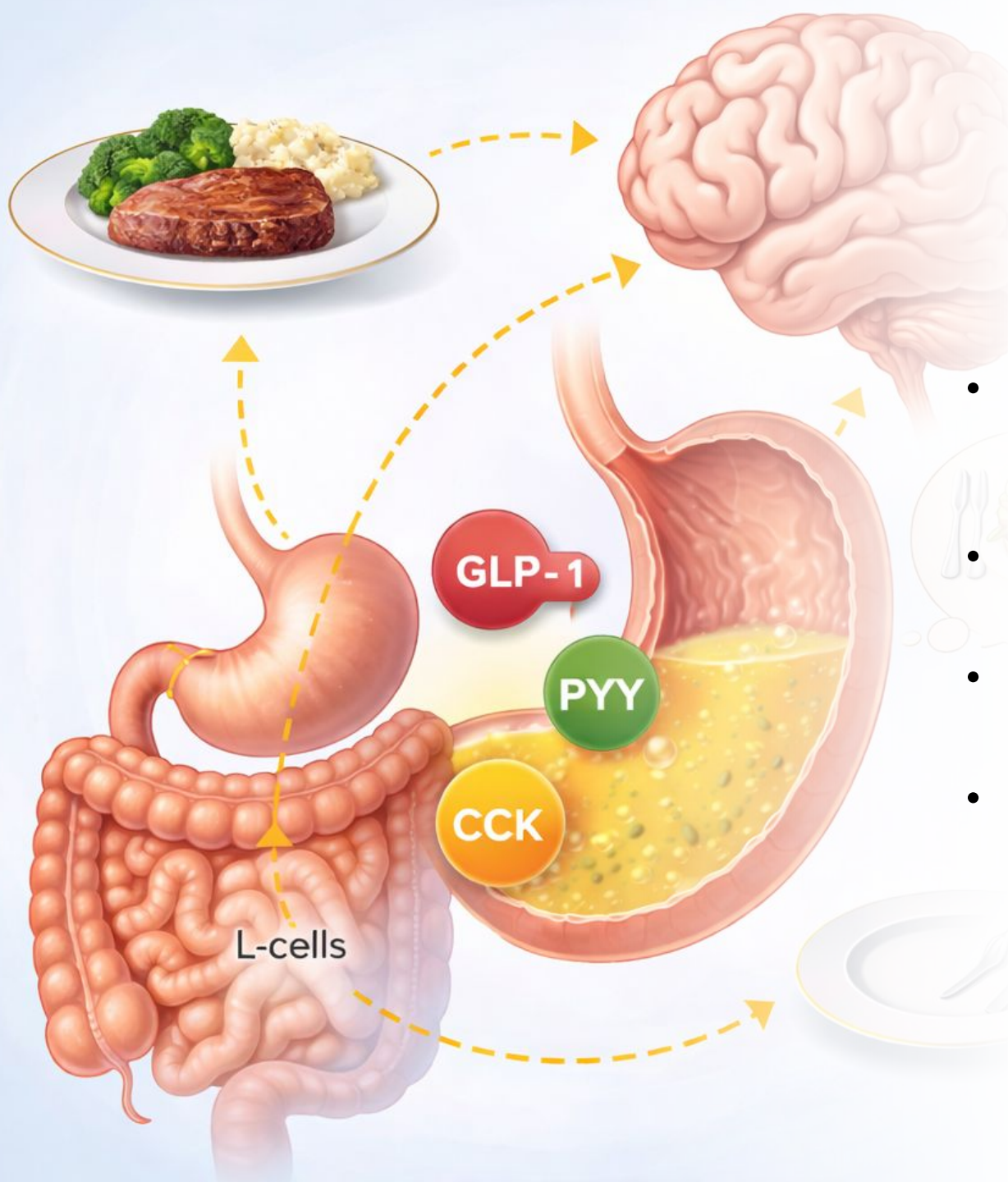


GLP-1 Physiology Overview

- Incretin hormone from intestinal L-cells
- Enhances glucose-dependent insulin secretion
- Suppresses glucagon
- Signals satiety via CNS pathways



Hormonal Appetite Control



- Earlier fullness and reduced food preoccupation
- Lower overall energy intake
- Risk of unintentional protein inadequacy
- Structured eating recommended early in therapy

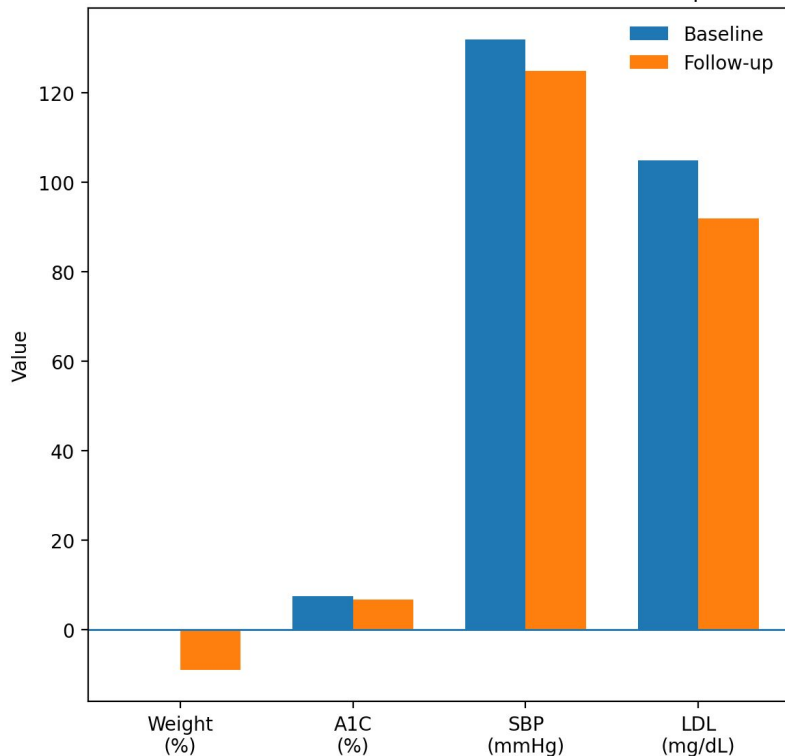
Delayed Gastric Emptying & GI Symptoms

- Slower gastric transit contributes to satiety
- Mechanism for nausea and early fullness
- Higher fat loads often worsen symptoms
- Solution: smaller meals, lower fat, slower pacing, hydration timing



Cardiovascular Outcomes – SELECT Trial

Cardiometabolic Metrics: Baseline vs Follow-up

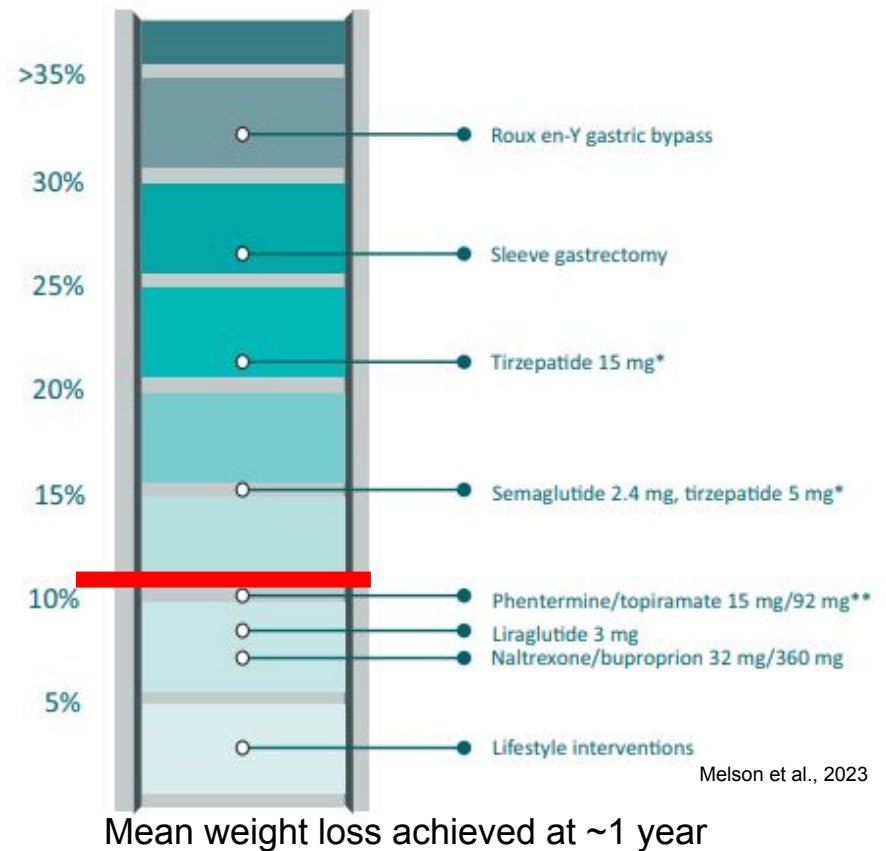


- **20% relative risk reduction in MACE**
- Studied in adults with overweight/obesity + established CVD
- Reinforces cardiometabolic framing of GLP-1 therapy

Source: SELECT Trial, NEJM 2023

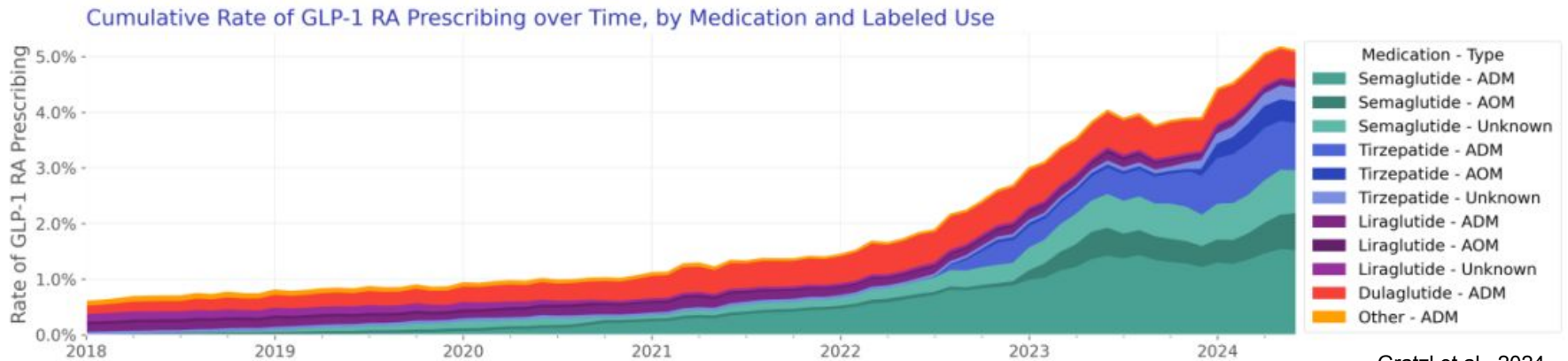
Intervention Outcomes

- Lifestyle interventions as first line treatment (5-10% weight loss)
- Weight loss >10% is significant!
- Impact on increasing number of organ systems/co-occurring chronic diseases
- Closing the treatment gap between Lifestyle Interventions and surgical treatment



