Taste Panel Evaluations of the Acceptability and Willingness to Pay for Alternative Blends of Ground Meats

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Abstract:

      An untrained consumer panel evaluated the acceptability, willingness to purchase and pricing of several different combinations of fresh ground beef and ground turkey. Important product attributes were flavor and texture, along with previous at home experience with the combined product. Thirty percent turkey appears to be the maximum for acceptability.

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Introduction

New fresh meats do not appear in the U.S. very frequently. The most recent is likely the introduction of fresh ratite meats (ostrich and emu) in the early 1990s. High production costs and limited availability curtailed consumption of these new fresh meats as did the sparsity of information available on their characteristics relative to traditional meats (Gillespie and Schupp). Previous new fresh meats that were as unsuccessful in achieving widespread consumer acceptance include buffalo and alligator.

Why is a new fresh meat product needed or even desirable? Other than desire for a larger choice in the marketplace, there are other reasons for the introduction of new fresh meat products:

a. Possibility of lowering the costs of fresh meat products currently consumed by many U.S. consumers,

b. Possibility of offering a fresh meat product with smaller quantities of less desirable nutrients, such as fat and cholesterol, and,

c. Provide the consumer a fresh ground meat product having the desirable characteristics of two or more existing traditional meats.

While many consumers may be content to regularly consume the current fresh meat products, others are likely to seek new ways of obtaining similar taste and flavor sensations but with some twists that add to the individual's enjoyment from consuming meat. While the sizes of the two groups are unknown, the wide acceptance of new processed meat products hints that the latter group may be significant in size and buying power.

The combining of two or more traditional fresh meats into a single product is another method of creating a new fresh meat product. Since consumers in general are aware of the characteristics of the traditional meats, their combined products are also likely to have fairly predictable preparation and edibility characteristics. This predictability is desirable if consumer acceptability of the new fresh meat product is expected to be achieved quickly and with minimum promotional expenses.

The traditional meats (beef, pork, chicken and turkey) have been combined in processed meat products for some time. [While lamb, goat, veal, and rabbit may also be traditional meats, their overall low per capita consumption led to their exclusion from consideration]. Consumers have accepted frankfurters, sausages, and many other processed meat products containing the traditional meats in varying proportions. Many of the mixed meat products have offered reduced fat and cholesterol contents as well as lower prices than similar products made from either beef or pork alone.

Ground beef supplemented with 25 percent plant protein (usually of soybean origin) has not proven to be popular among consumers even though the supplemented ground beef offers lower fat and cholesterol as well as a reduced price. Today, this combined ground meat product is largely limited to ready-made patties sold in frozen form.

What combinations of traditional meats offer the most promise for consumer acceptance? One possibility is obviously ground or structured products containing beef (for taste) and poultry (for lower price and fat). Ground beef is the flavor favorite among ground meats. Ground turkey can range from 1-15 percent fat, depending on content of dark meat and skin. Alone, ground turkey or chicken has had limited acceptability in patty form because of flavor and texture shortcomings relative to ground beef. As a result, these products have not caught on with fast

food outlets in patty form as has ground beef. Low fat turkey offers a challenge in preparation as it has a tendency to dry quickly under cooking (Johnson).

LSU researchers surveyed a random sample of Louisiana households by mail to determine their acceptance and perceptions of a combined fresh ground beef and turkey product (Schupp, et al.). Sixteen percent of the respondents reported having mixed the two ground meats in their own homes for a variety of uses, including as meat patties. The preferred product and packaging attributes, based on a conjoint analysis, were for a combined product containing 90 percent ground beef and 10 percent ground turkey, product sold fresh, retailed at hamburger price levels and prepackaged by the retailer. The largest complaint given for the proposed combined fresh meat product was the resistance to mixing the two species into a single product.

Will a combined ground beef and turkey product be acceptable to consumers? If so, what is the proportion of ground beef needed in the product for it to be acceptable? Will consumers purchase the combined product at same or higher prices than ground beef? An untrained consumer panel was used to help answer these and other questions.

