Investigating the risk-benefit balance of substituting red and processed meat with fish in a Danish diet

Danish dietary guidelines recommend the Danish population to increase the consumption of fish while decreasing the consumption of red and processed meat to prevent nutrition-related diseases. However, the presence of contaminants in these foods may affect the overall risk-benefit balance of such substitution. We performed a quantitative risk-benefit assessment on substituting red and processed meat with fish in a Danish diet. We modeled the substitution among Danish adults based on data from a Danish dietary survey and compared four alternative scenarios based on varying chemical and nutrient exposures to the current consumption. We quantified the overall health impact of the substitutions in terms of Disability-Adjusted Life Years (DALYs). Approximately 150 DALYs/100,000 individuals could be averted each year if Danish adults consumed 350 g of fish/week (fatty or mix of fatty and lean) while decreasing the consumption of red and processed meat. A lower beneficial impact was observed when consumption of fish was restricted to lean fish (80 DALYs/100,000 averted), and a marked health loss (180 DALYs/100,000) was estimated when consumption was restricted to tuna. Our results show an overall beneficial effect of the substitution if the consumption of large predatory fish is low and at least half is fatty fish.
Meeting the challenges in the development of risk-benefit assessment of foods

Background

Risk-benefit assessment (RBA) of foods aims to assess the combined negative and positive health effects associated with food intake. RBAs integrate chemical and microbiological risk assessment with risk and benefit assessment in nutrition.
Scope and Approach
Based on the past experiences and the methodological differences between the underlying research disciplines, this paper aims to describe the recent progress in RBAs, identifying the key challenges that need to be addressed for further development, and making suggestions for meeting these challenges.

Key Findings and Conclusions
Ten specific challenges are identified and discussed. They include the variety of different definitions and terminologies used in the underlying research disciplines, the differences between the “bottom-up” and the “top-down” approaches and the need for clear risk-benefit questions. The frequent lack of data and knowledge with their consequential uncertainties is considered, as well as the imbalance in the level of scientific evidence associated with health risks and benefits. The challenges that are consequential to the need of considering substitution issues are discussed, as are those related to the inclusion of microbiological hazards. Further challenges include the choice of the integrative health metrics and the potential scope of RBAs, which may go beyond the health effect. Finally, the need for more practical applications of RBA is stressed. Suggestions for meeting the identified challenges include an increased interdisciplinary consensus, reconsideration of methodological approaches and health metrics based on a categorisation of risk-benefit questions, and the performance of case studies to experience the feasibility of the proposed approaches.
Modelling of adequate and safe vitamin D intake in Danish women using different fortification and supplementation scenarios to inform fortification policies

Fortification of foods with vitamin D may be a population-based solution to low vitamin D intake. We performed modelling of vitamin D from diet, fortified foods and supplements in a population of Danish women 18-50 years, a risk group of vitamin D deficiency, to inform fortification policies on safe and adequate levels. Based on individual habitual dietary vitamin D intake of female participants from the Danish National Survey of Dietary Habits and Physical Activity (DANSDA) (n=855), we performed graded intake modelling to predict the intake in six scenarios increasing the vitamin D intake from a habitual diet without fish to habitual diet including fish, fortified foods and supplements (40/80 µg). Four different foods were used as potential foods to fortify with vitamin D. The vitamin D intake was below the Average Requirement (AR) of 7.5 µg/day for 88% of the assessed women. Safe levels of intake (}
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BFI (2012): BFI-level 1
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Scopus rating (2002): SJR 0.327 SNIP 0.637
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Scopus rating (2000): SJR 0.191 SNIP 0.322
Vitamin D vitamers affect vitamin D status differently in young healthy males

Dietary intake of vitamin D includes vitamin D3 (vitD3), 25-hydroxyvitamin D3 (25OH-D3), and vitamin D2 (vitD2). However, the bioactivity of the different species has not been scientifically established. The hypothesis in this study was that vitD3, 25OH-D3, and vitD2 have an equal effect on 25-hydroxyvitamin D in serum (vitamin D status). To test our hypothesis, we performed a randomized, crossover study. Twelve young males consumed 10 µg/day vitD3 during a four-week run-in period, followed by 3 × 6 weeks of 10 µg/day vitD3, 10 µg/day 25OH-D3, and 10 µg/day vitD2. The content of vitD3, vitD2, 25OH-D3, and 25-hydroxyvitamin D2 (25OH-D2) in serum was quantified by liquid chromatography-tandem mass spectrometry (LC-MS/MS). The hypothesis that the three sources of vitamin D affect vitamin D status equally was rejected. Based on the assumption that 1 µg vitD3/day will show an increase in vitamin D status of 1.96 nmol/L, the results showed that 23 µg vitD2 and 6.8 µg 25OH-D3 was similar to 10 µg vitD3. These results demonstrate that further investigations are necessary to determine how to quantify the total vitamin D activity based on chemical quantification of the individual vitamin D metabolites to replace the total vitamin D activity assessed in biological rat models.

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Common genetic variants are associated with lower serum 25-hydroxyvitamin D concentrations across the year among children at northern latitudes

In a longitudinal study including 642 healthy 8-11-year-old Danish children, we investigated associations between vitamin D-dependent SNP and serum 25-hydroxyvitamin D (25(OH)D) concentrations across a school year (August-June). Serum 25(OH)D was measured three times for every child, which approximated measurements in three seasons (autumn, winter, spring). Dietary and supplement intake, physical activity, BMI and parathyroid hormone were likewise measured at each time point. In all, eleven SNP in four vitamin D-related genes: Cytochrome P450 subfamily IIR1 (CYP2R1); 7-dehydrocholesterol reductase/nicotinamide adenine dinucleotide synthetase-1 (DHCR7/NADSYN1); group-specific complement (GC); and vitamin D receptor were genotyped. We found minor alleles of CYP2R1 rs10500804, and of GC rs4588 and rs7041 to be associated with lower serum 25(OH)D concentrations across the three seasons (all P

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Scopus rating (2013): CiteScore 3.61 SJR 2.746 SNIP 2.479
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Web of Science (2006): Indexed yes
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common_genetic_variants_are_associated_with_lower_serum_25hydroxyvitamin_d_concentrations_across_the_year_among_children_at_northern_latitudes.pdf. Embargo ended: 07/04/2018
Development, validation and implementation of a quantitative food frequency questionnaire to assess habitual vitamin D intake

Background A well-designed, validated quantitative food frequency questionnaire (FFQ) could offer an efficient and cost-effective method for assessing habitual vitamin D intake. The present study aimed to describe the development, validation and implementation of a vitamin D FFQ. Methods National food consumption survey data obtained from Irish adults (18–64 years) were used to identify foods that contribute 95% of vitamin D intake. A winter-based validation study was carried out for the resulting FFQ in 120 females, including 98 women [mean (SD) 65.0 (7.3) years] and 22 girls [12.2 (0.8) years], using a 14-day diet history (DH) as a comparator. Serum 25(OH)D concentrations were analysed. Validity coefficients were calculated using the method of triads. Cross-classification and Bland–Altman analysis were also performed. Results Median (interquartile range) vitamin D intakes (including the contribution from nutritional supplements) were 5.4 (3.7) and 3.7 (5.9) μg day⁻¹ from the FFQ and DH, respectively and intakes of vitamin D from food sources were 3.6 (3.1) and 2.4 (2.2) μg day⁻¹. The FFQ and DH classified 86% and 87% of individuals into the same and adjacent thirds of wintertime serum 25(OH)D status, respectively. There was a strong association (r = 0.71, P < 0.0001) and no significant systematic or proportional bias observed for the difference between estimates from the FFQ and DH. The validity coefficient for the FFQ was 0.92 (95% confidence interval = 0.80–0.97). Repeatability analysis (n = 56) performed 6–12 months later showed no significant difference in estimates of vitamin D between administrations. Conclusions The data obtained in the present study indicate high validity and good reproducibility of a short, interviewer-administered FFQ for vitamin D.

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Generne styrer danskernes D-vitaminniveau

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Bibliographical note
Normal weight children have higher cognitive performance – independent of physical activity, sleep, and diet

Background/objectives Aside from the health consequences, observational studies indicate that being overweight may also negatively affect cognitive function. However, existing evidence has to a large extent not controlled for the possible confounding effect of having different lifestyles. Therefore, the objective was to examine the independent associations between weight status and lifestyle indicators with cognitive performance in 8–11 year old Danish children.

Subjects/methods The analyses included 828 children (measured in 2011–2012) each having one to three measurement occasions separated by approximately 100 days. Dietary intake, physical activity, sedentary time, and sleep duration were measured using dietary records and accelerometers. The Children's Sleep Habits Questionnaire was used to assess sleep problems and the Andersen test was carried out to estimate cardio-respiratory fitness (CRF). Weight status (underweight, normal weight, and overweight/obese) was defined according to body mass index and cognitive performance was assessed using the d2-test of attention, a reading test, and a math test. A linear mixed model including a number of fixed and random effects was used to test associations between lifestyle indicators as well as BMI category and cognitive performance. Results After adjustment for demographics, socioeconomics, and multiple lifestyle indicators, normal weight children had higher cognitive test scores than overweight/obese and underweight children of up to 89% and 48% of expected learning within one school year (P < 0.05). Daily breakfast consumption, fewer sleep problems, higher CRF, less total physical activity, more sedentary time, and less light physical activity were associated with higher cognitive performance independently of each other in at least one of the three cognitive tests (P < 0.05). Conclusions Normal weight children had higher cognitive performance compared to overweight/obese as well as underweight children, independent of multiple lifestyle indicators.

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Scopus rating (2013): CiteScore 3.29 SJR 1.486 SNIP 1.102
Web of Science (2013): Impact factor 3.033
Sleep duration modifies effects of free ad libitum school meals on adiposity and blood pressure

Background: Insufficient sleep can potentially affect both energy intake and energy expenditure resulting in obesity and reduced cardiometabolic health. Objective: To investigate if habitual sleep duration of 8-11-year-olds modifies the effect of free ad libitum school meals on cardiometabolic markers, body composition, dietary intake, and physical activity. Methods: For two consecutive three-month periods this cluster-randomized, controlled, cross-over trial provided 530 children with school meals or usual lunch brought from home. Dietary intake, activity, and sleep were measured simultaneously for seven consecutive days using dietary records and accelerometers. Short and long sleeping children were defined as lower and upper tertile of sleep duration. Body composition, blood pressure, blood lipids, and homeostatic model assessment of insulin resistance (HOMAIR) were measured/calculated. Results: Overall, school meals compared to lunch from home had positive effects on physical activity and blood pressure in long sleeping children and negative effects on body fat in short sleeping children. Short sleeping children increased fat mass compared to long sleeping children by 0.21 (95% CI 0.03;0.38) kg, android fat mass by 0.02 (0.001;0.04) kg, waist circumference by 0.73 (0.23;1.24) cm, blood pressure by 1.5 (0.4;2.6) mmHg, fat intake by 1.1 (0.2;2.0) energy %, and decreased total physical activity by 7.2 (1.6;12.7) % (all P≤0.04), while HOMAIR and blood lipids were not modified by sleep duration (all P≥0.32). Conclusions: The susceptibility to increase abdominal adiposity and blood pressure when exposed to dietary changes can potentially be explained by too little sleep that results in increased caloric intake and reduced physical activity.
Socio-economic differences in cardiometabolic risk markers are mediated by diet and body fatness in 8- to 11-year-old Danish children: a cross-sectional study

Objective To explore whether socio-economic differences exist in cardiometabolic risk markers in children and whether lifestyle-related factors potentially mediate these differences. Design Cross-sectional study including measurements of fasting blood lipids, glucose, homeostasis model assessment of insulin resistance (HOMA-IR), blood pressure and heart rate. Potential mediators examined were fat mass index (FMI); intakes of fruit, vegetables, dietary fibre and added sugar; whole-blood n-3 long-chain PUFA (LCPUFA) as a biomarker of fish intake; and physical activity and sedentary time. Setting Nine primary schools in Denmark. Subjects Children aged 8–11 years (n 715). Results Children of parents with the shortest compared with longest education had higher TAG by 0·12 (95 % CI 0·04, 0·21) mmol/l and HOMA-IR by 0·36 (0·10, 0·62), whereas children of parents with a vocational education had higher total cholesterol by 0·14 (0·02, 0·27) mmol/l and LDL cholesterol by 0·14 (0·03, 0·25) mmol/l compared with children of parents with the longest education; all P<0·05. FMI explained 25 % of the difference in TAG, 64 % of the difference in HOMA-IR and 21–29 % of the differences in cholesterols. FMI and whole-blood n-3 LCPUFA combined explained 42 % of the difference in TAG, whereas FMI, whole-blood n-3 LCPUFA and dietary fibre explained 89 % of the difference in HOMA-IR. Conclusions Socio-economic differences were present in blood lipids and insulin resistance among 8- to 11-year-olds and were mediated by body fatness, whole-blood n-3 LCPUFA and dietary fibre. These lifestyle factors may be targets in public initiatives to reduce socio-economic differences. Confirmation in longitudinal studies and trials is warranted.

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Web of Science (2013): Impact factor 2.483
Sun Exposure Guidelines and Serum Vitamin D Status in Denmark: The StatusD Study

Little is known on how vitamin D status is affected by adherence to UVB-limiting sun exposure guidelines. Our aim was to investigate the relationship between adherence to the Danish sun exposure guidelines and vitamin D status. In total, 3194 Danes (2625 adults, 569 children) were recruited among the general population, and more than 92% had blood samples taken both autumn and spring. Using linear regression, we associated serum vitamin D concentrations to questionnaire responses on: seeking shade, wearing a sunhat, wearing protective clothing or using sunscreen. The odds ratio (OR) of either low (<25 or 50 nmol/L) or adequate/high (≥50 nmol/L) vitamin D status was examined using logistic regression. For adults, those who always sought shade or wore protective clothing compared to those who did not had lower levels of vitamin D (autumn concentrations for shade: 7.2 nmol/L lower (-11.0--3.6 nmol/L); for protective clothing: 9.9 nmol/L lower (-13.6--6.2 nmol/L). Adherence to all four guidelines was also associated with lower vitamin D concentrations (autumn: 9.7 nmol/L lower (-14.3--5.1 nmol/L). Use of sunscreen was associated with adequate vitamin D status, as those who always sought shade compared to those who did not had an OR (95% CI) of 1.68 (1.25-2.35) of having ≥50 nmol/L during both spring and autumn. No associations were found with wearing a sunhat, and there were no clear associations for children.

