

GUIDELINES FOR AMOUNTS OF PROTEIN-RICH
FOODS IN SELECTED MEAT AND POULTRY ENTREES

by

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Diploma of Home Science

University of Otago, New Zealand, 1965

9984

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

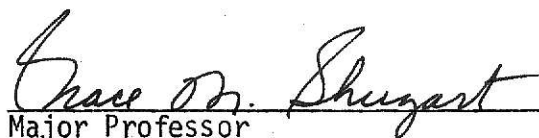
MASTER OF SCIENCE

Department of Institutional Management

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1972

Approved by:


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TABLE OF CONTENTS

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	3
Recipe Development and Standardization	3
Adjusting Recipe Yields	5
Handling and Cooking Losses of Meat	8
Nutritional Requirements of Government Sponsored Programs	10
PROCEDURE	12
Preliminary Work	12
Taste Panel	15
Procurement and Storage of Ingredients	15
Experimental Procedure	15
Statistical Analysis	18
RESULTS AND DISCUSSION	18
CONCLUSIONS	29
RECOMMENDATIONS FOR FURTHER STUDY	30
SUMMARY	31
ACKNOWLEDGMENTS	33
REFERENCES	34
APPENDIX A	37
APPENDIX B	51
APPENDIX C	75
APPENDIX D	80

INTRODUCTION

Meat and poultry are major sources of protein in the daily diet, and often the most costly. In institutional food services, budgetary restrictions may limit the amount of meat that can be served, but it is important that the protein intake meets daily requirements recommended by the Food and Nutrition Board of the United States National Research Council, 1968 revision.

Two areas in which there exists a particular need for control of constituents in the diet are the National School Lunch Program and the Medicare Program. Certain dietary requirements must be met in those programs if they are to remain eligible for receipt of federal assistance.

The National School Lunch Program has a guide that is designed to help in planning a midday meal that will meet the food requirements of school children when the foods are used in the amounts specified and in combination with other foods. The lunches so planned should meet one-third of the daily dietary allowances recommended by the National Research Council for 9 to 12 year old boys and girls (United States Congress, National School Lunch Act, 42 U.S.C. 1752).

With the introduction of the Medicare Program in hospitals and nursing homes, another challenge was presented. The Hospital Insurance component of the Medicare Program became operative on July 1, 1966. To assure that this program paid only for treatment in hospitals with staffs and facilities that met adequate standards of care, the law stated that food and nutritional needs of the patients were to be met in accordance with physicians' orders, and, to the extent medically possible, were to meet the dietary allowances of the Food and Nutrition Board of the National Research Council adjusted for age, sex and activity. A daily food guide for adults on which the hospital

diet might be based was incorporated into the "Conditions of Participation in Hospitals" (Code of Federal Regulations, Title 20, Chapter 3, Part 405.1125, revised, 1970). One responsibility of dietitians and public health nutritionists under this scheme is the provision of guide materials on menu planning to nursing homes (Nyhus, 1964). These include, among other things, standardized recipes.

The increasing number of meals served in other food services such as university residence halls and in-plant cafeterias also emphasizes the growing concern that these meals be as nutritious as those eaten at home and that they provide part or all of the daily food requirements. Protein, especially meat protein, needs special attention to provide the necessary amounts at a realistic cost.

One way commonly used in institutional food service to reduce the cost of meat and other animal proteins is to combine those foods with less expensive "extenders" in a casserole type entree. These entrees generally consist of three groups of ingredients: protein-rich ingredient, vegetables or pasta, and gravy or sauce. When the protein-rich group is increased or decreased to provide the required amount of protein, the other groups may be decreased or increased proportionately to maintain the volume of the total recipe. Many recipes list the meat or poultry ingredients in raw or "As Purchased" weight; this factor must be considered in determining the amount of meat or poultry to buy to yield the required weight of cooked edible ingredient per serving.

The objective of this study was to formulate guidelines for standardizing meat and poultry entree recipes to meet requirements for 2-oz and 3-oz total edible protein-rich food for portions of different sizes that would

comply with determinants for cost, acceptability and nutritional adequacy. Large quantity meat and poultry casserole type entrees were prepared and evaluated to determine acceptable ratios of protein-rich food to vegetable, pasta or substitute; and gravy, sauce or substitute. Special attention was given to conversion factors for calculating cooking and handling losses, thus determining edible yield from "As Purchased" weights given in recipes.

REVIEW OF LITERATURE

Recipe Development and Standardization

Food services are constantly in need of expanding their recipe files and revising recipes. Kotschevar (1966) pointed out that changes are necessary as new foods, improved ingredients and new equipment appear on the market. Further, cost requirements make it desirable to check recipes frequently for possible savings. Ericson (1960), and Aldrich and Miller (1967) also stressed the importance of cost control in food service operations. They consider regular use of standardized recipes and constant emphasis on obtaining the predicted number of specific sized portions the best cost control tools. They further declared that for this to work, it is essential that recipes yield the size and number of portions claimed.

The use of standardized recipes has been accelerated by demand for a consistent product and by rising costs, shortages of trained cooks, and decentralization of food service units (Zumsteg, 1961). The formula system, i.e., the standardized recipe, assures the same quality of food every time and permits management to have complete control.

Although there is no one simple master plan that can be applied effectively to every food service operation, Miller and Goodenow (1962) listed

some general guides in the initial planning and development of a food service production and cost control program. They are:

1. Recognizing the need and responsibility for and values to be gained through a production control program.
2. Developing basic plans for the program.
3. Surveying the adequacy of the available physical facilities.
4. Selecting and scheduling specific menu items for standardization.
5. Formulating procedures for testing and developing selected recipes.
6. Systematically calculating and standardizing recipe yield.
7. Constructing the written recipe.

According to Shugart (1962), a standardized recipe is one in which the amounts and proportion of ingredients and methods of procedure will produce a high quality product consistently. Kotschevar (1966) suggested that a standardized recipe produces a known quantity of food of a desired quality; it gives production control to management who must be responsible for it. The standardized recipe assists in eliminating human failure, and over a period of time it will contribute to standardization of quality, quantity and cost.

Recipe standardization, according to Ericson (1960), is the major element of portion control or portion planning. Increased food and labor costs are forcing the volume feeding industry to use portion planning, yet the advantages that can be achieved in planning, production and especially in cost control have proved that standardized recipes are worth the effort required to develop them. Aldrich and Miller (1967) emphasized that a standardization program can be developed only through a well planned and systematically executed program of standardization of recipes and procedures for food production. To be effective, such a program must be realistic, and it must be pursued consistently and continuously with the understanding and participation of all employees and supervisors involved in the preparation and service of food.

Miller and Goodenow (1962) added a word of caution: standardized recipes are fine, as far as they go, but alone they will not assure quality food, absolute yield, and controlled food costs. They are simply good dependable tools, and should be regarded so.

Adjusting Recipe Yields

Adjusting recipe yield involves dealing with fractions and decimals and a fairly complicated system of weights and measures (Aldrich and Miller, 1967). The literature has revealed four basic methods.

The Factor Method.

The factor method, described by Aldrich and Miller (1967), is a method requiring both calculation and concentration to assure accuracy. The procedure is outlined below:

1. Divide the desired yield by the known yield to obtain the basic factor.
2. So far as possible, convert to weights all amounts of ingredients given in measure in the original recipe. Add weights of all ingredients to get the total weight of the original recipe.
3. Multiply the amount of each ingredient in the original recipe by the factor.
4. Multiply the original total weight of ingredients by the factor.
5. Add together the new weights of all ingredients for the adjusted recipe. If the answers in steps 4 and 5 are not the same, check the calculations.
6. Change weights of any ingredients that can be more easily measured than weighed back to measures.
7. Check all amounts and round off unnecessary fractions to simplify weights or measures as far as accuracy permits.

The factor method is used by the Navy-Marine Corps and is described in "Food Operations Reference Manual, Naval Supply Systems Command", NAVSUP Publication 421 (1964).

Direct Reading Methods.

Direct reading tables for increasing or decreasing recipes, compiled by the Nutrition Services Division of the New York State Department of Mental Hygiene, were adapted for use by Aldrich and Miller (1967), and by Fowler, West and Shugart (1971). This method was developed for adjusting yields with a minimum of calculation, but its use is limited to adjusting recipes with a known yield that is divisible by 8, 10, or 25. Direct reading methods can be used when ingredients are expressed in either weights or measures. The procedure involves selecting from a given set of tables the known yield, deciding on the desired yield, then reading directly from the table the weights or measurements required for the new yield.

Percentage Method.

Two variations of the percentage method for adjusting recipe yield have been described. A "slide rule" device designed by Callahan (1959) is used with a special direct reading table. This method, reported by Callahan and Aldrich (1959), requires the listing of ingredients not only in pounds and ounces but also in terms of percentage of the total recipe. The advantage of this system is that once the basic recipe has been calculated in terms of percentages, it never need be calculated again. The recipe becomes the basis for any number of portions of any size. When handling and cooking losses have been calculated, the use of the special calculator and a direct reading technique makes it possible to determine quickly and accurately the amount in weights of each ingredient.

McManis (1971) described a method for adjusting the yield of recipes that also is based on percentages of ingredients and that requires no special equipment. The total weight of the ingredients is 100%, and each ingredient

is part of 100%. The procedure outlined by McManis follows:

1. Convert all ingredients in a recipe from measure or pounds and ounces to tenths of a pound. Carry to two decimal places.
2. Total the weights of the ingredients.
3. Calculate the percentage of each ingredient in relation to the total weight.
4. The sum of the percentages should be 100%.
5. Establish the weight needed to give the desired number of servings.
6. Add handling or cooking loss to the total weight needed.
7. Multiply each percentage number by the total weight to give the exact amount of each ingredient needed. Once the percentages for a recipe have been established, any number of servings can be calculated and the ratio of ingredients to the total will be the same.

Computer Method.

Sager and Ostenso (1968) developed a computerized method for recipe adjustment, including conversion of decimal figures to useable unit sizes and listing of ingredient amounts according to sequence of handling and/or addition. Information required by the computer program included:

1. Recipe identification (number, name, food category code, number of ingredients).
2. Daily use information (food types in which the recipe was being used, day, meal, acceptable alternate ingredients).
3. Ingredient information (name, number, unit size code, amount per 100 servings, number of alternate ingredients, food type combinations needed, code for controlling headings printed, and weight-to-measure conversion code).

With this information, the computer program actuated recipe adjustment to meet the required number of servings needed for a specific meal. Evaluation of the program model revealed that the adjusted recipe and food order amounts were mathematically accurate, but that it would need further refinement for adaptation to each specific food service operation. The computerized method provided accurate information at a speed far exceeding that of human capability.

Handling and Cooking Losses of Meat

A working knowledge of handling and cooking losses is helpful in adjusting yields of recipes and determining amounts of food to purchase. In a study by Dawson, Dochterman and Vettel (1958), yield of cooked meats varied with the kind and cut, preparation before and after cooking, and the method of cooking. The data were obtained in the food research laboratories of the Institute of Home Economics, United States Department of Agriculture, and in food service institutions from work done under United States Department of Agriculture research contracts at Iowa State University, Ames; Drexel University, Philadelphia; St. Luke's Hospital, New York, New York; and Grace-New Haven Community Hospital, Yale University, New Haven, Connecticut. The research was conducted to fill a need by the School Lunch Program for information on yield of cooked meat and poultry.

Averages and ranges in values for yield of cooked meat showed variations in meat cooked by procedures ordinarily used in institutional kitchens. Pecot and Watt (1956) assembled data on yields and losses in various stages of preparation of food. Data for this work came from a variety of sources; published and unpublished research since 1940 was studied and relevant details included in the tables present in the U.S.D.A. Handbook 102, "Food Yields Summarized by Different Stages of Preparation".

Sweetman and McKellar (1954) summarized early research on braising as a method of cooking meat. Included was a comparison by Tucker et al. (1946) of cooking a heel of round in the oven, on top of the stove, and in a pressure saucepan. Total losses varied from 33% for the oven cooked product to 36% for the top of the stove product. The pressure saucepan gave an intermediate value. Further experimentation showed that when beef and lamb stews were

pressure cooked, boiled and simmered to the same degree of doneness, there was little difference in the loss of weight ranging from 41.4% to 42.6% for browned beef stews and 43.3% to 45.6% for browned lamb stews.

Browning meat before stewing appeared to increase slightly the total weight losses as compared with the unbrowned product. Generally, shrinkage of meat cooked by moist heat methods was greater than that in meats cooked by dry heat methods. This is partly attributed to the necessity of reaching a more advanced stage of doneness to soften the connective tissue in the types of cut for which moist heat usually is employed.

Callahan and Aldrich (1959) agreed with the early workers and with Dawson and coworkers (1958) that losses vary to some degree with different production methods. They suggested as a guide for various types of entrees a 5% loss for handling only, and cooking losses of from 10% to 45%, depending on the product. However, they advised that each food service operation should determine cooking and handling losses for its own recipes.

