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Commentary

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Leveraging Dairy Protein in Low-Carbohydrate Diets: A Strategy for Improved Postprandial Blood Sugar Control

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Abstract

In the global fight against diabetes and metabolic disorders, dietary interventions such as low-carbohydrate diets (LCDs) have gained traction for their ability to stabilize blood glucose (BG) levels and improve insulin sensitivity. The Japan Low Carbohydrate Diet Promotion Association promotes three levels of carbohydrate restriction: super, standard, and petite LCDs, which contain 12%, 26%, and 40% of total calories from carbohydrates, respectively. Whey protein consumed as a premeal supplement can diminish postprandial BG elevations and could serve as an excellent adjunct to meals containing higher levels of carbohydrates, such as the petite and standard LCDs.

Keywords

Whey, Glucagon-Like Peptide-1, Low-Carbohydrate Diet, Gestation Diabetes Mellitus, Type 2 Diabetes, Blood Glucose

Abbreviations

GLP-1: Glucagon-Like Peptide-1; LCD: Low-Carbohydrate Diet; GDM: Gestation Diabetes Mellitus; T2D: Type 2 Diabetes; BG: Blood Glucose

Introduction

Metabolic dysfunction is becoming a more prevalent issue globally, manifesting as increasing rates of chronic disease. Dietary interventions are gaining recognition as a first-line approach for many conditions. Low-carbohydrate diets (LCDs) have gained traction for their ability to stabilize blood glucose (BG) levels and improve insulin sensitivity. The American Diabetes Association (ADA) reports that carbohydrate reduction has the "most evidence" for improving glucose variability [1]. The Japan Low Carbohydrate Diet Promotion Association (JLCDPA) promotes three levels of carbohydrate restriction: super, standard, and petite LCDs, which contain 12%, 26%, and 40% of calories from carbohydrates, respectively [2].

There are two major dairy proteins: whey and casein. Whey is rapidly metabolized compared to casein, leading to faster glucagon-like peptide-1 (GLP-1) and insulin secretion, making it a promising therapeutic tool

for individuals with metabolic dysfunction. Consumed as a premeal supplement, whey protein can reduce postprandial BG elevations [3] and serves as an effective adjunct to meals with higher carbohydrate content, such as the petite and standard LCDs.

Premeal Whey Protein

Whey increases both total and intact GLP-1 [4], which delays gastric emptying, increases satiety, and augments glucose-dependent insulin secretion. In a randomized, crossover clinical trial involving women with gestational diabetes mellitus (GDM) and those with normal glucose tolerance (NGT), published in *Diabetes Care*, it was demonstrated that premeal whey protein significantly reduces postprandial BG excursions in women [3]. Participants consuming 20 g of whey protein 30 minutes before a 75-g oral glucose tolerance test (OGTT) significantly lowered the incremental area under the curve (iAUC) for postprandial BG, with 15–30 g of whey being particularly effective for women with GDM. This effect is attributed to the rich content of branched-chain amino acids (BCAAs) in whey, which stimulate insulin secretion, and the ability of whey to slow gastric emptying, delaying carbohydrate absorption. These mechanisms align with the major goals of initiating and maintaining LCDs, which aim to minimize postprandial BG spikes and maintain stable BG levels.

Whey protein's benefits extend beyond GDM. Other studies have shown that dairy protein intake before meals increases insulin response and reduces postprandial glycemia in individuals with type 2 diabetes (T2D). For example, a 2004 study found that a high-protein LCD significantly reduced 24-hour glucose levels in people with untreated T2D, suggesting that protein-rich interventions can enhance glycemic control [5,6]. Indeed, signs of improved insulin sensitivity, such as reductions in HOMA-IR and triglyceride levels, have been demonstrated [7]. Whey achieves this in part by increasing certain serum amino acids, which in turn stimulate L-cell secretion of GLP-1 [8], known to enhance glucose-dependent insulin secretion (**Fig-1**). The GLP-1 receptor agonist exenatide has been shown to inhibit hepatic glucose appearance, increase glucose disappearance, and slow glucose absorption [9], but the hepatic effects of whey supplementation are not yet fully elucidated. These findings demonstrate the potential of whey as a dietary adjunct for managing BG in various populations, although long-term effects are not yet fully known.

