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Effects of a Paleolithic diet and exercise on liver fat, muscle fat and insulin sensitivity

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Akademisk avhandling

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Institutionen för medicin, Karolinska institutet, Stockholm, Sverige.

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Abstract

Finding ways to reduce risk for obesity-related disorders, including type 2 diabetes and cardiovascular disease, is important. Such approaches can include lifestyle interventions by diet and exercise. Our ancestors in the Paleolithic Era ate a diet based on vegetables, fruit, berries, lean meat, fish, seafood, nuts and eggs. Cereals, dairy products and legumes were not a significant part of the diet before the agricultural revolution, and neither were added sugar or salt. Furthermore, our ancestors were much more physically active compared to the average Western population.

Contemporary hunter-gatherers like the Kitava Islanders and the Greenlandic Inuit eat a diet similar to that of the Paleolithic Era and have a strikingly low frequency of cardiovascular events. Detailed studies of the metabolic effects of the Paleolithic diet, with and without exercise, are therefore warranted.

Impaired insulin sensitivity is a key factor in the development of type 2 diabetes and cardiovascular disease. In this thesis, insulin sensitivity was measured with the gold-standard examination – the hyperinsulinemic–euglycemic clamp – and also with fasting blood samples and the oral glucose tolerance test. We found the fasting index *Revised QUICKI* to be the best choice if the time-consuming gold-standard examination is not feasible. However, to distinguish insulin sensitivity of different tissues like skeletal muscle, liver and adipose tissue, the hyperinsulinemic–euglycemic clamp is preferred.

In our studies, the Paleolithic diet improved cardiovascular risk factors like overweight, insulin sensitivity, liver fat, triglycerides and blood pressure in obese, postmenopausal women. All study participants decreased liver fat when eating a Paleolithic diet. Six months of Paleolithic diet improved weight, liver fat and triglycerides significantly more than a conventional low-fat diet in obese, postmenopausal women. It was difficult for the women to remain adherent to the Paleolithic diet for 2 years, however, and most cardiovascular risk factors showed some degree of deterioration between 6 and 24 months. In individuals with type 2 diabetes, a Paleolithic diet for 12 weeks improved weight, insulin sensitivity, HbA1c, triglycerides and blood pressure. Exercise training did not improve these cardiovascular risk factors beyond the changes observed with the Paleolithic diet alone. The 12-week Paleolithic diet intervention also reduced muscle fat and liver fat, but exercise training reversed this effect.

A Paleolithic diet has strong effects on fat content in liver and muscle and on insulin sensitivity. Our present results indicate reduced metabolic flexibility in the fat content in liver and muscle tissue among patient with type 2 diabetes, which may improve through diet and exercise intervention.

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