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Carbohydrate Cycling as a Tool for Managing Body Composition in the Pre-Contest Phase

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Abstract

The study synthesizes evidence on carbohydrate cycling as a programmable lever for pre-contest physique preparation. The analysis integrates findings on glycogen manipulation, microcycle planning, intermittent energy restriction, and peak-week execution to delineate when low- and high-carbohydrate days preserve muscle size, enable high training volumes, and produce stage-ready morphology. The review consolidates reported loading windows (≈36–48 hours), intake bands compatible with supercompensation, and safety considerations regarding fluids and electrolytes. The work distinguishes scheduling effects from claims of metabolic "advantage," emphasizing that net energy balance governs fat loss while carbohydrate availability governs performance and appearance. The objective is to derive an operational template linking training tasks, glycogen trajectories, and loading cadence. Methods include comparative analysis of recent trials, case evidence, and narrative/quantitative syntheses, with cross-checking across endurance-derived glycogen data and physique-specific sources. The conclusions outline a decision framework for mesocycle and peak-week planning and specify boundary conditions for carbohydrate restriction and refeeding. The paper will assist coaches, competitive athletes, and applied sport nutritionists.

Keywords: *Carbohydrate Cycling, Peak Week, Glycogen Supercompensation, Physique Athletes, Intermittent Energy Restriction, Refeeds, Diet Breaks, Nutrient Timing, Body Composition, Pre-Contest Preparation.*

INTRODUCTION

Competitive physique preparation compresses concurrent targets—progressive fat loss, retention of fat-free mass, and a visually "full" muscle profile on stage—into a finite timeline. Carbohydrate availability interacts with these targets through its control of glycogen storage, cell volume, and the capacity to sustain higher-volume resistance work. Intermittent energy restriction and structured refeeds have been proposed to modulate endocrine strain without sacrificing the cumulative energy deficit required for fat loss. Practice documents from physique sport converge with endurance-derived glycogen data to justify brief depletion followed by staged loading in the final week, while alerts remain regarding fluid and electrolyte manipulation.

The aim is to construct an operational, evidence-anchored model for carbohydrate cycling across the final mesocycle and peak week that links training structure, glycogen management, and stage-day appearance. Tasks:

1) Systematize reported depletion/loading windows, intake ranges, and session pairing within a seven-day pre-contest timeline.
2) Compare continuous versus intermittent restriction with respect to fat-free mass, resting metabolic rate, and adherence, and position refeeds/diet breaks within the mesocycle.
3) Define boundary conditions and risks (hydration/electrolytes, gastrointestinal tolerance, performance under low carbohydrate) and translate them into practical safeguards.

Novelty – the paper fuses endurance-grade evidence on glycogen supercompensation with physique-specific case data and recent controlled work to produce a single, testable scheduling scheme for carbohydrate cycling that is explicitly mapped to session demands and peak-week logistics.

MATERIALS AND METHODS

The evidence base comprises peer-reviewed sources from the last five years, cross-checked for internal consistency and extracted for operational parameters (loading duration, intake bands, session alignment, fluid/electrolyte handling, endocrine and performance responses). The following contributions anchor the synthesis: C. Barakat [1] reported

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measurable increases in ultrasound-assessed muscle thickness and reductions in subcutaneous thickness during peak-week carbohydrate manipulation. B. I. Campbell [2] tested intermittent energy restriction in resistance-trained individuals and documented attenuation of losses in fat-free mass and resting metabolic rate versus continuous restriction at matched energy deficits. W. Cao [3] summarized endurance-sport carbohydrate strategies and loading windows relevant to glycogen supercompensation. G. Escalante [4] provided practice recommendations for peak-week planning in bodybuilders, including depletion-loading cadence and fluid/sodium stewardship. M. Henselmans [5] synthesized trials on carbohydrate provision and resistance performance, clarifying when acute availability affects work capacity. K. A. Homer [6] reviewed peak-week practices in physique competitors, emphasizing carbohydrate-centered approaches and safety. K. A. Homer [7] presented preliminary experimental data on a bodybuilding carbohydrate-loading protocol and competition-specific outcomes. A. J. Ritson [8] presented a contest-prep case with physiological indicators of low energy availability and partial normalization after brief energy repletion. M. R. Siedler [9] ran a randomized trial on diet breaks during energy restriction in trained females with body-composition and metabolic endpoints. D. Søegaard [10] examined carbohydrate restriction during recovery from high-intensity exercise and its effect on next-day performance and substrate use.

