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Palaeolithic diet in the treatment of type 2 diabetes

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ABSTRACT

The prevalence of type 2 diabetes has steadily increased over the past few decades. In the treatment of this disease, lifestyle modifications and dietary management are essential. There is evidence suggesting a beneficial impact of the Palaeolithic diet on monitoring glucose and insulin homeostasis; however, other studies have not confirmed these results. Therefore, further well-designed trials are necessary to demonstrate the health benefits of Palaeolithic nutrition in subjects with type 2 diabetes.

Introduction

Type 2 diabetes mellitus is a complex metabolic and endocrine disorder resulting from the interaction between genetic and environmental factors, which cause different degrees of alteration in insulin functionality on peripheral tissues, as well as in the pancreatic β cell. Over time, diabetes may lead to long-term complications, such as neuropathy, nephropathy and retinopathy. Type 2 diabetes is strongly associated with obesity, and subjects with diabetes are at a higher risk of developing cardiovascular disease, or non-alcoholic fatty liver disease. These complications can be delayed, or prevented by appropriate management of diabetes [1-3]. An important part of the treatment of this disease is diet. The American Diabetes Association (ADA) suggests there is no ideal eating pattern, or macronutrient distribution for individuals suffering from diabetes. However, subjects with diabetes should choose non-starchy vegetables, reduce added sugars and refined grains and replace highly processed foods with natural foods [4].

The Palaeolithic diet, also known as the Paleo diet, the stone-age diet, or the hunter-gatherer diet, is based on the dietary patterns of our ancestors who lived during the Palaeolithic era. This diet consists of eating vegetables, fruits, meat, fish, eggs and nuts, while excluding dairy products, refined grains, oils and legumes [5]. It is often classified as a low-carbohydrate diet which provides a low amount of sodium, and a high amount of dietary fibre, potassium and antioxidants [6]. Naturally, using the Paleo diet nowadays has some limitations, since it is not possible to fully adopt the same diet as people did 10,000 years ago. Nevertheless, it can be concluded that both the Palaeolithic diet and the nutritional therapy recommended by the ADA are based on similar products. Recently, the Paleo diet has become popular due to its health benefits, such as reduc-

ing anthropometric parameters, or improving lipid profiles and blood pressure [6-8]; however, the effectiveness of this diet in the treatment of type 2 diabetes remains unclear.

The effect of the Palaeolithic diet on glucose and insulin levels

Studies have shown that a Palaeolithic-type diet may improve fasting glucose and insulin concentrations [9, 10]. Lindeberg et al. [11] conducted a 12-week study in adults with ischemic heart disease and either glucose intolerance, or type 2 diabetes. They observed that 2-hour plasma glucose concentrations following an oral glucose tolerance test (OGTT) decreased by 26% in the Paleo diet group, whereas in the Mediterranean diet group the 2-hour plasma glucose levels decreased only by 7%. Similarly, Jönsson et al. [12] observed a significant reduction in the area under the curve (AUC) between 0 and 120 minutes (AUC 0–120) for glucose levels after subjects followed a Palaeolithic diet for 3 months. Moreover, Frassetto et al. [13] demonstrated a reduction in AUC 0–120 for insulin levels in the Palaeolithic diet group after only 10 days of the intervention. Unfortunately, Otten et al. [14] have observed no differences between the effects of the stone-age diet and the Nordic Nutrition Recommendations (NNR) on AUC 0–120 for glucose and insulin in the course of the OGTT. In two meta-analyses, the effects of the Palaeolithic diet on glucose and insulin concentrations were also not found [15, 16].

The effect of the Palaeolithic diet on insulin resistance and sensitivity

Elevated fasting glucose and insulin levels are associated with insulin resistance, as measured by the homeostasis model assessment of insulin resistance (HOMA-IR) index [17]. During a 2-year intervention, Otten et al. [18] showed a significant improvement in the HOMA-IR index after a 6-month Palaeolithic diet intervention, although this improvement deteriorated significantly between 6 and 24 months. Another study conducted by Otten et al. [9] also demonstrated that insulin resistance improved by 45% in subjects with type 2 diabetes on the Palaeolithic diet. In addition, a positive effect of the Palaeolithic diet on insulin resistance was also obtained in several other studies [6, 8, 19]. Nevertheless, a recent meta-analysis failed to confirm a significant effect of Paleo nutrition on the HOMA-IR index, and it was described as having no effect on fasting glucose and insulin concentrations [15]. On the other hand, Masharani et al. [6] reported that the Paleo diet improves insulin sensitivity in most insulin-resistant patients, which was not observed in the case of a diet adhering to ADA recommendations. Moreover, even following the Paleo diet over a short period (14 days) positively affected glucose control and lipid profiles [6].

The effect of the Palaeolithic diet on HbA1c levels

Glycated haemoglobin (HbA1c) levels provide information concerning the average blood glucose levels for the past 2 to 3 months and are a commonly used indicator of the metabolic control of diabetes [4]. A 3-month randomised crossover study demonstrated that in the Paleo group HbA1c levels were significantly lower (-0.4%) than in individuals following the conventional diabetes diet [12]. However, in a 12-month trial, participants following the Mediterranean diet demonstrated a greater reduction in HbA1c than those in the Palaeolithic diet group [20]. Nevertheless, the varying duration periods of the interventions may partially account for the differences in the obtained results.

The effect of the Palaeolithic diet on anthropometric parameters

It is suggested that the effectiveness of a diet in reducing glucose and insulin levels may depend on its effect on body weight reductions and other anthropometric parameters [21]. Meta-analyses conducted by Menezes et al. [7] and Ghaedi et al. [22] confirmed the effect of the hunter-gatherer diet on decreasing anthropometric parameters, such as body weight, waist circumference and body mass index. In a 2-year randomised controlled trial including obese women, greater ben-

eficial effects on anthropometric parameters were reported following the consumption of the Paleo diet in comparison with a diet based on the NNR [23]. Furthermore, in a similar long-term intervention, Stomby et al. [19] found that weight loss in overweight or obese women following the Palaeolithic diet was greater than those on the NNR diet after 6 months, although not at 24 months. Fasting serum insulin levels also decreased at 6 months in both groups, but the insulin concentrations were more favourable in the Paleo diet group.

Conclusions

In conclusion, the Palaeolithic diet may have powerful beneficial metabolic and physiologic effects in type 2 diabetes. However, the results of the available studies evaluating the effects of Palaeolithic nutrition on glucose and insulin homeostasis are not conclusive. Therefore, well-designed long-term trials are still necessary to confirm the effectiveness of the Palaeolithic diet in subjects with type 2 diabetes.

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Conflict of interest statement
The authors declare no conflict of interest.

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