

## EDITORIALS

## Low carbohydrate-high protein diets

Short term benefits of weight loss seem outweighed by longer term cardiovascular harms

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Low carbohydrate-high protein diets and their combinations (such as the Atkins diet) have become popular worldwide and are frequently adopted for weight control by lay people. These diets have also been suggested to have health benefits over low fat diets, mainly on the basis of results from short term intervention studies. These benefits include reductions in plasma triglyceride, glycated haemoglobin, and insulin concentrations as well as in systolic blood pressure,<sup>1-3</sup> with consequent improvements in conditions such as type 2 diabetes and non-alcoholic steatohepatitis.<sup>4</sup> However, the long term health effects of low carbohydrate-high protein diets are unclear, particularly as adherence to them has been associated with higher mortality from cardiovascular diseases in prospective cohort studies.<sup>5-7</sup> These conflicting results have fostered a debate over the benefits and risks of such diets.<sup>4</sup>

In the linked article (doi:10.1136/bmj.e4026), Lagiou and colleagues investigated the association between adherence to low carbohydrate-high protein diets and the incidence of cardiovascular disease in a prospective cohort of 43<th>396 Swedish women followed for an average of 15.7 years.<sup>8</sup> They looked for a diagnosis of incident cardiovascular disease, including ischaemic heart disease, ischaemic or haemorrhagic stroke, subarachnoid haemorrhage, or peripheral arterial disease. The women's habitual diet was assessed by use of food frequency questionnaires at baseline, and participants were grouped according to the macronutrient composition of their diets into tenths of low carbohydrate, high protein, and low carbohydrate plus high protein intake. Stronger adherence to any of these dietary patterns was consistently associated with a higher incidence of cardiovascular disease in a dose-response manner and independently of common risk factors. In particular, women had a 5% higher incidence of cardiovascular disease for each tenth of an increase in the low carbohydrate-high protein score, yielding a 62% higher incidence among women in the highest categories of low carbohydrate-high protein diets compared with the lowest.

In the context of previous studies,<sup>5-7</sup> Lagiou and colleagues provide further evidence that challenges the safety of long term adherence to low carbohydrate-high protein diets.<sup>8</sup> Although these results are based on an observational study, their biological

plausibility seems self evident. A low carbohydrate diet implies low consumption of wholegrain foods, fruits, and starchy vegetables and consequently reduced intake of fibre, vitamins, and minerals. A high protein diet may indicate higher intake of red and processed meat and thus higher intake of iron, cholesterol, and saturated fat. These single factors have previously been linked to a higher risk of major chronic diseases, including cardiovascular disease, in observational studies,<sup>9</sup> so it is not surprising that this combination of risk factors is linked to a higher incidence of disease and mortality.

As a consequence, long term adherence to low carbohydrate-high protein diets would require careful food choices, such as increased consumption of proteins from vegetables and cautious monitoring of saturated versus unsaturated fat intake, to avoid unfavourable eating patterns. This problem becomes even more challenging considering that these types of diets are mainly targeted at overweight and obese people, whose diets tend to be of lower quality. In addition, the higher incidence of cardiovascular disease in people following low carbohydrate-high protein diets was seen consistently across different protein sources and when adjusted for fat quality.<sup>8</sup> This further highlights the role of other factors not adjusted for by the authors, such as intake of fruits, vegetables, and fibre, and illustrates the complexity of these unfavourable eating patterns that may result from such diets.

A multinational randomised controlled trial recently found that adherence to a high protein diet reduced body weight but did not improve intermediary cardiovascular phenotypes.<sup>10 11</sup> In the same study, adherence to a low glycaemic index and low protein diet improved cardiovascular disease risk markers in addition to reducing body weight. In this context, Lagiou and colleagues' study may ring the bell for a new round in the scientific debate on the usefulness of low carbohydrate-high protein diets.<sup>8</sup>

Despite the popularity of these diets, clinicians should probably advise against their use for long term control of body weight. The European Society of Cardiology recommends high intakes of fruits, vegetables, and wholegrain products and reduced fat intake,<sup>12</sup> a pattern unlikely to fit low carbohydrate-high protein diets. Even in the highest categories of low carbohydrate-high protein diet the women in the current study did not yet reach

the low carbohydrate and high protein content recommended by commercial diets.<sup>8</sup> Considering the observed dose-response relation, we may assume that an even higher incidence of cardiovascular disease would be associated with full adherence to commercial diets.

The discrepancy between conclusions derived from short term intervention trials and those from long term survival studies needs to be resolved before low carbohydrate-high protein diets can safely be recommended to patients. But in the meantime, the short term benefits of low carbohydrate-high protein diets for weight loss that have made these diets appealing seem irrelevant in the face of increasing evidence of higher morbidity and mortality from cardiovascular diseases in the long term.

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