

**FIFTEENTH NATIONAL NUTRIENT DATABANK CONFERENCE
POSTER SESSION ABSTRACTS**

**Tailoring the MDRD (PHASE III) Nutrient Data Base for use with The CBORD Group, Inc.
Professional Diet Analyzer™**

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R.J. Meehan, M.B. Olson, M.F. Pederson, S.N. Powers, M.E. Yamamoto, and the MDRD Study

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Food Derails for Data Coding: Implementation Issues for Collaborative Clinical Trials

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**TAILORING THE MDRD (PHASE III) NUTRIENT
DATA BASE FOR USE WITH THE
CBORD GROUP INC. PROFESSIONAL DIET ANALYZER™**

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Microcomputers and software for nutrition analysis may be used in multi-center clinical trials to enhance patient compliance to complex nutrition interventions. Nutrient data bases selected for this purpose must meet the needs of both dietitians and patients. In the Modification of Diet in Renal Disease (MDRD) Study, a multi-center clinical trial designed to compare the effects of three levels of protein and phosphorus intake and blood pressure control on the progression of chronic renal disease, patient compliance with dietary prescriptions is based in part on record keeping or self-monitoring primarily of protein and phosphorus intakes and for some patients, calories and sodium. The MDRD Study is sponsored by the National Institutes of Health and the Health Care Financing Administration.

To permit instantaneous diet analysis and immediate feedback to study dietitians and patients all 15 MDRD clinical centers use the CBORD Group Inc. Professional Diet Analyzer™ software to plan individual menus, calculate patient food records and recipes and generate lists of foods sorted by nutrient values to help patients develop strategies for behavior change. The mainframe University of Pittsburgh nutrient data base of over 3,700 foods was adapted for use with this software. First, a subset data base called the Protein Counter was created containing 1,230 food items with 22 reported nutrients. Study dietitians provided feedback on the types of foods to include in the Protein Counter (eg. fast foods, low protein products) and helped the MDRD Nutrition Coordinating Center (NCC) edit food descriptions for clarity and brevity so as to be understood by patients. Dietitians also have the capability of adding up to 700 user foods including patient recipes and regional items not found in the subset data base. This microcomputer data base was piloted by both the NCC and study dietitians. In tailoring a nutrient data base, consultation with users provides a rich source of ideas and substantially increases its useability for patient education and as a tool for optimizing compliance.

EXPANSION OF FATTY ACID DATA IN THE USDA SURVEY NUTRIENT DATA BASE

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The USDA Survey Nutrient Data Base is used to translate food consumption data into nutrient consumption data in the government's National Nutrition Monitoring System. The Survey Nutrient Data Base is used for the Continuing Survey of Food Intake by Individuals (USDA), the Nationwide Food Consumption Survey (USDA), the National Health and Nutrition Examination Survey III (DHHS) and will be used in a nutrient data base system for microcomputers under development by the USDA and the University of Texas. This data base is generated and updated through a computer system which includes a Primary Data Set (PDS) of nutrient values for about 2,400 basic food items. The PDS contains 28 nutrient values for each of the foods including values for total lipid, and total saturated, monounsaturated and polyunsaturated fatty acids. The PDS has been expanded to include data for fatty acids specified by chain-length and number of double bonds. Fatty acid data were added from the USDA Nutrient Data Base for Standard Reference (Agriculture Handbook No. 8, revised) or imputed and documented according to procedures developed in the Nutrition Monitoring Division of the Human Nutrition Information Service.