Yield data obtained from many laboratory and food service unit tests are included in a U.S.D.A. publication P A - 270, "Food Buying Guide for Type A School Lunches" (1964). This bulletin provides information for planning and calculating quantities of food to be purchased and used by schools serving Type A lunches in the National School Lunch Program. It includes yield information on the quantity of ready-to-cook or cooked protein-rich food obtained from a pound of food as purchased, but emphasizes that yields of cooked meat and poultry will vary with type, age, fatness and weight of the animal, and the method, time and temperature of cooking.

Nutritional Requirements of Government

Sponsored Programs

School Lunch.

The National School Lunch Act, passed by the 79th Congress in 1946, provides that:

Lunches served by schools participating in the school lunch program under this Act shall meet minimum nutritional requirements prescribed by the Secretary (of Agriculture) on the basis of tested nutritional research.

The Type A lunch was designed to meet one-third to one-half of the minimum daily nutritional requirements of a child 10 to 12 years of age. By making some adjustments, that meal pattern could be adapted to meet the nutritional requirements for children of all ages (Gunderson, 1971). The base from which the requirements were established was the United States National Research Council Recommended Daily Dietary Allowances. As specified in the National School Lunch Regulations (U.S.D.A., 1970), a Type A lunch should contain as a minimum:

Fluid whole milk. One-half pint of fluid whole milk as a beverage.

Protein-rich food. Two ounces (edible portion as served of lean meat, poultry or fish; or two ounces of cheese; or one egg; or one-half cup of cooked dry beans or dry peas; or four tablespoons of peanut butter; or an equivalent of any combination of the above listed foods). To be counted in meeting this requirement, these foods must be served in a main dish or in a main dish and one other item.

Vegetables and fruits. Three-fourths cup serving consisting of two or more vegetables or fruits or both. A serving (one-quarter cup or more) of full strength vegetable or fruit juice may be counted to meet not more than one-quarter cup of this requirement.

Bread. One slice of whole grain or enriched bread; or a serving of other bread such as cornbread, biscuits, rolls, muffins, made of whole grain or enriched meal or flour.

Butter or margarine. One teaspoon of butter or fortified margarine.

The butter or margarine requirement has been reduced from two teaspoons as a result of research on the nutritive value of Type A lunches by Murphy, Grossman and Forziate (1968), Leverton (1969), and Murphy, Page and Koons (1970).

Medicare Program.

Medicare, health insurance for the aged, was provided under Title 18 of the Social Security Act of 1965, and went into effect on July 1, 1966. It is now a fully accepted part of the health care scene. Somers (1971) reported that qualitative improvements have been most evident in the areas of extended care and home health services, which barely existed prior to Medicare. The quality of care available in many small hospitals not previously inspected by the Joint Commission on accreditation of hospitals also has been raised.

Certain regulations for dietary services for extended care facilities have been set up in the Conditions of Participation; Extended Care Facilities (US HEW SSA, 1970). Part 405.1125 (d) refers to adequacy of diet, and states that:

The food and nutritional needs of patients are met in accordance with physicians' orders, and, to the extent medically possible, meet the dietary allowances of the Food and Nutrition Board of the National Research Council adjusted for age, sex and activity.

A normal diet menu plan for extended care facilities, set up by the American Hospital Association (1967), includes daily: one pint milk; the equivalent of five ounces edible cooked meat; six half-cup servings of vegetables and fruit; six servings of bread, cereal, potato and legume; and fats and sweets to meet caloric requirements and satisfy the appetite. This menu plan fulfills the requirements of a normal diet supplying 1800 calories. Since nutritional needs often are greater in sickness than in health, the

number of servings in each food group in the menu plan was designed to provide optimum nutrition with special emphasis on protein, iron, and thiamine.

PROCEDURE

Preliminary Work

Recipes for meat and poultry casserole type entrees that met the requirements listed below were selected from "Food for Fifty" (Fowler, West and Shugart, 1971).

1. Cubed meats with vegetables or fruit.
2. Cubed meats with pasta or dough.
 - a. Casseroles incorporating pasta or dough.
 - b. Casseroles with pasta or dough accompaniment.
3. Ground meats with pasta or dough.
 - a. Casseroles incorporating pasta or dough.
 - b. Casseroles with pasta or dough accompaniment.
4. Cubed chicken with pasta or dough.

A total of 18 recipes was selected and grouped according to the categories listed above (Appendix A).

Ingredients in each recipe were separated into three groups:

1. Protein-rich food. Meat, milk, eggs, cheese or dried beans.
2. Vegetable, pasta or substitute. Spaghetti, noodles, rice, potatoes and other vegetables, onions, and ingredients required to make pastry.
3. Gravy, sauce or substitute. Flour used to thicken gravies, tomato puree, all liquids, and any ingredient that was an integral part of the sauce, except seasonings.

Seasonings were grouped separately. Although the gravy or sauce, of which seasonings might be considered an integral part, varied in quantity within a particular recipe, the seasonings remained fairly constant.

Measurements or volumes in the original recipes were converted to pounds and ounces. Ounces were changed to tenths of a pound for ease in calculating (Table 5, Appendix A). Total weight was determined from the sum of all ingredients. Each ingredient was then expressed as a percentage of this total. Each group of ingredients also was calculated as a percentage of the total weight (Appendix A).

Practical portion sizes appropriate for luncheon or dinner for various groups were determined to be 4, 6, 8, and 10 oz. The 10-oz serving would be feasible in a food service operation where clients have healthy appetites. A goal of 2- or 3-oz edible cooked protein-rich food in each serving was chosen to meet government program requirements. The Type A school lunch requires at least 2-oz edible protein-rich food, and Conditions of Participation for Extended Care Facilities call for a total daily intake of 5-oz edible protein-rich food. One would assume that this could be supplied as a 2-oz and as a 3-oz serving. A table of portion sizes and various combinations of each of the three ingredient groups in the different portion sizes was prepared (Table 6, Appendix A).

An experimental design was set up on the advice of a statistician in the Department of Statistics, Kansas State University. Four recipes were chosen: two from Group 2 (cubed meats with pasta or dough) one of which was characteristic of subsection (a) in which the pasta or dough was incorporated in the product, and one was representative of subsection (b) where the pasta or dough was served as an accompaniment. Two recipes were selected from Group 3 (ground meats with pasta or dough) one each representing the two subsections described. The recipes selected were:

1. Hungarian goulash with noodles (2a).
2. Hungarian goulash on noodles (2b).

3. Creole spaghetti (3a).

4. Spaghetti and meat sauce (3b).

Each recipe was scheduled to be prepared and evaluated six times, each time with a different combination of ingredient groups.

Table 1. Recipes and combinations selected for preparation and evaluation.

Entree	Portion size, oz	Protein-rich food, oz	Vegetable, pasta, or substitute, oz	Gravy, sauce or substitute, oz
Hungarian Goulash with Noodles	6	2	1	3
	6	2	3	1
	6	3	2	1
	8	2	4	2
	8	3	2	3
	8	3	3	2
Hungarian Goulash and Noodles	10	2	3	5
	10	3	4	3
	10	3	5	2
	8	2	4	2
	8	3	2	3
	8	3	3	2
Creole Spaghetti	6	2	1	3
	6	2	3	1
	6	3	2	1
	8	2	4	2
	8	3	2	3
	8	3	3	2
Spaghetti and Meat Sauce	10	2	3	5
	10	3	4	3
	10	3	5	2
	8	2	4	2
	8	3	2	3
	8	3	3	2

A method for adjusting recipes to fit the various combinations of each of the three ingredient groups was devised (Appendix B). Using a random number table from Barnes (1968), the order of preparation and evaluation was determined (Table 7. Appendix B).

Taste Panel

A taste panel consisting of five members, three women and two men, was selected. Panel members were from the Institutional Management faculty and were familiar with large quantity food preparation methods and techniques. The taste panel members were introduced to the project and were given instruction in the use of the score sheet and in general behavior of taste panel members (Appendix, p. 76). They were provided with two opportunities to use the score sheet prior to the experiment. A schedule of the time and place for tasting was given to each member.

Procurement and Storage of Ingredients

Meat and produce were delivered three times during the experimental procedure. Cheese, canned and bottled ingredients, spaghetti, noodles and miscellaneous seasonings were purchased at the beginning of the experiment in quantities sufficient for the total procedure.

Experimental Procedure

Each product was prepared for 25 servings. All ingredients, including liquids, were weighed in pounds and ounces on a Toledo balance scale. Small amounts of seasonings were measured with standard measuring spoons.

The products were prepared in the Quantity Foods Laboratory. Two electronic trunnion kettles, each with 5-gallon capacity, were used for simmered products and the casseroles were baked in an electric oven.

During the experimental period, three products were prepared each day, requiring a total of eight days. The schedule for preparation follows:

Day	Entree	Portion size, oz	Protein-rich food, oz	Vegetable, pasta, or sub- stitute, oz	Gravy, sauce or substi- tute, oz
1	Creole spaghetti	6	2	1	3
	Spaghetti and meat sauce	8	2	4	2
	Hungarian goulash with noodles	8	3	3	2
2	Spaghetti and meat sauce	10	3	5	2
	Spaghetti and meat sauce	10	2	3	5
	Creole spaghetti	8	2	4	2
3	Creole spaghetti	8	3	2	3
	Hungarian goulash and noodles	10	3	5	2
	Hungarian goulash with noodles	6	3	2	1
4	Hungarian goulash with noodles	6	2	1	3
	Creole spaghetti	6	3	2	1
	Hungarian goulash and noodles	8	2	4	2
5	Creole spaghetti	6	2	3	1
	Hungarian goulash and noodles	10	2	3	5
	Hungarian goulash and noodles	10	3	4	3
6	Hungarian goulash with noodles	8	2	4	2
	Spaghetti and meat sauce	10	3	4	3
	Hungarian goulash and noodles	8	3	2	3
7	Spaghetti and meat sauce	8	3	2	3
	Creole spaghetti	8	3	3	2
	Hungarian goulash with noodles	8	3	2	3
8	Hungarian goulash with noodles	6	2	3	1
	Spaghetti and meat sauce	8	3	3	2
	Hungarian goulash and noodles	8	3	3	2

The formulae and procedures followed are included in Appendix B.

Products were evaluated in the Flavor Profile Analysis laboratory by members of the taste panel. Five tasting booths were set with the following:

1. Fork
2. Paper serviette
3. Score sheet filled out with date, name of the product, portion size and proportions.
4. Pencil
5. Glass with cold tap water.

Plates were warmed prior to the evaluation, and the casseroles and pasta were kept hot throughout the procedure on a food warmer that was preheated for ten minutes before the scheduled tasting time.

Two full-sized portions were placed on white plates and set under the Macbeth skylight. One full-sized portion was retained for freezing at -4°F . Each panel member was served a one-half portion from which to judge eating qualities. Panel members were asked to consider:

1. General appearance
2. Consistency
3. Flavor
4. Overall acceptability

Though numerical scores 1 to 5 were given, panelists were encouraged to include comments with special reference to portion size and proportions of the three ingredient groups.

A line spread reading, modified from Grawemeyer and Pfund (1943), and Griswold (1962), was taken of each sample. A 2-1/2" steel ring was filled with the product. If the product was accompanied with pasta, only the meat and sauce were used for the line spread reading; if the pasta was incorporated, a representative sample of the total product was used. The spread was recorded at 15 second intervals for a period of two minutes.

Cost per serving and percentage cooking and handling losses were calculated for each product. The figure used was 45%, suggested by Callahan

and Aldrich (1959) as a guide for cooking and handling losses of stews and ragouts. Losses were calculated to include pasta or dough when this was incorporated in the product, but where pasta or dough was served as an accompaniment, it was not considered when figuring losses.

Statistical Analysis

Numerical scores were tabulated for each panel member and an analysis of variance was run on data for each of the measurements used to evaluate the products.

RESULTS AND DISCUSSION

Interactions between the type of entree and the ratio of ingredient groups; the entree and the scores of panel members; and the ratios and the scores were studied (Table 2). No significant difference was noted in the interactions of the 6- and 10-oz portions for any of the five factors considered.

For the 8-oz portions, the interaction between the entree and ingredient ratio was significant at the 5% level for consistency and flavor of the product. However, the interactions of entree and panel member scores, and of ratios and panel member scores were not significant at this level. This would infer consistency of evaluation by panel members.

In the 8-oz servings, the type of entree apparently had some effect on the consistency of the final product (Table 3). Where creole spaghetti and the two variations of hungarian goulash rated high with a lesser amount of pasta, spaghetti and meat sauce rated low. This may be attributable more to the equal proportions of protein-rich food and gravy, sauce or substitute,

Table 2. Summary of analysis of variance for selected casserole type entrees.

