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ACCEPTABILITY OF COMMERCIALY
PREPARED FROZEN ENTREES
IN A HOSPITAL FOOD SERVICE

Thesis for the Degree of M. S.
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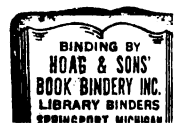
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ABSTRACT

ACCEPTABILITY OF COMMERCIALLY PREPARED FROZEN ENTREES IN A HOSPITAL FOOD SERVICE

By

Sister Bernadette Mary Novack

Health care delivery systems and health care costs are of prime concern to the health industry. Today labor payroll represents 60 - 70 percent of all hospital costs.

When the initial or intermediate food preparation stages are performed off the premise, labor time for hospital dietary management is reduced. Production schedules for entrees represent a substantial portion of the dietary budget since main kitchen preparation requires highly skilled employees. To reconstitute commercially prepared frozen entrees demands less skill than to prepare the same menu item by conventional methods. Incorporating commercially prepared frozen entrees in Saint Marys Hospital food service should prove advantageous to dietary management in negotiating future union contracts.

For this study five commercially prepared frozen entrees, chicken and noodles au gratin, macaroni and cheese, salisbury steak, stuffed pork chops and swiss

steak were selected and were paired with equivalent conventionally prepared menu items for paired-stimuli sensory evaluation.

The date and time for testing each frozen entree was arranged to coincide with the day and the meal that the equivalent conventionally prepared entree appeared on the patient two week cycle menu or the personnel cafeteria menu at Saint Marys Hospital, Rochester, Minnesota.

A taste panel of four to twelve judges, subjectively evaluated the five commercially prepared frozen entrees for each of four factors: appearance, color, consistency and texture, and flavor. The panelists used a four-point rating scale of perfect, good, fair, and poor, assigned values of 4, 3, 2, 1, respectively. Processors' instructions for frozen entrees that did not receive an overall 3.0 acceptability rating by the sensory evaluation panel for the initial test were modified for re-evaluation of the product.

After modification of the directives, re-evaluation of the five test entrees showed no improvement in flavor. However, the judges discerned some changes in consistency and texture, color, and appearance. Of the five commercially prepared frozen entrees tested only one entree, macaroni and cheese, with an overall average of 3.5 was judged acceptable for Saint Marys Hospital food service.

Sister Bernadette Mary Novack

Processors are producing new product lines and food scientists are improving processed food quality. Commercially prepared frozen entrees rated non-acceptable in 1970 may well be improved during the next decade and be evaluated as acceptable to Saint Marys Hospital food service in 1971 or 1975 or 1980.

ACCEPTABILITY OF COMMERCIALLY PREPARED FROZEN ENTREES
IN A HOSPITAL FOOD SERVICE

By

Sister Bernadette Mary Novack

A PROBLEM

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PREFACE

Before the turn of the century, the family medical practice of Dr. William Worrall Mayo and his sons, Dr. William James Mayo and Dr. Charles Horace Mayo, had established a distinguished reputation for internal medicine and surgery in Rochester, Minnesota. As the demand for their services increased, the Mayos invited other physicians to work with them. This private group practice of medicine became known in the early 1900's as the Mayo Clinic.

The Mayo Clinic is closely affiliated with two Rochester hospitals. When physical examinations indicate hospital treatment, arrangements are made for admission to Saint Marys Hospital or to Rochester Methodist Hospital whose medical staffs are composed of Mayo Clinic physicians.

Saint Marys Hospital has a rather unique history. The Sisters of Saint Francis who founded a convent in Rochester in 1875 had given some thought to opening a hospital but at that time their work was limited to teaching. A swirling tornado struck Rochester in August 1883 causing the death of 21 persons and the injury of several hundred. In its wake, the storm left a scene of

destruction and emphasized a distressing lack of hospital facilities. During the emergency, at Dr. William Worral Mayo's request, the Sisters supervised the nursing in an improvised hospital. Later, Mother Alfred approached Dr. William Worral Mayo and proposed that the Sisters would build a hospital if he would take charge of the medical staff. Saint Marys Hospital became a reality in 1889 and at that time had a capacity of 27 beds, a nursing staff of five Sisters and a medical staff of three doctors, Dr. William James and Dr. Charles Horace Mayo, and their father Dr. William Worral Mayo. Today Saint Marys Hospital with a capacity of 960 beds is one of the largest private hospitals in the United States. During the years of growth and development Saint Marys Hospital has maintained four objectives: the provision of physical, mental and spiritual care for the sick; the prevention of disease and promotion of health; the advancement of education; and the encouragement of medical research.

The professional staff of the department of dietetics at Saint Marys Hospital has two activities: one area is that of interpreting the nutritional needs of hospitalized human beings, and the other area is providing prepared food and service in comfortable surroundings to doctors, professional allied health team members, students and non-professional employees.

Dietary facilities at Saint Marys Hospital include one main kitchen, three centralized tray service areas, three cafeterias, and two private dining rooms. Average patient meal census per day is 2,205; approximately 1,760 professional staff and non-professional employees are served each day in the three cafeterias. On weekends, patient census may decrease 25 percent and cafeteria patronage is approximately 50 percent less than the weekday average. Saint Marys dietary department operates 16 hours a day, 365 days a year.

The author is a Franciscan Sister from the community--The Sisters of Saint Francis Congregation of Our Lady of Lourdes, Rochester, Minnesota. She is also one of five administrative staff dietitians at Saint Marys Hospital. Employee scheduling, food ordering, menu planning and product testing are basic concerns of the administrative staff dietitians.

