



34th National Nutrient Databank Conference

Prairie to Plate: Exploring Food and Nutrient Database Frontiers

12-14 July 2010, Grand Forks, North Dakota

BOOK OF ABSTRACTS - POSTER

34th NATIONAL NUTRIENT DATABANK CONFERENCE

*PRAIRIE TO PLATE:
EXPLORING FOOD AND NUTRIENT DATABASE FRONTIERS*

July 12-14, 2010 Grand Forks, North Dakota





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EuroFIR AISBL – THE UNIQUE EUROPEAN PROVIDER OF FOOD INFORMATION AND RELATED SERVICES

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Background: The European Commission funded Network of Excellence "European Food Information Resource" (EuroFIR) aimed to harmonize European food composition databases. The establishment of the follow-up legal entity EuroFIR AISBL, an international, non-profit, member-based association of food composition data researchers, expert users and stakeholders based in Belgium, was one of the key achievements of EuroFIR. Its primary mission is the scientifically based development, publication and exploitation of food information in order to support and underpin research into food quality, food safety, and diet & health in Europe and beyond.

Description: EuroFIR AISBL represents a key interface between the FCDB compiler organizations and their national funders and stakeholders, including a network of laboratories producing the data, and the users of food information from industry, academia and regulatory affairs. The association provides a complete range of benefits comprising access to food information via innovative data interfaces including data on nutrients and on non-nutritive bioactive compounds with putative health benefits, comprehensive training opportunities, technical support and tailored advice to members. It seeks to promote and develop quality assurance and traceability principles considering the implementation of international standards. Members have access to a European network of food composition data researchers, stakeholders, food industry and other contacts worldwide.

Conclusion: EuroFIR AISBL offers a single and unique food information resource to academia, industry, public sector funding bodies and regulators as well as individuals such as researchers, students or dietitians, who are all welcome to join the association as a member. For more information on membership: www.eurofir.org.



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A RAPID IN-VITRO METHOD FOR GLYCEMIC INDEX PREDICTION IN FOODS

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The food industry is developing increasing numbers of food products of reduced glycemic index (GI) to meet growing public demand. A very expensive and time consuming in-vivo test for GI is a major hurdle in developments of new food products with targeted GI values. A rapid and less expensive method has been developed to predict GI values of food samples using in vitro protocols. A variety of food samples of different matrix types have been analyzed to predict GI value by this method and results compared with those obtained using in-vivo classic method. A plot of the in-vivo results versus predicted in-vitro results of samples of a wide variety of matrices (n=90) exhibited a good correlation with an r^2 of 0.92. The slope of the best-fit line is very close to one and the intercept very close to zero. The cross-validated r^2 was calculated to be 0.89, indicating an excellent ability to predict the GI for samples not included in the correlation. The precision of the method as relative standard deviation was found to be 6%. The in-vitro GI method is a rapid, accurate, precise and inexpensive screening tool. This is not recommended for claims substantiation, but instead as a valuable tool in product development to monitor the effect of the ingredients and processing on the GI.



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A HPLC METHOD FOR ANALYSIS OF VITAMIN K2 (MENAQUINONE-7) IN INGREDIENTS AND DIETARY SUPPLEMENTS

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Vitamin K2 menaquinone-7 (mk-7) has been implicated in preventing osteoporosis and cardiovascular diseases and may also help in preventing other diseases such as Alzheimer's and some cancers. The dietary supplement industry is now making new dietary ingredients and the supplements containing this vitamin. An accurate and precise method is required to monitor the vitamin in ingredients and supplements. No official method is currently available from AOAC or AOCS for the analysis of Vitamin K2 mk-7. A study was undertaken to validate a HPLC method to analyze this vitamin in ingredients and dietary supplements. The vitamin was analyzed in the sample extracts by a reverse-phase HPLC using UV detection at 254 nm. The different extraction conditions were evaluated to determine the most efficient extraction method. The precision of the method as % relative standard deviation was found to be under 4.0%. The repeatability of the analysis as judged by the HORRATr value calculation was found to be satisfactory. The accuracy of the analysis evaluated by the percent recovery of the spike in the samples at different concentration was found to be satisfactory and ranged between 97-101%. The LOD of the method was determined to be 0.3 ppm.



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FoodBEAMS: FOOD AND BEVERAGE ENVIRONMENT ASSESSMENT AND MONITORING SYSTEM

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Background: Across the country, states and school districts are developing school nutrition policies that regulate the sale of a la carte foods on school campuses. School districts are implementing these policies; however, the lack of available nutrient information makes monitoring adherence challenging. The Food and Beverage Environment Assessment and Monitoring System (FoodBEAMS) is a computer-based tool that enables school stakeholders to efficiently and effectively understand the competitive school food environment, and identify areas for improvement within schools.

Materials and Methods: 1) Developed a database cataloging over 5500 competitive foods and beverages sold in schools, grades K-12. 2) Designed, developed, and tested a computer-based tool for data collection of competitive school food and beverage data. 3) Adapted the tool to allow users to assess nutrient profiles of competitive foods sold on school campuses and adherence to nutrient standards. 4) Tested the reliability of the tool among researchers and non-researchers

Results: FoodBEAMS was successfully developed and is being piloted in research studies assessing the school food environment in California and Washington. Baseline data collected from the schools demonstrated that schools are implementing the standards; however, to varying degrees. Inter-rater reliability among researchers and non-researchers was high.

