Plant and Animal Protein Intakes Are Differentially Associated with Large Clusters of Nutrient Intake that May Explain Part of Their Complex Relation with CVD Risk

Dear Editor:

We read with great interest the excellent review by Richter et al. (1) published in *Advances in Nutrition*. We would like to make some comments on the association between protein intake and nutrient intake that might throw some useful light on the point developed in that review.

In their careful review of the evidence that plant and animal protein differentially affect cardiovascular disease (CVD) risk, Richter et al. (1) largely developed the idea that an intake of these proteins is differentially associated with that of other nutrients, which should result in a confusion bias that precludes any firm conclusion that these effects are attributable to protein per se. Furthermore, they propose considerable heterogeneity in the association with the intake of other nutrients, because the specific sources of plant protein and animal protein are not rich in the same nutrients, which may explain the discrepant associations between animal protein intake and CVD outcomes. We very much adhere to this proposal and would like to further elaborate on the evidence at hand. In a recent work, we studied in detail the association between plant and animal protein intake and the nutrient adequacy of the diet of French adults (2). This nutrient adequacy was measured with the use of an integrative index that combined 35 probabilities of Adequate Intake for 24 nutrients. This method was able to account for the associations between plant and animal protein that are explained by both the nutrients associated with these proteins in the "whole food package" and the context in which they are consumed, i.e., what they may replace or displace. We showed that plant protein is strongly associated with nutrient adequacy. The association is very robust, because it holds true for all types of plant protein (cereals, legumes, nuts and grains, etc.) and both sexes. Using partial least square regression, we showed that the association between plant and animal protein intake and overall nutrient adequacy was not explained by a few nutrients but by virtually all of them taken together. This was particularly true for the intake of SFAs, sugars, potassium, sodium, folate, vitamin C, manganese, cholesterol, and fiber. Therefore, the list includes nutrients that are of more particular interest to CVD risk as discussed by Richter et al. (1), namely fiber, SFA, magnesium, and potassium—which are in part directly ascribed to the intake of plant (compared with animal) protein–rich foods—and sugars—which tend to result from a displacement related to the different food pattern associated with plant (compared with animal) protein intake. It also should be noted that the associations were considered after adjustment for potential confounding factors (such as energy, alcohol intake, age, and socioeconomic factors).

Furthermore, as predicted by Richter et al. (1), we indeed found in this population that animal protein intake (considered independently of plant protein intake) was not associated in such a simple way with nutrient intake and adequacy. In fact, the associations varied depending on the specific type of animal protein, with important contrasts between protein from fish and low-fat dairy (positively associated with the nutrient cluster related to global nutrient adequacy) and processed meat, cheese, and eggs (negatively associated). Interestingly, this global picture of the complex relation between plant and animal protein intake and nutritional adequacy recently was further corroborated by Philips et al. (3), who analyzed the dietary intake data from NHANES 2007–2010 and performed a review of the literature. The context of the whole diet is very important in examining the relation between protein intake and health-related outcomes (4).

We consider that although these data are still limited and fragmented, they lend credence to the suggestion that a large part of the association between plant and animal protein intake and CVD risk could be ascribed to the large nutrient cluster that they directly or indirectly convey. Nonetheless, we also consider, in the same way as Richter et al. (1), that the nature of a protein per se (i.e., the relative amounts of amino acids that it supplies) may affect CVD risk. As discussed by Richter et al. (1), there are a few potential mechanisms by which some amino acids can be expected to affect cardiovascular health, such as with arginine (5–7). However, in terms of plant compared with animal protein intake, it is necessary to further study how the association of certain amino acids may affect health. This may hold true for arginine and cysteine taken together (8), and for more complex associations, relative to the overall amino acid profile. In this respect, we would like to highlight the very recent publication by Jennings et al. (9), who studied the association between 7 (supposedly) cardioprotective amino acids and arterial stiffness and blood pressure. Interestingly, they found that whereas total plant protein intake and total animal protein intake were not associated with any of the outcomes assessed, a higher intake of these 7 amino acids from plant sources was associated with lower arterial stiffness.

Clearly, much remains to be done to try to decipher the relation between plant and animal protein intake and CVD, and the review by Richter et al. (1) is both timely and thorough. Refining dietary guidelines while taking into account the quality and nature of dietary proteins will be of considerable importance to public health in the near future.

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Note: The authors of the original article chose not to submit a reply.

Author disclosures: F Mariotti and J-F Huneau, no conflicts of interest.

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doi:10.3945/an.115.011932.