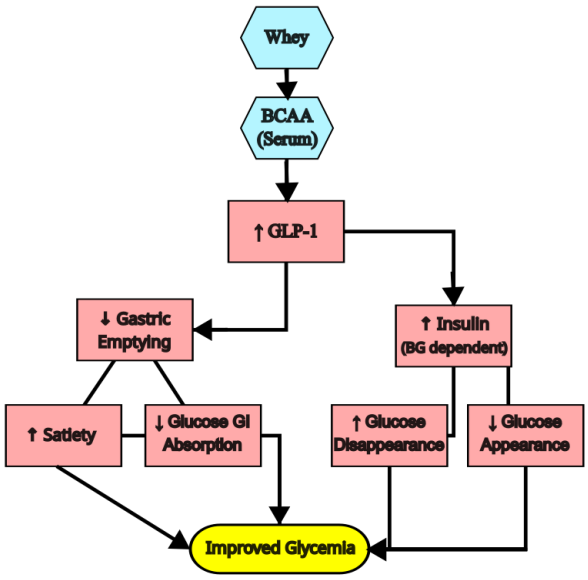

Fig-1: Proposed Mechanism of Premeal Whey Supplementation

Super, Standard, and Petite LCDs

LCDs are categorized based on carbohydrate intake: super, standard, and petite LCDs, which contain 12%, 26%, and 40% of calories from carbohydrates, respectively [2]. The JLCDPA advocates for these diets to prevent and manage metabolic disorders. A petite LCD, which allows for two meals each containing a serving of primarily carbohydrate-containing foods such as rice or pasta, offers moderate restriction for individuals seeking to lose a few pounds or with minimal metabolic issues. It is particularly accessible for individuals transitioning from high-carbohydrate diets. A standard LCD allows for just one meal with carbohydrate-rich foods, is more restrictive, and is often used by those with prediabetes or mild insulin resistance to achieve tighter glycemic control. Both approaches aim to reduce the glycemic load of meals, and adherence is easier to achieve than with the super LCD (which removes carbohydrate-rich foods entirely), particularly in cultures like Japan, where social norms discourage leaving food uneaten at restaurants and social gatherings. Strict carbohydrate restriction, while optimal for moderate to severe disease, can complicate dietary adherence for individuals who frequently dine socially for work.

Premeal whey protein offers a solution by enhancing glycemic control without requiring carbohydrate reductions and could enhance the benefits of petite and standard LCDs. For such individuals, consuming 15–30 g of whey protein before meals could allow moderate carbohydrate intake while mitigating glucose spikes and improving adherence.

Modest Rice Consumption in Milder Disease States

In Japan, rice consumption is deeply ingrained, posing a challenge for low-carbohydrate diet adoption. Even on a standard LCD, individuals may include small portions of rice (e.g., 50–100 g cooked, ~15–30 g carbohydrates) at lunch. The high glycemic index of rice can cause rapid BG spikes, undermining the goals of an LCD. Evidence provided above suggests that consuming whey protein before such a meal could counteract these effects by enhancing insulin secretion and slowing gastric emptying. This allows individuals to maintain cultural dietary practices while adhering to a standard LCD, making the diet more sustainable.

For example, an individual on a standard LCD consuming 80 g of carbohydrates daily could allocate 20–30 g to a small serving of rice at lunch. By taking 20 g of whey protein 30 minutes prior, they could reduce the postprandial BG spike, as demonstrated in the *Diabetes Care* study mentioned above [3]. This approach aligns with the JLCDPA goal of promoting therapies that minimize harm and death to individuals.

Premeal whey protein could enhance the less restrictive forms of LCD by providing a buffer against BG spikes, even when modest amounts of high-glycemic foods like rice are consumed. Premeal whey utilization could appeal to a broader audience, including those hesitant to fully eliminate traditional foods. Additionally, whey protein could play a significant role in improving insulin sensitivity and reducing diabetes risk, and be a powerful adjunct to LCDs. Collaboration with healthcare providers to educate patients on incorporating whey protein into petite or standard LCDs shows promise as a beneficial strategy to maintain good glycemic control.

