29th National Nutrient Databank Conference

Cancer and Obesity -- Critical Dietary Compositional Data Needed to Monitor Disease Risk

San Diego Marriott Hotel and Marina
Marriott Hall 1

Friday, April 1, 2005

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Nutrient Databank Directory

A committee of The National Nutrient Databank Conference has compiled an updated directory of software applications and their accompanying food composition databases, and of the reference databases that are sources of the food composition values and supporting information.

This directory is intended to assist potential users in determining which combination of program and database might best meet their needs. It will also be a resource for students and others who want to learn about and compare selected database and software features.

Visit the Nutrient Data Lab (ARS) website (http://www.nal.usda.gov/fnic/foodcomp/index.html) for access to the **International Nutrient Databank Directory** and information concerning past and future **National Nutrient Databank Conferences** (look under the "Information" heading).

Program Agenda

All presentations and poster sessions will be held in Marriot Hall 1.

8:00 - 8:30 Registration

8:30 - 8:40 Welcome – Phyllis Stumbo, Chair, National Nutrient Databank Steering Committee

Compositional Data for Monitoring Cancer Disease Risk
Session Chair: James Harnley, conference co-chair

8:40 - 9:30 Diet, Nutrition and Cancer: Challenges in Examining the Link
Cheryl Rock, PhD, RD

9:30 - 10:10 Considerations and Approaches to Organizing a Database of Bioactive Foods and Food Components
Leila Saldanha, PhD, RD

10:10 - 10:40 Break/posters

10:40 - 11:20 Herbal and dietary supplements for cancer prevention
Michael Wargovich, PhD

11:20 - 12:00 Targeted Metabolomics: Translating profiles of bioactive food components within broccoli into bioefficacy
Elizabeth Jeffery, PhD

12:00 - 1:10 Lunch

Compositional Data for Monitoring Obesity Disease Risk
Session Chair: Catherine Champagne, conference co-chair

1:10 - 2:00 The epidemic of obesity: new challenges for food composition and dietary assessment
George Bray, M.D.

2:00 - 2:40 Eating for optimum health: unique contributions of foods, unique challenges for composition and assessment
James Joseph, PhD

2:40 - 3:10 Break/Posters

3:10 - 3:50 The new dietary guidelines for Americans and changes in assessment of food intake
Penny Kris-Etherton, PhD

3:50 - 4:30 Low carbohydrate diets and nutrient intake measurement
Eric Westman, MD

4:30 Closing Remarks – Suzanne Murphy, Chair-elect, National Nutrient Databank Steering Committee

4:30 - 6:30 Reception/Posters

Diet, Nutrition and Cancer: Challenges in Examining the Link

Cheryl L. Rock, PhD, RD, Department of Family and Preventive Medicine, UCSD

The relationship between diet, nutrition and cancer is clearly complex. Numerous dietary constituents have been shown to exhibit properties that could reduce the risk and slow the progression of cancer. The time frame under study, across the continuum of cancer and carcinogenesis, affects the interpretation of all studies examining the link between dietary factors and cancer. The traditional approach to focusing on a specific food component, utilizing animal models and Phase I, II and III trials, may not be ideal when applied to biologically active food components. Formulation and the context of consumption, in addition to potential synergy when these biologically active compounds are provided via whole foods and within an overall dietary pattern, can have powerful effects on tissue uptake and molecular activities. Although the data are not entirely inconsistent, an overall dietary pattern and intakes of specific foods have been related to cancer risk and progression in epidemiological studies. However, disentangling the effects of dietary and nutritional factors from other environmental factors, and in consideration of the various genetic factors that influence susceptibility, is a daunting task. Dose-response relationships are not biologically relevant for many nutrients. Data and conclusions relating to phytochemicals based on observational epidemiological studies can be misleading, even more than data and conclusions relating to nutrients for which knowledge of food content and metabolism is of higher quality. Limitations and challenges in observational studies include confounding, homogeneity of the population under study, imprecise measures of intake, and failure to identify or examine across a range of intakes. Variability in food content and characteristics of the context are important issues, and the latter factor cannot be adequately examined or addressed in these epidemiological studies. In epidemiological and clinical studies, foods are often grouped, categorized and described differently, and the intakes that are quantified may not even adequately capture the contributing dietary sources of the dietary factor of interest. In clinical trials, diet (and dietary supplement) intervention studies have tested whether modulating dietary factors may influence cancer outcomes, but the timing of these interventions, in addition to the degree of diet modification that is achieved, is crucial in the interpretation of results. Given the imprecision of dietary assessment, the importance of biomarkers, including confirmatory biological evidence of dietary intakes and tissue uptake and activities, cannot be overstated, although the use of biomarkers in large clinical trials presents several challenges. Better characterization of study participants, especially relating to genetic factors and the overall dietary pattern, also would help in the interpretation of findings. Future research directions include measurement and characterization of influencing genetic factors, the promotion of improved approaches to describing dietary intakes, and increased reliance on biomarkers.

Approaches and Considerations to Organizing a Database of Bioactive Foods and Food Components

Leila Saldanha, PhD, RD

A set of possible questions to ask when organizing a database of bioactive foods and food components are: 1) what are bioactive foods and food components? 2) what is the intended use and who is the primary user of this database? and 3) what other factors affect organizing this database?

On September 16, 2004 the Office of Public Health and Science, Office of the Secretary, US Department of Health and Human Services issued a *Federal Register* notice inviting public comment on defining bioactive food components. In addition, comments were requested on four questions, regarding what compounds should/should not be classified as bioactive food components. Bioactive food components were defined in the notice, as "*constituents in foods or dietary supplements, other than those needed to meet basic human nutritional needs, that are responsible for changes in health status*"[1]. Seventeen written responses were received and these were primarily from processional and trade groups, a few were from scientists in academia. The common viewpoint was that everything in foods is bioactive. However, there were differing viewpoints on whether the level of a component determines if it should be classified as a "bioactive food component" or not, especially when it came to food components that are historically viewed as "essential," such as, vitamins and minerals.

If one accepts the premise that everything in foods is bioactive, then the next broad question to ask is what is the intended use and who is the primary user of this database? If the intended use of the database is to get estimates of exposure and relate these to health outcomes, then the guiding principles for organizing a database would be different than if the intended use is to elucidate mechanisms of action of bioactive food components.

The final question is what other factors affect organizing this database? Besides the obvious question of cost, there are the challenges in characterizing and identifying components, especially if components in foods and natural products are "complex mixtures," i.e., they act synergistically and a single component may not be responsible for the biological effects. There is also the challenge of developing uniform nomenclature. Further, if everything in foods is bioactive, then should we not name the food composition database the bioactive food components database and continue to build on this database as new bioactive components are discovered and quantified?

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[1] *Federal Register* Vol 69, No 179: Sept 16, 2004, pp 55821-55822

Targeted metabolomics: translating profiles of bioactive food components within broccoli into bioefficacy.

Elizabeth Jeffery
University of Illinois, Urbana, Illinois

It has only been over the last decade or so that we have recognized the substantial variation in metabolite content that occurs across genotypes of a plant food. Over the same time period, our interest in plant secondary metabolites that may provide health benefits by prevention of chronic diseases has also grown. Yet the variability in content of metabolites within plant foods, including essential and non-essential dietary nutrients, greatly confounds the study of efficacy in those consuming whole plant foods. This variability is in part due to genotype, environment and genotype-environment interactions. The reductionist approach to the study of efficacy of bioactive food components, involving purification of the component of interest and subsequent feeding to individuals, may not accurately describe the bioactivity of the whole food. The study of targeted metabolomics, allowing the study of content of a few metabolites and/or enzymes of interest across several genotypes and environments can help point the way toward stable genotypes that can be used to provide known amounts of a bioactive food component, allowing studies of dose-response for bioactive food components.

The Epidemic of Obesity: Challenges for Food Composition and Assessment.