Variation	df		General appearance F - ratios			Consistency F - ratios		
	6-oz	8-oz	10-oz	6-oz	8-oz	10-oz	6-oz	8-oz 10-oz
Entree-Ingredient ratio	2	6	2	0.86	1.66	1.53	5.34	3.80*
Entree-Panel member	4	12	3	0.18	0.52	1.52	1.25	0.96
Ingredient ratio-Panel member	8	8	6	0.34	1.21	0.57	2.22	0.89
#Error	5	17	4	0.87	0.42	0.47	0.38	0.31

Variation	Flavor F - ratios		Overall acceptability F - ratios			Total score F - ratios		
	6-oz	8-oz	10-oz	6-oz	8-oz	10-oz	6-oz	8-oz 10-oz
Entree-Ingredient ratio	0.37	2.99*	0.40	0.66	1.69	1.20	1.65	2.63
Entree-Panel member	0.55	1.04	2.76	0.12	1.07	1.47	0.02	0.42
Ingredient ratio-Panel member	0.53	1.43	3.13	0.86	0.95	1.00	0.65	1.41
#Error	0.68	0.40	0.14	0.91	0.34	0.42	9.64	4.23

* Significant at the 5% level.

Error mean square from least squares analysis of variance.

Table 3. Interactions of selected entrees and ratios of ingredient groups for 8-oz servings as they affect consistency of product.

Ratios [#]	Mean scores		
	2 : 4 : 2	3 : 2 : 3	3 : 3 : 2
Creole Spaghetti	2.7	4.6	3.0
Spaghetti and Meat Sauce	3.0	2.6	2.9
Hungarian Goulash with Noodles	2.6	4.2	3.25
Hungarian Goulash and Noodles	3.0	4.2	3.7

Ratios are presented in the following order:

Protein-rich food; vegetable, pasta or substitute; gravy, sauce or substitute.

Scores range from 1 (unsatisfactory) to 5 (superior).

than to the low amount of pasta. The nature of this product requires that there be a fairly "runny" meat and sauce mixture to coat the pasta adequately. Hungarian goulash accompanied by pasta rated high where there was a 3 : 2 ratio of protein-rich food to gravy, sauce or substitute, which would contradict the assumption made about the spaghetti and meat sauce and would indicate that a "firmer" product is desirable. Little difference was noted in the scores for consistency for the entrees that incorporated the pasta in the final product.

Scores for flavor were significantly different at the 5% level in the 8-oz portions. Although this measurement was not considered an important individual factor in this study, it often did affect the overall acceptability of a product, and it provided evidence for a low score for an otherwise acceptable product.

Ratios of 2 parts protein-rich food to 1 part vegetable, pasta or substitute to 3 parts gravy, sauce or substitute (2 : 3 : 1) and of 3 parts protein-rich food to 2 parts vegetable, pasta or substitute to 1 part gravy, sauce or substitute (3 : 2 : 1) were favored in the 6-oz portions (Table 4). Although the score for the 3 : 2 : 1 ratio was slightly higher, panel members indicated they liked the greater proportion of sauce in the 2 : 1 : 3 ratio. The "meaty" appearance in the 3 : 2 : 1 group apparently contributed to the higher score. Panelists commented that more sauce would be desirable in this combination (Plate I).

For the 8-oz portion, the combination with the lowest ratio of vegetable, pasta or substitute had the highest score. It also had the highest proportion of gravy, sauce or substitute, a factor contributing to the moistness of the product. The entree with a ratio of vegetable, pasta or substitute equal

Table 4. Average scores for different ratios of ingredient groups by portion size.

6-oz portion		8-oz portion		10-oz portion	
# Ratio of ingredients	Mean score	Ratio of ingredients	Mean score	Ratio of ingredients	Mean score
2 : 1 : 3	13.30	2 : 4 : 2	11.52	2 : 3 : 5	12.66
2 : 3 : 1	10.90	3 : 2 : 3	14.59	3 : 4 : 3	13.00
3 : 2 : 1	13.79	3 : 3 : 2	13.68	3 : 5 : 2	14.08

Ratios are presented in the following order:

Protein-rich food; vegetable, pasta or substitute; gravy, sauce or substitute.

Scores have a high value of 20.

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EXPLANATION OF PLATE I

Different ratios of ingredient groups in 6-oz portions

- A. 2-oz edible protein-rich food; 1-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute.
- B. 3-oz edible protein-rich food; 2-oz vegetable, pasta or substitute; 1-oz gravy, sauce or substitute.

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PLATE I



A



B

to the combined ratios of protein-rich food and gravy, sauce or substitute was least desirable; this fact was evidenced throughout the study (Plate II).

In the 10-oz portion, the high ratio of pasta to protein-rich food and gravy, sauce or substitute was favored. The difference in scores was largely attributed to the higher individual scores for flavor in the favored product. With flavor scores disregarded, scores for the two products 3 : 4 : 4 and 3 : 5 : 2 are similar. Flavor apparently had a negative effect on an otherwise generally acceptable product; this was supported by comments of the panelists.

Cooking and Handling Losses.

Actual cooking and handling losses were lower than the 45% figure suggested by Callahan and Aldrich (1959). Losses varied both with the product and with different formulae for each product (Appendix D, Table 9).

Line Spread Scores.

Products generally were fairly resistant to spreading and often spread no further after 45 to 60 seconds (Appendix D, Table 10). The line spread readings did not seem to bear specific characteristics that might help in establishing a guideline.

Cost.

Increasing amounts of protein-rich food, as might be expected, were accompanied by increased cost per serving (Appendix D, Table 11). Those entrees with higher amounts of pasta were slightly less expensive than those with more gravy or sauce. It appeared to be more economical to extend with pasta than with sauce or gravy, but overall acceptability may be affected if

EXPLANATION OF PLATE II

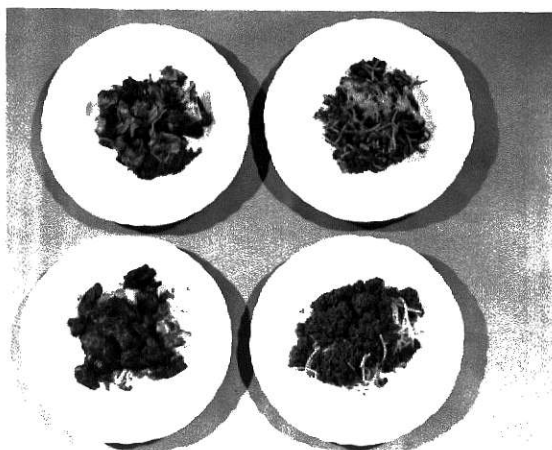
Different ratios of ingredient groups in 8-oz portions

- A. 2-oz edible protein-rich food; 4-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute.
- B. 3-oz edible protein-rich food; 2-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute.
- C. 3-oz edible protein-rich food; 3-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute.

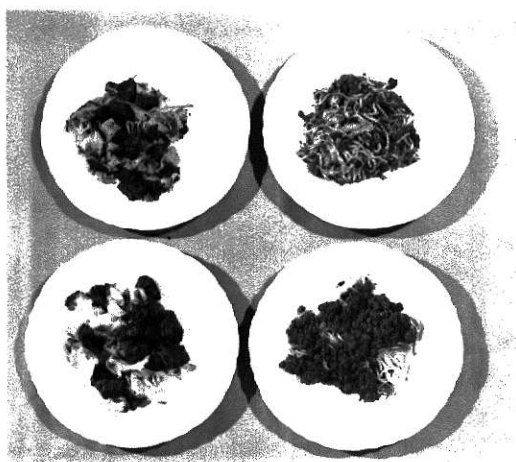
PLATE II



A



B



C

the proportion of pasta does not comply with determinants for an acceptable product.

General Observations.

It was observed that when protein-rich food was lower than 30% of the total product, overall acceptability was decreased as the total weight was made up with increased pasta or gravy or sauce. It was noted that 30% of a 6-oz portion is less than 2 oz, the amount necessary to meet nutritional requirements, but this requirement should be filled first. Two ounces of a 10-oz portion is 20% which, though it may meet nutritional requirements for edible protein-rich food, provides conditions for the addition of too much pasta or sauce to fulfill the requirements for an acceptable 10-oz portion.

The inclusion of pasta is an economical way of increasing portion size, but unless it is in proportion with the rest of the entree, overall acceptability is reduced. In their comments, panel members indicated that an entree with 50% or more pasta was too "dry", because too great a proportion of ingredients was taken up by pasta, leaving insufficient to meet the nutritional requirements for edible protein-rich food and to provide sufficient sauce to coat the pasta adequately.

It appeared important for entrees served with a pasta accompaniment to have sufficient gravy or sauce to coat the accompanying pasta, as well as to provide a good medium in which to disperse the meat. Less sauce at the expense of more pasta, though economically advantageous, was not conducive to optimum acceptability. Where pasta was incorporated in the entree, there was a greater surface of pasta to be coated. This affected the proportion of gravy or sauce provided, and a higher relative amount was required to provide

an acceptable product than was necessary in an entree where pasta was served as an accompaniment.

CONCLUSIONS

The objective of this study was to formulate guidelines for standardizing meat and poultry entree recipes to meet requirements for 2-oz and 3-oz total edible protein-rich food for portions of different sizes that would comply with determinants for cost, acceptability and nutritional adequacy. Based on these limitations, the following requirements appeared to be important for the most acceptable casserole type entree with pasta.

1. The proportion of protein-rich food to the total edible product should be no less than 30% and no more than 50% to meet acceptability requirements. In a portion as small as 6 oz, the percentage needs to be raised to 33-1/3 total edible cooked product to meet minimal nutritional requirements.
2. The proportion of pasta to the other two ingredient groups combined should be less than 50% for optimum acceptance.
3. For entrees that are served with a pasta accompaniment, the proportion of sauce or substitute to edible protein-rich food must be greater than 50%. The product was more acceptable when there was enough sauce to "go through" the pasta.
4. For entrees that incorporate the pasta, the proportion of sauce to edible protein-rich food must be not less than 50%. Equal proportions were acceptable. Acceptability was decreased when the amount of gravy or sauce was inadequate to coat the pasta moderately liberally.

Though only ground and cubed beef recipes were used in the experimental part of this study, it is feasible to assume that the generalizations made would apply to other cubed or ground meat or poultry casserole type entrees with pasta.

RECOMMENDATIONS FOR FURTHER STUDY

The present study was an attempt to establish guidelines for edible protein-rich food in different portion sizes of casserole type entrees. The method devised for calculating formulae is complicated, and may be too involved for the "normal" kitchen supervisor. However, it may be used when standardizing a recipe to meet a specific need. If a simplified method could be developed, its use may be more applicable to a wider variety of situations.

Once a recipe has been adjusted to meet those requirements, it will need work to produce a standard and high quality product. It is recommended that further study be pursued to develop each particular group in greater depth, and to expand the study to include other types of casseroles, such as vegetable stews or pies.

This study included some measurements of handling and cooking losses. Recent research in this area is limited, and it is recommended that this be further developed, especially in the field of meat and poultry casserole type entrees. Most of the work to date has included cooking and handling losses for meat only and as more casserole recipes and variations are being developed, it is important that more information on losses for these combination dishes be gathered and published. Though it is true that each operation should develop its own handling and cooking losses, some guide for those operations developing new recipes would be helpful.

SUMMARY

The objective of this study was to formulate guidelines for standardizing meat and poultry entree recipes to meet requirements for 2-oz and 3-oz total cooked edible protein-rich food for portions of different sizes. Cost and overall acceptability, important considerations for the type of food service to which such guidelines might be applied, were given attention.

Recipes for four casserole type entrees were selected from an original list of 18 taken from "Food for Fifty" by Fowler, West and Shugart. These represented cubed and ground meats with pasta or dough. Two of the recipes, one including ground meat and one including cubed meat, incorporated pasta as an integral part of the product; the other two, one including cubed and the other including ground meat were served with a pasta accompaniment. Different ratios of protein-rich ingredients; vegetable, pasta or substitute; and gravy, sauce or substitute were evaluated to determine the most feasible combinations for an acceptable entree of a predetermined portion size (6 oz, 8 oz or 10 oz) with either 2 oz or 3 oz of edible protein-rich food. The four entrees were prepared six times each in amounts to serve 25 portions.

The products were evaluated by a taste panel of five members, and analysis of variance was run to determine the effect of the entree, the ratio, and the panel member on general appearance, consistency, flavor, overall acceptability and total score. No significant differences were revealed except in consistency and flavor of the 8-oz entrees.

Based on the limitations of this study, general guidelines that would apply to any casserole type entree with pasta or dough were suggested.

1. The proportion of protein-rich food to the total edible product can be no less than 30% and no more than 50%. This appeared

characteristic of a product of optimum acceptability and nutritional adequacy.

2. The proportion of pasta to other ingredients must be less than 50%.

A higher proportion seemed to be characteristic of a product that did not reach standards for acceptability, even though it was nutritionally adequate.

3. For entrees that are served with a pasta accompaniment, the proportion of sauce or gravy to edible protein-rich food must be greater than 50%. The product was more acceptable to the consumer when there was sufficient sauce to "go through" the pasta.
4. For entrees that incorporate the pasta, the proportion of sauce to edible protein-rich food must be not less than 50%. Equal proportions were acceptable. Acceptability was low when the proportion of sauce was inadequate to coat the pasta moderately liberally.