In conclusion, adherence to the sun exposure guidelines on shade and protective clothing was associated with lower vitamin D status among Danish adults, but not children.
Validation of Reported Whole-Grain Intake from a Web-Based Dietary Record against Plasma Alkylresorcinol Concentrations in 8- to 11-Year-Olds Participating in a Randomized Controlled Trial

BACKGROUND: Whole-grain (WG) intake is important for human health, but accurate intake estimation is challenging. Use of a biomarker for WG intake provides a possible way to validate dietary assessment methods. OBJECTIVE: Our aim was to validate WG intake from 2 diets reported by children, using plasma alkylresorcinol (AR) concentrations, and to investigate the 3-mo reproducibility of AR concentrations and reported WG intake. METHODS: AR concentrations were analyzed in fasting blood plasma samples, and WG intake was estimated in a 7-d web-based diary by 750 participants aged 8-11 y in a 2 school meal × 3 mo crossover trial. Reported WG intake and plasma AR concentrations were compared when children ate their usual bread-based lunch (UBL) and when served a hot lunch meal (HLM). Correlations and cross-classification were used to rank subjects according to intake. The intraclass correlation coefficients (ICCs) between subjects' measurements at baseline and after the UBL were used to assess reproducibility. RESULTS: Correlations between reported WG wheat + rye intake and plasma AR were 0.40 and 0.37 (P <0.001) for the UBL and the HLM diets, and 78% and 77% were classified in the same or adjacent quartiles for the UBL and HLM diets, respectively. The ICC over 3 mo was 0.47 (95% CI: 0.38, 0.55) for plasma total ARs and 0.64 (95% CI: 0.58, 0.70) for reported WG intake. Correlations were higher when using the AR C17:0 homolog as a biomarker, reflecting rye intake instead of plasma total ARs [UBL: r = 0.47; HLM: r = 0.43, P <0.001; ICC = 0.51 (95% CI: 0.43, 0.59)]. CONCLUSIONS: Self-reported WG wheat + rye intake among children showed moderate correlations with plasma AR concentrations. Substantial intraindividual variation was found in WG intake and plasma AR concentrations. The AR homolog C17:0 may be used as a biomarker for WG intake when the WG intake primarily comes from rye as in the present study. This trial was registered at clinicaltrials.gov as NCT01457794.
Accuracy of self-reported intake of signature foods in a school meal intervention study: comparison between control and intervention period

Bias in self-reported dietary intake is important when evaluating the effect of dietary interventions, particularly for intervention foods. However, few have investigated this in children, and none have investigated the reporting accuracy of fish intake in children using biomarkers. In a Danish school meal study, 8- to 11-year-old children (n 834) were served the New Nordic Diet (NND) for lunch. The present study examined the accuracy of self-reported intake of signature foods (berries, cabbage, root vegetables, legumes, herbs, potatoes, wild plants, mushrooms, nuts and fish) characterising the NND. Children, assisted by parents, self-reported their diet in a Web-based Dietary Assessment Software for Children during the intervention and control (packed lunch) periods. The reported fish intake by children was compared with their ranking according to fasting whole-blood EPA and DHA concentration and weight percentage using the Spearman correlations and cross-classification. Direct observation of school lunch intake (n 193) was used to score the accuracy of food-reporting as matches, intrusions, omissions and faults. The reporting of all lunch foods had higher percentage of matches compared with the reporting of signature foods in both periods, and the accuracy was higher during the control period compared with the intervention period. Both Spearman's rank correlations and linear mixed models demonstrated positive associations between EPA+DHA and reported fish intake. The direct observations showed that both reported and
real intake of signature foods did increase during the intervention period. In conclusion, the self-reported data represented a true increase in the intake of signature foods and can be used to examine dietary intervention effects.
Vitamin D deficiency and obesity are both prevalent conditions in the northern countries, especially among immigrants. The aims were to assess the possible relationship between body fat and vitamin D status, and to investigate the effect of body fat on the response to oral vitamin D supplementation in Pakistani immigrants in Denmark. Data were obtained from a 1-year double-blind randomised controlled trial with oral vitamin D supplementation. A total of 122 women and men received either vitamin D3 supplementation (10 or 20μg/day) or placebo. No association was found between body fat percentage and vitamin D status in a multiple linear regression model (P<0.001). No effect of body fat was seen on the vitamin D status response following the intervention with vitamin D. In conclusion, there was no baseline association between body fat percentage and vitamin D status, and body fat percentage had no effect on the response to vitamin D supplementation.
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Common genetic variations in the CYP2R1 and GC genes are determinants of vitamin D status in Danes

Vitamin D is considered a key fat-soluble vitamin critically important for good bone- and overall health throughout life. Vitamin D deficiency increases the risk of developing rickets, osteomalacia and osteoporosis, and moreover increases the risk of various non-skeletal adverse health outcomes including cardiovascular diseases, autoimmune diseases, some cancers and overall mortality. In humans, vitamin D is mainly synthesized in the skin after solar exposure and only a small amount is obtained through the diet.

An inter-individual variation in vitamin D status exists, which may be explained by genetic variation in vitamin D modulating genes. Twin and family-based studies indicate that genetic variation may have an appreciable influence on vitamin D status. Moreover, several candidate gene studies including two genome-wide association studies (GWAS) have found single nucleotide polymorphisms (SNPs) in CYP2R1, CYP24A1, CYP27B1, C10orf88, DHCR7/NADSYN1, GC and VDR genes to be associated with vitamin D status. The main hypothesis of this work was that genetically determined variation in vitamin D metabolism would influence the effect of vitamin D sources (vitamin D-supplementation and ultraviolet (UV)-B) on vitamin D status.

This was done by assessing the association between 25 SNPs located in the CYP2R1, CYP24A1, CYP27B1, C10orf88, DHCR7/NADSYN1, GC and VDR genes and vitamin D status in 756 participants in the VitmaD study in late summer (paper I), at the end of a winter season (paper II), after 6 months intake of vitamin D3-fortified bread and milk (paper II) and in 92 participants in the VitDgen study after artificial UVB irradiation during winter (paper III).

Common genetic variations in the CYP2R1 and GC genes were found to be important determinants of vitamin D status in three out of four scenarios: in late summer, after 6 months intake of vitamin D3-fortified bread and milk and after artificial UVB irradiation, but not at the end of winter when no artificial vitamin D sources (vitamin D3-fortification or UVB irradiation) had been given.

Overall, a general negative gene-dose dependent relationship was observed between increasing numbers of risk alleles of CYP2R1 and GC and lower vitamin D status, and moreover an additive effect of CYP2R1 and GC polymorphisms on vitamin D status was observed. Genetically predisposed individuals carrying all risk alleles of CYP2R1 and GC had the lowest vitamin D status in late summer, the largest decrease in vitamin D status after intake of vitamin D3-fortified bread and milk during winter and the smallest increase in vitamin D status after artificial UVB irradiation compared to individuals carrying fewer or no risk alleles of CYP2R1 and GC.

Based on the studies included in this thesis, it is concluded that genetically predisposed individuals, with a genetic profile of CYP2R1 and GC leading to low vitamin D status, had the lowest vitamin D status in late summer and responded the least to increased exposure of the vitamin D sources, vitamin D3-fortification and UVB irradiation. Genetically determined variation in CYP2R1 and GC may potentially be used as a biomarker to identify at-risk individuals who have substantially increased risk of having low vitamin D status.

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Dietary intake and sources of vitamin D in Pakistani immigrants living in Copenhagen

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Diet-induced changes in iron and n-3 fatty acid status and associations with cognitive performance in 8-11-year-old Danish children: secondary analyses of the Optimal Well-Being, Development and Health for Danish Children through a Healthy New Nordic Diet School Meal Study

Fe and n-3 long-chain PUFA (n-3 LCPUFA) have both been associated with cognition, but evidence remains inconclusive in well-nourished school-aged children. In the Optimal Well-Being, Development and Health for Danish Children through a Healthy New Nordic Diet (OPUS) School Meal Study, the 3-month intervention increased reading performance, inattention, impulsivity and dietary intake of fish and Fe. This study investigated whether the intervention influenced n-3 LCPUFA and Fe status and, if so, explored how these changes correlated with the changes in cognitive performance. The study was a cluster-randomised cross-over trial comparing school meals with packed lunch (control). At baseline and after each treatment, we measured serum ferritin, whole-blood n-3 LCPUFA and Hb, and performance in reading, mathematics and d2-test of attention. Data were analysed using mixed models (n 726) and principal component analysis of test performances (n 644), which showed two main patterns: 'school performance' and 'reading comprehension'. The latter indicated that children with good reading comprehension were also more inattentive and impulsive (i.e. higher d2-test error%). The intervention improved 'school performance' (P=0.015), 'reading comprehension' (P=0.043) and EPA+DHA status 0.21 (95 % CI 0.15, 0.27) w/w % (P

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Effects of school meals based on the New Nordic Diet on intake of signature foods: a randomised controlled trial. The OPUS School Meal Study

A New Nordic Diet (NND) was developed in the context of the Danish OPUS Study (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet). Health, gastronomic potential, sustainability and Nordic identity were crucial principles of the NND. The aim of the present study was to investigate the effects of serving NND school meals compared with the usual packed lunches on the dietary intake of NND signature foods. For two 3-month periods, 834 Danish children aged 8-11 years received NND school meals or their usual packed lunches brought from home (control) in random order. The entire diet was recorded over 7 consecutive days using a validated Web-based Dietary Assessment Software for Children. The NND resulted in higher intakes during the entire week (% increase) of root vegetables (116 (95 % CI 1.93, 2.42)), cabbage (26 (95 % CI 1.08, 1.47)), legumes (22 (95 % CI 1.06, 1.40)), herbs (175 (95 % CI 2.36, 3.20)), fresh berries (48 (95 % CI 1.13, 1.94)), nuts and seeds (18 (95 % CI 1.02, 1.38)), lean fish and fish products (47 (95 % CI 1.31, 1.66)), fat fish and fish products (18 (95 % CI 1.02, 1.37)) and potatoes (129 (95 % CI 2.05, 2.56)). Furthermore, there was a decrease in the number of children with zero intakes when their habitual packed lunches were replaced by NND school meals. In conclusion, this study showed that the children increased their intake of NND signature foods, and, furthermore, there was a decrease in the number of children with zero intakes of NND signature foods when their habitual packed lunches were replaced by school meals following the NND principles.
Effects of school meals with weekly fish servings on vitamin D status in Danish children: secondary outcomes from the OPUS (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet) School Meal Study

Children's vitamin D intake and status can be optimised to meet recommendations. We investigated if nutritionally balanced school meals with weekly fish servings affected serum 25-hydroxyvitamin D (25(OH)D) and markers related to bone in 8- to 11-year-old Danish children. We conducted an explorative secondary outcome analysis on data from 784 children from the OPUS School Meal Study, a cluster-randomised cross-over trial where children received school meals for 3 months and habitual lunch for 3 months. At baseline, and at the end of each dietary period, 25(OH)D, parathyroid hormone (PTH), osteocalcin (OC), insulin-like growth factor-1 (IGF-1), bone mineral content (BMC), bone area (BA), bone mineral density (BMD), dietary intake and physical activity were assessed. School meals increased vitamin D intake by 0.9 (95% CI 0.7, 1.1) μg/d. No consistent effects were found on 25(OH)D, BMC, BA, BMD, IGF-1 or OC. However, season-modified effects were observed with 25(OH)D, i.e. children completing the school meal period in January/February had higher 25(OH)D status (5.5 (95% CI 1.8, 9.2) nmol/l; P = 0.004) than children completing the control period in these months. A similar tendency was indicated in November/December (4.1 (95% CI -0.12, 8.3) nmol/l; P = 0.057). However, the effect was opposite in March/April (-4.0 (95% CI -7.0, -0.9) nmol/l; P = 0.010), and no difference was found in May/June (P = 0.214). Unexpectedly, the school meals slightly increased PTH (0.18 (95% CI 0.07, 0.29) pmol/l) compared with habitual lunch. Small increases in dietary vitamin D might hold potential to mitigate the winter nadir in Danish children's 25(OH)D status while higher increases appear necessary to affect status throughout the year. More trials on effects of vitamin D intake from natural foods are needed.

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Plate waste and intake of school lunch based on the New Nordic Diet and on packed lunches: A randomised controlled trial in 8- to 11-year-old Danish children

The aim of the present study was to compare total food intake, total and relative edible plate waste and self-reported food likings between school lunch based on the new Nordic diet (NND) and packed lunch from home. In two 3-month periods in a cluster-randomised controlled unblinded cross-over study 3rd- and 4th-grade children (n 187) from two municipal schools received lunch meals based on NND principles and their usual packed lunch (control). Food intake and plate waste (n 1558) were calculated after weighing lunch plates before and after the meal for five consecutive days and self-reported likings (n 905) assessed by a web-based questionnaire. Average food intake was 6 % higher for the NND period compared with the packed lunch period. The quantity of NND intake varied with the menu (P < 0·0001) and was positively associated with self-reported likings. The edible plate waste was 88 (sd 80) g for the NND period and 43 (sd 60) g for the packed lunch period whereas the relative edible plate waste was no different between periods for meals having waste (n 1050). Edible plate waste differed between menus (P < 0·0001), with more waste on soup days (36 %) and vegetarian days (23 %) compared with the packed lunch period. Self-reported likings were negatively associated with percentage plate waste (P < 0·0001). The study suggests that portion sizes need to be considered in new school meal programmes. New strategies with focus on reduction of plate waste, children's likings and nutritious school meals are crucial from both a nutritional, economic and environmental point of view.
Socioeconomic differences in cardiometabolic risk markers are mediated by diet and fatness in Danish children

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Standardizing serum 25-hydroxyvitamin D data from four Nordic population samples using the Vitamin D Standardization Program protocols: Shedding new light on vitamin D status in Nordic individuals

Knowledge about the distributions of serum 25-hydroxyvitamin D (25(OH)D) concentrations in representative population samples is critical for the quantification of vitamin D deficiency as well as for setting dietary reference values and food-based strategies for its prevention. Such data for the European Union are of variable quality making it difficult to estimate the prevalence of vitamin D deficiency across member states. As a consequence of the widespread, method-related differences in measurements of serum 25(OH)D concentrations, the Vitamin D Standardization Program (VDSP) developed protocols for standardizing existing serum 25(OH)D data from national surveys around the world. The objective of the present work was to apply the VDSP protocols to existing serum 25(OH)D data from a Danish, a Norwegian, and a Finnish population-based health survey and from a Danish randomized controlled trial. A specifically-selected subset (n = 100-150) of bio-banked serum samples from each of the studies were reanalyzed for 25(OH)D by LC-MS/MS and a calibration equation developed between old and new 25(OH)D data, and this equation was applied to the entire data-sets from each study. Compared to estimates based on the original serum 25(OH)D data, the percentage vitamin D deficiency (<30 nmol/L) decreased by 21.5% in the Danish health survey but by only 1.4% in the Norwegian health survey; but was relatively unchanged (0% and 0.2%) in the Finnish survey or Danish RCT, respectively, following VDSP standardization. In conclusion, standardization of serum 25(OH)D concentrations is absolutely necessary in order to compare serum 25(OH)D concentrations across different study populations, which is needed to quantify and prevent vitamin D deficiency.