George A. Bray, M.D.
Boyd Professor, Pennington Center, Baton Rouge, LA

The past 25 years have seen a significant increase in the prevalence of obesity. Now more than 60% of adults are overweight and 30% are obese. This galloping epidemic portends an increase in the diseases associated with obesity, including diabetes, heart disease, gall bladder disease, hypertension, osteoarthritis, and some forms of cancer. In addition this rising disease burden will increase health care costs. At one level this epidemic is the result of an energy imbalance since human beings, like other animals, obey the laws of nature. At the practical level, however, it is what the energy balance concept does not tell us that is important in dealing with the problem of obesity. It doesn't tell us why men eat more than women, why men and women store fat in different parts of their body, why some drugs cause weight gain and others weight loss, or how the genetic make-up influences the response to environmental food challenges. The academic community is confronted with an every increasing number and variety of food choices. Foods vary with the season and with processing. The introduction of genetically modified organisms into the food supply changes the composition of what we eat, and having ways to informing consumers about what these effects are is of major importance. Similarly the additions to food and the use of food as "nutriceuticals" makes the needs of obtaining accurate analyses and complete data sets most important. This is a real challenge for the future.

Eating for optimum health: Unique contributions of foods, Unique challenges for composition and assessment.

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Numerous epidemiological studies have indicated that individuals who consume a diet containing high amounts of fruits and vegetables may prevent age-related disease such as Alzheimer Disease. Research from our laboratory has suggested that dietary supplementation with fruit or vegetable extracts high in antioxidants (e.g., blueberry, BB, spinach) can decrease the enhanced vulnerability to oxidative stress (OS) that occurs in aging and these reductions are expressed as improvements in behavior. In addition to their antioxoidant and anti-inflammatory activities, There appear to be additional multiple mechanisms involved in the beneficial effects observed from these supplementations. These mechanisms include enhancement of neuronal communication that involves increased signaling and neurogenesis. For example, collaborative work with Dr. David Morgan at the University of So. Florida shows that BB supplementation from 4 to 12 months of age in APP/PS1 mice can offset the putative deleterious consequences of amyloid beta deposition on behavior in APP/PS-1 mice by increasing extracellular signal regulated kinase (ERK) and protein kinase C, two important signaling factors in learning and memory. These same MAP kinases also appeared to be activated in learning in both aged and young rats, are enhanced by blueberry supplementation, and are correlated with behavioral performace. It also appears that polyphenolic compounds, such as those found in BB may exert their beneficial effects by enhancing the endogenous antioxidant and neuronal signaling capabilities of the organism. In addition, collaborative work with Dr. Gemma Casadesus from Case Western Reserve Univ. in Cleveland OH has indicated that one of the most striking effects of BB supplementation may involve increases in neurogenesis. The results have indicated that aged BB-supplemented rats, tested in the radial arm water maze (RAWM) and given injections of BrdU, showed a greater number of proliferating cells in the dentate gyrus than control cells and these numbers were inversely correlated with the number of errors in the RAWM performance [i.e., as the number of proliferated cells increased, the number of memory errors decreased (RAWM errors were also inversely correlated with the number of the anthocyanins that were localized in regions such as the cortex and hippocampus in the BB-supplemented animals. Taken together, these findings, along with those showing similar beneficial effects on MAP kinase and IGF-1 signaling and behavior in BB-supplemented animals, suggest that antioxidant-rich fruits such as BBs may improve cognitive and motor function by enhancing neuronal signaling and ultimately, neuronal communication. Clearly, however, the antioxidant/anti-inflammatory effects of the berryfruit polyphenols may only represent a small aspect of their beneficial effects.

The New Dietary Guidelines for Americans and Changes in Assessment of Food Intake

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The Dietary Guidelines, 2005 make 41 recommendations in nine topic areas: adequate nutrients within calorie needs; weight management; physical activity; food groups to encourage; fats; carbohydrates; sodium and potassium; alcoholic beverages; and food safety. An overarching message encourages Americans to make wise food choices within their calorie needs to achieve nutrient adequacy and engage in regular physical activity.

Two eating patterns have been issued to help implement the 2005 Dietary Guidelines – the USDA Food Guide and the DASH (Dietary Approaches to Stop Hypertension) Eating Plan.

The USDA Food Guide recommends daily amounts of food from each of six food groups (except for vegetables – recommended amounts are weekly) for calorie levels from 1000-3200. Specific recommendations are made for five different categories of vegetables (i.e., dark green, orange, legumes, starchy vegetables, and other vegetables) whole grains (at least 3 oz equivalent/d) and discretionary calories. The DASH Eating Pattern is based on 1600, 2000, 2600, and 3100 calories, and daily servings from eight food groups are recommended. Servings of fruits and vegetables are in cup measures in the USDA Food Guide and in cup and unit measures in the DASH Eating Plan. Basic food group recommendations have been made for children ages 2 to 3, 4 to 6, and 7 to 12 years. Serving sizes vary for children compared with adults, and serving sizes for different ages of children differ. Challenges in obtaining accurate food intake data relate to assessing intake of different vegetable categories (because of different weekly recommendations for each vegetable category), assessing consumption of whole grains (due to a possible lack of consumer knowledge of whole grain foods) and assessing discretionary calorie intake (because of a lack of knowledge of fat content of meats and dairy products). In addition variable serving sizes for children of different ages add to the challenges of collecting accurate dietary data.

Low Carbohydrate Diets and Nutrient Intake Measurement

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Abstract

Over the past several years, clinical trial evidence has emerged showing that diets restricted in carbohydrate content are an effective method for weight loss over a 6-12 month period. While the clinical observation that low carbohydrate diets could work for weight had been made many years ago, no formal scientific evaluation had been made. These studies will be reviewed with particular attention to the types of foods consumed on the most restrictive phases of these diets.

References

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POSTER ABSTRACTS
29TH NATIONAL NUTRIENT DATABANK CONFERENCE, SAN DIEGO, CA, APRIL 1, 2005

ABSTRACT #1. A REVIEW OF MULTIVITAMIN/MULTIMINERAL SUPPLEMENT PRODUCTS REPORTED IN THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES) 1999-2000. Karen Andrews, Cuiwei Zhao, Joanne Holden and Amy Schweitzer, Nutrient Data Laboratory, US Department of Agriculture; Jim Harnly and Wayne Wolf, Food Composition Laboratory, US Department of Agriculture; Johanna Dwyer, Mary Frances Picciano, Joseph Betz, Leila Saldanha, Elizabeth Yetley and Kenneth Fisher, Office of Dietary Supplements, National Institutes of Health; and Kathy Radimer and Bernadette Bindewald, National Center for Health Statistics, Centers for Disease Control, US Department of Health and Human Services
Objective: NHANES 1999-2000 data indicate that 35% of U.S. adults took a multivitamin/multimineral supplement in the past month: most of them on a daily basis. NHANES supplement data were evaluated for patterns that may help characterize the types of multivitamin/multimineral supplements most commonly consumed in the U.S. **Methods and Materials:** The NHANES dietary supplement data files were imported into Microsoft Access. Queries were constructed in Structured Query Language (SQL) for searches of supplement name and counts of vitamins or minerals. Total vitamin and mineral count distributions were determined separately for adult products with three or more vitamins and for products with one or more minerals. In addition, products self-identified as multivitamins or multivitamin/minerals that contained at least one Dietary Reference Intake nutrient (vitamin or mineral for which there are identified daily values or adequate intake amounts) were examined. Distributions were determined for specific vitamins in products with both "multi" and "vitamin" in the product name and for specific vitamins and minerals with "multi", "vitamin" and "mineral" in the product name. **Results:** The distribution of vitamin counts (>2) in adult supplement products indicates that the most commonly reported multivitamin products contain 13 vitamins. The distribution of mineral counts in adult supplement products shows that most of the products sold are either single or double mineral products (which may be in combination with vitamins or other supplement ingredients) or are multivitamin/multimineral products with 16 minerals and at least 13 vitamins. Dietary supplement products self-identified on the label as multivitamin products contain the same specific 11 vitamins 90% of the time; those self-identified as multivitamin/multimineral products also contained the same specific 11 vitamins and four specific minerals 90% of the time. **Significance:** The NHANES dietary supplement data files are useful for the evaluation of dietary supplement use in the U.S. Given the relatively high usage of multivitamin/multimineral supplements by Americans and the use of this category by researchers to describe supplement users, it is important to identify what specific vitamins and minerals are commonly contained in frequently reported multivitamin/multimineral products.

