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ACCEPTABILITY OF SELECTED CONVENIENCE  
CHICKEN PRODUCTS.**

**University of North Carolina at Greensboro,  
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ACCEPTABILITY OF SELECTED CONVENIENCE

CHICKEN PRODUCTS

by

Mary Ann Cross Farthing

A Dissertation Submitted to  
the Faculty of the Graduate School at  
The University of North Carolina at Greensboro  
in Partial Fulfillment  
of the Requirements for the Degree  
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Approved by



  
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APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at The University of North Carolina at Greensboro.

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FARTHING, MARY ANN CROSS. Acceptability of Selected Convenience Chicken Products. (1974) Directed by: Dr. Joan P. Cassilly and Dr. Aden C. Magee. Pp. 76.

This study was undertaken to determine the acceptability of selected convenience chicken products to older individuals, and to compare the acceptability scores obtained from older individuals with scores from persons representing the general public.

Three convenience chicken products provided by one processor were subjectively evaluated by two taste panels of older adults and a consumer panel. The products were frozen precooked chicken apple fritters, chicken breast fillets, and chicken patties. The Senior Scholars Taste Panel was chosen to represent a middle income group maintaining private homes. The Hall Towers Taste Panel was chosen to represent a low income group living in public housing. The Consumer Panel was composed of persons who selected the convenience chicken products when served in the cafeteria of the School of Home Economics of the University of North Carolina at Greensboro.

Acceptability tests were conducted on five replications for each of the convenience chicken products. All products were prepared according to the processor's instructions. Taste testing procedures for the two panels of older adults were as comparable as circumstances would allow. The consumer panelists were under no controls; the products were prepared just as those for the taste panels. All ratings were made on similar score sheets. Analyses of the data were made by analysis of variance, omega square, the Newman-Keuls test, and chi-square tests.

Analyses showed that both panels of older adults rated each of the three convenience chicken products above "good" (score = 4) or "fair" (score = 3) on the four acceptability factors and the overall score. The Hall Towers Taste Panel mean scores on all factors were generally higher on all products than were the mean scores for the Senior Scholars Taste Panel. However, the only statistically significant difference ( $p \leq .01$ ) between panel ratings was on the appearance factor. Tenderness received higher ratings from each taste panel than did any other acceptability factor or the overall score. Both taste panels rated the chicken patty higher than the chicken apple fritter or the chicken breast fillet. Except for flavor, both groups of older adults also rated the fritter higher than the fillet. Flavor of the fritter was rated lower by both taste panels than any other acceptability factor.

Responses of the two taste panels to questions related to acceptability indicated the same order of product preference as their ratings of the acceptability factors and the overall score. The chicken patty always received the most favorable responses. Panelists indicated that the fillet was most in need of improvement, especially in appearance and moistness. Other suggested improvements included adding more chicken and chicken flavor to the patty and the fritter. Both panels indicated willingness to buy all three products.

The Consumer Panel found the convenience chicken products somewhat less acceptable than did the other panels. The chicken patty received highest acceptability ratings, and the chicken breast fillet received lowest ratings. The Consumer Panel also rated tenderness higher than any other acceptability factor.

Suggestions for improving the products were similar to those of the taste panel members. Consumer panelists indicated more willingness to buy the fillet than the patty, and more than one-half were unwilling to purchase the fritter.

The results obtained from this study led to the following conclusions:

1. The frozen precooked chicken products evaluated in this project are acceptable to older adults as well as to the consuming public involved.

2. As the Consumer Panel employed in the present study operated under circumstances not subject to control by the investigator, product evaluations from these panelists must be interpreted with caution rather than generalized to the population at large.

3. The items tested would be purchased by older people if available at a reasonable price in quantities suitable for one or two persons.

4. Older adults such as those involved in this study are capable of making their food needs and interests known, and are willing to do so when given the opportunity.

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## CHAPTER I

### STATEMENT OF THE PROBLEM

The older population in the United States is increasing both in numbers and in proportion to other age groups. Currently there are more than 20 million men and women who are 65 years of age or older. Approximately 14 million live with relatives and friends in the community, whereas five million live alone. About one million of the elderly live in institutions (55).

The elderly American often faces difficulties in attempting to satisfy one basic need--food. Inadequate financial resources to meet the steady rise in food prices is a major problem for a large segment of the older population. Lack of transportation and mobility poses a real obstacle for those who do not live near shopping centers or grocery stores. Health problems and attendant disabilities may erode former proficiencies in meal preparation. Isolation and loneliness often contribute to the problem because to many older adults, it hardly seems worthwhile to prepare food to eat alone. Preparation of small amounts of food seldom seems worth the effort involved; preparing large quantities produces leftovers that seem to last forever.

Another barrier to good nutrition for many elderly individuals is lack of sound information regarding their food needs. Having established eating patterns while the science of nutrition was in its infancy, today's older Americans often have difficulty discriminating between food facts and misleading

advertising or nutritional quackery. Those who shop for themselves may therefore make poor choices from among the thousands of food items and dietary supplements available. If assisted in shopping, they know little of what to ask others to buy, or they have no guide for planning meals.

Since the eating habits of older adults are the result of accumulated lifelong experiences with food, improving dietary practices may be difficult. Satisfying a complex variety of food preferences and dietary needs among older individuals constitutes a major problem for those in charge of meal preparation and service, whether in the home, in the community, or in an institution. The problem can be alleviated somewhat by using favorite foods to meet nutritive needs. For example, chicken is well liked by many older persons and is therefore an excellent means of providing high quality protein in their diets.

Convenience food products are also especially important for older adults. In the home, simple food preparation means that the older individual finds it easier to meet personal food needs. For communities charged with providing services such as meals-on-wheels for the elderly, convenience foods can be used to reduce the needs for elaborate food preparation facilities and equipment. Institutions are already using a wide variety of convenience food items to offset the high cost of labor.

Information from dietary studies continues to indicate that neither nutrition knowledge nor food availability can be depended upon to insure wise food selection or consumption. Acceptability to the consumer is the key in the majority of food choices. For the reasons stated, determination of the

acceptability of convenience chicken products to older adults seemed particularly appropriate.

Specifically, the objectives of this study were to:

1. determine the acceptability of selected convenience chicken products to older individuals.
2. compare the acceptability scores obtained from older individuals with scores from persons representing the general public.
3. inform the processor of selected convenience chicken products of the findings.

The study was limited in several ways. Three frozen convenience chicken products developed for the institutional market by one poultry processor were selected for study. Two panels of older adults, one from a public housing unit and one composed of individuals maintaining private residences, evaluated the products for acceptability. The consumer panel consisted of individuals who patronized one university operated cafeteria.

The following operational definitions were developed for this study:

Acceptability. Degree of satisfaction related to appearance, flavor, tenderness, and moistness. For the purposes of this study, degree of acceptability is indicated by a score on each of the four acceptability factors and the overall score.

Acceptability factor. Characteristic of food to be evaluated such as flavor.

Convenience chicken products. Pre-breaded, pre-browned, and fully cooked chicken products which require no preparation other than heating prior to serving. The specific products in this study follow:

Chicken apple fritter. Ground chicken meat combined with dehydrated apples, soy protein products, seasonings, and spices, formed into a patty.

Chicken breast fillet. Boneless chicken breast meat chopped and formed into a fillet.

Chicken patty. Ground chicken, soy protein products, seasonings, and spices formed into a patty.



## CHAPTER II

### REVIEW OF LITERATURE

#### Introduction

The interrelationships between nutrition and the aging process are difficult to define and to document. However, dietary adequacy is recognized as an important factor in promoting the highest quality of life possible for older adults. Three aspects of these concerns follow: (1) problems faced by the elderly in meeting nutritional needs; (2) the determination of food acceptability; and (3) using convenience products in meeting food needs.

#### Nutrition and Aging

The exact effects of nutrition on aging are not clearly defined. Before maturity, nutritional factors influence growth and development. Nutritional status at the end of the growth period affects such attributes as bone density during old age. After maturity, however, it is difficult to separate the effects of nutrition and other environmental factors from physiological changes which result from the aging process itself. Lack of standards of normality in human aging adds to the problem (19).

Nutritional factors affect general well-being, the rate and extent of degenerative changes, and longevity. Food is one factor usually subject to personal control which affects the physical condition of older individuals (66). Dietary adequacy is vital in supporting as high a degree of health as the aging

process will allow (46). Sound nutrition practices also help to prevent the debilitating consequences of malnutrition on the behavior of older people (72).

Certain degenerative changes occur during human aging. The body's organ systems suffer gradual deterioration. This process may be due to a loss of protoplasm and a reduction in activity of cellular enzymes (77). The loss of functioning cells in the organs of the body also decreases ability to adjust to physiological stress (73). The rate and extent of these degenerative changes may be modified by nutritional factors. In some cases, improved diets have been associated with clinical improvement (66).

Longevity is affected by both overeating and undereating. Studies with experimental animals have demonstrated that length of life and susceptibility to certain degenerative diseases can be significantly modified by dietary manipulations (55, 64). Overeating is associated with a shortened life span in animals and in humans (64, 77). Restriction of nutrients can have pronounced effects on the age at death of many kinds of biologic organisms. Such effects are more difficult to demonstrate in the human (35). However, restriction of food intake sufficiently to prevent obesity has obvious health benefits.

Although nutrition makes an important and significant contribution to health and longevity, researchers have been unable to identify the mechanisms or specific nutrients responsible. The Recommended Dietary Allowances (RDA) of nutrients for the aging person (1968) suggest essentially the same requirements for protein, minerals, and vitamins as for the younger person, but suggest a reduction in caloric intake. This reduction reflects the decrease in

basal metabolic rate and physical activity. The incidence of obesity is high among older people, although it decreases after age 65 (24). Since excessive weight is associated with a number of chronic and degenerative diseases common to older persons, an individual's desirable weight for age 25 should be maintained throughout life (58).