Rising use of Incretin-based Therapies

- 1.16 million patients were prescribed GLP-1 RA's (4.8 million Rx)
- 87% for diabetes
- 13% for obesity



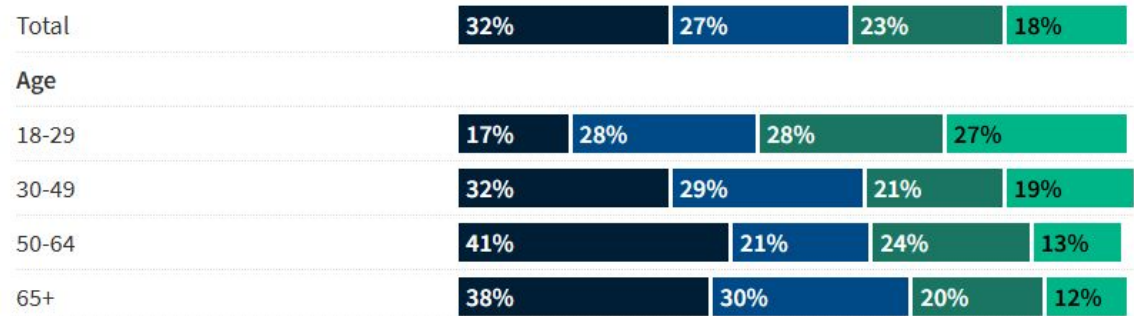
Understanding The Public Perception

- 12% of adults have taken
- 6% currently taking a GLP-1
- 62% DM2 or heart disease
- 48% weight loss

Larger Shares of Older Adults and Those With Chronic Conditions Have Heard “A Lot” About GLP-1 Drugs

How much have you heard, if anything, about a class of drugs being used for weight loss, such as Ozempic, Wegovy, and Mounjaro?

■ A lot ■ Some ■ A little ■ Nothing at all



NON-WEIGHT LOSS BENEFITS OF GLP-1S

- Reduced risk of major adverse cardiovascular events
- Improved blood sugar control
- Slowed progression of chronic kidney disease
- Potential reduction in fatty liver disease
- Reduced joint pain
- Reduction in sleep apnea symptoms
- Lowered risk of Alzheimer's disease
- Improved cognitive function

Gorgojo-Martínez, Mezquita-Raya, et al. (2023)



- 
- Substance use disorders
 - Psychosis
 - Cancer
 - Weight Maintenance

Future of GLP-1s?

Common (Affecting 5-15% of patients)

- Nausea, Vomiting, Diarrhea, Constipation
- <10% discontinue treatment due to GI issues

Less Common (Affecting 1-3%)

- Hypoglycemia
- Gallstones
- Injection-site reactions

Rare (Incidence < 1%)

- Pancreatitis (similar to placebo)
- Retinal events

Rodriguez, Goodwin Cartwright, et al. (2024); Smits, Van Raalte (2021)

Safety and Side Effects of GLP-1s





GLP-1 Medication Release Timeline

1. **Exenatide**
2. **Dulaglutide**
3. **Liraglutide**
4. **Semaglutide**
5. **Orforglipron**



AVAILABLE GLP-1 DRUGS ON THE MARKET

Exenatide

2005: First GLP-1 Drug Approved

- **Brand Name:** Byetta
- **Manufacturer (currently):**
AstraZeneca
- Approved for T2DM
- Twice-daily injection



AVAILABLE GLP-1 DRUGS ON THE MARKET

Dulaglutide

2014: Approved for T2DM

- **Brand Name:** Trulicity (injected)
- **Manufacturer:** Eli Lilly and Company
- **Suggested Dose:**
 - Start 0.75mg/1x/week;
 - can increase to 1.5, 3, 4.5 mg (max)
- **Mechanism of Action:**
 - Long-acting GLP-1 receptor agonist

Fala L. Trulicity (Dulaglutide): A New GLP-1 Receptor Agonist Once-Weekly Subcutaneous Injection Approved for the Treatment of Patients with Type 2 Diabetes. *American health & drug benefits*. 2015;8(Spec Feature):131-134.



AVAILABLE GLP-1 DRUGS ON THE MARKET

Liraglutide

2010: Approved for T2DM

2014: Approved for Weight Management

- **Brand Names:**
 - **Victoza** (T2DM)
 - **Saxenda** (weight management)
 - **Generic liraglutide**
- **Manufacturer:** Novo Nordisks
- **Suggested Dosage:**
 - Glycemic control & weight loss- start with 0.6 mg/day, then can increase to 1.2 mg/day or 1.8 mg/day
- **Mechanism of Action:** Long-acting GLP-1 Agonist



AVAILABLE GLP-1 DRUGS ON THE MARKET

Semaglutide

2017: Ozempic approved (first weekly dosing); 2019: **Rybelsus** approved (first oral GLP-1); 2021: **Wegovy** approved for weight mgmt

Brand Names:

- **Ozempic**: Injection (x1/week)
- **Wegovy**: Injection or Pill (x1/week)
- **Rybelsus**: Tablet

Manufacturer: Novo Nordisk

Mechanism of Action: GLP-1 agonist

- **Patent Ending Date:** [December 5, 2031](#); Wegovy has secondary patents (covering specific weight-management dosages and devices)



AVAILABLE GLP-1 DRUGS ON THE MARKET

Tirzepatide

Brand Name:

- **Mounjaro** (T2DM)
- **Zepbound** (Weight Management)

Manufacturer: Eli Lilly and Company

Mechanism of Action: Dual GLP-1 & GIP receptor agonist

- GIP receptor agonist component increases glucagon secretion in a hypoglycemic state

Suggested Dose:

- Mounjaro: typically started at 2.5mg/1x/week (for 4 weeks), then increased to 5mg/1x/week
 - ❑ Maximum dose is 15 mg/1x/week
- Zepbound: typically started at 2.5mg/1x/week (for 4 weeks), then increased to 5mg/1x/week
 - ❑ Typical maintenance dose 10-15mg weekly

- **Patent Ending Date: 2036-2037**



AVAILABLE GLP-1 DRUGS ON THE MARKET

Orforglipron

Brand Name:

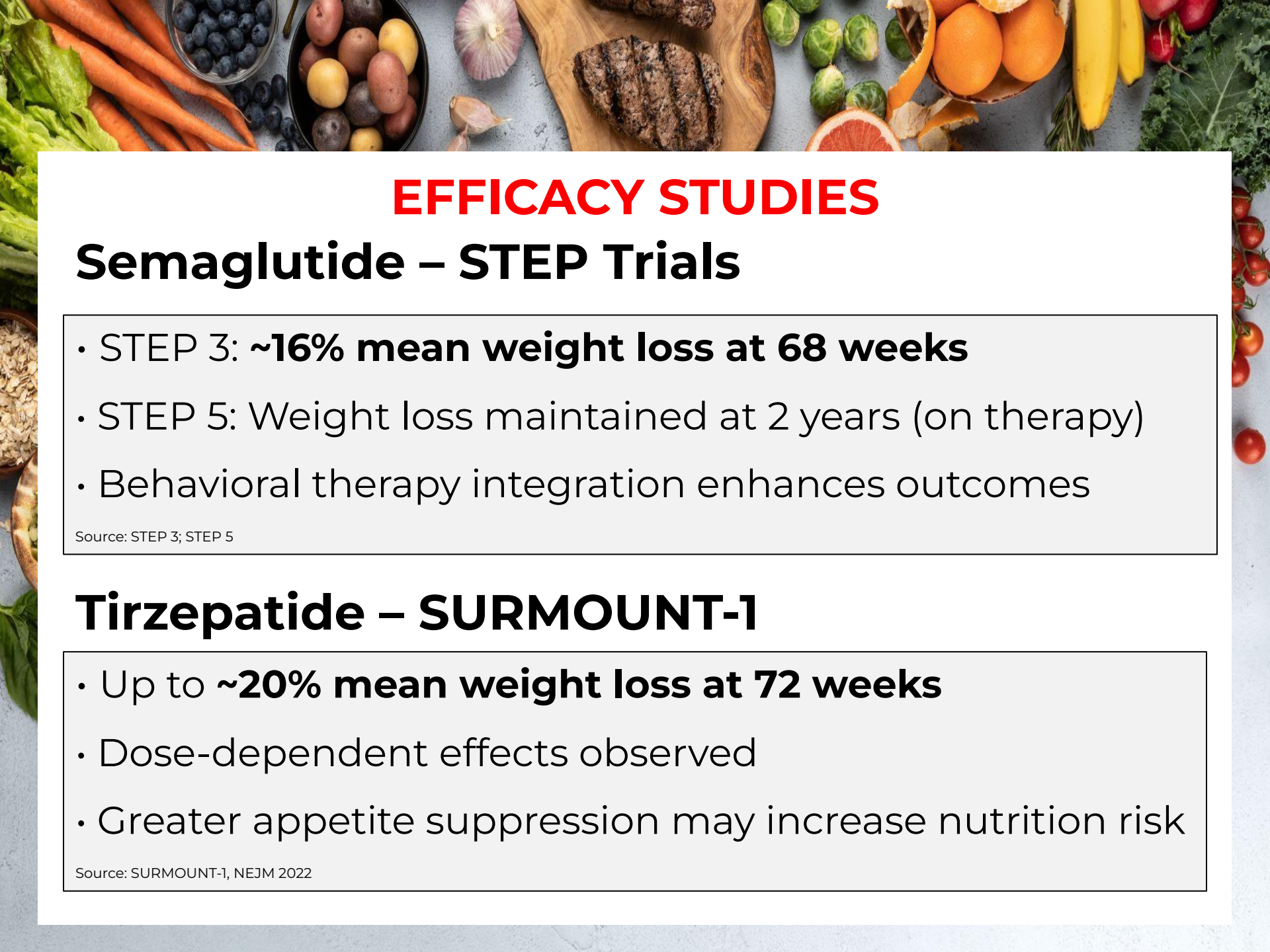
- **Foundayo** (Weight Management and T2DM)