ABSTRACT #2. ALGORITHMS FOR ESTIMATING ZINC INTAKE FROM WHOLE DIETS. Jeannemarie M. Beiseigel, PhD, RD and Janet R. Hunt, PhD, RD, USDA, ARS, Grand Forks Human Nutrition Research Center, Grand Forks, ND 58202
Objective: Algorithms to predict fractional Zn absorption (FZA) and total Zn absorbed (TZA) were developed from measurements of Zn absorption from whole diets. **Methods and Materials:** Data included studies measuring Zn absorption of healthy adults from three or more consecutive meals extrinsically labeled with Zn isotope. Diets (n = 28 from 10 studies) fitting these criteria contained 30 – 134 g protein, 0.17 – 5.1 g phytate, 3.4 – 22 mg Zn, 1.1 – 36 molar ratios of phytate:Zn, 0.12 – 2.1 g Ca, and 5.4 – 27 mg Fe. Dietary variables were normalized to 2,500 kcals to predict FZA (0.14 – 0.49) and TZA (1.7 – 6.0 mg). **Results:** Individual, logarithmic, and interaction terms were examined for best-fit linear regression models of FZA [Logit FZA = 1.06 – (0.258 * g phytate) – (0.535* ln (mg Zn)) + (0.373 * g Ca) – (0.273 * ln (mg Fe)); $R^2 = 0.83$; $p < 0.0001$] and TZA [ln (TZA) = 1.16 – (0.192 * g phytate) + (0.0709 * mg Zn) + (0.166 * g Ca) – (0.301 * ln (mg Fe)); $R^2 = 0.84$; $p < 0.0001$]. Variability in FZA was explained by phytate (62%, partial R-square), Zn (12%), Ca (7%) and Fe (2%). For TZA, zinc explained 43%, phytate 34%, Ca 3%, and Fe 4% of the variation. Protein lent no predictive power to either model. In a previous model, total Zn and phytate:Zn explained 41% of FZA variability from 15 diets (IZiNCG, Food Nutr Bull 2004;25:S94). That model explained 64% of FZA variability from these 28 diets, whereas the new model explained 83%. **Significance:** Such algorithms enable easy estimation of zinc absorption from whole diets.

ABSTRACT #3. AN APPROACH TO ASSESSING DIETARY SUPPEMENT INTAKE FOR USE IN CONJUNCTION WITH THE COLLECTION OF 24-HOUR DIETARY RECALLS. Lisa Harnack, Margaret Artz, Mary Stevens, Nancy Van Heel, and John Himes. University of Minnesota
Objective: With the rising use of dietary supplements it has become imperative that tools for assessing nutrient intake include assessment of their use. Presently, most nutritional analysis software programs for use in the collection and analysis of 24-hour dietary recalls are not designed for their assessment. The addition of this capability has been impeded, in part, by the lack of a standardized methodology for assessment of dietary supplement use. Thus, we have developed an assessment approach for use in combination with the collection of 24-hour dietary recalls. **Methods and Materials:** Approaches used to assess dietary supplement intake were identified through a literature review. For each approach found, we reviewed validity and reliability studies conducted to evaluate the methodology, and considered how well it could be adapted for use with the collection dietary recalls. **Results:** After considering the merits of available approaches, a new approach termed the Tiered 24-hour Dietary Supplement Recall was developed. With this approach, following completion of a recall a series of structured questions is used to collect detailed information about use of dietary supplements on the recall day. The first set of questions (Tier 1) is designed to produce an initial list of all dietary supplement products used on the recall day. Tier 2 provides for a review of the list with a chance to add or correct. Tier 3 collects the detail: 1.) full name of product; 2.) number of times taken on the recall day; 3.) dosage taken each time used; and 4.) issues surrounding use such as reason for taking. Tier 4 involves reviewing information collected allowing for additions or corrections. **Significance:** The approach has the potential to work well in conjunction with the collection of dietary recalls; testing will be required to refine the method and establish its reliability and validity.

ABSTRACT #4. ASSESSMENT OF HISTAMINE CONTENT IN FOODS. Beverly J. McCabe-Sellers, Cathleen G. Staggs, Margaret L. Bogle, USDA, Agricultural Research Service, Lower Mississippi Delta Nutrition Intervention Research Initiative
Objective: Few articles have addressed the histamine content of foods, although serious adverse events can occur with this biogenic amine (BA). Histamine is linked to cluster headaches, hypertensive crisis, food-drug interactions, and to potentially fatal histamine intoxication. Histamine is the only BA with a defined legal upper limit in foods (50μg/g). Biogenic amines are present in a wide variety of foods. The presence of high concentration of histamine is indicative of spoilage or degradation. Current animal research suggests that the presence of biogenic amines in the food matrix could increase susceptibility to potentially adverse effects on the human gut such as increased susceptibility to E.coli 0157:H7. **Methods and Materials:** A literature review resulted in a collection of previously published values for histamine content in foods to update guidelines in prevention. **Results:** Twenty-four articles reported histamine values. Out of 86 foods analyzed, 15% (n=13) had at or above the legal limit of histamine, 22% (n=20) had non-detectable levels of histamine and the remaining 63% (n=67) had detectable but safe levels. Histamine rich foods include fermented foods (e.g., cheeses, fish products, soy products) and meat and vegetables stored overlong or under improper temperatures. **Significance:** The most frequent adverse event associated with histamine is headaches; avoidance is the best prevention. Increased exposure to food contaminants and environmental pollution has potential adverse effects on gastrointestinal tract epithelial barrier. Biogenic amines in food may cause a host of pathophysiological reactions and pathogenesis of gastrointestinal diseases. More sensitive indicators to detect histamine in foods could avoid adverse health effects. This project was funded by USDA, ARS 6251-53000-004-00D.

ABSTRACT #5. ASSIGNMENT OF PORTION SIZES RELATING CANADA'S FOOD GUIDE FOR HEALTHY EATING (CFGHE) FOOD GROUPING PRINCIPLES TO EACH OF THE CANADIAN NUTRIENT FILE (CNF) FOODS. Marie-France Verreault, Danielle Brulé, Beth Junkins, Lydia Dumais, Renée Crompton, Josephine Deeks, Health Canada, Health Products and Food Branch, Ottawa, Canada
Objectives: Canada's Food Guide to Healthy Eating, is well accepted and understood by the Canadian public as a key tool for dietary guidance. Dissatisfaction existed however, with the limited number of foods for which group and portion sizes were defined. Extension to each of the foods in the CNF database will assist health professionals to apply the principles of the Food Guide in a standardized fashion and expand the opportunity to collect rudimentary nutrient intake data by tying the group assignments back to the nutrient database. The objectives were to: 1) To standardize the reporting of data within food groups particularly for nutrition assessment and monitoring purposes, across the country; and 2) To allow the computer-assisted breakdown of diets into Food Guide servings. **Methods and Materials:** Adherence to CFGHE food grouping philosophy remained the overriding guiding principle while expanding the traditional 4 food groups into over 40 subgroups and the development of objective thresholds for subgroup assignment and portion size calculation. Another 8 subgroups termed "Other foods" were formed for assignment of foods with little or no nutrient density. Examples of similar work from industry, academia and other countries were considered. Recognition of common sense eating patterns also came into account (ie 1 medium apple). Consistency within and across groups was key. **Results:** Excel tables are now available on-line describing a CNF food code, food descriptions, CFGHE subgroup assignment, and the size of portion which provides one serving of the assigned subgroup. The subgroups codes were constructed in a manner which easily allows the collapse to broader categories where desired. Documentation reporting the rationales, thresholds and decision-making process accompany these files. **Significance:** These tables have now been applied to Canada's most recent survey data to assess Canadian eating patterns. Reception from health professionals accessing the tables has been very positive and the availability of a standard now allows comparison from one survey to another.