Significance: The FoodBEAMS electronic data collection system and nutrient database enables food service directors, nutritionists, school personnel, parents, advocates, and other stakeholders to assess adherence to the state and local school nutrition policies, and to identify which foods and beverages need to change to increase adherence and create a healthy school nutrition environment.



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STUDENTS FROM SCHOOLS WITH HIGHER RATES OF FREE AND REDUCED MEALS TAKE BREAKFASTS WITH FEWER CALORIES

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Background: The Food and Nutrition Service of the United States Department of Agriculture (USDA) sponsored the third School Nutrition Dietary Assessment Study (SNDA-III) to provide information about school meals. Data were collected from a nationally representative sample of schools during the 2004-2005 school year.

Objective: The objective was to determine characteristics of schools meeting the current USDA regulatory calorie standards set for the School Breakfast Program.

Description: The percentage of students that were presented with and took breakfasts that met the calorie standards were analyzed according to the percentage of students eligible for free or reduced price meals. Schools were arranged in quartiles with quartile 1 consisting of schools with less than 28% of the students eligible for free or reduced price meals (most affluent), quartile 2 covered 28-48% (moderately affluent), quartile 3 covered 48-64% (moderately impoverished), and quartile 4 contained greater than 64% (most impoverished).

Conclusion: The percentage of students meeting the calorie requirement did not exceed 45% in any of the quartiles; however, only 6.5% of students in quartile 4 (most impoverished) met the standards versus 23.0% in quartile 1 (most affluent), 42.8% in quartile 2, and 23.9% in quartile 3. No significant difference was found between quartiles for calories of breakfast presented to students. However, a significant difference was found in calories taken by students between quartile 2 (moderately affluent) and both quartile 3 and 4. Students in quartile 4 (most impoverished) took approximately 100 kcal less than students in quartile 2.



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MATRIX EXTRACTION PROCESS OPTIMIZATION FOR DETERMINATION OF TRACE ELEMENTS PROFILE IN FISH BY ICP-MS WITH RELEVANCE FOR FOOD COMPOSITION DATABANKS

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Objective: To study the extraction yield of trace elements from fish samples for determination by ICP-MS in compliance with food composition data quality criteria.

Material and Methods: Extraction yield of trace elements from matrix by microwave digestion was monitored using spiked samples. Digestion processes (DP) using different nitric acid/peroxide hydrogen ratios were applied in association with several microwaves programmers (MWP) to optimize the extraction of trace elements from matrix. The extracts were analyzed by ICP-MS and HPLC-ICP-MS for determination of total elements and elemental chemical species. To frame quality criteria USDA data quality evaluation system (DQES) was used as reference guideline.

Results: Repeatability, reproducibility, selectivity and linearity of blank samples were in agreement with the criteria established in ISO standards. Recovery percentages indicated that MWP and DP conditions are complex and food matrix dependent. Uncertainty of measurement is affected by the concentration of the standards used in the calibration curve and also by the concentration of internal standard. Recovery using commercial calibrants and SRMs/CRMs was the best parameter to assess the adequacy of the analytical procedure. The obtained results were supported by good laboratory performance in collaborative studies. The matrix extraction procedure seems crucial to guarantee the correct identification and quantification of total element and chemical species present.

Significance: The design of internal quality control parameters of ICP-MS and HPC-ICP-MS according to DQES criteria is crucial to ensure reliable data to be further scrutinized by compilers.



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METHODS OF ANALYSIS DATABASE TO SUPPORT THE EVALUATION OF FOOD ANALYTICAL DATA ON MINERALS AND TRACE ELEMENTS

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Objective: To create an analytical quality database that will assist compilers upon evaluating data quality on minerals and trace elements.

Materials and Methods: Methods selected for the database belong to AOAC methods, CEN, NKM, for analysis of minerals and trace elements identified in Europe and USA as prioritized nutrients. COMAR, NIST, IRMM, and IAEA Catalogues were used to create the SRMs/CRMs lists. Information from the most important food PT schemes producers was evaluated to merge different outputs on availability of PT schemes. Papers on methods of analysis cited in Scopus were scrutinized for update reference literature.

Results: Comprehensive information for each mineral and trace element to evaluate measurement procedures was gathered. Distinctive features include: a) mineral chemical characteristics; b) principle scope and method steps; c) contextual information that enables users to evaluate the compatibility between available methods; d) a list of Reference Materials for analysis of minerals that allows the compiler to determine if an appropriate RM was used in the assay; e) an inventory of PT providers to support compilers on the evaluation of laboratory performance; f) bibliography references is provided to give guidance on how it can be used by compilers organizations to improve and update the overall quality of the assessment.

Significance: The database will be a resource tool for those interested in the harmonization of food composition databanks.

Funding: *This work was completed on behalf of the EuroFIR Consortium and funded under the EU 6th Framework Food Quality and Safety Programme', Contract No. FOOD-CT-2005-513944*



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NUTRITION SCIENCE LABS INCORPORATE SUSTAINABILITY THEME

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University of North Texas

Background: This presentation describes a nutrition science lab for undergraduates that encouraged students to preserve agricultural resources through wise food choices and healthy eating behaviors. A better understanding of how to purchase and use foods has a positive outcome in waste reduction and nutrient retention.

Objective: A primary objective was to expose students to sustainability principles that positively influenced food purchases decision-making and attitudes toward local agriculture and the food production system.

