Abstracts

Session 1

Biomarker levels in white and British Indian vegetarians and non-vegetarians in the UK Biobank

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Background: A comprehensive description of disease biomarker levels comparing meat-eaters, vegetarians and vegans is lacking.

Objective: To perform cross-sectional analyses of biomarker levels by diet group in a large cohort.

Methods: The UK Biobank recruited 500,000 middle-aged participants throughout the United Kingdom in 2006-2010. Blood and urine were collected from the participants, and assayed for a range of biomarkers related to disease status of cardiovascular diseases, bone and joint health, cancer, diabetes, renal disease, and liver health. We estimated geometric mean concentrations of these biomarkers by six diet groups (221,295 regular meat-eaters, 222,038 low meat-eaters, 5,053 poultry-eaters, 10,470 fish-eaters, 6,804 vegetarians, 416 vegans) in white British participants, and two diet groups in British Indian participants (4091 meat eaters, 1444 vegetarians), adjusted for relevant covariates including body mass index .

Results: We observed differences in the concentrations of many biomarkers by diet group. The biomarkers with the largest percentage difference by extreme diet groups (i.e. vegans versus regular meat-eaters) within each disease outcome group in the white British population are reported below. Compared with white British regular meat-eaters, white British vegans had lower C-reactive protein (1.09, 0.99-1.20 versus 1.44, 1.43-1.44 mg/L) and low density lipoprotein cholesterol (3.12, 3.05-3.19 versus 3.65, 3.65-3.65 mmol/L); lower vitamin D (34.6, 33.2-36.1 versus 44.4, 44.3-44.5 nmol/L); higher sex hormone-binding globulin (51.2, 49.0-53.3 versus 44.9, 44.8-45.0 nmol/L); lower haemoglobin A1C (HbA1C, 33.9, 33.5-34.3 versus 35.1, 35.1-35.1 mmol/mol); lower urinary creatinine (5376, 5063-5708 versus 7289, 7269-7308 µmol/L); and lower gamma glutamyltransferase (23.3, 22.0-24.6 versus 29.7, 29.6-29.8 U/L). Patterns were similar in British Indians, with the

exception of HbA1C which was not significantly different between meat-eaters and vegetarians. Patterns were also consistent between women and men.

Conclusions: In this large population cohort, participants with different degrees of animal-food exclusion exhibit differences in many biomarkers associated with disease risk.

Meat consumption and the risk of ischaemic heart disease: a systematic review and meta-analysis

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There is uncertainty regarding the association between unprocessed red meat and processed meat consumption and risk of ischaemic heart disease (IHD), and little is known regarding the association with poultry intake. We therefore conducted a systematic review and dose-response meta-analysis of prospective studies on unprocessed red meat, processed meat, and poultry intake and IHD risk.

We searched CAB Abstract, MEDLINE, EMBASE, Web of Science, bioRxiv and medRxiv for prospective cohort studies or systematic reviews of meat intake and risk of IHD up to May 20th, 2020. Study specific results were extracted by three researchers independently and summary relative risks (RRs) and 95% confidence intervals (CIs) were calculated using fixed-effects models. Heterogeneity among studies was evaluated using the I2 and Q statistic.

Of the 2,299 initially identified references, 12 published articles met the inclusion criteria (ntotal=1,248,333; ncases=28,173). Studies were based in Asia, Australia, US and Europe. Of the 12 papers six were rated as high-quality (score 5), based on an adapted Newcastle - Ottawa Quality Assessment Scale (0-5) for cohort studies, two reached a score of 4 and four a score of 3. Comparing the highest to the lowest intakes, positive associations were observed for unprocessed red meat intake and IHD (risk ratio, RR 1.11, 95%-Confidence interval (CI), 1.06, 1.17, I2= 27%, pheterogeneity=0.16, nstudies=10), and processed meat intake and IHD (RR 1.09, 95%-CI 1.04, 1.15, I2= 49%, pheterogeneity=0.06, nstudies=7). There was no association between poultry intake and IHD risk (RR 1.03, 95%-CI 0.99, 1.07, I2= 33%, pheterogeneity=0.15, nstudies=7).

These preliminary findings suggest small positive associations between unprocessed red and processed meat intake and risk of IHD. Further analyses are needed to clarify whether the results are robust in different subgroups and dose response analyses.

Pathways to "5-a-day": modelling the health impacts and environmental footprints of meeting the target for fruit and vegetable intake in the UK

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Background: Increasing fruit and vegetable consumption in the UK could benefit both public health and environmental sustainability.

Objective: To quantify the health and environmental impacts associated with four different pathways to meeting the UK's "5-a-day" recommendation for fruit and vegetable consumption.

