

## Abstract

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# The plasma proteome of plant-based diets: analyses of 2920 proteins in 49,615 people from the UK Biobank

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The investigation of proteomics, which describes the large-scale study of multiple proteins and their interconnected pathways, may enable a more comprehensive understanding of disease mechanisms due to the integral role of proteins in many biological processes <sup>(1)</sup>. Circulating protein levels can be altered by diet, but current evidence on this is limited. We aimed to assess differences in the plasma proteome between people of different habitual dietary groups, defined by degree of animal food consumption.

We used data from the UK Biobank <sup>(2)</sup> of middle-aged (mostly 40 to 69 years) men and women recruited throughout the UK between 2006-2010. Relative concentrations of 2920 plasma proteins were quantified using the Olink Proximity Extension Assay in blood samples from 49,615 (54% women) participants. All participants completed a touchscreen questionnaire, which asked about their consumption of red and processed meat, poultry, fish, dairy and eggs, as well as ethnicity and lifestyle habits. We defined six diet groups among the white British participants, including 23,243 regular meat eaters (red and processed meat consumption >3 times/wk), 23,472 low meat eaters, 486 poultry eaters, 1081 fish eaters, 721 vegetarians, and 54 vegans, and two diet groups among the British Indians, including 391 meat eaters and 167 vegetarians. We used multivariable linear regressions adjusting for key socio-demographic and lifestyle confounders to assess the differences in individual protein concentrations between diet groups, with correction for multiple testing based on the effective number of independent tests.

We observed significant differences in many plasma proteins by diet group. In the white British population, 632 plasma proteins were significantly different in one or more pairwise comparisons between regular meat eaters and at least one of the other diet groups ( $p$ -value < 0.000037), including 266 proteins for vegetarians and 15 proteins for vegans. Of the biggest differences, compared with regular meat eaters, vegetarians (and other non-meat eaters) had significantly higher FGF21 (+0.40 SD), CKB (+0.34), GUCA2A (+0.33), FOLR1 (+0.32), IGFBP2 (+0.31) and DSG2 (+0.30); all groups except the vegans had lower HAVCR1 (also called KIM-1, -0.38 in vegetarians). Vegetarians also had significantly lower SELENOP (-0.46), while the vegans had lower FGFBP2 (-0.68). The observed differences were generally similar in direction in both ethnicities, but only two proteins were significantly different (SUMF2 and ATRAID, both of which were higher in vegetarians) when comparing British Indian vegetarians and meat eaters, likely owing to the relatively small number of British Indians in the study.

In this first comprehensive assessment of plasma proteins by diet group, we identified many differences in proteins between groups defined by animal food consumption. The variations in protein levels suggest differences in various biological activities, including gastrointestinal tract and kidney function, which may relate to differences in future disease risk.

## References

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