Dietary intake and nutritional status of the aged have been the focus of a number of studies during the past ten years. While few cases of clinical malnutrition have been reported, research findings indicate deficiencies of some nutrients. Giffit et al. (24) reported that when diets of the elderly are inadequate, they tend to be low in several nutrients rather than a single one. An extensive review of research indicated that calcium, iron, ascorbic acid, and the B vitamins are the nutrients most likely to be deficient in diets of older individuals (24).

Even though there is generally decreasing food intake with advancing age, some studies have shown little alteration in the quality of the diets (19). Follow-up studies of an aging population in San Mateo County, California, indicated that mean intakes of nutrients by the various age groups met the 1964 RDA with two exceptions, calories for men and calcium for women. However, a slightly downward trend in nutrient intake was noted with advancing age. After comparing these findings with those reported from other parts of the country, the authors concluded that the majority of older persons consumed diets which provide at least two-thirds of nutrient recommendations (75).

In other dietary evaluation studies involving older adults, it was also found that most subjects had met two-thirds of the 1964 RDA of nutrients.

Calcium, vitamin A, and ascorbic acid were most frequently below the recommendations (36).

Le Bovit (41) reported a food consumption study of 283 Rochester, N. Y., Social Security recipients in one or two person households. Some of the homemakers were between ages 55 and 65, but most were over 65. The quality of the diets as compared with the 1964 RDA decreased with advancing age of the homemaker. With the homemakers under age 75, only 20% of the households failed to meet two-thirds of the allowances; 65% of households with homemakers over age 75 failed to meet the two-thirds figure.

Data obtained from a 1965 survey of food intake of individuals in the United States was reviewed by Pao (53) with respect to eating patterns of the elderly. Most persons over age 65 had at least one serving of meat or meat alternate during the day. Although white potatoes were the most popular vegetable, diets were often deficient in other vegetables and in citrus fruits. Dairy products were often omitted except for insignificant amounts such as milk in coffee.

In a 1969 monograph on nutrition and aging, Howell and Loeb (32) reported little evidence of a high incidence of actual clinical malnutrition among older Americans although there are many reports of their poor eating habits from health and social service professionals. Better correlation between medical records, dietary histories, and subjective health reports is needed. Achieving such a goal may be complicated by poor recall in older persons (11).

Both medical and dietary data were collected during the Ten-State Nutrition Survey of 1968-1970 (83). Findings indicated that persons over 60

years of age showed evidence of general undernutrition not restricted to the very poor or to any single ethnic group.

Factors in later years which contribute to poor dietary habits were identified by Gertman (15) as: (1) economic changes resulting from retirement and greatly reduced income; (2) physiological changes such as loss of teeth, diminished sensitivity of taste and smell, and decreased physical activity and metabolism; (3) social changes such as altered living patterns, routine, and family composition; and (4) psychological changes resulting from loneliness and anxiety.

The economic circumstances of older Americans have received considerable attention in the literature (32, 54, 55, 80). Livingstone (43) reported that 30% of the population who are 65 and over live below the poverty line established by the Social Security Administration. Another 10% have incomes only slightly above the poverty line (43). For these individuals, inadequate funds to buy food make optimal nutrition impossible (80).

Transportation difficulties are becoming more acute for the elderly (17), and the high cost of maintaining and operating a private vehicle is prohibitive for some older persons. Public transportation is costly and service is limited in many areas. Crossing busy streets, carrying groceries, and enduring bad weather add to the problems of the older food shopper (71).

Ignorance contributes to malnutrition among all age groups and the aged are no exception (54). In a study relating nutritional beliefs and practices, Jalso and coworkers (34) found that as age increased, valid nutritional opinions

and practices decreased. Watkin (84) pointed out that some scientists "have thinly veiled contempt for the elderly's often irrational quest for nutritional panaceas (p. 809)." According to Martin (47), older people represent a disproportionately high number of those who spend millions of dollars each year on unneeded dietary products.

Certain physiological changes during the aging process contribute to altered eating habits (73, 79). Although there is considerable variation among older persons, some general observations can be made. Progressive decrease in the basal metabolic rate occurs with age; therefore, caloric requirements are lower while other nutritive needs may remain unaltered. There are indications that the functioning capacity of the gastro-intestinal system is reduced, resulting in lowered absorption, poor muscle tone, and decreased mucus secretion in the intestines. Taste and sense of smell may be less acute (10, 14). Loss of teeth or ill-fitting dentures influence chewing and the choice and acceptance of food (7, 40, 44). Fading of the senses of vision and hearing and chronic conditions such as arthritis and cataracts may add to the older person's disability and feeling of dependency (44).

Social and psychological changes which accompany aging also have profound effects on food practices. Isolation and loneliness have been stressed as contributors to poor nutrition of the aged (55, 82, 85), and some older people find little incentive to prepare meals to eat alone. Le Bovit (41) found that poor appetite and lack of interest in eating were much more serious problems for those living alone than for those living with another person. Entirely new

patterns of living and eating are not readily learned and adopted by older people (32). Confusion or depression may accompany necessary alterations in living and eating arrangements (61, 73). Physicians and dietitians sometimes recommend diets such as salt or fat restriction which are foreign to the older person's customary eating habits. Changes in the diets of older individuals should not be suggested unless their current practices are undesirable and the proposed modifications are for health reasons (80).

Food is a medium of socialization and not merely a biologic necessity; the social life of the adult is based to a great extent upon the pleasures of food and drink. If hunger and appetite become dissociated from eating behavior, the individual may eat for social significance rather than for satisfaction of physiological needs (72, 85). As more individuals are lost from the older person's social circle, the opportunity for social interchange represented by eating with others is also lost. Unfavorable stereotyping of the aged does not encourage overcoming their isolation (50).

Realizing that eating in a social setting is very important to the mental as well as the physical well-being of older people, community organizations throughout the country are providing group meals in a variety of settings (82). Pelcovits and Wolgamot (56) stressed the importance of planning such meals in keeping with the food preferences as well as the nutritional requirements of the elderly. One Florida study (9) indicated that rigid consumption patterns may cause nutritional inadequacies, even when the meals served meet the RDA (20). The nutritional contribution of group meals for the elderly is therefore dependent

upon the acceptability of the foods served.

Regardless of social or psychological problems, older people respond well to special efforts to serve their favorite foods (86). Fruits, sweets, and meats have been noted as favorites among the elderly (8, 37). Chicken, a popular meat among Americans of all ages (13, 16), is especially acceptable to the aged (37). It has a mild flavor and tenderness, and is available at a relatively reasonable price in a variety of convenience packages.

#### Determining Food Acceptability

New food products are successful only to the extent that they meet an identified consumer want, need, or interest (4). Food products without sensory attractions for the intended consumer have limited value on the market, regardless of desirable characteristics such as nutritive value, price, simple storage, or convenience (76). Although cost and convenience are important to consumers, Hoskins (31) stressed that "the inherent sensory properties of foods are the major factor in determining their overall acceptance (p. 397)."

Determining food acceptability is of recognized importance to the food industry. Whether a new product is unique or imitative, its developers need information on consumer acceptance (33). Tests of acceptability can indicate if a product is suitable for its intended purpose and is likely to be accepted by most potential consumers (11, 33).

Appearance, odor, flavor, and texture are among the sensory properties most often measured (38). Both objective and subjective methods are used to evaluate sensory properties of food, and the relative merits of each are



discussed in the literature. Objective methods of measuring food quality depend upon a wide variety of chemical, histological, and physical tests (25). Such tests range from simple procedures to highly sophisticated instrumentation. For example, gas chromatography and mass spectrometry can separate and identify volatile chemical components (65).

Sawyer (65) indicated that gas chromatography is limited in characterizing flavor in terms of the broad spectrum of stimuli to which the consumer is exposed when he is presented with food. The sense of smell is most responsible for the variety of flavors distinguished and enjoyed by the consumer. Sawyer stated further that "the human nose is still more sensitive to certain odorous stimuli than the best instrumentation available at the present time (p. 51)."

The advantage of objective methods is that they are more accurately calibrated than are human sensors and are less subject to drift and fatigue (38). The basic disadvantage is that of measuring sensory properties indirectly. Objective techniques cannot provide information regarding the effects of flavor blends, combination of appearance factors, and texture components on overall consumer acceptance (65). The significance of instrumental methods rests with how well they correlate with valid human sensory data (38, 65).

Subjective methods used to evaluate consumer acceptability depend on the product's stage of development (31). Prior to market testing expert panels are used to define flavor characteristics, and differences or similarities to other products. These panels are composed of trained judges who rate food

items on palatability, i. e., "the combination of those flavor qualities which tend to make the product pleasing to the consumer (6, p. 356)." Working under carefully controlled laboratory conditions, experienced judges can provide reliable estimates of food quality. However, such judgments may not reflect the attitudes and preferences of consumers (67).

The next step in the subjective evaluation of food involves the use of consumer acceptability taste panels before the product is test marketed (31). Individuals participating on acceptability taste panels should be representative of the population for whom the food product is intended (1, 12, 68). Criteria for selection of consumer panel members may include size of family or age of specific family members, occupation of the breadwinner, economic or social level, and geographic area (33). To represent the consumer, subjects must be chosen at random without regard to sensitivity for taste, odor, or other food product stimuli (68). Panelists should be instructed only in the mechanics of the test. No attempt should be made to influence their evaluations or their manner of arriving at decisions (1, 5).

Authorities differ regarding the number of panelists necessary for determining food acceptability (6). More subjects are required for consumer studies than for quality control or palatability ratings by trained judges (1, 6, 25). Because of such practical considerations as expense, availability of personnel, and convenience, most panels consist of from four to twelve members (5, 17, 25). When the number of panelists is limited, results which are comparable to those of a larger panel can be obtained if the scoring of each sample

is replicated two or three times during the study (17, 25). Accepted procedure for a taste panel is to perform only a few tasks at once, to evaluate a restricted number of samples, and to answer a limited number of questions (1).