ABSTRACT #6. BIOAVAILABLE DIETARY IRON ESTIMATIONS FOR THE CANADIAN NUTRIENT FILE. Marcia J. Cooper, Mary R. L'Abbé, Health Canada, Bureau of Nutritional Sciences, Health Products and Food Branch, Health Canada, Ottawa, Canada
Objective: The Canadian Nutrient File (CNF), like most national food composition databases, lists only total iron values. Heme/nonheme levels or bioavailability data are not included in the database. Our objective was to estimate bioavailable iron of specific foods considering enhancing and inhibiting components to be able to determine bioavailable iron from the Canadian diet for various age and sex groups. **Methods and Materials:** In order to estimate the bioavailable dietary iron (BDI) from foods, an extensive literature search was conducted to estimate the proportion of heme and nonheme iron content of specific foods/groups of foods. Recent research suggests that the heme content of meat, fish and poultry (MFP) is not consistent for all categories of foods as was originally proposed at 40% by Monsen et al. (1978). To adjust for the phytate component of foods, the published phytate-adjusted availability percentage was utilized to determine non-heme bioavailability. A sample of both MFP foods and non-heme iron foods were utilized to estimate bioavailability. **Results:** Using a modified Monsen model, BDI was calculated to be 0.78, 0.42, 0.42, 0.24, 0.18 and 0.16 mg for 100g of sirloin steak, lean ground beef, turkey leg, pork tenderloin, chicken breast and tuna, respectively (representing 15–74% heme iron content), for an individual with 250 mg of stored iron (typical levels seen in Canadian premenopausal women). Considering the phytate component of foods, BDI was calculated to be 0.013, 0.023, 0.025, 0.035 and 0.21 mg for potato, popcorn, navy beans, chickpeas and Corn Flakes®, respectively. Overall, BDI is lower for these foods compared to published data, which had been derived assuming there was 0 mg of stored iron, and did not account for phytate content. **Significance:** These preliminary findings indicate that using a realistic approximate of storage iron, considering dietary inhibitors and calculated values for the proportion of heme and nonheme iron in MFP foods, might better estimate BDI. Adding information on the bioavailable iron in food composition databases rather than just the total iron content of foods will provide a better understanding of the adequacy of iron associated with specific dietary habits (e.g., vegetarianism).

ABSTRACT #7. DEVELOPING A DATABASE FOR NITRATE, NITRITE, AND *N*-NITROSO COMPOUND CONTENT OF PROCESSED MEATS. Thea Palmer Zimmerman, Stephen G. Hull, Suzanne W. McNutt (Westat); Rashmi Sinha, Amanda Cross (National Cancer Institute)

Objective: To develop a database for nitrate, nitrite, and *N*-nitroso compounds (NOCs) in processed meats to link to a food frequency questionnaire (FFQ). **Methods and Materials:** A high intake of processed meat is associated with an increased risk for several cancers. These associations are thought to be due to the additives used during meat processing. A meat module FFQ was developed by the National Cancer Institute, using food codes for processed meats from the Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96 and 1998 to assess the intake of commonly consumed processed meats. The FFQ contained 91 questions, including 35 questions about types of processed meats. Ten of the processed meat types were chosen for analysis of nitrate, nitrite, and NOCs based on the frequency of consumption in CSFII 1994-96 and 1998. The amount of additives varies in similar types of processed meats because of product formulations, and they may decrease with the shelf life of the product. We used information on brand names associated with each food code from the USDA Nutrient Data Laboratory to prepare composite samples for each meat type. Meat products were purchased at grocery stores, cooked if necessary, and combined. Two meat types were chosen as blinded quality control samples. **Results:** Twenty-three food codes representing 90% of the total consumption of the 10 meat types (bacon, regular; beef, lunch meats; bologna, regular; chicken/turkey cold cuts; ham, baked/steak; ham, luncheon meat, regular; ham, luncheon meat, lean; hot dog, regular; salami; and sausage, link/smoked) were identified. Ninety-one products were used to prepare the composites. Aliquots of the 10 meat type composite samples were sent to a commercial laboratory for measurement of nitrite, nitrate, and NOCs. **Significance:** Since processed meats are implicated as a risk factor for several cancers due to the additives present, it is imperative that the levels of these compounds be made available to researchers in the fields of diet and cancer. We have developed a standard process to prepare food products for a limited number of meat samples for the analysis of additives. This process could be applied to the analysis of other additives as needed for database development.

ABSTRACT #8. NUTRIENT DATABASE DEVELOPMENT FOR NATIONAL HEALTH AND NUTRITION SURVEY IN KOREA
Bok-Hee Kim, Yoonna Lee, Haeng-Shin Lee, Young-Ai Jang, Cho-il Kim, Korea Health Industry Development Institute

Objective: As people get more health-conscious in Korea recently, the necessity of developing databases for nutrients in Korean foods with little information has been raised continuously. To provide true and correct information on diet and health for consumers, a 5-year project for nutrient database was started in 2001. **Methods and Materials:** Food list representing usual diet of Koreans was developed based on the result of the 1998 or 2001 National Health and Nutrition Survey (NHNS) and 1999 or 2002 Seasonal Nutrition Survey. Based on the food intake data obtained from 1-day 24-hour recall interviews, food list for analysis was formulated considering the amount and frequency of consumption, dietary pattern differences by area, sex and age class, and probable high content of target nutrients designated for each year. About 100 to 200 representative foods were selected depending on the target nutrient and purchased in triplicates considering the area of production or the best-selling brands for processed foods. Foods were then analyzed for fatty acids, vitamins (B6, D, E, and folate), minerals (Cu, Mg, Zn, Mn, I, and Cr), and amino acids in each year using GC, HPLC, microbiological assay, ICP, etc. **Results:** Database was developed for aforementioned nutrients and some of these data have been incorporated into the 6th edition of 'Food Composition Table' in Korea already. As the last item of the project, dietary fiber database will be developed this year. **Significance:** This database contributes toward achieving health goals stated in the 'Health Plan 2010' by allowing informed-consumers decide and choose foods based on the recent, updated and true nutrient content information of foods. It also has been used in analyzing and understanding the result of the NHNS to provide further information on the relationship between diet and health.

ABSTRACT #9. RELATIONSHIP BETWEEN RISK FACTORS OF CARDIOVASCULAR DISEASE AND KOREAN DISH INTAKE. Hyun-Kyung Moon· Hyun-Hee Kang,. Dept. of Food and Nutrition, Dankook University, Seoul. Korea

Objective: The recent Korean diet has been westernized because of the rapid economic development. With the change of diet, incidence of Cardiovascular disease(CVD) tends to be increasing. The change to westernized dietary patterns is supposed to influence the risk factor of CVD. This study aims to explore the effect of the westernized diet on CVD in regard to the relation of Korean dish intake to risk factors of CVD. **Methods and Materials:** The data were obtained from 6,566 (over 20 years old) of 8,004 subjects, who took part in both the health examination and dietary survey among the '98 KNHNES. The types of dish were classified into Korean, Orient, Western, modified Korean, modified Orient, and modified Western according to ingredient of dish and cooking method, to examine the general dietary patterns. The types of dish were analyzed in respect of economic class groups and age groups, both of which have the basic influence on the dietary life. The economic levels were classified into low, middle, high on the standard of the poverty-line, while the age groups into 20, 30, 40, over 50. The risk factors of CVD were divided into the 4 groups of 0, 1-2, 3-4, 5-7 according to the numbers of risk factors of 7 in all: hypercholesterolemia, low HDL, high LDL, high triglyceride, hypertension, diabetes and smoking. Statistical analysis was carried out in the methods of GLM and $\chi 2$-test using the SAS to examine the interrelationships of types of dish, economic levels, age, and risk factors of CVD($P=0.05$). **Results:** The result showed that the low economic level and the old age corresponded to the high intake of Korean dish($p<0.05$). It seems that Korean dish did not show any relationship with risk factors of CVD. However, as economic class and age groups were sorted respectively, the numbers of risk factors of CVD might be in diverse proportion to the intake of Korean dish. Especially in the groups of low-30, high-30 and high-50, this phenomenon was statistically significant($p<0.05$). **Significance:** The westernization of dietary life might influence the risk factors of CVD among Koreans. Therefore, the further study on this suggestion might be required.