A COMPUTERIZED MODELING SYSTEM FOR ASSESSING DIETARY CHANGE

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The Dietary Change Research Model is a research tool developed by the U.S. Department of Agriculture that provides insights into the type and degree of change needed in diets of Americans to meet nutritional recommendations. This information can be used to target dietary practices that need improvement and develop strategies promoting positive change. The computerized mathematical model starts with computerized mathematical model starts with a food intake pattern (expressed in quantities of 37 different food groups) that has been estimated using data from USDA's nationwide food consumption surveys. It then generates a new pattern meeting a specified set of nutritional criteria (defined as maximum or minimum quantities for us to 27 nutrients and food components) while minimizing overall change. The model also identifies those nutritional criteria which are "restrictive" or most responsible for the changes seen. A model-generated pattern set at 2200 kcal is presented here. The original pattern is that of women 19-50 years old taken from USDA's 1985 Continuing Survey of Food Intakes by Individuals. Nutritional criteria were drawn from recommendations made by the National Research Council's Committee on Diet and Health and the 1989 Recommended Dietary Allowances. Changes in the amounts and types of food groups needed to meet the nutritional criteria are presented, along with those criteria which were "restrictive". The value of this information lies primarily in what can be learned from comparing and analyzing differences in the original and model-generated patterns. This requires an understanding of the types of changes and restrictive criteria identified by the model as well as some knowledge of the food item makeup and nutritional attributes of each food group. Results, particularly those which might not have been anticipated, can provide valuable insights into the types of nutrition education efforts which might be most appropriate and effective for a particular audience.

DETERMINATION OF VITAMIN B-6, AVAILABLE LYSINE AND EPSILON-PYRIDOXYLLYSINE IN A NEW INSTANT BABY FOOD PRODUCT

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Selected jar and instant baby foods processed in 1985 and 1987 were analyzed for their vitamin B-6, available lysine and epsilon-pyridoxyllysine content in Summer 1988. Jar and instant "Vegetable and Beef" were found to be higher in available lysine content but lower in vitamin B-6 than "Banana" products. Instant products were found to be higher in vitamin B-6 than jar products. On a wet weight basis the instant products also contained higher amounts of available lysine than jar products. However, when adjusted for protein content jar products were higher in available lysine than instant products. Baby foods processed in 1985 tended to be lower in vitamin B-6 and available lysine content than products processed in 1987. Pyridoxyllysine was below detectable quantities in all of the baby foods analyzed in this study.

AN AUTOMATED SYSTEM FOR CALCULATING THE NUTRIENT CONTENT OF METABOLIC DIETS

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The mission of the Grand Forks Human Nutrition Research Center is to plan, develop and implement research that is designed to produce new knowledge about human nutrient requirements with emphasis on minerals. This often requires calculating the nutrient content of metabolic diets with a number of dietary constraints. The GRAND nutrient database is part of a system which involves menu calculations, and generation of menus, labels and production charts for metabolic diets. Our program runs on an IBM mainframe computer using the VM/CMS operating system. There are four components of this system:

- 1) menus are developed by using a working subset of the database which allows the dietitian to plan a rotating menu cycle,
- 2) general master menus are then created at proportional energy levels,
- 3) volunteer master menus are created and modified for individual preferences, and
- 4) volunteer daily menus are duplicated from volunteer master menus for specific time frames.

Labels are printed for individually weighed ingredients and sorted for ease of use. Production charts are printed to assist technicians in calculating daily food use. This system saves dietary staff time required to manually prepare menus and labels which results in enhanced work flow and decreased human error.

**COMPUTERIZED RECIPE NUTRIENT ANALYSIS FOR CLINICAL TRIALS:
THE MODIFICATION OF DIET IN RENAL DISEASE (MDRD) STUDY**

**F.L. Jones, W.P. Amoroso, F.A. Averbach, D.W. Burry,
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J.A. Naujelis, M.E. Yamamoto, and the MDRD Study**

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The MDRD Study is a multicenter clinical trial, sponsored by the National Institutes of Health (NIH) and the Health Care Financing Administration (HCFA), designed to determine whether three different levels of dietary protein and phosphorus intake and/or the reduction of blood pressure will reduce the rate of progression of chronic renal disease. MDRD patients' diet modifications can be complex and may require significant changes in usual eating patterns. Evaluation of patients' dietary intakes is done in part through bimonthly three-day food records, and patients are encouraged to include recipes for mixed items. Mixed dishes and recipes are difficult foods for the patient to describe. These items may be continually modified by the patient to improve compliance to the study diet. This continual modification of foods creates special challenges for nutrient analysis of MDRD patients' mixed dishes and recipes. A computer recipe analysis program, "Cookbook", was developed by the University of Pittsburgh to facilitate estimates of patients' nutrient intakes from recipe ingredients.