Description: Lab exercises incorporated Wendell Berry's seven principles of participation in a sustainable food system. Challenges included keeping exercises relevant to young adults with limited cooking skills and budgets, researching community resources such as farmer's markets and community gardens, and designing activities that were compatible with space, time, and facility constraints. The lab experience was structured around required and optional exercises. An example of a required lab was sensory evaluation of bottled and tap waters that related results to waste reduction and support of local water supplies. Optional exercises included farmer for a semester (container gardening); investigating country of origin (PLU sticker book); learning about the food industry (create a sustainable eating plate); community gardening (log book); and exploring the history of food plants (essay).

Conclusions: Exposing students to sustainable principles enhances awareness of agriculture and motivates them to become active rather than passive participants in the food system. A nutrition science lab is a natural place to learn about healthy food decisions that support agricultural communities and to consider the larger consequences of personal food choices.



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CHILDREN'S ARTIFICIAL SWEETENER INTAKE IS SMALL BUT DIFFERS BY MOM'S WORKING STATUS IN KOREA

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Objective: With increasing intake of sweetened beverages among school children, we attempted to perform risk assessment for dietary intake of artificial sweeteners (AS: aspartame, acesulfame-K, saccharin sodium) through beverages and snacks for children.

Materials and Methods: A food frequency questionnaire was developed to estimate the intake of artificially sweetened beverages and snacks (ASBS) based on the result of AS monitoring by Korea Food & Drug Administration (KFDA). Then, 28 schools each were selected for elementary (ES), junior high (JS) and high (HS) schools in Seoul, Korea using a stratified multistage sampling method. Students in a class from 2nd and 5th grades at ES, and 2nd grade at JS and HS were surveyed for the frequency and amount of ASBS during 1 week prior to survey. The survey was repeated for 3 seasons from June through December 2009 to compensate for any possible seasonal effect. Sweetener intake was estimated using AS database of KFDA and compared to the Acceptable Daily Intake (ADI).

Results: A total of 10,099 children responded and their AS intake was 0.19 ± 0.004 , 0.10 ± 0.003 , and 0.004 ± 0.0004 mg/kg bw/day for aspartame, acesulfam-K and saccharin sodium, respectively. Dietary intake of AS was proven very safe with the proportion of intake against ADI for each AS being only 0.47%, 0.67% and 0.08%. Interestingly however, AS intake was higher among children of working mothers compared to that of housewives' children.

Significance: A tighter parents' discretion and guidance for ASBS are advised for working mothers' children in Korea



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CHILDREN WITH HIGHER FAT INTAKE GET MORE FAT FROM DINNER: 2007-2009 SPECIAL INTAKE SURVEY FOR CHILDREN (SDISC) IN KOREA

Haeng-Shin Lee¹; Yoonna Lee¹; Do-Hee Kim¹; Jee-Yeon Lee¹; Eunmi-Koh¹; Jae-Jin Moon¹; Kwang-il Kwon²; Jong-Wook Kim²; Hye-Kyung Park²; Cho-il Kim¹

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Objective: With increasing prevalence of obesity among children, we attempted to differentiate the dietary pattern of children according to fat intake level.

Materials and Methods: Data from Special Dietary Intake Survey for Children in Korea (SDISC) was used for the analysis. SDISC was conducted from November 2007 through May 2009 covering 4 seasons and collected dietary intake information by 24-hour recall method for non-consecutive 2 days from 6,625 children. Dietary pattern was compared among 3 fat intake level groups, 'lower than Acceptable Macronutrient Distribution Range (AMDR)', 'within AMDR', and '>AMDR' according to the proportion of fat energy in total energy intake (PF).

Results: Mean energy intake of children was 1,201.8 kcal/day, 1,732.3 kcal/day and 1,931.4 kcal/day for 1-6yrs, 7-12 yrs and 13-19 yrs, respectively. The number of children belonged to each of 3 AMDR groups were 985, 4,946 and 694. PF was different by age, meal occasion and AMDR group. Although PF was higher for snack than any other meal among young children for all AMDR groups, it was highest for lunch in AMDR group, it was highest for dinner with significant difference between within AMDR and >AMDR group ($p < 0.05$). There was no sex difference and the amount of fat intake from each meal differed up to 6 fold (5g vs. 32g in 7-12 yr boys) among AMDR groups.

Significance: This study revealed that a moderation on dinner could make a difference in fat intake of children from >AMDR group.



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TRENDS IN THE FATTY ACID COMPOSITION OF FRYING OILS USED AT LEADING FAST FOOD RESTAURANTS OVER THE PAST 12 YEARS BASED ON FRENCH FRIES AS A PROXY INDICATOR

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University of Minnesota

Objective: Evaluate trends in the fatty acid composition of frying oils used at leading fast food restaurants over the past 12 years based on French fries as a proxy indicator.

Methods: Fatty acid composition data for French fries available at six leading fast food restaurants between 1996 and 2008 were obtained from the University of Minnesota Nutrition Coordinating Center Food and Nutrient Database. In this database the nutrient composition of foods available at these restaurants were updated every other year, thus allowing for examination of general trends.

Results: Major changes in the fatty acid composition of French fries were observed at four of the six restaurant chains examined, with the most marked changes occurring between 2004 and 2008. At all four chains the saturated and trans-unsaturated fatty acid composition of French fries decreased while the polyunsaturated and/or monounsaturated fatty acid content increased. Little change in the fatty acid composition of French fries occurred at two of the six restaurant chains.

