LOW FAT CURED LAMB AND MUTTON PRODUCTS.

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Story in Brief

The sheep industry has virtually no value added products in the marketplace. With the popularity of lower fat meat products with claims of 5-10% fat, the lamb industry has an untapped market with a potential for growth. The objective of this study is twofold; 1) develop the technology for the curing lamb products and 2) examine the possibility of producing low fat cured products from mutton. Cured meat products were manufactured from the legs of pork, lamb and mutton carcasses and analyzed for processing and sensory differences. Pork had a greater muscle yield, but processing parameters were not different between the three products. There were no differences for all sensory traits except flavor intensity between pork and the other two products. It is feasible to manufacture low fat cured lamb or mutton products using similar manufacturing procedures that are currently available in the pork industry. However, the increased labor cost per pound of product involved due to lower muscle yields of lamb and the initial raw material costs will force this product into a niche or specialty market.

(Key Words: Lamb, Mutton, Cured Meats.)

Introduction

Low fat cured meat products, primarily pork and turkey, have been the marketing norm in the retail case in recent years. The pork industry has incorporated the attributes of convenience and low fat for consumers in developing the "95% fat free" hams and other products. The sheep industry has very few viable further processed products. The Sheep Industry Development Program (1988) has identified further processed lamb products as one of their top priorities. With the popularity of lower fat meat products with claims of 5-10% fat, the lamb industry has an untapped market with a potential for growth. Manufacturing cured lamb products that would fit this market is a possibility and one that must be considered. Additional lamb products that are convenient

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and low fat should appeal to today's consumer. Previous research in the curing of lamb products has been concerned with curing whole legs (Ziauddin et al., 1974). As the off-flavors commonly associated with lamb or mutton are primarily from the fat components (Pearson et al., 1973), the curing technology of tumbling used in the manufacture of many pork products may be a feasible way in which to eliminate some of these negative attributes. Although the technologies to manufacture these products is not new, they could be applied to lamb and possibly mutton to produce a consumer acceptable product.

Mutton has always been difficult to merchandise because of its strong flavor. Consequently the price differential between lamb and mutton is quite high. Since most of the strong flavor components are found in the fat portion, the development of a low fat meat product, with most of the fat removed, may be a feasible way to utilize mutton. Therefore, the objective of this study is twofold; 1) develop the technology for the curing lamb products from legs and 2) examine the possibility of producing low fat cured products from mutton.

Material & Methods

Fresh legs were removed from pork, lamb and mutton carcasses 48-72 hr after slaughter. The legs were then boned, muscles separated and separable fat removed. The muscle yield was calculated as muscle weight divided by the leg weight. Three legs were used for each replication. Three replications of the products were manufactured.

Manufacturing Procedure

The manufacturing procedure consisted of grinding the separated, defatted muscles using a 3-hole kidney shaped plate using a 2 blade knife (Biro, Marblehead, OH). A 22% by weight curing solution (Water 76.28%, Salt 10.7%, Dextrose 10.7%, Sodium Tripolyphosphate 2.0% Sodium erythorbate 0.25% and Sodium nitrite 0.07%) was added to the meat. This mixture was placed in a tumbler (VMR-35-526, Globus) and tumbled (20 rpm) for 2 hours. After tumbling, the mixture was held overnight (16-18 hours). The products were stuffed into cellulose casing (7R, Viskase, Chicago, IL), clipped and cooked in a smokehouse (Alkar, Lodi, WI) with computer control (DDC, Alkar, Lodi, WI). The products were thermally processed using the same thermal processing schedule presented in Table 1. The products were held in a refrigerated cooler (34-36^{O}F) for 12 hours and then weights were recorded. The products vacuum packaged (Multivac, KOCH Supplies, Kansas City, MO) in pouches and placed in refrigerated storage (34-36^{O}F) until further analysis.

Table 1. Thermal processing schedule for pork, lamb and mutton legs.

Time	Dry Bulb	Wet Bulb	Smoke
30 min.	54°C	18°C	No
30 min.	60°C	49°C	Yes
60 min.	71°C	60°C	Yes
60 min.	77°C	66°C	Yes
Until internal temperature reaches 67°C	82°C	71°C	Yes
1 min.	hot water shower (38°C)		
Until internal temperature reaches 38°C	cold water shower (10°C)		

Product Analyses

The products were analyzed for proximate composition (AOAC, 1984) and pH (Acton et al, 1972). The products were analyzed by a trained taste panel. The taste panel (n=8) was trained using AMSA (1978) procedures and were selected on their repeatability. Training consisted of differentiating between different levels of lamb in a cooked beef pattie, differentiating texture and cured pork flavor in various cured pork products varying in texture from whole muscle to restructured products. The panelists analyzed 6 randomized products per session. The statistical analysis consisted of analysis of variance (Steel and Torrie, 1980) with specie as the main effect and least square means to separate significant differences ($P<0.05$).