Design: Epidemiological modelling study. Individual dietary intake data from the National Diet and Nutrition Survey (2012/13-2016/17) in the UK constituted the baseline diet. The adoption of diets optimised to meet the "5-a-day" (i.e. 400g) recommendation for fruit and vegetable consumption in the UK was assessed. Four pathways were designed to quantify the relative impacts of increasing consumption of vegetables only compared to both fruit and vegetables, as well as the impacts of prioritising varieties grown in the UK over the varieties currently consumed, a large proportion of which are imported. Greenhouse gas emissions

(GHGE), blue water footprint (WF), life expectancy at birth and total diet cost associated with the different 5-a-day diets were quantified.

Results: Achieving the 5-a-day target in the UK could increase average life expectancy at birth by 7-8 months and reduce diet-related GHGE by 6.1 to 12.2 Mt CO_2eq/year; blue WFs would change by -0.14 to +0.07 km3/year. Greater reductions in GHGEs were achieved by prioritising increased vegetable consumption over fruit, while the greatest reduction in WF was obtained by prioritising vegetable varieties produced in the UK. Larger health benefits were obtained by maintaining consumption of imported as well as home-grown varieties. All the pathways resulted in an increased cost (£0.34-£0.46 per day), and cost increases were greater for diets prioritising UK-grown varieties.

Conclusions: Benefits to both population and environmental health could be expected from the UK reaching its 5-a-day target for fruit and vegetables. Our analysis identifies cross-sectoral trade-offs and opportunities resulting from national policy to promote fruit and vegetable consumption in the UK.

Nutritional quality of plant-based meat available in the UK: a cross-sectional survey

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Background: Plant-based diets have been gaining popularity in the UK due to increasing concerns in health, animal welfare, and the environment. The objective of this study is to compare the nutritional quality of plant-based meat with that of the equivalent meat products.

Methods: We conducted a cross-sectional survey of plant-based meat available from 15 retailers in the UK, and collected data for the equivalent meat products. From products labels, we extracted data on energy density, total and saturated fat, protein, fibre, sugar and salt content per 100g and reported mean ± standard deviation. We calculated the nutrient profile score (NPS) for all products using the UK Nutrient Profiling Model and compared meat products with plant-based meat through Wilcoxon tests. We calculated the percentage of products that would get at least one high/red label for fat, saturated fat, and salt using the UK's front of pack colour coded labelling criteria. We calculated the proportion of plant-based products that would meet the Public Health England (PHE) salt targets.

Results: We collected data for 207 plant-based meat and 226 meat products. Compared to meat, plant-based meat had significantly lower energy density, total fat, saturated fat, and protein and significantly higher fibre, and sugar per 100g of product. Salt content in plant-based meat was significantly higher in four out of six categories. Plant-based meat had a significantly lower (i.e. healthier) NPS in five out of six categories. Around 20% of the plant-based meat and 46% of the meat products had at least one high/red criteria for either total fat, saturated fat, or salt. Around 40% of the plant-based products had their salt content below the PHE targets.

Conclusions: Compared to meat, plant-based meats have a better nutrient profile. However, more progress is needed for reducing salt in these products.

Dairy intake and risk of cancer: findings from the China Kadoorie Biobank prospective cohort study

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Background: Consumption of dairy products has been associated with possible higher or lower risks of some types of cancer. However, results are often inconsistent and evidence from China, particularly for prospective data, is very limited. The primary aim of the present study was to investigate the associations between intake of dairy products and incidence of 17 common cancers in Chinese adults.

Methods: During 2004-2008, the prospective China Kadoorie Biobank Study recruited slightly over 0.5 million adults from ten diverse regions (five urban and five rural) across China. Information on the consumption frequency of dairy products was collected at the baseline and periodic resurveys, using a validated interviewer-administered laptop-based questionnaire. Over a mean follow-up of 10.8 years, 28,665 incident malignant cancer cases were recorded among the 510,146 study participants, who did not have a prior history of cancer at baseline. Cox regression analyses were performed to estimate multivariable-adjusted hazard ratios (HRs) for incident cancers associated with dairy intake.

Results: Overall, 68.5% reported never or rare consumption and 20.4% of participants reported consuming dairy products at least once per week, with milk accounting largely for the total dairy intake. After adjusting for a range of potential confounders, including sociodemographic and lifestyle factors and BMI, the adjusted HRs per 50 g/day increase in usual dairy consumption were 1.07 (95% CI 1.04-1.10), 1.10 (1.01-1.21), 1.19 (1.01-1.41) and 1.16 (1.06-1.28) for total cancer, liver cancer, lymphoma and female breast cancer, respectively. These associations were similar across subgroups defined by baseline sociodemographic and lifestyle characteristics (e.g. smoking and alcohol consumption) and across the ten survey regions. No associations were observed between dairy and risk of the other 14 cancers.

Conclusion: In this large study of Chinese adults, higher intake of dairy products was associated with higher risks of overall cancer, liver cancer, lymphoma and female breast cancer. Nevertheless, the exact mechanisms underlying such associations require further investigation.