Objectives:

The primary objective of the study was to estimate consumer acceptability and pricing of a combined fresh ground beef and turkey product. Specific subobjectives include:

a. Estimate the acceptability of several ground products consisting of different proportions of ground beef and ground turkey, respectively, with respect to selected socioeconomic characteristics and previous experience with the product.

b. Estimate the likelihood of consumers purchasing the combined products specified under "a" if commercially available.

c. Estimate acceptable pricing levels for the two combined ground meat products relative

to the price of ground beef.

Data and Methods:

Participation in an untrained consumer taste panel was solicited from among faculty, graduate students, and staff of a major research university and from among individuals in the local community that had, in the past, participated in sensory taste panels at the university. A total of 115 consumers were invited to participate in a single tasting session (over a one week period) and to provide selected socioeconomic characteristics. Since participants were not paid for their services on the panel, the panel was primarily comprised of university employees and students. Provisions were made for free parking near the test center for those who drove onto campus for the taste session.

An evaluation form (questionnaire) was developed, reviewed by project personnel and other university personnel with taste panel experience, and revised accordingly. The evaluation form called for the individual to rate the three samples for color, flavor, texture and overall liking using nine-point hedonic scales (from dislike extremely to like extremely). The wording of the questions and the selection of the nine-point hedonic scale were adapted from previous research involving consumer product evaluation. The individual was also asked to indicate whether the sample was acceptable (yes, no), whether he/she would purchase the product if available commercially (yes, no) and if the latter was answered YES, the price willing to pay compared to 100 percent ground beef, the control (lower, same, higher).

Ground beef (75 percent lean) and ground turkey (85 percent lean) were purchased from a local corporate food chain. The use of commercially available beef and turkey, instead of more specific products formulated by project personnel from whole tissue beef and turkey, was chosen to: (1) provide a grind, appearance and fat content of ground beef familiar to consumers, (2)

avoid extra handling and processing which could introduce food safety concerns, and (3) avoid introduction of any product complications that could inadvertently enter through the research nature of the university. The two products were mixed carefully in three proportions (100 % ground beef; 90 % ground beef and 10 % ground turkey; 70 % ground beef and 30 % ground turkey - hereafter referred to as 100:0, 90:10 and 70:30), formed into approximately one inch patties, identified by content and quick frozen. The facilities of the university's food science department were used for proper mixing of the two ground products, formation of the mini patties, freezing and storing the samples, cooking the mini patties and for consumer evaluation of the samples.

Approximately one hour prior to each tasting session, sufficient samples of the three products were removed from the freezer and the mini patties grilled until all pink color was removed. The cooked, coded samples were placed on compartmentalized plastic plates for presentation to the evaluator. Each panel member was also given a glass of water, an empty glass for product removed from the mouth, toothpicks for handling the cooked samples and evaluation forms coded for the three samples.

When the panel members arrived for the session, they were seated in the test area, briefed on the test procedure, asked to sign a form indicating that they understood the minor risks associated with the test procedure and given the opportunity to leave immediately if allergic to either beef or turkey products. After completing the evaluation session, panel members were offered complimentary snacks and drinks.

The data were analyzed using chi-squared, analysis of variance, probit and ordered probit analysis. Table 1 provides a list of the independent variables used in probit analyses dealing with overall acceptability of the products, willingness to purchase the products and price to be paid

for the products along with their definitions and expected signs. Previous experience with mixing ground beef and ground turkey in the home was expected to lead to more favorable responses for the products containing turkey, hence, a positive expected sign for each of the regressions. Consumers generally have perceptions of the desired flavor, texture and color of ground meats, which impact their acceptance, purchase, and pricing of various meats. These are likely to have positive expected signs.

While individuals tend to become more health oriented with age, leading to positive expected signs, they also are more reluctant to change established habits, leading to negative expected signs. Additionally, the palate needs greater stimulation with age, encouraging the older to seek foods with new tastes (Disbrowe)   Hence, the age variable was considered to have an indeterminate sign. Females are usually more knowledgeable of food characteristics, leading to a positive expected sign.

The authors have no basis for hypothesizing a sign for black and Asian variables. A positive sign is hypothesized for samples containing turkey for those with a college degree or higher under the assumption that education increases health awareness. On the other hand, income is hypothesized to have a negative influence on samples containing turkey under the assumption that adding turkey to ground beef would result in it being classified as an inferior good.

