## POSTER SESSION SCHEDULE

**Monday, April 13, 1987**

1. FDA's Factored Food Vocabulary
   E. Smith

3. Design of a Nutrient Data Base Using Multiple Sources of Nutrient Information
   B. Hoverson

5. Are Current Methods of Determining Calcium and Phosphorus Intake Accurate?
   L.L. Oenning

7. Design and Use of the Extended Table of Nutrient Values (ETNV)
   M.C. Moore

**Tuesday, April 14, 1987**

2. Development of a Computerized Food Frequency Questionnaire to Estimate Current Individual Intake of Nutrients
   A. Engle

4. Development of a Nutrient Analysis Program with Enhanced Date Management and Graphics Capabilities
   W. Lehman

6. The Effects of Exercise and Nutrition Regimen on Serum Lipid Concentrations, Dietary Intake, and Body Composition Measurements
   N. DiMarco

8. Construction of an Abbreviated Data Base for Use with a Food Frequency Instrument
   L.G. Borrud

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Monday, April 13, 1987

## FDA'S FACTORED FOOD VOCABULARY

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The lack of a standardized vocabulary for describing food products limits the effective use and coordination of databases containing diverse food names. At FDA's Center for Food Safety and Applied Nutrition (CFSAN), scientists and information specialists have developed the Factored Food Vocabulary (FFV), which provides a standardized but flexible language for describing foods and food products. FFV is multihierarchic and retrieval-oriented. It provides the capability for coding and retrieving eleven aspects or "factors" of foods, including product type, food source, cooking method, preservation method, container or wrapping, etc.

The FFV provides a structure which can be overlaid with various types of data pertinent to foods, e.g., nutrient data, toxicology data, or demographic data. It has been applied to CFSAN's Total Diet Study and, in collaboration with the National Cancer Institute, to the food names of the USDA's Nutrient Data Base for Standard Reference. These are to be studied to determine retrieval effectiveness. It is hoped that FFV will permit the integration of information from these and other databases, such as the USDA National Food Consumption Survey, the FDA's Food Labeling and Product Surveillance (FLAPS) files, and the National Health and Nutrition Examination Survey (NHANES II), to meet the diverse needs of researchers and to analyze food-related data more effectively in the future

## DESIGN OF A NUTRIENT DATA BASE USING MULTIPLE SOURCES OF NUTRIENT INFORMATION

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The requirements of a nutrient data base vary for specific applications. To increase flexibility in a research setting, a data base (GRAND) was developed containing multiple sources of nutrient data. In the GRAND system, each of up to 100 sources can be used independently or can be combined with other sources. The user establishes a priority scheme to select the sources of nutrient values to be included in a working subset of the data base. For example, a person planning diets for a metabolic research study may want to choose values from on-site laboratory analyses of specific foods as the primary source of data. Someone conducting research on free-living subjects may wish to choose as the first source the values from Agricultural Handbook 8. Different subsets of the data base can be used for various applications without altering the master data base. The multiple source design allows new data to be continually added without replacing existing data; updating involves changing only the master data base, from which new subsets of the data base can be generated. Updating the data base with a new source of information involves adding the new source and including it with a user-determined ranking in a new priority scheme. Because existing nutrient values from other sources are not replaced, they are still available to other users who may choose to prioritize sources of nutrient data differently. A multiple source design required substantial computing power and disk storage to handle the larger data base and its rearrangement into subsets for particular applications. When sufficient computing power and disk storage are available, and a data base is needed for several applications, a multiple source design may provide the desired flexibility.