Significance: Results suggest that fast food restaurants are making major changes in the frying oils they use. Consequently, food and nutrient database developers may need to pay close attention to fried restaurant menu items when updating to ensure nutrient composition values in their database are current with the marketplace.



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LANGUAL FOOD DESCRIPTION: UPDATE

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Background: LanguaL (<http://www.languaL.org>) is a multilingual, faceted thesaurus created to describe foods in a systematic way. Originally developed in the US more than 30 years ago, LanguaL has been managed by the European LanguaL technical committee since 1999.

Objective: In the context of the EuroFIR (European Food Information Resource) project, it was decided to link European food composition databases (FCDB) using LanguaL. This meant that the thesaurus needed updates as well as a food indexing tool to facilitate systematic food description.

Description: Inspired by the FDA “Autocoder” program, a Food Product Indexer software was developed incorporating the LanguaL thesaurus and a number of already indexed data sets. Between 2005 and 2009, several short (1-2 day) food indexing courses were organized for FCDB compilers. Feedback between the LanguaL Technical Committee and the compilers – especially in EuroFIR - allowed the latter to improve their indexing skills. In turn, the compilers proposed translations of the thesaurus (Czech, Danish, French, German, Hungarian, Italian, Portuguese, Spanish) and new descriptors. The result was thus a set of more than 30,000 LanguaL indexed foods in national FCDBs and specialized datasets, which are now combined in the EuroFIR eSearch facility.

Conclusion: FCDB compilers benefit from standardized food description, allowing foods to be linked and compared across borders and language barriers. The LanguaL thesaurus has, in turn, benefited from the expertise of the compilers.

Funding: *This work was completed on behalf of the EuroFIR consortium and funded under the EU 6th Framework Food Quality and Safety Programme (FOOD-CT-2005-513944).*



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ADDITION OF CONJUGATED LINOLEIC ACID (CLA) TO A FOOD AND NUTRIENT DATABASE

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Background: Conjugated linoleic acid (CLA) is a polyunsaturated fatty acid found primarily in meat and dairy products. It has received attention in recent years because of its potential health benefits. Although numerous isomers of CLA have been identified in foods two isomers, cis-9trans-11 and trans-10cis-12 show distinctive biological activities.

Objective: To describe the approach used to add CLA and its two major isomers to the 2009 release of the University of Minnesota Nutrition Coordinating Center (NCC) Food and Nutrient Database.

Description: Values for total CLA and its two isomers, c9t11 and t10c12, were assigned to the approximately 3,500 core foods in the NCC Food and Nutrient Database. To accomplish this task, values from the USDA National Nutrient Database for Standard Reference, Release 21 were first utilized. SR 21 provided values for 2% of the core foods. The scientific literature was searched to identify analytic data for rest of the core foods. When more than one analytic value was found, priority was given to values from U.S. studies and those obtained using reverse phase HPLC methodology. Values were imputed for the foods that have fat content and for which data from SR 21 and the literature were lacking using standard imputation procedures (28% of core foods).

Conclusion: The approach described herein may be a useful model for others considering adding CLA to a database. A considerable amount of imputation will be required, thus careful thought should be given to imputation procedures.



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SURVEY OF DIETARY N-3 FATTY ACID INTAKES AND FOOD SOURCES IN MIDWESTERN COLORECTAL PATIENTS

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University of Nebraska, Lincoln, NE

Objective: The purpose of this study was to estimate n-3 fatty acid dietary intakes of colorectal patients and identify foods contributing to intakes.

Methods: Men (n=32) and women (n=47) patients were recruited from a Midwestern gastroenterology clinic. A dietitian obtained informed consent, a food recall and a 152 item n-3 food frequency questionnaire (n-3 FFQ) at the clinic using visuals and food models. Two additional 24-h recalls, including a weekend recall, were returned by mail.

Results: Daily intake of n-3 fatty acids was 0.91 ± 0.59 g (mean \pm SD) from food recalls and 1.05 ± 0.63 g from the n-3 FFQ. Pearson correlation of omega-3 fatty acids intake between the food recalls and n-3 FFQ was 0.35. Ninety percent of omega-3 fatty acid intake as estimated with n-3 FFQ was provided by 56 foods and English walnuts (14%), salmon (7%), canola oil (7%), Miracle Whip (5%), and beef (5 %) were the five top ranked food sources. The top five food category contributors and percent of n-3 fatty acid intake were nuts/seeds (21), seafood (15), fats/oils (13), legumes (10), and meats (9).

Significance: Twelve percent of men and 30% of women colorectal patients met the recommended Adequate Intake for n-3 fatty acids as assessed by 3-24 h recalls. The n-3FFQ is useful in estimating intake of this nutrient concentrated in foods infrequently consumed. The top n-3 fatty acid food contributor and food category were of plant origin. Marine sources were second in diets of Midwestern men and women.



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DIETARY SOURCES OF SELECT NUTRIENTS AMONG TREE NUT CONSUMERS AND NON-CONSUMERS: NHANES 2003-2006

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Objective: To examine intakes of protein, dietary fiber, monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), vitamin E and magnesium contributed from food sources in diets of tree nut consumers and non-consumers using 24-hour recall data from NHANES 2003-2006 participants aged 2+ years (n=16,822)

Methods: Survey-specific FNDDS and Nutrient Database for Standard Reference releases were used to disaggregate and classify foods into groups defined by the USDA Dietary Source Nutrient (DSN) Database 1.0. The DSN category "nuts and seeds (including butters and pastes)" and tree nuts (almonds, Brazil nut, cashew, filbert, macadamia, pecan, pistachio, walnut, pine nut) included items eaten "out of hand" or as spreads or ingredients of mixed dishes. Analyses using SUDAAN determined nutrient intake (mean, SEM), percentage contribution, and ranking of 51 food groups for tree nut consumers and non-consumers.