INTRODUCTION

Health care delivery systems and health care costs are of prime concern to the health industry. Total health care amounted to \$3.6 billion or less than 4 percent of the gross national product in 1928-29 and showed a gradual increase during the next three decades, 1930-60. With the adoption of medicare and medicaid programs in 1965, health care spiraled to \$63 billion or 7 percent of the gross national product in 1968-69 and continues to rise (4).

Additional demands for hospital and related health services made possible by medical insurance and federal and state aid to needy people have exerted a steady pressure on hospital daily service charges. Persons requiring hospitalization during the past five years have seen a climbing cost per day, from \$48.15 per day in 1966 to \$67.60 per day in 1969 (21). The National Advisory Commission on Health Manpower projects that \$100.00 per day patient cost will be met before 1975 in large city hospitals if this trend continues (3). Today labor payroll represents 60-70 percent of all hospital costs and continuous pressure on hospital labor costs has come from economic and non-economic demands by labor unions during the past decade (21, 25).

The non-professional employees at Saint Marys Hospital, Rochester, Minnesota are members of Hotel, Hospital, Restaurant and Tavern Employees Union, Local No. 21, and collective bargaining between Saint Marys Hospital and Local Union No. 21 dates to 1945. Long range plans proposed by Hotel, Hospital, Restaurant and Tavern Employees Union and discussed with Saint Marys Hospital include:

1. Regular work week for employees shall be less than 40 hours.
2. Employees shall not work more than seven consecutive days during a two week work period and days off shall include at least two weekends (Saturday, Sunday or Sunday, Monday) per calendar month.
3. Additional compensation shall be paid to employees for all time worked Saturday and Sunday.

These projections in union planning are forcing dietary management at Saint Marys Hospital to seriously consider a significant reduction in total labor hours with particular concern for weekend work schedules.

When the initial or intermediate food preparation stages are performed off the institutional premise, labor time for hospital food production is reduced. Production schedules for entrees represent a substantial portion of the dietary budget since main kitchen preparation requires highly skilled employees. To reconstitute commercially prepared frozen entrees demands less skill than to prepare the same menu item by conventional methods. Incorporating commercially prepared frozen entrees in Saint Marys

Hospital food service should prove advantageous to dietary management in negotiating future union contracts.

The purpose of this investigation was to determine the acceptability of selected commercially prepared frozen entrees for incorporation in the Saint Marys Hospital food service, Rochester, Minnesota. This work was exploratory in nature.

PROCEDURE

Information on commercially prepared frozen entrees was compiled at Michigan State University during April 1 - July 1, 1970. Verification of reconstitution instructions recommended by processors and evaluation of the commercially prepared frozen entrees was scheduled at Saint Marys Hospital during August and September, 1970.

Preliminary Planning

With access to information available on commercially prepared frozen entrees for Michigan State University dormitories food services division the author reviewed literature prepared by 13 food processing companies for the institutional food market.

During the 1970 Winter and Spring Terms (January 1 - June 1) the residence hall managers assessed 60 products from these 13 processing companies and decided that seven processors could supply acceptable frozen entrees. Appendix, Exhibit 5 lists these seven processing companies; Appendix, Exhibit 6 identifies 37 frozen entrees from these processing companies rated acceptable by Michigan State University food service managers by brand name and quality evaluation.

Interviews with managerial personnel in dormitories and food services division elicited information on problems encountered in the introduction of selected commercially prepared frozen entrees in residence hall food service at Michigan State University during January 1, 1970 - July 1, 1970. The food stores manager as well as the residence hall operations managers stated two major complaints on packaging and two on information available for handling and serving frozen entrees:

1. Variability from one processor to another in weights of equivalent frozen entrees packed in standard counter pans or units thereof, and in number of frozen entree units packed per case:
2. Variability from one processor to another in the number of portions and weights of each portion in each package for portioned items:
3. Inadequate directions for storing and tempering frozen entrees:
4. Limited information on reconstitution procedures for all types of gas or electric deck ovens, microwave ovens, quartz infra-red ovens, convection ovens, steam cookers, pressure cookers, steam-jacketed kettles and deep fat fryers.

Reconstitution Procedure

Five commercially prepared frozen entrees were selected from 37 menu items rated acceptable by Michigan State University food service managers. The menu items were chosen from the following categories of Saint Marys Hospital recipe file: Group A-meats, salisbury steak, swiss steak and stuffed pork chops; Group B-meat extenders,

chicken and noodles au gratin; Group C-meat substitutes, macaroni and cheese. These entrees were procured by the purchasing agent at Saint Marys Hospital through a Minneapolis food broker and are listed in Exhibit 1 by brand name and processor.

Exhibit 1.--Commercially prepared frozen entrees listed by brand name and processor evaluated at Saint Marys Hospital, Rochester, Minnesota, August and September, 1970.

Entree	Brand Name	Processor
Chicken and Noodles au Gratin	Sara Lee	Sara Lee Food Service Division
Macaroni and Cheese	Stouffer's	Stouffer Foods Corporation
Salisbury Steak	Campbell's Efficienc	Campbell Soup Company
Swiss Steak	Hormel Chefs' Delight	George A. Hormel & Company
Stuffed Pork Chops	Hormel Chefs' Delight	George A. Hormel & Company

The date and the time for testing each frozen entree was arranged to coincide with the day and the meal that the equivalent conventionally prepared entree appeared on the patient two week cycle menu or the personnel cafeteria menu.