Manufacturer: Eli Lilly and Company

Mechanism of Action: GLP-1 agonist (non peptide)

Suggested Dose:

- Once daily
- Titrate to dose at 30 day intervals
 - ❑ Starting dose 0.8mg
 - ❑ Increase to 2.5mg, then 5.5mg, to 9mg to 14.5mg
 - ❑ Maximum dose 17.2mg daily



EFFICACY STUDIES

Semaglutide – STEP Trials

- STEP 3: **~16% mean weight loss at 68 weeks**
- STEP 5: Weight loss maintained at 2 years (on therapy)
- Behavioral therapy integration enhances outcomes

Source: STEP 3; STEP 5

Tirzepatide – SURMOUNT-1

- Up to **~20% mean weight loss at 72 weeks**
- Dose-dependent effects observed
- Greater appetite suppression may increase nutrition risk

Source: SURMOUNT-1, NEJM 2022



RESEARCH



COMPARISON OF EFFICACY

Tirzepatide versus Semaglutide Once Weekly in Patients with Type 2 DM

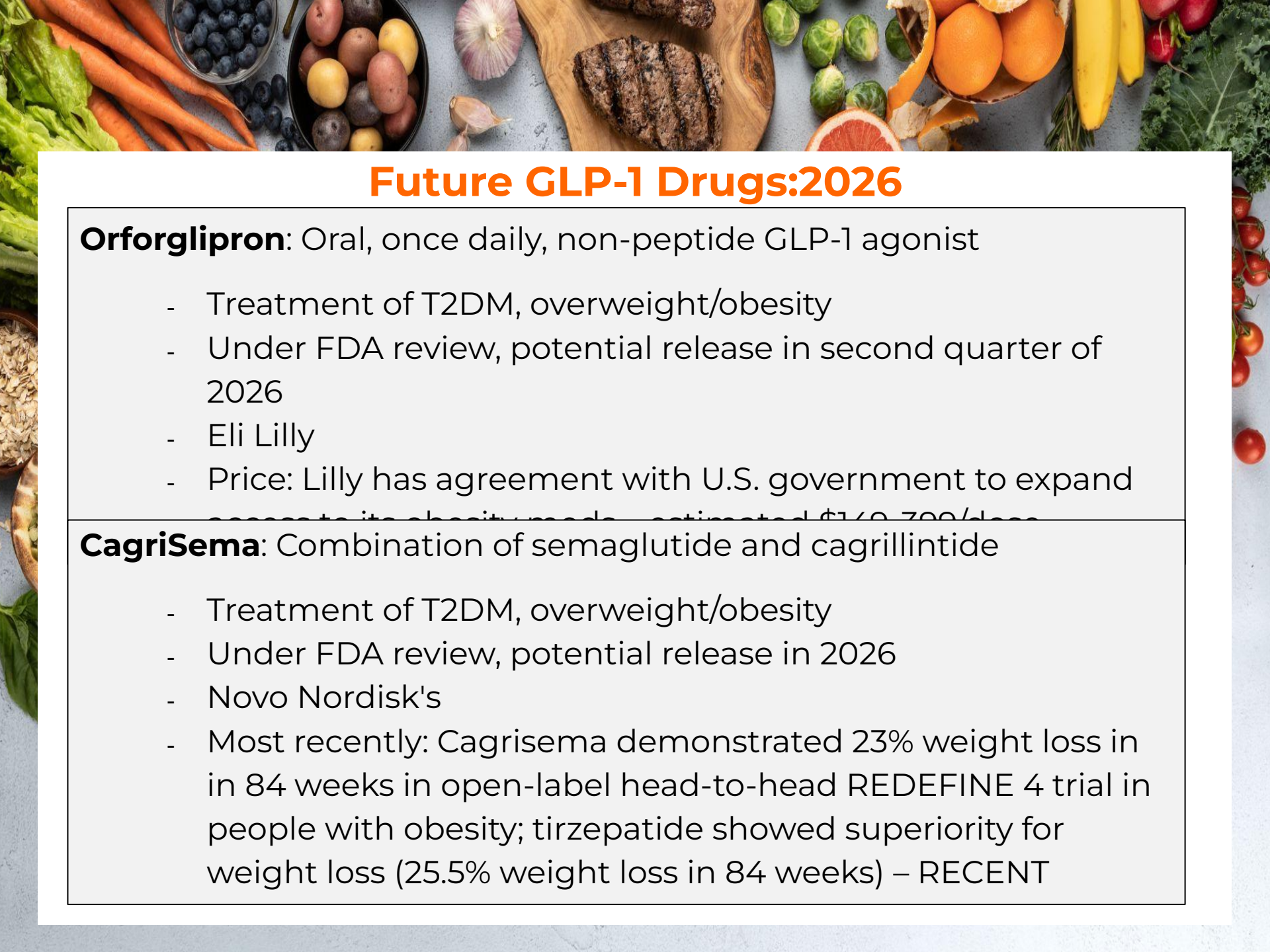
- Tirzepatide improved HbA1c levels in T2D patients to a greater extent than semaglutide
- Reductions in body weight were greater with all tirzepatide doses than with semaglutide

Frías JP, Davies MJ, Rosenstock J, et al. *The New England journal of medicine*. 2021;385(6):503-515. doi:10.1056/NEJMoa210751

Semaglutide vs Tirzepatide for Weight Loss in Adults with Overweight or Obesity (2024)

- Tirzepatide was associated with significantly greater weight loss

Rodriguez PJ, Goodwin Cartwright BM, Gratzl S, et al. Semaglutide vs Tirzepatide for Weight Loss in Adults With Overweight or Obesity. *JAMA Intern Med*. 2024;184(9):1056-1064. doi:10.1001/jamainternmed.2024.2525



Future GLP-1 Drugs:2026

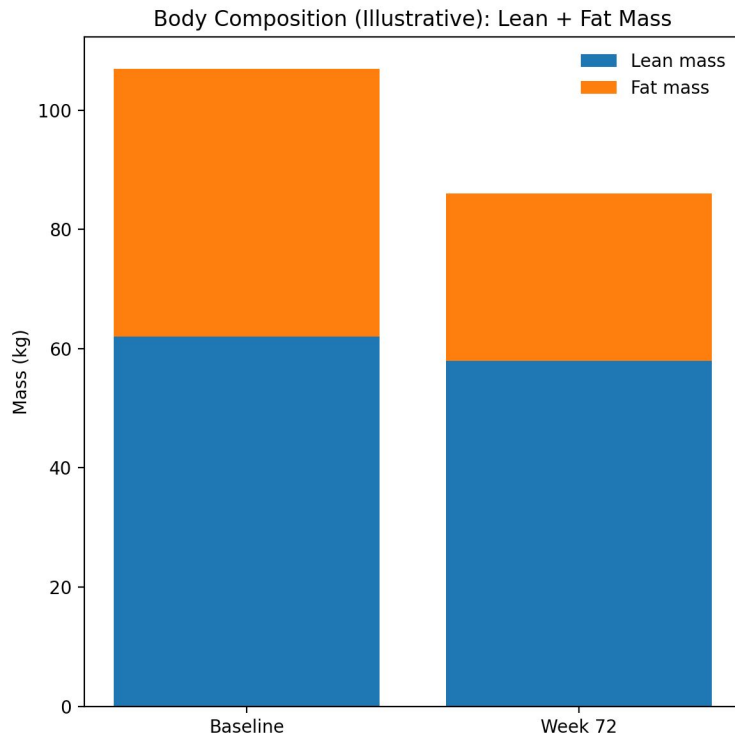
Orforglipron: Oral, once daily, non-peptide GLP-1 agonist

- Treatment of T2DM, overweight/obesity
- Under FDA review, potential release in second quarter of 2026
- Eli Lilly
- Price: Lilly has agreement with U.S. government to expand access to its obesity drugs, estimated \$140-200/dose

CagriSema: Combination of semaglutide and cagrilintide

- Treatment of T2DM, overweight/obesity
- Under FDA review, potential release in 2026
- Novo Nordisk's
- Most recently: Cagrisema demonstrated 23% weight loss in 84 weeks in open-label head-to-head REDEFINE 4 trial in people with obesity; tirzepatide showed superiority for weight loss (25.5% weight loss in 84 weeks) – RECENT

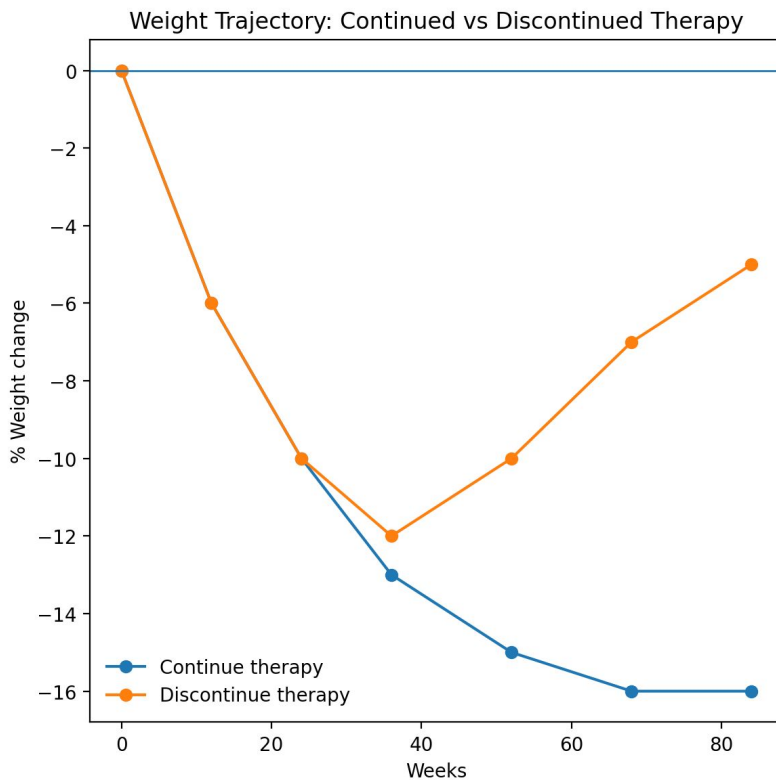
Body Composition Findings



- DEXA: fat mass ↓ and lean mass ↓ during weight reduction
- Fat-free mass $\neq$ skeletal muscle
- Functional measures are critical for interpretation
- 20–40% of weight lost may be lean mass
- Older adults at greater risk