ACKNOWLEDGMENTS

Appreciation is gratefully acknowledged to Mrs. Grace Shugart, Professor and Head, Department of Institutional Management, for her interest and constant guidance and help in the planning and completing of this study; to Dr. Dorothy Harrison, Professor, Department of Foods and Nutrition, and to the late Mrs. Raymona Middleton, Assistant Professor, Department of Institutional Management, for their interest and helpful suggestions. Thanks are expressed to Mrs. Merna Zeigler, Associate Professor, Department of Institutional Management, who assumed membership on the Advisory Committee, for her valuable assistance in the latter part of the project. Acknowledgment is paid also to Dr. Arthur Dayton, Associate Professor, Department of Statistics, for his help in the statistical analysis of the data, and to members of the taste panel for their help during the experimental part of the study.

A special commendation is made to the Association of Home Science Alumnae of New Zealand, under whose auspices the author was an exchange student at Kansas State University.

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APPENDIX A

Grouping of Selected Recipes

1. Cubed meats with vegetables or fruits

Beef stew
Chop suey
Sweet and sour pork

2. Cubed meats with pasta or dough

- a. Casseroles incorporating pasta or dough:
Hungarian goulash with noodles (adapted)
- b. Casseroles with pasta or dough accompaniment:
Beef stroganoff and noodles
Hungarian goulash and noodles or rice

3. Ground meats with pasta or dough

- a. Casseroles incorporating pasta or dough:
Beef and pork casserole
Creole spaghetti
Lasagna
- b. Casseroles with pasta or dough accompaniment:
American pizza
Cheeseburger pie
Meat balls and spaghetti
Spaghetti and meat sauce

4. Cubed chicken with pasta or dough

Chicken and noodles
Chicken and rice casserole
Chicken pie
Chicken tetrazini
Chicken turnovers
Curried chicken and rice

Table 5. Ounces and their decimal equivalents of a pound.

Ounces	Decimal part of a pound	Ounces	Decimal part of a pound
1/4	0.016	8-1/4	0.516
1/2	0.031	8-1/2	0.531
3/4	0.047	8-3/4	0.547
1	0.063	9	0.563
1-1/4	0.078	9-1/4	0.578
1-1/2	0.094	9-1/2	0.594
1-3/4	0.109	9-3/4	0.609
2	0.125	10	0.625
2-1/4	0.141	10-1/4	0.641
2-1/2	0.156	10-1/2	0.656
2-3/4	0.172	10-3/4	0.672
3	0.188	11	0.688
3-1/4	0.203	11-1/4	0.703
3-1/2	0.219	11-1/2	0.719
3-3/4	0.234	11-3/4	0.734
4	0.250	12	0.750
4-1/4	0.266	12-1/4	0.766
4-1/2	0.281	12-1/2	0.781
4-3/4	0.297	12-3/4	0.797
5	0.313	13	0.813
5-1/4	0.328	13-1/4	0.828
5-1/2	0.344	13-1/2	0.844
5-3/4	0.359	13-3/4	0.859
6	0.375	14	0.875
6-1/4	0.391	14-1/4	0.891
6-1/2	0.406	14-1/2	0.906
6-3/4	0.422	14-3/4	0.922
7	0.438	15	0.938
7-1/4	0.453	15-1/4	0.953
7-1/2	0.469	15-1/2	0.969
7-3/4	0.484	15-3/4	0.984
8	0.500	16	1.000

Adapted from Standardizing Recipes for Institutional Use. The American Dietetic Association, 1967.

Table 6. Portion sizes and weights of edible protein-rich food; vegetable, pasta or substitute; and gravy, sauce or substitute.

Portion size, oz	Edible protein-rich food, oz	Vegetable, pasta or substitute, oz	Gravy, sauce or substitute, oz
4	2	0.5	1.5
4	2	1	1
4	2	1.5	0.5
6	2	1	3
6	2	2	2
6	2	3	1
6	3	1	2
6	3	1.5	1.5
6	3	2	1
8	2	1	5
8	2	2	4
8	2	3	3
8	2	4	2
8	2	5	1
8	3	1	4
8	3	2	3
8	3	2.5	2.5
8	3	3	2
8	3	4	1
10	2	1	7
10	2	2	6
10	2	3	5
10	2	4	4
10	2	5	3
10	2	6	2
10	2	7	1
10	3	1	6
10	3	2	5
10	3	3	4
10	3	3.5	3.5
10	3	4	3
10	3	5	2
10	3	6	1

Grouping of recipe ingredients, conversion to weight by decimals, and percentage of each ingredient of the total weight.

1. Cubed Meats with Vegetables or Fruits.

Beef Stew

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Beef, 1" cubes	12 lb 8 oz	12.5	<u>46.57</u>	<u>46.57</u>
Vegetable or pasta				
Potatoes	2 lb	2.0	7.51	
Carrots	2 lb	2.0	7.51	
Onions	1 lb	1.0	3.76	
Celery	1 lb 8 oz	1.5	<u>5.65</u>	<u>25.41</u>
Gravy or sauce				
Water	3 qt + 1-1/4 c	6.936	26.07	
Flour	5 oz	.313	<u>1.17</u>	<u>27.24</u>
Seasonings				
Salt	1/2 c	.34	1.28	
Pepper	2 t	.03	<u>.11</u>	<u>1.39</u>
Total		26.619	99.63	99.63

Chop Suey

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Beef or veal, 1/2" cubes	5 lb	5.0	16.53	
Pork, 1/2" cubes	5 lb	5.0	<u>16.53</u>	<u>33.06</u>
Vegetable or pasta				
Green pepper, chopped	4 oz	.25	.83	
Onion, chopped	8 oz	.5	1.65	
Celery, sliced	5 lb	5.0	16.53	
Bean sprouts or Chinese vegetables	3 No.2 cans	3.75	<u>12.40</u>	<u>31.41</u>
Sauce or gravy				
Water	1 gal + 1 pt	9.423	31.16	
Cornstarch	6 oz	.375	1.24	
Soy sauce	1 - 1-1/2 c	.77	<u>2.55</u>	<u>34.95</u>
Seasonings				
Salt	1/4 c	.17	<u>.56</u>	<u>.56</u>
Total		30.238	99.98	99.98

Sweet and Sour Pork

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Pork, lean 1" cubes	10 lb	10.0	<u>35.64</u>	<u>35.64</u>
Vegetable or pasta				
Green pepper strips	1 lb	1.0	3.56	
Onions, 1/8's	2 lb	2.0	7.13	
Tomatoes, wedged	3 lb	3.0	10.69	
Pineapple chunks	1 No.10 can	4.5	<u>16.04</u>	<u>37.42</u>
Sauce or gravy				
Soy sauce	1-3/4 c	1.09	3.88	
Fat	12 oz	.75	2.67	
Broth, meat or chicken	1 qt + 1 pt	3.141	11.19	
Brown sugar	10 oz	.625	2.25	
Cornstarch	3 oz	.188	.67	
Pineapple juice	1-1/2 c	.785	2.80	
Vinegar	2 c	.96	<u>3.42</u>	<u>26.86</u>
Seasonings				
Salt	1-1/2 t	.022	<u>.08</u>	<u>.08</u>
Total		28.061	100.00	100.00

2. Cubed Meats with Pasta or Dough.

a. Casseroles Incorporating Pasta or Dough

Hungarian Goulash with Noodles (adapted)

b. Casseroles with Pasta or Dough Accompaniment

Beef Stroganoff and Noodles

Ingredients	Amt given		Wt by decimals	% total	
Protein-rich ingredients					
Beef round	10	lb	10.0	<u>35.41</u>	<u>35.41</u>
Vegetable or pasta					
Mushrooms	2	lb 8 oz	2.5	8.85	
Onions	1	lb 4 oz	1.25	4.43	
Noodles, A.P.	4	lb	4.0	<u>14.16</u>	<u>27.44</u>
Sauce or gravy					
Fat		8 oz	.5	1.77	
Beef broth	2-1/2	qt	5.235	18.54	
Cultured sour cream	2	qt	2.252	15.06	
Flour		8 oz	.5	<u>1.77</u>	<u>37.14</u>
Total			28.237	99.99	99.99

Hungarian Goulash and Noodles

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Beef, cubed	10 lb	10.0	<u>35.33</u>	<u>35.33</u>
Vegetable or pasta				
Noodles, A.P.	3 lb	3.0	10.60	
Onions	1 lb 8 oz	1.5	<u>5.30</u>	<u>15.90</u>
Sauce or gravy				
Water	4 qt	8.376	29.60	
Flour	1 lb 4 oz	1.25	4.42	
Fat	8 oz	.5	1.77	
Brown sugar	5 oz	.313	1.11	
Worcester sauce	1-1/2 c	.72	2.54	
Vinegar	2 T	.06	.21	
Catsup	1 qt	2.32	<u>8.20</u>	<u>47.85</u>
Seasonings				
Mustard, dry	1 T	.015	.05	
Paprika	1/4 c	.07	.25	
Cayenne	1/8 t	neg.		
Salt	1/4 c	.17	.60	
Garlic	1 clove	.01	<u>.03</u>	<u>.93</u>
Total		28.304	100.01	100.01

3. Ground Meats with Pasta or Dough.

a. Casseroles Incorporating Pasta or Dough

Beef and Pork Casserole

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	4 lb	4.0	19.48	
Ground pork	4 lb	4.0	19.48	
Cheese, cheddar	2 lb	2.0	<u>9.74</u>	<u>48.70</u>
Vegetable or pasta				
Onions	1 lb	1.0	4.87	
Noodles, A.P.	1 lb 12 oz	1.75	8.52	
Breadcrumbs	1 lb 2 oz	1.125	5.48	
Butter or margarine	5 oz	.313	<u>1.52</u>	<u>20.39</u>
Sauce or gravy				
Tomato soup	1-1/2 qt	3.15	15.34	
Water	1-1/2 qt	3.14	<u>15.29</u>	<u>30.63</u>
Seasonings				
Salt	1 T	.045	.22	
Pepper	1 t	.01	<u>.05</u>	<u>.27</u>
Total		20.533	99.99	99.99

Creole Spaghetti

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	5 lb	5.0	29.12	
Cheese, ground	1 lb 8 oz	1.5	<u>8.74</u>	<u>37.86</u>
Vegetable or pasta				
Spaghetti, A.P.	3 lb	3.0	17.47	
Onion	6 oz	.375	2.18	
Green Pepper	1 lb	1.0	<u>5.82</u>	<u>25.47</u>
Sauce or gravy				
Tomato puree	3 qt	6.3	<u>36.69</u>	<u>36.69</u>
Total		17.175	100.02	100.02

Lasagna

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	5 lb	5.0	22.61	
Swiss or mozzarella cheese	2 lb 8 oz	2.5	11.31	
Parmesan cheese	1-1/2 c	.281	1.27	
Cottage cheese, dry	2 lb 8 oz	2.5	<u>11.31</u>	<u>46.50</u>
Vegetable or pasta				
Noodles, Lasagna, A.P.	2 lb 8 oz	2.5	<u>11.31</u>	<u>11.31</u>
Sauce or gravy				
Tomato sauce	3 qt	6.96	31.48	
Tomato paste	1 qt	2.35	<u>10.63</u>	<u>42.11</u>
Seasonings				
Pepper	1 t	.01	.04	
Basil, crumbled	1 t	.005	.02	
Oregano, crumbled	1 T	.005	<u>.02</u>	<u>.08</u>
Total		22.111	100.00	100.00

b. Casseroles with Pasta or Dough Accompaniment

American Pizza

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Sausage	2 lb 8 oz	2.5	14.38	
Ground beef	2 lb 8 oz	2.5	14.38	
Mozarella cheese	2 lb 8 oz	2.5	<u>14.38</u>	<u>43.14</u>
Vegetable or pasta				
Flour	3 lb 10 oz	3.625	20.83	
Salt	1-1/2 t	.022	.13	
Sugar	3 T	.094	.54	
Yeast, compressed	1 oz	.063	.36	
Water	2-2/3 c	1.44	8.27	
Fat	3 T	.094	<u>.54</u>	<u>30.67</u>
Sauce or gravy				
Tomato paste	1 qt	2.35	13.50	
Tomato puree	1 qt	2.1	<u>12.07</u>	<u>25.57</u>
Seasonings				
Thyme or oregano	2 t	.01	.06	
Salt	1 T	.045	.61	
Cumin, ground	1/2 t	.002	.01	
Garlic clove	1	.01	.06	
Chili powder	2 T	.04	<u>.23</u>	<u>.97</u>
Total		17.395	100.35	100.35

Spaghetti and Meat Sauce

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	8 lb	8.0	<u>26.80</u>	<u>26.80</u>
Vegetable or pasta				
Spaghetti, A.P.	4 lb	4.0	<u>13.40</u>	<u>13.40</u>
Sauce or gravy				
Tomato puree	5 qt	10.5	35.17	
Water	1 qt	2.094	7.01	
Catsup	1-3/4 qt	4.04	13.53	
Onion	1 lb	1.0	3.35	
Worcester sauce	1/4 c	.12	<u>.40</u>	<u>59.46</u>
Seasonings				
Bay leaves	2 only	neg.		
Thyme	1 t	.005	.02	
Garlic	1 clove	.01	.03	
Cayenne pepper	2 t	.01	.03	
Salt	1-1/2 T	.067	<u>.22</u>	<u>.30</u>
Total		29.846	99.96	99.96