A comparative analytical review combined structured source extraction, cross-study triangulation, and integrative synthesis; evidence was mapped into a week-level scheduling template and two decision tables; narrative appraisal assessed external validity to physique sport; where possible, conclusions were stress-tested against convergent findings from endurance and resistance-training literatures.

RESULTS

Energy and substrate periodization before competition relies on alternating low- and high-carbohydrate days to align glycogen availability with the training microcycle while preserving visual "fullness" on stage. Observational and experimental data from physique athletes indicate that peak-week carbohydrate manipulation—after a preceding depletion phase—expands muscle thickness and subjective fullness while reducing subcutaneous thickness, consistent with intracellular water shifts into the myocyte [1, 4, 6].

Intermittent energy restriction frameworks that incorporate planned refeed days or diet breaks reduce the cumulative strain of prolonged caloric deficit and blunt the decline of fat-free mass and resting metabolic rate relative to continuous restriction during contest preparation; randomized work in resistance-trained participants confirms attenuation of these losses with intermittent approaches, while similar trials with multiday "diet breaks" report non-inferiority for body-composition outcomes alongside better weight-loss efficiency [2, 3, 9].

Across the final mesocycle, carbohydrate cycling modifies glycogen trajectories with predictable performance and morphology consequences. High-carbohydrate loading over ~36–48 h restores or supercompensates glycogen, with endurance data showing doubling potential under sustained intakes of ~8–12 $g \cdot kg^{-1} \cdot day^{-1}$; physique-sport synthesis papers and athlete reports converge on similar loading windows, executed after short-term depletion to accentuate muscle volume on show day [3, 4, 6].

Acute carbohydrate availability exerts small effects on single, moderate-volume strength sessions, yet benefits emerge as total work per muscle group increases and as glycogen becomes limiting; a systematic review in trained lifters finds that, in a fed state up to ~10 sets per muscle group, performance is largely maintained, implying that strategic low-carbohydrate days can be allocated to lower-priority or skill-dominant sessions without compromising progression [5].

Peak-week field and laboratory observations in bodybuilders document that coordinated carbohydrate loading (after brief depletion) increases ultrasound-assessed muscle thickness and shifts body water toward the intracellular compartment, while subcutaneous thickness decreases—precisely the visual change sought on stage. Safety signals show that aggressive water manipulations risk dehydration, whereas carbohydrate-centered peaking achieves the target appearance without compromising hydration when electrolytes are not unduly restricted [1, 6].

Evidence from a detailed case report during 18 weeks of contest preparation highlights endocrine and metabolic costs of sustained low energy availability—clinically low free T3 and depressed resting energy expenditure—yet documents partial normalization of thyroid function after two days of modest energy repletion, supporting the rationale for periodic carbohydrate refeeding to mitigate metabolic down-regulation during the lead-in to peak week [8].

Two controlled investigations of "intermittent dieting" approaches refine the practical bounds of cycling: a randomized trial in trained women reported equivalent body-composition change between intermittent and continuous restriction across identical net deficits, while a synthesis of intermittent dieting with strategic break periods indicates comparable or, in some designs, more efficient fat loss at similar calorie exposure; together, these findings constrain claims around "metabolic advantage," while preserving strong justification for carbo-refeeds as behavioral and endocrine relief valves in physique preparation [9, 3].

Parallel work on carbohydrate restriction during recovery from high-intensity exercise shows maintained next-day performance in trained subjects despite enhanced fat oxidation, implying that low-carbohydrate days can be positioned after lower-glycogen-cost sessions to cultivate metabolic flexibility without undermining subsequent training quality—provided that high-carbohydrate loading precedes key volume or stage-rehearsal days [10].

