INFLUENCE OF USING MECHANICALLY SEPARATED CHICKEN MEAT FROM DIFFERENT PARTS AND LEVELS ON THE CHEMICAL, PHYSICAL AND SENSORY PROPERTIES OF BOLOGNA TYPE PRODUCT

N.J. BERAQUET, M.T.E.L. GALVÃO and R.Z.M. DA SILVA
Meat Technology Centre - ITAL, Caixa Postal 139, Campinas, São Paulo, Brazil

Summary: Meat bologna containing mechanically separated chicken meat (MSCM) from backs and necks at the levels of 20, 40 and 100% were evaluated for cooking loss, water holding capacity/ /emulsion stability, proximate composition, pH, shear compression and sensory analysis for firmness, juiciness, flavor and overall acceptability. For all treatments, cooking losses were in the range of 6,9 - 7,6%. Water holding capacity was not affected neither by the source of meat nor by its level in the products, total volumes release being in the range of 4,8 - 7,1%. Products final pHs were 6,2, 6,3-6,4 and 6,5 for MSCM levels of 20, 40 and 100%.
Firmness (shear compression) decreased with the increase of MSCM level although differences were not statistically significant when MSCM from necks was used. Subjective evaluation revealed that products elaborated with 20 and 40% MSCM from backs were firmer than the 100% ones while when necks were used the 20% MSCM level products were firmer than the 40 and 100% ones. No differences were found in juiciness and flavour for all treatments. All products were considered slightly desirable.

Introduction: Mechanical deboning recovers the meat from bony parts like backs and necks in an economical way. Many researchers have been studying the factors that influence the chemical, physical and organoleptic characteristics of the mechanically separated chicken meat (MSCM) (FRONING, 1976; FRONING, 1981; BERAQUET, 1988).
The main use of MSCM is in emulsion type products due to its paste like texture.
Important properties of MSCM for this application are its functional properties like water holding capacity and emulsion stability which were reviewed in detail by RANDALL (1977). Functional properties are affected by the chemical composition of the MSCM and by its quality.
The effects of type of raw material and equipment on MSCM composition have been well studied. HAMM & SEARCY (1981) determined the chemical composition and mineral content of MSCM from skinless necks, backs and spent layers. DURANTI & CERLETII (1988) also determined the chemical composition and the nutritional value of MSCM from wings, necks, backs and breast and compared them with the nutritional value of the hand deboned meat. SCHULLER (1985) reported that the equipment used to produce MSCM could affect its composition. Nevertheless, the data of KUMAR et alii (1984) and MAST et alii (1982) do not confirms this.
The use of MSCM in emulsion type products has been studied under different approaches. MAURER et alii (1969) studied the influence of kind of poultry and its parts on the emulsifying capacity of salt soluble proteins. MAYFIELD et alii (1978) showed that products elaborated with higher protein content released less water, fat and gelatin. KUMAR & WISMER PEDERSEN (1984) showed that luncheons meat prepared with 70% MSCM were softer than luncheons meat prepared with hand deboned meat.
Few works have been conducted to determine the effect of the use of MSCM from different parts on the product physical and chemical characteristics. KUMAR & WISMER PEDERSEN (1983) compared reestructured products elaborated with MSCM from spent-layers and backs to products elaborated using hand deboned meat from spent-layers. These authors observed that products prepared with hand deboned meat had a better texture than the product prepared with MSCM. Products elaborated with MSCM from spent-layers were considered better than the ones prepared with MSCM from backs. BAKER & KLINE (1984) compared frankfurters prepared with MSCM from backs, skinless necks and a mixture of backs and necks at the ratio of 5:1. Frankfurters containing MSCM from necks were considered soft and had the least acceptability.
The purpose of this work was to evaluated the influence of the use of two types of MSCM at three levels on the chemical, physical and sensory properties of a bologna type product.

Materials and Methods: Three trials were conducted on the processing of meat bologna type product using MSCM from skinless backs and necks at the levels of 20, 40 and 100%. The skinless necks and backs were mechanically separated in a POSS deboning machine. The MSCM was frozen to -20°C and kept at this temperature for about 1 week until bolognas were prepared. Beef and pork meat from shoulder were used at the ratio of 1,5 beef: 1,0 pork. The products were formulated to contain cerca of 22% fat and 13% protein. To achieve the desired fat percentage pork back fat was added when necessary. The meats were chopped in a "cutter" with salt, phosphate, nitrite and 1/2 of the water until a temperature of 4°C was reached. Then, seasonings, GDL, erithorbate and 1/2 of the water were added and the mixture was chopped until 12°C. The emulsions were stuffed into 80 mm cellulosic casings. The products were cooked for 4,5h divided in three stages: 90 min at 50°C (drying process); 90 min at 60°C (reddening process) and 90 min from 70 - 80°C until ane internal temperature of 72°C was reached. After being held overnight at 5°C the bolognas were analysed

