FGF21 Sugar System
Performance-First Weight Management

United States Coast Guard Academy Wrestling

Philosophy & System Overview

Unlike crash weight-cutting methods, this system teaches athletes to manage body composition through strategic fuel timing while maintaining hydration, glycogen stores, and competitive readiness.

Fuel control, not weight cutting: This system teaches manipulation of glycogen, hydration, and gut content through macronutrient timing—not through dehydration or starvation.

Core Principles: Performance over scale weight—a hydrated, fueled wrestler always outperforms a depleted one. Weight class is the entry requirement; performance is the goal. We will be using five levers ranked by performance cost.

The Five Fuel Tanks: What Changes When You Cut Weight

Your body weight consists of five distinct "tanks" or levers that change at different rates with different performance impacts.

Tank	What It Is	How It Changes	Performance Impact
1. Water	Hydration in blood/cells	Fluctuates hourly	HIGH - Critical for everything
2. Glycogen	Stored carbs in muscle/liver	Depletes with training, refills in 16-20 hrs	HIGH - Your power source
3. Gut Content	Food/liquid in digestive system	Clears in 12-24 hrs based on fiber	LOW - Minimal impact
4. Fat	Stored energy	Burns slowly with FGF21, 1-2lbs. per week.	NONE - Pure positive to lose
5. Muscle	Contractile tissue	Only with severe caloric deficit	CRITICAL - Never sacrifice

Weekly Drop Breakdown:

(167 lb walking around weight, cutting to 157 lb):
Glycogen and water bound to it: 3-4 lbs.
Gut content: 2-3 lbs. (fiber reduction Thu-Fri).
Water loss: 3% of bodyweight for no performance impact = 5lb
Fat loss: 0.5-1 lb per week (permanent, FGF21 bonus).
Muscle: ZERO (protected by protein timing). Body will break down muscle for calories in caloric restriction
Total: 12 pounds or ~7% body weight drop weekly or in this case 12 pounds, which puts you under 157.

What Should Your Walking-Around Weight Be?

Formula: Walking-Around Weight = (Competition Weight × 1.05) + Typical Practice Loss.

Examples: 157 class: (157 × 1.05) + 4lb. lost in practice = 167.85 lbs
Practice Loss: Weigh before/after practice to find your individual loss (3-5 lbs typical).
Season Goal: Gradually lower walking-around weight through consistent fat loss while maintaining muscle.

Two Protocols: Track A vs Track B

Track A (Fructose Early): For athletes above walking-around weight with body fat to lose (>8-10%). **Mon-Wed:** 60:40 fructose:glucose ratio → Burns fat, activates FGF21. **Thu-Fri:** 40:60 ratio → Restores glycogen for competition.

Track B (Glucose Early): For lean athletes (5-8% body fat) at walking-around weight. **Mon-Wed:** 40:60 glucose:fructose → Supports heavy training. **Thu-Fri:** 50:50 balanced → Maintains energy.

Weekly Protocol: Day-by-Day Execution

Protocol begins Monday (6 days before weigh-in). All weights are POST-PRACTICE targets.

The 1% Per Day Descent: Daily Target Weights (Post-Practice)

Class	Mon	Tue	Wed	Thu	Fri AM	Sat
125	133	131	129	127	126	125
133	141	139	137	135	134	133
141	149	147	145	143	142	141
149	158	156	154	151	150	149
157	167	164	162	159	158	157
165	175	173	170	167	166	165
174	185	182	179	176	175	174
184	196	193	190	187	185	184
197	209	206	203	200	198	197
285	303	298	294	289	287	285

MONDAY-WEDNESDAY: Metabolic Phase. Carbs: 8-10 g/kg. Protein: 50-75g total. Hydration: Full (see targets below).
Track A Sample: Breakfast: Apple juice (16oz), banana, rice cakes with agave. Mid-morning: Pear, grape juice. Lunch: White rice with honey, melon, apple juice. Pre-practice: Honey (20-30g). Post-practice: Rice cakes, honey, juice. Dinner: White rice, cooked fruit, juice. Evening: Apple slices, grape juice.