"Cookbook" is a multi-component program which uses the University of Pittsburgh Nutrient Database and allows for the entry and modification of recipes. Each recipe ingredient, with its amount and a yield factor (to convert raw to cooked) is consecutively added into the recipe program. These ingredients are then saved with the total recipe calculation of 22 nutrients and gram weight. After the recipe has been saved, modifications to the recipe can be made. New food items can then be added to the recipe or old food items may be deleted.

"Cookbook" has facilitated the nutrient evaluation of modified standard recipes for use in the MDRD Study Intervention program. It has also increased our capabilities to evaluate individual nutrient intakes for patients who modify home recipes. "Cookbook" gives the study the ability to accurately assess the nutrient intake of patients who consume mixed dishes and the ability to continually modify the patient's diet to meet MDRD Study goals.

HAIR AND SERUM ZINC STATUS AND PREDICTION IN EGYPTIAN CHILDREN

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Zinc status of Egyptian children 18-30 months and 6-10 years of age was characterized in relation to morbidity, growth, and socioeconomic variables. In a pilot study of adequately nourished to moderately malnourished children, mean hair zinc was 135 $\mu\text{g/g}$ (63-230 $\mu\text{g/g}$), with suboptimal zinc status suggested for 44%. Predictors of hair and serum zinc were explored for 23 school-aged and 40 preschool children. Included in models were weaning age for preschoolers, body size (length- or height- and weight-for-age Z-scores), current growth over 6 months or longer, illness over 10 to 12 months, demographic variables affecting food availability and distribution, sex, and season. Data were collected by Egyptian workers as part of a larger field project. Hair and serum samples were analyzed for zinc content by atomic absorption spectrometry. Results showed no difference in hair zinc levels by color, louse egg fragments and mucilage, or henna dye differences. In multiple regression models, the best predictor of hair zinc in preschoolers was season of year, with zinc lower in summer. Season, negative effect of percent weeks ill with diarrhea, and positive effects of socioeconomic status (SES) based on father's education/literacy and economic subsistence base excluding agriculture (ESB-A) predicted 23% of total hair zinc variation in preschoolers. In preschoolers, positive effect of rate of weight increase, and negative effects of summer, rate of height increase, SES based on father's occupation(s) (SES2), and ESB-A predicted 53% of total serum zinc variation. Negative effect of SES2 and ESB-A, and positive effects of summer percent weeks ill with diarrhea and height for age Z scores predicted 60% of total serum zinc variation in school-aged children. Negative effects of percent weeks ill with diarrhea, parents' age and child:adult ratio predicted 29% of hair zinc in school-aged children.

VITAMIN AND MINERAL SUPPLEMENT USE AMONG U.S. CHILDREN AND ADULTS

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Vitamin and mineral supplement use in a nationally representative sample of noninstitutionalized U.S. children 2-6 y and adults 18+ y was assessed as part of the 1986 National Health Interview Survey. Prevalence of the supplement use among adults was 39% (32% of males, 45% of females) and among children was 53%. Most uses (90% for adults, 78% for children) were not prescribed by physicians. Among adult users, 61% consumed 1 product, 20% consumed 2 and 19% consumed 3 to 12 products. Vitamin C (33%) was the most frequently consumed vitamin, and Fe and Ca were the most frequently consumed minerals by adults. The adult mean vitamin intakes ranged from 95 to 1130% of the Recommended Dietary Allowances (RDA); their mean mineral intakes were mostly <100% RDA. Among the children using supplements, 88% used only 1 product. Vitamin C (47%) was the most frequently consumed vitamin and Fe (19%) was the most frequently consumed mineral by children. The mean vitamin intakes among children ranged from 90 to 252% RDA; their mean mineral intakes were <20% RDA except for I, Fe and Zn, which exceeded 80% RDA.