A conventional food product is defined as that product for which the employee assembles the ingredients; weighs or measures the ingredients as indicated on the recipe card; follows a step-by-step procedure in

the combining and handling of the ingredients to yield a given product of good quality.¹

The conventionally prepared entree served as a control.

Commercially prepared frozen entrees were held in the storeroom freezer at -10°F. The dietitian requisitioned the frozen entree from storeroom 2-3 days prior to the production schedule and the head cook placed the frozen entree in a walk-in refrigerator at 35°F for tempering, or that process--prior to heating--of raising the temperature of a frozen food (-10 - 0°F) to a more desirable temperature of 35°F by holding the food in a walk-in refrigerator for 24-36 hours. Prior to testing, one oven in the three deck electric oven was preheated to the specified temperature. The oven temperature was checked for accuracy and adjustments were made if necessary.

The commercial inset pan was placed in a stainless steel inset pan to prevent the commercial pan from bending and causing accidental burns. This safety measure came as a suggestion from the residence hall food service managers at Michigan State University. The stainless steel inset was placed in the preheated three deck electric oven and the entree was baked at the specified temperature for the given time.

¹P. J. Aldrich and G. A. Miller, Standardization of Recipes for Institutional Use. Circular bulletin 233 prepared by Michigan State University Agricultural Experiment Station, East Lansing, 1963.

Evaluation

The five commercial frozen entrees were paired with conventionally prepared menu items for paired-stimuli sensory evaluation. All conventionally prepared menu items had previously been judged acceptable by Saint Marys Hospital dietary department through the on-going recipe testing program.

Representative types of subjective evaluations are difference tests, rank order tests, descriptive tests, acceptance and preference tests and scoring tests . . . Difference tests are referred to as single-stimulus, paired-stimuli, duo-trio, triangle and multi-sample tests, depending on the number of samples tested at one time (2).

A program for evaluation conventionally prepared menu items and processed foods has been operative at Saint Marys Hospital for the past 15 years. The sensory evaluation panel at Saint Marys Hospital is the director and/or associate director of the dietary department, main kitchen staff dietitians, dietetic interns assigned to main kitchen, the head cook and her assistant head cook. Panel members score products on four palatability characteristics, appearance, color, texture and consistency and flavor: for general acceptability using a four point numerical scale ranging from "perfect" to "poor." A mean acceptability score of 3.0 has been established. The

evaluation form is included in the Appendix, Exhibit 7. Thus a paired-stimuli sensory evaluation method most closely followed the procedure used at Saint Marys Hospital.

The commercial frozen entrees were heated as specified on the reconstitution instructions and the conventionally prepared menu items were prepared as directed on the Saint Marys Hospital standard recipe card (Appendix, Exhibit 8). The commercially prepared entree (sample), and the conventionally prepared entree (control), were portioned into 1/9 insets at internal temperature of 170°F. For additional testing, the remainder of the entree test item (control and sample) was kept hot in the bain marie.

Between four to twelve judges participated in each taste panel for this study: the director or the associate director of the dietary department, two to three staff dietitians, the head cook or her assistant head cook, and three or four dietetic interns. The judges subjectively evaluated five commercially prepared frozen entrees for each of four factors: appearance, color, consistency and texture, and flavor. The panelists used a four-point rating scale of perfect, good, fair and poor, assigned values of 4, 3, 2, 1, respectively. The judges were asked to comment on each factor as further interpretation of commercial entree quality and give an

overall comparison with the conventionally prepared entree. Processors' instructions for frozen entrees that did not receive an overall 3.0 acceptability rating by the sensory evaluation panel for the initial test were modified for re-evaluation of the product.

Sensory methods, in which palatability is evaluated by a panel of judges, answers questions of how a food tastes, smells, looks and feels. Sensory evaluations are affected by environmental conditions, by the individual panel member's state of health, age and sex, as well as by his conscious or subconscious bias. To minimize the influence of such factors, serving conditions were standardized.

The entree test item (control and sample), six inch paper plates, flatware, paper napkins and evaluation forms were arranged on a small buffet table in the staff dietitians' office. Each panel member served herself one portion of the commercial entree (sample) and one portion of the menu entree (control). The panel members were instructed to record their evaluations on the scorecard forms.