Track B Sample: Breakfast: Dextrose powder (40g), white rice, banana. Mid-morning: Rice cakes with honey, small apple. Lunch: White rice, potato, orange juice. Pre-practice: Dextrose (30-40g). Post-practice: White rice, honey, dextrose. Dinner: White rice, potato, small fruit. Evening: Rice cakes, honey.

Supplements (optional): TUDCA 250mg AM/PM, Choline 500mg AM/PM, electrolytes with all fluids. **What to Expect:** Initial hunger subsides in 4-6 hours, slight thermogenesis, steady energy, strong training performance.

THURSDAY: Transition Phase. Both tracks converge: 50:50 balanced carbs, 6-8 g/kg. CRITICAL: Fiber elimination begins—NO fruits/vegetables Thursday-Friday. Only white rice, potato, honey, dextrose, rice cakes. **Evening (60-90 min after practice): Collagen + Leucine Dose.** Collagen: 0.3-0.4 g/kg (25-30g for 170 lb). Leucine: 0.04-0.05 g/kg (3-4g for 170 lb). Mix with juice/water. This protects muscle without blocking FGF21. **Why collagen + leucine?** Leucine supports muscle synthesis. Isoleucine (in whey/chicken) blocks FGF21. Collagen provides leucine without isoleucine.

FRIDAY: Performance Prep. Glucose dominant (40:60), 5-7 g/kg. Minimal protein. Continue fiber elimination. **Sample:** Breakfast: White rice, honey, dextrose. Mid-morning: Rice cakes, honey. Lunch: Small white rice, honey, dextrose. Pre-practice: Dextrose (20-30g). Post-practice: White rice, honey, dextrose. Dinner: Small white rice, potato, honey. Evening (optional): Collagen + leucine dose. **Expected:** Weight 1-2 lbs above class post-practice. Overnight loss of 1-2 lbs (gut clearing, respiration). Wake Saturday at/near competition weight.

Hydration Targets by Weight Class (Monday-Wednesday)

Add 1-2g sodium per liter. Use electrolyte mixes, not plain water.

Weight Classes	Daily Fluid (oz)
125-133	90-105
141-149	100-115
157	110-120
165-174	115-130
184-197	125-140
285	150-170

Food Lists by Fructose:Glucose Ratio.
HIGH FRUCTOSE (60:40+) Track A Mon-Wed: Apple/grape/pear juice, apples, pears, grapes, watermelon, mango, agave, honey.
BALANCED (50:50) Thursday: White rice, honey, ripe banana, rice cakes, orange juice.

HIGH GLUCOSE (40:60+) Track B Mon-Wed & All Athletes Thu-Fri: Dextrose powder, white rice, potato, rice cakes, maltodextrin, honey. **Thu-Fri ZERO FIBER:** Eliminate ALL fruits/vegetables. Only white rice, potato, honey, dextrose, rice cakes.

Reverse Water Load with Distilled Water

- **Purpose:** Drop extracellular water and sodium to appear and weigh "drier" while preserving muscle glycogen and intracellular water.
- **Mechanism:**
  - Distilled water is electrolyte-free, forcing the body to release sodium and flush extracellular fluid.
  - Keep normal filtered water early in the week, then switch to distilled for the final 24–36 hours.
- **Why it works:**
  - Sugar-fast keeps insulin and glycogen high (muscle stays full).
  - Distilled water removes subcutaneous and extracellular water.
- **Timing:**
  - **Mon–Wed:** Regular water + normal sodium + full sugar-fast meals.
  - **Thu:** Switch to distilled, maintain volume.
  - **Fri:** Distilled only, cut sodium, drop water volume.
  - **Sat:** Weigh-in → Rehydrate with sodium + glucose solution (500–700 mg sodium/L).