CALORIC AND NUTRIENT INTAKES OF EXERCISING AND NON-EXERCISING ADULT WOMEN

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Caloric and nutrient intakes of 56 to 65-year-old women involved in moderate exercises were examined. Twenty women were randomly assigned to exercise (N=10) or non-exercise (N=10) groups. Women in the exercise group exercised on an ergometer three days per week, 30 minutes per session at 70%-75% of maximal heart rate for 11 weeks. At weeks 0 and 12, three-day food intake records were obtained to assess dietary intake. Treadmill submax stress tests obtained at weeks 0 and 12 were used to determine cardiovascular fitness. Caloric and nutrient intakes were analyzed using the USDA Dietary Analysis Program for Personal Computer. Dietary adequacy was assessed using the revised 1989 RDA. Intakes of nutrients varied widely. Caloric intake ranged between 1256 ± 244 and 1517 ± 456 at weeks 0 and 12. Except for vitamin C, there was no significant difference in nutrient intakes between the two groups. Intakes of calcium, zinc and vitamin E were 84%, 66% and 80% of the 1989 RDA, respectively. Intakes of proteins, folate, vitamin B12, phosphorous, and vitamin C were 118%, 133%, 158%, 125% and 208% of the 1989 RDA, respectively. Vitamin C intake was significantly higher ($p < .03$) in the exercise group than in the non-exercise group at week 12 but not at week 0. It is concluded that in this group of women, nutrient intakes are adequate. However, nutrition education to maximize the intakes of calcium, zinc and vitamin E may be necessary.

**FOOD DETAILS FOR DATA CODING:
IMPLEMENTATION ISSUES FOR COLLABORATIVE CLINICAL TRIALS**

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The Modification of Diet in Renal Disease (MDRD) Study is a multicenter, 5-year clinical trial sponsored by the National Institutes of Health and the Health Care Financing Administration designed to determine whether controlled dietary protein and phosphorus intakes and/or control of blood pressure will alter the progression of chronic renal disease. Periodic evaluation of MDRD patients' dietary intakes is done in part through 24-hour recalls and food records. Reported intake is encumbered by problems of patient's memory, food descriptive and quantitative skills and reporting precision. The goal of data completeness must be weighed against patient burden and its effect on the patient-therapist relationship. Frequent questions in long duration clinical trials are: 1) how much food detail is needed and 2) how can patients and data collectors be motivated to provide these details over the course of the Study. Some answers in the MDRD Study are provided through review of food data clarification requests (queries) sent to MDRD Clinical Centers. Queries are requests for required, additional food detail for data coding.

In 1989, 934 queries were sent for the 6,287 days of MDRD patients' intakes reported. Query rates halved after the first 4 months of 1989. While missing required food details occurred for most food types, some appeared with high frequency and if unclarified, could have led to significant uncertainty in nutrient intake estimates. Problem areas included bakery goods and meats and specifics for quantities consumed. Food code choices specified by different descriptor details had nutrient differences as great as 100% for protein, phosphorus, calories or sodium. Conversely, when nutrient values for food code choices were not significantly different for key nutrients, queries for that food detail could be eliminated.

As with all work requiring careful detail, consistent performance monitoring and feedback are essential to ensure sustained work quality. The most important benefit of such monitoring is the production of dietary assessments which are truly consistent with what patients are actually eating. Through assistance in establishing limits for detail and providing rationale for required detail, monitoring may also lead to greater efficiency of intake reporting and thereby, contribute to patients' diet reporting motivation and compliance.