



2022 NSCA *NATIONAL* CONFERENCE

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#NSCACon22

› *KNOWLEDGE*
› *ADVANCEMENT*
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CONFLICT OF INTEREST STATEMENT

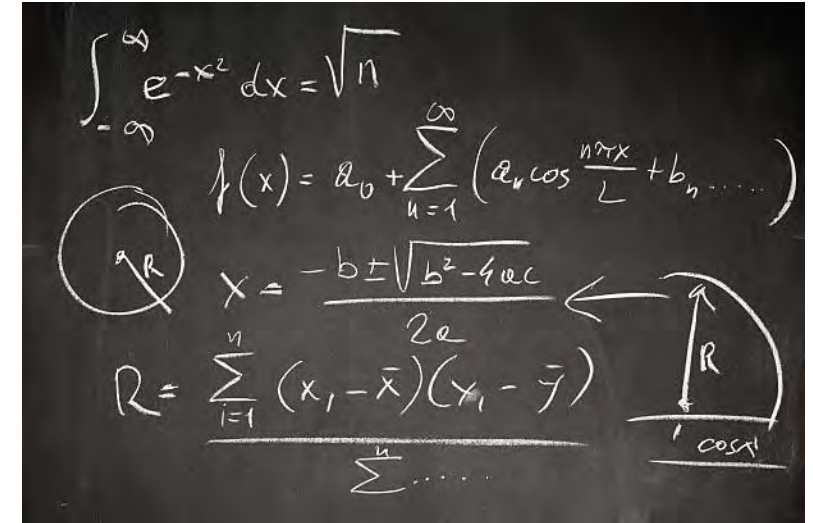
I have no actual or potential conflict of interest
in relation to this presentation.

Learning Objectives

- Describe the most commonly used peak week strategies by bodybuilders
- Identify effective/ineffective and safe/unsafe peak week practices used by bodybuilders.
- Design evidence based peak week strategies for bodybuilders

Specific Peak Week Variables that can be Manipulated

- Carb Depletion/Loading (*)
- Water/Electrolyte Manipulation (*)
- Fat Intake
- Protein Intake
- Dietary Supplements
- Fiber and fermented oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) intake
- Resistance and Aerobic Training



Handwritten mathematical formulas on a chalkboard:

- $$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$
- $$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \dots \right)$$
- $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
- $$R = \frac{\sum_{i=1}^n (x_i - \bar{x})(x_i - \bar{y})}{\sum_{i=1}^n \dots}$$
- A diagram of a right triangle with hypotenuse R and angle $\cos x$.

What is Peak Week?

- Competitors need to achieve their peak physique during the day of competition
- Competitors employ various interventions during the final days leading to competition
 - Reported Strategies:
 - Altering exercise and nutritional regimens
 - Manipulation of macronutrient, water, and electrolyte intake
 - Consumption of various dietary supplements
- Primary goals:
 - Maximize muscle glycogen content
 - Minimize subcutaneous water
 - Reduce the risk abdominal bloating

Prevalence of Using Peak Week Strategies

- Chappel et al. surveyed 81 bodybuilders (1):
 - 93.8% employed a peak week strategy
 - Carb manipulation and water/electrolyte manipulation are most commonly reported strategies
- Many peak week protocols exist, but research is lacking on:
 - Efficacy
 - Safety
 - Best Practices

Carb Loading for Peak Week



- Glycogen loading can ↑:
 - intracellular water content (2)
 - muscle thickness (3)
 - lean body mass (LBM) estimates (4)
- Early research suggested that each gram of muscle glycogen stored is accompanied by approximately 3–4 g of intracellular water
 - But, relative extent of intracellular hydration in grams of water per gram of glycogen varies greatly between people (5)

Evidence on Carb Loading



- Bamman et al.(6):
 - US measurements taken 24–48 h into this 3-day carb loading period (~290 g/day) = 4.9 % increase in biceps brachii muscle thickness when compared to measures obtained six weeks earlier
- de Moraes et al. (3):
 - Results showed a 3 % increase in muscle thickness of the upper arms for those who manipulated carb intake prior to competition vs no change in those who did not
 - Carb-up group showed improvements in subjective aesthetic measures as determined by visual inspection of photos from trained judges
- Schoenfeld et al. (7):
 - 3 Days low carb (<50g/day) followed by 2 x 450g carb load days
 - 5% increase in UE and 2% increase in LE