ABSTRACT #10. ESTIMATION OF SELENIUM INTAKE VIA A REPRESENTATIVE DIET OF THE KOREAN POPULATION
Chang-Hwan Oh, Jiyung Kim, Jongsei Park, Younju Choi[1], Hye Young Lee[1], Hye Kyoung Park[1], Haeng-Shin Lee[2], Cho-il Kim[2]
LabFrontier Corp., [1]Korea Food and Drug Administration, [2]Korea Health Industry Development Institute

Objective: While Selenium (Se) has attracted increasing attention internationally for its anticancer effect and strong antioxidative characteristics, there have been almost no attempts to estimate dietary intake of Se for the Korean population due to the lack of appropriate database. This study was undertaken to develop a Se database for Korean foods and estimate dietary intake of Se of Koreans. **Methods and Materials:** Food intake data of the Korean population from 2001 National Health and Nutrition Survey and 2002 Seasonal Nutrition Survey were used to develop a food list for selenium analysis. Foods consumed in larger amount, with more frequency, in a specific season, and mainly in certain age classes were considered for the list and analyzed for Se content using ICP-MS. Then, dietary Se intake of Koreans was estimated by multiplying Se content with mean intake values of respective foods. **Results:** Selenium database with a little more than 200 foods representing typical Korean diet was developed. And the mean Se intake of the Korean population was estimated as 68.646 μg/person/day based on this database. The most important source of Se for Koreans was rice that provided 20 μg/person/day of Se. Due to the characteristic dietary pattern of Koreans, contribution of 'cereals and grains' group to Se intake reached 35%. And 2 other food groups of importance were 'fishes and shellfishes' and 'meat and poultry' with 21 and 20% contribution respectively. **Significance:** It seemed that current selenium intake level of Koreans is quite appropriate and this database could be used in determining the reference values in Dietary Reference Intakes for Koreans.

ABSTRACT #11. FOLATE INTAKE BY WOMEN OF CHILD-BEARING AGE: THE IMPACT OF FORTIFICATION Patricia M. Guenther, PhD, RD,[1] Chun-Fu Chen, MS,[2] and Helen H. Jensen, PhD,[2] [1]USDA Center for Nutrition Policy and Promotion, [2]Iowa State University, Center for Agricultural and Rural Development
Objective: To determine if the fortification policy implemented in 1998 benefits low-income women more than it does higher income women of child-bearing age by determining if low income women, compared to higher income women, get a greater proportion of their total folate intake from the fortificant form, folic acid. **Methods:** Intakes of total folate and of the fortificant form, folic acid, from 1,921 low income women age 14 to 50 years (household income less than or equal to 185% of the federal poverty level) and 2,814 higher income women of the same age in the 1999-2002 National Health and Nutrition Examination Survey, were weighted to account for the sample design and non-response, and the means were tabulated. Analysis of variance (WesVar, version 4.2) was used to determine if there was a difference between lower and higher income females age 14 to 50 years in the intakes of total folate, naturally occurring folate, and folic acid and in the mean proportions of total folate provided by folic acid. The nutrient database used to code the 1999-2000 intake data contained only total folate (mcg). The USDA Food and Nutrient Database for Dietary Studies (FNDDS), version 1, was used to code the 2001-2002 intake data. It includes total folate (mcg and mcg dietary folate equivalents (DFE)), naturally occurring folate (mcg), and folic acid (mcg), the fortificant form. We linked the food codes used in 1999-2000 with the nutrient values for those same codes found in the FNDDS. For the 139 food codes that were used with the 1999-2000 data but not used with the 2001-2002, staff at the USDA Center for Nutrition Policy and Promotion found the best matches with codes that are in the FNDDS. We multiplied the folic acid values (mcg) by 1.7 to determine DFE. Information on amounts of folic acid received from supplements was not available. **Results:** In general, the women with incomes higher than 185% of poverty had higher average daily intakes of total folate and of both the naturally occurring and the synthetic forms. These differences were statistically significant at the .05 level for total folate intakes by girls age 14 to 18 years (533 versus 439 DFE) and women age 31 to 50 (492 versus 430 DFE); for natural folate intakes by women age 19 to 30 years (185 versus 150 DFE) and 31 to 50 years (208 versus 171 DFE); and for folic acid intakes for girls age 14 to 18 (383 versus 293 DFE). The proportion of total folate provided by folic acid was significantly greater for the higher income 14- to 18-year-old girls (65 versus 62%); and not significantly different among women age 19 to 30 or 31 to 50. **Significance:** In 1994-95, between 50 and 75% of men and between 75 and 90% of women had usual intakes of folate below their folate requirement (IOM, 1998). In 1998, folate fortification of enriched breads, breakfast cereals, pasta, rice, and flour became mandatory. This policy was established to increase folate intake among women of child-bearing age and thereby reduce the incidence of neural tube defects. Differences in the amount and source of folate (from fortification or natural folate) illustrate the important role of fortification in diets of women of child-bearing age.

ABSTRACT #12. HEALTH AND DIETARY STATUS OF 55 YEARS OF AGE OR OLDER CAUCASIAN AND AFRICAN AMERICAN MALES. Shanthy Bowman, Ph.D and Ellen Harris, Dr.P.H. USDA, Agricultural Research Service, Beltsville, MD.
Objective: The life expectancy has increased in the U.S. Eating a healthful diet, as people age, reduces the likelihood of having diet-related health conditions such as obesity, heart disease, diabetes, and certain types of cancer and increases the quality of life. The aim of the study was to find out whether differences existed in dietary intakes and health conditions of Caucasian and African American males who were 55 years of age or older. **Methods and Materials:** The study included 1,597 Caucasian and 197 African American males in the U.S. Department of Agriculture's 1994-1996 Continuing Survey of Food Intakes by Individuals. The socio-economic characteristics and health status were analyzed. Their nutrient and food intakes were compared using regression analyses controlling for age, income, urbanization, and region. Survey design effects were used in the analyses. The alpha= 0.05 level of significance was chosen for all analyses. **Results:** A high percent (26%) of African Americans were from households with income less than 131% poverty, as compared with only 9 percent of Caucasians. Also, a very high percent (69% vs. 21%) of them lived in central cities. Although the African American males consumed 193 kilocalories less energy than Caucasians, they consumed more total fat and less dietary fiber, calcium, phosphorus, and magnesium per 1,000 kilocalories of energy intake. Also, they ate 58 grams less vegetables and drank 55 grams less milk than Caucasians. A significantly higher percentage of African Americans than Caucasians were obese (25.7% vs. 16.1%), were current smokers (28% vs. 16%), had diabetes (24% vs. 13%) or hypertension (62% vs. 39%). About 25 percent in each group had heart disease and 13 percent had cancer. **Significance:** Certain types of cancer, diabetes, heart disease, and hypertension are associated with obesity and with eating high fat foods. The study showed a higher prevalence of such diet-related health conditions among persons who were obese and who consumed a diet high in fat-density.

ABSTRACT #13. MEN WITH HIGHER BMI EAT MORE MEATS, SALTS, AND OILS. Cho-il Kim, Yoonna Lee, Haeng-Shin Lee, Young-Ai Jang, Bok-Hee Kim, Korea Health Industry Development Institute
Objective: During the period of 3 years from 1998 to 2001, the prevalence of overweight and obesity among male adults increased for 30% in Korea. To look into those factors involved in overweight/obesity, dietary intake of male adult population was analyzed in terms of food intake and nutrient intake. **Methods and Materials:** Data from the 2001 National Health and Nutrition Survey was used in the analysis. Food and nutrient intake data from 24 hr recall interviews and anthropometry data was matched individually with subject ID. Then we divided adult male subjects of 20 to 64 years into 5 groups according to BMI (<18.5, 18.5~23, 23~25, 25~30, & 30≤) and compared their intake by food group and nutrient. **Results:** Over 38 % and 31 % of subjects fell into the 2nd and 4th category of BMI respectively. Although mean intakes of most nutrients tended to increase with higher BMI, energy, protein, fat and sodium intakes were with most clear differences. Accordingly, expressing nutrient intake per 1,000 kcal abolished the increasing tendency of micronutrient intake and, calcium intake/1,000 kcal decreased with higher BMI. Men of the highest BMI (H) group ate double amounts of meats & poultry and vegetable oils compared to that of the lowest BMI (L) group. On the other hand, fruit intake was the lowest in H group. Altogether, MAR (mean nutrient adequacy ratio) varied from 0.77 in L group to 0.86 in H group even with the highest proportion of fat driven energy. **Significance:** It seems that adult men with higher BMI eat more meats & poultry, salts and vegetable oils compared to their leaner counterparts. And this may have resulted in their current weight status. Education focusing on dietary modification would help them moving down to a lower BMI category.