## ARE CURRENT METHODS OF DETERMINING CALCIUM AND PHOSPHORUS INTAKE ACCURATE?

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Our earlier studies showing important effects of dietary phosphorus as well as calcium on bone health led us to examine the accuracy of our methods for determining dietary levels of these nutrients. We compared three different methods of calculating calcium and phosphorus content with chemical analysis in 14 daily diets. The diets were taken from general hospital and cafeteria menus, individual food records (some containing restaurant foods) and daily menus designed for research projects. For each diet, meals were assembled from the specified sources or reconstructed from detailed food records; homogenized in deionized water prior to ashing, and chemically analyzed for calcium (atomic absorption spectrophotometry) and phosphorus content (colorimetry). To obviate observer variation, only one observer calculated nutrient content by: 1) hand calculation, using nutrient data given by Pennington and Church (1985) and Leveille, et al. (1983); and 2) two different commercial computer software programs. Comparisons of chemical analyses with calculated values showed an insignificant trend toward overestimation of calcium content (paired-t, $p > 0.05$); but, all these methods significantly underestimated phosphorus content (paired-t, $p <= 0.01$). On average, estimates of phosphorus content deviated from actual by 250 mg/d; however, those diets with a greater proportion of processed or convenience foods deviated by more than 350 mg/d. For accurate calculation of phosphorus and possibly calcium intake, nutrient data sources must be updated to reflect present industrial use of phosphate and calcium additives. In addition, when calculating intakes, we need to secure more information about the foods consumed.

## DESIGN AND USE OF THE EXTENDED TABLE OF NUTRIENT VALUES (ETNV)

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The demand for accurate computerized data banks has grown in direct proportion to the increase in emphasis on good nutrition as a vital component of sound health. The ETNV consists of foods and recipes contained in studies from 18 states and one foreign country. Basic and marketplace foods contain information on 97 nutrients. The USDA is the primary data source followed by other accepted sources, journals, correspondence and actual analysis. Before acceptance, all data and recipes are cross-checked for reliability: protein, fat, CHO, ash, and moisture must equal 100.0 gm +/- .01: all have internal checks for missing data, except ash, minerals and moisture. Three recipe programs have options for applying vitamin loss. Each recipe program deals with a "multi-level" approach; recipes containing multi-level dependencies (a recipe within a recipe). Examination of all basic foods via their biological families is made so that not only amino acids, but fatty acids, CHO subgroups, vitamins, and minerals can be checked for consistency. The capability of assessing missing data carries over to case histories so that reliability is enhanced. Estimates of heme- and nonheme iron in a case history are based on percent plant and animal protein obtained from identified ingredients in school lunch, family, or commercial recipes. Dietary intakes up to 99 days can be averaged and analyzed for nutrient content in one to nine food intake periods. Rigid quality controls and calculation of each separate food intake provide opportunity not only to evaluate nutrient components, but also interrelationships, and potential dietary assimilation. Percent of RDA and nutrient to kcalorie ratios are available.

## DEVELOPMENT OF A COMPUTERIZED FOOD FREQUENCY QUESTIONNAIRE TO ESTIMATE CURRENT INDIVIDUAL INTAKE OF NUTRIENTS

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The aim of this study was to develop and test a computerized nutrition assessment questionnaire designed for a personal computer which could be used to screen individuals for eating patterns that may be associated with cancer risk. Eighty-five food frequency questions were developed, using food items determined by Block et al. to contribute at least 85% of kcal, fat, cholesterol, vitamin A, vitamin C, and calcium to the daily dietary intake of Americans.

After a simple command is entered, the questions appear on the terminal screen and respondents enter their frequency of intake and portion size with the aid of food models and household measuring cups and spoons which are within reach.

A small nutrient data base was developed containing values for the nutrients of interest and for dietary fiber, using the American Health Foundation's DIAN Nutrient Analysis System. These nutrient values, derived from a representative food or a calculate average of foods grouped together in a question, are used by a second program to calculated estimated daily nutrient intake for each individual. Results are reported on the terminal screen or can be printed out.

Pilot testing with 94 subjects who were staff members in a public school district indicated that 97% of the sample, even without prior computer experience, could successfully respond to the questionnaire when on-site supervision was provided. Average length of time for completion was 45 minutes for the total program.