For determining the acceptability of new or unusual foods where there are no similar products for comparison, Seaton and Gardner (69) found that the single sample presentation proved successful. In scalar scoring used for acceptability tests, samples to be rated are presented to each panelist in random order (33). The panelist may be asked to rate each sample for particular characteristics, using an acceptability scale from "very good" to "very poor" (p. 28). Scoring is facilitated by including such descriptive adjectives or phrases arranged in a graduated series accompanying the numerical scores. Characteristics to be rated should appear in logical order on the score sheet with those evaluated by sight listed first, followed by odor and taste (6, 25).

Use of a rating scale in scoring food products is the most frequently employed system of sensory testing because of its simplicity, diversity, and ease of statistical analysis (6, 67). One of the advantages of the rating scale is that it can be used by panelists with a minimum of training. Some researchers have concluded that for untrained raters, the maximum number of steps on the rating scale should be five (27).

Researchers and other authorities fail to agree as to which of several factors is most important in determining food acceptability (25). According to Kramer (38), no quality attribute of a food is entirely independent; it may overlap and be influenced by other characteristics. One factor taken by itself may

make the food unacceptable, but considered in relation to the product as a whole, the same attribute does not outweigh other pleasing qualities. An overall acceptability evaluation is frequently made. This overall score usually represents an average of the scores assigned the individual factors, and therefore provides a composite evaluation of the food product's acceptability (25).

Rating scores assigned to acceptability factors can be reported as percentages, rankings, and mean values (6). Analysis of the data generally involves a comparison of such scores for each sample evaluated and/or for each panel member (33).

#### Convenience Chicken Products

Convenience foods are those which "have services added to the basic ingredients to reduce the amount of preparation required in the home (8, p. 26)." A wide variety of partially or fully prepared foods is available in grocery stores--canned, frozen, dehydrated, and freeze dried; single portions, multiportions, and entire meals; mixes for numerous foods such as cakes, breads, soups, and salad dressings. Since the use of such products greatly simplifies food preparation, convenience foods are particularly important to older adults. This review focuses on frozen convenience chicken products because of their potential use in meeting the food needs of the elderly.

The use of convenience food by older persons is difficult to document. Bivens (8) speculated that older individuals might be expected to turn to convenience foods because of health or other age related reasons. The relatively large reported increase in use of these items by lower income families was

interpreted by Bivens as due to the inclusion of single person households in the 1965 food consumption data (81). Twenty percent of the older population lives alone, and many of them have inadequate incomes (43, 55). However, Tinklin et al (78) found that convenience products were used less frequently by households with a male head over age 50 than by families with a younger male head; families with incomes below \$6000 also reported infrequent use of convenience foods.

Almost every food prepared at home can now be found in frozen form. New combinations of foods such as complete meals and entrees are continually introduced in supermarkets. Although such foods save meal preparation time with only moderate increases in cost (51), their chief value to older persons lies in the reduced effort required for meeting food needs. Development of new frozen poultry products is of particular interest as a source of high quality protein due to the popularity of fresh poultry with this age group (30).

Frozen precooked poultry products which receive a short heat treatment just prior to serving are being used more widely in the home as well as in restaurants and institutions. An important deterrent in the use of such foods is the inferior flavor noted after reheating (28). This off flavor may account for a consumption rate lower than that of other convenience meats in spite of the popularity of fresh poultry (28). For example, Tinklin et al. (78) found the use of poultry items was limited to frequent serving of frozen pot pies as main dishes. The presence of other ingredients may mask poultry off flavor in such mixtures. Careful control of precooking temperatures may

prevent the rapid onset of off flavors in reheated chicken (28). Newer methods of freezing and improved storage containers also may help to insure high quality in frozen poultry products (42, 45).

Frozen convenience foods are usually produced under two sets of standards--quality control measures established voluntarily by the processor and regulations maintained by governmental agencies. Processors employ scientific knowledge to freeze foods at the peak of quality. Most processors also maintain quality assurance divisions which continually strive for product improvement (51). The United States Department of Agriculture (USDA) has the major responsibility for enforcing governmental regulations to insure wholesomeness of meat and poultry products. Strict standards of both quality and sanitation which must be met by frozen products are established and maintained by the meat and poultry inspection branches. For example, regulations require that boneless poultry products contain the same proportions of meat, skin, and fat that occur on the whole carcass or carcass part. Deviations from this standard must be indicated on the product label (3). USDA standards also require that the batter and breading content of finished poultry products be limited to 30% of finished product weight (48). The standards under which poultry products are processed assure consumers that poultry will continue to be a reliable source of animal protein.

The increased use of mechanization is increasing yield of protein from the carcasses of poultry by making readily available meat from bony parts such as necks and backs. A variety of processed poultry products can be made from

this meat (2, 22). Standards have been established for content of protein and fat, color of meat, and viscosity for deboned poultry in products such as chicken and turkey rolls, loaves, and frankfurters. Flavor aspects of mechanically deboned poultry are under study (26).

The protein content of convenience chicken products is often extended by using soy proteins. Soybeans provide an excellent source of plant protein for human consumption because of the high protein content, good amino acid composition, and low cost (70). Soybeans contain little starch and consist of approximately 40% protein and 20% oil (89). Extraction of the oil with hexane results in defatted flakes and in flours with protein contents of 50% or more (60, 89). Further extraction eliminates carbohydrates and some other minor constituents and produces soy concentrates which are approximately 70% protein on a dry weight basis (60, 88, 89). Still further processing yields isolates, the purest forms of soy protein, which contain more than 90% protein on a dry basis (60, 89). Concentrates and isolates are included in convenience foods for nutritional and functional properties.

Soy protein concentrates have several properties which have promoted their acceptance for food use (49). First, they blend with other food stuffs because of mild flavor and range from cream-yellow to light tan color. In addition, they have the ability to absorb water and to bind fat.

Soy protein isolates have additional functional properties which make them adaptable in food products. Their more useful characteristics include ease of dispersing, suspending, gelling, thickening, and emulsifying. They

also bind fat and absorb water (49, 60). These properties are particularly important to the processor of new convenience foods (49).

Used in desirable proportions in meat patties, both soy concentrates and soy isolates retard cooking shrinkage. Retention of moisture aids in producing more flavorful patties (60). In addition, the higher yield of patties for a given amount of meat results in a lower cost per portion.

Regardless of the relatively low cost of soy proteins, Robinson (63) stressed the necessity for emphasizing the contribution of these meat extenders to the overall acceptance of foods rather than the economic advantages of their use. Lachance (39) affirmed the idea that the food industry should regard its primary role as providing nutrients in acceptable form. As industry continues to improve frozen convenience chicken products, these items should be more acceptable to consumers, particularly the older consumer.

### Summary

Sound nutrition practices are vital in supporting the highest degree of health the aging process will allow. Many older adults consume recommended amounts of nutrients, but others have difficulty in meeting daily food needs. Economic circumstances, social isolation, and physical disabilities are major factors contributing to poor food habits among the elderly.

Food products must meet an identified consumer want, need, or interest to be successful in the marketplace. Sensory evaluation of new food products is an important part of determining acceptability to the intended consumer. Taste panels are used at two or more points prior to market testing. Expert



panels are used to define flavor characteristics and differences or similarities to other products. Untrained taste panels rate food products on a number of factors related to consumer acceptability. Criteria for selection of panel members and for taste test procedure are followed in food acceptability testing.

A wide variety of convenience food products is used by Americans. Frozen convenience chicken products tend to be used less often than other convenience meats in spite of the popularity of fresh poultry. Quality control measures are maintained in processing frozen products. It can be expected that improved methods of freezing and storing will improve the flavor of frozen convenience chicken products which in turn will increase acceptability. A number of new poultry products such as rolls, loaves, and frankfurters are made from mechanically deboned meat. Soy proteins are added to convenience foods for their nutritional and functional properties.

## CHAPTER III

### PROCEDURES

#### Selection of Subjects

The subjects in this study were individuals from three different groups who were asked to taste three convenience chicken products and complete a score sheet designed to determine acceptability. A description of the three taste panels follows:

1. Senior Scholars Taste Panel. A group of older adults retired from a variety of professions, principally in education or business, chosen to represent a middle socio-economic group maintaining private homes.

A list of the 30 active members was obtained from the Senior Scholars' program chairman. Those on the list were contacted by telephone and invited to a meeting for explanation and discussion of taste panel participation. Five Senior Scholars attended and all were willing to participate on the taste panel. Five additional participants were recruited by telephone. The total number of panelists was 10, two men and eight women, all white.

2. Hall Towers Taste Panel. A group of older adults chosen to represent a low income group living in public housing. Hall Towers Apartments (Greensboro, N. C.) is a federally subsidized housing unit for older adults whose income is under \$5000. Most of the residents are retired mill employees and/or their wives.

The community services coordinator of the housing unit extended to all 178 residents an invitation to the meeting at which the investigator explained the study and taste panel participation. Only ten residents were interested in serving on the panel. Later four of these withdrew, two of whom recruited replacements, bringing the total number of participants to eight, one man and seven women, all white.

3. Consumer Panel. Noon hour customers in the cafeteria of the School of Home Economics of the University of North Carolina at Greensboro chosen to represent the eating public. This cafeteria is open to the general public as well as to the university community. Customers at the noon hour include members of the faculty, staff, graduate and undergraduate students, campus visitors, and Greensboro residents. To obtain acceptability scores from this group when the convenience chicken products were served, everyone who selected an entree was asked to complete an entree score sheet. The chicken product score sheets were separated from the others and used as consumer ratings. The Consumer Panel varied in size on the six testing dates, ranging from 12 to 32 individuals. A total of 116 consumers evaluated the convenience chicken products. Of these, 55% were female, 39% were male, 6% did not indicate sex; the majority were white.