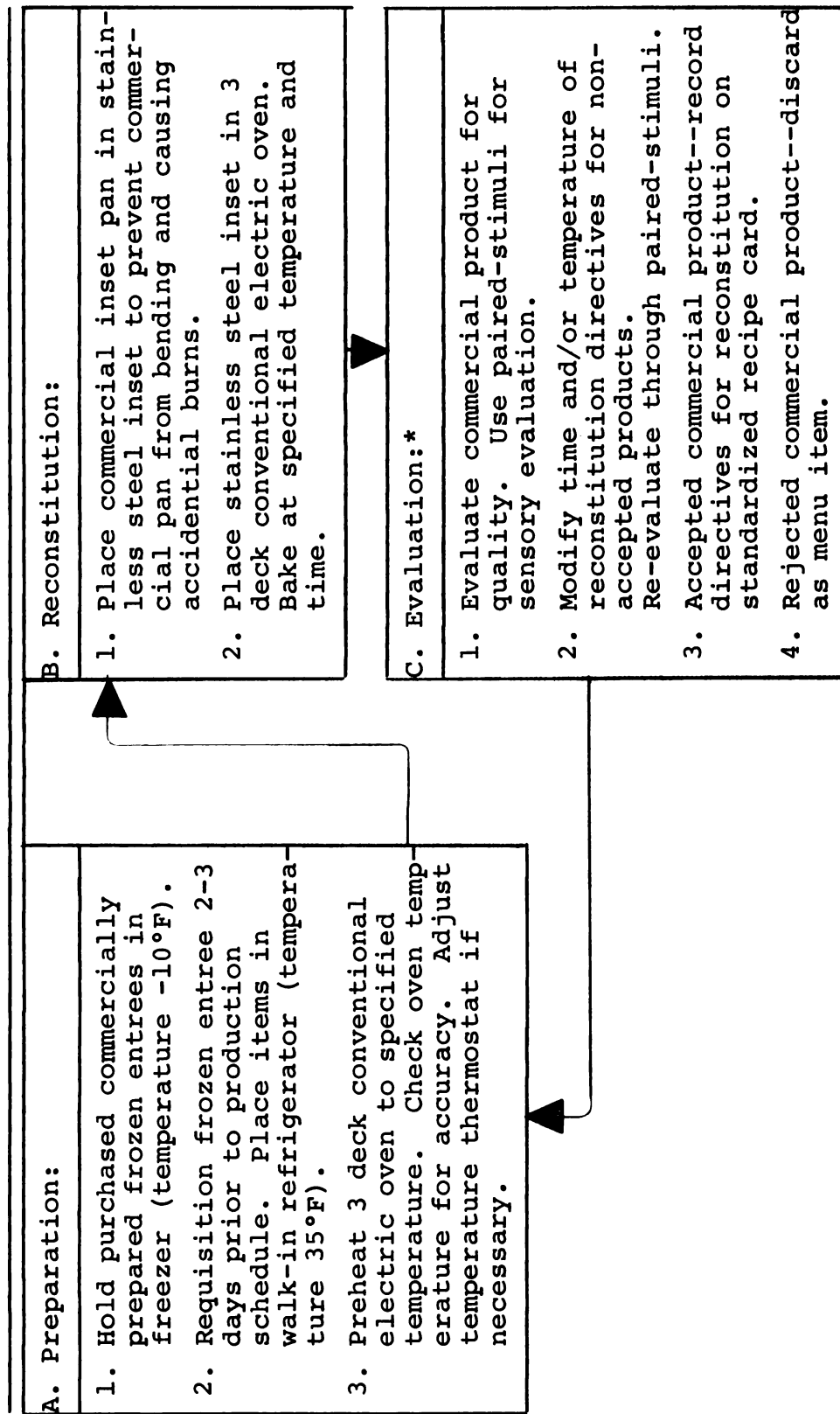
For a non-accepted item the head cook suggested changes in length of time and/or temperature for modifying the processor's reconstitution directives. Subsequent to the initial test the entree was reconstituted with the modified directives, and re-evaluated with a conventionally

prepared menu item by paired-stimuli sensory evaluation. Depending on the number of variations in the processor's reconstitution instructions, data were collected for one to three replications of non-accepted menu items.

The number of replications for re-evaluation of each item was dependent on the number of inset pans per case. Two products, macaroni and cheese from Sara Lee Food Service Division and swiss steak from George A. Hormel & Company, were packed with more than two insets per case and for these products two replications were scheduled. Since the remaining three products had two insets per case, no replications were arranged for chicken and noodle au gratin, salisbury steak and stuffed pork chops.

In summary, verification of reconstitution instructions recommended by processors for commercially prepared frozen entrees requires three major steps: preparation, reconstitution, and evaluation. See Exhibit 2. The procedure used in this study followed these three steps.

Exhibit 2.--Flow chart: verification of reconstitution instructions recommended by processors for selected commercially prepared frozen entrees.



*Saint Marys Hospital standardized formulas for selected entrees were prepared as a control for evaluation. Entrees were not frozen prior to paired-stimuli sensory evaluation.

RESULTS AND DISCUSSION

The purpose of this investigation was to determine the acceptability of selected commercially prepared frozen entrees for incorporation in the Saint Marys Hospital food service, Rochester, Minnesota. The commercial frozen entrees were reconstituted by directives that accompanied the product, and subjectively evaluated by means of paired-stimuli with equivalent conventionally prepared menu items.

The five selected frozen entrees, chicken and noodles au gratin, macaroni and cheese, salisbury steak, swiss steak and stuffed pork chops were products of four processors, Sara Lee Food Service Division, Stouffer Foods Corporation, Campbell Soup Company, and George A. Hormel and Company. Instructions for reconstitution recommended by the processors and given on the respective packages included directions for steam, gas and electric equipment. For this study, reconstitution procedures with one exception were limited to directives for the conventional three deck oven.

The author was interested in tempering frozen entrees since frozen foods required for weekend food service at Saint Marys Hospital are delivered from the central hospital storeroom on Friday morning and the dietary

department freezer space is limited to frozen vegetable storage. The feasibility of tempering frozen foods prior to reconstitution has been suggested by Mr. Louis E. Murphy, Director of Marketing Management Advisory and Research Center, Inc., in Pittsburgh, Pennsylvania (17). Only one of the four processors, Campbell Soup Company, gave instructions for tempering, indicating the time and temperature required.

Evaluations of each of the five products follow; also included are modifications in reconstitution instructions and the re-evaluation of the product.

CHICKEN AND NOODLES AU GRATIN--Sara Lee Food Service
Division
Net weight 12 pounds per 12" x 20", two insets
per case.

Initial test. The processor's instructions follow:

processor's instructions

1. preheat oven to 400°F
2. remove cover and place pan in oven
3. bake at 400°F for one hour or until heated through and also golden brown.