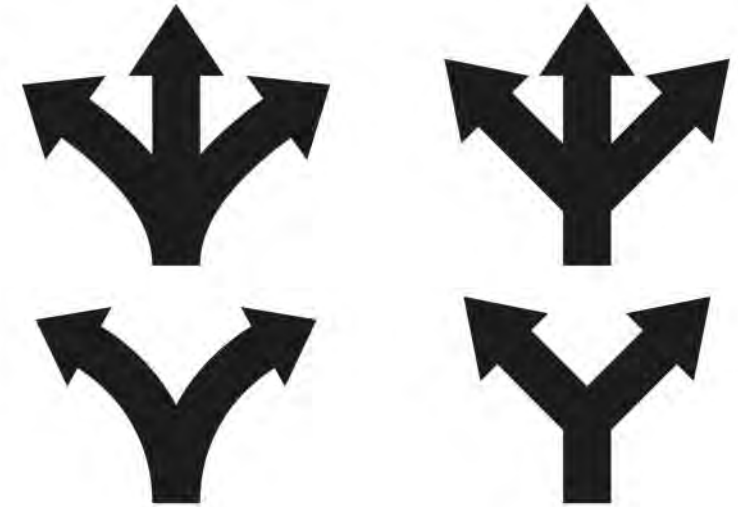
Carb Loading Considerations



- Gastrointestinal symptoms reported (3):
 - Abdominal pain
 - Heartburn
 - Constipation or diarrhea
- Cutting sodium and/or water during carb loading is not likely beneficial (8)
- Competitors should experiment with the strategy at least 2–4 weeks in advance (8)

Ways to Carb Load

- Front Load (start high end low)
- Back Load (start low, end high)
- Middle Load (Start Low, go high, modify as needed)
 - This is our recommended method TBD later



Prevalence of Water and Electrolyte Manipulation

- Chappell et al. (1):
 - ~65% water load, ~32% water restrict, and ~25% do both
 - Loading = 4-12 L of water/day followed by 10-24 h of water restriction
 - ~13% sodium restrict, ~18% sodium load, and ~6% do both
 - Generally practiced 3-4 days prior to competition
- Mitchell et al. (9)
 - 100% of competitors (n=7) used water load/water cut strategy
 - Drink > 10L of water early in week and reduce each subsequent day



Reasons/Risks/Benefits of Water & Electrolyte Manipulation

- Goal = minimize subcutaneous water to maximize the underlying skeletal muscle definition
- Potential Benefits
 - May drop to lower weight class and may provide advantage if time correctly
 - May create favorable shift of fluids from extra- to the intracellular compartment (10)
 - May enhance help achieve goal to enhance muscle definition
- Potential Risks
 - Hyperkalemia (11)
 - Hypokalemia (12, 13)
 - Hyponatremia (11)
 - Water intoxication (11)
 - Timing is off and strategy backfires