#### Development of the Score Sheet

A one-page score sheet was developed for use in subjective evaluation of three convenience chicken products. This instrument was divided into four parts: (1) Likert-type acceptability scales; (2) questions related to acceptability;

(3) instructions; and (4) demographic data. (See Appendix A.)

Five Likert-type rating scales asking for judgments ranging from "very good" (score = 5) to "very poor" (score = 1) were developed for the acceptability factors of appearance, flavor, tenderness, moistness, and overall acceptability.

The questions about acceptability were as follows:

Do you like this product as served? Yes \_\_\_\_\_ No \_\_\_\_\_

Do you think this product should be improved? Yes \_\_\_\_\_ No \_\_\_\_\_  
If "Yes, " how would you improve it?

Would you be willing to buy this product if available at a reasonable price? Yes \_\_\_\_\_ No \_\_\_\_\_

Instructions were of two kinds, those stating how to use the score sheet and those stating the restrictions for testing the products. Panelists were asked to refrain from eating other foods until scoring was complete in order to avoid the influence of additional food flavors on the product evaluation.

Two adjustments were made in the score sheet format to adapt it for each panel's use. First, the title was modified to read "Entree Score Sheet" for use by the Consumer Panel. The word "entree" was also substituted for the word "chicken" in the instructions. As both the Senior Scholars and the Consumer Panel ate in the cafeteria, space was provided at the bottom of the score sheets for listing other foods chosen for lunch.

The demographic data section included items concerning occupation, sex, and age range.

The use of the five-point rating scale with appropriate adjectives in the sensory evaluation of food follows the recommendations of such authorities as

Griswold (25), Amerine, et al (6), and Palmer (52). The validity and usability of the instrument were determined by a panel of two professors knowledgeable in instrument development and two graduate students who were experienced in the use of similar rating scales. Four members of the target population also reviewed the instrument for clarity of wording and instructions, and ease of rating. Suggested changes were made.

### Taste Testing Procedures

Acceptability tests were conducted on five replications of each of three precooked convenience chicken products from one processor: apple fritters, breast fillets, and patties. All products were served to taste panel members during the noon hour. As only one product was presented at each session, 15 days were required to complete testing. To avoid monotony, testing sessions were not held on two days in succession. Dates for the testing sessions were worked out at the convenience of the two taste panels of older adults. The three chicken products were randomly assigned to testing sessions. Collection of data was completed during November and December of 1973, and January of 1974.

The frozen precooked convenience chicken products were delivered to the School of Home Economics by an employee of the processor. The products were in heavy plastic bags in cardboard cartons containing 50 or 100 portions each. The carton also contained the processor's instructions for preparing the products. Carton labels listed the ingredients of each chicken item (Appendix B). These cartons were placed immediately in an upright freezer at 0° F and were

removed as needed for testing purposes. Products for testing at Hall Towers were wrapped in heavy duty foil and transported by car as needed to Hall Towers where they were placed in a freezer. Time in route was approximately 20 minutes; time in the Hall Towers freezer prior to heating was approximately 10 minutes. None of the products showed evidence of thaw or deterioration during the taste testing period.

All convenience chicken products were prepared by the investigator according to the processor's directions. Frozen products were placed on a flat baking pan and heated in a conventional electric oven for 20 minutes at 400° F. Three new Taylor oven thermometers tested together in one oven were employed in regulating those ovens used to a constant temperature. Time lapse between heating and serving was kept to a minimum and was approximately the same for both taste panels. Products served the Consumer Panel were prepared by the investigator or by cafeteria personnel carefully instructed in following the processor's directions. However, these products were subject to the fluctuations in cafeteria steam table temperature, as well as variations in length of time between heating and selection by the consumer during the noon hour.

As laboratory taste test facilities were not available, the two panels of older adults were served in surroundings familiar to them. The Senior Scholars were accustomed to eating in the cafeteria so were served in a reserved area there. The Hall Towers Taste Panel members were served in the general meeting room of the building where they resided.

Taste testing procedures for the two panels of older adults were as comparable as circumstances would allow. Seating arrangements, service of samples, and place settings were similar. Throughout all taste testing, consistency of service was maintained by serving each convenience chicken product individually on the same size white plate with a minimum of decoration around the border. At the first two taste sessions for each group, the score sheet was explained by the investigator and additional instructions for taste test procedure were read (Appendix A). These instructions asked panelists not to discuss their opinions of the product, to complete the score sheet as directed, to turn the score sheet face down upon completion, and to indicate at the bottom of the page if they had a cold on that day. Questions were answered regarding method of rating but no product information was provided. Panelists were reminded to taste and to complete the score sheet prior to seasoning the chicken or consuming any other food. Score sheets were collected as soon as completed.

As the Senior Scholars Panel met in the cafeteria, members tasted and rated the chicken items before eating the remainder of their lunch. The Hall Towers panelists consumed the product immediately or wrapped it in foil and took it to their apartments. No members of either panel left any of the chicken items on their plates.

Each convenience chicken product was offered twice on the serving line in the cafeteria of the School of Home Economics. Products were randomly assigned to six dates selected from a four-week period, with one or two products offered each week. To avoid the influence of price on food selection, the

convenience chicken items were sold at the same price as the other entrees offered on those dates.

The Consumer Panel operated in circumstances fairly typical of the usual consumer in a public cafeteria. Panelists were under no controls except those exercised in heating and serving the convenience chicken products. As chosen, the chicken item was served alone on a luncheon plate. The panelist was given the score sheet as the meal charge was being tabulated. Score sheets were collected by the cashier as the panelists left the dining room.

#### Analysis of Data

Several methods were used in analyzing the data obtained from the two panels of older adults and the Consumer Panel. The major steps in data analysis are summarized in this discussion.

From the two panels of older adults, acceptability scores were combined for five replications of each of the three convenience chicken products. Each panelist's mean scores were determined on the acceptability factors and overall acceptability of each of the three products. These means were used as the acceptability scores in other computational procedures.

A fixed model factorial design with repeated measures on one factor was used in analysis of variance to determine significant differences. Differences were accepted as significant at the .05 level of probability. Omega square was used to show the proportion of variance in the dependent



variable which could be attributed to the independent variable. The Newman-Keuls test for comparisons among means was used to indicate significant differences in product mean scores on acceptability factors and the overall score.

Acceptability scores on each product evaluated by the Consumer Panel were treated on a percentage basis to show what proportion of the respondents rated acceptability factors of the three products as *very good*, *good*, *fair*, *poor*, or *very poor*. From all three panels, questions requiring a "yes" or "no" answer were also treated on a percentage basis. The chi-square test was applied to the question responses of the Senior Scholars Taste Panel and the Hall Towers Taste Panel to indicate significant departure from an equal division of "yes" or "no" responses as expected on the basis of random choice or response. Chi-square analysis of Consumer Panel responses was not possible due to incomplete data on some questions.

## CHAPTER IV

### RESULTS AND DISCUSSION

Selected convenience chicken products from one processor were subjectively evaluated by two panels of older adults and a consumer panel. Frozen precooked chicken apple fritters, chicken breast fillets, and chicken patties were rated on appearance, flavor, tenderness, moistness, and a composite score assessing overall acceptability. Panelists were also asked a series of questions related to acceptability of the products.

This chapter presents the results of the study. Following a description of the panels, comparisons are made of product ratings, and acceptability factors are analyzed. Finally, panel responses to questions about acceptability are compared.

#### Description of Panels

The two taste panels in this study were chosen to represent somewhat different socio-economic groups of older adults. The Senior Scholars Taste Panel was chosen as representative of a middle socio-economic group maintaining private homes. The Hall Towers Taste Panel was chosen to represent a low income group living in public housing.

The Senior Scholars panelists ranged in age from the sixties to the middle eighties (See Table 1, page 31). This panel included two husband-wife teams, all of whom were in the 71-75 age range. The only male on the Hall

Table 1. Age and sex distribution of taste panel members.

Age Range	Taste Panel			
	Senior Scholars		Hall Towers	
	Males	Females	Males	Females
61-65		2		1
66-70		3		2
71-75	2	2		2
76-80			1	2
81-85	—	<u>1</u>	—	—
Total	2	8	1	7

Towers Panel was a bachelor in the 76-80 age range. All remaining members of both panels were widows.

Most of the Senior Scholars panelists were retired from positions in business or education. The two wives on the panel had worked outside the home for only brief periods after they were married. The Hall Towers panelists were retired from a variety of positions in the unskilled labor market. Only one member, a former licensed practical nurse, had had formal professional training.

All members of these taste panels appeared to enjoy participation in the study. Their interest was demonstrated by prompt attendance at taste test

sessions and cooperation in all taste panel procedures. Completed score sheets were obtained from all panelists except one. Because of an accident which dislocated a shoulder, one member of the Hall Towers Panel was unable to attend the final taste test session to evaluate the chicken breast fillet. Consequently, fillet mean scores for this panelist were based on four replications rather than on five.

The Consumer Panel represented a convenience sample of the general public in a university community. The age and sex distribution of these panelists are shown in Table 2. More than one-half of the panelists were female and almost one-half were in the age ranges between 20 and 30. By occupation, the panelists were usually students or members of the University faculty or staff.

Members of the Consumer Panel did not appear as interested in participating in the study as did the two taste panels of older adults. Observation revealed that some of them did not follow score sheet instructions in evaluating the convenience chicken product. Some of the panelists were suspicious of the product, expressing on the score sheet their doubts regarding the chicken content of each item.

#### Comparison of Product Ratings

Both similarities and differences occurred in the ratings of the three convenience chicken products by the two taste panels (Table 3, page 34). The products were generally acceptable to both panels, with the majority of mean scores falling near or above the "good" rating (score = 4). Tenderness received higher ratings from each taste panel than did any other acceptability factor or

Table 2. Age and sex distribution of Consumer Panel.