Schematic integration of these strands yields a reproducible pre-contest template anchored in microcycle-level carbohydrate periodization. Figure 1 depicts a seven-day sequence that consolidates the literature: early-week depletion aligned to lower-priority sessions; mid-to-late-week staged loading that ramps toward 6–10 $g \cdot kg^{-1} \cdot day^{-1}$ depending on muscle mass and gastrointestinal tolerance; show-day top-ups calibrated from individual backstage "pump" responses. The loading envelope and timing follow endurance-grade glycogen data [3] while the specific peaking cadence reflects physique-sport syntheses and case-level observations [1, 4, 6].

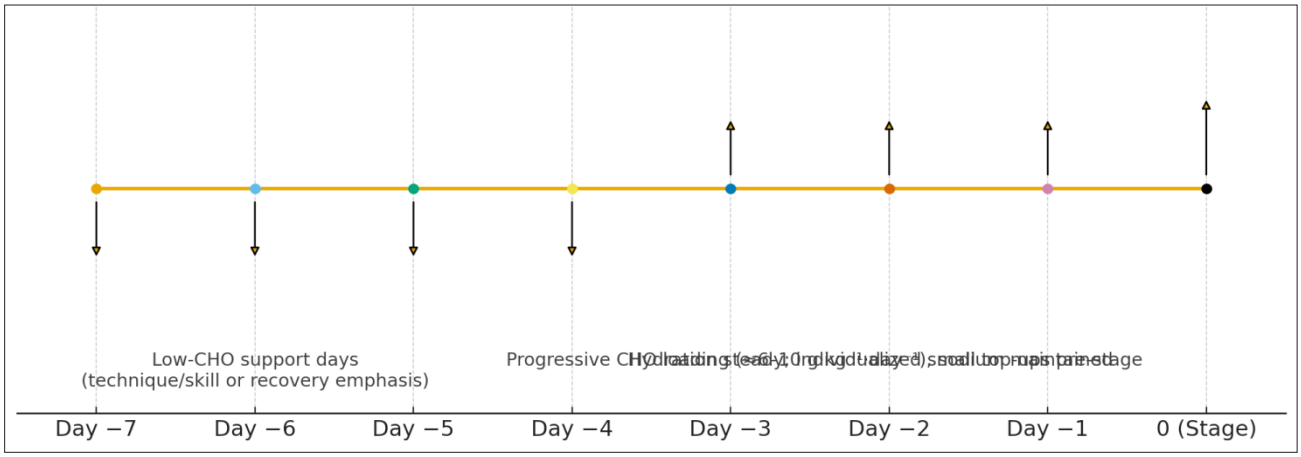

Figure 1. Evidence-informed seven-day carbohydrate-cycling timeline for the pre-contest microcycle (adapted from [1, 3, 4, 6]).

To operationalize in real prep, the data support:

1) prioritizing high-carbohydrate days for the heaviest volume or full-body "pump" work late in the week,

2) reserving lower-carbohydrate days for technical, posing, low-volume, or active-recovery work,

3) avoiding aggressive sodium/water restriction in the final 72 hours to minimize dehydration risk,

4) inserting one-day refeeds during earlier mesocycles when psychological strain or training quality deteriorate, with the understanding that aggregate energy deficit—not cycling per se—drives the fat-loss endpoint [1, 2, 5, 6, 9].

Finally, boundary conditions emerge from ketogenic and very-low-carbohydrate syntheses: strength outcomes in trained participants appear largely intact, but hypertrophy and high-volume anaerobic performance trend downward under restrictive carbohydrate provision, a pattern incompatible with the visual aims of physique peaking; thus, carbohydrate cycling that culminates in staged loading remains the pragmatic route for preserving muscle size and stage fullness while reaching requisite leanness

DISCUSSION

Aligning the evidence on glycogen management, training volume, and physique-specific peaking shows that carbohydrate cycling functions as a scheduling tool rather than a metabolic shortcut. Short-term depletion followed by staged loading consistently associates with the visual outcomes prized by physique athletes—greater muscle thickness and subjective "fullness" with reduced subcutaneous thickness—while avoiding the dehydration risk that accompanies aggressive water or sodium manipulation when electrolytes are sensibly maintained [1, 4, 6, 7]. The magnitude and timing of this effect match endurance-derived supercompensation windows, in which 36–48 hours of high carbohydrate intake after prior reduction restore or even supercompensate glycogen stores; translating that cadence to physique preparation appears to produce similar volumizing benefits when loading is paired with pump-oriented sessions close to competition [3, 4, 6].