Source: SURMOUNT-1 DEXA Analysis

Withdrawal & Regain



- Discontinuation is associated with weight regain
- Continued therapy supports maintenance (trial data)
- Build maintenance skills during active treatment

Source: STEP Extension; SURMOUNT-4

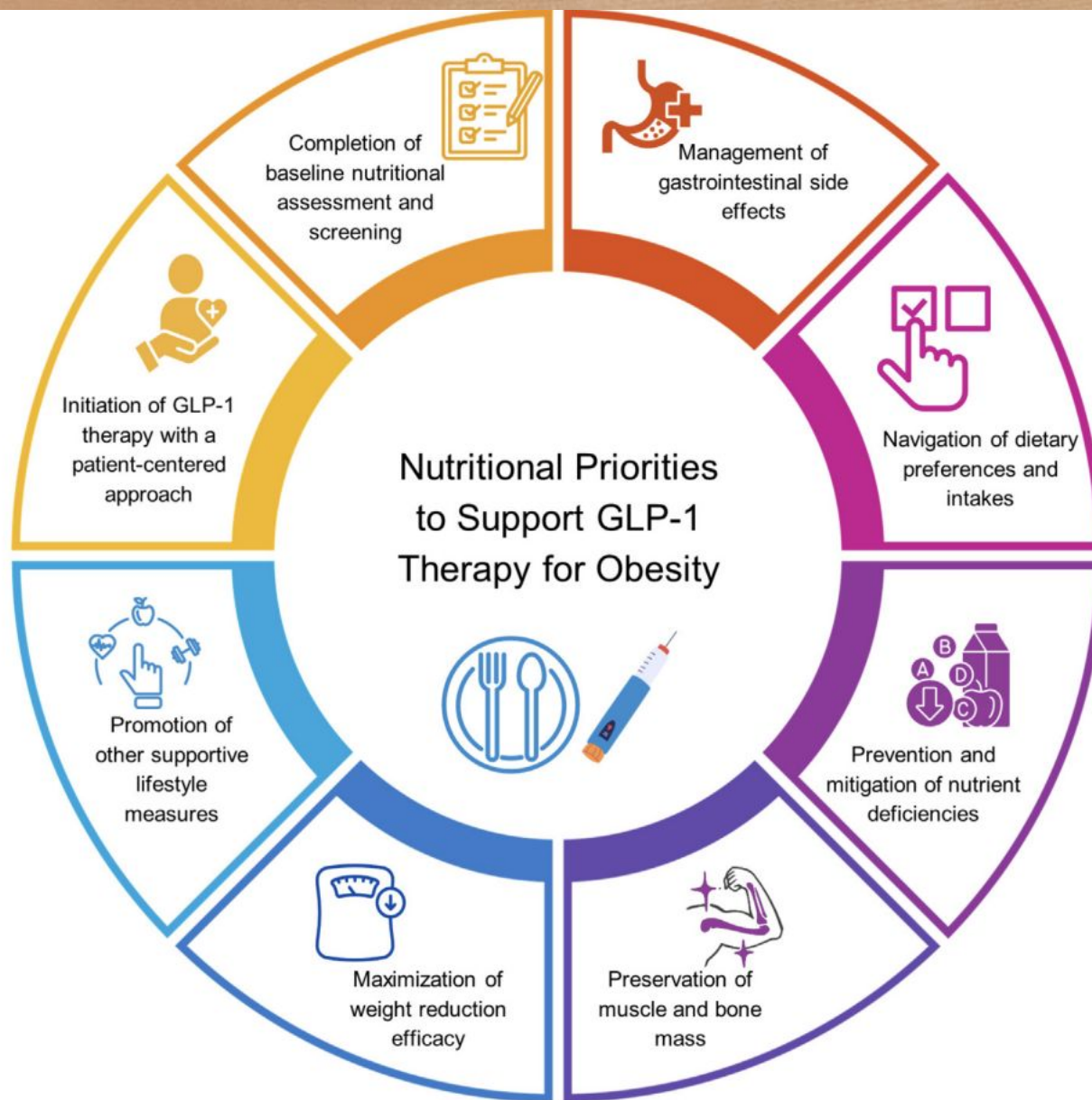


FIGURE 1. Key elements of nutritional priorities to support GLP-1 therapy for obesity.



NUTRITION SHIFT RISKS

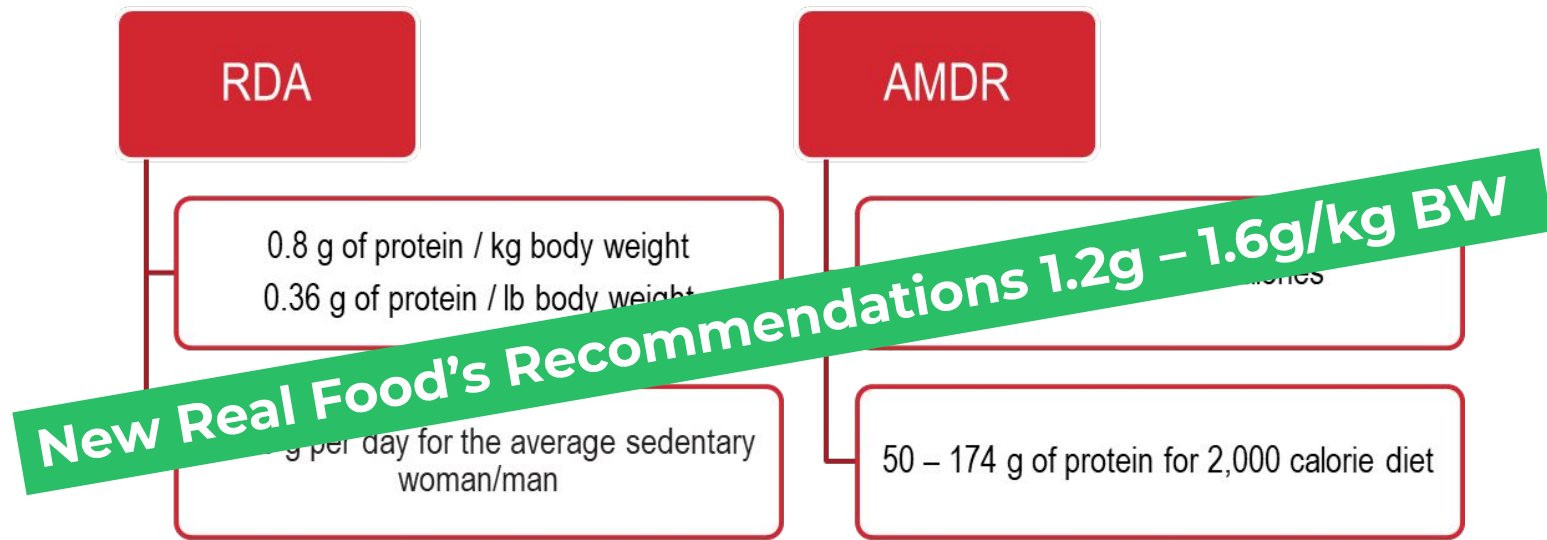
- Lower intake increases need for nutrient density
- Protein and fiber often decline first
- Micronutrient risk increases with reduced variety
- Fluids with symptoms



Got an RD?

GENERAL POPULATION

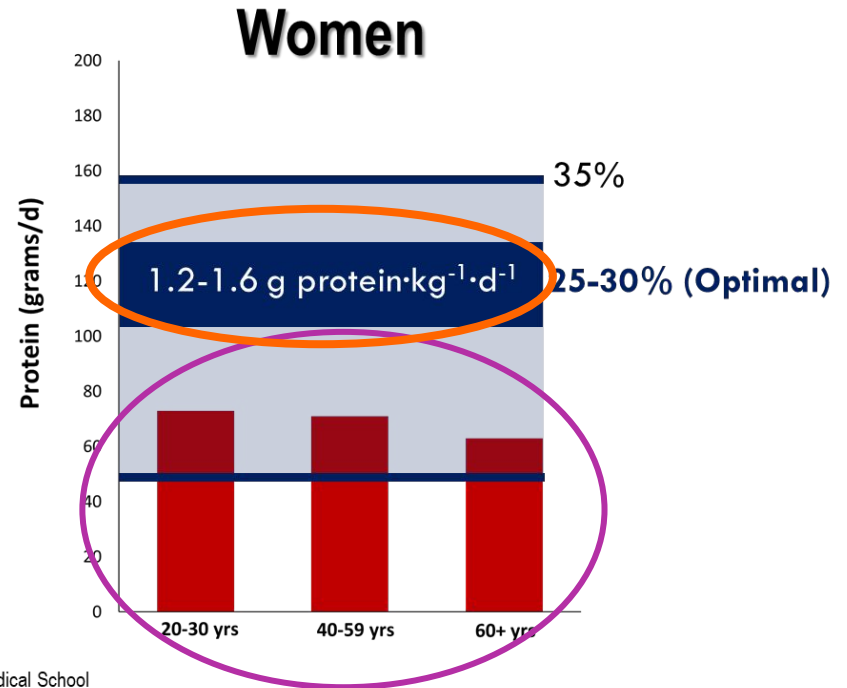
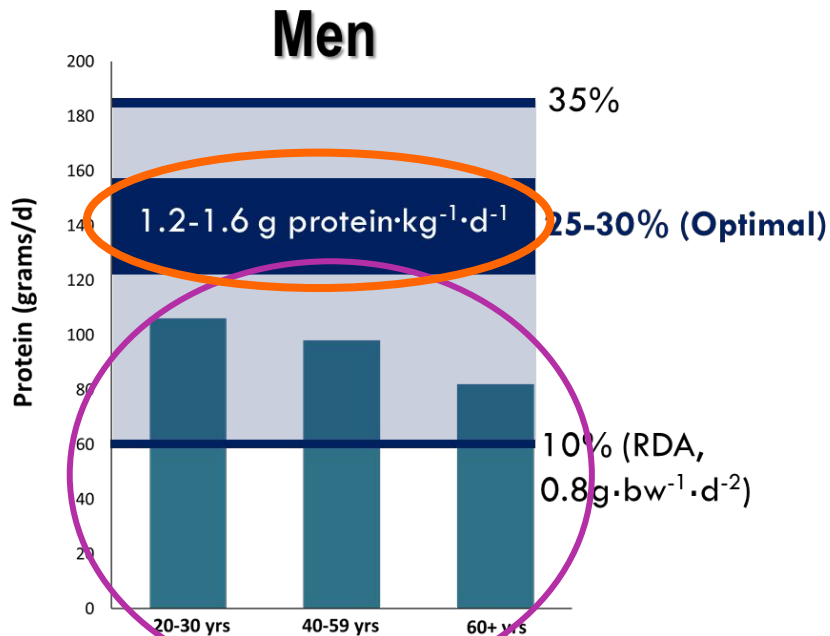
Protein Recommendations - Adequate vs. Optimal



Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: National Academies Press, 2005.
USDA/ARS. 2017. What We Eat in America, NHANES 2013-2014, individuals 2 years and over (excluding breast-fed children), day 1.

GENERAL POPULATION Intake vs. Protein Requirements

How much protein is *optimal*?



Population Data; "What We Eat in America" NHANES 2015-2016; Dr. Heather Leidy, University of Texas & Dell Medical School

GENERAL Practical Protein Recommendations based on POPULATION AMDR

For a

2,000 calorie diet

25-30% calories from protein would be

500-600 calories from protein

Which equals

125 - 150 grams protein per day



Bauer J, et al. Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group. JAMDA 2013;14:542-559.

Layman DK, et al. Defining meal requirements for protein to optimize metabolic roles of amino acids. Am J Clin Nutr 2015;101(Suppl):1330S-8S.

Symons TB, et al. A moderate serving of high-quality protein maximally stimulates skeletal muscle protein synthesis in young and elderly subjects. J Am Diet Assoc. 2009 Sep;109(9):1582-6.

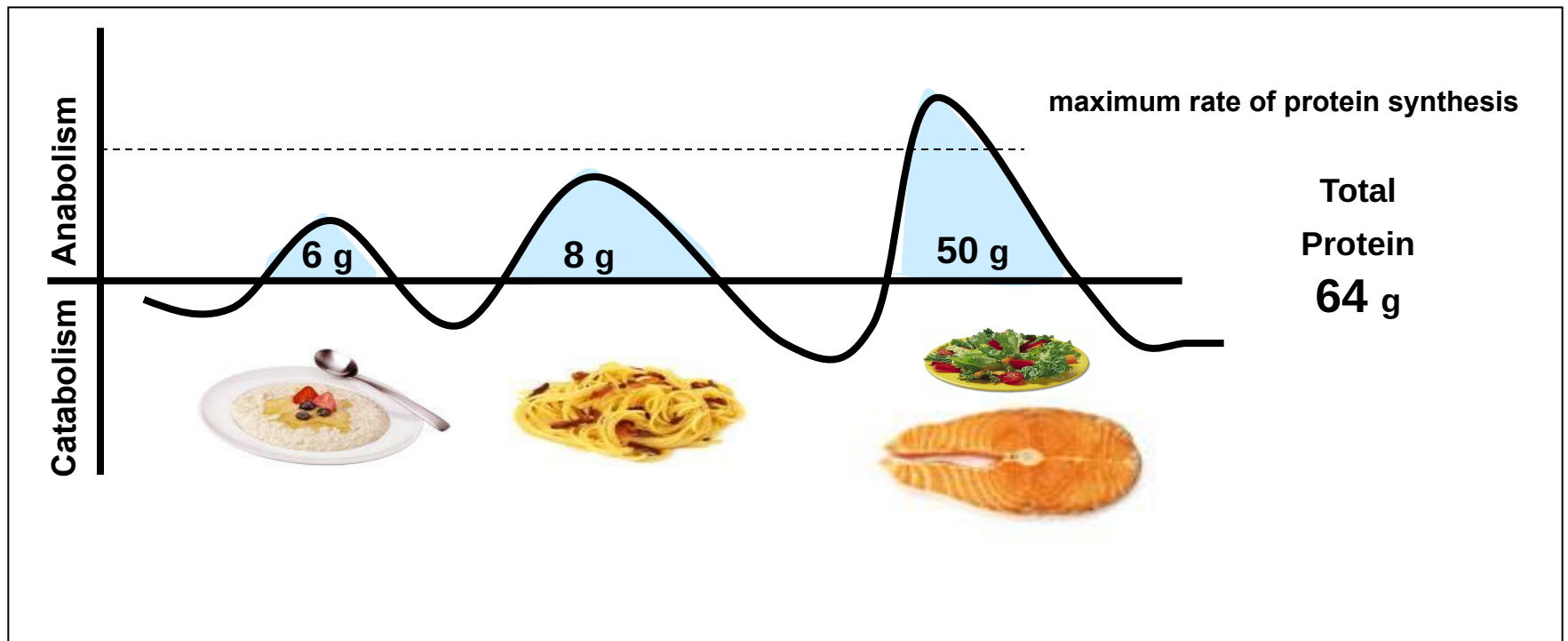
GLP-1 Patient Protein Target Strategies

- RDA? – NO
- 1.6 – 2g/kg (A)BW
- 1.5 g/kg fat-free mass/day (when available)
- Distribute protein across eating occasions provide meal-based goals ≥ 30 g per meal

Source: GLP-1 Nutrition Advisory 2025

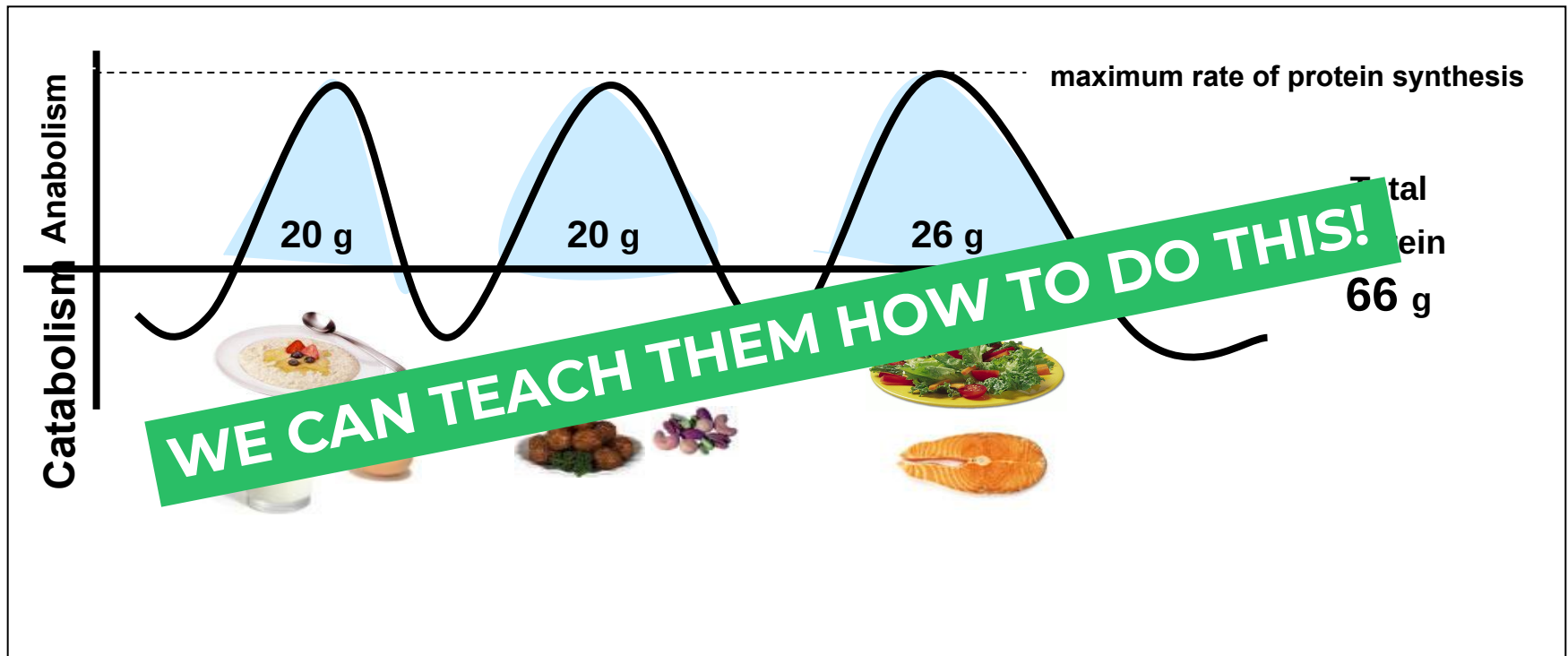


GENERAL POPULATION TYPICAL DAILY PROTEIN DISTRIBUTION



Paddon-Jones, Douglas, and Blake B Rasmussen. "Dietary Protein Recommendations and the Prevention of Sarcopenia." *Current Opinion in Clinical Nutrition and Metabolic Care*. 2009;12(1):86-90. <https://doi.org/10.1097/mco.0b013e32831cef8b>.

GENERAL POPULATION OPTIMAL DAILY PROTEIN DISTRIBUTION



Paddon-Jones, Douglas, and Blake B Rasmussen. "Dietary Protein Recommendations and the Prevention of Sarcopenia." *Current Opinion in Clinical Nutrition and Metabolic Care*. 2009;12(1):86-90. <https://doi.org/10.1097/mco.0b013e32831cef8b>.