Results:

The socioeconomic characteristics of the consumer panel reflect its university source (Table 2). The high level of education, large proportion of students and low percentage of retirees are typical of a panel selected primarily from a university community. Panel findings indicate that two percent less report the combining of ground beef and ground turkey in their

homes than the mail survey reported earlier.

How did the panel rate the three products for color, flavor and texture? The average ratings for the three characteristics and products were between "like slightly" and "like moderately" (Table 3). Unexpectedly, the color rating for the 90:10 product was superior to the rating for the 100:0 product.

How acceptable were the three products to the panel members? The percentage of members rating the products acceptable ranged from 93.8 percent for 100:0 product to 84.2 percent for 70:30 product. Willingness to purchase the three products ranged from 79.8 percent for 100:0 to 68.4 percent for 70:30. Based on those panel members willing to purchase the three products, 74.7, 76.1 and 69.2 percent were willing to purchase the 100:0, 90:10 and 70:30 samples, respectively, at prices equal to hamburger. Surprisingly, a larger percentage (16.7) would purchase the 70:30 product at a higher price than hamburger than they would the 100:0 product (8.8).

Are the ratings for color, flavor, and texture different among products? Superscripts on the product means of Table 3 provide the answers. Ratings for color differed only between 90:10 and 70:30 products while differences for flavor were between 100:0 and 70:30 products. Texture ratings did not differ by product.

Acceptability and willingness to purchase between 100:0 and 90:10 samples and between 90:10 and 70:30 samples did not differ. However, both acceptability and willingness to purchase differed between 100:0 and 70:30 samples. While both acceptability and willingness to purchase declined from 100:0 to 70:30 samples, the differences were significant only between the extreme samples.

Panel member assessments of the values of the three ground samples relative to ground

beef were given in Table 3. Chi-squared analysis was used to determine differences in assessments by meat sample. As noted previously, the 70:30 sample received the highest value assessment. Assessments were significantly different between the 70:30 and 100:0 samples but not between the 100:0 and 90:10 samples.

Which of the variables defined in Table 1 are most responsible for determining the panel's acceptability of the three ground meat products, their willingness to purchase the three products, and their assessments of the value of the three products relative to the price of ground beef? These results are given in Tables 4-6. Each of the overall models for acceptability was significant at the one percent level based on a chi-squared test. Table 4 indicates that flavor is responsible for a strong positive influence on the acceptability of the three products and that the color trait negatively influences the acceptability of the 90:10 beef product. Previous experience with mixing ground beef and ground turkey in the home negatively influenced acceptability of the 100:0 and 90:10 beef products. Asians were less willing to accept the combined products and higher income was negatively associated with acceptability of 100 % ground beef.

Again, each of the overall product models for willingness to purchase were significant at the one percent level based on a chi-squared test. Improved flavor and texture traits positively impacted willingness to purchase each of the three products and color preference negatively influenced willingness to purchase the 100:0 and 90:10 beef products (Table 5). Previous experience with mixing the two ground meats in the home was negatively and positively associated with the 90:10 and 70:30 beef products, respectively. Females or higher income panel members were less likely to purchase the 70:30 beef product.

While the overall product model for perceived product value for the 100:0 product was not significant, the remaining two models were, each at the one percent level, based on a chi-

squared test. Flavor and texture positively influenced the panel members to value the 90:10 beef

product higher (Table 6). Flavor also was associated with a higher value for the 70:30 beef

product. However, color negatively influenced the perceived value of the 100:0 beef product.

Implications

As expected, actual taste evaluations of the products had greater impacts on the

acceptability, willingness to purchase, and assessment of value of the three products than did the

panel members socioeconomic characteristics. The reader must recognize that the composition of

the consumer panel severely limits the application of the results to the Louisiana population.

Flavor was a significant factor influencing the panel member's overall acceptability and

willingness to purchase each of the three products. Flavor is usually the most important edibility

trait of ground meat products among consumers. While color and texture were of lesser

importance, texture was also important in determining willingness to purchase the three ground

meat samples. Color differences were not readily distinguishable in grilled beef samples,

particularly when the percentage of beef in the three samples was no less than 70 percent.