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The effects of Nordic school meals on concentration and school performance in 8- to 11-year-old children in the OPUS School Meal Study: a cluster-randomised, controlled, cross-over trial
It is widely assumed that nutrition can improve school performance in children; however, evidence remains limited and inconclusive. In the present study, we investigated whether serving healthy school meals influenced concentration and school performance of 8- to 11-year-old Danish children. The OPUS (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet) School Meal Study was a cluster-randomised, controlled, cross-over trial comparing a healthy school meal programme with the usual packed lunch from home (control) each for 3 months (NCT 01457794). The d2 test of attention, the Learning Rating Scale (LRS) and standard tests on reading and mathematics proficiency were administered at baseline and at the end of each study period. Intervention effects were evaluated using hierarchical mixed models. The school meal intervention did not influence concentration performance (CP; primary outcome, n 693) or processing speed; however, the decrease in error percentage was 0·18 points smaller (P<0·001) in the intervention period than in the control period (medians: baseline 2·03 %; intervention 1·46 %; control 1·37 %). In contrast, the intervention increased reading speed (0·7 sentence, P=0·009) and the number of correct sentences (1·8 sentences, P<0·001), which corresponded to 11 and 25 %, respectively, of the effect of one school year. The percentage of correct sentences also improved (P<0·001), indicating that the number correct improved relatively more than reading speed. There was no effect on overall math performance or outcomes from the LRS. In conclusion, school meals did not affect CP, but improved reading performance, which is a complex cognitive activity that involves inference, and increased errors related to impulsivity and inattention. These findings are worth examining in future trials.
Validation of a Food Frequency Questionnaire for dietary vitamin D and calcium by cognitive interviewing

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Vitamin D status and its determinants during autumn in children at northern latitudes: a cross-sectional analysis from the optimal well-being, development and health for Danish children through a healthy New Nordic Diet (OPUS) School Meal Study

Sufficient summer/autumn vitamin D status appears important to mitigate winter nadirs at northern latitudes. We conducted a cross-sectional study to evaluate autumn vitamin D status and its determinants in 782 Danish 8-11-year-old children (55°N) using baseline data from the Optimal well-being, development and health for Danish children through a healthy New Nordic Diet (OPUS) School Meal Study, a large randomised controlled trial. Blood samples and demographic and behavioural data, including 7-d dietary recordings, objectively measured physical activity, and time spent outdoors during school hours, were collected during September-November. Mean serum 25-hydroxyvitamin D (25(OH)D) was 60·8 (sd 18·7) nmol/l. Serum 25(OH)D levels ≤50 nmol/l were found in 28·4 % of the children and 2·4 % had concentrations...
Vitamin D status is associated with cardiometabolic markers in 8-11-year-old children, independently of body fat and physical activity

Vitamin D status has been associated with cardiometabolic markers even in children, but the associations may be confounded by fat mass and physical activity behaviour. This study investigated associations between vitamin D status and cardiometabolic risk profile, as well as the impact of fat mass and physical activity in Danish 8-11-year-old children, using baseline data from 782 children participating in the Optimal well-being, development and health for Danish children through a healthy New Nordic Diet (OPUS) School Meal Study. We assessed vitamin D status as serum 25-hydroxyvitamin D (25(OH)D) and measured blood pressure, fasting plasma glucose, homoeostasis model of assessment-insulin resistance, plasma lipids, inflammatory markers, anthropometry and fat mass by dual-energy X-ray absorptiometry, and physical activity by 7 d accelerometry during August-November. Mean serum 25(OH)D was 60·8 (sd 18·7) nmol/l. Each 10 nmol/l 25(OH)D increase was associated with lower diastolic blood pressure (-0·3 mmHg, 95 % CI -0·6, -0·0) (P=0·02), total cholesterol (-0·07 mmol/l, 95 % CI -0·10, -0·05), LDL-cholesterol (-0·05 mmol/l, 95 % CI -0·08, -0·03), TAG (-0·02 mmol/l, 95 % CI -0·03, -0·01) (Ps0·001 for all lipids) and lower metabolic syndrome (MetS) score (P=0·01). Adjustment for fat mass index did not change the associations, but the association with blood pressure became borderline significant after adjustment for physical activity (P=0·06). In conclusion, vitamin D status was negatively associated with blood pressure, plasma lipids and a MetS score in Danish school children with low prevalence of vitamin D deficiency, and apart from blood pressure the associations were independent of body fat and physical activity. The potential underlying cause-effect relationship and possible long-term implications should be investigated in randomised controlled trials.

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What do Danish children eat, and does the diet meet the recommendations?: Baseline data from the OPUS School Meal Study

A child’s diet is an important determinant for later health, growth and development. In Denmark, most children in primary school bring their own packed lunch from home and attend an after-school care institution. The aim of the present study was to evaluate the food, energy and nutrient intake of Danish school children in relation to dietary guidelines and nutrient recommendations, and to assess the food intake during and outside school hours. In total, 834 children from nine public schools located in the eastern part of Denmark were included in this cross-sectional study and 798 children (95·7 %) completed the dietary assessment sufficiently (August-November 2011). The whole diet was recorded during seven consecutive days using the Web-based Dietary Assessment Software for Children (WebDASC). Compared with the food-based dietary guidelines and nutrient recommendations, 85 % of the children consumed excess amounts of red meat, 89 % consumed too much saturated fat, and 56 % consumed too much added sugar. Additionally 35 or 91 % of the children (depending on age group) consumed insufficient amounts of fruits and vegetables, 85 % consumed insufficient amounts of fish, 86 % consumed insufficient amounts of dietary fibre, 60 or 84 % had an insufficient Fe intake (depending on age group), and 96 % had an insufficient vitamin D intake. The study also showed that there is a higher intake of fruits and bread during school hours than outside school hours; this is not the case with, for example, fish and vegetables, and future studies should investigate strategies to increase fish and vegetable intake during school hours.

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Change in sleep duration and proposed dietary risk factors for obesity in Danish school children

Background
Recent cross-sectional studies found higher consumption of energy-dense foods among children with short sleep duration; however, longitudinal studies examining changes in sleep and diet over time are needed.

Objective
This study aimed to investigate prospective associations between changes in objectively measured sleep duration and
alterations in proposed dietary risk factors for obesity in 8–11-year-old Danish children.

Methods
Four hundred forty-one children recorded dietary intake during seven consecutive days, along with accelerometer measurements estimating sleep duration at baseline and after ~200 days.

Results
Baseline sleep duration did not predict changes in dietary intake or vice versa (all P ≥ 0.69). However, 1-h lower sleep duration was associated with higher intake of added sugar (1.59 E%; P = 0.001) and sugar-sweetened beverages (0.90 E%; P = 0.002) after 200 days with no change in energy density of the diet (P = 0.78).

Conclusion
Our results suggest that a negative change in sleep duration is associated with higher intakes of sugar containing foods/beverages.

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BFI (2014): BFI-level 1
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Common variants in CYP2R1 and GC genes are both determinants of serum 25-hydroxyvitamin D concentrations after UVB irradiation and after consumption of vitamin D3-fortified bread and milk during winter in Denmark

Background: Little is known about how the genetic variation in vitamin D modulating genes influences ultraviolet (UV)B–induced 25-hydroxyvitamin D [25(OH)D] concentrations. In the Food with vitamin D (VitmaD) study, we showed that common genetic variants rs10741657 and rs10766197 in 25-hydroxylase (CYP2R1) and rs842999 and rs4588 in vitamin D binding protein (GC) predict 25(OH)D concentrations at late summer and after 6-mo consumption of cholecalciferol (vitamin D3)–fortified bread and milk.

Objectives: In the current study, called the Vitamin D in genes (VitDgen) study, we analyzed associations between the increase in 25(OH)D concentrations after a given dose of artificial UVB irradiation and 25 single nucleotide polymorphisms located in or near genes involved in vitamin D synthesis, transport, activation, or degradation as previously described for the VitmaD study. Second, we aimed to determine whether the genetic variations in CYP2R1 and GC have similar effects on 25(OH)D concentrations after artificial UVB irradiation and supplementation by vitamin D3–fortified bread and milk.

Design: The VitDgen study includes 92 healthy Danes who received 4 whole-body UVB treatments with a total dose of 6 or 7.5 standard erythema doses during a 10-d period in winter. The VitmaD study included 201 healthy Danish families who were given vitamin D3–fortified bread and milk or placebo for 6 mo during the winter.

Results: After UVB treatments, rs10741657 in CYP2R1 and rs4588 in GC predicted UVB-induced 25(OH)D concentrations as previously shown in the VitmaD study. Compared with noncarriers, carriers of 4 risk alleles of rs10741657 and rs4588 had lowest concentrations and smallest increases in 25(OH)D concentrations after 4 UVB treatments and largest decreases in 25(OH)D concentrations after 6-mo consumption of vitamin D3–fortified bread and milk.

Conclusion: Common genetic variants in the CYP2R1 and GC genes modify 25(OH)D concentrations in the same manner after artificial UVB-induced vitamin D and consumption of vitamin D3–fortified bread and milk. The VitDgen study was registered at clinicaltrials.gov as NCT01741233. The VitmaD study was registered at clinicaltrials.gov as NCT01184716.
Common Variants in CYP2R1 and GC Genes Predict Vitamin D Concentrations in Healthy Danish Children and Adults

Environmental factors such as diet, intake of vitamin D supplements and exposure to sunlight are known to influence serum vitamin D concentrations. Genetic epidemiology of vitamin D is in its infancy and a better understanding on how genetic variation influences vitamin D concentration is needed. We aimed to analyse previously reported vitamin D-related polymorphisms in relation to serum 25(OH)D concentrations in 201 healthy Danish families with dependent children in late summer in Denmark. Serum 25(OH)D concentrations and a total of 25 SNPs in GC, VDR, CYP2R1, CYP24A1, CYP27B1, C10or88 and DHCR7/NADSYN1 genes were analysed in 758 participants. Genotype distributions were in Hardy-Weinberg equilibrium for the adult population for all the studied polymorphisms. Four SNPs in CYP2R1 (rs1562902, rs7116978, rs10741657 and rs10766197) and six SNPs in GC (rs4588, rs842999, rs2282679, rs12512631, rs16846876 and rs17467825) were statistically significantly associated with serum 25(OH)D concentrations in children, adults and all combined. Several of the SNPs were in strong linkage disequilibrium, and the associations were driven by CYP2R1-rs10741657 and rs10766197, and by GC-rs4588 and rs842999. Genetic risk score analysis showed that carriers with no risk alleles of CYP2R1-rs10741657 and rs10766197, and/or GC rs4588 and rs842999 had significantly higher serum 25(OH)D concentrations compared to carriers of all risk alleles. To conclude, our results provide supporting evidence that common polymorphisms in GC and CYP2R1 are associated with serum 25(OH)D concentrations in the Caucasian population and that certain haplotypes may predispose to lower 25(OH)D concentrations in late summer in Denmark.

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BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.32 SJR 1.427 SNIP 1.136
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Scopus rating (2014): CiteScore 3.54 SJR 1.559 SNIP 1.148
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Dietary effects of introducing school meals based on the New Nordic Diet: a randomised controlled trial in Danish children.

The OPUS School Meal Study

The OPUS (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet (NND)) School Meal Study investigated the effects on the intake of foods and nutrients of introducing school meals based on the principles of the NND covering lunch and all snacks during the school day in a cluster-randomised cross-over design. For two 3-month periods, 834 Danish children aged 8-11 years from forty-six school classes at nine schools received NND school meals or their usual packed lunches brought from home (control) in random order. The whole diet of the children was recorded over seven consecutive days using a validated Web-based Dietary Assessment Software for Children. The NND resulted in higher intakes of potatoes (130%, 95% CI 2.07, 2.58), fish (48%, 95% CI 1.33, 1.65), cheese (25%, 95% CI 1.15, 1.36), vegetables (16%, 95% CI 1.10, 1.21), eggs (10%, 95% CI 1.01, 1.19) and beverages (6%, 95% CI 1.02, 1.09), and lower intakes of bread (13%, 95% CI 0.84, 0.89) and fats (6%, 95% CI 0.90, 0.98) were found among the children during the NND period than in the control period (all, P< 0.05). No difference was found in mean energy intake (P= 0.4), but on average children reported 0.9% less energy intake from fat and 0.9% higher energy intake from protein during the NND period than in the control period. For micronutrient intakes, the largest differences were found for vitamin D (42%, 95% CI 1.32, 1.53) and iodine (11%, 95% CI 1.08, 1.15) due to the higher fish intake. In conclusion, the present study showed that the overall dietary intake at the food and nutrient levels was improved among children aged 8-11 years when their habitual packed lunches were replaced by school meals following the principles of the NND.
Eicosapentaenoic acid and docosahexaenoic acid in whole blood are differentially and sex-specifically associated with cardiometabolic risk markers in 8-11-year-old Danish children.

n-3 long-chain polyunsaturated fatty acids improve cardiovascular risk markers in adults. These effects may differ between eicosapentaenoic acid (EPA, 20:5n-3) and docosahexaenoic acid (DHA, 22:6n-3), but we lack evidence in children. Using baseline data from the OPUS School Meal Study we 1) investigated associations between EPA and DHA in whole blood and early cardiometabolic risk markers in 713 children aged 8-11 years and 2) explored potential mediation through waist circumference and physical activity and potential dietary confounding. We collected data on parental education, pubertal stage, 7-day dietary records, physical activity by accelerometry and measured anthropometry, blood pressure, and heart rate. Blood samples were analyzed for whole blood fatty acid composition, cholesterol, triacylglycerol, insulin resistance by the homeostatic model of assessment (HOMA-IR), and inflammatory markers. Whole blood EPA was associated with a 2.7 mmHg (95% CI 0.4; 5.1) higher diastolic blood pressure per weight% EPA, but only in boys. Heart rate was negatively associated with both EPA and DHA status (P = 0.02 and P = 0.002, respectively). Whole blood EPA was negatively associated with triacylglycerol (P = 0.003) and positively with total cholesterol, low density and high density lipoprotein (HDL) cholesterol and HDL:triacylglycerol (all P < 0.05).
Fatness predicts decreased physical activity and increased sedentary time, but not vice versa: support from a longitudinal study in 8- to 11-year-old children

Objective:
To examine independent and combined cross-sectional associations between movement behaviors (physical activity (PA), sedentary time, sleep duration, screen time and sleep disturbance) and fat mass index (FMI), as well as to examine longitudinal associations between movement behaviors and FMI.

