The Effect of Protein on Blood Sugar Control and Insulin Sensitivity

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Type 2 diabetes mellitus (T2DM) is characterized by elevated blood glucose levels due to insulin resistance and relative insulin deficiency, leading to metabolic disturbances in the lipid profile, including alterations in high-density lipoprotein, low-density lipoprotein, total cholesterol, and triglyceride levels[1].

IMPORTANCE OF MANAGING INSULIN SENSITIVITY IN DIABETES

- Insulin resistance is suggested as the most potent individual predictor for the onset of type 2 diabetes[2].
- Dietary composition and the distinct metabolic impacts of specific nutrients exert noteworthy additional influences on insulin resistance[2].
- While these effects are generally modest, with adjustments to insulin resistance and diabetes risk falling within the range of 10% to 30%, they could hold significant importance on a population-wide scale[2].

INTERVENTIONS TO IMPROVE INSULIN SENSITIVITY AND CONTROL BLOOD SUGAR

- Numerous studies suggest that weight loss can enhance insulin sensitivity and decrease the risk of diabetes and cardiovascular disease[3].
- High-protein diets have gained popularity for weight loss and body composition improvement, demonstrating modest benefits over standard protein and relatively high carbohydrate diets, at least in the relatively short-term (1 to 2 years)[3].

EFFECT OF PROTEIN ON BLOOD SUGAR CONTROL AND INSULIN SENSITIVITY

- Studies have investigated the impact of high-protein diets on insulin sensitivity using direct assessment methods[4,5]. High-protein diets have shown to enhance glucose metabolism and increase insulin sensitivity among individuals with T2DM[6-8].
- Comparisons of dietary interventions between high-protein and high-carbohydrate diets, specifically tailored for achieving a weight loss of around 5% or more of the total body weight, indicate that high-protein diets may contribute to enhancements in glucose metabolism and increased insulin sensitivity among obese individuals[4,5].
- A study in overweight women at risk of diabetes and following an ad libitum high-protein, high-fiber diet found improvements in body composition and conventional cardiometabolic risk factors, including static indices of insulin sensitivity, supporting the use of this approach for overweight individuals at risk of diabetes[9].

MECHANISMS BY WHICH PROTEIN IMPROVES BLOOD SUGAR AND INSULIN SENSITIVITY

- Dietary protein, being metabolized more slowly than dietary carbohydrates, leads to lower postprandial glucose and insulin responses compared to a high-carbohydrate meal[10,11].
- Layman and Baum proposed an alternative theory, suggesting that dietary protein stabilizes blood glucose concentrations when taken in higher quantities[12].

CLINICAL BENEFITS OF HIGH-PROTEIN DIET AND PROTEIN SUPPLEMENTATION

Additional Benefits of Protein in Older People with Diabetes

- In the context of older individuals with diabetes, protein intake assumes a crucial role in diabetes management[13].
- Adequate protein intake, especially at ≥1.0 g/kg body weight/day, is associated with better preservation of knee extension power and physical function in older adults with diabetes[13].

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- Additionally, low-protein intake, when combined with low energy intake, emerges as a risk factor for mortality in older patients with diabetes[14].
- Since diabetes is a widely recognized risk factor for sarcopenia, it is advisable to advocate for adequate protein intake in older individuals with diabetes, excluding those with end-stage renal failure[15].

Additional Benefits of Protein in Young People with Diabetes

- For young people with diabetes, nutrition therapy is recommended to maintain ideal body weight, support optimal growth and development, and prevent acute and chronic complications.
- Proper distribution and timing of protein intake, advice on suitable foods before and after exercise, and before sleep play crucial roles[16].
- Ensuring protein inclusion in the meal before exercise may help reduce the risk of hypoglycemia during exercise, and co-ingesting carbohydrates and protein post-exercise can attenuate the risk of late-onset hypoglycemia[16].
- The optimal macronutrient distribution, tailored to individual assessments, suggests carbohydrates at 40% to 50% of energy, fat at <35% of energy (with <10% saturated fat), and protein at 15% to 25% of energy[16].
- Research also suggests that milk may be advantageous post-exercise to prevent nocturnal hypoglycemia in individuals with type 1 diabetes[17].

CONCLUSION

In conclusion, effective management of blood sugar and insulin sensitivity is imperative in type 2 diabetes, with dietary interventions, especially those emphasizing high-protein intake, playing a pivotal role. The array of clinical advantages extends across age groups, highlighting the significance of incorporating protein, whether through dietary sources or supplements, to enhance overall quality of life.