Age Range	Male	Females	Not Indicated
15-20	3	1	
21-25	5	15	3
26-30	14	14	2
31-35	9	6	
36-40	4	3	
41-45	1	6	1
46-50	2	7	
51-55	2	4	
56-60	1	3	
61-65		1	
66-70	1	1	
Not indicated	<u>2</u>	<u>3</u>	<u>1</u>
Total	44	65	7

Table 3. Taste panel mean scores and standard deviations.

Factor	Convenience Chicken Product					
	Fritters		Fillets		Patties	
	Mean	SD	Mean	SD	Mean	SD
Senior Scholars Taste Panel (n=10)						
Appearance	4.12	.58	3.88	.50	4.24	.51
Flavor	3.66	.94	3.96	.52	4.16	.75
Tenderness	4.74	.31	4.48	.49	4.88	.32
Moistness	4.52	.39	3.74	.60	4.74	.31
Overall Score	4.01	.84	3.88	.53	4.38	.70
Hall Towers Taste Panel (n=8)						
Appearance	4.73	.35	4.69	.47	4.75	.41
Flavor	4.35	.82	4.42	.66	4.65	.46
Tenderness	4.80	.28	4.75	.48	4.80	.35
Moistness	4.68	.41	4.48	.76	4.73	.48
Overall Score	4.63	.49	4.44	.64	4.65	.53

Scale: 5=very good; 4=good; 3=fair; 2=poor; 1=very poor.

the overall score. Flavor of the chicken apple fritter received a lower rating from each taste panel than did any other acceptability factor. Both taste panels rated the chicken patty highest and the chicken breast fillet lowest of the three products.

The Hall Towers panel generally gave higher ratings to the convenience chicken products than did the Senior Scholars. This was true in acceptability factor ratings and the overall score. Hall Towers panelists were also more favorable in their responses to the questions related to acceptability. The Senior Scholars panelists were more critical of the products and gave more suggestions for improving the products than did the Hall Towers panelists.

Consumer Panel ratings on the acceptability factors and the overall score were generally mixed. Table 4 shows the percentages of the respondents who rated each factor as "very good," "good," "fair," "poor," or "very poor." At least one-half of the ratings were equal to or higher than "good" (score = 4), except for the appearance and moistness of the fillet. As with the two panels of older adults, the chicken patty was rated highest most often, with the chicken breast fillet receiving the least favorable response. The Consumer Panel also rated tenderness higher than any other acceptability factor.

Consumer Panel responses to questions related to acceptability were generally less favorable than those of the other taste panels. Suggestions for improving the products were similar. However, the consumer panelists indicated more willingness to buy the chicken breast fillet, despite its lower ratings, than they did for the chicken patty or the chicken apple fritter.

Table 4. Consumer Panel ratings on acceptability factors and the overall score.

Factor	Ratings									
	Very Good 5		Good 4		Fair 3		Poor 2		Very Poor 2	
	No.	%	No.	%	No.	%	No.	%	No.	%
Chicken Apple Fritter (n=36)										
Appearance	6	16.7	20	55.6	6	16.7	4	11.1	0	0
Flavor	10	27.8	11	30.6	11	30.6	3	8.3	1	2.8
Tenderness	23	63.9	8	22.2	4	11.1	1	2.8	0	0
Moistness	13	36.1	13	36.1	9	25.0	1	2.8	0	0
Overall Score	9	25.0	11	30.6	10	27.8	3	8.3	0	0
Chicken Breast Fillet (n=36)										
Appearance	4	11.1	11	30.6	12	33.3	8	22.2	0	0
Flavor	9	25.0	16	44.4	6	16.7	2	5.6	2	5.6
Tenderness	9	25.0	22	61.1	3	8.33	1	2.8	0	0
Moistness	4	11.1	13	36.1	8	22.2	8	22.2	2	5.6
Overall Score	4	11.1	15	41.7	9	25.0	2	5.6	2	5.6



Table 4. Continued.

Factor	Ratings									
	Very Good 5		Good 4		Fair 3		Poor 2		Very Poor 2	
	No.	%	No.	%	No.	%	No.	%	No.	%
Chicken Patty (n=44)										
Appearance	7	15.9	16	36.4	15	34.1	4	9.1	1	2.3
Flavor	14	31.8	14	31.8	12	27.3	3	6.8	1	2.3
Tenderness	18	40.9	15	34.1	9	20.4	2	4.6	0	0
Moistness	18	40.9	12	27.3	11	25.0	3	6.8	0	0
Overall Score	12	27.3	16	36.4	9	20.4	4	9.1	0	0

Acceptability Factors

Appearance. The appearance of the three convenience chicken products was similar, both in the frozen precooked form and after heating for 20 minutes at 400° F. All three items were shaped like patties. The chicken breast fillet was slightly larger than the chicken fritter and the chicken patty, weights per portion being 3.0, 2.9, and 2.8 ounces respectively (Appendix B). The fillet was a lighter brown than the fritter or the patty, both before and after heating.

Analysis of variance of the appearance values (Table 5) indicated a significant value ( $p \leq .01$ ) for the taste panel main effect. This indicated a significant difference between the Senior Scholars panelists and the Hall Towers panelists in their evaluations of the appearance factor.

Table 5. Analysis of variance of taste panel mean scores on appearance.

Sources of Variance	df	MS	F
Between subjects	17		
A (taste panel)	1	5.57	15.05**
Subjects within groups	16	.37	
Within subjects	36		
B (products)	2	.18	1.13
AB (panel x product interaction)	2	.14	.84
B x subjects within groups	32	.16	

\*\* $p \leq .01$

Omega square for taste panels indicated that 29% of the variance in the appearance mean scores could be attributed to differences between taste panels. When mean scores were compared (see Table 3, page 34) it was found that the Hall Towers panelists rated the appearance of all three convenience products higher than did the Senior Scholars. When the mean scores for both taste panels were combined as in Table 6, the appearance of all three chicken items was rated above "good" (score = 4).

Table 6. Means and standard deviations of combined scores for the Senior Scholars Taste Panel and the Hall Towers Taste Panel.

N=18

Factor	Convenience Chicken Product					
	Fritters		Fillets		Patties	
	Mean	SD	Mean	SD	Mean	SD
Appearance	4.39	.57	4.25	.63	4.47	.53
Flavor	3.97	.93	4.16	.62	4.38	.67
Tenderness	4.77	.29	4.60	.49	4.84	.33
Moistness	4.59	.40	4.07	.75	4.73	.38
Overall Score	4.28	.75	4.13	.63	4.50	.63

Scale: 5=very good; 4=good; 3=fair; 2=poor; 1=very poor.

Comparison of the Consumer Panel ratings of the appearance factor for the three convenience chicken products (see Table 4, page 36) showed that over one-half (55.6%) of the respondents rated the appearance of the fritter in the "good" category. A higher proportion of respondents rated the fillet and the patty in the "fair-good" category.

The chicken patty was rated higher on appearance than the chicken breast fillet. Appearance of the chicken breast fillet was rated as "poor" by 22.2% of the panelists, as compared to only 9.0% who rated the appearance of the patty as "poor."

The lower ratings on appearance received by the chicken breast fillet may have been due to its light color on serving. The other two products were a darker brown after heating and may have had more appeal to the consumer.

Flavor. Analysis of variance (Table 7) revealed a significant difference ( $p \leq .05$ ) between products in product ratings on flavor. Omega square for products indicated that 12% of the variation in the dependent measure (flavor) was attributable to differences among products. The Newman-Keuls test of means on flavor indicated that the chicken patty mean score was significantly higher than that of the chicken apple fritter, but not significantly higher than that of the chicken breast fillet. Mean scores of the fritter and fillet did not differ significantly.

The flavor of the three convenience chicken products was generally acceptable to both panels of older adults, as indicated by mean scores ranging from 3.66 to 4.65 (Table 3, page 34). The Hall Towers Taste Panel rated the flavor of all three products slightly higher than did the Senior Scholars Panel. However, analysis of variance indicated that this difference was not significant (see Table 7, page 41).

Table 7. Analysis of variance of taste panel mean scores on flavor.

Source of Variance	df	MS	F
Between subjects	17		
A (taste panels)	1	4.05	3.38
Subjects within groups	16	1.20	
Within subjects	36		
B (products)	2	.72	4.24*
AB (panel x product interaction)	2	.045	0.26
B x Subjects within groups	32	.17	

\* $p \leq .05$

Consumer Panel scoring on the three convenience chicken products points to a generally favorable evaluation of flavor (Table 4, page 36). At least one-fourth of the panelists rated the flavor of each product as "good" or as "very good." Combining these two categories indicated that the fillet was rated as "good" or "very good" by a slightly higher proportion (69.4%) of the panelists than the 63.6% and 58.4% respectively who rated the patty and fritter that high. Only nine individuals gave "very poor" ratings to the acceptability factors of the products. Flavor was the only factor to receive any such rating on all products.

Tenderness. The tenderness of the three convenience chicken products was acceptable to both panels of older adults, with all mean scores above the

"good" rating (Table 3, page 34). Analysis of variance of mean scores as summarized in Table 8 indicated no significant difference between the Senior Scholars Taste Panel and the Hall Towers Taste Panel in their ratings on tenderness.

Table 8. Analysis of variance of taste panel mean scores on tenderness.

Source of Variance	df	MS	F
Between subjects	17		
A (taste panels)	1	.09	.26
Subjects within groups	16	.35	
Within subjects	36		
B (products)	2	.22	5.50**
AB (panel x product interaction)	2	.135	3.38*
B x subjects within groups	32	.04	

\* $p \leq .05$

\*\* $p \leq .01$

The chicken breast fillet was rated lower on tenderness than either the chicken apple fritter or the chicken patty. As shown by the analysis of variance summary in Table 8, the difference among tenderness mean scores was significant at the .01 level of probability. Omega square for products indicated that only 1% of the variance in the dependent measure (tenderness) could be attributed to differences in products.