Methods:
Cross-sectional and longitudinal analyses were done using data from the OPUS school meal study on 785 children (52% boys, 13.4% overweight, ages 8–11 years). Total PA, moderate-to-vigorous PA (MVPA), sedentary time and sleep duration (7 days and 8 nights) were assessed by an accelerometer and FMI was determined by dual-energy X-ray absorptiometry (DXA) on three occasions over 200 days. Demographic characteristics, screen time and sleep disturbance
(Children’s Sleep Habits Questionnaire) were also obtained.

Results:
Total PA, MVPA and sleep duration were negatively associated with FMI, while sedentary time and sleep disturbances were positively associated with FMI (P<less than or equal to)-0.01). However, only total PA, MVPA and sleep duration were independently associated with FMI after adjustment for multiple covariates (P<0.001). Nevertheless, combined associations revealed synergistic effects among the different movement behaviors. Changes over time in MVPA were negatively associated with changes in FMI (P<0.001). However, none of the movement behaviors at baseline predicted changes in FMI (P>0.05), but higher FMI at baseline predicted a decrease in total PA and MVPA, and an increase in sedentary time (P<less than or equal to)-0.001), even in normal-weight children (P<less than or equal to)-0.03).

Conclusion:
Total PA, MVPA and sleep duration were independently associated with FMI, and combined associations of movement behaviors showed a synergistic effect with FMI. In the longitudinal study design, a high FMI at baseline was associated with lower PA and higher sedentary time after 200 days but not vice versa, even in normal-weight children. Our results suggest that adiposity is a better predictor of PA and sedentary behavior changes than the other way around.

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Scopus rating (2015): CiteScore 4.93 SJR 2.958 SNIP 1.662
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Scopus rating (2012): CiteScore 4.71 SJR 2.355 SNIP 1.651
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Finding the Optimum Scenario in Risk-benefit Assessment: An Example on Vitamin D

Background: In risk-benefit assessment of food and nutrients, several studies so far have focused on comparison of two scenarios to weigh the health effect against each other. One obvious next step is finding the optimum scenario that provides maximum net health gains. Aim: This paper aims to show a method for finding the optimum scenario that provides maximum net health gains. Methods: A multiple scenario simulation. The method is presented using vitamin D intake in Denmark as an example. In addition to the reference scenario, several alternative scenarios are simulated to detect the scenario that provides maximum net health gains. As a common health metric, Disability Adjusted Life Years (DALY) has been used to project the net health effect by using the QALIBRA (Quality of Life for Benefit Risk Assessment) software. Results: The method used in the vitamin D example shows that it is feasible to find an optimum scenario that provides maximum net health gain in health risk-benefit assessment of dietary exposure as expressed by serum vitamin D level. With regard to the vitamin D assessment, a considerable health gain is observed due to the reduction of risk of other cause mortality, fall and hip fractures when changing from the reference to the optimum scenario. Conclusion: The method allowed us to find the optimum serum level in the vitamin D example. Additional case studies are needed to further validate the applicability of the approach to other nutrients or foods, especially with regards to the uncertainty that is usually attending the data.

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Low Physical Activity Level and Short Sleep Duration Are Associated with an Increased Cardio-Metabolic Risk Profile: A Longitudinal Study in 8-11 Year Old Danish Children

Background: As cardio-metabolic risk tracks from childhood to adulthood, a better understanding of the relationship between movement behaviors (physical activity, sedentary behavior and sleep) and cardio-metabolic risk in childhood may aid in preventing metabolic syndrome (MetS) in adulthood. Objective: To examine independent and combined cross-sectional and longitudinal associations between movement behaviors and the MetS score in 8-11 year old Danish children. Design: Physical activity, sedentary time and sleep duration (seven days and eight nights) were assessed by accelerometer and fat mass index (fat mass/height(2)) was assessed using Dual-energy X-ray absorptiometry. The MetS-score was based on z-scores of waist circumference, mean arterial blood pressure, homeostatic model assessment of insulin resistance, triglycerides and high density lipoprotein cholesterol. All measurements were taken at three time points separated by 100 days. Average of the three measurements was used as habitual behavior in the cross-sectional analysis and changes from first to third measurement was used in the longitudinal analysis. Results: 723 children were included. In the cross-sectional analysis, physical activity was negatively associated with the MetS-score (P

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Provision of healthy school meals does not affect the metabolic syndrome score in 8-11-year-old children, but reduces cardiometabolic risk markers despite increasing waist circumference

An increasing number of children are exhibiting features of the metabolic syndrome (MetS) including abdominal fatness, hypertension, adverse lipid profile and insulin resistance. Healthy eating practices during school hours may improve the cardiometabolic profile, but there is a lack of evidence. In the present study, the effect of provision of school meals rich in fish, vegetables and fibre on a MetS score (primary outcome) and on individual cardiometabolic markers and body composition (secondary outcomes) was investigated in 834 Danish school children. The study was carried out as a cluster-randomised, controlled, non-blinded, cross-over trial at nine schools. Children aged 8-11 years received freshly prepared school lunch and snacks or usual packed lunch from home (control) each for 3 months. Dietary intake, physical activity, cardiometabolic markers and body composition were measured at baseline and after each dietary period. The school meals did not affect the MetS score (P= 1·00). However, it was found that mean arterial pressure was reduced by 0·4 (95 % CI 0·0, 0·8) mmHg (P= 0·04), fasting total cholesterol concentrations by 0·05 (95 % CI 0·02, 0·08) mmol/l (P= 0·001), HDL-cholesterol concentrations by 0·02 (95 % CI 0·00, 0·03) mmol/l, TAG concentrations by 0·02 (95 % CI 0·00, 0·04) mmol/l (both P<0·05), and homeostasis model of assessment-insulin resistance by 0·10 (95 % CI 0·04, 0·16) points (P= 0·001) compared with the control diet in the intention-to-treat analyses. Waist circumference increased 0·5 (95 % CI 0·3, 0·7) cm (P<0·001), but BMI z-score remained unaffected. Complete-case analyses and analyses adjusted for household educational level, pubertal status and physical activity confirmed the results. In conclusion, the school meals did not affect the MetS score in 8-11-year-olds, as small improvements in blood pressure, TAG concentrations and insulin resistance were counterbalanced by slight undesired effects on waist circumference and HDL-cholesterol concentrations.

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Organisations: National Food Institute, Division of Nutrition, University of Copenhagen, Copenhagen University Hospital
Real-life use of vitamin D₃-fortified bread and milk during a winter season: the effects of CYP2R1 and GC genes on 25-hydroxyvitamin D concentrations in Danish families, the VitmaD study.

Common genetic variants rs10741657 and rs10766197 in CYP2R1 and rs4588 and rs842999 in GC and a combined genetic risk score (GRS) of these four variants influence late summer 25-hydroxyvitamin D (25(OH)D) concentrations. The objectives were to identify those who are most at risk of developing low vitamin D status during winter and to assess whether vitamin D₃-fortified bread and milk will increase 25(OH)D concentrations in those with genetically determined low 25(OH)D concentrations at late summer. We used data from the VitmaD study. Participants were allocated to either vitamin D₃-fortified bread and milk or non-fortified bread and milk during winter. In the fortification group, CYP2R1 (rs10741657) and GC (rs4588 and rs842999) were statistically significantly associated with winter 25(OH)D concentrations and CYP2R1 (rs10766197) was borderline significant. There was a negative linear trend between 25(OH)D concentrations and carriage of 0-8 risk alleles (p <0.0001). No association was found for the control group (p = 0.1428).

There was a significant positive linear relationship between different quintiles of total vitamin D intake and the increase in 25(OH)D concentrations among carriers of 0-2 (p = 0.0012), 3 (p = 0.0001), 4 (p = 0.0118) or 5 (p = 0.0029) risk alleles, but not among carriers of 6-8 risk alleles (p = 0.1051). Carriers of a high GRS were more prone to be vitamin D deficient compared to carriers of a low GRS. Furthermore, rs4588-AA carriers have a low but very stable 25(OH)D concentration, and interestingly, also low PTH level.
Short sleep duration and large variability in sleep duration are independently associated with dietary risk factors for obesity in Danish school children.

Background: Lack of sleep and increased consumption of energy-dense foods and sugar-sweetened beverages (SSB) have all been suggested as factors contributing to the increased prevalence of overweight and obesity. Objective: To evaluate whether objectively measured sleep duration (average and day-to-day variability) as well as parent-reported sleep problems are independently associated with proposed dietary risk factors for overweight and obesity in 8-11 year old children. Design: In this cross-sectional study data on sleep duration and day-to-day variability in sleep duration were measured in 676 Danish, apparently healthy children by an objective measure (actigraphy) for 8 nights, and the Children's Sleep Habits Questionnaire (CSHQ) was filled out by the parents. Diet was recorded using a web-based food record for 7 consecutive days. Fasting blood samples were obtained for measurements of plasma leptin and ghrelin levels. Results: Sleep duration (hours/night) was negatively and significantly (P=0.003) associated with energy density (ED) of the diet (β=-0.32 kJ/g), added sugar (β=-1.50 E%) and SSB (β=-1.07 E%). Furthermore, variability in sleep duration (min/night) was positively associated with SSB (β=0.20 E%, P=0.03), independent of sleep duration, and CSHQ-score was positively associated with ED (β=0.16 kJ/g, P=0.04). All of these associations were independent of potential confounders (age, sex, pubertal status, height, weight, screen time, moderate-to-vigorous physical activity, and parental education and...
ethnicity). Conclusion: Our study suggests that short sleep duration, high sleep duration variability, and experiencing sleep problems are all associated with a poor, obesity-promoting diet in children. International Journal of Obesity accepted article preview online, 8 August 2013. doi:10.1038/ijo.2013.147.

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Vitamin D status and effects of food fortification in families

Background and aims: The importance of vitamin D in bone health is recognised and low concentrations have been associated with increased risk of disease. Cutaneous synthesis is considered the major source of vitamin D, but during winter where sufficient sun exposure is restricted at Northern latitudes, intake from food and dietary supplements become essential. Vitamin D intakes are lower than dietary recommendations in most populations and low vitamin D status is common. The PhD thesis is based on the VitmaD study in which a realistic and model derived fortification strategy was investigated in a real-life setting. The aim was to investigate the effect of increasing vitamin D intake by fortification of milk and bread to the amount recommended in the Nordic Nutrition recommendations (NNR) on serum 25(OH)D concentration in families during winter in Denmark (paper 1). Secondly, the aim was to assess vitamin D status and its determinants at baseline of the study (paper 2). Further, to model the relationship between total vitamin D intake and serum 25(OH)D taking into account potential effect modifiers and estimate required vitamin D intake during winter (paper 3). Methods: The VitmaD study was a randomized controlled trial in 782 children and adults (4-60 years) recruited as 201 families. Families were randomly assigned to vitamin D fortified or nonfortified milk and bread for 6 months starting from September. The milk and bread replaced the subjects’ usual consumptions of products. Information on dietary intake, supplement use, health and lifestyle was obtained by self-administered web-based questionnaires. Serum 25(OH)D was analysed by liquid chromatography-tandem mass spectrometry (LC/MS-MS). Mixed models with family as a random factor were applied in all the statistical analyses. Results: At baseline of the study (late summer) the geometric mean (IQR) serum 25(OH)D concentration was 72.1 (61.5-86.7) nmol/L with no overall differences between age (P=0.190), gender (P=0.332) or age and gender groups (P=0.223) (paper 2). The prevalence of serum 25(OH)D <50 nmol/L was 9 %. In the multiple analysis of all subjects, vitamin D status was negatively associated with BMI (P<0.001) and positively associated with dietary vitamin D (P=0.008), multivitamin use (P=0.019), solarium use (P=0.006), outdoor stay in light clothes (P=0.001), sun preference (P=0.002) and sun vacation (P<0.001). The intra-family correlation was stronger in children (0.42) compared with adults (0.24). Thus children within a family seemed to be more alike than adults within a family with respect to vitamin D status. The planned fortification strategy was to increase the vitamin D intake to 7.5 µg/day. This succeeded in 66 % of the subjects in the fortification group with a median vitamin D intake (habitual diet plus fortified milk and bread) of 9.4 µg/day compared with 2.2 µg/day in the control group (paper 1). During winter the serum 25(OH)D concentration decreased from 73.1 to 67.6 nmol/L (-Δ5.5 nmol/L) in the fortification group (P<0.001) and from 71.1 to 41.7 nmol/L (-Δ29.4 nmol/L) in the control group (P<0.001). The final serum 25(OH)D concentration was significantly higher in the fortification group compared with in the control group (P<0.001, interpreted estimate 1.59) and the treatment effect was not affected by BMI, multivitamin use and sun vacation. The prevalence of serum 25(OH)D <50 nmol/L remained low in the fortification group (16 %) whereas it increased to 65 % in the control group. The relationship between total vitamin D intake from natural foods, fortified milk and bread and dietary supplements and serum 25(OH)D concentration in winter was best fitted by a non-linear curve (paper 3). The effect of total vitamin D intake on serum 25(OH)D concentration was 4 % higher in men compared with women (P<0.014) and 10 % higher in the group with lowest initial 25(OH)D concentration (<61.5 nmol/L) compared with the group with highest initial 25(OH)D concentration (>86.9 nmol/L) (P<0.001). It was not modified by age (P=0.132) or BMI (P=0.884). Estimated required vitamin D intake was 5, 11, 23 and 39 µg/day for 50, 75, 90 and 95 % of the population to maintain vitamin D status >50 nmol/L during winter. These figures were higher for the group with lowest initial 25(OH)D concentration (11, 18, 34 and >34 µg/day) and lower for the group with highest initial 25(OH)D concentration (<1, 3, 8 and 17 µg/day). Conclusions: In the population of Danish families, serum 25(OH)D concentration was above 50 nmol/L in late summer and it was associated with both dietary and sun related factors. Children within a family seemed to be more alike than adults within a family with respect to vitamin D status. Vitamin D fortification of milk and bread reduced the decrease in serum 25(OH)D concentration during winter and ensured concentrations above 50 nmol/L. The relationship between total vitamin D intake and vitamin D status was non-linear. Estimated total vitamin D intake to maintain serum 25(OH)D above 50 nmol/L was largely dependent on the initial vitamin D status.