ABSTRACT #14. DINING OUT FREQUENCY AFFECTS NUTRIENT INTAKE OF THE KOREAN ADULT POPULATION. Cho-il Kim, Haeng-Shin Lee, Bok-Hee Kim, Young-Ai Jang, Yoonna Lee, Korea Health Industry Development Institute
Objective: With rapid economic growth during last 3 decades, dining out frequency of the Korean population jumped up and corresponding expenses reached 46% of total food expenditure as of 2003. Since obesity and overweight prevalence also has increased in Korea, we looked into the relationship between nutrient intake and dining out frequency of the Korean adult population. **Methods and Materials:** Data from nutrition survey part of the 2001 National Health and Nutrition Survey was used in the analysis. Nutrient intake data from 24 hr recall interview and dining out frequency from dietary habit questionnaire was matched individually with subject ID. Then we divided subject into 2 groups with dining out frequency of once or more per day (F group) and less than once a day (S group). **Results:** Covering almost 10,000 subjects from a nationwide sample of 4,000 households, 31.7% of those 3 years and older was dining out at least once a day. And the age group with most frequent dining out was 20-29yr that 43.4% dined out once or more everyday. Among adult population, there was a clear difference in mean nutrient intake between 2 groups of dining out frequency. The energy intake and the proportion of fat energy as well as fat intake *per se* were consistently higher in F group than S group. The most clear difference was seen in age class of 30-49years that energy intake of F group was 299kcal higher than that of S group. On the other hand, the adequacy of other nutrient intake compared to RDA of each sex-age group was somewhat better in F than S group. One exception was vitamin C and it was consistently better in S group.
Significance: It seems that frequent dining out leads to a higher energy/fat intake and lower vitamin C intake that may have some impact on the recent increase in overweight/obesity prevalence in mid-aged adults in Korea. A modification in selection of foods when dine out with increased physical activity is needed to prevent any further increase in overweight/obesity prevalence.

ABSTRACT #15. RELATING CANADA'S FOOD GUIDE FOR HEALTHY EATING TO FOOD CONSUMPTION AND NUTRITION SURVEYS. Beth Junkins, Josephine Deeks, Marie-France Verreault, Patrick Laffey, Isabelle Rondeau, Maya Villeneuve, Health Canada, Health Products and Food Branch
Objective: To assess the dietary adherence of the Canadian population against the guidance provided in Canada's Food Guide for Healthy Eating (CFGHE) using data from provincial nutrition surveys. **Methods and Materials:** The classification of foods and recipes into CFGHE groups as well as portion size assignments was developed using the guiding principles and thresholds from work previously conducted on the Canadian Nutrient File (CNF) (see Deeks et al. poster presented at this conference). To extend the decisions from the CNF to the Nutrition Survey System (NSS), a data entry system used to assign nutrient composition to the provincial nutrition surveys, required a number of additional steps. Reported foods from the 24-hour dietary recalls were coded either as basic foods or as recipes with ingredients. Each recipe was examined to determine whether the recipe as a whole could be classified in a single food group, or the recipe ingredients could be classified in their respective food groups. Total portions of each food group consumed in one day were estimated for each respondent. Population usual intake distributions for portions consumed in each food group separately were derived taking the day-to-day variability into account. **Results:** Currently, two provincial nutrition surveys (adults in British Columbia and children in Quebec) have published results using this approach. The results showed that the minimum recommendations for: (i) fruits and vegetables were not met by adults nor children; (ii) dairy products were not met by adults and girls 9 years and older; and (iii) grain products were not met by the majority of women. About half the women did not consume enough meat and alternatives. It was also noted that approximately one quarter of the energy intake came from other foods. Compliance to the directional statements was often problematic. **Significance:** This new approach has provided valuable information on dietary compliance of British Columbia adults and Québec children to the guidance provided in CFGHE. It has also allowed a better understanding of the nutrient intake results. This approach is being used in the assessment and revision of the current CFGHE.

ABSTRACT #16. EFFECT OF HEATING ON HEME IRON. James Harnly, Edith Blackwell, Charmonte Watkins Food Composition Laboratory, Beltsville Human Nutrition Research Center, U.S. Department of Agriculture, Bldg. 161, BARC-East, Beltsville, MD 20705; Andrea Docking, Raymond Glahn Plant Soil and Nutrition Laboratory, Agriculture Research Service, U.S. Department of Agriculture, Tower Road, Ithaca, NY 14853
Objective: Determination of the effect of cooking on heme Fe. **Methods and Materials:** Purified hemoglobin and myoglobin were purchased from commercial sources and ground steak was purchased at a local market. Heme Fe was extracted from the meat samples with acidified acetone and quantified by atomic absorption spectrometry (AAS) and reverse phase liquid chromatography with diode array detection (RP-LC-DAD). **Results:** It is well established that heme Fe is absorbed by a different

and more efficient mechanism than non-heme (or inorganic) Fe. Current wisdom is that myoglobin and hemoglobin travel intact to the small intestine where proteases chew up the globin protein, freeing the heme Fe (ferroprotoporphyrin IX) to be taken into the endothelial cells through the process of endocytosis. We have shown that it is unlikely that the globins reach the small intestine intact. Using size exclusion LC with DAD and AAS detectors, we are unable to detect intact myoglobin after cooking at 140 °F or higher. We are now investigating the degree of break down of heme Fe by cooking. Samples of pure hemoglobin, myoglobin, and meat were cooked at temperatures between 70 and 180 °F. Heme Fe was extracted with acidified acetone and quantified by AAS and reverse phase LC-DAD. The molecular signal arising from the porphyrin molecule decreased by less than 10% at the highest cooking temperatures. The Fe associated with the porphyrin decreased by 40% at 180 °F. **Significance:** These results suggest that the characterization of heme Fe in meats is a complex process requiring chromatographic separation and atomic signal detection.

ABSTRACT #17. SCREENING OF PLANTS, HERBS, AND SPICES FOR GLYCOSYLATED FLAVONOIDS. Longze Lin and James Harnly Food Composition Laboratory, Beltsville Human Nutrition Research Center, U.S. Department of Agriculture, Bldg. 161, BARC-East, Beltsville, MD 20705
Objective: Develop a systematic approach for the determination of glycosylated flavonoids in a wide range of plants, herbs, and spices. **Materials and Methods:** Plant meterials, herbs, and spices were purchased from food supply sources and the local market. Authentic standards were purchased from chemical supply companies. Samples were extracted with a methanol:water (60:40, v/v) mixture followed by separation by reverse phase liquid chromatography with tandem diode array and mass spectrometric detection. Both positive and negative mass spectra are acquired at a low (70 v) and high (250v) excitation potential. **Results:** There are more than 6,000 glycosylated flavonoids in the plants. Analytically this presents an enormous challenge with respect to separation, identification, and quantification. Fortunately, there are usually fewer than 20 in a specific plant material and the types of flavonoids tend to be common to genus and species. The first phase in determining glycosylated flavonids is the use of the same extraction, separation, and detection steps to "screen" the samples. Based on this "screening data", tentative identifications can be made for the sugars, other congeners, the parent flavonoids, and avariety of phenolic acids. The second phase, positive identification of the glycosylated, is, in general, more difficult. The process is simple if authentic are available. However, in most cases it is necessary to compare screening data from other plant materials (with positively identified flavoniods), further mass spectrometric fragmentation, nuclear magnetic resonance spectrometry, and different columns to separate isomers. To date, screening data has been acquired for approximately 100 plant materials and 70 herbs and spices. **Significance**: There is considerable interest in the flavonoid content of foods, herbs, and spices. The described methodology is a required step in developing an analytical parameter database that will allow routine identification and quantification of these compounds.