Reverse Water Load Protocol (oz/day by weight class)

Day	Goal / Focus	125–141 lbs	149–165 lbs	174–197 lbs	285 lbs	Water Type	Sodium
Mon	Baseline hydration	1.0 gal	1.25 gal	1.5 gal	1.75 gal	Regular	Normal
Tue	Increase diuresis	1.25 gal	1.5 gal	1.75 gal	2.0 gal	Regular	Normal
Wed	Peak hydration	1.5 gal	1.75 gal	2.0 gal	2.25 gal	Regular	Moderate
Thu	Switch to distilled	1.25 gal	1.5 gal	1.75 gal	2.0 gal	**Distilled**	Low
Fri	Sharp cut (flush phase)	8–10 oz	8–12 oz	12–16 oz	16–20 oz	**Distilled**	Very Low
Sat	Weigh-in / Rehydrate	Sips pre	Sips pre	Sips pre	Sips pre	Regular	Reintroduce
Sun	Normalization	1.0 gal	1.25 gal	1.5 gal	1.75 gal	Regular	Normal

Notes: This REPLACES standard hydration targets. Spread intake evenly throughout day. Continue electrolytes as water decreases. Monitor urine color (light yellow through Wed). If dizzy/cramping, increase water immediately. Post-weigh-in rehydration becomes even more critical with this method.

Post-Weigh-In Recovery: The Performance Window

First 2 hours are CRITICAL. Proper protocol restores 70-80% glycogen and full hydration within 4-6 hours—more than enough for peak performance. Minimum time needed: 1.5-2 hours between weigh-in and first match.

Recovery Timeline (Every 15 Minutes Counts)

Time	Action & Purpose
0-15 min	Electrolyte drink (20-24oz) + sodium (1-2g) → Restore plasma volume
15-30 min	Dextrose drink (40-50g) or rice cakes + honey → Rapid glucose spike
30-45 min	Protein: 20-30g whey or lean fish/chicken → Muscle recovery, insulin
45-60 min	More carbs: white rice, potato, juice (50-60g) → Continue glycogen
60-90 min	Full meal: rice, potato, lean protein, juice → Maximize glycogen
90-120 min	Additional carbs if needed: rice cakes, juice, dextrose → Top off stores
2-4 hrs	Continue carb-rich meals, maintain hydration → 70-80% glycogen—ready
4+ hrs	Normal fueling, sustained energy → Maintain readiness between matches

Rehydration Formula: 24-28 oz fluid + 1-2g sodium per pound lost. Most athletes (5-8 lbs lost): 120-200 oz in first 2-4 hours. **Glycogen Recovery:** 1 hr: 15-20% (too early). 2 hrs: 30-40% (minimum acceptable). 4 hrs: 60-70% (good—feel strong). 6 hrs: 80-90% (excellent—peak readiness). **Key:** You DON'T need 100% glycogen to dominate. At 70-80% (4-6 hours), you have more than enough for 7-minute matches.

Tournament Day Fueling: Multiple Match Performance

Wrestling 4-6 matches with 1-1.5 hours between requires strategic fueling. Each match depletes 10-15% glycogen. Use fast-absorbing carbs (glucose-dominant) and minimal protein/fat. Keep gut light while muscles stay fueled.

Between-Match Fueling (1-1.5 Hour Window)

Time After Match	What to Consume
0-5 min	Electrolyte drink (16-20oz) + dextrose (20-30g)
10-15 min	Rice cakes (2-3) + honey (2 Tbsp)
20-30 min	Fruit juice (8-12oz) - apple or grape
40-50 min	Small white rice (1/2 cup) OR banana

Target: 30-50g simple carbs per hour between matches. Total for day: 150-250g. **Hydration:** Sip 16-24oz electrolyte drink per hour (1g sodium per 16oz). No chugging—steady sipping. **AVOID:** Heavy meals, high-fat

foods, fiber, excessive protein, carbonated drinks, large fluid volumes at once. **OPTIMAL:** Dextrose powder, rice cakes with honey, white rice (small portions), ripe bananas, apple/grape juice, electrolyte drinks.

Physiological Mechanisms: How This System Works

This section explains the science for coaches and interested athletes. Not required for execution.