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Vitamin D status and its determinants in children and adults among families in late summer in Denmark.

The impact of the familial relationship on vitamin D status has not been investigated previously. The objective of the present cross-sectional study was to assess serum 25-hydroxyvitamin D (25(OH)D) concentration and its determinants in children and adults among families in late summer in Denmark (56°N). Data obtained from 755 apparently healthy children (4-17 years) and adults (18-60 years) recruited as families (n 200) in the VitmaD study were analysed. Blood samples were collected in September-October, and serum 25(OH)D concentration was measured by liquid chromatography-tandem MS. Information on potential determinants was obtained using questionnaires. The geometric mean serum 25(OH)D concentration was 72·1 (interquartile range 61·5-86·7) nmol/l (range 9-162 nmol/l), with 9 % of the subjects having 25(OH)D concentrations <50 nmol/l. The intra-family correlation was 0·27 in all subjects, 0·24 in the adults and 0·42 in the children. Serum 25(OH)D concentration was negatively associated with BMI (P<0·001) and positively associated with dietary vitamin D intake (P= 0·008), multivitamin use (P= 0·019), solarium use (P= 0·006), outdoor stay (P= 0·001), sun preference (P= 0·002) and sun vacation (P<0·001), but was not associated with lifestyle-related factors in the adults when these were assessed together with the other determinants. In conclusion, the majority of children and adults among the families had serum 25(OH)D concentrations >50 nmol/l in late summer in Denmark. Both dietary and sun-related factors were determinants of vitamin D status and the familial component was stronger for the children than for the adults.
A school meal study: comparing plate waste and likings of packed lunch and school lunch based on the New Nordic Diet

Background and objectives: The majority of Danish children do not eat in accordance with the national dietary guidelines. The OPUS School Meal Study is a school-based intervention study testing the health effects of the New Nordic Diet (NND). The aim of this sub-study was to compare edible plate waste and self-reported likings between packed lunch from home and the served NND meal.
Methods: The OPUS School Meal study is a cluster-randomized controlled 2-period cross-over study consisting of two three-month periods: an intervention period (NND) and a control period. 187 children (8-11y) at two schools were assigned to the food waste sub-study. Edible plate waste was measured by weighing individually the meal for 5 consecutive days before and after lunch at the end of each dietary period. Self-reported smiley ratings from a web-based dietary assessment software for children were compared to edible plate waste. Data were statistical modelled in two steps, a generalised linear mixed model was fitted for the probability of waste/no waste, and secondly a model for positive waste data was fitted.

Results: 74% of all meals (N=1558) had edible plate waste (>5g). Looking at all lunches the odds for leaving edible plate waste was 11 times higher for NND than for packed lunch (P < 0.001). Looking at the meals (N=1060) with edible plate waste the amount was not significantly different between meal types; the median (IQR) for NND was 85.0 (36.5; 150.0) and the median (IQR) for packed lunch 70.0 (40.0; 119.0). Lunches rated as ‘really bad’ or ‘bad’ in the self-reported likings had more waste than lunches rated ‘really good’ (P < 0.001).

Conclusions: The odds of having edible plate waste were significantly higher for NND meals compared to packed lunch. Liking of school meals are a significant determinant in order to reduce edible plate waste.

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Autumn vitamin D status in 782 eight-eleven year old Danish children - preliminary results from the Opus school meal study

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Comparing plate waste and likings of packed lunch and school lunch based on the New Nordic Diet

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Method development in risk-benefit assessment and burden of disease estimation of food

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Randomized controlled trial of the effects of vitamin D–fortified milk and bread on serum 25-hydroxyvitamin D concentrations in families in Denmark during winter: the VitmaD study

Background: Vitamin D intakes are lower than dietary recommendations in most populations, and thus, a low vitamin D status is widespread, especially during winter.

Objective: We investigated the effects of increasing vitamin D intake to the recommended amount by fortification of milk and bread on serum 25-hydroxyvitamin D [25(OH)D] concentrations in families during winter in Denmark.

Design: The study was a randomized controlled trial in 782 children and adults (4–60 y old) recruited as 201 families. Families were randomly assigned to vitamin D–fortified or nonfortified milk and bread for 6 mo starting in September. The milk and bread replaced the participants’ usual consumptions of products.

Results: Median (IQR) vitamin D intakes (habitual diet plus fortified products) were 9.4 μg/d (6.5, 12.3 μg/d) and 2.2 μg/d (1.5, 3.0 μg/d) in fortification and control groups, respectively. Geometric mean (IQR) serum 25(OH)D concentrations decreased from 73.1 nmol/L (61.9, 88.5 nmol/L) to 67.6 nmol/L (56.2, 79.4 nmol/L) in the fortification group and from 71.1 nmol/L (61.2, 85.9 nmol/L) to 41.7 nmol/L (29.5, 58.9 nmol/L) in the control group (both P < 0.001). The final 25(OH)D concentration was significantly higher in the fortification group than in the control group (P < 0.001). By the end of the study, <1% of subjects in the fortification group and 25% of subjects in the control group had 25(OH)D concentrations <30 nmol/L and 16% and 65% of subjects, respectively, had 25(OH)D concentrations <50 nmol/L.

Conclusion: Vitamin D fortification of milk and bread reduces the decrease in serum 25(OH)D concentrations during winter and ensures 25(OH)D concentrations >50 nmol/L in children and adults in Denmark. This trial was registered at clinicaltrials.gov as NCT01184716.
Seasonal changes in vitamin D status among Danish adolescent girls and elderly women: the influence of sun exposure and vitamin D intake.

Background/objectives: To determine seasonal variation in vitamin D status in healthy Caucasian adolescent girls and elderly community-dwelling women living in Denmark, and to quantify the impact of sun exposure and intake on the seasonal changes in vitamin D status. Subjects/methods: A 1-year longitudinal observational study of 54 girls (11-13 years) and 52 women (70-75 years). The participants were examined three times (winter-summer-winter). Serum 25-hydroxyvitamin D (S-25OHD) concentration and vitamin D intake were measured at each visit. Sun exposure was measured during summer. Results: S-25OHD concentrations (winter, summer, winter) were median (25, 75 percentiles)
23.4 (16.5, 36.4), 60.3 (42.7, 67.7), 29.5 (22.2, 40.4) and 47.2 (27.3, 61.1), 67.3 (35.1, 79.2), 50.5 (32.7, 65.5) nmol/l for girls and women, respectively. The usual sun habits were determinant (P=0.002) for change in vitamin D status from winter to summer. Vitamin D intake from supplements (P
The dietary effect of serving school meals based on the new Nordic diet – A randomised controlled trial in Danish children

Background and objectives:
The OPUS study is a school-based intervention study testing selected health effects of New Nordic Diet (NND). Children are served lunch and snacks based on NND. The hypothesis is that Danish school children eat a healthier diet when receiving NND school meals as compared with packed lunch brought from home. To investigate the effects on intake of selected macronutrients in Danish school children when served school meals based on NND compared with packed lunch.

Methods:
In a cluster-randomized controlled unblinded cross-over study children received school meals based on NND for 3 months and their usual packed lunch for 3 months. The daily intake of food and beverages was recorded 3 times during 7 consecutive days using a validated self-administered web-based dietary assessment software tool for children. Statistical analysis was performed by hierarchical mixed models.

Results:
834 children from 9 schools were included and 96%, 89% and 80% filled out the first, second and third dietary assessment sufficiently (4-7 days), respectively. The preliminary results showed that the effect of serving NND resulted in a reduction in fat E% (P<0.0001), total fat (P=0.0007) and saturated fat (P<0.0001) intake for the NND compared to packed lunch; and an increase in protein E% (P<0.0001), and a borderline significant increase in dietary fiber intake (P=0.0471). There was no effect for energy intake, carbohydrate E% and added sugar E% (P>0.05). Effects are adjusted for BMI, season and household education.

Conclusions:
Danish school children’s dietary intake of total and saturated fat decreased, fat E% decreased and protein E% increased when eating NND lunch and snacks compared to packed lunch brought from home. The OPUS project (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet) is supported by the Nordea Foundation.

General information
Vitamin D status among families in Denmark: Baseline data from the vitmad study

Background and objectives:
The beneficial effect of vitamin D in bone health is acknowledged and the vitamin has also been associated with several chronic diseases. It is therefore relevant to determine the prevalence of vitamin D insufficiency in different groups, and vitamin D statuses within families have not been studied previously. The objective of the present study was to evaluate serum 25-hydroxyvitamin D (25(OH)D) concentrations among families in Denmark (56 °N) after seasonal UVB peak and to ascertain determining factors.

Methods:
Cross-sectional study with 755 children and adults (4-60 y) recruited as families in the VitmaD study. Blood samples were collected in September-October 2010, and vitamin D status was measured as serum 25(OH)D concentration by LC-MS/MS. Vitamin D intake and lifestyle factors were assessed in self-administered questionnaires. Determinants of vitamin D status were identified in a linear mixed model with family as a random variable.

Results:
Mean (±SD) serum 25(OH)D concentration was 75 ± 20 nmol/l (range 9-162 nmol/l) and only 10 % had 25(OH) D <50 nmol/l. Determinants of serum 25(OH)D were age (p=0.036), BMI class (p=0.001), multi vitamin use (p=0.033), sun behaviour (p=0.005), outdoor stay (p=0.033), sun vacation (p<0.001), and physical activity (p=0.040). Gender (p=0.692) and vitamin D intake (p=0.238) were not associated to serum 25(OH)D.

Conclusions:
The prevalence of vitamin D insufficiency among families in Denmark was low after seasonal UVB peak. Sun vacation was the strongest determinant for vitamin D status at this time of the year.
Vitamin D status and association to bone health in 781 healthy 8–11 years old Danish school children: preliminary results from the Opus school meal study

Background: Low vitamin D concentrations among children and adolescents at northern latitudes are frequently observed. Also, inverse associations between 25-hydroxyvitamin D (25(OH)D) and PTH concentrations have been found in children of different ages. More studies on the link between vitamin D status and childhood bone health are needed.

Objective: To evaluate the status of serum 25(OH)D in autumn and the association between 25(OH)D concentrations and bone health in 781 healthy 8–11 years old Danish children (55°N).
Methods: A cross-sectional analysis was performed using baseline data from the optimal well-being, development and health for Danish children through a healthy New Nordic Diet (OPUS) School Meal Study, including 3rd and 4th graders from nine public schools. In autumn 2011, fasting blood samples were drawn and serum 25(OH)D and intact PTH analysed. Background interviews were conducted and anthropometry, puberty stage, intake of dietary supplements and physical activity was measured. Whole body DXA scans were performed and total body less head (TBLH) DXA values were used in data analyses.

Results: Serum 25(OH)D ranged from 15.2 to 132 nmol/l, with mean of 60.7±18.7 nmol/l. Twenty-six percent of the children had concentrations between 25 and 50 nmol/l, while 2.4% had concentrations <25 nmol/l. Intake of dietary supplements ≥4 days/week (n=305) was associated with higher serum 25(OH)D (P<0.001). Girls had significantly lower 25(OH)D (P<0.001), and significantly higher iPTH (P=0.012) concentrations than boys. Serum 25(OH)D was inversely associated with iPTH without, and with, adjustment for age, gender, pubertal stage, month and ethnicity (P<0.001). No significant associations were found between serum 25(OH)D and bone mineral content (BMC) without, nor with, adjustment for bone area (BA), age, height, weight, gender, pubertal stage, ethnicity and physical activity. Likewise, no associations were found between serum 25(OH)D and BA or BMD.

Conclusion: A substantial number of Danish children did not reach the recommended level of 25(OH)D (>50 nmol/l) during autumn. Despite a significant association with iPTH, no overt association between serum 25(OH)D and bone health was established.

The OPUS project (optimal well-being, development and health for Danish children through a healthy New Nordic Diet) is supported by a grant from the Nordea Foundation.

Design of the OPUS School Meal Study: A randomised controlled trial assessing the impact of serving school meals based on the New Nordic Diet

Introduction: Danish children consume too much sugar and not enough whole grain, fish, fruit, and vegetables. The Nordic region is rich in such foods with a strong health-promoting potential. We lack randomised controlled trials that investigate the developmental and health impact of serving school meals based on Nordic foods. Aim: This paper describes the rationale, design, study population, and potential implications of the Optimal well-being, development and health for Danish children through a healthy New Nordic Diet (OPUS) School Meal Study. Methods: In a cluster-randomised cross-over design, 1021 children from 3rd and 4th grades (8–11 years old) at nine Danish municipal schools were invited to participate. Classes were assigned to two 3-month periods with free school meals based on the New Nordic Diet (NND) or their usual packed lunch (control). Dietary intake, nutrient status, physical activity, cardiorespiratory fitness, sleep, growth, body composition, early metabolic and cardiovascular risk markers, illness, absence from school, wellbeing, cognitive function, social and cultural features, food acceptance, waste, and cost were assessed. Results: In total, 834 children (82% of those invited) participated. Although their parents were slightly better educated than the background population, children from various socioeconomic backgrounds were included. The proportion of overweight and obese children (14%) resembled that of earlier examinations of Danish school children. Drop out was 8.3%. Conclusions: A high inclusion rate and low drop out rate was achieved. This study will be the first to determine whether school meals based on the NND improve children’s diet, health, growth, cognitive performance, and early disease risk markers.
Risk-benefit assessment of cold-smoked salmon: microbial risk versus nutritional benefit

The objective of the study is to perform an integrated analysis of microbiological risks and nutritional benefits in a fish product, Cold Smoked Salmon (CSS).