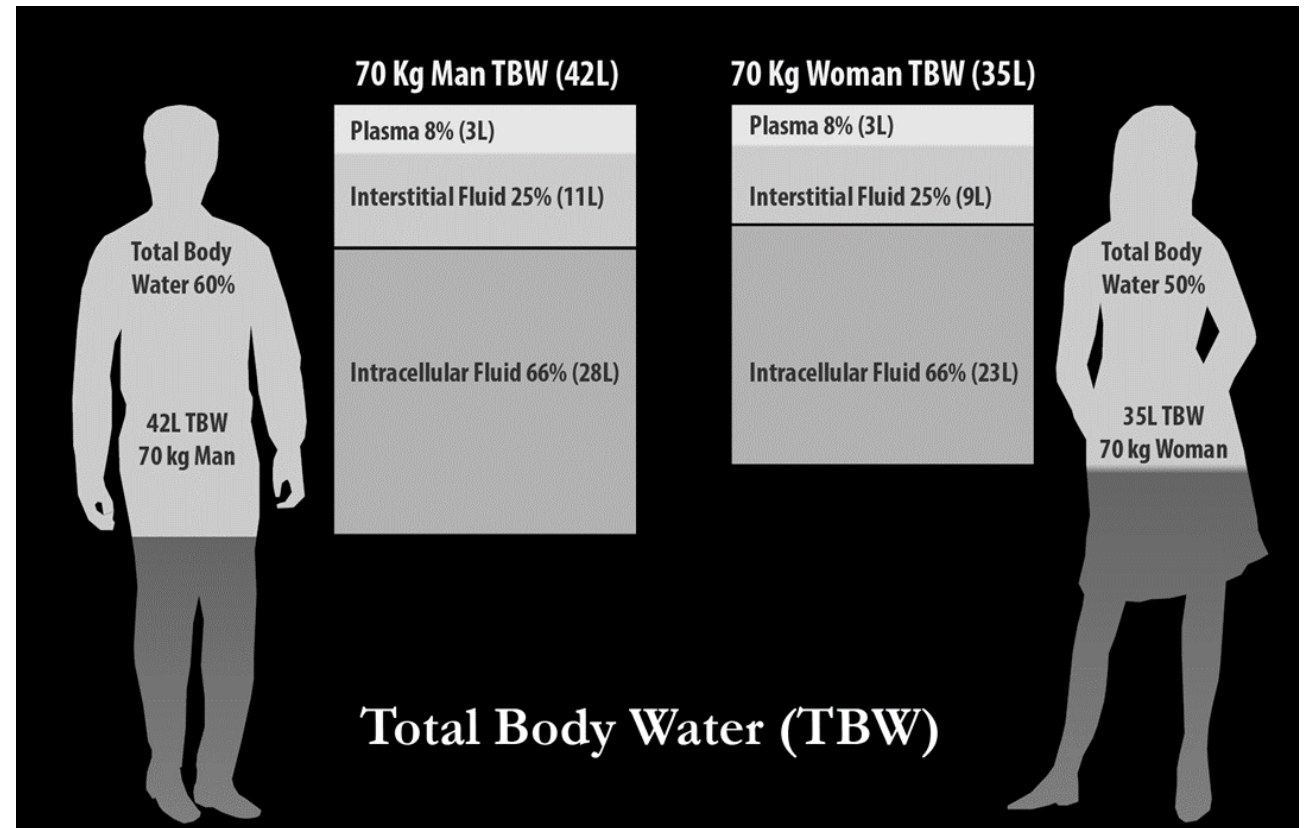
Strategies of Water and Sodium Manipulation

- No concrete evidence-based strategies identified
- Effectiveness/safety of these strategies not well understood and may be risky
- Pharmaceutical diuretics not recommended as risks exponentially increase
- Practice runs should be done if considering doing these strategies or it may be best to avoid manipulating these variables



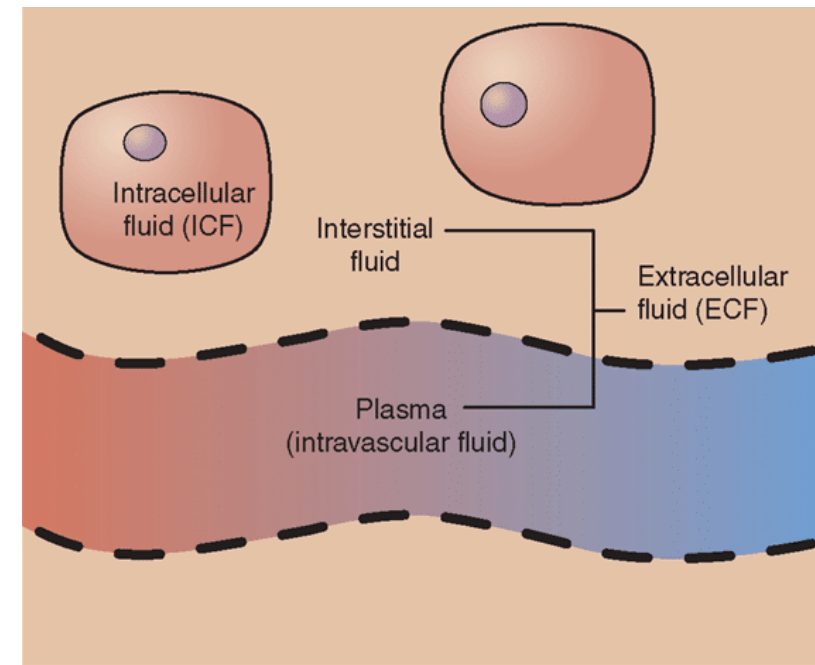
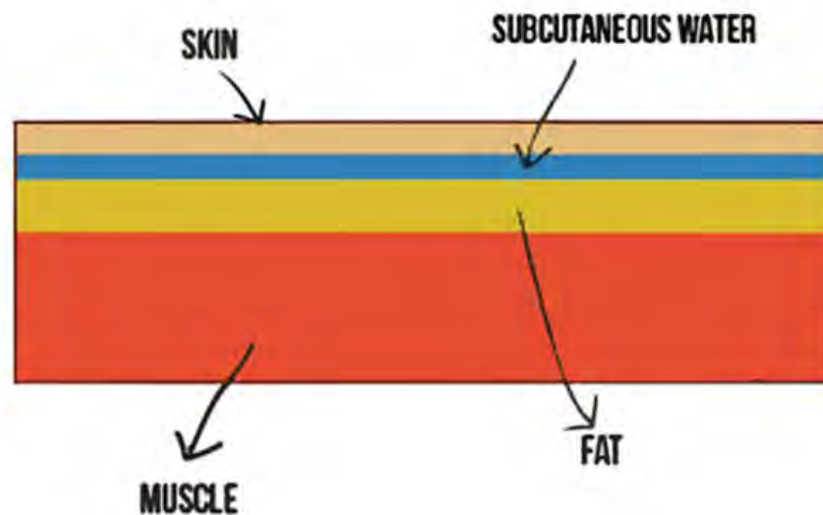
Understanding Total Body Water