FGF21 (Fibroblast Growth Factor 21): Metabolic hormone produced by liver in response to fructose when protein is low. **Effects:** Increases fat burning, reduces appetite, improves insulin sensitivity, increases metabolic rate, burns visceral fat preferentially. **Activation:** High fructose (60:40+), low protein (<75g/day) for 2-3 days, consistent carb fueling, adequate hydration. **Why protein blocks FGF21:** Isoleucine (in whey/poultry) suppresses FGF21. We use collagen + leucine instead—leucine supports muscle, no isoleucine to block fat burning.

GDF15 (Growth Differentiation Factor 15): Works synergistically with FGF21. Produced by mitochondria during metabolic stress. **Effects:** Reduces hunger through GFRAL receptor, increases stress resistance, improves gut motility, enhances fat utilization. **Why athletes aren't hungry:** GDF15 rises naturally with FGF21 activation. Appetite suppression makes low protein Mon-Wed comfortable.

mTOR (Mechanistic Target of Rapamycin): Cellular signaling pathway regulating protein synthesis and energy metabolism. **Effects:** Activates muscle protein synthesis, regulates cell growth/repair, coordinates with insulin. **Leucine strategy:** Leucine is primary mTOR activator. Collagen provides leucine without isoleucine, allowing muscle protection while maintaining FGF21. **Timing:** Keep mTOR low Mon-Wed (maximize FGF21). Pulse mTOR Thu-Fri with collagen + leucine (protect muscle). This timing balance maintains both performance and body composition.

Glycogen Kinetics: Depletion: Hard practice uses 1-2% per minute. 2-hour session depletes 30-40% of stores, releasing 3-4 lbs glycogen-bound water. **Refilling:** With glucose, refills at 5-7% per hour. Full restoration: 16-20 hours. 70-80% (4-6 hours) is sufficient for 7-minute matches. **Fructose vs Glucose:** Glucose refills muscle glycogen directly. Fructose refills liver first, then converts slowly. Shift from fructose (fat burning) to glucose (glycogen) Thu-Fri ensures you make weight AND have explosive power.

Aldosterone & Reverse Water Loading: Aldosterone regulates sodium/water retention. High water intake suppresses aldosterone—body excretes more sodium/water. When intake drops, aldosterone rises to conserve, but has 12-24 hour lag. **Mechanism:** High volumes Mon-Wed suppress aldosterone. Taper Thu-Fri—aldosterone stays suppressed 12-24 hours, causing continued excretion despite lower intake. Creates 2-4 lbs additional loss. **Individual variation:** Some respond more strongly. Track response over 2-3 competitions to determine effectiveness.

Season-Long Management

Post-Competition Week: Sunday: Full refeed—normal eating, high protein (120-150g). Mon-Tue: Resume walking-around weight monitoring, normal training.

Weekly Tracking Markers: Walking-around weight (should gradually decrease on Track A), body composition (monthly—confirm fat loss not muscle), training performance (power/technique/stamina stay high), recovery quality (sleep/mood/motivation normal), competition results (improve or stay consistent).

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System Summary

Key Principles: Performance always first—weight is entry requirement. Fuel control, not weight cutting—manipulate glycogen/hydration/gut through timing. Use five levers in order of performance cost. Track selection matters (A for fat loss, B for performance). System repeatable across 11-15 competitions without cumulative damage.

Coach Quick Reference: Determine walking-around weight, assign Track A or B, implement base protocol (glycogen management, fiber elimination, collagen + leucine), add reverse water load if needed, execute post-weigh-in recovery, manage tournament fueling, monitor season-long progress.

Athlete Quick Reference: Know walking-around weight for your class. Follow Track A (fructose early) or Track B (glucose early) per coach assignment. Hit daily target weights post-practice (1% table). Eliminate fiber Thu-Fri. Take collagen + leucine Thu-Fri nights. Execute post-weigh-in recovery immediately. Fuel between matches with fast carbs and electrolytes.

Bottom Line: Unlike crash weight-cutting methods, this system teaches athletes to manage body composition through strategic fuel timing while maintaining hydration, glycogen stores, and competitive readiness. Athletes make weight safely, recover quickly, and perform at their best when it matters most.