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## DEVELOPMENT OF A NUTRIENT ANALYSIS PROGRAM WITH ENHANCED DATA MANAGEMENT AND GRAPHICS CAPABILITIES

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The use of nutrient data base information in conjunction with diet analysis software has become and established tool in clinical dietetics, nutritional counseling, and nutrition education and research. Limitations of current software include the inability to incorporate and analyze large amounts of data collected over a period of time, and to check completeness of data base information for nutrients of interest.

The authors have developed a diet analysis software package and data base which analyzes 44 nutrients for 5600 separate food items. The diet evaluation report includes the number of missing data entries for each nutrient. This indicates to the user nutrient completeness for each diet analyzed. The program can also collect, sort and store unlimited amounts of diet data which can then be accessed for future analysis. The user can define various parameters by which the data can be categorized (e.g., age, sex, supplemental use, demographic location, etc.). Comparisons can then be made between various subgroups or categories (e.g., male vs. female) or between an individual and a subgroup (e.g., Mary Jones vs. all females). the authors have used the program to create ASCII files which can be easily transported into more sophisticated statistical software packages.

The software also has integral graphics capabilities which permit the generation of bar graphs and line plots for the various calculated group or individual files.

## THE EFFECTS OF EXERCISE AND A NUTRITION REGIMEN ON SERUM LIPID CONCENTRATIONS, DIETARY INTAKE, AND BODY COMPOSITION MEASUREMENTS

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A six weeks program involving aerobic conditioning, weight training, and two dietary regimens ((Treatment I-120 kcals, low fat (30%) kcal, low cholesterol (300 mg/day) and Treatment II - no caloric restriction, low fat, low cholesterol)) was evaluated in 27 previously sedentary males and females 20 to 55 years of age. (Treatment I = 5 males, 8 females, Treatment II = 2 males, 4 females and Control = 4 males, 4 females). Some of the variables evaluated included dietary intake, body weight, body circumferences, percentage of body fat, concentration of serum total cholesterol, and estimated maximal oxygen uptake. The participants were randomly assigned to one of the two treatment groups or a sedentary control group and were pre- and post-tested on the above variables. Diet and exercise records were recorded daily by all subjects and were turned in weekly. Two days per week from each diet recall sheet were randomly chosen and analyzed by The Texas Woman's University DEC system 2050 computer using The Ohio State University Nutrient Data Base. The Ohio State Nutrient Data Base was chosen for this study because of the relative completeness of its entries, the variety of foods listed, and the ability to provide feedback to each subject on average weekly nutrient consumption. Because of the nature of the variables analyzed, diet records were assessed for total kilocalories, percent fat, and cholesterol consumed per day. The Kruskal-Wallis analysis of the six groups, based on sex and treatment, revealed none of the variables examined were statistically significant (Alpha = 0.01).

## CONSTRUCTION OF AN ABBREVIATED DATABASE FOR USE WITH A FOOD FREQUENCY INSTRUMENT

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A food frequency instrument to collect accurate and reliable dietary data in a multi-ethnic population of Whites, Blacks, and Hispanics in South Texas was developed and evaluated as one component of Nutrition Methodology for Epidemiologic Cancer Studies. This instrument was designed to assess usual intake of total fat and vitamins A and C. A unique data base was the foundation of the microcomputer nutrient analysis program used with the instrument. To construct the data base, the diet of the targeted population was first inventoried by means of a 24-hour dietary recall. Foods identified from the recall data were ranked by their percent contribution to each nutrient of interest. All like foods were combined to yield the smallest number of mutually exclusive food types. A master list of these distinct food types was constructed which captured at least 80% of the intake of each nutrient. A weighted average nutrient value per 100 g for each nutrient for each food type was calculated using the individual food codes comprising the food type, the number of times each food code was reported consumed in each ethnic group, and the amount of nutrient in 100 g of the food. A weighted average gram value for each food type was calculated using the food types and associated ethnic-specific nutrient and gram weights was the result of this methodology.