- Muscle = ~70-75% water
- Fat = ~10% water
- Bodybuilders typically have higher total body water content vs average man due to higher levels of muscle



Goal of Bodybuilder with Water/Sodium Manipulation

- Minimize the extracellular interstitial fluid that surrounds the myocytes, specifically subcutaneous water, while preserving or increasing the muscle intracellular water
- This represents the ideal “full and dry” appearance



Altering ICW:ECW is not a Simple Task

- Manipulating water/sodium do not work in isolation
- Other strategies focused on optimizing intramyocellular volume (i.e., those targeting intramyocellular glycogen, triglyceride, and potassium content) may need to be considered (along with or independent of manipulation of water/sodium) for the appearance of muscularity to be enhanced



Muscle Water and Glycogen Loss

- Costill et al (14):
 - Participants cycled in hot chamber to lose 2.2 % (stage 1), 4.1 % (stage 2), and 5.8 % (stage 3) of their body weight
 - When participants lost 2.2 % of their body weight within the first ~ 1.5 h in stage 1, 30 % of the water lost was ICW while 70 % was ECW
 - Ratio of ICW to ECW lost became 52 % ICW/48 % ECW at stage 2 (~ 3.5 h mark) and 50 % ICW/50 % ECW at stage 3 (~ 5.5 h mark)
 - Large loss of ICW in muscle at stage 1 may be explained by the significant loss of muscle glycogen content (which contains water) from pre-dehydration at 115 mmol/kg down to 76 mmol/kg
 - However, muscle glycogen content levels dropped at a much lower rate to 73 mmol/kg at stage 2 and 61 mmol/kg at stage 3

Homeostatic Mechanisms to Control Water/Electrolyte Balance

- TBW and total body osmolarity (TBO) attempt to remain balanced
 - Water redistributes itself between the ICW and ECW so the osmolarity of bodily fluids approximates TBO
- Once plasma osmolarity (via changes in total body water and electrolytes) reach a physiological threshold, a complex neuroendocrinological network throughout the body in the brain, blood vessels, kidneys, and endocrine glands respond to stabilize it