Cheeseburger Pie

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	10 lb	10.0	41.68	
Eggs, beaten	12 only, 1ge	1.438	5.99	
Milk	3-1/3 c	1.77	7.38	
Cheese	3 lb	3.0	<u>12.50</u>	<u>67.55</u>
Vegetable or pasta				
Pastry	3 lb	3.0	12.50	
Breadcrumbs	1 lb 10 oz	1.625	6.77	
Green pepper	1 lb	1.0	<u>4.17</u>	<u>23.44</u>
Sauce or gravy				
Tomato sauce	3 c	1.74	<u>7.25</u>	<u>7.25</u>
Seasonings				
Salt	3 oz + 2 T	.275	1.15	
Pepper	1 T	.025	.10	
Oregano	2 T	.03	.12	
Mustard	2 T	.03	.12	
Worcester sauce	2 T	.06	<u>.25</u>	<u>1.74</u>
Total		23.993	99.98	99.98

Meat Balls and Spaghetti

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Ground beef	8 lb	8.0	22.75	
Ground pork	4 lb	4.0	11.38	
Milk	1 pt	1.063	<u>3.02</u>	<u>37.15</u>
Vegetable or pasta				
Spaghetti, A.P.	4 lb	4.0	11.38	
Bread	6 slices (9oz)	.563	<u>1.60</u>	<u>12.98</u>
Sauce or gravy				
Tomato soup	3 qt	6.3	17.92	
Tomato paste	1-1/4 qt	2.9	8.25	
Water	3-1/2 qt	7.329	20.84	
Worcester sauce	1/2 c	.25	.68	
Sugar	2 T	.063	.18	
Onions	8 oz	.5	<u>1.42</u>	<u>49.29</u>
Seasonings				
Salt	2 T	.09	.25	
Pepper	2 t	.02	.06	
Paprika	2 T	.04	.11	
Mustard	2 T	.03	.08	
Garlic	4 cloves	.025	<u>.07</u>	<u>.57</u>
Total		35.163	99.99	99.99

4. Cubed Chicken with Pasta or Dough.

Chicken and Noodles

Ingredients	Amt given	Wt by decimals.	% total	
Protein-rich ingredients				
Chicken, E.P.	5 lb	5.0	<u>33.69</u>	<u>33.69</u>
Vegetable or pasta				
Noodles, A.P.	2 lb 8 oz	2.5	<u>16.84</u>	<u>16.84</u>
Sauce or gravy				
Chicken fat or butter	10 oz	.625	4.21	
Flour	6 oz	.375	2.53	
Chicken stock	3 qt	6.282	<u>42.33</u>	<u>49.07</u>
Seasonings				
Salt	1 T	.045	.30	
Pepper	1 t	.01	<u>.07</u>	<u>.37</u>
Total		14.837	99.97	99.97

Chicken and Rice Casserole

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Cooked chicken	5 lb	5.0	<u>21.89</u>	<u>21.89</u>
Vegetable or pasta				
Rice	4 lb	4.0	17.51	
Mushrooms, sliced	1 lb 12 oz	1.75	7.66	
Almonds, shredded	8 oz	.5	2.19	
Pimiento, chopped	4 oz	.25	1.09	
Breadcrumbs	12 oz	.75	3.28	
Butter	4 oz	.25	<u>1.09</u>	<u>32.82</u>
Sauce or gravy				
Chicken fat or butter	8 oz	.5	2.19	
Flour	4 oz	.25	1.09	
Milk	2-1/2 qt	5.315	23.27	
Chicken broth	2 qt	4.188	<u>18.34</u>	<u>44.89</u>
Seasonings				
Salt	2 T	.09	<u>.39</u>	<u>.39</u>
Total		22.843	99.99	99.99

Chicken Pie

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Chicken, cooked	6 lb	6.0	<u>19.80</u>	<u>19.80</u>
Vegetable or pasta				
Batter crust	6 qt	9.369	30.92	
Potatoes	3 lb 8 oz	3.5	11.55	
Peas	2 lb	2.0	<u>6.60</u>	<u>49.07</u>
Sauce or gravy				
Chicken gravy	1 gal	9.431	<u>31.12</u>	<u>31.12</u>
Total		30.300	99.99	99.99

Chicken Tetrazini

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Chicken, cooked	5 lb	5.0	29.43	
Cheese, shredded	8 oz	.5	<u>2.94</u>	<u>32.37</u>
Vegetable or pasta				
Spaghetti, A.P.	2 lb	2.0	11.77	
Mushrooms	1 lb	1.0	5.88	
Pimiento	1 c	.49	2.88	
Parsley	2 T	.03	<u>.18</u>	<u>20.71</u>
Sauce or gravy				
Butter or margarine	12 oz	.75	4.41	
Onion	6 oz	.375	2.21	
Flour	6 oz	.375	2.21	
Milk	3 qt	6.378	<u>37.54</u>	<u>46.37</u>
Seasonings				
Salt	2 T	.09	<u>.53</u>	<u>.53</u>
Total		16.988	99.98	99.98

Chicken Turnovers

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Chicken, cooked	5 lb	5.0	<u>39.18</u>	<u>39.18</u>
Vegetable or pasta				
Pastry	5 lb	5.0	<u>39.18</u>	<u>39.18</u>
Sauce or gravy				
Chicken fat or butter	6 oz	.375	2.94	
Flour	4 oz	.25	1.96	
Chicken broth	1 qt	2.094	<u>16.41</u>	<u>21.31</u>
Seasonings				
Salt	1 T	.045	<u>.35</u>	<u>.35</u>
Total		12.764	100.02	100.02

Curried Chicken and Rice

Ingredients	Amt given	Wt by decimals	% total	
Protein-rich ingredients				
Hens A.P. (38 lb) = E.P.	10 lb	10.0	<u>35.79</u>	<u>35.79</u>
Vegetable or pasta				
Rice	5 lb	5.0	<u>17.89</u>	<u>17.89</u>
Sauce or gravy				
Butter or chicken fat	1 lb	1.0	3.58	
Flour	1 lb 4 oz	1.25	4.47	
Chicken broth	5 qt	10.47	<u>37.47</u>	<u>45.52</u>
Seasonings				
Curry powder	2 oz	.125	<u>.45</u>	<u>.45</u>
Accompaniments not counted.				
Total		27.945	99.65	99.65

APPENDIX B

Method Used for Adjusting Recipes

1. Using one of the four selected recipes, and a Recipe Expansion Sheet, enter original recipe ingredients and total weight for 50 portions.
2. Enter number of portions and the size of portion required in the adjusted recipe.
3. Record weight of cooked edible protein-rich food per portion required.
4. From Table 6, Appendix A, select portions and ingredient groups to be tested.
5. Calculate amount of meat required using the following formula:

$$K (x) N = A.P.$$

Where K = factor for cooking and handling loss for the meat cut
(Appendix B, p. 53)

x = pounds of cooked edible meat required per portion

N = number of servings required

A.P. = as purchased

Enter the required amount of meat as purchased (A.P.) on the Recipe Expansion Sheet (Appendix B).

6. Calculate total amount of cooked product required, add handling and cooking losses (Appendix B, p. 54), and enter the desired total amount of A.P. ingredients. In these calculations, the weight of spaghetti and noodles used is cooked edible portion.
7. Subtract meat A.P. from the total new weight to determine the combined weight of the remaining ingredients.
8. Divide the total from (7) by the number of ounces of vegetable, pasta or substitute plus ounces of gravy, sauce or substitute. This will form the basis for determining the new amounts for these ingredient groups.
9. Determine amounts of other ingredients to give the required weight in each ingredient group and round off.

Conversion Factors for Meats and Poultry Used
in Selected Entrees (Value = k)

Beef, ground	1.388
round, (without bone)	1.369
stewing steak, (without bone)	1.515
Pork, ground	1.754
loin, (without bone)	1.369
sausage, (bulk)	2.083
Veal, stewing steak, (without bone)	1.515
Chicken, stewing, (dressed, excluding giblets)	2.941
(ready-to-cook, excl. giblets)	2.272

Adapted from Food buying guide for Type A school lunches. U.S.D.A.
Bulletin P A - 270, 1964.

Cooking and Handling Losses

- 5% handling loss only
- 10% salmon loaves, tuna loaves, bread dressings
- 15% creole shrimps, and similar dishes using cooked shrimp
- 20% creamed tuna, salmon a la king
- 25% meat loaves
- 30% chicken a la king
- 45% stews and ragouts

Adapted from Callahan, J.F. and Aldrich, P.J. 1959. New method of calculating yield of recipes. J. Amer. Diet. Assoc. 35:45.

RECIPE EXPANSION SHEET

NAME:

NUMBER OF PORTIONS:

PORTION SIZE:

ADJUSTED TOTAL WEIGHT:

EDIBLE PROTEIN-RICH FOOD PER PORTION:

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.

b.

c.

d.

e.

f.

g.

Ingredients:

Original recipe (50 S)

a

b

c

d

e

f

g

TOTAL WEIGHT:

RECIPE EXPANSION SHEET

NAME: Creole Spaghetti

NUMBER OF PORTIONS: 50

PORTION SIZE: 6-oz

ADJUSTED TOTAL WEIGHT: 27.187 lb

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	2	:	1	:	3
b.	2	:	2	:	2
c.	2	:	3	:	1
d.					
e.					
f.					
g.					

Ingredients:	Original recipe (50 S)		a	b	c	d	e	f	g
Ground beef, 1b	5.0		6.56	6.56	6.56				
Cheese, ground, 1b	1.5		1.5	1.5	1.5				
Spaghetti, A.P. 1b [*]	3.0		1.1	2.044	3.14				
Green pepper, 1b	.375		.375	.375	.375				
Onion, 1b	1.0		1.0	1.0	1.0				
Tomato puree, 1b	6.3		14.34	9.56	4.78				
Seasonings	.125		.125	.125	.125				
TOTAL WEIGHT	26.3		28.3	27.296	27.9				

^{*}Total weight is calculated using E.P. weights for spaghetti (1 lb A.P. = 4 lb E.P.)

RECIPE EXPANSION SHEET

NAME: Creole Spaghetti

NUMBER OF PORTIONS: 50

PORTION SIZE: 6-oz

ADJUSTED TOTAL WEIGHT: 27.187 lb

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	2
b.	3	:	1.5	:	1.5
c.	3	:	2	:	1
d.					
e.					
f.					
g.					

Ingredients:	Original recipe (50 S)						
	a	b	c	d	e	f	g
Ground beef, 1b	5.0	10.875	10.875				
Cheese, ground, 1b	1.5	1.5	1.5				
Spaghetti, A.P. 1b [*]	3.0	1.5	2.12				
Green pepper, 1b	.375	.375	.375				
Onion, 1b	1.0	1.0	1.0				
Tomato puree, 1b	6.3	9.87	7.4	4.93			
Seasonings, 1b	.125	.125	.125	.125			
TOTAL WEIGHT	26.3	27.285	27.275	27.285			

* Total weight is calculated using E.P. weights for spaghetti (1 lb A.P. = 4 lb E.P.)

RECIPE EXPANSION SHEET

NAME: Creole Spaghetti

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	2	:	1	:	5
b.	2	:	2	:	4
c.	2	:	3	:	3
d.	2	:	4	:	2
e.	2	:	5	:	1
f.					
g.					

Ingredients:	Original recipe (50 S)					a	b	c	d	e	f	g
Ground beef, 1b	5.0					6.56	6.56	6.56	6.56	6.56		
Cheese, ground, 1b	1.5					1.5	1.5	1.5	1.5	1.5		
Spaghetti, A.P. 1b*	3.0					.82	1.99	3.17	4.346	5.51		
Green pepper, 1b	.375					.375	.375	.375	.375	.375		
Onion, 1b	1.0					1.0	1.0	1.0	1.0	1.0		
Tomato puree, 1b	6.3					23.45	18.76	14.07	9.38	4.69		
Seasonings, 1b	.125					.125	.125	.125	.125	.125		
TOTAL WEIGHT	26.3					36.29	36.28	36.31	36.32	36.29		

*Total weight is calculated using E.P. weights for spaghetti (1 1b A.P. = 4.0 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Creole Spaghetti

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 lb

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	4
b.	3	:	2	:	3
c.	3	:	2.5	:	2.5
d.	3	:	3	:	2
e.	3	:	4	:	1
f.					
g.					