Literature study identified the major health risks and benefits in connection with CSS consumption. The reduction of the risk of Coronary Heart Disease (CHD) mortality and stroke, as well as enhanced cognitive (IQ) development of unborns following maternal intake, are identified as the main health benefits of omega-3 fatty acid from CSS. Contrary, risk of meningitis, septicemia and abortion/stillborn are identified as a major health risk endpoints due to exposure to the pathogen L. monocytogenes. Two consumption scenarios were considered: a reference scenario (23g/day and 20g/day for man and woman respectively) and an alternative scenario (40g/day for both sexes). In order to evaluate and compare the risks and benefits, the Disability Adjusted Life Years (DALY) method has been used as a common metric. Results show that the overall health benefits outweigh the risk, foremost contributed by the effect of decreased CHD mortality and IQ increase. A sensitivity analysis indicated that this result was robust for the analyzed parameters, except the storage time: the adverse effect of consumption of CSS prevails over the beneficial effect if the storage time of CSS is increased from two weeks to five weeks or more, due to an increased risk of listeriosis. This study demonstrates how microbial risks can be integrated in risk-benefit assessment, and shows that a sensitivity analysis has an added value, even if the benefits largely outweigh the risk in the initial analysis.
Application of the BRAFO tiered approach for benefit–risk assessment to case studies on dietary interventions

The respective examples, described in this paper, illustrate how the BRAFO-tiered approach, on benefit–risk assessment, can be tested on a wide range of case studies. Various results were provided, ranging from a quick stop as the result of non-genuine benefit–risk questions to continuation through the tiers into deterministic/probabilistic calculations. The paper illustrates the assessment of benefits and risks associated with dietary interventions. The BRAFO tiered approach is tested with five case studies. In each instance, the benefit–risk approach is tested on the basis of existing evaluations for the individual effects done by others; no new risk or benefit evaluations were made. The following case studies were thoroughly analyzed: an example of food fortification, folic acid fortification of flour, macronutrient replacement/food substitution; the isocaloric replacement of saturated fatty acids with carbohydrates; the replacement of saturated fatty acids with monounsaturated fatty acids; the replacement of sugar-sweetened beverages containing mono- and disaccharides with low calorie sweeteners and an example of addition of specific ingredients to food: chlorination of drinking water.

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Organisations: Division of Nutrition, National Food Institute, National Institute of Public Health and the Environment, Danone Vitapole, Quadram Institute, Ajinomoto Foods Europe S.A.S., Netherlands Organisation for Applied Scientific Research - TNO, Hacettepe University, Ulster University, King’s College London, Netherlands Nutrition Centre, International Life Sciences Institute
Pages: s710-s723
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Publication information
Journal: Food and Chemical Toxicology
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.99 SJR 1.144 SNIP 1.427
Web of Science (2017): Impact factor 3.977
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.96 SJR 1.351 SNIP 1.58
Web of Science (2016): Impact factor 3.778
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.44 SJR 1.202 SNIP 1.415
Web of Science (2015): Impact factor 3.584
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.12 SJR 1.038 SNIP 1.369
Web of Science (2014): Impact factor 2.895
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.26 SJR 1.02 SNIP 1.506
Web of Science (2013): Impact factor 2.61
ISI indexed (2013): ISI indexed yes
D-vitamin. Opdatering af videnskabelig evidens for sygdomsforebyggelse og anbefalinger

General information
State: Published
Organisations: Division of Nutrition, National Food Institute, Division of Toxicology and Risk Assessment, Division of Food Chemistry
Number of pages: 84
Publication date: Jun 2010

Publication information
Place of publication: Søborg
Publisher: Danmarks Tekniske Universitet, Fødevareinstituttet
Edition: 1
Camellia sinensis and bone health - Scientific substantiation of a health claim related to Camellia sinensis and bone health Article 13(5) of Regulation (EC) No 1924/2006

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: EFSA Publication
Publication date: 2009

Publication information
Publisher: European Food Safety Authority
Original language: English
Source: orbit
Source-ID: 246046
Research output: Research - peer-review › Report – Annual report year: 2009

Chondroitin and chondroitin sulphate and joint health - Scientific substantiation of a health claim related to chondroitin and joint health Article 13(5) of Regulation (EC) No 1924/2006

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: EFSA Publication
Publication date: 2009

Publication information
Publisher: European Food Safety Authority
Original language: English
Source: orbit
Source-ID: 246045
Research output: Research - peer-review › Report – Annual report year: 2009

Glucosamine with or without chondroitin sulphate and joint health - Scientific substantiation of a health claim related to glucosamine and joint health Article 13(5) of Regulation (EC) No 1924/2006

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: EFSA Publication
Publication date: 2009

Publication information
Publisher: European Food Safety Authority
Original language: English
Source: orbit
Source-ID: 246049
Research output: Research - peer-review › Report – Annual report year: 2009


General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: EFSA Publication
Publication date: 2009
Vitamin D status assessed by a validated HPLC method: within and between variation in subjects supplemented with vitamin D3

Objective. The aim of this study was to develop and validate a high-pressure liquid chromatography (HPLC) method for assessing vitamin D status as 25-hydroxyvitamin D2 (S-25OHD2) and 25-hydroxyvitamin D3 (S-25OHD3) in serum.

Material and methods. We assessed the within- and between-subject variation of vitamin D status in serum samples from four different dietary intervention studies in which subjects (n=92) were supplemented with different doses of vitamin D3 (5-12 g/day) and for different durations (4-20 months). Results. The HPLC method was applicable for 4.0-200 nmol S-25OHD/L, while the within-day and between-days variations were 3.8 % and 5.7 %, respectively. There was a concentration-dependent difference between results obtained by a commercial radioimmunoassay and results from the HPLC method of -5 to 20 nmol 25OHD/L in the range 10-100 nmol 25OHD/L. The between-subject variation estimated in each of the four human intervention studies did not differ significantly (p=0.55). Hence, the pooled standard deviation was 15.3 nmol 25OHD3/L. In the studies with 6-8 samplings during 7-20 months of supplementation, the within-subject variation was 3.9-7.2 nmol 25OHD3/L, while vitamin D status was in the range 47-120 nmol/L. Conclusions. The validated HPLC method was applied in samples from human intervention studies in which subjects were supplemented with vitamin D3. The estimated standard deviation between and within subjects is useful in the forthcoming decision on setting limits for optimal vitamin D status.

General information
State: Published
Organisations: Division of Food Chemistry, National Food Institute, Division of Nutrition
Contributors: Jakobsen, J., Bysted, A., Andersen, R., Bennett, T., Brot, C., Bugel, S., Cashman, K. D., Denk, E., Harrington, M., Teucher, B., Walczyk, T., Ovesen, L.
Pages: 190-197
Publication date: 2009
Peer-reviewed: Yes
Vitamin D supplementation does not affect serum lipids and lipoproteins in Pakistani immigrants

Potential long-term negative effects of increased vitamin D consumption are not thoroughly examined. The aim of this study was to investigate possible negative effects of vitamin D supplementation on serum lipids and lipoproteins. A 1-year long randomised double-blinded placebo-controlled intervention study with two doses of vitamin D3 (10 and 20 g/day) was carried out among 89 women (18–53 years of age) and 84 men (18–64 years of age) of Pakistani origin living in Denmark with low vitamin D status. This study did not find changes in total cholesterol, LDL-cholesterol, HDL-cholesterol, LDL-
cholesterol/HDL-cholesterol ratio, VLDL-cholesterol and triacylglycerol after daily supplementation with 10 or 20 g vitamin D for 1 year. In conclusion, increasing the vitamin D intake by 10–20 g per day for 1 year is safe for Pakistani immigrants with regards to serum lipids and lipoproteins.
Effect of vitamin D supplementation on bone and vitamin D status among Pakistani immigrants in Denmark: a randomised double-blinded placebo-controlled intervention study

Severe vitamin D deficiency is common among Muslim immigrants. The dose necessary to correct the deficiency and its consequence for bone health are not known for immigrants. The aim was to assess the effect of relatively low dosages of supplemental vitamin D on vitamin D and bone status in Pakistani immigrants. This 1-year-long randomised double-blinded placebo-controlled intervention with vitamin D-3 (10 and 20 μg/d) included girls (10.1 - 14.7 years), women (18.1-52.7 years) and men (17.9-63.5 years) of Pakistani origin living in Denmark. The main endpoints were serum 25-hydroxyvitamin D (S-25OHD), parathyroid hormone, bone turnover markers and bone mass. The study showed that supplementation with 10 and 20 μg vitamin D-3 per d increased S-25OHD concentrations similarly in vitamin D-deficient Pakistani women (4-fold), and that 10 μg increased S-25OHD concentrations 2-fold and 20 μg 3-fold in Pakistani men. S-25OHD concentrations increased at 6 months and were stable thereafter. Baseline S-25OHD concentrations tended to be lower in girls and women than in men; females achieved about 46 nmol/l and men 55 nmol/l after supplementation. Serum intact parathyroid hormone concentrations decreased at 6 months, but there was no significant effect of the intervention on bone turnover markers and dual-energy X-ray absorptiometry measurements of the whole body and lumbar spine.

General information
State: Published
Organisations: Division of Nutrition, National Food Institute, Division of Food Chemistry
Contributors: Andersen, R., Melgaard, C., Skovgaard, L. T., Brot, C., Cashman, K. D., Jakobsen, J., Lamberg-Allardt, C., Ovesen, L.
Pages: 197-207
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: British Journal of Nutrition
Volume: 100
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.65 SJR 1.756 SNIP 1.555
Web of Science (2017): Impact factor 4.586
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.46 SJR 2.055 SNIP 1.535
Web of Science (2016): Impact factor 4.844
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.52 SJR 1.583 SNIP 1.442
Web of Science (2015): Impact factor 4.051
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.18 SJR 1.532 SNIP 1.273
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.61 SJR 2.746 SNIP 2.479
Web of Science (2013): Impact factor 3.861
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.12 SJR 2.308 SNIP 2.427
Web of Science (2012): Impact factor 5.5
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 3.13 SJR 2.085 SNIP 1.649
Web of Science (2011): Impact factor 4.842
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.236 SNIP 1.253
Web of Science (2010): Impact factor 3.774
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.627 SNIP 0.572
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.966 SNIP 1.2
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.987 SNIP 1.255
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.715 SNIP 0.925
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.519 SNIP 1.139
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.626 SNIP 1.088
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.727 SNIP 1.509
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.736
Estimated intake of intense sweeteners from non-alcoholic beverages in Denmark, 2005

In 2005, 76 out of 177 analysed samples of non-alcoholic beverages were found to contain the intense sweeteners cyclamate, acesulfame-K, aspartame, and saccharin. The content of cyclamate did not exceed the now permitted maximum level in the European Union of 250 mg l(-1) in soft drinks. The estimated intake of the sweeteners was calculated using the Danish Dietary Survey based on 3098 persons aged 1-80 years. The estimated intake with 90th percentiles of 0.7, 0.8 and 0.2 mg kg(-1) body weight day(-1) for acesulfame-K, aspartame, and saccharin, respectively, was much lower than the acceptable daily intake values of 15, 40, 7, and 2.5 mg kg(-1) body weight day(-1) for acesulfame-K, aspartame, and saccharin, respectively, and on the same level as in the similar investigation from 1999. In contrast to the 1999 investigation, the 90th percentile of the estimated cyclamate intake in 1-3 year olds with 3.7 mg kg(-1) body weight day(-1) was in 2005 lower than the acceptable daily intake of 7 mg kg(-1) body weight day(-1). However, the 99th percentile for 1-3 year olds with 7.4 mg kg(-1) body weight day(-1) still exceeded the acceptable daily intake slightly. The 90th percentile for the whole population with 0.9 mg kg(-1) body weight day(-1) was halved compared with 1999. The reduction in the European Union of the maximum permitted level for cyclamate from 400 to 250 mg l(-1) has brought the intake of cyclamate in small children down to well below the acceptable daily intake value.

General information
State: Published
Organisations: Division of Food Chemistry, National Food Institute, Division of Nutrition
Contributors: Leth, T., Jensen, U., Fagt, S., Andersen, R.
Pages: 662-668
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Food Additives and Contaminants
Volume: 25
Issue number: 6
ISSN (Print): 0265-203X
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.121 SNIP 3.86
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.941 SNIP 1.365
Web of Science (2010): Indexed yes
Nitrite and Nitrate Content in Meat Products and Estimated Intake in Denmark From 1998 to 2006

The content of nitrite and nitrate in cured meat products has been monitored in Denmark seven times between 1995 and 2006. The maximum permitted added amounts of sodium nitrite in Denmark (60 mg kg\(^{-1}\) for most products up to 150 mg kg\(^{-1}\) for special products) have not been exceeded, except for a few samples back in 2002. The intake, mean and intake distribution of sodium nitrite have been calculated from 1998 to 2006 with data from the Danish dietary survey conducted in 2000-02 on Danes from four to 75 years of age. The amounts used by industry have been relatively stable through the whole period with levels varying between 6 and 20 mg sodium nitrite kg\(^{-1}\) with sausages, meat for open sandwiches and salami-type sausages being the greatest contributors. The mean intake of sodium nitrate was around 1 mg day\(^{-1}\), which is very low compared with the total intake of 61 mg day\(^{-1}\). The mean intake of sodium nitrite was 0.017 and 0.014, 0.009 and 0.008, 0.007 and 0.003 mg kg\(^{-1}\) body weight day\(^{-1}\) for men and women in the age groups 4-5, 6-14 and 15-75 years, respectively, which was much lower than the acceptable daily intake (ADI) of 0.09 mg kg\(^{-1}\) body weight day\(^{-1}\). The 99th percentile for the group of 4-year-olds was 0.107 and 0.123 mg kg\(^{-1}\) body weight day\(^{-1}\) for boys and girls, respectively, and the 95th percentile was 0.057 and 0.073 mg kg\(^{-1}\) body weight day\(^{-1}\) for boys and girls, respectively, highest for the girls. With fewer than 100 boys and girls in the 4-5-year age group, only very few persons were responsible for the high intake. The conversion of nitrate to nitrite in the saliva and the degradation of nitrite during production and storage must also be considered when evaluating the intake of nitrite.