The practical boundary of "how low" and "how often" to reduce carbohydrate depends on session demands. When sets per muscle group remain modest and athletes arrive fed, resistance performance is largely maintained, implying that low-carbohydrate days can be scheduled for lower-priority, technical, posing, or recovery work without compromising progression [5]. Where total work rises and glycogen turnover accelerates, carbohydrate availability becomes more predictive of output; hence the logic of concentrating higher carbohydrate just before the heaviest or stage-rehearsal days, while placing carbohydrate restriction in recovery windows, a configuration that enhances fat oxidation yet preserves next-day performance in trained subjects [10]. Together these results argue for microcycle-level matching of carbohydrate targets to the mechanical and metabolic cost of each day rather than a uniform restriction [5, 10].

Intermittent energy restriction strategies—single-day refeeds or planned "diet breaks"—operate less as fat-loss accelerators than as adherence and endocrine management tools. Randomized and controlled data in resistance-trained populations indicate that, at equal cumulative deficits, body-composition outcomes are comparable to continuous restriction; the distinctive signal lies in attenuating declines in fat-free mass and resting metabolic rate and in enabling athletes to sustain the preparatory arc under high cognitive and emotional load [2, 9]. Case-level physiology during contest preparation adds plausibility: markers consistent

with low energy availability (including thyroid hormones) show partial normalization after brief energy repletion, supporting periodic carbohydrate refeeding as a targeted countermeasure during long dieting blocks [8]. In other words, the case for cycling rests on aligning carbohydrate availability with session purpose and on strategically interrupting the endocrine and behavioral costs of sustained deficit, not on expectations of a "metabolic advantage" beyond the arithmetic of energy balance [2, 8, 9].

A synthesis of practice-facing parameters is provided in Table 1. It collates the interventions most frequently described across the included sources and the outcomes that matter for stage readiness, without prescribing a single numeric template.

Table 1. Operational features of pre-contest carbohydrate cycling and observed outcomes [1-10]

Intervention/practice	Observed or intended outcome
Short-term glycogen reduction followed by staged carbohydrate loading (~36–48 h; high g·kg^{-1}·day^{-1})	Increased muscle thickness and perceived fullness; reduced subcutaneous thickness; competition-specific appearance without dehydration when electrolytes are maintained
Alignment of high-carbohydrate days with high-volume or pump-oriented sessions near competition	Higher total work capacity where glycogen is limiting; improved morphology on stage day
Placement of low-carbohydrate days on recovery/technique/posing sessions	Maintained next-day performance when restriction is confined to recovery windows; increased fat oxidation
Intermittent refeeds or diet breaks within long deficits	Attenuation of FFM and RMR decline; comparable fat loss to continuous restriction at equal energy exposure
Preference for carbohydrate-centered peaking over aggressive fluid/sodium manipulation	Target appearance achieved with lower dehydration risk; practical safety profile
Brief energy repletion during extened prep	Partial normalization of thyroid-related markers; symptom relief consistent with reduced low-energy stress

The operational picture that emerges is hierarchical: session demands set the carbohydrate target, while the calendar location within the final mesocycle refines the amplitude and timing of depletion and loading. Endurance-derived supercompensation windows provide the intake horizon for the loading block, but physique-specific sources emphasize rehearsal, gastrointestinal tolerance, and stage-day logistics, moving the evidence base from theory to execution [3, 4, 6, 7]. Importantly, the resistance-training literature narrows claims about acute carbohydrate effects on strength, which helps prevent over-feeding on days when sets and muscle-group workloads are inherently modest [5].

