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# The Balancing Interplay of Protein Intake to Optimize Kidney and Cardiovascular Health

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Recent guidelines on nutritional management for patients with chronic kidney disease (CKD) recommend a low-protein diet to help preserve quality of life and reduce mortality related to declining kidney function. These recommendations are based on relatively strong evidence for patients with advanced CKD without diabetes, and on expert opinion for those with diabetic kidney disease. However, beyond preserving renal function, there is a growing need to consider how nutritional management impacts cardiovascular disease (CVD) risk. From a cardiovascular perspective, high carbohydrate intake is known to increase the risk of CVD and stroke. This has been supported by numerous studies and systematic reviews, with some research indicating that Asian populations may be particularly vulnerable to CVD risks associated with high carbohydrate consumption. Among carbohydrate sources, sugar-sweetened beverages are of particular concern due to their effects on blood glucose levels and obesity. Furthermore, even fructose—often considered a sugar substitute—has been linked to increased uric acid levels, hypertension, atherosclerosis, and insulin resistance, underscoring the need to limit excessive intake. As an alternative to high carbohydrate intake, increasing protein consumption has been proposed, as it may improve lipid metabolism, glycemic control, and weight management, potentially reducing CVD risk. While early observational studies suggested that higher total protein intake may be associated with lower CVD risk, subsequent meta-analyses have shown mixed results regarding its impact on CVD and all-cause mortality. However, the intake of plant-based proteins has consistently been shown to lower CVD risk across studies. This may be due to the fact that animal-based proteins often contain metabolites such as heme iron and trimethylamine N-oxide (TMAO), which are linked to increased cardiovascular risk. Additionally, animal protein consumption is associated with worsening metabolic acidosis, further contributing to cardiovascular

complications.

**Keywords:** CKD, Cardiovascular risk, protein intake, TMAO, plant protein