Previous experience with mixing ground beef and ground turkey in the home appears to

be the most influential of the variables associated with panel members themselves. Its impact

was negative with the 90:10 sample but positive with the 70:30 sample. Previous users of the

combined ground meat product may have been using a larger proportion of turkey for at home

uses and not able to pick up the addition of turkey until it became 30 percent of the combined

product.

The most unexpected result from the study was the higher value given to the sample with

the highest proportion of ground turkey. We specifically used commercially available ground

beef and turkey to avoid injecting bias into the study by the means used to determine the content

or grind of either beef or turkey. While it is possible that the small pieces evaluated by the panel could have been more devoid of any evidence of fat or oil in the sample containing the largest quantity of turkey, and hence of more value, no actual fat content tests were made. More research is needed to evaluate this point.

The primary objective of the study was to estimate whether a new fresh meat product consisting of a combination of ground beef and ground turkey had the potential to be a marketable product. The results indicate that a ground meat product containing up to 30 percent ground turkey, the remainder being ground beef, is potentially salable to over two thirds of the evaluators. Further research as to the impact of this substitution on the cost, fat content and other nutritive contents of ground beef (hamburger) is needed to further assess the potential market.

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    2000, Roanoke, VA.

Table 1. Independent Variables, Expected Signs and Definitions, Probit and Ordered Probit Analyses, Untrained Consumer Member Panel, Louisiana State University, 2001.

Variable	Expected Sign	Definition
Previous Use[a]	Pos	Yes = 1, No = 0
Color[b]	Neg	Interval [Dislike Extremely (1) - Like Extremely (9)]
Flavor[b]	Neg	Interval [Dislike Extremely (1) - Like Extremely (9)]
Texture[b]	Neg	Interval [Dislike Extremely (1) - Like Extremely (9)]
Age	?	Continuous
Female	Neg	Female = 1, Male = 0
Black	?	Black = 1, Otherwise = 0
Asian	?	Asian = 1, Otherwise = 0
College	Pos	College Education or Higher = 1, Otherwise = 0
Income	Neg	Continuous

[a] Panel members indicated whether they had previously mixed ground beef and ground turkey in their home for use in meals.
[b] Panel members rated grilled samples of products for color, flavor and texture using 1-9 hedonic scales (Dislike Extremely = 1 to Like Extremely = 9)

Table 2. Percentage of Total for Consumer Panel Socioeconomic Characteristics, Louisiana State
University, 2001

Characteristic	Percent	Characteristic	Percent
Previous Use	14.5	HH W/ Children	33.3
Age (Average in years)	36.1	HH W/O Children	66.7
Female	60.5	Education	
Race		College or higher	71.1
Asian	10.4	Employment	
Black	10.4	Employed	60.9
Hispanic	7.1	Student	36.5
White	64.3	Retired	2.6
Other	7.8	Income (Average in $)	38,520.0

Table 3. Means for Color, Flavor and Texture and Percentages of Panel Members Giving Yes Responses to Acceptability, Willingness to Purchase and Values Relative to Hamburger, Untrained Consumer Panel Evaluations, Louisiana State University, 2001

Variable	Product (% Beef)		
	100	90	70
Color (Ave: 1-9 Scale)	6.64^{ab}	6.70^{a}	6.48^{b}
Flavor (Ave: 1-9 Scale)	6.57^{a}	6.52^{ab}	6.24^{b}
Texture (Ave: 1-9 Scale)	6.56^{a}	6.38^{a}	6.38^{a}
Acceptable (% Yes)	93.8^{a}	88.6^{ab}	84.2^{b}
Purchase (% Yes)	79.8^{a}	76.3^{ab}	68.4^{b}
Price Will Pay (% Yes)			
Less than Hamburger	16.5	17.1	14.1
Same as Hamburger	74.7^{a}	76.1^{ab}	69.2^{b}
More than Hamburger	8.8	6.8	16.7

Note: Color, flavor and texture analysis based on analysis of variance and the remainder were analyzed through use of chi-squared analysis.
[ab] Means with the same letter superscripts are not significantly different.