Results: For tree nut consumers, the "nuts and seeds" category was the 3rd highest ranked dietary source of protein (contributing 9%), and 1st highest ranked dietary source of fiber, magnesium, MUFA, PUFA, and vitamin E (with 15, 23, 29, 30 and 34% of intakes, respectively, contributed from "nuts and seeds"). Intakes from the "crackers, popcorn, pretzels and chips" category were lower for tree nut consumers than non-consumers, and contributed 3.2 vs. 6.6% fiber, 2.5 vs. 5.6% magnesium, 5.2 vs. 11.5% PUFA, and 3.6 vs. 10.1% vitamin E.

Significance: Large proportions of protein, fiber, magnesium, MUFA, PUFA and vitamin E intakes were contributed from nuts and seeds for consumers of tree nuts, therefore, their consumption should be encouraged.



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TRENDS IN SODIUM CONTENT FOR SELECTED SAVORY SNACK FOODS IN THE USDA STANDARD REFERENCE

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Objective: Commercially-prepared foods account for 75% of elevated sodium intakes, one of several factors which increase the risk for hypertension and cardiovascular disease. The What We Eat In America Survey 2005-6 showed adult mean intake exceeding 3000mg/day, well above the current guidelines of 2300mg/day. The Nutrient Data Laboratory of ARS/USDA, sampled and analyzed nine high-consumption salty snacks under the National Food and Nutrient Analysis Program (NFNAP) to update sodium content.

Materials and Methods: Analytical NFNAP nutrient data are generated using a nationally-representative sampling in 12-24 locations, USDA-qualified laboratories, official analytical methods and a rigorous quality control program. Sodium values for potato chips (regular, fabricated, reduced-fat/fabricated), tortilla chips (regular, nacho, ranch), cheese puffs, and corn chips were determined using the ICP method and compared to 10-year-old USDA analytical data.

Results: Mean sodium values per 100g declined in all snacks studied: fabricated potato chips, by 40% (656 to 388mg), reduced-fat/fabricated potato chips, by 4% (428 to 411mg), and regular potato chips, by 12% (594 to 525mg). Sodium in pretzels declined by 21% (1715 to 1357mg), cheese puffs by 13% (1050 to 910mg) and corn chips by 2% (630 to 616mg). Tortilla chip levels declined across flavors: nacho by 13% (708 to 615mg); regular by 20% (528 to 421mg); and ranch by 15% (612 to 519mg). Across snacks, mean sodium content decreased from 219 to 181mg/1-ounce serving.

Significance: These data reflect trends in sodium reduction in many U.S. snacks and provide updated information for USDA databases and for the health and scientific communities.



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ADDING VITAMIN D DIETARY VALUES TO DIETARY ASSESSMENT OF RURAL MINORITY CHILDREN

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Vitamin D (VitD) has become the "in" nutrient for disease prevention with food values only recently available in sufficient quantity.

Purpose: This study examined the benefit of incorporating VitD food values into dietary assessment in which Healthy Eating Index (HEI) scores were computed for rural African-American children, ages 6-14, at summer day camps.

Materials and Methods: Dietary data were collected using the USDA Automated Multiple Pass Method between June-August, 2008-2009. VitD values were computed for each reported food by using the table FNDDSRLinks from the FNDDS3 dataset, the SR22 foods to compute VitD values/100grams/food, and amounts of VitD consumed [(grams of food consumed)*(VitD value/100 g)]. Pyramid servings were computed using MyPyramid Equivalents Database 2.0. FNDDS identifiers were mapped to identifiers in the MyPyramid database. Pyramid equivalents were achieved by multiplying grams consumed by pyramid equivalent value/divided by 100. HEI 2005 values were computed using the Pyramid Servings data. The SAS program HEI2005_NHANES012.SAS was used to compute HEI 2005 component and total scores.

Results: From 230 24-hour recalls, mean 2008-2009 HEI (95% Confidence Intervals) scores for milk were 4.90(3.33,5.47) and 4.98 (4.23, 5.73)out of 10 points, respectively. VitD (mcg/d) intakes were 3.44 mcg (3.03,3.85) and 3.29 (2.66,3.82) out of DRI Adequate Intake of 5.0 mcg.

Conclusion: Children had mean milk HEI scores at the 50% level, VitD assessment was improved by other foods, most likely fortified breakfast cereals. This suggests that addition of VitD values improves dietary assessment evaluation beyond HEI scores alone.