The comprehensive evidence underscores the versatile benefits of protein in regulating blood sugar levels, providing valuable insights applicable to individuals of varying ages in the holistic management of diabetes.

REFERENCES

1. Yu Z, Nan F, Wang LY, Jiang H, Chen W, Jiang Y. Effects of high-protein diet on glycemic control, insulin resistance and blood pressure in type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials. Clin Nutr. 2020;39(6):1724-34.
2. Weickert MO. What dietary modification best improves insulin sensitivity and why? Clin Endocrinol. 2012;77(4): 508-12.
3. Santesso N, Akl EA, Bianchi M, Mente A, Mustafa R, Heels-Ansdell D, et al. Effects of higher-versus lower-protein diets on health outcomes: a systematic review and meta-analysis. Eur J Clin Nutr. 2012;66(7):780-8.
4. Piatti PM, Monti F, Fermo I, Baruffaldi L, Nasser R, Santambrogio G, et al. Hypocaloric high-protein diet improves glucose oxidation and spares lean body mass: comparison to hypocaloric high-carbohydrate diet. Metabolism. 1994;43(12):1481-7.
5. Farnsworth E, Luscombe ND, Noakes M, Wittert G, Argyiou E, Clifton PM. Effect of a high-protein, energy-restricted diet on body composition, glycemic control, and lipid concentrations in overweight and obese hyperinsulinemic men and women. Am J Clin Nutr. 2003;78(1):31-9.
6. Parker B, Noakes M, Luscombe N, Clifton P. Effect of a high-protein, high-monounsaturated fat weight loss diet on glycemic control and lipid levels in type 2 diabetes. Diabetes Care. 2002;25(3):425-30.
7. Gannon MC, Nuttall FQ, Saeed A, Jordan K, Hoover H. An increase in dietary protein improves the blood glucose response in persons with type 2 diabetes. Am J Clin Nutr. 2003;78(4):734-41.
8. Lombardo M, Bellia C, Moletto C, Aulisa G, Padua E, Della-Morte D, et al. Effects of quality and quantity of protein intake for type 2 diabetes mellitus prevention and metabolic control. Curr Nutr Rep. 2020;9(4):329-37.
9. Te Morenga L, Docherty P, Williams S, Mann J. The effect of a diet moderately high in protein and fiber on insulin sensitivity measured using the Dynamic Insulin Sensitivity and Secretion Test (DISST). Nutrients. 2017;9(12):1291.
10. Raben A, Agerholm-Larsen L, Flint A, Holst JJ, Astrup A. Meals with similar energy densities but rich in protein, fat, carbohydrate, or alcohol have different effects on energy expenditure and substrate metabolism but not on appetite and energy intake. Am J Clin Nutr. 2003;77(1): 91-100.
11. Nuttall FQ, Gannon MC, Wald JL, Ahmed M. Plasma glucose and insulin profiles in normal subjects ingesting diets of varying carbohydrate, fat, and protein content. J Am Coll Nutr. 1985;4(4):437-50.
12. Layman DK, Baum JI. Dietary protein impact on glycemic control during weight loss. J Nutr. 2004;134(4): 968S-973S.
13. Rahi B, Morais JA, Gaudreau P, Payette H, Shatenstein B. Energy and protein intakes and their association with a decline in functional capacity among diabetic older adults from the NuAge cohort. Eur J Nutr. 2016;55(4):1729-39.
14. Sone H, Katagiri A, Ishibashi S, Abe R, Saito Y, Murase T, et al; JD Study Group. Effects of lifestyle modifications

on patients with type 2 diabetes: the Japan Diabetes Complications Study (JDCS) study design, baseline analysis and three year-interim report. Horm Metab Res. 2002;34(9):509-15.

15. Tamura Y, Omura T, Toyoshima K, Araki A. Nutrition management in older adults with diabetes: a review on the importance of shifting prevention strategies from metabolic syndrome to frailty. Nutrients. 2020;12(11):3367.
16. Annan SF, Higgins LA, Jelleryd E, Hannon T, Rose S, Salis S, et al. ISPAD Clinical Practice Consensus Guidelines 2022: Nutritional management in children and adolescents with diabetes. Pediatr Diabetes. 2022;23(8):1297-321.
17. Hernandez JM, Moccia T, Fluckey JD, Ulbrecht JS, Farrell PA. Fluid snacks to help persons with type 1 diabetes avoid late onset postexercise hypoglycemia. Med Sci Sports Exerc. 2000;32(5):904-10.

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