Risk management remains central in peak week. The physique literature repeatedly cautions against aggressive dehydration tactics, since the desired intracellular shift in water follows carbohydrate-driven glycogen restoration rather than fluid withdrawal; this favors plans that keep electrolytes stable and prioritize carbohydrate staging [1, 4, 6, 7]. Equally practical are constraints around gastrointestinal throughput during loading, often solved by distributing intake and favoring lower-residue carbohydrate sources already tested earlier in prep [4, 6]. Endocrine and behavioral fragility under prolonged restriction provides the rationale for refeed or break insertion before the final microcycle, given the documented responsiveness of thyroid-related indices and resting expenditure to brief energy repletion [2, 8, 9]. Table 2 consolidates these constraints into a decision aid for the final mesocycle.

Table 2. Common constraints in pre-contest carbohydrate cycling and practical mitigations [1, 3-10].

Constraint	Practical mitigation
Gastrointestinal intolerance during loading	Rehearse foods and pacing; distribute carbohydrate across the day; prefer low-residue, familiar sources
Over-restriction of water/sodium in peak week	Maintain electrolytes and steady hydration; rely on staged carbohydrate loading for visual fullness
Loss of quality during high-volume sessions under low carbohydrate	Place low-carbohydrate days on recovery/technique sessions; reserve higher carbohydrate for heavy or pump-focused training
Endocrine suppression and metabolic down-regulation under sustained deficit	Schedule single-day refeeds or multi-day diet breaks earlier in the mesocycle; verify tolerance and return-to-deficit plan
"Spillover" or bloating when loading too late/too fast	Use staggered, 36–48-hour loading windows with monitoring and prior rehearsal
Extrapolation from endurance protocols without physique-specific validation	Pilot protocols during earlier mesocycles; integrate physique-specific case/experimental reports

Placing these findings into a periodized frame suggests a three-layer decision structure. First, anchor the microcycle by assigning carbohydrate peaks to the heaviest or stage-mimicking sessions and troughs to recovery or skill days, consistent with the differential impact of carbohydrate availability across volumes [5, 10]. Second, add refeeds or short breaks in earlier mesocycles when falling training quality, mood, or thermic markers hint at accumulating low-energy stress; evidence indicates preservation of fat-free mass and resting expenditure without compromising fat loss when the net deficit is held constant [2, 9]. Third, in the final week, employ brief depletion then staged loading within an endurance-derived window, executed with the physique-specific safeguards on fluids, sodium, and gastrointestinal tolerance documented in case and synthesis work [1, 3, 4, 6, 7].

Limitations in the current body of work temper prescriptive certainty. Most controlled carbohydrate-availability studies come from endurance or mixed-modality paradigms and only indirectly model the volumetric and morphological outcomes relevant to physique competition [3, 5, 10]. Physique-specific evidence—case analyses, practice syntheses, and early experimental reports—improves ecological validity but remains sparse and heterogeneous in protocol detail [1, 4, 6, 7]. Intermittent dieting trials establish useful bounds on claims about metabolic advantage, yet they do not standardize refeed carbohydrate sources, sodium handling, or exact timing against a peak-week backdrop [2, 9]. The safest inference, therefore, is procedural rather than absolutist: carbohydrate cycling provides a controllable lever for visual and performance targets when its amplitude and placement are keyed to session demands, rehearsed ahead of time, and embedded within a deficit-driven fat-loss strategy that includes planned relief from low energy availability.

CONCLUSION

The synthesis isolates carbohydrate cycling as a scheduling mechanism that aligns glycogen availability with training tasks while preserving stage-day morphology. Depletion followed by 36–48 hours of staged loading, executed with steady electrolytes and rehearsed food choices, produces the volumizing and subcutaneous-thickness profile sought at competition time. Intermittent restriction functions as a control valve for endocrine and behavioral strain rather than a shortcut to fat loss; net energy balance governs adiposity change, whereas carbohydrate timing governs the ability to maintain higher-volume sessions and achieve visual fullness. The operational template emerging from the review assigns low-carbohydrate days to recovery/skill work, positions higher-carbohydrate days before heavy or pump-focused sessions, and reserves peak-week for brief depletion and progressive loading with conservative hydration management. Boundary conditions include vigilance for gastrointestinal throughput, avoidance of aggressive fluid/sodium restriction, and prudent placement of refeeds or multi-day breaks in earlier mesocycles when training quality or well-being deteriorate. The resulting framework closes the loop on the stated tasks by specifying parameters, comparing restriction modes, and codifying safeguards into a coherent, practitioner-ready plan.