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IMPROVEMENTS NEEDED FOR DIETARY BORON ASSESSMENTS IMPACTING PUBLIC HEALTH AND POLICIES

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Scientific uncertainty has hampered establishment of policies, i.e., in the European Union, for dietary boron due to varying intakes and evolving methods of collection, processing and analysis. The following examples demonstrate the need to improve diet assessments that depend on nutrient data banks. One study of diet records was repeatedly analyzed using updated versions of a commercial software program. Boron content increased 16% between the earliest and latest versions of the program. The 341% increase between the most recent software analysis and the chemical analysis was due to an error reporting boron as mg/g rather than $\mu\text{g/g}$. The importance of including nutrients obtained from dietary supplements was confirmed in an osteoporosis study where 85% of 39 participants reported consuming 1-19 dietary supplements daily. A government data bank provided boron content on supplements ranging from 0.07 μg to 3 mg B/unit in 203 of over 3,000 products listed. An additional 42 products on the list had 'borate' on the label. Our analysis showed boron (in $\mu\text{g/g}$) in selected products not listing boron on the label; St. John's Wart (57.0), Siberian Ginseng (19.0), Dong Quai (0.5), a multivitamin and mineral supplement (152) and an ergogenic aid (137.0). These examples illustrate that more research is needed to provide the scientific support to validate public policies and dietary recommendations being made regarding such ultra trace elements as boron. Accurate and comprehensive assessments of ultra trace elements in the human environment are dependent upon improving analysis methodologies and subsequently created data banks.



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SODIUM VALUES IN FAMILY-STYLE RESTAURANT FOODS

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Objective: Excessive sodium intake is of public health concern in the U.S., with 77 percent of intake contributed by processed packaged and restaurant foods. According to WWEIA, the mean intake in 2005-2006 was 3,434 mg/day, exceeding the Dietary Guidelines for Americans recommendation of 2,300 mg/day. Numerous health organizations recommend substantial reductions in sodium levels in these foods over the coming decade. Under the USDA Nutrient Data Laboratory's monitoring program, high-consumption restaurant foods that are substantial contributors of sodium in the American diet have been sampled and analyzed.

Materials and Methods: In 2008, six high-consumption foods from four popular nationwide family-style restaurants chains were collected in 12 locations. Samples of French fries, fried shrimp, mozzarella sticks, sirloin steak and children's macaroni and cheese and chicken tenders were composited using USDA National Food and Nutrient Analysis Program protocols. Composites and quality control materials were analyzed by USDA-approved laboratories using the ICP method; serving size weights were determined.

Results: Sodium values in French fries (n=18) ranged from 46-521 mg/100g (mean=654mg/208g serving) and in sirloin steak (n=23) from 134-549 mg/100g (mean=442mg/144g serving). Fried shrimp (n=23; 685-1136 mg/100g; mean=1152mg/135g serving) and mozzarella sticks (n=18; 656-933 mg/100g; mean=1842mg/232g serving) had the highest levels. The levels in the children's items were consistent among restaurants; chicken fingers (n=17) ranged from 524-684 mg/100g (mean=664mg/113g serving) and macaroni and cheese (n=23), 317-417 mg/100g (mean=832mg/226g serving).

Significance: These observations provide a baseline value for sodium monitoring in several high-consumption restaurant foods and current, accurate data on restaurant foods for USDA databases.



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IMPROVING NUTRIENT DATABASE VALUES FOR BROCCOLI

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General Mills

Recent interest in nutrient content claims has increased as marketers are looking to bring innovative health news to vegetables. In the Mid 1990's, the American Frozen Food Institute (AFFI) collected nutrient values for frequently consumed frozen vegetables. The AFFI nutrient data collection was a broad national study that was designed to reflect multiple sources, varieties, and crop years resulting in higher variability than you would find in a single sourced ingredient. Frequently AFFI values are used as the basis for labeling vegetable ingredients. Comparing the broccoli data from both AFFI and USDA Standard Reference it was noted that similar values were used for broccoli florets and stalk. General Mills differentiates between broccoli stalk and florets in their product formulas and sources broccoli ingredients from a single source location. Because of these two factors, an in depth study was designed to determine nutrient values that would accurately reflect the ingredient nutrition profile. Broccoli stalk and florets were collected and analyzed at Medallion labs. The preliminary data indicates florets are more nutrient dense than stalks. The analytical results revealed potential new claims for vitamin A, vitamin D, and fiber on Green Giant products containing broccoli. Labels will be updated for Green Giant products over the next year. This ongoing study will continue to analyze broccoli florets and stalk to further document year to year variation. While it is not possible to have a single source of some ingredients when it is possible this can reduce variability, cost and time for claims validation.



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VITAMIN D3 CONTENT OF SEAFOOD FROM A NATIONWIDE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) SAMPLING

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Objective: The objective of the study was to update USDA food composition data and generate vitamin D3 data for the FDA list of the 20 most frequently consumed fish in the United States. The species sampled for the study included 14 finfish, three mollusks and three crustaceans.

Materials and Methods: In 2007 and 2008, the USDA sampled seafood from 12 statistically selected supermarkets across the United States. Orange roughy and tilapia had already been sampled in 2002. Most nutrients were determined on samples from individual locations, and some nutrients, including vitamin D3, were determined on composite samples from 2-3 locations. When preliminary results indicated vitamin D3 levels >2 mcg/100g, the samples from individual retail locations were analyzed. A validated HPLC method that incorporated quality control materials was used for all determinations.

Results: From the preliminary data it was clear that none of the shellfish examined provide significant amounts of vitamin D3. The vitamin D3 levels in finfish varied by species. Catfish, cod, haddock, and pollock were all low (<1 mcg /100g). Swordfish, salmon, and rainbow trout generally had the highest levels of vitamin D3 but there was substantial variability between individual samples: 14±13 mcg/100g (mean±SD) for swordfish, and 11±4 mcg/100g and 16±3 mcg/100g for salmon and rainbow trout, respectively.