COMMON PROBLEM AREA - PROTEIN AT BREAKFAST

RANDOMIZED CROSSOVER-DESIGN STUDY

Leidy, Heather J, et al. "Beneficial Effects of a Higher-Protein Breakfast on the Appetitive, Hormonal, and Neural Signals Controlling Energy Intake Regulation in Overweight/Obese, "Breakfast-Skipping," Late-Adolescent Girls." The American Journal of Clinical Nutrition. 2013;97(4):677-688.

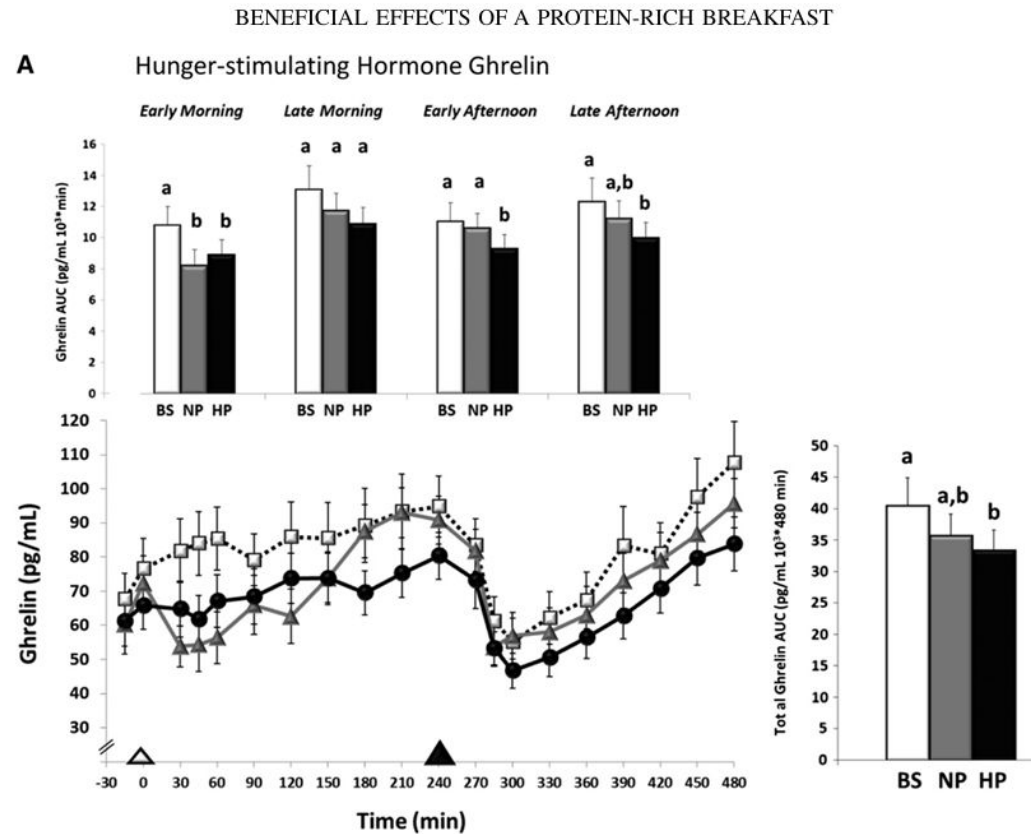
★ **20 overweight teenage females**

★ **Three breakfast groups:**

- No breakfast (skip)
- Normal protein (NP)
- High protein (HP)

★ **HP Breakfast:**

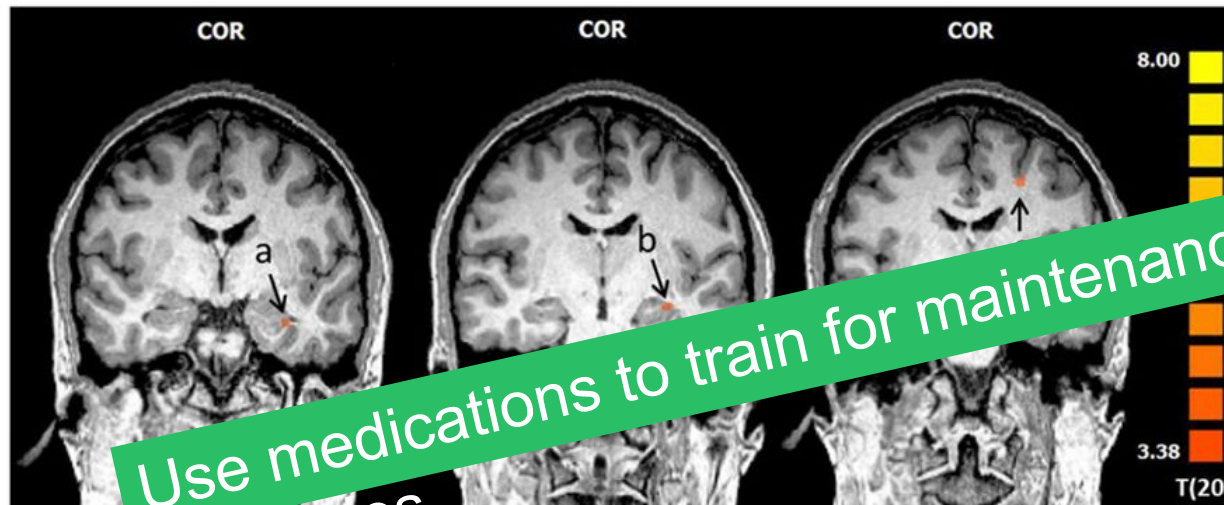
- Reduced daily ghrelin
- Reduced evening snacking of high-fat foods.
- Improved glycemic control



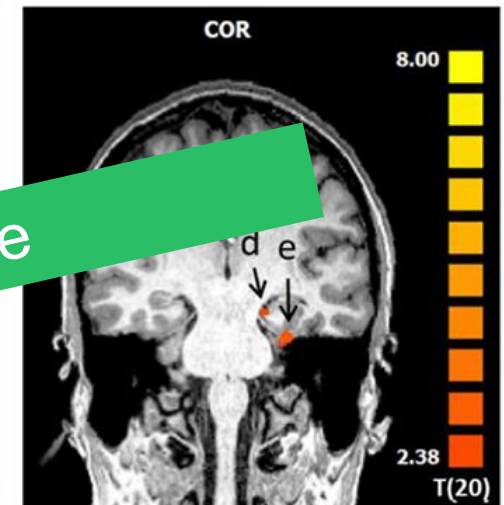
Leidy, Heather J, et al. **"Beneficial Effects of a Higher-Protein Breakfast on the Appetitive, Hormonal, and Neural Signals Controlling Energy Intake Regulation in Overweight/Obese, "Breakfast-Skipping," Late-Adolescent Girls."** The American Journal of Clinical Nutrition. 2013;97(4):677-688.

LEIDY ET AL

A Activation BS greater than Breakfast



B Activation NP greater than HP



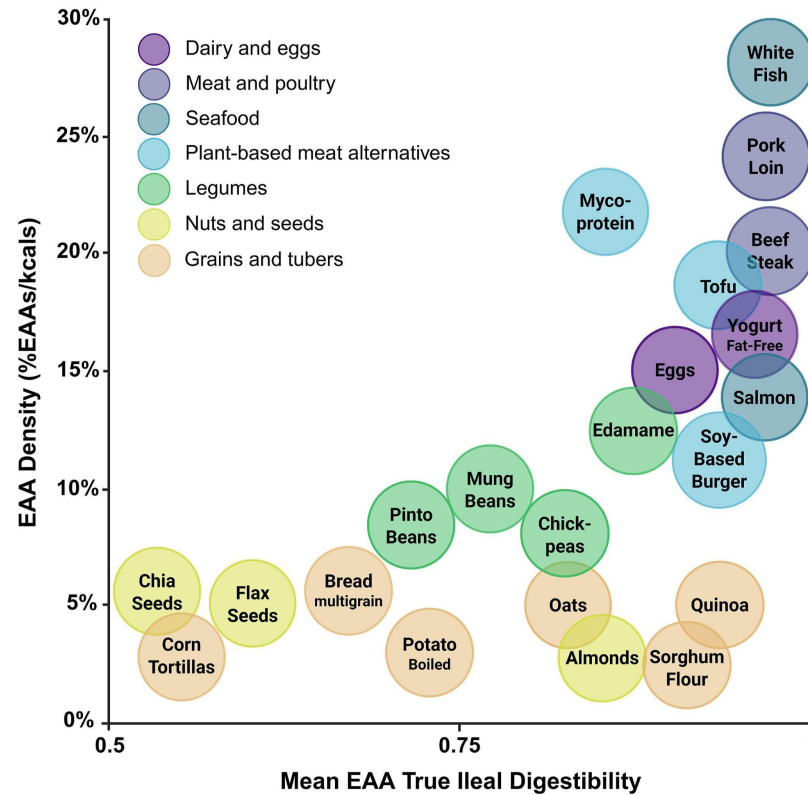
- ★ A high-protein breakfast may reduce brain-driven food cravings and daily desire to eat (compared to a normal protein breakfast or no breakfast).

MAKE IT TANGIBLE FOR PATIENTS - Protein Foods are not Equal

WHAT DOES 25 GRAMS OF PROTEIN LOOK LIKE?