Results and Discussion

The muscle yield is presented in Table 2. As expected, the pork legs had a greater yield of muscle from the wholesale cut. This is an obvious economical disadvantage for lamb and mutton in terms of the labor involved in the deboning process. There was no difference ($P>0.05$) due to raw material in terms of cooked or processing yield. The average yield over all three replications and raw material types was 88.43% ($\pm$1.28). The pH values of the products were also not different ($P>0.05$) with the mean being 6.09 ($\pm$0.18). These data indicate that even though their are initial raw material differences that the

Table 2. Muscle yield means and standard deviations of pork, lamb, and mutton legs.

Raw Material	Yield^{a}
Pork	52.6 (3.71)^{b}
Lamb	46.9 (7.87)^{c}
Mutton	42.2 (6.08)^{c}

^{a} Defatted muscle wt Î wholesale cut weight x 100

^{bc} Means with the same superscript are not different (P>0.05).

processing properties of the lamb or mutton are similar to pork in this application.

The composition of the final cooked products are presented in Table 3. All of the products were less than 10% fat. This achieved the less than 10% fat objective in all products and would enable the products to be so labeled. The pork product was different (P<0.05) in fat content than the lamb or mutton species. This difference was also present in the moisture and protein values. Even though significant differences exist between pork and the other two products, all three products would be considered as comparable low fat products in the marketplace. There was a difference in protein content between lamb and mutton. This is probably due to the slight difference (non-significant) in fat content that was magnified in the higher protein content.

Table 4 presents the taste panel results for the ham products. There were no differences for all traits except flavor intensity between pork and the other two products. The values represented for the lamb and mutton products are considered slightly bland in the flavor intensity scale. Although these are different (P<0.05) than the pork product, slightly stronger flavor is not necessarily a detriment to product success. Since the other sensory parameters

Table 3. Cooked pork, lamb and mutton leg product composition means and standard deviations.

Product	Moisture	Fat	Protein
Pork	67.4 (2.6)^{b}	7.3 (1.4)^{a}	20.5 (0.6)^{ab}
Lamb	70.8 (1.4)^{a}	3.5 (0.9)^{b}	21.0 (1.9)^{a}
Mutton	70.8 (2.5)^{a}	4.6 (0.4)^{b}	19.3 (1.2)^{b}

^{ab} Means with the same superscript are not significantly different (P>0.05)

Table 4. Taste panel means and standard deviations for cured pork, lamb, and mutton legs.

	Sensory Parameters[a]					
Product	Saltiness	Juiciness	Tenderness	Connective tissue	Flavor intensity	Off flavor
Pork	5.5 (1.2)^{b}	3.3 (1.2)^{b}	5.5 (1.3)^{b}	5.5 (1.4)^{b}	2.9 (1.8)^{c}	3.8 (0.7)^{b}
Lamb	5.3 (1.3)^{b}	3.7 (1.1)^{b}	5.5 (1.4)^{b}	5.6 (1.5)^{b}	4.6 (1.8)^{b}	3.5(0.8)^{b}
Mutton	5.4 (1.0)^{b}	3.5 (1.2)^{b}	5.3 (1.3)^{b}	4.8 (1.4)^{b}	4.4 (1.8)^{b}	3.7 (0.6)^{b}

[a] Sensory parameters: (6 point scale) Saltiness 6 = None, 1 = extremely salty; (8 point scales) Juiciness 8 = Extremely juicy, 1 = Extremely dry; Tenderness 8 = Extremely tender, 1 = Extremely tough; Connective Tissue 8 = None, 1 = Abundant; Flavor intensity 8 = Extremely intense, 1 = Extremely bland; (4 point scale) Off-flavor 4 = None, 1 = Intense

[bc] Means with the same superscript are not different ($P>0.05$).

were not different (P<0.05), this indicates that either the cured mutton or lamb products are reasonable equivalents to a low fat cured pork product. This once again indicates that to manufacture an acceptable lamb or mutton product using the procedures currently available in pork is feasible and could be successful.

Summary and Conclusions

It is feasible to manufacture low fat cured lamb or mutton products using similar manufacturing procedures that are currently available in the pork industry. This is supported by the data that showed no differences (P>0.05) in cooked yield and taste panel results. The low fat cured lamb or mutton product is a viable alternative to pork. However, the increased labor cost per pound of product involved due to lower muscle yields of lamb and the initial raw material costs will force this product into a niche or specialty market.

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