Significance: Consumption of some fish species could provide a significant amount of naturally occurring vitamin D to the diet. The variability in vitamin D content of fish demonstrates the importance of a representative sampling plan to obtaining reliable food composition data.



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AMERICAN INDIAN AND ALASKA NATIVE FOODS IN THE USDA NATIONAL NUTRIENT DATABASE

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Objective: The USDA American Indian and Alaska Native (AIAN) Foods Database, part of the USDA National Nutrient Database for Standard Reference, includes high-quality data for over 150 traditional native foods. Most of the foods are nutrient-dense and highly-consumed by the elderly; the effort in many tribes is to encourage the return to these native foods, particularly among younger members, to replace energy-rich, nutrient-poor mainstream foods.

Materials and Methods: A sampling frame was developed for the contiguous 48 states and includes 24 American Indian tribes/reservations; sampling of subsistence foods from several Alaska village tribes across harvest regions is also ongoing. Foods targeted were based on results of focus groups, informal interviews, FFQs, and scientific publications. Under the National Food and Nutrient Analysis Program (NFNAP), analytical data for over 100 nutrients and food components for each sample are generated using USDA-qualified analytical labs, official analytical methods, and a rigorous quality control program.

Results: To date, traditional foods from the Navajo, Apache, Hopi, Plains, Shoshone-Bannock, and several Alaskan village tribes have been analyzed. Nutrient profiles for deer, elk, buffalo, marine mammals, fish, wild plants (land and water), food mixtures (everyday and ceremonial) indicate that these foods tend to be more nutrient-dense than mainstream foods consumed in recent years.

Significance: In addition to supporting ethnic food profiles in the USDA nutrient databases, tribal health professionals use these data to develop nutrition education programs encouraging increased consumption of traditional foods to counter growing health problems in the AIAN population, including obesity, diabetes, and cancer.



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DEVELOPMENT OF THE OVERALL NUTRITIONAL QUALITY INDEX (ONQI) SCORE FOR A FOOD FREQUENCY NUTRIENT DATABASE

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Objective: To develop the Overall Nutritional Quality Index (ONQI) score for two large ongoing prospective cohorts, the Nurses Healthy Study's (NHS) and Health Professional Follow Up Study's (HPFS) 1986 food frequency questionnaires (FFQ) and test the ability of ONQI to predict major chronic disease risk.

Materials and Methods: Foods were categorized according to 24 different food categories based on ONQI criteria. The ONQI algorithm was applied to 141 food profiles. A 100 point scale was applied. The resulting ONQI score was multiplied by frequency of consumption, summed for all foods and then weighted by total frequency servings. A total of 62,287 women from the NHS and 42,559 men from HPFS, free of disease at baseline, were followed for 20 years.

Results: We documented 20,005 cases of chronic disease in women and 13554 cases in men. The mean (SD) of the ONQI score was 23.0 (7.3) in the men and 24.3 (6.9) in the women. The ONQI score was inversely associated with risk of CVD (RR in women and men: 0.78; p-trend 0.001) and diabetes (Women: RR=0.85, p-trend=0.001; men: RR=0.82, p-trend=0.02), but not cancer. The ONQI score was inversely associated with all-cause mortality (Women: RR=0.90, p-trend=0.001; RR=0.88, p-trend=0.004).

Significance: Though a FFQ does not provide brand specific food analysis, the results indicate that the ONQI score may be a useful public health tool to help better guide consumer's food choices both within and across food categories.



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ADOLESCENTS' ABILITIES TO IDENTIFY FOODS AND BEVERAGES AT TIME OF CONSUMPTION

TusaRebecca E. Schap¹; Bethany L. Six¹; Deborah A. Kerr²; Edward J. Delp³; David S. Ebert³; Carol J. Boushey¹

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Description of foods has been acknowledged by adolescents as a burdensome component of diet assessment (Boushey, 2009). The development of a mobile telephone food record (mpFR) that fits into the lifestyle of young people may address these barriers (Winter, 2009; Zhu, 2008). Adolescents using the mpFR will confirm automated food identifications and in some cases may need to type words to identify foods using the mpFR application.

Objective: The objective of this study is to determine adolescents' abilities to correctly identify foods and beverages using written words at time of consumption.

Materials and Methods: Data were collected from adolescents (11-18y) recruited from summer camps at Purdue University. Adolescents participated in one lunch (n=63) and 55 (87%) returned for breakfast the next morning. Thirty-eight different foods and beverages familiar to adolescents were served. During the meal, adolescents wrote their food identification on a worksheet representing their meal.

Results: Adolescents identified 30 foods correctly 100% of the time. Food items that were not consumed by the participants were sometimes misidentified (e.g., cream cheese and yogurt). Twice, Coke® was identified as rootbeer.

Significance: This analysis provides evidence that adolescents can correctly identify familiar foods and beverages at the time of meal consumption. These results support previous findings that adolescents can identify foods served when prompted with an image up to 14 hours post-prandial (Schap, FASEB J. 2009 23:223.6). Analysis of words written by adolescents to identify foods informs the development of a database search mechanism to be integrated in the mpFR.