Practical Implementation and Considerations

Incorporating premeal whey protein is straightforward. A 15 - 30 g dose can be consumed as a shake, mixed with water or milk, or incorporated into foods like yogurt or smoothies. The timing - 30 minutes before a meal - is critical to maximize insulin response and delay gastric emptying. For individuals on a petite LCD, this could complement a diet containing carbohydrate-rich foods such as fruits, rice, or whole grains. For individuals on a standard LCD, it could allow occasional inclusion of rice or other carbohydrate-rich foods without compromising glycemic goals.

However, considerations include cost, accessibility, and dietary preferences. Whey protein supplements may be expensive for some, and lactose intolerance could limit dairy-based options. Non-dairy protein alternatives, such as pea or soy protein, could be considered, though their efficacy for glycemic control requires further study. Additionally, individuals should consult healthcare providers to ensure that whey protein aligns with their health needs.

Conclusion

Premeal whey protein offers a promising strategy to enhance the efficacy of LCDs, particularly for managing postprandial BG. Consuming 15–30 g of premeal whey reduces glucose excursions [4], making it a valuable tool for petite and standard LCDs. For individuals in Japan, where rice is a dietary staple, whey protein can mitigate the glycemic impact of modest carbohydrate intake, supporting cultural dietary practices within a low-carbohydrate framework. The JLCDPA can leverage this evidence to promote flexible, sustainable LCDs, enhancing their appeal and effectiveness. By integrating whey protein into dietary strategies, individuals can achieve better glycemic control, paving the way for improved metabolic health and diabetes prevention. Further research is required to determine the long-term effects of premeal whey protein, particularly when used with LCDs.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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References

[1] Evert AB, Dennison M, Gardner CD, Garvey WT, Lau KHK, MacLeod J, Mitri J, Pereira RF, Rawlings K, Robinson S, Saslow L, Uelmen S, Urbanski PB, Yancy WS Jr. Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report. Diabetes Care. 2019 May;42(5):731-54. [**PMID**: 31000505]

[2] Bando H, Ebe K. Beneficial and Convenient Method of Low Carbohydrate Diet (LCD) as Petite, Standard and Super LCD. Asp Biomed Clin Case Rep. 2023 Nov 04;7(1):1-4.

[3] Smedegaard S, Kampmann U, Ovesen PG, Suder LB, Knudsen JH, Wegener G, Brunsgaard LH, Rittig N. Premeal Whey Protein Lowers Postprandial Blood Glucose in Women With Gestational Diabetes Mellitus: A Randomized, Crossover Clinical Trial. Diabetes Care. 2025 Jun 1;48(6):1022-31. [**PMID**: 40261798]

[4] Jakubowicz D, Froy O, Ahrén B, Boaz M, Landau Z, Bar-Dayan Y, Ganz T, Barnea M, Wainstein J. Incretin, insulinotropic and glucose-lowering effects of whey protein pre-load in type 2 diabetes: a randomised clinical trial. Diabetologia. 2014 Sep;57(9):1807-11. [**PMID**: 25005331]

[5] Gannon MC, Nuttall FQ. Effect of a high-protein, low-carbohydrate diet on blood glucose control in people with type 2 diabetes. Diabetes. 2004 Sep;53(9):2375-82. [**PMID**: 15331548]

[6] Smith K, Taylor G, Brunsgaard LH. Effects of whey protein on gastric emptying and glycaemic control in type 2 diabetes. Am J Clin Nutr. 2016 Dec;104(6):1512-19.

[7] Pal S, Ellis V, Dhaliwal S. Effects of whey protein isolate on body composition, lipids, insulin and glucose in overweight and obese individuals. Br J Nutr. 2010 Sep;104(5):716-23. [**PMID**: 20377924]

[8] Rigamonti AE, Leoncini R, De Col A, Tamini S, Cicolini S, Abbruzzese L, Cella SG, Sartorio A. The Appetite-Suppressant and GLP-1-Stimulating Effects of Whey Proteins in Obese Subjects are Associated with Increased Circulating Levels of Specific Amino Acids. Nutrients. 2020 Mar 15;12(3):775. [**PMID**: 32183423]

[9] Gastaldelli A, Gaggini M, Daniele G, Ciociaro D, Cersosimo E, Tripathy D, Triplitt C, Fox P, Musi N, DeFronzo R, Iozzo P. Exenatide improves both hepatic and adipose tissue insulin resistance: A dynamic positron emission tomography study. Hepatology. 2016 Dec;64(6):2028-37. [**PMID**: 27639082]

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