Twelve judges rated chicken and noodles au gratin 3.0 for appearance and color. Six judges considered consistency and texture worth 3.0 but the other six thought the au gratin sauce was too thin. Some judges stated that the chicken and vegetables were tender and others commented that they were tough. Flavor was rated 2.0. Most judges complained of an unidentified flavor--like a metallic taste.

Average scores in the initial test did not meet the acceptability criteria of 3.0 for all palatability characteristics:

average initial test scores

appearance	3.0
color	3.0
consistency and texture	2.5
flavor	2.0
overall average	2.5

CHICKEN AND NOODLES AU GRATIN--Sara Lee Food Service
Division

Re-evaluated test. Modified instructions for reconstitution of chicken and noodles au gratin follow:

modified instructions

1. temper one tray in walk-in refrigerator at 35°F for 24-36 hours
2. empty contents into a standard half counter inset pan, do not cover
3. preheat the oven to 375°F
4. bake for 90 minutes.

On re-evaluation nine judges felt that the consistency of the au gratin sauce was improved by the longer heating time at a lower temperature. There was no replication of the modified instructions.

average re-evaluation test scores:

appearance	3.0
color	3.0
consistency and texture	2.7
flavor	2.0
overall average	2.5

Chicken and noodles au gratin with an average palatability score in re-evaluation of 2.5 did not meet a mean acceptability score of 3.0 and consequently was judged unsatisfactory for Saint Marys Hospital food service.

MACARONI AND CHEESE--Stouffer Foods Corporation
 Net weight 12 ounce pouch, 24- 12 ounce pouches
 per case.

Initial test. The processor's instructions follow:

processor's instructions

1. heat this sealed pouch in boiling water
2. leave pan uncovered
3. after heating cut top of pouch open
4. remove product from pouch immediately after heating.

The seal on the sample pouch was torn as the pouch was removed from the case.

modifications due to torn pouch

1. empty pouch in 1/9 inset pan
2. cover with lid
3. heat in low pressure steamer for 30 minutes or until hot
4. remove from steamer, uncover
5. place 1/9 inset under broiler for 5 minutes or until golden brown

Five judges evaluated macaroni and cheese. For appearance, color, and consistency and texture, ratings were divided between 4.0 and 3.0. Two judges rated flavor 2.0 because they disliked the cheddar cheese taste.

average initial test scores

appearance	3.5
color	3.5
consistency and texture	3.5
flavor	3.0
overall average	3.5

Overall average scores for initial test on macaroni and cheese, 3.5, met acceptable palatability criteria. However, incorporation of Stouffer Foods Corporation frozen macaroni

and cheese in Saint Marys Hospital food service would require inclusion of tempering times and temperatures in the reconstitution instructions.

MACARONI AND CHEESE--Stouffer Foods Corporation

Re-evaluated test. Modified instructions for reconstitution of macaroni and cheese follow:

modified instructions

1. temper 12 pouches in walk-in refrigerator at 35°F for 24-36 hours
2. open and empty pouches into standard inset pan
3. preheat oven to 350°F
4. bake in oven uncovered for 45 minutes to one hour until golden brown.

Five judges evaluated macaroni and cheese for two replications. The average re-evaluated scores showed no change from the initial test scores.

average re-evaluated test scores:

appearance	3.5
color	3.5
consistency and texture	3.5
flavor	3.0
overall average	3.5

Macaroni and cheese with an average palatability score in re-evaluation of 3.5 more than met the mean acceptability score of 3.0. Macaroni and cheese was judged acceptable for Saint Marys Hospital food service.

SALISBURY STEAK--Campbell's Efficiency--Campbell Soup
Company
Net weight 10.0 pounds per 12" x 20" inset, two
insets, per case.

Initial test. The processor's instructions follow:

processor's instructions

1. refrigerate tray at 40°F
2. preheat oven to 450°F
3. puncture the cover of tray with 20-25 random holes
4. bake in 450°F oven for one hour.

Twelve judges rated salisbury steak 3.0 for appearance and color. Ten judges rated consistency and texture between 2.0 and 1.0; two judges rated these palatability characteristics 3.0. Consensus was that consistency and texture of salisbury steak was sponge-like.

The initial test product was not thoroughly heated to the internal temperature of 170°F after baking for one hour at 450°F and the top layers of the salisbury steak started to burn.

Average scores in the initial test did not meet the acceptability criteria of 3.00 for palatability characteristics.

average initial test scores

appearance	3.0
color	3.0
consistency and texture	2.0
flavor	2.0
overall average	2.5

SALISBURY STEAK--Campbell's Efficiency--Campbell Soup
Company

Re-evaluated test. Modified instructions for reconstitution of salisbury steak follow:

modified instructions

1. temper on tray 36 hours in 35°F walk-in refrigerator
2. place disposable pan inside standard stainless steel inset pan
3. preheat oven to 350°F
4. bake in oven uncovered for three hours.

Lowering the temperature and baking for a longer time yielded a hot product that was not charred.

Twelve judges in re-evaluating salisbury steak, did not change their evaluations. The re-evaluated test scores showed no change from the initial test scores.

average re-evaluated test scores

appearance	3.0
color	3.0
consistency and texture	2.0
flavor	2.0
overall average	2.5

Salisbury steak with an overall average score of 2.5 in re-evaluation did not meet a mean acceptability score of 3.0 and was judged unsatisfactory for Saint Marys Hospital food service.

STUFFED PORK CHOPS--George A. Hormel & Company
Net weight 8 pounds 12 ounces per 12" x 20" inset,
two insets per case.