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THE PREVALENCE OF FOLATE INADEQUACY BY LIFESTYLE CHARACTERISTICS AFTER ACCOUNTING FOR FOLATE OVERAGES POST-FOLIC ACID FORTIFICATION IN CANADA

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Objective: Because there is no maximum to the Canadian folic acid fortification mandate, overages are possible, and have been previously documented, resulting in actual food folate values higher than that reported in the Canadian Nutrient File. Our objective was to estimate (including accounting for folate overages) the prevalence of inadequacy among adults based on the following lifestyle characteristics: smoking, alcohol consumption, obesity and diabetes.

Materials & Methods: Using food intake data from the Canadian Community Health Survey 2.2 (n=35,107), we estimated the prevalence of inadequacy (percent of individuals with usual folate intake below the Estimated Average Requirement) among adults based on the following lifestyle characteristics: smoking (daily smokers vs. non-smokers), alcohol users vs. abstainers, obese (BMI ≥ 30 kg/m²) vs. non-obese individuals and diabetics vs. non-diabetics. Intakes were also adjusted to account for folate overages.

Results: The prevalence of folate inadequacy was not different between smokers (n=4,326; 11.3%) and non-smokers (n=14,826; 10.5%), nor between obese (n=3,183; 11.8%) and non-obese (n=8,567; 9.4%) individuals. Diabetics had a higher inadequacy (n=1,536; 23.5%) than non-diabetics (n=18,357; 10.1%) ($P < 0.05$), and alcohol abstainers had a higher inadequacy (n=4,374; 15.9%) than alcohol users (n=13,633; 8.9%) ($P < 0.05$).

Significance: After adjusting foods for overages, we found that neither smoking nor obesity was a risk factor for folate inadequacy; alcohol abstainers had higher inadequacy than users. The higher prevalence of inadequacy observed in diabetics compared to non-diabetics is likely due to dietary guidance aimed at diabetics encouraging them to choose whole grain (not currently fortified) over white flour products.



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PHYSICAL, CHEMICAL, FUNCTIONAL AND SENSORY CHARACTERISTICS OF HARD-TO-COOK WHITE AFRICAN YAM BEANS (*SPHENOSTYLIS STERNOCARPA*)

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Objective: High protein-energy African yam beans (AYB) is a staple food in Eastern Nigeria where it is commonly known as “odudu”. Seed composition and functional properties are important in utilization of AYB in food formulations. Therefore, this study characterized lesser known hard-to-cook/dehull AYB based on its physical, chemical, functional and sensory properties.

Materials & Methods: White AYB (brown-eye, firmly attached testa, seed weight 0.13g, seed size 0.70x0.48x0.38 mm) seeds were cleaned, dehulled, converted into flour and functional properties were measured using standard methods. Swelling index of flour was obtained as ratio of volume occupied by sample after and before swelling. Water and oil absorption capacities were measured; then volume was noted and weight multiplied by density of water (1g/mL) or oil (0.902g/mL) and result was expressed as g oil or water absorbed/g sample.

Results: Dehulled AYB flour contained 8.59% moisture, 23.30% protein, 2.24% ether extract, 2.40% ash and 63.47% carbohydrate. Energy content was 3.49 kcal (14.61 KJ) per gram dehulled AYB flour. Results of functional properties for dehulled AYB flour are water absorption capacity 1.53g H₂O/g, oil absorption capacity 1.96g oil/g, emulsion capacity 2.50mL/g, foam capacity 32.2%, gelation capacity 6.0%, bulk density 0.97g/mL, swelling index 2.23, and wettability 41 seconds. Sensory acceptability of moin-moin (seasoned steamed AYB patties) meals prepared with dehulled AYB was high except for appearance which had the least score.

Significance: White AYB can serve as protein-rich ingredient in multicomponent foods and can complement wheat flour in composite/baked products which are protein-deficient staple foods in most developing countries.



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NUTRITION AND HEALTH PRINCIPLES WITH BIOLOGY LEARNING

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The objective of this project is to propose that the integration of nutrition education within the biology and health sciences curriculum and the inclusion of diverse instructional methods will increase students' motivation, learning, and achievement. Also, translating educational research, theory, and practice into effective classroom methodology with success rates confirmed by supporting statistical evidence. The final goal is to provide a solid foundation of instruction in biological studies to prepare students for greater success at Malcolm X College, and in their future careers, and personal endeavors.



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DEMONSTRATION ABSTRACT

THE 2010 INTERNATIONAL NUTRIENT DATABANK DIRECTORY: CONVERTING TO A WEB-BASED DIRECTORY

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Background: The International Nutrient Databank Directory (INDD) has been published since 1976, presenting information about current food composition databases in a format that can be compared and contrasted. The INDD includes data about national or reference databases, user databases, and software applications. The 2008 version, published as a PDF document and available for download on the Web, included 41 organizations.

Objective: To convert the INDD to a web-based application.

Description: The INDD had been produced in a hard copy report format until 2008, when it was published as a PDF available for download from the NNDC website. The 2008 INDD required tedious hand entry, careful proofreading of the data, and difficult formatting. Starting in 2010, the INDD will be available as a web-based directory. The initial version (available Summer 2010) will contain updated database information. Additional features will be added in the future, including: direct entry of data by developers, filtering and searching of the database, and the ability to download PDF reports.

Conclusion: The online version of the INDD will allow database developers to enter information directly into the INDD, thus streamlining the updating of the INDD and allowing for more current information to be presented. It will also allow users to more easily find the information they are seeking and download information as a PDF report. These improvements promise to benefit the nutrition community with more easy access to information about nutrient databases and their developers.