REFERENCES

1. Barakat, C., Escalante, G., Stevenson, S. W., Bradshaw, J. T., Barsuhn, A., Tinsley, G. M., & Walters, J. (2022). Can bodybuilding peak week manipulations favorably affect muscle size, subcutaneous thickness, and related body composition variables? Sports, 10(7), 106. https://doi.org/10.3390/sports10070106
2. Campbell, B. I., Aguilar, D., Colenso-Semple, L. M., Hartke, K., Fleming, A. R., Fox, C. D., Longstrom, J. M., Rogers, G. E., Mathas, D. B., Wong, V., Ford, S., & Gorman, J. (2020). Intermittent energy restriction attenuates the loss of fat free mass in resistance trained individuals: A randomized controlled trial. Journal of Functional Morphology and Kinesiology, 5(1), 19. https://doi.org/10.3390/jfmk5010019
3. Cao, W., He, Y., Fu, R., Chen, Y., Yu, J., & He, Z. (2025). A review of carbohydrate supplementation approaches and strategies for optimizing performance in elite long-distance endurance. Nutrients, 17(5), 918. https://doi.org/10.3390/nu17050918
4. Escalante, G., Stevenson, S. W., Barakat, C., Tinsley, G. M., Trexler, E. T., & Campbell, B. I. (2021). Peak week recommendations for bodybuilders: An evidence-based approach. BMC Sports Science, Medicine and Rehabilitation, 13, 68. https://doi.org/10.1186/s13102-021-00296-y
5. Henselmans, M., Bjørnsen, T., Hedderman, R., & Vårvik, F. T. (2022). The effect of carbohydrate intake on strength and resistance training performance: A systematic review. Nutrients, 14(4), 856. https://doi.org/10.3390/nu14040856
6. Homer, K. A., Cross, M. R., & Helms, E. R. (2024). Peak week carbohydrate manipulation practices in physique athletes: A narrative review. Sports Medicine - Open, 10(1), 8. https://doi.org/10.1186/s40798-024-00674-z
7. Homer, K. A., Jukic, I., Cross, M. R., & Helms, E. R. (2024). The effect of a bodybuilding carbohydrate-loading protocol on anthropometry: Preliminary findings from a randomized crossover trial. Nutrition, 127, 112528. https://doi.org/10.1016/j.nut.2024.112528
8. Jiménez-Martínez, P., Alix-Fages, C., Helms, E. R., Espinar, S., González-Cano, H., Baz-Valle, E., Janicijevic, D., García-Ramos, A., & Colado, J. C. (2024). Dietary supplementation habits in international natural bodybuilders during

pre-competition. Heliyon, 10(5), e26730. https://doi.org/10.1016/j.heliyon.2024.e26730

9. Ritson, A. J., McDonald, L., Agu, J., & Bannock, L. G. (2024). From semi-starvation to the stage: A case report on indicators of low energy availability in a drug-free bodybuilder during contest preparation and peak week. Frontiers in Nutrition, 11, 1465001. https://doi.org/10.3389/fnut.2024.1465001
10. Siedler, M. R., Lewis, M. H., Trexler, E. T., Lamadrid, P., Waddell, B. J., Bishop, S. F., SanFilippo, G., Callahan, K., Mathas, D., Mastrofini, G. F., Henselmans, M., Vårvik, F. T., & Campbell, B. I. (2023). The effects of intermittent diet breaks during 25% energy restriction on body composition and resting metabolic rate in resistance-trained females: A randomized controlled trial. Journal of Human Kinetics, 86, 117–132. https://doi.org/10.5114/jhk/159960