Initial test. The processor's instructions follow:

processor's instructions

1. keep frozen until ready for use
2. place covered pan in 350°F oven for 1-1/2 hours
3. reduce heat to 300°F for additional 1-1/2 hours
4. remove cover during the last 15 minutes for browning.

Four judges rated stuffed pork chops 2.0 for appearance, color, and flavor. The characteristics of consistency and texture were rated 3.0 by one judge and three judges rated consistency and texture 2.0 since the meat adjacent to the bone portion was tough. The judges commented that the true pork flavor was masked by a strong sage flavor in the dressing.

Average scores in the initial test fell below the acceptability criteria of 3.0 for palatability characteristics.

average initial test scores

appearance	2.0
color	2.0
consistency and texture	2.0
flavor	2.0
overall average	2.0

STUFFED PORK CHOPS--George A. Hormel & Company

Re-evaluated test. Modified instructions for reconstitution of stuffed pork chops are:

modified instructions

1. temper one tray in walk-in refrigerator at 35°F for 24-36 hours
2. place disposable inset pan into a standard stainless steel inset
3. preheat oven to 350°F
4. bake stuffed pork chops with cover on for 1-1/2 hours
5. lower temperature to 300°F
6. remove cover and bake for 1-1/2 hours or until stuffed pork chops are browned.

The longer baking time in an uncovered inset allowed the stuffed pork chops to brown. The judges rated the appearance and color 2.5. On re-evaluation consistency and texture as well as flavor remained 2.0.

average re-evaluation test scores

appearance	2.5
color	2.5
consistency and texture	2.0
flavor	2.0
overall average	2.5

The overall average of 2.5 in the re-evaluation of stuffed pork chops did not meet the mean acceptability score of 3.0. Consequently this product was judged unsatisfactory for Saint Marys Hospital food service.

SWISS STEAK--Chef's Delight--George A. Hormel & Company
 Net weight 6 pounds per 6" x 10" inset, four
 insets per case.

Initial test. The processor's instructions follow:

processor's instructions

1. remove cover
2. heat in 400°F oven to an internal temperature of
150°F
3. approximately 90 minutes.

Eight judges gave swiss steak an overall average of 2.5.

Fabrication of the swiss steak was unsatisfactory as evidenced by one side of the portioned steak cut with the grain of the beef round and the opposite side cut against the grain, as well as connective tissue found in the interior of the steak.

Some judges objected to the square, flat steak portion and others stated this method of cutting showed good portion control. Flavor values were divided between those judges who thought the gravy too spicy and those who were of the opinion it was too bland. The average score in the initial test did not meet the acceptability mean score of 3.0.

average initial test score

appearance	2.5
color	3.0
consistency and texture	1.5
flavor	2.5
overall average	2.5

SWISS STEAK--Chef's Delight--George A. Hormel & Company

Re-evaluated test. Modified instructions for reconstitution of swiss steak follow:

modified instructions

1. temper one or two insets in walk-in refrigerator at 35°F for 24-36 hours
2. portion the contents into a standard half counter inset pan
3. preheat oven to 375°F
4. leave pan uncovered and bake in oven for two hours.

On the re-evaluation test and one replication the average re-evaluated test scores of the eight judges were identical to averaged initial test scores.

average re-evaluated test scores

appearance	2.5
color	3.0
consistency and texture	1.5
flavor	2.5
overall average	2.5

Swiss steak with an average palatability score in re-evaluation of 2.5 did not meet a mean acceptability score of 3.0 and consequently was judged unsatisfactory for Saint Marys Hospital food service.

The initial average palatability evaluations of five commercially prepared frozen entrees, chicken and noodles au gratin, macaroni and cheese, salisbury steak, stuffed pork chops and swiss steak, are summarized by quality characteristics in Exhibit 3.

Exhibit 3.--Initial - average palatability evaluations for five commercially prepared frozen entrees.

Quality characteristics	Chicken and noodles au gratin	Macaroni and cheese	Salisbury steak	Stuffed pork chops	Swiss steak
Appearance	3.0	3.5	3.0	2.0	2.5
Color	3.0	3.5	3.0	2.0	3.0
Consistency and texture	2.5	3.5	2.0	2.0	1.5
Flavor	2.0	3.0	2.0	2.0	2.5
Overall average	2.5	3.5	2.5	2.0	2.5

Figure 1 shows a comparison of average palatability evaluations for these entrees.