Chemical and Physical Analysis. Cooking loss was determined on the finished bolognas by weighting 7-10 bolognas for each treatment before and after cooking in a semi-analytical balance. Water holding capacity/emulsion stability were determined according to the sample placed in a sealed bag as described by methodology of Parks and Carpenter (1987). pH was measured with a potentiometer in a slurry of 10 g samples homogenized with 50 ml distilled water. The moisture, fat and ash content were determined using the methodology descirbed by HORWITZ (1980). Protein content was determined using the macrokjedahl method as described by Torry Research Station (1973) for total nitrogen. All determinations were carried in triplicate. For Objective texture measurement, cylinders of 1 cm of height and 0,8 cm diameter were taken from 1 cm thick bolognas slices from the middle portion with a cork borer and compressed to 30% of its height in an Instron Model TM-2318. 10 samples were compressed for each treatment.

Sensory Analysis was conducted using a trained panel of 10 judges to evaluate each sample for firmness, juiciness, flavor and overall quality on a descriptive analysis with a 10 point scale. The bolognas were served to the panelists in cubes. The evaluated parameters mean values were statistically analysed using the Tukey Test at 5% level.

Results and Discussion: Cooking losses, emulsion stability and pH of bolognas type products are shown in **Table 1.** For the same type of raw material there were not differences between the MSCM levels on the cooking losses. Cooking losses were in the range of 7,1 - 76% for products processed with MSCM from backs and 6,9 - 7,2% for products containing MSCM from necks. Emulsion stability was not affected neither by the source of MSCM nor by its level. Bolognas produced with MSCM from backs released a total volume of water-gel in the range of 5,6 - 7,1% and the ones elaborated with MSCM from necks released a total volume in the range 4,8 - 6,9%. None of the products showed fat releasing. Similarly to this study FRONING & JANKI (1971) reported losses of water-gel in the range of 4,6 - 6,5% for frankfurters.

pH values (**Table 1**) didn't differ statistically between products elaborated with 20 and 40% MSCM from backs. The bolognas presented pHs of 6,21, 6,31 and 6,47 for MSCM from backs levels 20, 40 and 100% levels respectively. At the 100% level the pH was considered statistically higher than the others. As shown in **Table 1** the pH of bolognas processed with MSCM from necks presented similar trends and values.

The proximate composition of the bolognas is shown in **Table 2.** Products containing MSCM from backs din't show statistical differences in relation to the moisture, fat and protein contents that were in the range of 58,8 - 61,1%; 20,8 - 22,3% and 12,8 - 13,1% respectively. Ash content, of 2,7% was the same for products containing 20 and 40% MSCM. At 100% level, the ash content, of 3,2% was considered statistically higher than at other levels probably due to its higher bone content.

Moisture contents of bolognas containing MSCM from necks ranged from 59,3 to 60,3%. Although there were statistically significant differences between treatments these were small reflecting the fact that there were no significant differences in cooking weight losses **(Table 1).** Fat

Table 1. Effect of MSCM from backs and necks at different levels on the cooking loss, emulsion stability and pH of bologna type products.

Product	Cooking loss (%)	Emulsion stability (% water-gel released)	pH
Backs			
20%	7,3[a*]	5,6[a]	6,21[b]
40%	7,1[a]	6,1[a]	6,31[b]
100%	7,6[a]	7,1[a]	6,47[a]
Necks			
20%	7,2[a*]	5,4[a]	6,22[c]
40%	7,1[a]	4,8[a]	6,38[b]
100%	6,9[a]	6,9[a]	6,50[a]

* same letter means no differences between two mean values at 5% level.

Table 2. Proximate composition of bologna type products made with MSCM from backs and necks at different levels.

Product	pH**	Moisture (%)	Fat (%)	Protein (%)	Ash (%)
Backs	6,71				
20%		59,8[a*]	22,3[a]	12,9[a]	2,7[b]
40%		61,1[a]	20,8[a]	12,8[a]	2,7[b]
100%		58,8[a]	21,7[a]	13,1[a]	3,2[a]
Necks	6,79				
20%		59,3[b]	22,7[a]	13,0[a]	2,6[a]
40%		60,3[a]	21,8[a]	13,3[a]	2,8[a]
100%		60,2[ab]	21,5[a]	12,6[a]	2,9[a]

* same letter means no difference between two mean values at 5% level.

** pH of raw materials.

Table 3. Objective firmness (shear compression) and sensory evaluation of bologna type products made with MSCM from backs and necks at different levels.