The significant AB interaction ( $P = .05$ ) shown in Table 6, page 39, indicated that the scoring on tenderness of each of the three products was not the same for both taste panels. Figure 1 illustrates the differences in the tenderness factor as rated by the two taste panels. The Hall Towers panelists rated the products more equally on tenderness than did the Senior Scholars Panel.

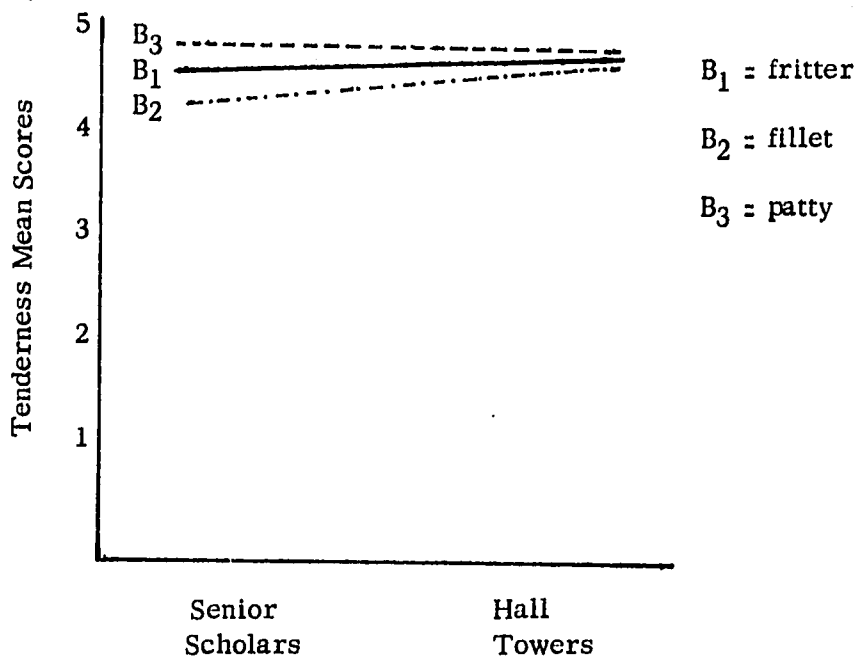


Fig. 1. Panel x product interaction: tenderness mean scores.

The Newman-Keuls test on means indicated that the tenderness mean score on chicken breast fillet was significantly lower than that of the chicken apple fritter or the chicken patty. Mean scores for the patty and fritter did not differ significantly.

The Consumer Panel rated the three convenience chicken products higher on tenderness than on any other acceptability factor. Both the chicken

apple fritter and the chicken breast fillet received "good" or "very good" ratings from 86.1% of the respondents, while the chicken patty received these ratings from 75% of this panel. The chicken patty received ratings of "fair" from a higher proportion of panelists than did the chicken apple fritter or chicken breast fillet (Table 4, page 36). Few ratings on tenderness of "poor" or "very poor" were given to these products.

Moistness. Mean scores on moistness of the three convenience chicken products were above the "good" rating except for the slightly lower value given the chicken breast fillet by the Senior Scholars panelists (Table 3, page 34). Analysis of variance of mean scores on moistness as summarized in Table 9

Table 9. Analysis of variance of taste panel mean scores on moistness.

Source of Variance	df	MS	F
Between subjects	17		
A (taste panels)	1	1.17	2.17
Subjects within groups	16	.54	
Within subjects	6		
B (products)	2	1.93	17.55**
AB (panel x product interaction)	2	.72	6.55**
B x subjects within groups	32	.11	

\*\*p  $\leq$  .01



indicated no significant difference between the Senior Scholars Taste Panel and the Hall Towers Taste Panel in their evaluations of product moistness. However, analysis of variance (Table 9, page 43) showed the difference in moistness scores of the products significant at the .01 level of probability. The significant AB interaction ( $p \leq .01$ ) indicated that the scoring on the three products was not independent of panel membership. As shown in Figure 2, the differences in product ratings were not the same for both panels. As the main effect for panels was shown to be insignificant, the significant interaction resulted from product differences, noted by the Senior Scholars.

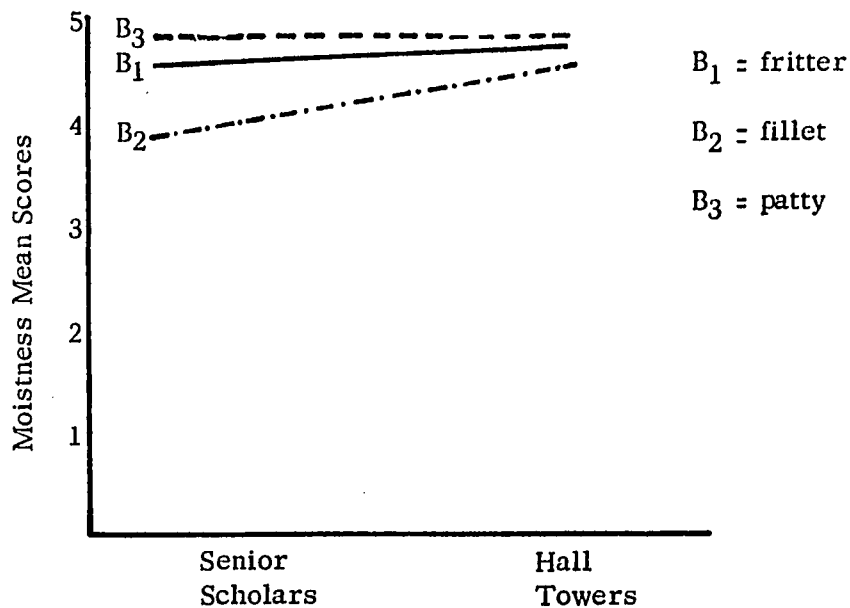


Fig. 2. Panel x product interaction: moistness mean scores.

Omega square indicated that 6% of the variance in the dependent measure (moistness) could be attributed to differences in the products. However,

differences had to be qualified because of the interaction.

The chicken breast fillet received lower ratings on moistness than did the chicken apple fritter or the chicken patty. The Newman-Keuls procedure employed in testing means also indicated that the fillet mean score was significantly different from that of the fritter or patty. While no significant differences were shown between product mean scores for the Hall Towers panelists, the Newman-Keuls test indicated that the Senior Scholars panelists rated moistness of the fillet significantly lower than that of the patty or the fritter. Mean scores for the patty and fritter were not shown to be significantly different.

Consumer Panel scoring on the moistness of the three convenience chicken products followed somewhat the pattern of the older adult taste panels. Moistness ratings of the chicken apple fritter and the chicken patty were similar with the chicken breast fillet receiving lower ratings than either of the other products. Less than one-half (47.2%) of the panelists rated moistness of the fillet as "good" or "very good," while the fritter and patty received such ratings from more than two-thirds of the panelists. The three products received comparable proportions of "fair" ratings. However, the fillet received moistness ratings of "poor" or "very poor" from 27.8% of the respondents, the patty from 6.8%, and the fritter from 2.8%.

Overall Score. The analysis of variance summary shown in Table 10 indicated no significant difference between the overall scores of the Senior Scholars Taste Panel and the Hall Towers Taste Panel.

Table 10. Analysis of variance of taste panel means of the overall scores.

Source of Variance	df	MS	F
Between subjects	17		
A (taste panels)	1	3.15	3.21
Subjects within groups	16	.98	
Within subjects	36		
B (products)	2	.58	4.46*
AB (panel x products interaction)	2	.135	1.04
B x subjects within groups	32	.13	

\* $p \leq .05$

A significant difference ( $p \leq .05$ ) was indicated between products on the overall score. Omega square indicated that 12% of the variance of the dependent measure (overall score) could be attributed to product differences. The insignificant AB interaction mean square shown in Table 10 denoted independence of the product overall scores with respect to panel membership.

Both panels of older adults found the convenience chicken products generally acceptable, as shown by the combined means of the overall score above the "good" rating (Table 6, page 39). Each panel's mean scores on the overall score were above 4.0 except the Senior Scholars' rating of the fillet overall score (3.88) (Table 3, page 34). The Newman-Keuls procedure for testing means showed the fillet overall score mean to be significantly lower than

that of the chicken patty. No other significant differences were found among overall score means.

The Consumer Panel rating of the overall score of the three chicken products was similar to those of the two older adult taste panels. The chicken patty received a higher proportion (63.7%) of combined "good" and "very good" ratings than did the chicken apple fritter (55.6%) and the chicken breast fillet (52.8%). The chicken breast fillet received more "very poor" ratings than did the chicken apple fritter or the chicken patty (Table 4, page 36). Ratings of "fair" and "poor" were quite similar.

#### Responses to Questions Related to Acceptability

Each panelist in all three groups was asked three "yes-no" questions and one open-ended question about the convenience chicken products. Panel responses to these questions are shown in Table 11 as percentages of the total responses to each question for each product. Chi-square analysis was used to determine if the distribution of "Yes" and "No" responses by the taste panels diverged significantly from an equal division expected on the basis of random choice or response (see Table 12). Consumer Panel responses could not be subjected to chi-square analysis due to failure of some of these panelists to respond to all questions.

Do you like this product as served? Of the three products, the chicken patty received the highest proportion of affirmative responses from both taste panels and the fritter the least. Each group ranked the products in the same order. Chi-square values indicated a significantly higher proportion ( $p \leq .01$ )

Table 11. Panel responses to questions related to product acceptability, expressed as percentages of the total responses. <sup>a</sup>

Panel	Response	Convenience Chicken Product		
		Fritter	Fillet	Patty
Question: Do you like this product as served?				
Senior Scholars	Yes	72	82	88
	No	28	18	12
Hall Towers	Yes	80	82	90
	No	20	18	10
Consumers	Yes	72	55	75
	No	25	42	18
	No Response	3	3	7
Question: Do you think this product should be improved?				
Senior Scholars	Yes	70	86	50
	No	30	14	50
Hall Towers	Yes	38	54	32
	No	62	46	68
Consumers	Yes	47	67	45
	No	28	25	39
	No Response	25	8	16

Table 11. Continued.