ABSTRACT #18. THE FLUORIDE CONTENT OF BREWED AND MICROWAVE BREWED BLACK TEAS. Pamela Pehrsson[1], Rena Cutrufelli[1], Kristine Patterson[1], Katherine Phillips[2], Amy Rasor[2], Judy Heilman[3], Charles Perry[4], and Joanne Holden[1]. [1]US Department of Agriculture (USDA), Agricultural Research Service, Nutrient Data Laboratory, Beltsville, Maryland; [2]Virginia Polytechnic Institute and State University, Blacksburg, Virginia; [3]University of Iowa, College of Dentistry, Iowa City, Iowa; and [4]National Agricultural Statistics Service, Fairfax, Virginia.
Objective: Fluoride (F) intake is recognized to be important to dental and bone health. Tealeaf is a known F accumulator and may contribute significantly to individual intake. The total F concentration in brewed tea also depends on the F in the brew water, which is highly variable across the US. The USDA's Nutrient Data Laboratory determined the fluoride content of brewed and microwaved teas, using geographically matched tap water samples, for inclusion in the USDA National Fluoride Database. **Methods and Materials:** Tap water samples were collected twice (over time) from 144 nationally representative residential locations in 72 counties, in 4 Census regions (2 residences per county). Thirty-six water composites were prepared by combining the samples from the 2 sites, from each time and from two counties, paired by closeness of location. Two brands of top-selling regular and one of decaffeinated teabags were purchased in one of the 4 locations corresponding to water sampling for each of the 36 composites. Each teabag was steeped for 4 minutes in 180 mL boiled water, in an acid-washed beaker. One regular brand was microwaved (tea bag and water together) for 1 minute in a 1200-watt microwave, and steeped for another 30 seconds. Over all samples, the water brew temperature was 93.4 ± 2.5 °C (89.0 to 100 °C). The F content was determined by direct read using an ion-selective electrode method at University of Iowa. **Results:** The mean F content for regular brewed tea was 373 ± 6 mcg/100 g (n=63) and for decaffeinated tea was 269 ± 8 mcg/100 g (n=33). The F content of regular brewed tea varied by region from 355 mcg/100g in the South to 393 mcg/100 g in the Midwest; decaffeinated varied from 247 mcg/100 g in the West to 293 mcg/100 g in the Midwest. The overall mean for microwaved regular tea, lower than regular brew, was 322 ± 5 mcg/100 g (n=36). No significant regional differences were shown; values ranged from 309 mcg/100 g in the Northeast to 319 mcg/100 g in the Midwest. In all cases, prepared tea using water from the Midwest had the highest F values. The mean F content of the brewed teas was 4-5 times higher than the national mean of the tap water, analyzed separately (71 ± 3 mcg/100g). **Significance:** These data are the first nationally representative fluoride values for brewed teas, and will provide valuable information to the dental and medical research community in assessment of fluoride intake and impact on the health of bones and teeth. Supported by NIH Agreement Y3-HV-8839 with the National Institute of Dental and Craniofacial Research and the National Heart, Lung, and Blood Institute.

ABSTRACT #19. THE INTAKES OF CHOLINE, BETAINE, AND FOLATE IN A CASE-CONTROL STUDY ON LUNG CANCER Kimberly M. Paskiewicz[1], John D. Radcliffe[1,2], Ladia M. Hernandez[1], Patricia C. Pillow[1], Margaret R. Spitz[1]: [1]Department of Epidemiology, The University of Texas M. D. Anderson Cancer Center, Houston, TX; [2]Department of Nutrition and Food Sciences, Texas Woman's University, Houston, TX.
Objective: To determine, in an ongoing case-control study on lung cancer, dietary intakes of choline, betaine, and folate, three methyl donors that may play a role in reducing the global hypomethylation of DNA, a condition that may promote lung carcinogenesis. **Methods and Materials:** Intakes of choline, betaine, and total food folate (TFF) were obtained for cases (n = 899) and controls (n = 1223) by using a modified version of the Health Habits and History Questionnaire and a companion nutrient

file, which contained USDA's recently released values for choline and betaine. DietSys+Plus, version 5.9 was used for dietary analysis. Between group comparisons were done using a Student's t-test in SPSS version 12.0. **Results:** For cases versus controls, daily intakes (mean ± SD) per 1000 kcal were: 244 ± 74 versus 252 ± 79 µg dietary folate equivalents for TFF, ($p < 0.05$); 163 ± 34 versus 161 ± 36 mg for choline; and 108 ± 65 versus 113 ± 73 mg for betaine. Leading dietary sources were: white bread, green salad, and breakfast cereals for TFF; eggs, coffee, and milk for choline; and high fiber cereal, dark bread, and spinach for betaine. **Significance:** Folate may be more effective than choline and betaine in preventing lung cancer, possibly as a result of being a more effective methyl donor. Increased intakes of foods high in TFF may reduce the incidence of lung cancer.

ABSTRACT #20. THE NHANES DIETARY SUPPLEMENT DATABASE FOR CONTINUOUSLY COLLECTED SURVEY DATA
Bernadette Bindewald, Kathy Radimer, Melissa Dimeler, Jaime Wilger, National Center for Health Statistics / CDC; Johanna Dwyer, Mary Frances Picciano, Office of Dietary Supplements/NIH
Objective: Develop and maintain a dietary supplement database for continuously collected NHANES survey data that can accommodate changes in supplement name, contents, manufacturer, and label appearance, and can be used as the basis for public databases. **Methods and Materials:** NHANES participants are asked to bring out containers of all dietary supplements taken in the past 30 days. Interviewers record the supplement name and manufacturer from the label. NHANES staff obtain supplement labels or copies from manufacturers, catalogs, and the internet. Supplement data are entered into a database. These data include: complete supplement name, serving size, recommended dosage, product form, ingredient names and amounts, and manufacturer name and address. Maintaining the database requires tracking changes to supplements (e.g. in nutrient or other ingredient content, manufacturer, or supplement name) and creating a linked record for each supplement reformulation, as well as adding new products. Default products are also created and can be used when an exact supplement match cannot be identified because of incomplete information on the product or because the supplement label could not be obtained. **Results:** The current NHANES database includes approximately 6000 supplement records. It includes records for supplements reported by NHANES participants, default products that were created based upon report frequency, and generic products (i.e. no brand name but with exact ingredients amounts, e.g. vitamin C 500 mg, Calcium 600mg with vitamin D 200IU). The database includes all types of supplements (e.g. amino acids, botanicals, zoologicals, and other non-vitamin, non-mineral ingredients) as well as antacids that contain calcium or magnesium, since these may also be used as dietary supplements. **Significance:** The NHANES database provides dietary supplement ingredient information that can be used with dietary recall data to improve estimations of total nutrient intake for NHANES participants. This supplement information is released in SAS format with the NHANES dietary supplement usage data . It will also serve as the basis for creation of an Excel-based database that will be available on the NHANES website. Each database will include supplements reported in NHANES for each two year release cycle (e.g. NHANES 1999-2000, NHANES 2001-2002) as well as default supplements.

ABSTRACT #21. TOTAL DIET STUDY 2003: DIETARY EXPOSURE OF KOREAN POPULATION TO HEAVY METALS.
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Objective: With increasing concern on food safety, this study was performed to monitor dietary exposure of the Korean population to heavy metal contaminants (arsenic, cadmium, mercury and lead) and estimate the health risk. **Methods and Materials:** Food list representing customary diet of Koreans was developed based on the nutrition survey result of the 2001 National Health and Nutrition Survey (NHNS). Based on the food intake data obtained from 24-hour recall interviews, food list was formulated considering the amount and frequency of consumption, differences by area, sex and age class, and probable heavy metal content. Total of 108 kinds of foods were selected and prepared to ready to eat state according to their typical cooking methods. A simplified set of representative cooking methods such as simmering, broiling, griddling, steaming, boiling, and/or parboiling was used in preparation. Foods were then homogenized for chemical analysis by Inductively Coupled Plasma Emission Spectrometry and gold amalgamation. The dietary intake of each heavy metal was estimated from the content of heavy metals in foods and corresponding food intake data. **Results:** Heavy metals were detected at the level of nd~7.21 mg/kg for arsenic, nd~5.37 mg/kg for cadmium, nd~0.76 mg/kg for lead, and nd~0.074 mg/kg for mercury. Dietary intakes were estimated to be 42.32 µg/person/day for arsenic, 15.59µg/person/day for cadmium, 24.04 µg/person/day for lead, and 2.20 µg/person/day for mercury. These values corresponded to 1.5%, 27.1%, 12.2%, and 4.0% of provisional tolerable weekly intake (PTWI) respectively. **Significance:** It seemed that there is no imminent health risk due to heavy metals examined in this study for the total diet of the Korean population.

