ACCEPTABILITY AND PREFERENCE OF BEEF FRANKFURTERS PREPARED WITH FAT REPLACERS

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Background

Growing awareness of the link between diet and health is fast changing consumer habits, so that there has been increasing demand for foods with health enhancing properties, such as low-fat meat products. As food component, fat contributes as key for both sensory and physiological benefits (Jimenez-Colmenero, 2000). Fat contributes to flavor, or the combined perception of mouthfeel, taste, and flavor. Ingredients, which will include fat substitutes, protein and carbohydrate-based fat replacers, and "mouthfeel" flavors, may be used in the formulation of a variety of low or no-fat food products (Pszczola, 1997).

Objectives

This study has evaluated the acceptability and preference of beef frankfurters using four different fat replacers (FRs) - 1) control. 2) carrageen, 3) modified cassava starch, 4) microparticulated whey protein, and 5) oat bran (Chart 1).

Methods

Sensory evaluation: 57 untrained panelists, sausage consumers, recruited among staff and graduate students of Faculdade de Saúde Pública-USP, Brazil tested the sausages. Approximately 2.5cm, of cooked in water, sausage presented to each consumer at random. Each consumer has received 5 different uniform samples: a control and 4 with FRs. The samples were simultaneously presented, coded with three-digit and balanced-block design. The test was realized in individual booths and under fluorescent light. Affective test was employed to measure product liking and preference (ranking). For acceptance hedonic structured scale was used from 1 – dislike extremely, 5 – neither like or dislike, to 9 – like extremely. The panelist was asked to assign an order to the sample accord in to her preference. **Total fat** - the lipids were determined using the dry column methodology suggested by Marmer & Maxwell (1981), which defend such method as a viable alternative to extraction using chloroform, methanol, and water. The beakers employed were previously stove dried for 12 hours at 105ºC, after this they were cooled in a dessicator and weighed. Ten milliliters of the dry column extract were transferred to the beaker and evaporated under nitrogen. Afterwards the extract was placed in a stove at 105ºC and, after 3 hours, it was cooled in a dessicator and weighed on an analytical balance. **Cholesterol** - The non-saponifiable lipids were analyzed through the colorimetric method of Bohac et al., (1988), according to whom this is an efficient method which yields similar results to those achieved through gaseous chromatography, with the advantage of being less costly. The lipids were extracted and analyzed through the technique described by Marmer & Maxwell (1981). Three milliliters of extract taken from each sample were evaporated under nitrogen. After being dried, the samples were saponified through the addition of 10 mL of a 12% potassium hydroxide (KOH) solution in ethanol and subjected to an 80ºC water bath with agitation for 15 minutes. They were then promptly cooled through the addition of 5 mL of distilled, demineralized water followed by double extraction with 10 mL of hexane. Four-milliliter aliquots of the hexane were taken and dried under nitrogen (N_2) flow. Six milliliters of a saturated solution of ferrous sulfate in glacial acetic acid were added, as well as 2 mL of concentrated sulfuric acid (H_2SO_4). The samples thus treated were read with a "Coleman-295" spectrophotometer at 490nm. The calibration curve was constructed based on 50-, 100-, 150-, and 200-µg solutions, subjecting the SIGMA® C-8253 standard cholesterol concentrations to the saponification and color development stages. A 10 to 40µg gradient was achieved at the end of the process.

Results and discussions

The results of hedonic scale were subjected to one way analysis of variance ($p<0,05$), frequency distributions and TUKEY test. The rank values for preference was analyzed by Friedman test (Resurreiccion, 1998). FIZZ - Sensory analysis and consumer test management software version 2.00 (Biosystems) was used for statistical analysis. The frankfurters' proximate composition results were uniform owing to the fact that their formulations were previously balanced. However, the data showed little difference among the treatments. Whey protein was the treatment that presented the best performance in terms of lipid reduction, while carrageen was the most effective in reducing cholesterol and energy (Table 1). Through sensory evaluation, the untrained panelists indicated that the formulation with the fat replacer cassava starch was similar to the control (pork backfat) according to the acceptability and preference (Figure 1). The lipid level in cassava starch formulation was higher than the others formulations, expect for the control. However, the fat level did not show statistical differences.

Conclusions

It was suggested that the lipid content was not the main decision factor for the panelist acceptance. It is probable that the combination of fat replacers with sensory evaluation and certain enhancing characteristic of the frankfurters and further work in this area are necessary to isolate the ideal fat-replacer.

References

Bohac C. E., Rhee K.S., Cross H.R., Ono K. (1998) Assessment of methodologies for colorimetric cholesterol assay of meats. Journal of Food Science, 53: 1642-43.

Jimenez-Colmenero, F. (2000) Relevant factors in strategies for fat reduction in meat products. Trends in Food Science & Technology, 11:56-66.

Marmer W.N., Maxwell R.J. (1981) Dry column method for the quantitative extraction and simultaneous class separation of lipids from muscle tissue. Lipids, Champaign, 16: 365-71.

Pszczola, D. E. (1997) For fat replacement. Food Technology, 51 (1) 83-88.

Keywords

Low fat; Sausages; sensory evaluation, product development.

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Figure and Tables

Chart 1 – Frankfurter formulations with different types of fat replacers

Ingredients	Formulations (g)				
	1	2	3	4	5
Beef meat	1700	1700	1700	1700	1700
Pork back fat	300	-	-	-	-
Carrageen	-	4 *	-	-	-
Modified cassava starch	-	-	40 *	-	-
Microparticulated whey protein	-	-	-	160 *	-
Oat bran	-	-	-	-	60 *
Water	700**	700**	700**	700**	700**
Cure mixture	5	5	5	5	5
Starch	100	100	100	100	100
Frankfurter seasoning	20	20	20	20	20
Emulsifier	10	10	10	10	10
Sweet paprika	4	4	4	4	4
Nutmeg	4	4	4	4	4
White pepper	3	3	3	3	3
Sugar	10	10	10	10	10
Fixing agent	10	10	10	10	10
Ajinomoto	5	5	5	5	5
Garlic	15	15	15	15	15
Onion	10	10	10	10	10
Soy protein	60	60	60	60	60
Salt	30	30	30	30	30

1 - Pork backfat frankfurter (control); 2 - Carrageen frankfurter; 3 - Modified cassava starch frankfurter; 4 - Microparticulated whey protein frankfurter; 5 - Oat bran frankfurter; * The fat replacer value recommended on each ingredient's label was used; ** Values expressed in (mL); the other values are expressed in (g).
FRs amount was used according to supplier's recommendations.

Table 1 – Lipids, cholesterol, and caloric content reduction (percent) of the formulated Frankfurters as compared to a control sample (pork back fat).

Frankfurters	% Lipids	% Cholesterol	% Energy
Carrageen	69.98	31.96	28.97
Cassava starch	69.49	23.04	24.88
Whey protein	71.69	14.75	24.80
Oat bran	70.59	15.29	27.40

Figure 1 - Acceptability (%) and Preference (%) of the Formulated Frankfurters