Panel	Response	Convenience Chicken Product		
		Fritter	Fillet	Patty
Question: Would you be willing to buy this product if available at a reasonable price?				
Senior Scholars	Yes	74	76	88
	No	26	24	12
Hall Towers	Yes	70	87	88
	No	30	13	12
Consumers	Yes	42 <sub>3</sub>	58	54
	No	53	33	39
	No Response	5	9	7

<sup>a</sup>Fritters: N=36; Fillets: N=36; Patties: N=44.

Table 12. Chi-square analyses of taste panel responses to questions.<sup>a, b</sup>

Taste Panel	Chicken Convenience Product		
	Fritter	Fillet	Patty
Question: Do you like this product as served?			
Senior Scholars	8.82**	19.22**	27.38**
Hall Towers	13.22* *	14.77**	24.02**
Question: Do you think this product should be improved?			
Senior Scholars	7.22**	12.50**	0
Hall Towers	2.02	.10	4.22*
Question: Would you be willing to buy this product if available at a reasonable price?			
Senior Scholars	10.58**	12.50**	27.38**
Hall Towers	5.62*	20.10**	21.02**

<sup>a</sup>Total responses for 5 replications: Senior Scholars Taste Panel = 50,  
Hall Towers Taste Panel = 40

<sup>b</sup>Chi-square for 1 df at .05 = 3.84

Chi-square for 1 df at .01 = 6.64

\* $p \leq .05$

\*\* $p \leq .01$

of "Yes" responses on all three products than expected on the basis of random choice.

The Consumer Panel liked the patty (75%) and the fritter (72.2%) about equally. Only 55.6% of these panelists indicated that they liked the fillet as served.

The Consumer Panel also provided a higher proportion (75%) of positive responses to the question as applied to the chicken patty than when directed to the fritter or fillet. Only 55.6% of these panelists indicated that they liked the fillet as served, compared to 72.2% who answered the question affirmatively on the fritter.

Do you think this product should be improved? If "Yes," how would you improve it? Responses to the first of these questions indicated that members of both taste panels saw less need to improve the chicken patty than the chicken breast fillet or chicken apple fritter. The Senior Scholars panelists were evenly divided in positive and negative responses on the chicken patty, but provided a higher proportion of affirmative answers on the fillet (86%) than on the fritter (70%). While indicating the same order of preference as the Senior Scholars panelists, the Hall Towers panelists provided fewer positive responses on this question applied to all three products than did the Senior Scholars (Table 11, page 49). Chi-square analysis indicated that the Senior Scholars Taste Panel diverged significantly ( $p \leq .01$ ) from an expected equal division of question responses on the fritter and the fillet, with a high proportion of "yes" responses, indicating that the panelists saw a need for improving these two products. The Hall



Towers panelists had a significant division ( $p \leq .05$ ) of positive and negative responses on the question related to the patty (Table 12, page 51). The proportion of "no" responses was higher than "yes" answers suggesting that few of these panelists saw a need to improve the patty.

Approximately two-thirds of the Consumer Panel members indicated that the chicken breast fillet should be improved. The proportion of affirmative responses was similar when the question was asked about the chicken apple fritter (47.2%) and the chicken patty (45.4). However, approximately one-fourth of the Consumer Panel members failed to respond to this question on the chicken apple fritter (Table 11, page 49).

The secondary open-ended question was included in the score sheets to solicit suggestions from panelists who saw a need to improve the convenience chicken products. A variety of suggestions were received from all three panels. The Consumer Panel was most critical of the convenience chicken products, followed by the Senior Scholars Taste Panel. The comments from the Hall Towers Taste Panel were generally favorable.

The suggestion most often made for improving the three convenience chicken products was that seasonings should be increased, especially salt. Sauces, gravy, and garnishes were also suggested as improvements for each product.

The chicken patty received fewer criticisms from all three panels than did the other two products. Suggestions for its improvement included making the portion larger and adding more chicken and chicken flavor.

The chicken apple fritter was criticized most often as being too sweet. Adding more chicken and chicken flavor while decreasing the breading content were suggested improvements.

The chicken breast fillet received more suggestions for improvement from all three panels than did the other two products. The fillet was regarded as "too pale" and "too dry" with suggestions most often pointing to the need to improve appearance and to increase moisture. Other suggestions also related to improving the flavor of the fillet.

Would you be willing to buy this product if available at a reasonable price? A high proportion of taste panel members indicated willingness to buy the three convenience chicken products (Table 11, page 49). The chicken patty again received the highest number of affirmative responses with proportions of "Yes" and "No" answers being the same for the Senior Scholars and the Hall Towers panelists. A slightly higher proportion of the Senior Scholars Taste Panel was willing to buy the fillet than the fritter. Hall Towers panelists also showed a greater willingness to buy the fillet (87%) than the fritter (70%). Chi-square analysis as summarized in Table 12 indicated that the observed distribution of yes-no responses by Senior Scholars panelists deviated significantly ( $p \leq .01$ ) from an equal division on all three products, with a high proportion of "yes" responses. For the Hall Towers Panel, the differences between observed frequencies and an even distribution of yes-no responses were more significant ( $p \leq .01$ ) for the patty and the fillet than for the fritter ( $p \leq .05$ ). In all instances, there were more "yes" responses than "no."

The Consumer Panel differed from the two taste panels of older adults in responses to this question. A slightly higher proportion of these panelists (58.3%) indicated willingness to buy the chicken breast fillet than were willing to purchase the chicken patty (54.5%). Only 41.7% of the Consumer Panel answered the question affirmatively with respect to the chicken apple fritter. Consumer Panel willingness to buy the products could be related to chicken content. Comments on the score sheets suggested that some panelists questioned the chicken content of the patty and the fritter.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

The eating habits of older adults are the result of accumulated lifelong experiences with food. Satisfying a complex variety of food preferences and dietary needs among older individuals constitutes a major problem for those in charge of meal preparation and service, whether in the home or in an institution. The problem can be alleviated somewhat by using favorite foods to meet nutritive needs. Since chicken is well liked by many older people, it is an excellent means of providing high quality protein in their diets.

Convenience food products are also especially important for older adults. In the home, simple food preparation means that the older adult finds it easier to more adequately meet personal food needs. In the institution, convenience foods can help to offset the high cost of labor.

#### Summary

This study was undertaken to (1) determine the acceptability of selected convenience chicken products to older individuals, and (2) compare the acceptability scores obtained from older individuals with scores from persons representing the general public.

Three convenience chicken products provided by one processor were subjectively evaluated by two taste panels of older adults and a consumer panel. The products were frozen precooked chicken apple fritters, chicken breast

fillets, and chicken patties. The Senior Scholars Taste Panel was chosen to represent a middle income group maintaining private homes. The Hall Towers Taste Panel was chosen to represent a low income group living in public housing. The Consumer Panel was composed of persons who selected the convenience chicken products when served in the cafeteria of the School of Home Economics of the University of North Carolina at Greensboro.

Acceptability tests were conducted on five replications for each of the convenience chicken products. All products were prepared according to the processor's instructions. Taste testing procedures for the two panels of older adults were as comparable as circumstances would allow. The consumer panelists were under no controls; the products were prepared just as those for the taste panels. All ratings were made on similar score sheets. Analyses of the data were made by analysis of variance, omega square, the Newman-Keuls test, and chi-square tests.

Analyses showed that both panels of older adults rated each of the three convenience chicken products above "good" (score = 4) or "fair" (score = 3) on the four acceptability factors and the overall score. The Hall Towers Taste Panel mean scores on all factors were generally higher on all products than were the mean scores for the Senior Scholars Taste Panel. However, the only significant difference ( $p \leq .01$ ) between panel ratings was on the appearance factor. Analysis of variance indicated significant taste panel-product interactions on tenderness ( $p \leq .05$ ) and moistness ( $p \leq .01$ ), suggesting that differences in product ratings on these two acceptability factors were not the

same for both taste panels. Tenderness received higher ratings from each taste panel than did any other acceptability factor or the overall score. Both taste panels rated the chicken patty higher than the chicken apple fritter or the chicken breast fillet. Except for flavor, both groups of older adults also rated the fritter higher than the fillet. Flavor of the fritter was rated lower by both taste panels than any other acceptability factor.

Responses of the two taste panels to questions related to acceptability indicated the same order of product preference as their ratings of the acceptability factors and the overall score. The chicken patty always received the most favorable responses. Panelists indicated that the fillet was most in need of improvement, especially in appearance and moistness. Other suggested improvements included adding more chicken and chicken flavor to the patty and the fritter. Both panels indicated willingness to buy all three products.

The Consumer Panel found the convenience chicken products somewhat less acceptable than did the other panels. The chicken patty received highest acceptability ratings, and the chicken breast fillet received lowest ratings. The Consumer Panel also rated tenderness higher than any other acceptability factor. Suggestions for improving the products were similar to those of the taste panel members. Consumer panelists indicated more willingness to buy the fillet than the patty, and more than one-half were unwilling to purchase the fritter.

### Conclusions

The results obtained from this study led to the following conclusions:

1. The frozen precooked chicken products evaluated in this project are acceptable to older adults as well as to the consuming public involved.
2. As the Consumer Panel employed in the present study operated under circumstances not subject to control by the investigator, product evaluations from these panelists must be interpreted with caution rather than generalized to the population at large.
3. The items tested would be purchased by older people if available at a reasonable price in quantities suitable for one or two persons.
4. Older adults such as those involved in this study are capable of making their food needs and interests known, and are willing to do so when given the opportunity.

