
K**S****U**

UTILIZATION OF SURIMI-LIKE PRODUCTS FROM
PORK WITH SEX-ODOR IN RESTRUCTURED,
PRECOOKED PORK ROASTS

C. M. Garcia Zepeda, C. L. Kastner, D. H. Kropf,
M. C. Hunt, P. B. Kenney, J. R. Schwenke¹,
and D. S. Schleusener

Summary

Surimi-like materials from boar and sow muscle and Alaska pollack surimi were evaluated at a 5% inclusion level in a restructured, precooked (158°F) pork roast. Meat batches were formulated to contain 95% chunked ham muscles and either 5 or 0% surimi-like or surimi binder, either 0.2 or 1.0% NaCl, and 0.5% phosphate. The surimi washing process did not remove or decrease boar taint intensity of the binder or enhance instrumental and sensory textural characteristics of the finished product. Products without binder were comparable or superior in textural and microbial characteristics to those with binders. Increasing salt content had detrimental effects on TBA (rancidity) and color but enhanced product textural attributes. Fish surimi did not have greater structural integrity than washed boar counterparts.

(Key Words: Boar, Odor, Pork, Quality.)

Introduction

Increasing marketing alternatives for pork is an important goal for the swine industry. Enhancing quality of restructured pork products offers significant economic opportunities for this industry by maximizing value of pork and creating palatable, convenient, nutritious, and profitable products from low-cost, pork, raw materials. The utilization and value of meat from some hogs is limited by the prevalence of sex odor. Approximately 65% of all boar carcasses and up to 5% of all barrows and females exhibit sex odor. The manifestation of sex odor can cause carcasses to be put into restrictive use categories or even condemned. Additionally, consumer acceptance can be influenced by marketing carcasses with marginal sex odor problems. Fat contains the sex odor, which has been described as onion-like, perspiration-like, and urine-like. Thus, removing fat from the lean fraction could minimize and potentially eliminate the odor.

Fish surimi has been proposed as an alternative to salt-extracted proteins as the binding mechanism in restructured meats. Fish surimi, in both dried and frozen forms, has been used successfully as a binder to restructure red meat products, but the pork industry should determine if a comparable or better and economically competitive surimi-like material could be produced from pork skeletal muscle. Therefore, the objective of this study was to develop a surimi-like material by using a refining process that removes the undesirable odors and flavors from these otherwise less than optimum value carcasses, while providing a highly

¹Department of Statistics.

functional myofibrillar component. Use of this refined material as a binding agent could produce a restructured pork product with enhanced characteristics.

Procedures

Six sow carcasses were conventionally slaughtered at the Kansas State University Meat Laboratory. The carcasses were chilled in a 36°F cooler for 24 h and fabricated. Major muscles were excised from the hams and from four additional hams purchased frozen from a commercial sow processor. Frozen boar meat trimmings (50/50 and 75/25 lean to fat ratio) were obtained from a commercial boar processor. All muscles were manually trimmed of exterior fat and connective tissue and frozen (-4°F) until experimentation began.

Sow muscles were thawed in a 36°F cooler and chunked through a 24 x 48 mm, kidney-shaped, grinder plate. Chunks were thoroughly mixed to ensure that muscles from different animals and sources were uniformly distributed. The pork chunks were then refrozen (-4°F).

To prepare the binders sow muscles and lean boar trimmings were ground twice through a 3.2 mm plate. Unwashed binders were collected at this time. For binders to be washed, fat content of both raw materials was standardized to 12% to evaluate the efficacy of the washing process to remove boar odor. Boar and sow ground meat was washed twice. A 1:5 meat to water ratio was used; water and ground meat were moderately agitated for 15 min at 39°F. The slurry was rested for 30 min; water was decanted; and meat particles were placed in cheese cloth (2 mm openings), and manually pressed to remove excess water. The amount of water removed from the meat particles was added to the pressed particles in the second washing procedure to approximate the meat:water ratio of the first washing. Wash water was again decanted; the particles were filtered, pressed, and centrifuged at 2000 x g (2800 rpm) for 15 min; and the supernatant was discarded. Cryoprotectants (0.15% sodium tripolyphosphate (STPP), 0.15% tetrasodium polyphosphate (TSPP), 4% sorbitol, and 4% sucrose) were added to unwashed and washed binders at levels present in fish surimi. Alaska pollack surimi was purchased frozen. All binders were vacuum packaged and stored at -4°F until product manufacture.