Ingredients:	Original recipe (50 S)					a	b	c	d	e	f	g
Ground beef, 1b	5.0	10.875	10.875	10.875	10.875	10.875	1.5	1.5	1.5	10.875	1.5	10.875
Cheese, ground, 1b	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Spaghetti, A.P. 1b*	3.0	.825	1.79	2.64	3.23	4.46						
Green pepper, 1b	.375	.375	.375	.375	.375	.375						
Onion, 1b	1.0	1.0	1.0	1.0	1.0	1.0						
Tomato puree, 1b	6.3	19.1	14.325	11.93	9.55	4.77						
Seasonings, 1b	.125	.125	.125	.125	.125	.125						
TOTAL WEIGHT	26.3	36.275	35.36	36.365	36.345	36.485						

*Total weight is calculated using E.P. weights for spaghetti (1 lb A.P. = 4 lb E.P.)

RECIPE EXPANSION SHEET

NAME: Spaghetti and Meat Sauce

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	2	:	1	:	5
b.	2	:	2	:	4
c.	2	:	3	:	3
d.	2	:	4	:	2
e.	2	:	5	:	1

f.

g.

Ingredients:	Original recipe (50 S)	a	b	c	d	e	f	g
Ground beef, 1b	8.0	8.4	8.4	8.4	8.4	8.4		
Spaghetti, A.P. 1b*	4.0	1.16	2.325	3.487	4.65	5.77		
Tomato puree, 1b	10.5	13.0	11.0	9.0	7.0	3.5		
Water, 1b	2.094	3.0	2.25	1.25	.5	.25		
Catsup, 1b	4.04	5.5	4.0	2.75	1.0	.5		
Onion, 1b	1.0	1.5	1.0	.75	.5	.25		
Worcester sauce, 1b	.12	.12	.12	.12	.1	.1		
Seasonings, 1b	.092	.092	.092	.092	.092	.092		

TOTAL WEIGHT	41.846	36.252	36.162	36.31	36.192	36.172		
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*Total weight is calculated using E.P. weights for spaghetti (1 1b A.P. = 4 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Spaghetti and Meat Sauce

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	4
b.	3	:	2	:	3
c.	3	:	2.5	:	2.5
d.	3	:	3	:	2
e.	3	:	4	:	1
f.					
g.					

Ingredients:	Original recipe (50 S)	a	b	c	d	e	f	g
Ground beef, 1b	8.0	13.0	13.0	13.0	13.0	13.0		
Spaghetti A.P. 1b*	4.0	1.16	2.325	2.9	3.487	4.65		
Tomato puree, 1b	10.5	11.0	9.0	8.25	7.0	3.4		
Water, 1b	2.094	2.15	.75	.5	.3	.2		
Catsup, 1b	4.04	4.25	3.0	2.0	1.5	.65		
Onion, 1b	1.0	1.0	1.0	.75	.4	.2		
Worcester sauce, 1b	.12	.12	.12	.12	.12	.1		
Seasonings, 1b	.092	.092	.092	.092	.092	.092		

TOTAL WEIGHT	41.846	36.252	36.262	36.31	36.36	36.242
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*Total weight is calculated using E.P. weights for spaghetti (1 lb A.P. = 4.0 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Spaghetti and Meat Sauce

NUMBER OF PORTIONS: 50

PORTION SIZE: 10-oz

ADJUSTED TOTAL WEIGHT: 45.375 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

	a.	2	:	1	:	7	
	b.	2	:	2	:	6	
	c.	2	:	3	:	5	
	d.	2	:	4	:	4	
	e.	2	:	5	:	3	
	f.	2	:	6	:	2	
	g.	2	:	7	:	1	
Ingredients:	Original recipe (50 S)	a	b	c	d	e	f g
Ground beef, 1b	8.0	8.4	8.4	8.4	8.4	8.4	8.4
Spaghetti, A.P. 1b*	4.0	1.155	2.31	3.465	4.62	5.775	6.93 8.085
Tomato puree, 1b	10.5	18.5	15.5	13.0	11.0	8.5	5.6 2.8
Water, 1b	2.094	3.75	3.5	3.0	2.25	1.5	1.0 .5
Catsup, 1b	4.04	7.5	6.5	6.0	4.0	3.0	2.0 1.0
Onion, 1b	1.0	2.0	1.75	1.0	1.0	.75	.5 .25
Worcester sauce, 1b	.12	.24	.18	.15	.12	.1	.06 .03
Seasonings, 1b	.092	.14	.1	.092	.092	.092	.06 .05

TOTAL WEIGHT 41.846 45.15 45.17 45.502 45.342 45.442 45.34 45.37

* Total weight is calculated using E.P. weights for spaghetti (1 1b A.P. = 4 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Spaghetti and Meat Sauce

NUMBER OF PORTIONS: 50

PORTION SIZE: 10-oz

ADJUSTED TOTAL WEIGHT: 45.375 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	6
b.	3	:	2	:	5
c.	3	:	3	:	4
d.	3	:	3.5	:	3.5
e.	3	:	4	:	3
f.	3	:	5	:	2
g.	3	:	6	:	1

Ingredients:	Original recipe (50 S)	a	b	c	d	e	f	g
Ground beef, 1b	8.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Spaghetti, A.P. 1b*	4.0	1.12	2.25	3.375	4.05	4.57	5.77	6.9
Tomato puree, 1b	10.5	15.0	13.0	11.0	9.5	8.0	5.5	2.0
Water, 1b	2.094	3.0	2.5	2.0	1.5	1.0	.5	.2
Catsup, 1b	4.04	8.0	6.0	4.5	4.0	3.5	2.0	1.0
Onion, 1b	1.0	1.5	1.25	1.0	1.0	1.0	1.0	.75
Worcester sauce, 1b	.12	.3	.2	.2	.12	.12	.12	.12
Seasonings	.092	.092	.092	.092	.092	.092	.092	.092
TOTAL WEIGHT	41.846	45.372	45.042	45.292	45.412	44.992	45.292	44.762

*Total weight is calculated using E.P. weights for spaghetti (1 1b A.P. = 4 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 6-OZ

ADJUSTED TOTAL WEIGHT: 27.187 lb

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED:	Protein-rich food	Vegetable, pasta or subs.	Gravy, sauce or subs.
1	1	1	1
2	1	1	1
3	1	1	1
4	1	1	1
5	1	1	1
6	1	1	1
7	1	1	1
8	1	1	1
9	1	1	1
10	1	1	1
11	1	1	1
12	1	1	1
13	1	1	1
14	1	1	1
15	1	1	1
16	1	1	1
17	1	1	1
18	1	1	1
19	1	1	1
20	1	1	1
21	1	1	1
22	1	1	1
23	1	1	1
24	1	1	1
25	1	1	1
26	1	1	1
27	1	1	1
28	1	1	1
29	1	1	1
30	1	1	1
31	1	1	1
32	1	1	1
33	1	1	1
34	1	1	1
35	1	1	1
36	1	1	1
37	1	1	1
38	1	1	1
39	1	1	1
40	1	1	1
41	1	1	1
42	1	1	1
43	1	1	1
44	1	1	1
45	1	1	1
46	1	1	1
47	1	1	1
48	1	1	1
49	1	1	1
50	1	1	1
51	1	1	1
52	1	1	1
53	1	1	1
54	1	1	1
55	1	1	1
56	1	1	1
57	1	1	1
58	1	1	1
59	1	1	1
60	1	1	1
61	1	1	1
62	1	1	1
63	1	1	1
64	1	1	1
65	1	1	1
66	1	1	1
67	1	1	1
68	1	1	1
69	1	1	1
70	1	1	1
71	1	1	1
72	1	1	1
73	1	1	1
74	1	1	1
75	1	1	1
76	1	1	1
77	1	1	1
78	1	1	1
79	1	1	1
80	1	1	1
81	1	1	1
82	1	1	1
83	1	1	1
84	1	1	1
85	1	1	1
86	1	1	1
87	1	1	1
88	1	1	1
89	1	1	1
90	1	1	1
91	1	1	1
92	1	1	1
93	1	1	1
94	1	1	1
95	1	1	1
96	1	1	1
97	1	1	1
98	1	1	1
99	1	1	1
100	1	1	1

Recipe code

	2	:	1	:	1	3
a.	2	:	1	:	1	3
b.	2	:	2	:	2	2
c.	2	:	3	:	1	1
d.						

Ingredients:

Original recipe (50 s)

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Beef, cubed, 1b
Noodles, A.P. 1b
Onions, 1b

Water, 1b
Flour, 1b
Fat, 1b
Brown sugar, 1b
Worcester sauce, 1b
Vinegar, 7b
Catsup, 1b

Seasonings, 1b

TOTAL WEIGHT

34.304	27.230	27.225	27.295
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* Total weight is calculated using E.P. weights for noodles (1 lb A.P. = 3 lb E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 6-oz

ADJUSTED TOTAL WEIGHT: 27.187 lb

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	2
b.	3	:	1.5	:	1.5
c.	3	:	2	:	1
d.					
e.					
f.					
g.					

Ingredients	Original recipe (50 S)	a	b	c	d	e	f	g
Beef, cubed, 1b *	10.0	14.125	14.125	14.125				
Noodles, A.P. 1b	3.0	.95	1.7	2.4				
Onions, 1b	1.5	1.5	1.5	1.5				
Water, 1b	8.375	5.4	4.3	2.6				
Flour, 1b	1.25	.6	.35	.3				
Fat, 1b	.5	.25	.18	.13				
Brown sugar, 1b	.313	.2	.15	.1				
Worcester sauce, 1b	.72	.5	.3	.25				
Vinegar, 1b	.06	.04	.04	.03				
Catsup, 1b	2.32	1.5	1.0	.75				
Seasonings, 1b	.265	.265	.265	.2				

TOTAL WEIGHT 34.304 27.23 27.31 27.185

* Total weight is calculated using E.P. weights for noodles (1 lb A.P. = 3 lb E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	2	:	1	:	5
b.	2	:	2	:	4
c.	2	:	3	:	3
d.	2	:	4	:	2
e.	2	:	5	:	1
f.					
g.					

Ingredients:	Original recipe (50 S)	a	b	c	d	e	f	g
Beef, cubed, 1b	10.0	9.3	9.3	9.3	9.3	9.3		
Noodles, A.P. 1b *	3.0	1.0	2.5	4.0	5.5	7.0		
Onions, 1b	1.5	1.5	1.5	1.5	1.5	1.5		
Water, 1b	8.375	14.5	10.5	8.3	5.2	2.5		
Flour, 1b	1.25	2.25	2.0	1.25	1.0	.5		
Fat, 1b	.5	.75	.6	.5	.3	.15		
Brown sugar, 1b	.313	.6	.5	.3	.2	.1		
Worcester sauce, 1b	.72	1.25	1.0	.72	.5	.25		
Vinegar, 1b	.06	.1	.08	.06	.04	.03		
Catsup, 1b	2.32	3.25	3.0	2.0	1.5	.75		
Seasonings, 1b	.265	.35	.3	.265	.265	.2		
TOTAL WEIGHT	34.304	36.85	36.28	36.195	36.305	36.28		

* Total weight is calculated using E.P. weights for noodles (1 1b A.P. = 3 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 8-oz

ADJUSTED TOTAL WEIGHT: 36.25 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

a.	3	:	1	:	4
b.	3	:	2	:	3
c.	3	:	2.5	:	2.5
d.	3	:	3	:	2
e.	3	:	4	:	1
f.					
g.					

Ingredients:	Original recipe (50 S)	a	b	c	d	e	f	g
Beef, cubed, 1b	10.0	14.125	14.125	14.125	14.125	14.125		
Noodles, A.P. 1b *	3.0	1.0	2.45	3.2	4.0	5.4		
Onions, 1b	1.5	1.5	1.5	1.5	1.5	1.5		
Water, 1b	8.375	11.0	8.0	6.5	5.0	2.5		
Flour, 1b	1.25	1.65	1.15	1.0	.85	.4		
Fat, 1b	.5	.5	.5	.4	.4	.2		
Brown sugar, 1b	.313	.425	.313	.3	.3	.15		
Worcester sauce, 1b	.72	.8	.70	.6	.6	.3		
Vinegar, 1b	.06	.06	.06	.06	.05	.03		
Catsup, 1b	2.32	3.0	2.32	2.0	1.4	.7		
Seasonings, 1b	.265	.265	.265	.265	.265	.265		
TOTAL WEIGHT	34.304	36.325	36.283	35.35	36.49	36.37		

* Total weight has been calculated using E.P. weights for noodles (1 1b A.P. = 3.0 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 10-oz

ADJUSTED TOTAL WEIGHT: 45.375 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 2-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

	a.	b.	c.	d.	e.	f.	g.
2	2	2	2	2	2	2	2
10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
8.375	8.375	8.375	8.375	8.375	8.375	8.375	8.375
1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
.5	.5	.5	.5	.5	.5	.5	.5
.313	.313	.313	.313	.313	.313	.313	.313
.72	.72	.72	.72	.72	.72	.72	.72
.06	.06	.06	.06	.06	.06	.06	.06
2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
.265	.265	.265	.265	.265	.265	.265	.265
34.304	34.304	34.304	34.304	34.304	34.304	34.304	34.304
45.15	45.15	45.15	45.15	45.15	45.15	45.15	45.15
45.295	45.295	45.295	45.295	45.295	45.295	45.295	45.295
45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3
45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38
45.36	45.36	45.36	45.36	45.36	45.36	45.36	45.36
45.44	45.44	45.44	45.44	45.44	45.44	45.44	45.44
45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34

*Total weight is calculated using E.P. weights for noodles (1 1b A.P. = 3 1b E.P.)

