RECIPE CALCULATIONS--NEW RESEARCH IN METHODOLOGIES

Patricia M. Powers, M.S., R.D.

Nutrient analysis systems have been applied to many aspects of dietetics. In the literature, numerous authors have described the automation of nutritional intake analysis that has occurred in government, school lunch programs, food industry, research, education, health care, and fitness programs. Professionals have applied the data generated with nutrient analysis systems to evaluate the adequacy of diets planned, served, and consumed. A key feature of these systems has been estimating the nutrients in foods as eaten by individuals and groups. Incorporating a recipe calculation method in software routines has allowed users to estimate nutritional values in a wide range of mixed dishes.

In a research project conducted at the University of Missouri-Columbia, four methods for computing the nutrient values of recipes were compared. Those four procedures were the yield factor method (1), retention factor method (2), direct addition of raw ingredients which was referred to as the summing method, and the procedure developed for the national school lunch program (3) which was referred to as the simplified retention factor method in this study. Two versions of the summing method were included in the comparison. In one version, the nutrient profiles of the raw ingredients were added and in the second, nutrient profiles of the cooked ingredients were added. The four methods were believed to be those most commonly used with nutrient analysis systems.

Distinctly different approaches were used in the four methods for computing the nutrients in recipes. The yield factor method utilized several yield factors to adjust ingredient weights and applied nutrient profiles that match the finished form of ingredients. In the retention factor method, nutrient profiles of raw or cooked ingredients were utilized. Nutrient retention factors were applied to the nutrient profiles of raw or cooked foods, and fat and moisture change percentages were applied to reflect overall changes in cooking. The summing method was a very simplistic procedure that involved adding the nutrients contributed by each ingredient to determine the total nutrient contents of recipes. The simplified retention factor method utilized a set of yield factors, retention factors, and fat change factors to compute energy and seven nutrients for the entire recipe and per portion.

Four pork entree recipes were selected for analysis with the calculation methods. The recipes were roast pork, pork and noodle casserole, pan-broiled pork chops, and pork chops with vegetables. Assumptions were made about the changes expected to occur in many of the ingredients. For methods that adjusted ingredient weights to exclude refuse and accommodated fat and moisture changes, adjustment factors, based on the stated assumptions, were applied. Thus, in those methods, changes were held constant to provide comparability of results.

Models were designed to simulate the algorithms of the calculation methods. A microcomputer spreadsheet software package provided the structure for the models. Values for 21 food constituents for the entire recipe, per portion, and per 100 grams were computed with the yield factor, retention factor, and two summing models. Energy and seven nutrients were computed for the entire recipe and per portion of the four selected recipes by the simplified retention factor model. The nutrient values generated by the models were compared to identify any differences. The nutrient values per 100 grams, computed with all models except the simplified retention factor model, were ranked to identify relationships of the models and consistencies in the recipes across the models.

The amount of differences among the models varied in the four recipes. Identical results were generated in the yield factor, retention factor, and summing-cooked models for the recipe with fewest ingredients (roast pork). The retention factor and summing-cooked models also produced identical results for the recipe for pan-broiled pork chops. None of the methods gave the same results in the recipes for pork and noodle casserole and pork chops with vegetables. In the pork and noodle casserole recipe, the retention factor model generated the highest values for all food constituents except water which was the lowest. The summing-raw model gave the highest value for water in all four recipes and the lowest values for most of the other food constituents.

The results from this study provided insight into the comparability of computerized recipe calculation procedures for recipes; however, the evidence was not sufficient to identify any one method as superior. Since laboratory analyses were not performed for the recipes, no standard was available with which to compare the results generated from the models.

The summing-raw method does not appear to be appropriate for calculating the nutrient composition in cooked mixed dishes even though that method was not compared with laboratory analyses. Since no provisions are made for adjusting ingredients in cooked dishes to reflect changes from preparation and cooking, incorrect estimations of nutrients are probably produced. Therefore, the summing-raw method should be avoided except for uncooked foods.

Implementation of any recipe calculation method, other than the summing-raw, requires judgement on the part of a coder. Each of the calculation methods involve distinct procedures, but when coding a wide variety of recipes, much interpretation and many assumptions are made that may influence the results. Although large amounts of data are currently available to support the calculation methods, more data are needed to supply information for the vast array of preparation and cooking procedures used in recipes. However, the amount of additional data needed could be minimized if a single general purpose method were designated as the preferred calculation method.

SELECTED REFERENCES

1. Andrews, J.T.: Development of a standardized recipe data file for computer systems. In: Moore, A.N., and Tuthill, B.H. (Eds.): Computer Assisted Food Management Systems. pp. 33-45, Columbia, MO: University of Missouri Technical Education Services, 1971.

2. Perloff, B.: Recipe Systems: Formulations and Calculations. Proceedings, Ninth National Nutrient Data Bank Conference, Amherst, MA, June 18, 1984 (In press).

3. Fulton, L.H., and Gray, B.: Microcomputer System for Assessing the Nutrient Content of School Lunches. Proceedings, Ninth National Nutrient Data Bank Conference, Amherst, MA, June 18, 1984 (In press).