	 AMOUNT	 CALORIES	 PROTEIN
Quinoa	 3 cups	666	25g
Peanut Butter	 6.5 tbsp	613	25g
Black Beans	 1 2/3 cups	379	25g
Edamame	 1 1/3 cups	249	25g
Beef	 3 ounces	173	25g

PROTEIN DENSITY AND DIGESTIBILITY DIFFERS BY FOOD ITEM



Matthews JJ, Arentson-Lantz EJ, Moughan PJ, Wolfe RR, Ferrando AA, Church DD. Understanding Dietary Protein Quality: Digestible Indispensable Amino Acid Score and Beyond. J Nutr 2025;In press. doi: 10.1016/j.tjn.2025.07.005

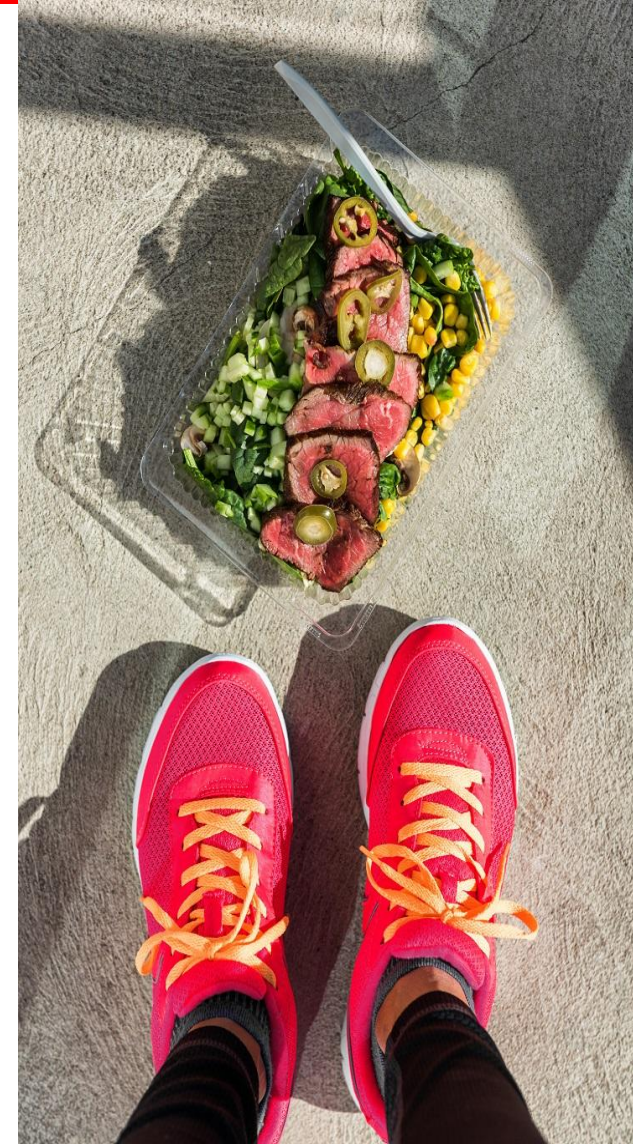
Protein Quality Considerations

- Prioritize complete protein sources with high EAA
- Compact, nutrient-dense options support low appetite
- Examples: lean meats, dairy, eggs, soy,



RESISTANCE TRAINING INTEGRATION

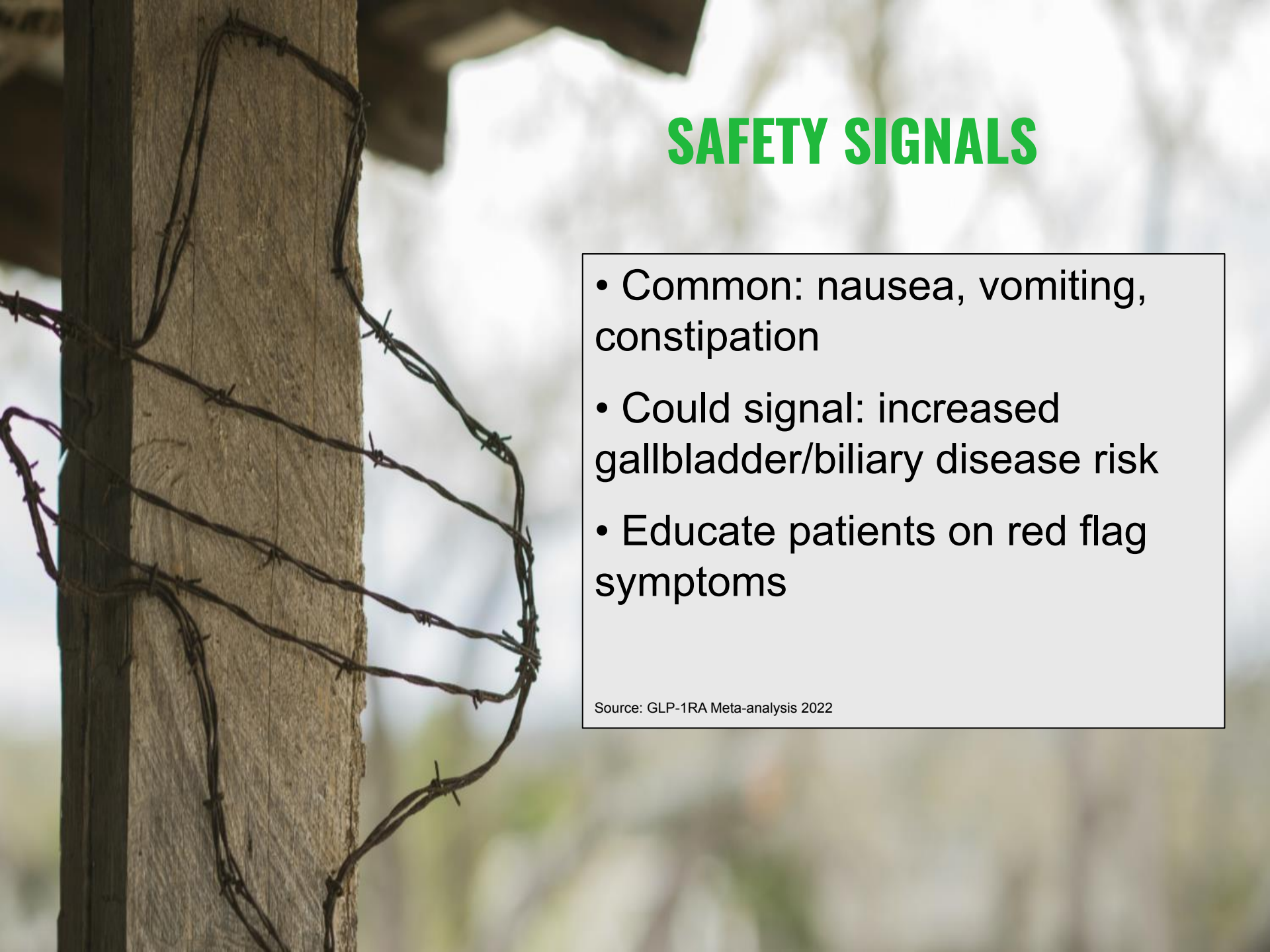
- **Protein alone is insufficient to preserve muscle**
- 2–3 sessions/week weight bearing exercise recommended
- Progressive overload/increases support strength retention



MICRONUTRIENT MONITORING



- Risk-based screening approach
- Common priorities:
 - Vitamin D
 - Calcium
 - Iron
 - B12
- Food-first strategy with targeted supplementation



SAFETY SIGNALS

- Common: nausea, vomiting, constipation
- Could signal: increased gallbladder/biliary disease risk
- Educate patients on red flag symptoms

Source: GLP-1RA Meta-analysis 2022

GI Symptom Protocol

Nausea

- smaller meals
- lower fat
- slow pacing

Constipation

- hydration
- gradual fiber
- movement

Red flags:

- RUQ pain
- persistent vomiting
- dehydration



Case Study 1

- T2D + GLP-1RA
- Basal insulin + sulfonylurea therapy
- Appetite drops by week 2

Discussion:

nutrition plan

hypoglycemia mitigation

protein target

Case Study 2

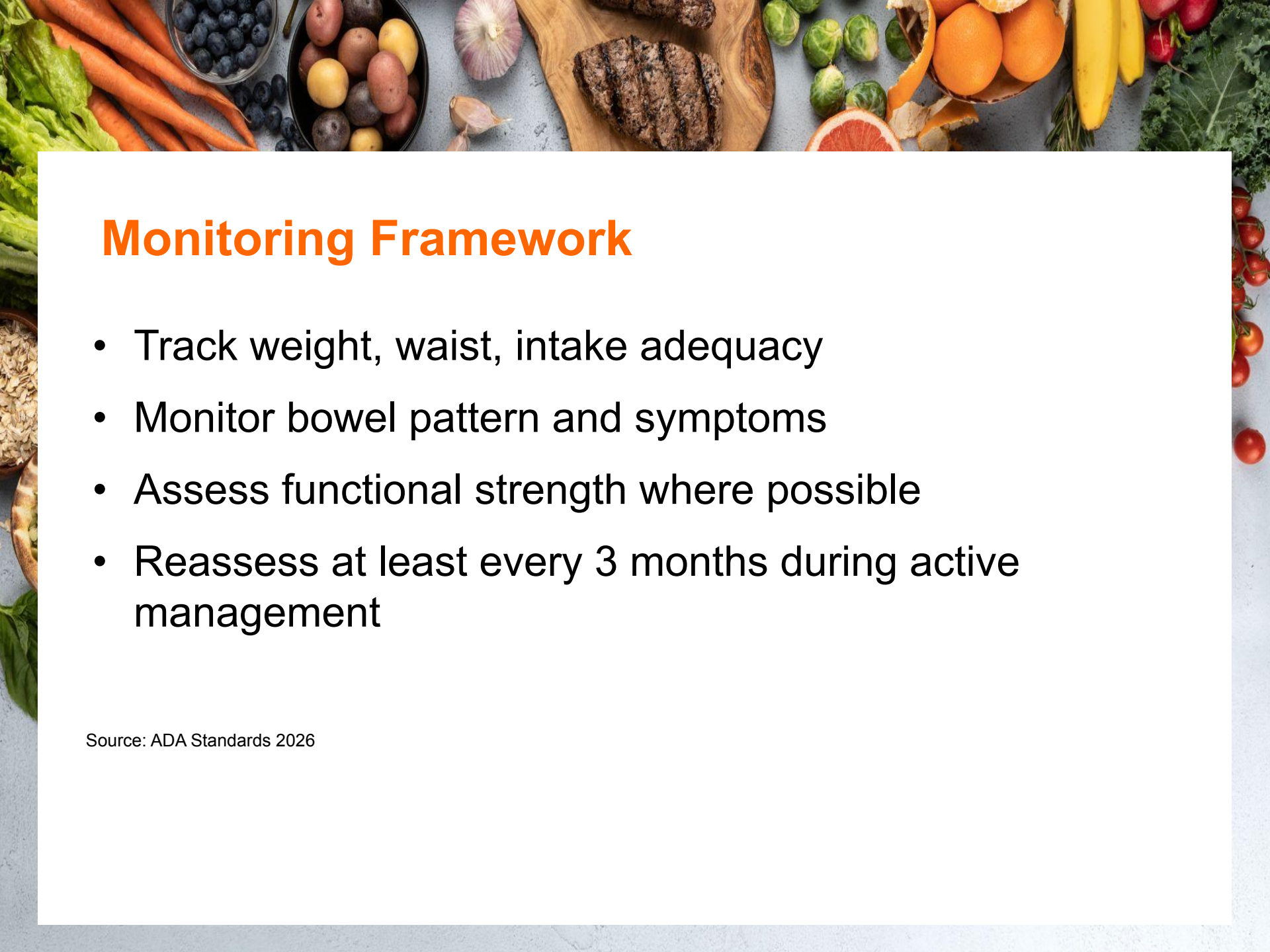
- Older Adult + Sarcopenia Risk
- Early satiety + 1 meal/day pattern
- Constipation complaints