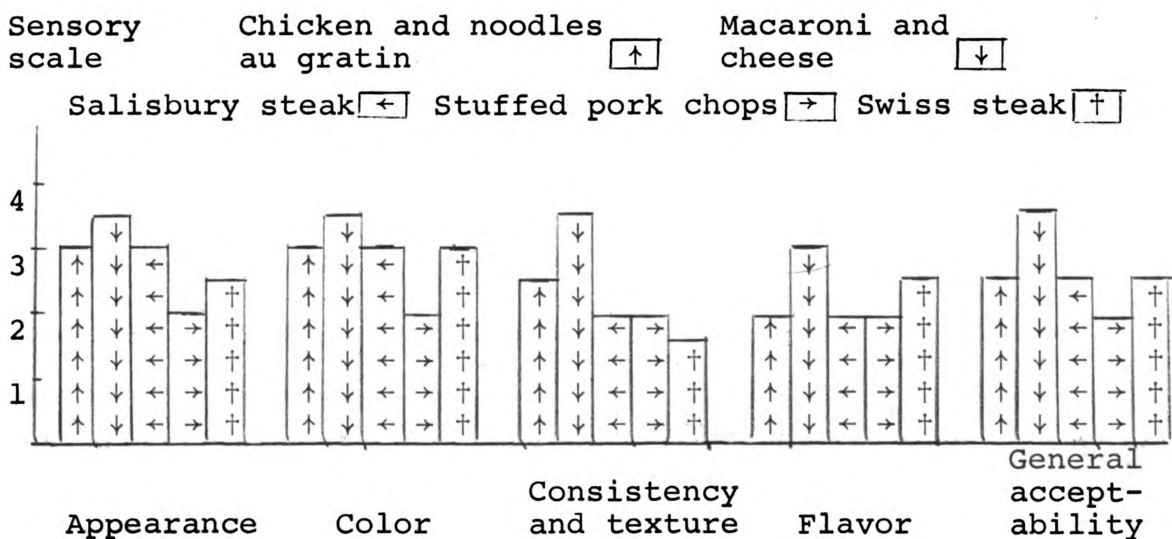


Figure 1.--Comparison of initial - average palatability evaluations for five commercially prepared frozen entrees.

As shown in Exhibit 3 and Figure 1 quality of the five commercially prepared frozen entrees was below the accepted standard in one or more of four palatability characteristics (appearance, color, consistency and texture, and flavor) when the entrees were evaluated through paired-stimuli with equivalent conventionally prepared entrees.

Amerine et al. (2) states that appearance has the greatest initial influence as visual properties of selection. Appearance includes the size, shape, color and conformation of an item. Consistency is an oral tactile sensation, indicating a degree of firmness, density or viscosity. The texture is perceived through the eyes and apprehended by the skin and muscle senses in the mouth. Texture is the roughness, smoothness and graininess of an item.

Once the food has been tasted, color, consistency and texture are secondary to flavor. The most common complaint of the judges was an after-taste flavor probably due to preservatives and additives. Flavor is affected by the loss of volatile substances, caramelization of carbohydrates, melting and decomposition of fats and by decomposition of proteins. Flavor is considered by many as the immediate important contribution of food to customer and/or patient satisfaction.

The re-evaluated average palatability evaluations of five commercially prepared frozen entrees, chicken and noodles, macaroni and cheese, salisbury steak, stuffed pork chops, and swiss steak are summarized by quality characteristics in Exhibit 4.

Exhibit 4.--Re-evaluated - average palatability evaluations for five commercially prepared frozen entrees.

Quality characteristics	Chicken and noodles au gratin	Macaroni and cheese	Salisbury steak	Stuffed pork chops	Swiss steak
Appearance	3.0	3.5	3.0	2.5	2.5
Color	3.0	3.5	3.0	2.5	3.0
Consistency and texture	2.7	3.5	2.0	2.0	1.5
Flavor	2.0	3.0	2.0	2.0	2.5
Overall average	2.5	3.5	2.5	2.5	2.5

Figure 2 shows a comparison of re-evaluated average palatability evaluations of these entrees.

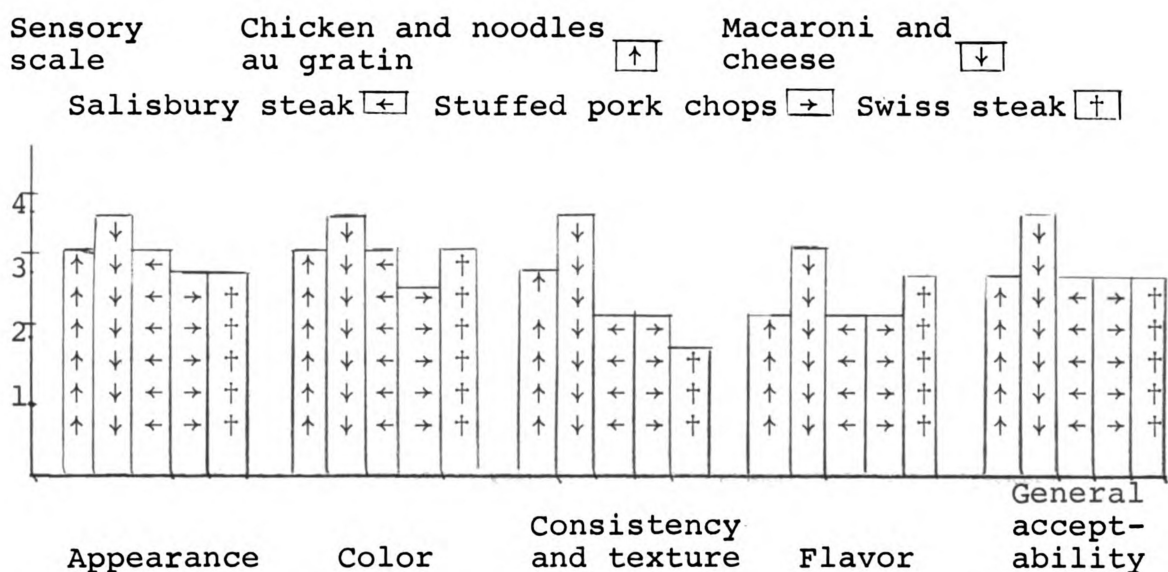


Figure 2.--Comparison of re-evaluated average palatability evaluations for five commercially prepared frozen entrees.

After modification of the directives, re-evaluation of the five test entrees showed no improvement in flavor. However, the judges discerned some changes in consistency and texture, color, and appearance. See Exhibit 4 and Figure 2. Of the five commercially prepared frozen entrees tested during August and September 1970, only one entree, macaroni and cheese, with an overall average of 3.5 was judged acceptable for Saint Marys Hospital food service.