RECIPE EXPANSION SHEET

NAME: Hungarian Goulash

NUMBER OF PORTIONS: 50

PORTION SIZE: 10-oz

ADJUSTED TOTAL WEIGHT: 45.375 1b

EDIBLE PROTEIN-RICH FOOD PER PORTION: 3-oz

RATIOS CALCULATED: Protein-rich food Vegetable, pasta or subs. Gravy, sauce or subs.

Recipe code

	a	b	c	d	e	f	g
a.	3	1	1	:	6		
b.	3	2	2	:	5		
c.	3	3	3	:	4		
d.	3	3.5	3.5	:	3.5		
e.	3	4	4	:	3		
f.	3	5	5	:	2		
g.	3	6	6	:	1		
Ingredients	Original recipe (50 S)						
Beef, cubed, 1b	10.0	14.125	14.125	14.125	14.125	14.125	14.125
Noodles, A.P. 1b *	3.0	2.47	3.96	4.7	5.45	6.93	8.42
Onions, 1b	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Water, 1b	8.375	14.0	12.0	10.15	8.25	6.0	3.0
Flour, 1b	1.25	2.0	1.5	1.35	1.2	.7	.3
Fat, 1b	.5	.7	.5	.5	.5	.3	.1
Brown sugar, 1b	.313	.5	.35	.32	.3	.2	.1
Worcester sauce, 1b	.72	1.0	.6	.55	.5	.3	.14
Vinegar, 1b	.06	.1	.08	.07	.06	.04	.02
Catsup, 1b	2.32	3.6	2.5	2.4	2.3	1.2	.6
Seasonings, 1b	.265	.4	.3	.275	.25	.2	.2
TOTAL WEIGHT	34.304	45.47	45.335	45.34	45.335	45.355	45.345

* Total weight is calculated using E.P. weights for noodles (1 lb A.P. = 3 lb E.P.)

Table 7. Order of testing as determined by random sample table (Barnes, 1968).

Entree	Portion size, oz	Protein-rich food, oz	Vegetable, pasta or substitute, oz	Gravy, sauce or substitute, oz	Test no.
Hungarian goulash with noodles	6	2	1	3	10
	6	2	3	1	22
	6	3	2	1	9
	8	2	4	2	16
	8	3	2	3	21
	8	3	3	2	3
Hungarian goulash and noodles	10	2	3	5	14
	10	3	4	3	15
	10	3	5	2	8
	8	2	4	2	12
	8	3	2	3	18
	8	3	3	2	24
	8	3	3	2	24
Creole spaghetti	6	2	1	3	1
	6	2	3	1	13
	6	3	2	1	11
	8	2	4	2	6
	8	3	2	3	7
	8	3	3	2	20
	8	3	3	2	20
Spaghetti and meat sauce	10	2	3	5	5
	10	3	4	3	17
	10	3	5	2	4
	8	2	4	2	2
	8	3	2	3	19
	8	3	3	2	23
	8	3	3	2	23

Spaghetti and Meat Sauce

25 servings

Test:	2	4	5	17	19	23
Ground beef, lb.	4.2	6.5	4.2	6.5	6.5	6.5
Spaghetti, A.P. lb.	2.325	2.88	1.73	2.29	1.15	1.744
E.P.	9.3	11.52	6.92	9.16	4.6	6.976
Tomato puree, lb.	3.5	2.75	6.5	4.0	4.5	3.5
Water, lb.	.25	.25	1.5	.5	.375	.15
Catsup, lb.	.5	1.0	3.0	1.75	1.5	.75
Onion, lb.	.25	.5	.5	.5	.5	.2
Worcester sauce, lb.	.05	.06	.075	.06	.06	.06
Bayleaves	1	1	1	1	1	1
Thyme, t.	1/2	1/2	1/2	1/2	1/2	1/2
Garlic, lb.	.005	.005	.005	.005	.005	.005
Cayenne, t.	1	1	1	1	1	1
Salt, Tb. *	3/4	3/4	3/4	3/4	3/4	3/4
TOTAL WEIGHT *	18.096	22.636	22.741	22.516	18.081	18.182

Procedure:

1. Brown beef. Drain off excess fat.
2. Add remaining sauce ingredients.
3. Cook slowly, stirring frequently, until thickened, approximately half an hour.
4. Cook spaghetti in boiling salted water. Drain well.
5. Serve in weighed stainless steel counter pans.
6. Serve the appropriate portion size.

* Total weight is calculated using the spaghetti E.P. weight.

Creole Spaghetti

25 servings

Test:	1	6	7	11	13	20
Ground beef, lb.	3.28	3.28	5.437	5.437	3.28	5.437
Cheese, ground, lb.	.75	.75	.75	.75	.75	.75
Spaghetti, A.P. lb.	.425	2.173	1.02	1.07	1.62	1.616
E.P.	1.7	8.692	4.08	4.28	6.48	6.464
Green pepper, lb.	.187	.187	.187	.187	.187	.187
Onion, lb.	.5	.5	.5	.5	.5	.5
Tomato puree, lb.	7.17	4.69	7.162	2.465	2.39	4.775
Salt, lb.	.063	.063	.063	.063	.063	.063
TOTAL WEIGHT*	13.650	18.162	18.179	13.682	13.65	18.176

Procedure:

1. Brown beef, onion and garlic. Drain off excess fat.
2. Add puree.
3. Cook spaghetti in boiling salted water. Drain well.
4. Add sauce, pour into a weighed stainless steel baking dish 12" x 20" x 2".
5. Sprinkle cheese on top.
6. Bake 45 minutes at 325°F.
7. Serve the appropriate size portion.

*Total weight is calculated using the spaghetti E.P. weight.

Hungarian Goulash

Hungarian Goulash									
Test:	3,24	8*	9°	10°	12,16	14*	15*	18,21	22°
Beef, cubed, 1b.	7.062	7.062	7.062	4.65	4.65	4.65	7.062	7.062	4.65
Noodles, A.P. 1b.	2.00	3.465	1.2	.5	2.75	2.0	2.725	1.225	2.00
E.P.	6.00	10.395	3.6	1.5	8.25	6.0	8.175	3.675	6.0
Onions, 1b.	.75	.75	.75	.75	.75	.75	.75	.75	.75
Brown sugar, 1b.	.15	.1	.05	.156	.1	.25	.15	.156	.05
Mustard, dry, 1b.	.007	.005	.005	.007	.007	.01	.007	.007	.007
Paprika, 1b.	.035	.025	.025	.035	.035	.05	.03	.035	.035
Cayenne pepper, t.	1/16	1/16	1/16	1/16	1/16	1/8	1/16	1/16	1/16
Salt, 1b.	.085	.075	.075	.085	.085	.15	.08	.085	.085
Worcester sauce, 1b.	.3	.15	.125	.36	.25	.5	.25	.35	.125
Vinegar, 1b.	.025	.02	.015	.03	.02	.05	.03	.03	.015
Catsup, 1b.	.7	.6	.375	1.00	.75	1.75	1.15	1.16	.25
Water, 1b.	1.875	2.25	.975	3.138	1.95	5.34	3.093	3.00	1.05
Flour, 1b.	.425	.35	.15	.6	.5	1.0	.6	.575	.2
Water, cold, 1b.	.625	.75	.325	1.046	.65	1.78	1.031	1.00	.35

Garlic, 1b.	.005	.005	.005	.005	.005	.01	.005	.005	.005
Fat, 1b.	.2	.15	.065	.25	.15	.375	.25	.25	.075
TOTAL WEIGHT#	18.244	22.687	13.602	13.612	18.152	22.665	22.663	18.140	13.647

Procedure:

1. Brown beef, onions and garlic in fat. Drain off excess fat.
2. Combine seasonings and first measure of water.
3. Add to browned meat.
4. Cover container and simmer 2-1/2 to 3 hours or until meat is tender.
5. Cook noodles in boiling salted water. Drain well.**
6. Mix flour and cold water until smooth; add to hot mixture and cook till thickened.
7. Add noodles and heat through.**
8. Cook noodles in boiling salted water. Drain well.°°
9. Serve into weighed stainless steel counter pans.
10. Serve the appropriate portion sizes.

° Recipe from Group 2a only.

* Recipe from Group 2b only.

°° Omit step from Group 2a recipe.

** Omit step from Group 2b recipe.

Total weight is calculated using the noodles E.P. weight.

APPENDIX C

Instructions to Panel Members

The objective of this study is the formulation of guidelines for standardizing meat (and poultry) entree recipes to meet requirements for 2-oz and 3-oz total edible protein-rich food for portions of different sizes that will comply with determinants for cost, acceptability and nutritional adequacy. We are particularly interested in the ratios of edible protein-rich food to vegetable, pasta or substitute to gravy, sauce or substitute, and how the ratios presented are accepted by you. The ratios selected for evaluation were chosen as extremes that may be possible in practice. In theory, there are more extreme combinations that we decided were definitely impractical.

As we shall be testing 3 products a day on eight days, you will not be asked to consume the total amount, but we would like specific comments as to whether or not you believe that you could eat the serving size presented. Comments referring to general appearance and overall acceptability, particularly in reference to the ratios of protein-rich food to vegetable, pasta or substitute to gravy, sauce or substitute are strongly encouraged.

- I. Tasting will be done in Room 124.
- II. Please refrain from eating or smoking for one hour before the tasting.
- III. Please refrain from wearing perfumes or hand lotions, and do not use soap when washing hands prior to tasting.
- IV. Booths will be set up with the following:
 1. Score sheet.
 2. Pencil.
 3. Fork.
 4. Glass with water.
 5. Napkin.

-2-

- V. There will be two actual sized servings of the product on display for you to judge.
- VI. When tasting, try to get a representative sample of the total product. This is most important, as it is the overall combination that is important to the consumer.
- VII. Please indicate your identity with your I.D. number. Names are not necessary; the I.D. will serve to identify one member's comments.
- VIII. Please use scores from (1) unsatisfactory, to (5) superior, and make comments as applicable. These are desirable.

SCORE CARD

Identification Number:

Date:

Product:

Factor	Score	Comments
General Appearance		
Consistency		
Flavor		
Overall Acceptability		

Scores:

1. Unsatisfactory
2. Fair
3. Good
4. Excellent
5. Superior

Comments may be continued on the back of the page.

SUMMARY OF INDIVIDUAL SCORE SHEETS

NAME OF PRODUCT:

DATE TESTED:

GROUP:

EVALUATED BY:

NUMBER OF PORTIONS:

COMPOSITION IN OZ E.P.:

Protein-rich food:
Vegetable, pasta or subs.:
Gravy, sauce or subs.:

TOTAL WEIGHT A.P.:

TOTAL DESIRED E.P. WEIGHT:

TOTAL ACTUAL E.P. WEIGHT:

TOTAL COST:

COST PER PORTION:

LINE SPREAD SCORE:

IDENTIFICATION	GENERAL APPEARANCE	CONSISTENCY	FLAVOR	ACCEPTABILITY
TOTAL AVERAGE				

COMMENTS AND DISCUSSION

APPENDIX D

EXPLANATION OF PLATE III

Comparison of 3 combinations of ingredient groups for 4 selected recipes (8-oz portions)

A. Hungarian Goulash with Noodles

Top: 3-oz protein-rich food; 2-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute
Left: 3-oz protein-rich food; 3-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute
Right: 2-oz protein-rich food; 4-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute

B. Hungarian Goulash and Noodles

Top: 3-oz protein-rich food; 2-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute
Left: 2-oz protein-rich food; 4-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute
Right: 3-oz protein-rich food; 3-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute

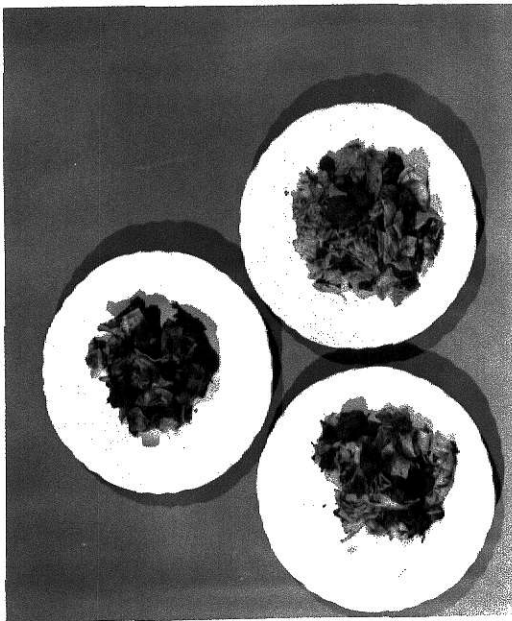
C. Creole Spaghetti

Top: 3-oz protein-rich food; 2-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute
Left: 3-oz protein-rich food; 3-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute
Right: 2-oz protein-rich food; 4-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute

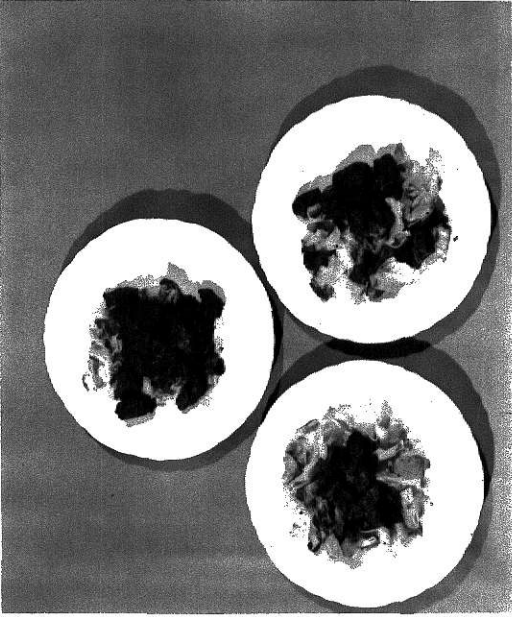
D. Spaghetti and Meat Sauce

Top: 3-oz protein-rich food; 2-oz vegetable, pasta or substitute; 3-oz gravy, sauce or substitute
Left: 3-oz protein-rich food; 3-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute
Right: 2-oz protein-rich food; 4-oz vegetable, pasta or substitute; 2-oz gravy, sauce or substitute

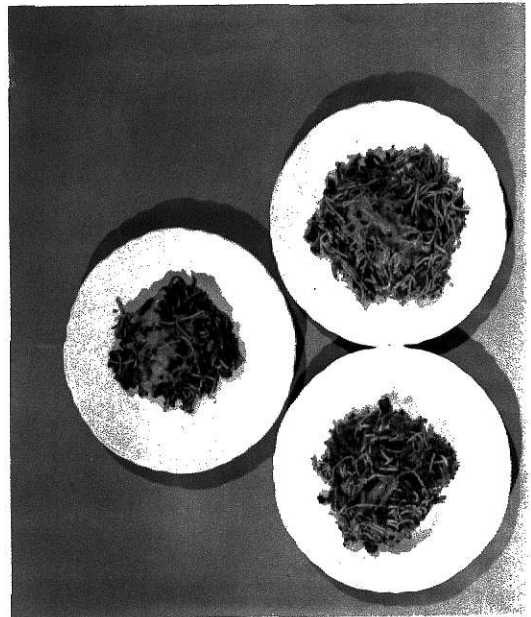
PLATE III



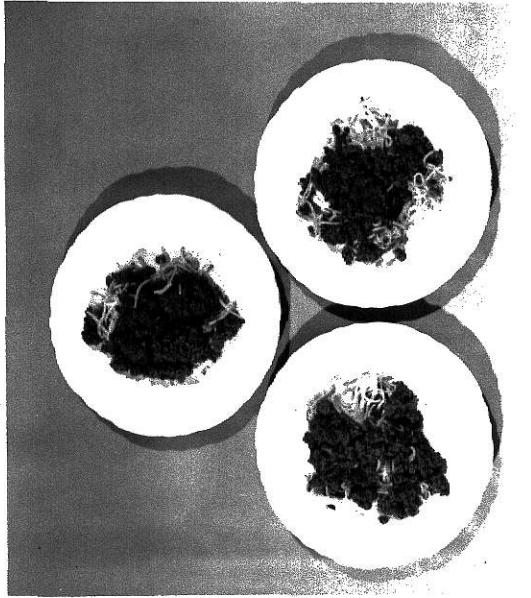
A



B



C



D

Table 8. Mean scores for different ratios of ingredient groups.

1. 6-oz serving (2 samples)

Factor	Panel Members					Ave.
	1	2	3	4	5	
Ratio -- <u>2 : 1 : 3</u>						
General appearance	2.99	3.50	3.50	5.10	3.50	3.72
Consistency	2.99	3.99	3.99	4.95	2.50	3.68
Flavor	2.50	2.50	2.99	3.38	1.99	2.67
Overall acceptability	2.99	3.50	3.50	4.05	1.99	3.21
Total score	11.50	13.50	13.99	17.52	9.99	13.30
Ratio -- <u>2 : 3 : 1</u>						
General appearance	1.99	3.70	2.50	2.99	3.05	2.85
Consistency	1.99	2.16	2.50	1.99	4.09	2.55
Flavor	1.99	3.90	2.99	1.99	2.85	2.74
Overall acceptability	1.99	3.84	2.50	1.99	3.41	2.75
Total score	8.00	13.59	10.50	8.99	13.41	10.90
Ratio -- <u>3 : 2 : 1</u>						
General appearance	3.50	3.99	2.99	4.50	3.50	3.70
Consistency	2.99	2.99	2.99	2.99	2.99	2.99
Flavor	2.99	3.99	3.99	2.99	2.99	3.39
Overall acceptability	3.50	3.50	2.99	3.99	3.50	3.48
Total score	12.99	14.50	12.99	14.50	13.00	13.60

Ratios are presented in the following order:

Protein-rich food: vegetable, pasta or substitute: gravy, sauce or substitute.

Scores range from 1 (unsatisfactory) to 5 (superior).

Total score is accumulative and does not exceed 20.

Table 8. (continued)

2. 8-oz serving (4 samples)

Factor	Panel Members					Ave.
	1	2	3	4	5	
Ratio -- <u>2 : 4 : 2</u>						
General appearance	2.99	2.75	2.99	2.94	2.65	2.86
Consistency	3.50	2.75	2.99	1.96	2.89	2.82
Flavor	2.99	2.75	3.50	2.91	2.60	2.95
Overall acceptability	2.99	2.50	2.99	2.06	2.99	2.71
Total score	12.50	12.99	12.99	10.20	11.18	11.52
Ratio -- <u>3 : 2 : 3</u>						
General appearance	3.99	4.75	3.75	3.25	3.48	3.84
Consistency	3.99	4.75	3.50	3.75	3.49	3.90
Flavor	3.25	3.75	3.25	3.50	2.80	3.31
Overall acceptability	3.75	3.75	3.50	3.50	3.25	3.55
Total score	14.75	16.99	13.99	14.25	12.97	14.59
Ratio -- <u>3 : 3 : 2</u>						
General appearance	3.50	4.03	3.50	2.70	4.04	3.55
Consistency	3.75	3.50	2.99	2.38	3.44	3.21
Flavor	4.25	3.34	3.25	3.03	2.87	3.35
Overall acceptability	3.75	3.76	3.50	3.43	2.98	3.48
Total score	15.75	14.60	13.75	10.97	13.35	13.68

Ratios are presented in the following order:

Protein-rich food: vegetable, pasta or substitute: gravy, sauce or substitute.

Scores range from 1 (unsatisfactory) to 5 (superior).

Total score is accumulative and does not exceed 20.

Table 8. (conclusion)

3. 10-oz serving (2 samples)

Factor	Panel Members				Ave.
	1	2	3	4	
Ratio -- <u>2 : 3 : 5</u>					
General appearance	2.50	3.50	2.99	2.83	2.95
Consistency	1.50	3.50	2.99	2.33	2.58
Flavor	3.99	3.50	3.50	4.17	3.79
Overall acceptability	2.50	3.50	3.50	2.50	3.00
Total score	10.99	13.99	12.99	12.67	12.66
Ratio -- <u>3 : 4 : 3</u>					
General appearance	3.99	3.50	3.50	2.50	3.37
Consistency	3.50	2.99	3.50	2.99	3.24
Flavor	1.99	3.50	2.99	2.99	2.87
Overall acceptability	2.99	3.50	2.50	2.99	2.99
Total score	12.50	13.50	12.50	12.50	12.75
Ratio -- <u>3 : 5 : 2</u>					
General appearance	2.99	3.50	2.99	2.33	2.95
Consistency	3.99	3.99	3.50	3.50	3.74
Flavor	3.50	4.50	3.50	3.99	3.87
Overall acceptability	3.50	2.99	3.50	2.99	3.24
Total score	13.99	14.99	13.50	13.83	14.08

Ratios are presented in the following order:

Protein-rich food: vegetable, pasta or substitute: gravy, sauce or substitute.

Scores range from 1 (unsatisfactory) to 5 (superior).

Total score is accumulative and does not exceed 20.

Scores for Panel Member 5 were disqualified.

Table 9. Average cooking and handling losses.

Casserole	% Loss
Creole Spaghetti	21
* Spaghetti and Meat Sauce	18
Hungarian Goulash with Noodles	23
* Hungarian Goulash and Noodles	33

* Pasta not included in calculation.

Table 10. Line spread scores for selected casserole type entrees.

Portion size	Ratio	Line spread			
		C.S.	M.S.	H.G.1	H.G.2
6 oz	2 : 1 : 3	4		6	
	2 : 3 : 1	0		0	
	3 : 2 : 1	0		0	
8 oz	2 : 4 : 2	0	4	0	9
	3 : 3 : 2	0	0	0	6.5
	3 : 2 : 3	0	7.5	0	1
10 oz	2 : 3 : 5		7		7.5
	3 : 4 : 3		0		6
	3 : 5 : 2		3		6

Ratios are presented in the following order:

Protein-rich food: vegetable, pasta or substitute: gravy, sauce or substitute.

C.S.--Creole Spaghetti.

M.S.--Spaghetti and Meat Sauce.

H.G.1--Hungarian Goulash with Noodles.

H.G.2--Hungarian Goulash and Noodles.

Table 11. Cost per serving for selected casserole type entrees.

Name	Serving size	Ratio	Cost per serving (¢)
Creole Spaghetti	6 oz	2 : 3 : 1	18.80
		2 : 1 : 3	21.60
		3 : 2 : 1	25.28
	8 oz	2 : 4 : 2	22.24
		3 : 3 : 2	27.92
		3 : 2 : 3	29.52
Spaghetti and Meat Sauce	8 oz	2 : 4 : 2	20.00
		3 : 3 : 2	26.92
		3 : 2 : 3	28.00
	10 oz	2 : 3 : 5	24.40
		3 : 5 : 2	26.44
		3 : 4 : 3	25.80
Hungarian Goulash (both variations)	6 oz	2 : 3 : 1	22.76
		2 : 1 : 3	22.80
		3 : 2 : 1	31.28
	8 oz	2 : 4 : 2	24.92
		3 : 3 : 2	33.16
		3 : 2 : 3	33.40
	10 oz	2 : 3 : 5	26.64
		3 : 5 : 2	34.76
		3 : 4 : 3	34.96

Ratios are presented in the following order:

Protein-rich food: vegetable, pasta or substitute: gravy, sauce or substitute.

Prices used are current for June, 1972.

GUIDELINES FOR AMOUNTS OF PROTEIN-RICH
FOODS IN SELECTED MEAT AND POULTRY ENTREES

by

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Diploma of Home Science

University of Otago, New Zealand, 1965

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Institutional Management

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1972

A nutritionally adequate and acceptable diet at a moderate cost is a goal of most institutional food services. Meat and poultry, the major sources of protein in the diet, are among the most costly items on the menu, yet certain daily requirements for protein must be met. Two specific areas in which it is particularly important for control of dietary constituents are the National School Lunch Program and the Medicare Program. These government sponsored plans must comply with federal regulations to remain eligible for monetary assistance.

The objective of this study was to formulate guidelines for standardizing meat and poultry entree recipes to meet requirements for 2-oz and 3-oz total cooked edible protein-rich food for portions of different sizes. Cost and overall acceptability, important considerations for the type of food service to which such guidelines might be applied, were given attention.

Recipes for four casserole type entrees were selected from an original list of 18 taken from "Food for Fifty" by Fowler, West and Shugart. These represented cubed and ground meats with pasta or dough. Two of the recipes, one including ground meat and one including cubed meat, incorporated pasta as an integral part of the product; the other two, one including cubed and the other including ground meat, were served with a pasta accompaniment. Different ratios of protein-rich ingredients; vegetable, pasta or substitute; and gravy, sauce or substitute were evaluated to determine the most feasible combinations for an acceptable entree of a predetermined portion size (6-oz, 8-oz or 10-oz) with either 2-oz or 3-oz of edible protein-rich food. The four entrees were prepared six times each in amounts to serve 25 portions.

The products were evaluated by a taste panel of five members, and analysis of variance was run to determine the effect of the entree, the ratio,

and the panel member on general appearance, consistency, flavor, overall acceptability and total score. No significant differences were revealed except in consistency of the 8-oz entrees.

Based on the limitations of this study, general guidelines that would apply to any casserole type entree with pasta or dough were suggested: the proportion of protein-rich food be no less than 30% and no more than 50%; the proportion of pasta to other ingredient groups be less than 50%; for entrees served with a pasta accompaniment the proportion of sauce to edible protein-rich food be greater than 50%; and for entrees incorporating the pasta, the proportion of sauce to edible protein-rich food be not less than 50%. In the latter, equal proportions are acceptable.