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Effects of Consuming Ounce-Equivalent Portions of Animal- vs. Plant-Based Protein Foods, as Defined by the Dietary Guidelines for Americans on Essential Amino Acids Bioavailability in Young and Older Adults: Two Cross-Over Randomized Controlled Trials

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Abstract: Background: The Dietary Guidelines for Americans (DGA) recommends consuming a variety of “Protein Foods” based on “ounce-equivalent” (oz-eq) portions. No study has assessed the same oz-eq portions of animal- vs. plant-based protein foods on essential amino acid (EAA) bioavailability for protein anabolism in young and older adults. Objectives: We assessed the effects of consuming two oz-eq portions of pork, eggs, black beans, and almonds on postprandial EAA bioavailability in young and older adults. Methods: We conducted two investigator-blinded, randomized crossover trials in young ($n = 30$; mean age \pm SD: 26.0 ± 4.9 y) and older adults ($n = 25$; mean age \pm SD: 64.2 ± 6.6 y). Participants completed four testing sessions where they consumed a standardized meal with two oz-eq of either unprocessed lean pork, whole eggs, black beans, or sliced almonds. Blood samples were taken at baseline and 30, 60, 120, 180, 240, and 300 min postprandially. Plasma EAA bioavailability was based on postprandial integrated positive areas under the curve. Results: Participant age did not affect EAA bioavailability among the four protein foods tested. Two oz-eq portions of pork (7.36 g EAA) and eggs (5.38 g EAA) resulted in greater EAA bioavailability than black beans (3.02 g EAA) and almonds (1.85 g EAA) in young and older adults, separately or combined ($p < 0.0001$ for all). Pork resulted in greater EAA bioavailability than eggs in young adults ($p < 0.0001$), older adults ($p = 0.0007$), and combined ($p < 0.0001$). There were no differences in EAA bioavailability between black beans and almonds. Conclusions: The same “oz-eq” portions of animal- and plant-based protein foods do not provide equivalent EAA content and postprandial bioavailability for protein anabolism in young and older adults.

Keywords: dietary protein; protein recommendations; amino acid composition; protein quality; metabolism; protein synthesis; anabolic response; muscle; aging; ageing

1. Introduction

The 2020–2025 Dietary Guidelines for Americans (DGA) recommend that “Protein Foods” should be consumed as part of a healthy dietary pattern [1]. The protein foods group includes animal-based—red meats, poultry, fish, and eggs—and plant-based—soy products, beans, peas, and lentils, and nuts and seeds—protein-rich foods. The DGA uses ounce-equivalent (oz-eq) as the unit of measure to “identify the amount of (protein group) foods . . . with similar nutritional content” [1]. For example, one oz-eq equals one ounce of meat, one whole egg, 0.25 cups of beans, or 0.5 ounces of nuts. The basis for stating that these protein foods are “equivalent” and have “similar nutritional content” is unclear.