General information
State: Published
Organisations: Division of Food Chemistry, National Food Institute, Division of Nutrition
Contributors: Leth, T., Fagt, S., Nielsen, S., Andersen, R.
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Peer-reviewed: Yes

Publication information
Journal: Food Additives and Contaminants
Volume: 25
Issue number: 10
ISSN (Print): 0265-203X
Objective: To determine vitamin D and bone status in adolescent girls, pre-menopausal women and men of Pakistani origin, to single out determinants of vitamin D status and to determine the association between vitamin D status, bone metabolism and bone status. Subjects/Methods: Cross-sectional study, Copenhagen (55 degrees N), January- November. Serum 25-hydroxyvitamin D (S-25OHD), serum intact parathyroid hormone (S-iPTH), bone turnover markers and whole body and lumbar spine bone mineral density were measured. Sun, smoking and clothing habits, age, body mass index (BMI), and vitamin D and calcium from food and from supplements were recorded. Thirty-seven girls (median age, range: 12.2 years, 10.1 - 14.7), 115 women (36.2 years, 18.1 - 52.7) and 95 men (38.3 years, 17.9 - 63.5) of Pakistani origin
(immigrants or descendants with Pakistani parents) took part in the study. Results: Median concentration of S-25OHD was 10.9, 12.0 and 20.7 nmol/l for girls, women and men, respectively. Forty-seven per cent of the girls, 37% of the women and 24% of the men had elevated S-iPTH, and there was a negative relationship between S-iPTH and S-25OHD. Use of vitamin D-containing supplements had a positive association with S-25OHD for men (P = 0.04) and women (P = 0.0008). Twenty-one per cent of the women and 34% of the men had osteopenia. Neither S-25OHD nor S-iPTH was associated with lumbar spine or whole body bone mineral content. Conclusions: Severely low vitamin D status and elevated S-iPTH is common among Pakistani immigrants in Denmark. The low vitamin D status is not associated with bone markers or bone mass among relatively young Pakistanis.
Vitamin D intervention among Pakistani immigrants

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Melgaard, C., Skovgaard, L. T., Brot, C., Cashman, K. D., Jakobsen, J., Lamberg-Allardt, C., Ovesen, L.
Publication date: 2008
Peer-reviewed: No
Event: Abstract from 9th Nordic Nutrition Conference, Copenhagen, Denmark.
Source: orbit
Source-ID: 236667
Research output: Research - peer-review › Journal article – Annual report year: 2008

Vitamin D intervention among Pakistani immigrants

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Melgaard, C., Skovgaard, L. T., Brot, C., Cashman, K. D., Jakobsen, J., Lamberg-Allardt, C., Ovesen, L.
Publication date: 2008
Peer-reviewed: No
Event: Poster session presented at 9th Nordic Nutrition Conference, Copenhagen, Denmark.
Source: orbit
Vitamin D supplements do not affect serum lipids and lipoproteins

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Brot, C., Mejborn, H., Mølgaard, C., Skovgaard, L. T., Trolle, E., Ovesen, L.
Publication date: 2008
Peer-reviewed: No
Event: Abstract from 9th Nordic Nutrition Conference, Copenhagen, Denmark.
Source: orbit
Source-ID: 236662
Research output: Research › Conference abstract for conference – Annual report year: 2008

Vitamin D supplements do not affect serum lipids and lipoproteins

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Brot, C., Mejborn, H., Mølgaard, C., Skovgaard, L. T., Trolle, E., Ovesen, L.
Publication date: 2008
Peer-reviewed: No
Event: Poster session presented at 9th Nordic Nutrition Conference, Copenhagen, Denmark.
Source: orbit
Source-ID: 236664
Research output: Research › Poster – Annual report year: 2008

Vitamin D status in adolescent girls, elderly women and immigrants

General information
State: Published
Organisations: Danish Veterinary and Food Administration
Contributors: Andersen, R., Ovesen, L., Skovgaard, L. T., Mølgaard, C.
Publication date: Sep 2007

Publication information
ISBN (Print): 87-92-15806-4
Original language: English
Source: orbit
Source-ID: 245986
Research output: Research › Ph.D. thesis – Annual report year: 2007

D-vitamin status hos unge piger, ældre kvinder og indvandrere

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R.
Pages: 17-19
Publication date: 2007
Peer-reviewed: Unknown

Publication information
Journal: Diætisten
ISSN (Print): 1395-1769
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Teenage girls and elderly women living in northern Europe have low winter vitamin D status

Objective: To determine the vitamin D status (serum 25-hydroxyvitamin D; S-25OHD) in adolescent girls and elderly community-dwelling women living in four countries of northern Europe and to explain differences in S-25OHD concentrations between and within the countries. Design: A cross-sectional observational study conducted in a standardised way during February-March. S-25OHD was analysed by high-performance liquid chromatography. Vitamin D and calcium intake was calculated using a standardised food composition database. Setting: Denmark, Finland, Ireland, and Poland. Subjects: A total of 199 girls (mean (s.d.) age 12.6 (0.5) y) and 221 women (mean (s.d.) age 71.8 (1.4) y).

Results: The median (inter quartiles) concentration of S-25OHD was 29.4 (20.3, 38.3) nmol/l for the girls and 40.7 (28.0, 54.2) nmol/l for the women. S-25OHD below 25 nmol/l was found in 37% of the girls and 17% of the women, and S-25OHD below 50 nmol/l was found in 92% of the girls and 37% of the women. Positive significant determinants for S-25OHD in girls were use of vitamin D supplements, and in women sun habits, dietary vitamin D intake, use of vitamin D and calcium supplements. Body mass index and smoking were negative determinants in women. For women predictors could explain the differences between countries (P-country=0.09, R-2=0.39), but for girls the difference remained significant even after including predictors (P-country=0.03, R-2=0.15). Conclusion: Vitamin D status is low in northern Europe during winter. More than one-third of the adolescent girls have vitamin D status below 25 nmol/l and almost all are below 50 nmol/l. Two-thirds of the elderly community-dwelling women have vitamin D status below 50 nmol/l. Use of vitamin D supplements is a significant positive determinant for S-25OHD for both girls and women (P=0.001).

Sponsorship: The European Fifth Framework Programme (Contract No. QLK1-CT-2000-00623).
Hypovitaminosis D in Europe

General information
State: Published
Organisations: Division of Nutrition, National Food Institute, Division of Food Chemistry
Publication date: 2004
Peer-reviewed: No
Event: Poster session presented at IOF World Congress, Brazil.
Source: orbit
Source-ID: 238932
Research output: Research › Poster – Annual report year: 2004

Immigrants - vitamin D, bone accretion and lack of sun exposure

General information
State: Published
Organisations: Division of Nutrition, National Food Institute, Division of Food Chemistry
Contributors: Andersen, R., Mølgård, C., Skovgaard, L. T., Brot, C., Cashman, K. D., Jakobsen, J., Lamberg-Allardt, C., Ovesen, L.
Publication date: 2004
Peer-reviewed: No
Event: Abstract from Conference on Fortification of food in Europe.
Source: orbit
Source-ID: 247719
Research output: Research › Conference abstract for conference – Annual report year: 2004

Severe vitamin D deficiency among Pakistani living in Denmark

General information
Severe vitamin D deficiency among Pakistani living in Denmark

Vitamin D Intake and status of Pakistani immigrants in Denmark

Vitamin D Intake in Danish pubertal girls

Vitamin D Intake in Danish pubertal girls
Geographical differences in vitamin D status, with particular reference to European countries

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State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Ovesen, L., Andersen, R., Jakobsen, J.
Pages: 813-821
Publication date: 2003
Peer-reviewed: Yes

Publication information
Journal: PROCEEDINGS OF THE NUTRITION SOCIETY
Volume: 62
Issue number: 4
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
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Web of Science (2017): Impact factor 5.347
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.99 SJR 1.562 SNIP 0.993
Web of Science (2016): Impact factor 4.421
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 4.78 SJR 1.938 SNIP 1.544
Web of Science (2015): Impact factor 4.703
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 4.88 SJR 1.977 SNIP 1.451
Web of Science (2014): Impact factor 5.273
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.63 SJR 1.771 SNIP 1.362
Web of Science (2013): Impact factor 4.937
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.5 SJR 1.362 SNIP 1.008
Web of Science (2012): Impact factor 3.674
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.33 SJR 0.879 SNIP 0.802
Web of Science (2011): Impact factor 2.77
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.957 SNIP 1.029
Web of Science (2010): Impact factor 3.925
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.062 SNIP 1.109
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.639 SNIP 1.69
Scopus rating (2007): SJR 1.596 SNIP 1.306
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.305 SNIP 1.304
Subchronic oral toxicity study on the three flavouring substances: octan-3-ol, 2-methylcrotonic acid and oct-3-yl 2-methylcrotonate in Wistar rats

Groups of 10 male and 10 female rats were administered 0, 25, 100 or 400 mg octan-3-ol/kg body weight per day, 77 mg 2-methylcrotonic acid/kg body weight per day or 163 mg oct-3-yl 2-methylcrotonate/kg body weight per day by gavage for 90 days. Relative liver weights of high-dose octan-3-ol males, and males and females dosed with oct-3-yl 2-methylcrotonate were significantly greater than those of the control. In male and female rats dosed with the highest level of octan-3-ol and in male rats dosed with 2-methylcrotonic acid, incidences of bile duct proliferation were increased. In the kidneys of males dosed with mid- and high level of octan-3-ol and oct-3-yl 2-methylcrotonate, tubular karyomegaly and desquamation of tubular epithelial cells were observed. Based on increased liver weight and microscopic evaluation of the liver and kidney, a no-observed-effect level (NOEL) of 25 mg/kg for octan-3-ol in rats was established. The histopathological evaluation of the liver of rats dosed with oct-3-yl 2-methylcrotonate revealed lesions corresponding to the lesions seen in rats dosed mid-dose with octan-3-ol. This observation is in accordance with the general assumption that oct-3-yl 2-methylcrotonate is completely hydrolysed to octan-3-ol and 2-methylcrotonic acid. However, when comparing the liver histopathology of oct-3-yl 2-methylcrotonate and 2-methylcrotonic acid and the kidney lesions of all three substances, conflicting results were seen and the present study does not allow the conclusion to be drawn that oct-3-yl 2-methylcrotonate and structurally-related esters are completely hydrolysed, at least under the conditions of the present study. (C) 2003 Elsevier Science Ltd. All rights reserved.
The vitamin D status in two risk groups from four European countries
The vitamin D status in two risk groups from four European countries

In this review many examples are given of the complexities involved in using some biomarkers in relation to assessing the effects of dietary exposure, when there is frequently a need to determine changes following long-term low level exposure to dietary components. These range from understanding why the biomarker might be valuable and how best it can be measured, to the pitfalls which can occur in the interpretation of data. Analytical technique is considered in relation to folic acid and selenium, and flavonoid and carotenoid species are used to illustrate how the metabolism of a compound may alter the validity or adequacy of a marker. Vitamin A is discussed in relation to the difficulties which can arise when there are several biomarkers that may be available to assess exposure to one nutrient. Vitamin B-12 is discussed in relation to the dietary choices made by individuals. Possible interactions and the role of measuring total antioxidant capacity is considered in some detail. In contrast to most nutrients, there is a marked lack of biomarkers of either exposure or effect for most non-nutrients. The role of biological effect monitoring is considered for dietary contaminants, fumonisins and polyhalogenated aromatic hydrocarbons. Aflatoxins are discussed to exemplify food contaminants for which the biomarker approach has been extensively studied. Finally some compounds which are deliberately added to foods and some which appear as processing contaminants are each considered briefly in relation to the requirement for a biomarker of exposure to be developed.

A critical assessment of some biomarker approaches linked with dietary intake

In this review many examples are given of the complexities involved in using some biomarkers in relation to assessing the effects of dietary exposure, when there is frequently a need to determine changes following long-term low level exposure to dietary components. These range from understanding why the biomarker might be valuable and how best it can be measured, to the pitfalls which can occur in the interpretation of data. Analytical technique is considered in relation to folic acid and selenium, and flavonoid and carotenoid species are used to illustrate how the metabolism of a compound may alter the validity or adequacy of a marker. Vitamin A is discussed in relation to the difficulties which can arise when there are several biomarkers that may be available to assess exposure to one nutrient. Vitamin B-12 is discussed in relation to the dietary choices made by individuals. Possible interactions and the role of measuring total antioxidant capacity is considered in some detail. In contrast to most nutrients, there is a marked lack of biomarkers of either exposure or effect for most non-nutrients. The role of biological effect monitoring is considered for dietary contaminants, fumonisins and polyhalogenated aromatic hydrocarbons. Aflatoxins are discussed to exemplify food contaminants for which the biomarker approach has been extensively studied. Finally some compounds which are deliberately added to foods and some which appear as processing contaminants are each considered briefly in relation to the requirement for a biomarker of exposure to be developed.
Towards a strategy for optimal vitamin D fortification (OPTIFORD)

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Brot, C., Ovesen, L. ..
Pages: 74-77
Publication date: 2001
Peer-reviewed: Yes

Publication information
Journal: Nutrition, Metabolism & Cardiovascular Diseases
Volume: 98
Issue number: 4
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Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.35 SJR 1.475 SNIP 1.121
Web of Science (2017): Impact factor 3.318
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.38 SJR 1.588 SNIP 1.151
Web of Science (2016): Impact factor 3.679
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.17 SJR 1.564 SNIP 1.168
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.36 SJR 1.57 SNIP 1.243
Web of Science (2014): Impact factor 3.323
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.75 SJR 1.525 SNIP 1.35
Web of Science (2013): Impact factor 3.875
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 3.66 SJR 1.516 SNIP 1.275
Web of Science (2012): Impact factor 3.978
Safety evaluation of fructans

General information
State: Published
Organisations: Division of Nutrition, National Food Institute, Division of Toxicology and Risk Assessment
Contributors: Knudsen, I., Andersen, R., Mejborn, H., Poulsen, M., Andersson, C., Gudmundsdóttir, E., Hallikainen, A., Mølck, A., Paulsen, J. E.
Publication date: 2000

Separation and determination of alditols and sugars by high-pH anion-exchange chromatography with pulsed amperometric detection
Carbohydrates such as alditols (polyols or sugar alcohols), monosaccharides and disaccharides are separated as anions by anion-exchange chromatography with a sodium hydroxide eluent, MA1 CarboPac column and pulsed amperometric detection. We report a high-pH anion-exchange chromatographic-pulsed amperometric detection (HPAEC-PAD) method that determines all the polyols used as food additives in food products and the most commonly found mono- and disaccharides on a routine basis. The linearity, repeatability, internal reproducibility and accuracy are described. The applicability of the method has been demonstrated by the analysis of 46 relevant samples and by participation twice in the Food Analysis Performance Assessment Scheme (FAPAS) testing programme for food additives. (C) 2000 Elsevier Science BN. All rights reserved.