Implications

This exploratory study pointed to the essentiality of an on-going program for continuous evaluation of commercially prepared frozen entrees at Saint Marys Hospital. Processors are aware that food quality is not a fixed entity. Processors must consider the selection of raw product, production and holding of product and finally, the utilization of product by the consumer. Food scientists are working on improving quality and safety of present day consumer products. Through improved processing methods the institutional food manufacturers should have a more precise control of "quality" palatability characteristics: appearance, color, consistency and texture, and flavor. Frozen entrees rated non-acceptable in 1970 may well be improved during the next decade and be evaluated as acceptable to Saint Marys Hospital food service in 1971 or 1975 or 1980.

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APPENDIX

Exhibit 5.--Processors of frozen entrees rated acceptable
by Michigan State University food service
managers, January 1 - July 1, 1970.

Brand Name	Processor	Address
Campbell's Efficienc	Campbell Soup Company	Campbell Soup Company Food Service Products Division 375 Memorial Drive Camden, New Jersey 08101
Chef's Pantry	Grill Meats Incorporated	Grill Meats Incorporated 1034 Hancock Street Sandusky, Ohio 44807
Durkee	Durkee Food Service	Durkee Food Service S.C.M. Corporation 900 Union Commerce Building Cleveland, Ohio 44115
Hormel Chefs' Delight	Hormel	George A. Hormel & Company Post Office Box 800 Austin, Minnesota 55912
Menu Maker	Menu Maker Food Service Company	Menu Maker Food Service Company Executive Post Office Box 18127 3796 La Mar Memphis, Tennessee 38118
Sara Lee	Sara Lee	Sara Lee Food Service Division 500 Waukeegan Road Deerfield, Illinois 60015
Stouffer's	Stouffer's	Stouffer Foods Corporation Cleveland, Ohio 44115

Exhibit 6.--Quality evaluation for 37 frozen entrees from seven processing companies.*

Menu Item	Brand Name	Quality Evaluation
beef stew	Sara Lee Stouffer's	good product good product
beef short ribs	Hormel	very good (expensive)
beef tips in gravy	Chef's Pantry	good
b.b.q. chicken	Campbell's	good flavor (small pieces)
cabbage rolls	Chef's Pantry	good
chicken and dumplings	Hormel	very good
chicken and noodles au gratin	Sara Lee	plenty of chicken and cheese flavor
chicken chop suey	Menu Maker	good
chicken chow mein	Campbell's	good plenty of meat
chili con carne	Durkee	pretty good
corned beef brisket (cooked)	Chef's Pantry	very good
corned beef round (cooked)	Chef's Pantry	very good

*These entrees were rated acceptable by Michigan State University food service managers January 1 - July 1, 1970.

Exhibit 6.--Continued.

Menu Item	Brand Name	Quality Evaluation
creamed chipped beef	Hormel	good (sometimes too thin)
escalloped chicken and noodles	Stouffer's	very good
escalloped potatoes and ham	Hormel	good flavor (will thicken)
haddock with lemon butter	Durkee	good
lasagna	Sara Lee Menu Maker	very good good
macaroni beef and tomatoes	Stouffer's	very good
macaroni and cheese	Stouffer's Campbell's	very good strong cheese flavor
meat balls in sour cream	Hormel	good
meat loaf with tomato sauce	Campbell's	good
pork chow mein	Hormel	very good
pork loin boneless (cooked)	Chef's Pantry	good flavor
pot roast of beef	Sara Lee	good (difficult to portion)

Exhibit 6.--Continued.

Menu Item	Brand Name	Quality Evaluation
roast sirloin tip (cooked)	Chef's Pantry	real good
salisbury steak	Campbell's	very good
shrimp creole	Menu Maker	very good
sliced pork and dressing	Menu Maker	good
sliced turkey and dressing	Menu Maker	good
sloppy joe	Chef's Pantry Durkee	good flavor good as a Coney sauce
swiss steak	Hormel	good
stuffed pork chops	Hormel	very good
tuna noodle au gratin cheese topping	Sara Lee	good flavor
veal and peppers	Sara Lee	real good flavor
veal parmigianni	Campbell's	good
veal poulette (stuffed veal)	Chef's Pantry	dressing good
vegetable chop suey	Menu Maker	good

Exhibit 7.--Scorecard--evaluation form, Saint Marys Hospital, Rochester, Minnesota.

Product _____

Date _____

SCORECARD

GOALS	SCORE	WHY
Appearance	4 Perfect	
	3 Good	
	2 Fair	
	1 Poor	
Color	4 Perfect	
	3 Good	
	2 Fair	
	1 Poor	
Consistency and texture	4 Perfect	
	3 Good	
	2 Fair	
	1 Poor	
Flavor	4 Perfect	
	3 Good	
	2 Fair	
	1 Poor	
Temperature 180-212°F 170-180°F 160-170°F 140-160°F 0-140°F		
	Total	

How does this menu item compare with the conventionally prepared entree?

Exhibit 8.--Recipe card F.84, Saint Marys Hospital, Rochester, Minnesota.

Front of recipe card

Ingredients	Size servings				
	Servings				
Procedure:					

Back of recipe card

Check system

Date	Remarks	Suggested changes	Initial

Saint Marys Hospital, Rochester, Minn.

Recipe card F.84

MICHIGAN STATE UNIVERSITY
COLLEGE OF HOME ECONOMICS
EAST LANSING, MICHIGAN

Thesis M.S. 1970

NOVACK, Sister Bernadette Mary

Acceptability of Commercially
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