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Session 4.2. Healthy Nordic diet and cardiometabolic disease prevention - Part 2 Systems biology to study Nordic diet

Nordic diet and disease – results from the Diet, Cancer and Health cohort

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For decades, the Mediterranean diet has been associated with lower risk of chronic disease and has consequently been considered a model for healthy eating, whereas the interest in health effects of the traditional Nordic diet is much more recent. The aim of our research was to assess whether a diet based on healthy Nordic food items was associated with incidence of myocardial infarction, type 2 diabetes, colorectal cancer and to all-cause mortality.

The studies are based on the Danish prospective Diet, Cancer and Health cohort, where to 57,053 men and women aged 50-64 years were recruited between 1993 and 1997. Information on diet was obtained by food frequency questionnaires and incident cases of the diseases of interest were identified through record linkage with national registries. Six food items of Nordic origin with expected health promoting effects were selected a priori (fish, cabbages, rye bread, oatmeal, apples and pears, and root vegetables). Each participant was given one point for intake above the sex specific median for each food item, resulting in scores between 0 and 6 on the healthy Nordic food index.

After thoroughly adjustment for potential confounding, a higher score on the healthy Nordic food index was related to lower incidences of myocardial infarction and type 2 diabetes among both men and women. For colorectal cancer, the index was significantly associated to lower incidence among women but not men. For all-cause mortality, the association was strongest among men and only borderline statistically significant among women.

Adherence to a healthy Nordic food index was found associated to lower incidences of several major chronic diseases. The risk estimates were of magnitudes very similar to what has previously been reported for the Mediterranean diet index, supporting that a healthy Nordic diet may be a relevant alternative from a public health perspective.

Metabolomic response to Nordic foods

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Introduction: Several studies have tested metabolic risk factors following dietary intervention with Nordic diets. The SYSDIET study tested a healthy Nordic diet according to the Nordic Nutrition Recommendation (NNR) in five different countries while the SHOPUS study in Denmark tested the "New Nordic Diet" designed to meet NNR while also being sustainable and palatable.

Objectives: To investigate whether metabolic profiles 1) reflect Nordic diets, 2) are improved by data fusion and 3) reflect dietary compliance.

Methods: Plasma and urine samples from both studies were profiled by one or several metabolomics platforms (LC-MS, GC-MS, NMR) and the data analysed by PLS-DA.

Results: Metabolic profiles of both urine and plasma reflected the Nordic or control diets with varying degree of performance, depending on the analytical platform used. The best ROC-curves for the SHOPUS study had AUC's above 0.8. Data fusion across platforms or sample types did not improve these models. The metabolic profiles from SYSDIET also discriminated between the countries and centres where the samples had been collected. There was only about 10% overlap between the volunteers identified as potentially non-compliant based on their most discriminating urine or plasma profiles. This may reflect that relatively many volunteers are only occasionally non-compliant while only few are more consistently non-compliant. For this latter group the marker patterns included markers of several foods that were clearly not part of the diet they were supposed to follow, supporting the interpretation that these subjects were in fact non-compliant and not just having individual characteristics of metabolism placing them outside the main pattern.

Conclusion: Dietary patterns with Nordic foods are reflected with good accuracy by metabolomics at the group level, but patterns of several samples from each volunteer may be needed to identify the more consistently non-compliant participants. Data fusion did not improve the models in this study.

Influence of Nordic diet on adipose tissue and blood cell transcriptomics

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