Product	Firmness (objective lb/g)	Sensory Paramater			
		Firmness	Juiceness	Flavor	Overall quality
Backs					
20%	2,0[a*]	5,5[a]	5,2[a]	7,6[a]	6,9[a]
40%	1,8[b]	5,6[a]	4,8[a]	7,6[a]	6,8[a]
100%	1,6[c]	4,3[b]	5,2[a]	7,7[a]	6,2[a]
Necks					
20%	2,0[a]	5,6[a]	5,0[a]	7,3[a]	6,3[a]
40%	1,8[a]	4,8[b]	5,2[a]	7,0[a]	6,0[a]
100%	1,6[a]	4,8[b]	5,4[a]	7,1[a]	5,8[a]

* same letter means no difference between two mean values at 5% level.

and protein contents were in the range of 21,5 - 22,7% and 12,6 - 13,3% respectively and were not affected by the level of MSCM. Ash content increased with the level of MSCM from 2,6 to 2,9% and differences were not statistically significant.

As MSCM from necks levels increased from 20 to 100% the objective firmness decreased from 2,0 to 1,6 lb/g but values were not statistically different.

The products containing MSCM from backs presented the same range of values of objective firmness but probably due to a less scatter in data the differences were statistically significant. These objectives measurements for backs are in more agreement with the sensory data. **Table 3** shows that bolognas containing 20 and 40% MSCM from backs didn't differ statistically and with scores of 5,5 and 5,6 respectively were significantly firmer than the product containing 100% MSCM. The score 5,0 was considered as "ideal". When MSCM from necks were used products at the 20% levels were significantly firmer than the others. The range of scores were the same for the products containing the two types of MSCM. Juiciness was considered ideal at score 5,0 and all products from both types of MSCM showed a score around 5,0 without statistical differences. No difference were fround in flavour between levels for both types of MSCM. The increasing of MSCM slightly decreased the overal quality although differences were not statistically significant. These scores reveal that the bolognas containing MSCM from backs and from necks were slightly desirable.

Conclusions: The results have shown that the source of MSCM had no influence on its functional properties. Sensorially acceptable bologna type products could incorporate a 100% MSCM from either backs or necks.

REFERENCES:

BAKER, R.C.; KLINE, D.S., 1984. Acceptability of frankfurters made from mecanically deboned poultry meat as affected by carcass part, condition of meat and days of storage. Poultry Science, 63, 274-278.

BERAQUET, N.J., 1988. Panorama da carne de frango mecanicamente separada. Anais do Seminário da Produção e Utilização de Carne de Frango Separada Mecanicamente. ITAL, Campinas, 1-19 abril.

DURANTI, M.; CERLETTI, P., 1980. Chemical composition and nutritional value in vitro of mechanically deboned poultry meat. British Poultry Science, 21(1), 1-7.

FRONING, G.W.; JANKI, D., 1971. Effect of pH and salt preblending on emulsifying characteristics of mechanically deboned turkey frame meat. Poultry Science, 4, 1206-1209.

FRONING, G.W., 1976. Mechanically deboned of poultry meat. Food Technology, 30(9), 50-63.

FRONING, G.W., 1980. Mechanically deboning of poultry and fish. Advances in Food Research, 27, 110-143.

HORWITZ, W. ed., 1980. Official methods of analysis of the Association of Official Analytical Chemists 13 ed. Washington, D.C. A.O.A.C., 1018p.

KUMAR, S.; WISMER-PEDERSEN, J., 1983. Quality of luncheon meat with mechanically deboned poultry meat as sole ingredient. Indian Journal of Poultry Science, 18(2), 85-90.

MAST, M.G.; VIJTTENBOOGAART, T.G.; GERRITS, A.R.; VRIES, A.W., 1982. Effects of auger and press type mechanical deboning machines on selected characteristics of mechanically deboned poultry. Journal of Food Science, 47(6), 1757-1762, 1766.

MAURER, A.J.; BAKER, R.C.; VADEHRA, D.V., 1969. The influence of type of poultry and carcass part on the extractability and emulsifying capacity of salt-soluble proteins. Poultry Science, 48(3), 1127-1129.

MAYFIELD, T.L.; HALE Jr., K.K.; RAIO, V.N.M.; ANGULO CHACON, I.A., 1978. Effects of levels of fat and protein on the stability and viscosity of emulsion prepared from mechanically deboned poultry meat. Journal of Food Science, 43, 197-201.

PARKS, L.L.; CARPENTER, J.A., 1987. Functionality of six non meat proteins in meat emulsion systems. Journal of Food Science, 52(2), 271-274, 278.

RANDALL, C.J., 1977. Use of mechanically deboned and manually deboned poultry meat in meat emulsions: a review. Can. Inst. Food Science Technol. J., 10(3), 147-152.

SCHULLER, G.A., 1985. Deboned poultry characteristics. Presented to the South Eastern Poultry and Eggs Association International Meeting, January, 25.

TORRY RESEARCH STATION, 1973. Reccomended Analytical Methods for Fish and Fish Products. Aberdeen (TD.123).