The investigator's experience with the convenience chicken products suggests that such foods are particularly appropriate in helping to meet the nutritive needs of older adults due to ease of storage, preparation, and consumption.

### Recommendations for Further Study

The results of this investigation lead to several recommendations for further study. A similar project should involve the same convenience chicken products improved through incorporation of the major suggestions from all three panels of the present study. Increasing chicken content and flavor of the fritter and the patty, increasing moistness of the fillet, improving seasonings, and adding

sauces or gravies would probably enhance the acceptability of chicken apple fritters, chicken breast fillets, and chicken patties.

Indications of broad consumer acceptability could be obtained by using taste panels representing a cross-section of the general public. If economically feasible for the processor, the convenience chicken products should also be tested on the consumer market. Test marketing results would provide information regarding acceptability of these and similar items to the general public.

The total evaluation of food products appropriate for older adults should involve further participation of these individuals on taste panels. As the segment of the population over age 65 increases, convenience food products will be even more important in helping the elderly meet nutritive needs. Information from subjective evaluation of new foods is vital to the food industry in developing products acceptable to older adults.



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**APPENDIX A**

**Instructions and Product Score Sheets**

INSTRUCTIONS TO BE READ TO TASTE PANEL MEMBERS  
AT THE FIRST TWO MEETINGS

1. Please do not discuss your opinions of the product being tasted in order not to influence the scoring of other panel members.
2. Be sure to score each factor listed on the score sheet.
3. Write your name and occupation in the spaces provided.
4. Check the blank beside your age range.
5. Answer the questions at the bottom of the score sheet.
6. If you have a cold during any of the taste panel meetings, state this at the bottom of the score sheet.
7. Turn the score sheet face down on the table before continuing your lunch.

Sample No. \_\_\_\_\_ Kind \_\_\_\_\_ Date \_\_\_\_\_

**CONVENIENCE CHICKEN PRODUCT SCORE SHEET**  
(For Senior Scholars Taste Panel)

**Instructions:**

PLEASE DO NOT SEASON THE CHICKEN OR EAT ANY OTHER FOOD  
WITH IT UNTIL YOU HAVE COMPLETED THE SCORE SHEET.

Circle the number which best describes the factor being scored.

FACTOR	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Appearance	5	4	3	2	1
Flavor	5	4	3	2	1
Tenderness	5	4	3	2	1
Moistness	5	4	3	2	1
Overall Score	5	4	3	2	1

Signature \_\_\_\_\_ Occupation \_\_\_\_\_ Sex: M \_\_\_ F \_\_\_

**Age Range:**

15-20 _____	36-40 _____	56-60 _____	76-80 _____
21-25 _____	41-45 _____	61-65 _____	81-85 _____
26-30 _____	46-50 _____	66-70 _____	86-90 _____
31-35 _____	51-55 _____	71-75 _____	91-95 _____

Do you like this product as served? Yes \_\_\_\_\_ No \_\_\_\_\_

Do you think this product should be improved? Yes \_\_\_\_\_ No \_\_\_\_\_  
If "Yes", how would you improve it?

Would you be willing to buy this product if available at a reasonable price?  
Yes \_\_\_\_\_ No \_\_\_\_\_

Please list all other foods you selected with this product.

Sample No. \_\_\_\_\_ Kind \_\_\_\_\_ Date \_\_\_\_\_

CONVENIENCE CHICKEN PRODUCT SCORE SHEET  
(For Hall Towers Taste Panel)

Instructions:

PLEASE DO NOT SEASON THE CHICKEN OR EAT ANY OTHER FOOD  
WITH IT UNTIL YOU HAVE COMPLETED THE SCORE SHEET.

Circle the number which best describes the factor being scored.

FACTOR	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Appearance	5	4	3	2	1
Flavor	5	4	3	2	1
Tenderness	5	4	3	2	1
Moistness	5	4	3	2	1
Overall Score	5	4	3	2	1

Signature \_\_\_\_\_ Occupation \_\_\_\_\_ Sex: M \_\_\_ F \_\_\_

Age Range:

15-20 _____	36-40 _____	56-60 _____	76-80 _____
21-25 _____	41-45 _____	61-65 _____	81-85 _____
26-30 _____	46-50 _____	66-70 _____	86-90 _____
31-35 _____	51-55 _____	71-75 _____	91-95 _____

Do you like this product as served: Yes \_\_\_\_\_ No \_\_\_\_\_

Do you think this product should be improved? Yes \_\_\_\_\_ No \_\_\_\_\_

If "Yes", how would you improve it?

Would you be willing to buy this product if available at a reasonable price?

Yes \_\_\_\_\_ No \_\_\_\_\_

Sample No. \_\_\_\_\_ Kind \_\_\_\_\_ Date \_\_\_\_\_

ENTREE SCORE SHEET  
(For Consumer Panel)

Instructions:

PLEASE DO NOT SEASON THE ENTREE OR EAT ANY OTHER FOOD WITH IT UNTIL YOU HAVE COMPLETED THE SCORE SHEET.

Circle the number which best describes the factor being scored.

FACTOR	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Appearance	5	4	3	2	1
Flavor	5	4	3	2	1
Tenderness	5	4	3	2	1
Moistness	5	4	3	2	1
Overall Score	5	4	3	2	1

\_\_\_\_\_ Occupation \_\_\_\_\_ Sex: M \_\_\_ F \_\_\_

Age Range:

15-20 _____	36-40 _____	56-60 _____	76-80 _____
21-25 _____	41-45 _____	61-65 _____	81-85 _____
26-30 _____	46-50 _____	66-70 _____	86-90 _____
31-35 _____	51-55 _____	71-75 _____	91-95 _____

Do you like this product as served? Yes \_\_\_\_\_ No \_\_\_\_\_

Do you think this product should be improved? Yes \_\_\_\_\_ No \_\_\_\_\_

If "Yes", how would you improve it?

Have you eaten this product before? Yes \_\_\_\_\_ No \_\_\_\_\_

Would you be willing to buy this product if available in a grocery store?

Yes \_\_\_\_\_ No \_\_\_\_\_

Please list all other foods you selected with this product.

**APPENDIX B**

**Ingredient and Nutritive Content of Convenience**

**Chicken Products**

INGREDIENT INFORMATION AS LISTED  
ON PRODUCT LABELS

CHICKEN APPLE FRITTER

INGREDIENTS; Chicken, water, dehydrated apples, textured vegetable protein (soy flour, niacin, calcium pantothenate, ferrous sulfate, vitamin B6, riboflavin, vitamin B12 /on dicalcium phosphate/), soy protein concentrate, chicken broth, soy protein isolate, imitation chicken flavor (modified food starch, hydrolyzed vegetable protein, monosodium glutamate, sugars, vegetable fat, amino acids, disodium inosinate, disodium guanylate), nonfat dry milk, sugar, salt, monosodium glutamate, sodium phosphates, hydrolyzed vegetable protein, spices, tumeric, paprika, onion powder, garlic powder and dextrose.

BATTERED WITH: Corn flour, wheat flour, salt, baking powder, nonfat dry milk, spices, and dry eggs.

BREADED WITH: Wheat flour, bread crumbs, nonfat dry milk, salt, vegetable shortening, dextrose, sugar, baking powder, yeast extractives, flavoring.

Fried in vegetable oil.

CHICKEN BREAST FILLET

FINISHED PRODUCT INGREDIENTS: Chicken Breast with sodium phosphates, breading consisting of wheat flour, cracker crumbs, salt, monosodium glutamate, spices.

BATTERED WITH: Water, corn flour, wheat flour, modified whey, salt, vegetable gums, baking soda. FRIED IN VEGETABLE OIL.

CHICKEN PATTY

FINISHED PRODUCT INGREDIENTS: Chicken, soya protein concentrate, soya protein isolate, imitation chicken flavor (modified food starch, hydrolyzed vegetable protein, monosodium glutamate, sugars, vegetable fat, amino acids, disodium inosinate, disodium guanylate), nonfat dry milk, salt, monosodium glutamate, sodium phosphates, hydrolyzed vegetable protein, spices, tumeric, paprika, onion powder, garlic powder and dextrose.

BATTERED WITH: Corn flour, wheat flour, salt, baking powder, nonfat dry milk, spices, and dry eggs.

BREADED WITH: Wheat flour, bread crumbs, nonfat dry milk, salt, vegetable shortening, dextrose, sugar, baking powder, yeast extractives, flavoring.

FRIED IN VEGETABLE OIL.

NUTRITIONAL ANALYSIS FOR 100 GRAMS  
OF EDIBLE PRODUCT\*

Product	Chicken Apple Fritter	Chicken Breast Fillet	Chicken Patty
Water (grams)	45.34	56.77	54.43
Food Energy (calories)	314	222	276
Protein (grams)	15.69	20.25	16.25
Fat (grams)	20.89	10.07	19.19
Carbohydrates			
Total (grams)	13.90	11.17	8.00
Fiber (grams)	2.49	0.10	0.42
Ash (grams)	2.31	1.84	2.55
Sodium (milligrams)	500.0	490.0	840.0
Potassium (milligrams)	420.0	190.0	140.0
Calcium (milligrams)	89.6	12.3	123.0
Iron (milligrams)	2.8	2.4	3.5
Vitamin A Value (I.U.)	2092	1674	2335
Thiamine (milligrams)	0.71	0.59	1.01
Riboflavin (milligrams)	0.5	0.2	0.3
Niacin (milligrams)	4.7	4.3	1.3
Ascorbic Acid (milligrams)	12.0	6.2	5.3
Weight per Portion (ounces)	2.9	3.0	2.8
Breeding to Finished Weight (percent)	25.0	25.0	25.0
Cooked Edible Yield (percent)	100.0	100.0	100.0

\*Compiled by an independent test laboratory and verified by Holly Farms Quality Assurance Division.