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Sørensen, A.
Pages: 195-204
Publication date: 2000
Peer-reviewed: Yes

**Publication information**
Journal: JOURNAL OF CHROMATOGRAPHY A
Volume: 897
Issue number: 1-2
ISSN (Print): 0021-9673
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.81 SJR 1.378 SNIP 1.212
Web of Science (2017): Impact factor 3.716
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.97 SJR 1.463 SNIP 1.318
Web of Science (2016): Impact factor 3.981
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 4.03 SJR 1.693 SNIP 1.398
Web of Science (2015): Impact factor 3.926
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 4.28 SJR 1.823 SNIP 1.507
Web of Science (2014): Impact factor 4.169
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 4.6 SJR 2.006 SNIP 1.613
Web of Science (2013): Impact factor 4.258
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 4.6 SJR 2.298 SNIP 1.697
Web of Science (2012): Impact factor 4.612
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.47 SJR 2.451 SNIP 1.664
Web of Science (2011): Impact factor 4.531
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.234 SNIP 1.564
Web of Science (2010): Impact factor 4.194
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.169 SNIP 1.566
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.895 SNIP 1.43
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.859 SNIP 1.539
An enzymatic method for the determination of fructans in foods and food products - Comparison of the results by high performance anion exchange chromatography with pulsed amperometric detection

We report a new and non-equipment demanding method of measuring the content of fructans as well as the contents of free glucose, free fructose and sucrose in foods and food products enzymatically. This method comprises hydrolysis of fructans into D-glucose and D-fructose enzymatically and measurement of the released sugars enzymatically. Sucrose is hydrolysed by alpha-glucosidase instead of beta-fructosidase, which is normally used. In addition, sucrose is measured in the form of D-fructose instead of the typical D-glucose form, and the fructanase used to hydrolyse the fructans has fewer side effects than the fructanase reported as normally used. The method is tested on ten standard substances and five fructan products, and nine foods and food products are also analysed. The enzymatic measurement of the released sugars is confirmed by measurements done by high performance anion exchange chromatography with pulsed amperometric detection.

General information
State: Published
Organisations: Division of Nutrition, National Food Institute
Contributors: Andersen, R., Sørensen, A.
Pages: 148-152
Publication date: 1999
Peer-reviewed: Yes

Publication information
Journal: EUROPEAN FOOD RESEARCH AND TECHNOLOGY
Volume: 210
Issue number: 2
ISSN (Print): 1438-2377
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.9 SJR 0.737 SNIP 0.846
Web of Science (2017): Impact factor 1.919
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.81 SJR 0.763 SNIP 0.881
Web of Science (2016): Impact factor 1.664
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.55 SJR 0.728 SNIP 0.82
Projects:

**Ha(c)k Dit Grønt**
Ha(c)k your Greens is a digital learning universe for the teaching of biology in the elementary school, which promotes healthy food habits in children from 7th to 9th grade. The vision of the project is to create an engaging community in the class, where knowledge, and experiences with designing your own greens in a high-tech and fun way, creates an interest in food, meals and health. Ha(c)k your Greens learning universe comprises of a food computer integrated with a web-based platform, where the students can programme how the greens will grow and find educational material. In this way the teaching of the journey from ground to table is moved into the classroom and the biology classes. Two prototypes will be developed and tested during 2019-2020.

**Jacobsen, H. V. S., Project Participant, National Food Institute**
**Andersen, R., PI, Research Group for Risk-Benefit, National Food Institute**
**Ravn-Haren, G., Project Participant, Research Group for Risk-Benefit, National Food Institute**
**Svagin, J., Project Participant, Office for Innovation & Sector Services**
**Lund, H. H., Project Participant, Centre for Playware, Copenhagen Center for Health Technology, Department of Electrical Engineering, Automation and Control**

**Intervention med målrettede kostråd på risikomarkører for hjertekarsygdom**
Arentoft, J. L., PhD Student, National Food Institute
Andersen, R., Main Supervisor, National Food Institute
Andersen, E. W., Supervisor, Department of Informatics and Mathematical Modeling
Overvad, K., Supervisor
Tetens, I., Supervisor, National Food Institute
Trolle, E., Examiner, National Food Institute
Thorsdottir, I., Examiner
Toft, U. M. N., Examiner
Institut stipendie (DTU) Samf.

**Risk-benefit assessment of whole diet**
Thomsen, S. T., PhD Student, National Food Institute
Andersen, R., Main Supervisor, National Food Institute
Pires, S. M., Supervisor, National Food Institute
Poulsen, M., Supervisor, National Food Institute
Devlesschauwer, B., Supervisor
Samfinansieret - Andet

**Healthy Kids are involved kids**
Stjernqvist, N. W., PhD Student, National Food Institute
Trolle, E., Main Supervisor, National Food Institute
Jensen, B. B., Supervisor
Terkildsen Maindal, H., Supervisor
Sabinsky, M., Supervisor, National Food Institute
Tetens, I., Supervisor, National Food Institute
Andersen, R., Examiner, National Food Institute
Andersen, P. T., Examiner
Lehre, A., Examiner
Andersen, P. T., Examiner
Lehre, A., Examiner
Samfinansierede - Virksomhed
15/12/2014 → 06/04/2018
Award relations: Healthy Kids are involved kids
Project: PhD

Food-based solutions for optimal vitamin D nutrition and health
Grønborg, I. M., PhD Student, National Food Institute
Andersen, R., Main Supervisor, National Food Institute
Andersen, E. W., Supervisor, Department of Informatics and Mathematical Modeling
Tetens, I., Supervisor, National Food Institute
Ravn-Haren, G., Examiner, National Food Institute
Meyer, H. E., Examiner
Rejnmark, L., Examiner
Meyer, H. E., Examiner
Rejnmark, L., Examiner
Samfinansieret - Andet
01/09/2014 → 23/09/2018
Award relations: Food-based solutions for optimal vitamin D nutrition and health
Project: PhD

Effekten af D-vitamin berigelse i danske familier
Madsen, K. H., PhD Student, National Food Institute
Rasmussen, L. B., Main Supervisor, National Food Institute
Andersen, E. W., Supervisor
Mølgaard, C., Supervisor
Pedersen, A. N., Examiner, National Food Institute
Abrahamsen, B., Examiner
Meyer, H. E., Examiner
Institut stipendie (DTU) Samf.
15/11/2009 → 26/02/2014
Award relations: Effekten af D-vitamin berigelse i danske familier
Project: PhD

Betydningen af genotyper for D-vitaminstatus
Nissen, I., PhD Student, National Food Institute
Andersen, R., Main Supervisor, National Food Institute
Andersen, E. W., Supervisor
Ravn-Haren, G., Supervisor, National Food Institute
Vogel, U. B., Supervisor, National Food Institute
Wulf, H. C., Supervisor
Poulsen, M., Examiner, National Food Institute
Linneberg, A., Examiner
Meyer, H. E., Examiner
Forskningsrådsfinansiering
01/09/2010 → 15/12/2015
Award relations: Betydningen af genotyper for D-vitaminstatus
Project: PhD

Towards a strategy for optimal vitamin D fortification, OPTIFORD
The overall research plan for the project included five specific objectives achieved through five work packages, of which Danish Institute for Food and Veterinary Research (DFVF) participated in two: To assess the dose necessary to replenish vitamin D status in an immigrant population group with minimal sun exposure and to determine the effect on bone mass (WP3) To examine the influence of dissimilarities in environmental and behaviouristic patterns on supply levels of vitamin
Vitamin D fortification
Several studies have shown that vitamin D status in the general population gradually decreases over the Winter season. This project aims at studying the effectiveness of vitamin D fortification of commonly consumed foods in alleviating this reduction in vit D status in families.

Tetens, I., Project Manager, National Food Institute, Division of Nutrition
Rasmussen, L. B., Project Participant, National Food Institute, Division of Nutrition
Mejborn, H., Project Participant, National Food Institute, Division of Nutrition
Andersen, R., Project Participant, National Food Institute, Division of Nutrition
Madsen, K. H., Project Participant, National Food Institute, Division of Nutrition
01/11/2009 → 15/11/2012
Collaborators: Arla Foods, Danish Agency for Science and Higher Education, Øresund Food, Lantmännen Unibake
Project: Research

Activities:

12th European Nutrition Conference (FENS)
Rikke Andersen (Participant)
National Food Institute
Research Group for Risk-Benefit
Description
Oral presentation: Vitamin D intake-status relationship among Danes aged 4-60 years during winter
FENS 2015

Related event

12th European Nutrition Conference (FENS)
20/10/2015 → 23/10/2015
Berlin, Germany
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Interventions with vitamin D in Denmark
Rikke Andersen (Invited speaker)
National Food Institute
Research Group for Risk-Benefit
Description
Oral presentation: Interventions with vitamin D in Denmark
Symposium at the 19th Nordic Congress of General Practice 16-18 June 2015

Related event

The 19th Nordic Congress of General Practice
16/06/2015 → 18/12/2015
Göteborg, Sweden
Vitamin D status and intake in Nordic countries
Rikke Andersen (Invited speaker)
National Food Institute
Division of Nutrition

**Description**
VitmaD – Results from a Vitamin D fortification project in Denmark

Seminar: "Vitamin D status and intake in Nordic countries – what is recommended and how to meet recommendations?"

**Related event**

Vitamin D status and intake in Nordic countries
22/10/2014 → 23/10/2014
Helsinki, Finland
Activity: Talks and presentations › Conference presentations

10th Nordic Nutrition Conference 2012
Period: 3 Jun 2012 → 5 Jun 2012
Rikke Andersen (Participant)
National Food Institute
Division of Nutrition

**Description**
Medforfattere: Rikke Andersen1, Christine Brot1, Jette Jakobsen2, Heddie Meiborn1, Christian Mølgaard3, Lene Theil Skovgaard4, Ellen Trolle1, Inge Tetens1 and Lars Ovesen1 1Division of Nutrition, National Food Institute, Technical University of Denmark, Denmark; 2Division of Food Chemistry, National Food Institute, Technical University of Denmark, Denmark; 3Department of Human Nutrition, Faculty of Life Sciences, University of Copenhagen, Denmark; 4Department of Biostatistics, University of Copenhagen, Denmark

**Related event**

10th Nordic Nutrition Conference 2012
03/06/2012 → 05/06/2012
Reykjavik, Iceland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

Vitamin D fra kosten og hvordan berigelse kan foretages
Period: 4 Feb 2009
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

**Description**
Place: Ernæringsselskabet, Århus, Denmark

Unknown external organisation
Activity: Talks and presentations › Conference presentations

D-vitamin - hvor får vi det fra, hvilken betydning har det, og hvor meget har vi brug for?
Period: 24 Apr 2008
Rikke Andersen (Speaker)
National Food Institute
Vitamin D status in adolescent girls, elderly women and immigrants
Period: 11 Mar 2008
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Vitamin D status and effect of vitamin D supplementation among Pakistani immigrants in Denmark
Period: 1 Jan 2007 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Hypovitaminosis D in Europe
Period: 1 Jan 2004 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Immigrants – vitamin D, bone accretion and lack of sun exposure
Period: 1 Jan 2004 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Description
Place: Conference on ‘Fortification of food in Europe’, Copenhagen, Denmark

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

OPTIFORD: Towards a strategy for optimal vitamin D fortification
Period: 1 Jan 2004 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Description
Place: Nutrition and Ageing Workshop, Brussels, Belgium

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Vitamin D intake and status of Pakistani immigrants in Denmark
Period: 1 Jan 2004 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Description
Place: The 8'th Nordic nutrition conference, Tønsberg, Norway

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

Vitamin D status hos to risikogrupper i fire europæiske lande
Period: 1 Jan 2003 → …
Rikke Andersen (Speaker)
National Food Institute
Division of Nutrition

Description
Place: Danish Nutrition Society, Slagelse, Denmark

Related external organisation

Unknown external organisation
Activity: Talks and presentations › Conference presentations

EuroFoodChem X
Period: 22 Sep 1999 → 24 Sep 1999
Rikke Andersen (Participant)
National Food Institute
Division of Nutrition

Description
Fructans

Place: EuroFoodChem X konferencen, Budapest
Degree of recognition: International

Related event

EuroFoodChem X
22/09/1999 → 24/09/1999
Budapest, Hungary
Activity: Attending an event › Participating in or organising a conference

Press clippings:

D-vitamin og berigelse
Rikke Andersen
02/12/2014

Subject
D-vitamin og berigelse
National Food Institute, Division of Nutrition

Media contribution (1)

D-vitamin og berigelse
02/12/2014
Politiken, Print
Emilie Klebing
http://politiken.dk/forbrugogliv/sundhedogmotion/ECE2458809/eksperterderskal-d-vitamin-i-broed-og-maelk/
Rikke Andersen
National Food Institute, Division of Nutrition
Press/Media: Press / Media