Discussion:

protein distribution

resistance training

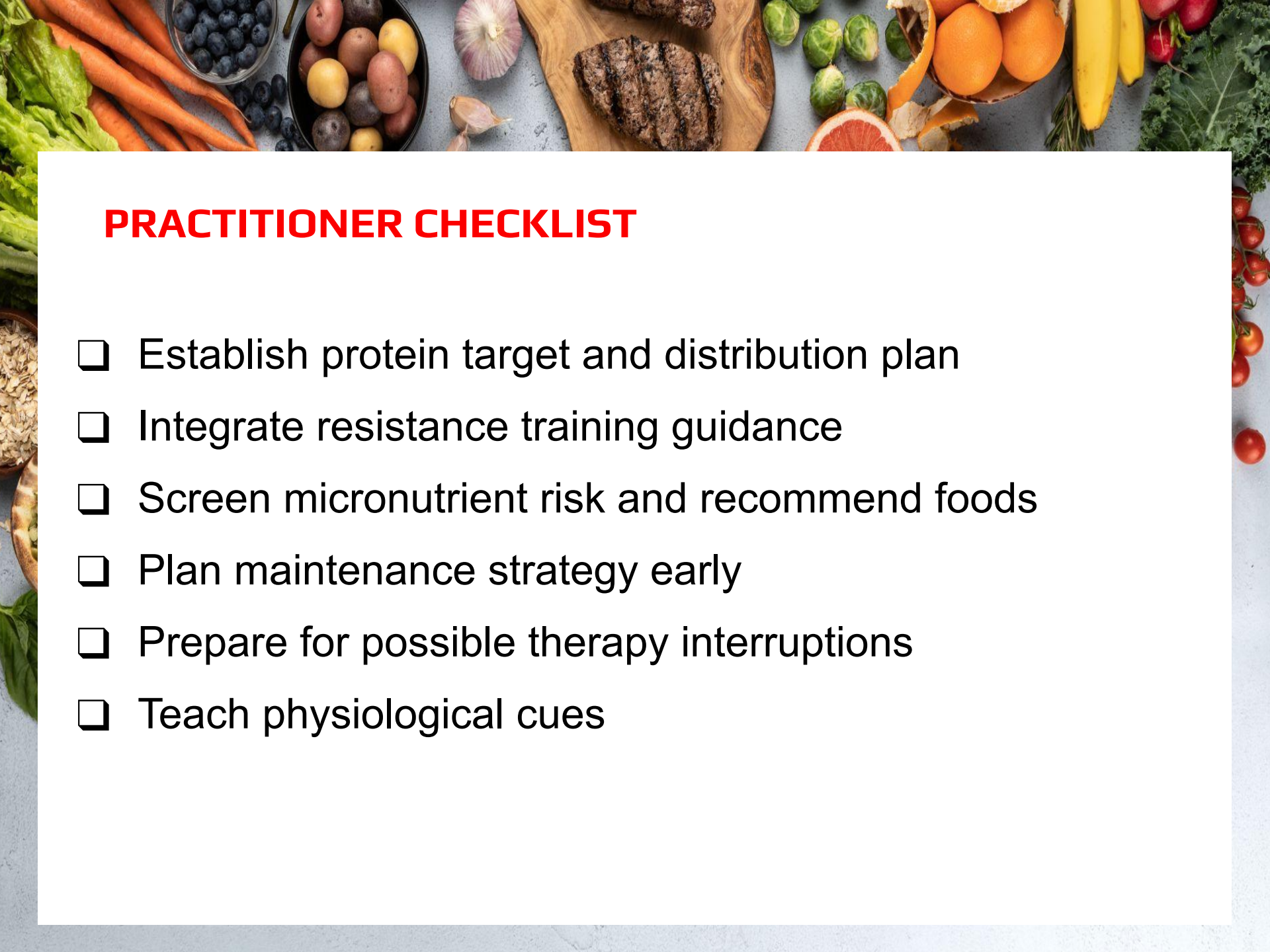
GI strategy



Monitoring Framework

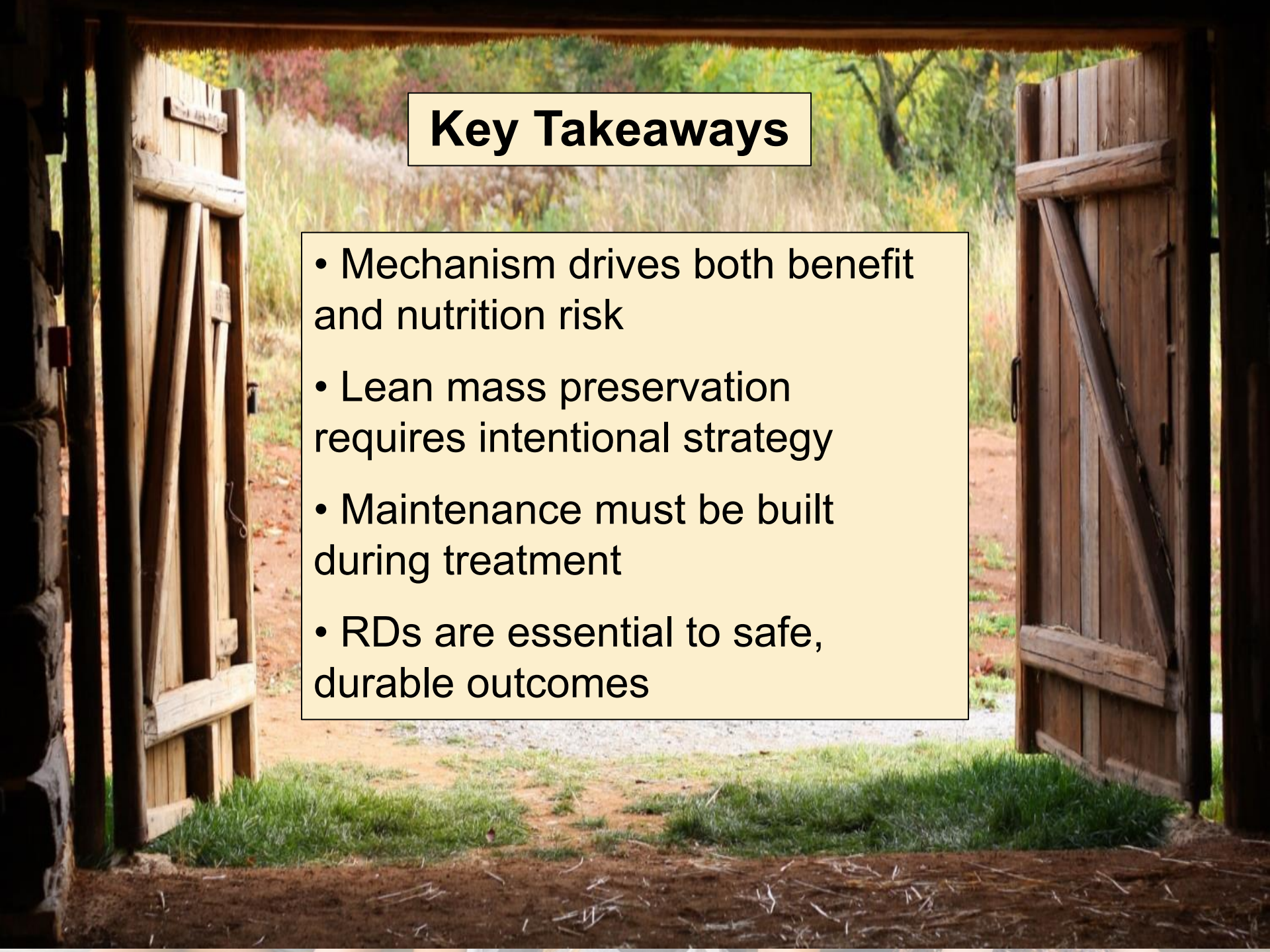
- Track weight, waist, intake adequacy
- Monitor bowel pattern and symptoms
- Assess functional strength where possible
- Reassess at least every 3 months during active management

Source: ADA Standards 2026



PRACTITIONER CHECKLIST

- ☐ Establish protein target and distribution plan
- ☐ Integrate resistance training guidance
- ☐ Screen micronutrient risk and recommend foods
- ☐ Plan maintenance strategy early
- ☐ Prepare for possible therapy interruptions
- ☐ Teach physiological cues



Key Takeaways

- Mechanism drives both benefit and nutrition risk
- Lean mass preservation requires intentional strategy
- Maintenance must be built during treatment
- RDs are essential to safe, durable outcomes

References - Highlights

- CDC NHANES Data Brief 508 (2023)
- American Diabetes Association. Standards of Care 2026
- SELECT Trial. N Engl J Med. 2023
- STEP 3 & STEP 5 Trials
- SURMOUNT-1 & SURMOUNT-4 Trials
- Friedman. The Discovery and Development of GLP-1 based drugs. 2024
- Mozaffarian et al. Nutritional Priorities for GLP-1 Therapy. 2025
- GLP-1RA Gallbladder Meta-analysis. 2022



Hawley Evilsizer, MS, RDN, LD

Hawley@letslovefoodagain.com
www.letslovefoodagain.com

socials