Dehydration, Homeostasis, and Timing

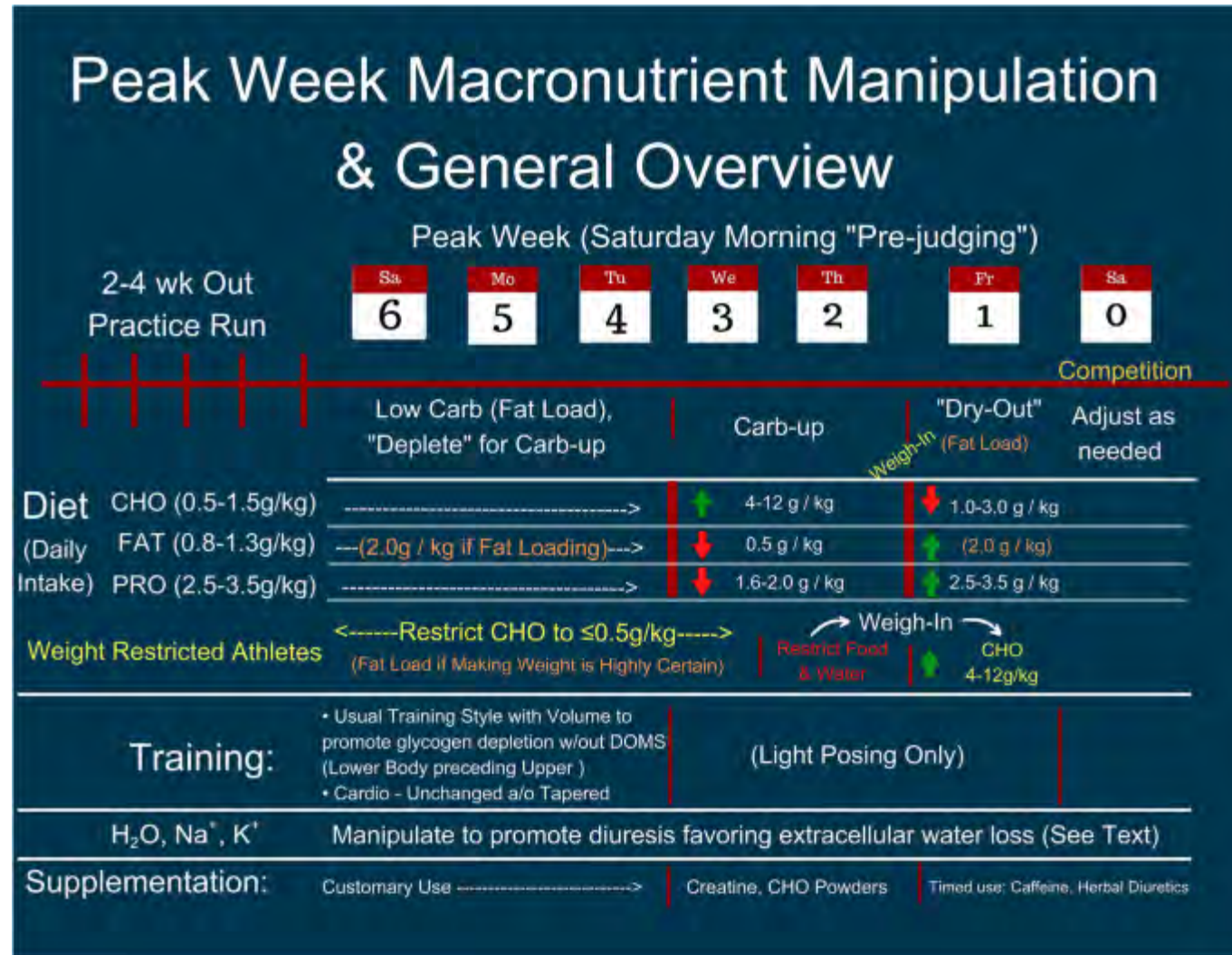
- Plasma osmolarity increases and blood pressure decreases
 - Renal baroreceptors in the juxtaglomerular apparatus (JGA) release renin
 - Renin activates the renin-angiotensin-aldosterone system (RAAS)
 - RAAS helps maintain fluid, electrolyte, and blood pressure homeostasis
 - Eventually it releases aldosterone from adrenal glands to fine tune homeostasis
- Baroreceptors in the aorta/carotid arteries also detect decrease in blood pressure and signal the release of antidiuretic hormone to conserve water, increase blood volume, and increase blood pressure
- There is a temporal lag in establishing fluid and electrolyte homeostasis



Strategies to Consider For Diuresis

- Head Down Tilt Sleep Position -4 to -6 degrees (15, 16, 17)
 - Simulates the increase in cardiac venous return and results in diuresis
 - mediated in part by increase in atrial natriuretic peptide and reduced plasma renin
- Water Loading/Cutting (18) vs Constant Water Intake
 - drinking a large quantity of water (100 ml/kg) for 3 days followed by significantly cutting water to 15 ml/kg on day 4
 - Keeping water constant is another option
- Herbal diuretics (8), caffeine (20), and Vit C (21)
- Carb Loading should be done with adequate water and sodium
 - Sodium-glucose dependent cotransporters – SGLT1(22-23)

Putting it all Together (9)