Table 4. Factors Influencing the Acceptability of Three Alternative Ground Meat Products,
Untrained Consumer Panel Evaluations, Probit Analysis, Louisiana State University,
2001.

Variable[a]	Product (% Beef)					
	100		90		70	
Constant	-7.588	0.1840	-2.706	0.2261	-5.801**	0.0062
Color	-0.300	0.6350	-0.827*	0.0584	-0.242	0.6144
Flavor	2.638**	0.0151	2.450**	0.0008	1.359**	0.0217
Texture	0.213	0.7625	-0.055	0.8811	0.868	0.1000
Previous Use	-4.201*	0.0611	-3.157**	0.0437	2.855	0.2281
Age	0.653	0.4369	-0.441	0.3112	-0.181	0.7102
Female	-0.586	0.6891	-0.346	0.7337	-0.976	0.4363
Black	-4.107	0.1023	[b]		-1.112	0.5242
Asian	-4.084	0.1422	-3.090**	0.0422	-2.658*	0.0954
College	2.228	0.3318	1.874	0.1612	-0.867	0.4902
Income	-0.892*	0.0965	-0.442	0.1211	0.199	0.5427

[a] See Table 1 for definitions of variables.
[b] The model would not run with this variable in place. A possible explanation include correlation problems with another variable.
* Ten percent significance level   ** Five percent significance level

Table 5. Factors Influencing Willingness to Purchase Three Alternative Ground Meat Products, Untrained Consumer Panel Evaluations, Probit Analysis, Louisiana State University, 2001.

Variable[a]	Product (% Beef)					
	100		90		70	
Constant	-7.911**	0.0020	-6.586**	0.0010	-11.581**	0.0002
Color	-0.658*	0.0622	-0.509*	0.0941	-0.048	0.8996
Flavor	0.913**	0.0114	1.417**	0.0002	1.685**	0.0006
Texture	1.203**	0.0013	0.592**	0.0257	0.657*	0.0800
Previous Use	-1.468	0.1194	-1.957**	0.0384	4.048**	0.0244
Age	0.585	0.1505	-0.177	0.5478	0.258	0.4463
Female	0.051	0.9408	-0.168	0.8049	-1.843*	0.0595
Black	0.108	0.9367	0.449	0.7079	-1.567	0.1427
Asian	-0.096	0.9223	-0.082	0.9324	-1.616	0.1810
College	-0.028	0.9720	-0.146	0.8538	0.495	0.5618
Income	-0.143	0.4255	-0.006	0.9699	-0.361*	0.0763

[a] See Table1 for definitions of variables.
* Ten percent significance level   ** Five percent significance level

Table 6. Factors Influencing Assessment of Value of Three Alternative Ground Meats Relative to
    Ground Beef, Untrained Consumer Panel Evaluations, Ordered Probit Analysis,
    Louisiana State University, 2001.

Variable[a]	Product (% Beef)					
	100		90		70	
Constant	0.846	0.5178	-2.505*	0.0518	-4.146*	0.0586
Color	-0.320*	0.0716	-0.211	0.1189	-0.128	0.5026
Flavor	0.378	0.1321	0.390**	0.0475	0.750**	0.0035
Texture	0.071	0.7341	0.329**	0.0211	0.294	0.2129
Previous Use	0.571	0.2313	-0.154	0.8165	0.661	0.1138
Age	-0.104	0.3658	-0.026	0.8725	-0.088	0.5185
Female	-0.233	0.5289	-0.332	0.3734	-0.636	0.1374
Black	0.492	0.5574	0.624	0.3029	-0.448	0.6333
Asian	0.469	0.4533	1.027	0.1257	0.305	0.6941
College	-0.560	0.1640	-0.259	0.5172	-0.053	0.9073
Income	-0.007	0.9909	0.107	0.2051	-0.074	0.4194
Mu (1)	2.666**	0.0000	2.982**	0.0000	2.930**	0.0000

[a] See Table 1 for definitions of variables.
* Ten percent significance level   ** Five percent significance level