ABSTRACT #22. UPDATING THE VALUES FOR THE VITAMIN E (VE) CONCENTRATION FOR FRUITS AND VEGETABLES IN A NUTRIENT DATABASE.
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Objective: To update values for the concentration of VE (2-R isomers of alpha-tocopherol) in a nutrient database used in epidemiological studies on the role of fruits and vegetables in the prevention of cancer. **Methods and Materials:** An extensive review of the literature was carried out to obtain published analytical values for the VE concentration of fruits and vegetables used in the food frequency questionnaire that we are currently using, as well as those of others. The majority of the values were published in English, but some were published in other languages (Danish and Japanese). Pooled values were compared with those for the corresponding foods (closest nutrient database number match) in Standard Reference, Release 17 (SR17). **Results:** Analytical values were found for 30 vegetables and 32 fruits. Corresponding analytical values were found for 26 vegetables and 25 fruits in SR17. The median VE value (mg/100g) for vegetables was 0.44 (range: 0.01 – 4.50) and that for fruits was 0.41 (range: 0.02 – 5.12). For vegetables, the three highest values were found for canned tomato paste, sweet red peppers, and turnip greens; for fruits the three highest values were found for dried apricots, green olives, and avocados. There was a high correlation between our values and those in SR17 for both vegetables ($r = 0.95$) and fruits ($r = 0.94$); $p < 0.01$ for both. **Significance:** Fruits and

vegetables can be important dietary sources of VE (particularly when consumed in recommended amounts). Since VE may play a role in the preventive effect of fruits and vegetables against cancer, it is important to have reliable information on their VE content.

ABSTRACT #23. USE OF KEY FOODS WITH AN ANALYTICAL QUALITY CONTROL PROGRAM. Haytowitz, D.B., Patterson, K.P., Exler, J., Pehrsson, P.R., Holden, J.M. U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. Beltsville, Maryland, USA.
Objective: This presentation describes the use of the Key Foods approach to prioritize foods and nutrients for analysis, as well as its use in a quality control (QC) program. Recently released NHANES 2001-02 dietary intake data allowed an update of Key Foods. As part of the National Food and Nutrient Analysis Program, NDL maintains a vigorous (QC) program, using locally developed control composites and certified reference materials (CRMs). Comprehensive nutrient analysis of CRMs would be cost-prohibitive; therefore, NDL employs a prioritization scheme for specific nutrients. **Methods and Materials:** Using recipes in the Food and Nutrient Database for Dietary Studies and dietary intake data from NHANES, intake data for foods in the USDA National Nutrient Database for Standard Reference are generated. The amount of food consumed is multiplied by concentrations of a specified set of nutrients, identified as nutrients of concern (e.g., shortfall nutrients) by the 2005 Dietary Guidelines Advisory Committee. Results are sorted in descending order, by nutrient. Individual and cumulative percent intakes are calculated for each nutrient and the food items are separated into quartiles based on cumulative percent intake. Those foods in the top three quartiles for each nutrient are aggregated to develop an overall Key Foods list. The percent contribution for each nutrient in the selected food items is summed to calculate a point score. The food list is sorted by point score in descending order and separated into quartiles. Nutrients in the 1st quartile for a food are considered "critical" for QC purposes. **Results:** The updated Key Foods list contains 455 foods: 9 in the 1st quartile, 23 in the 2nd, 65 in the 3rd, and 358 in the 4th quartile. For the most part, foods in the 1st quartile in this version of the Key Foods list are the same as the last version using NHANES 1999-2000, though the order has shifted. The 1st quartile contains commonly consumed foods, e.g., milk, eggs, orange juice, cheese, margarine, and salt, the latter because of its high usage and sodium content. Whole and 2% milk are in the 1st quartile because they have 7 nutrients in the 1st quartile for individual nutrients—these nutrients would be considered "critical" for the milks (and only sodium for salt) in the QC process. **Significance:** The use of the Key Foods list provides NDL a cost-effective method for indicating "critical" nutrients for its QC program, as well as for prioritizing foods and nutrients for analyses.

ABSTRACT #24. USING COMPOSITION DATA ON NAVAJO FOODS TO DEVELOP CYCLE MENUS FOR NAVAJO SENIOR CENTERS. Ann Sorenson, Karl Smith, Utah State University; Bessie Holiday, Oljato Chapter Senior Center, Navajo Nation and Pamela Pehrsson, USDA HNRC
Objective: The USDA/ARS Nutrient Data Laboratory has a mandate to collect Native American Foods to add the National Food Composition Data Base. Approximately 30 traditional Navajo foods were collected and analyzed at the food composition laboratories in 2001. The food composition data was returned to the Navajo partners who collaborated on the project. The objective was to provide technical assistance to Navajo senior center staffs in creating cycle menus that incorporate the low glycemic traditional Navajo foods into congregate cycle menus. **Methods and Materials:** One of our team developed a unique menu-building program for the senior center staffs. This customized program was created to meet all the needs of building and adjusting cycle menus as well as generating data on the dietary recalls or food diaries of individuals and groups. The food/nutrient database included the entire latest edition of the USDA food composition database as well as a special file of the Navajo foods sent to USDA for analysis. Data will be updated, as previously sampled foods are monitored or new foods analyzed. **Results:** In May 2004, our team trained 29 people from 14 Navajo Chapters to use the computer program. By the end of the workshop, every participant created 1 to 3 weeks of menus that met the government standards. We have subsequently trained staff from an additional 21 senior centers and personnel from two Navajo health centers. The web-based program will be offered on line by the end of spring 2005. **Significance:** Diabetes was almost unheard of when the Navajo people consumed the traditional Navajo diet. We hope this intervention will lower the incidence of diabetes, obesity, cancer and heart disease and improve the general health of the Navajo elders the by encouraging the inclusion of traditional food in their diets.

ABSTRACT #25. IMPUTING FLUORIDE VALUES FOR DENTAL STUDY INTAKE RECORDS. Phyllis J. Stumbo[1], Catherine A. Chenard[1], Keith E. Heller[2], and Stephen M Levy[2], [1] General Clinical Research Center, [2]College of Dentistry, University of Iowa, Iowa City, IA
Background: Fluoride values recently became available for U.S. foods. The USDA Nutrient Data Lab published values for 400 foods in October 2004. The foods were selected using the Key Foods concept developed by USDA. This system identifies foods that are significant sources of nutrients and assigns values for new nutrients to these foods. **Objective:** Fluoride values were added to existing food intake records using the new USDA values. **Methods:** In a study of fluid intake, 68 subjects in Iowa City, Iowa kept food and beverage recalls and records for 6 days, 3 in the summer and 3 in the winter during the 2002 calendar year. Fluoride intake was of interest but data was not available when the records were analyzed using NDS-R Version 4.04_32 (University of Minnesota). Therefore fluoride values were assigned manually to the foods contained in these records. **Results:** 1734 unique foods, excluding vitamin and mineral supplements, were consumed by the 68 subjects. As foods were assigned fluoride values, an exact or nearly exact match was found for 733 foods. Fluoride values for the remaining foods were assigned by using the fluoride values 1) for a similar or representative food; 2) for a different form of the same food; 3) based on a major ingredient source(s); 4) for the product recipe or ingredient list, 5) for general item when food record detail lacked specificity, 6) adjusted value to represent different water source, or 7) assumed zero for insignificant source. For example, dill pickles represent olives, pecans represent all nuts and white rice represents whole grain rice. This is similar to imputing methods reported by others. Some foods had no comparable item, for example steak sauce. **Significance:** Using the assigned USDA values, fluoride intake was similar between records and recalls taken in the summer and those from the winter months.