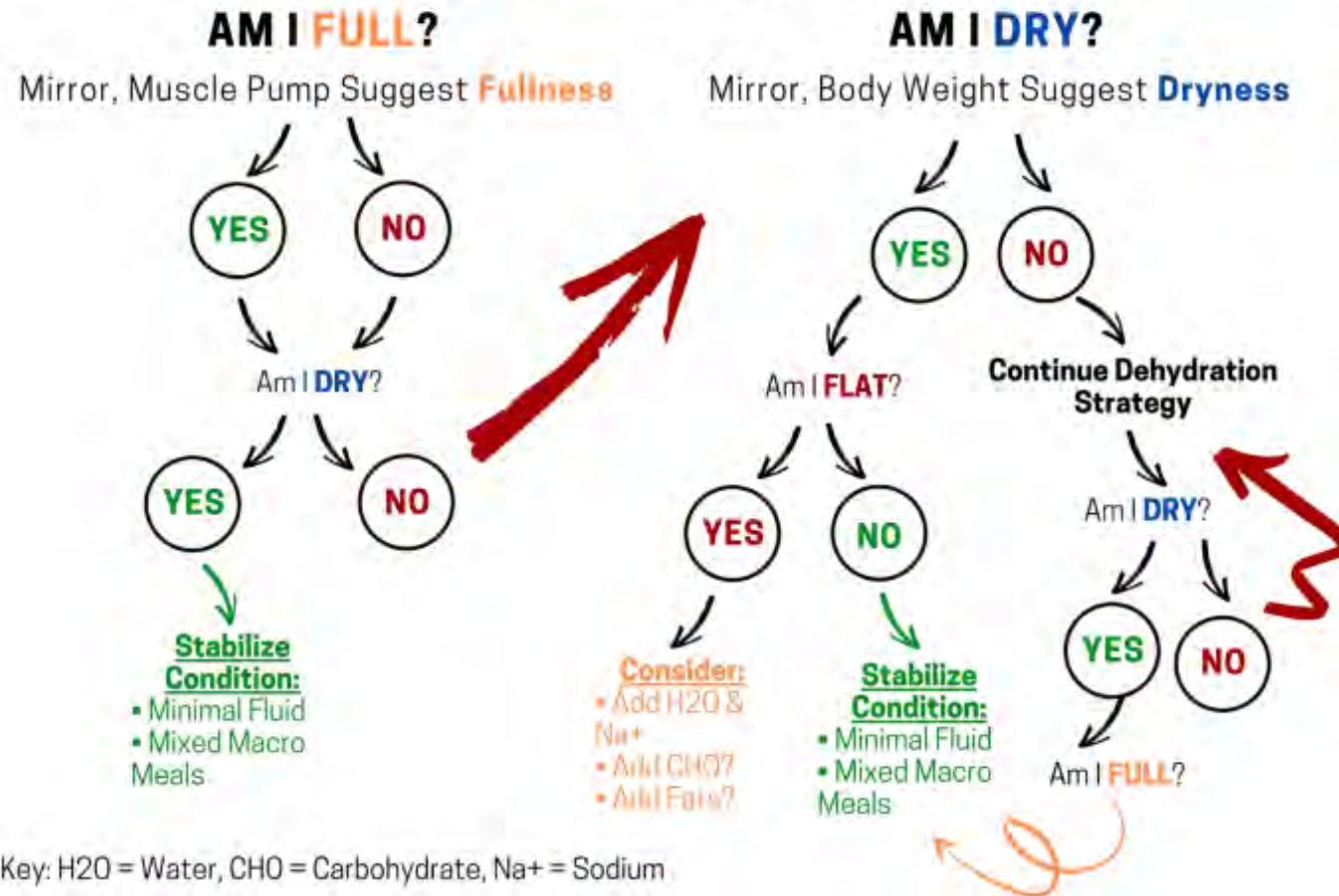


Peak Week Weight Change Insights (9)

	Body Weight (BW in lbs)		Note	Insight
Sunday (Start of Peak Week)		202	End of diet before peak week	
Wednesday AM (Pre-Glycogen Loading)		200	After 2-3 days of lower carbohydrate intake	
Friday AM (Post-Glycogen Loading)		205	After higher carbohydrate intake	Weight gain suggests glycogen super compensation
Saturday AM (Competition Day)	S C E N A R I O S	202	Clear urination and BW consistently falling	Further dehydration may improve appearance
		200	Minimal and darker urination with BW slowing	Water loss has been effective
		198	Urination ceased and BW constant	Very likely dehydrated, beware of being "flat"

Competition Day Adjustments (9)

Competition Day Competitor Adjustments: Muscle Fullness vs. Physique Dryness



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Questions?