The pork chunks and binders for each replication were thawed overnight at 36°F and the pork chunks were thoroughly mixed with 0.51% TSPP. This chunk preblend was stored for 12 h until binder addition and stuffing. Each standardized binder, washed boar muscle (WBM), unwashed boar muscle (UBM), washed sow muscle (WSM), unwashed sow muscle (USM) or fish surimi (FS), was mixed with 4% NaCl for 15 min, activated by one pass through an emulsifier, and stored for 12 h. Then, 10-lb batches were formulated to contain 95% chunks and 5% finely (3.2 mm) ground, unwashed material or ground, washed surimi-like material or fish surimi corresponding to each treatment outlined previously, with the exception of the non-binder treatment formulation (0/0.2). This latter treatment consisted of 100% sow chunks and the same percentage of cryoprotectant present in each binder in order to minimize confounding ingredients effects. After addition of the appropriate ingredients, each batch was mixed for 15 min, vacuumized, and stuffed into a No. 6 fibrous, prestuck casing. Roasts were

cooked to an internal temperature of 158°F, then chilled. Roasts were dried, weighed, vacuum packaged, and frozen for subsequent analyses.

The vacuum-packaged roasts were thawed and tested or stored for 14 d at 36°F. Then slices (0.29 in) from the roasts were overwrapped with oxygen permeable PVC Resinite packaging film and placed under lighting at 1076 lux in a 37°F display case for 6 or 12 h. Slices taken from the center of the roasts an external face (F) slice were evaluated before display (0 h) and rancidity (TBA) and color measurements were determined. A professional, trained, seven-member panel evaluated each treatment within each replication in triplicate before and after 14 d of vacuum storage. Panelists were selected also for their ability to detect boar and fish odor. They evaluated tensile strength, firmness, off flavor, boar flavor/aroma fishy flavor/aroma, and uniformity of appearance. The Instron Universal Testing Machine was used to measure tensile strength, hardness, and cohesiveness of the roasts. Microbial counts were conducted on meat samples before and after heat processing and during the display period (before and after vacuum storage of roasts for 14 d including external face samples) at 0, 6, and 12 h.

Results and Discussion

Washing boar muscle did not alter ($P > .05$) the compositional, physicochemical, instrumental, and sensory textural measurements of finished restructured pork roasts relative to those containing unwashed muscle, fish surimi, or no added binder. Bind did not increase with the increased percentage of myofibrillar proteins after removal of sarcoplasmic proteins during the surimi washing process. Washing increased ($P < .05$) the lightness and decreased ($P < .05$) the yellowness of external face samples. Washing did not affect TBA (rancidity) numbers at 0 and 6 h of display but decreased ($P < .05$) the 12 h values compared to the unwashed counterparts, which had the only TBA value above the threshold level of 1.0 of all treatment combinations throughout the retail display period. From the microbial standpoint, washing tended to decrease mesophilic and psychrotrophic bacterial counts of center slices and significantly decrease ($P < .05$) both mesophilic and psychrotrophic counts for uncooked roasts. Microbial counts did not reach spoilage or deterioration levels in any treatment combination. Washing did not improve ($P > .05$) product yields or conclusively remove or reduce the intensity of boar taint.

In regard to compositional, functional, yield, color, TBA, microbial, instrumental, and sensory measurements, products formulated to contain 0.2% NaCl and no binder were comparable or superior to products containing washed or unwashed adjuncts. Redness of pork roast was increased ($P < .05$) with the addition of unwashed boar muscle; however, addition of washed material did not affect ($P > .05$) redness values. Unwashed boar muscle tended to have higher TBA (rancidity) values. Uncooked products without binder were more ($P < .05$) microbiologically stable than those formulated with washed or unwashed binders.

Sensory and instrumental textural responses agreed that higher salt products had greater ($P < .05$) tensile strength and sensory firmness than lower salt products. Also, there was a tendency for higher salt products to be harder and more cohesive ($P > .05$) than lower salt counterparts. Products containing 1% NaCl had higher ($P > .05$) yield. The high-salt

treatment adversely affected ($P < .05$) color, TBA (rancidity), and uniformity of appearance values of cooked pork products. Exterior and center slices were ($P < .05$) darker with higher salt concentration. In addition, increasing salt content had noticeable effects on 12 h TBA numbers ($P < .05$); warmed over flavor; and metallic, sour, and fishy off-flavor notes of cooked roasts. Salt adversely affected consumer acceptance of restructured meat products by increasing oxidation and causing off-colors and flavors.

Products containing washed boar binder were comparable to or had greater structural integrity than fish counterparts. Two factors may have influenced these results. First, binder emulsification and product temperature were higher ($P < .05$) for fish surimi, which could have affected the heat stability of the fish proteins. Secondly, the amount of fish used may have been insufficient to enhance overall textural properties of the roasts. Warmed over and fishy flavor notes were intensified by the addition of fish binder in the formulation. However, TBA values were not different ($P > .05$) between treatments throughout retail display.

Conclusions

The surimi washing process did not improve physicochemical, instrumental, and sensory textural measurements of finished restructured pork roasts nor remove or decrease boar odor intensity of binders. Functional, temperature, yield, color, TBA, microbial, instrumental, and sensory measurements indicated that products formulated to contain 0.2% NaCl and no binder were comparable or superior to those with binder and the same salt content. Increasing salt content had detrimental effects on TBA and color but enhanced product sensory and instrumental texture attributes. Fish surimi products did not have greater structural integrity than counterparts containing boar muscle.



Mark Nelsen, breeding barn manager.