Pork Quality Progress & Opportunities: The National Quality Benchmarking Study

Thomas H. Powell, Executive Director, American Meat Science Association, Savoy, Illinois

Principal Investigators:

Colorado State University, Fort Collins, Colorado
John A. Scanga, Assistant Professor, Keith E. Belk, Assistant Professor, Gary C. Smith, Distinguished Professor

Texas A&M University, College Station, Texas
Jeff W. Savell, Professor & E.M. Rosenthal Chair, Davey B. Griffin, Associate Professor, Extension Meat Specialist

University of Illinois, Urbana, Illinois
Floyd K. McKeith, Professor

Status of Problem

The Food Marketing Institute (FMI, 2000) summarized the factors that consumers feel are important when making food purchasing decisions; ranked in descending order of importance were: (1) taste; (2a) nutrition, (2b) food safety, (4) cost and (5) storability. At the same time, consumers still try to economize when shopping: (a) "low prices" ranked 8th in Importance of Supermarket Features, and (b) 20% or more of supermarket shoppers did one or more of the following economizing behavior--looked in newspaper for grocery specials, participated in frequent shopper programs, stocked-up on bargain items, used cents-off coupons, compared prices at different supermarkets (FMI, 2000). These factors indicated that consumers are still very conscious of value (satisfaction received for price paid).

Although the 1992 Pork Chain Audit concluded that the U.S. pork industry sacrificed $10.10 (at the packing level) for each of the 88 million barrows and gilts slaughtered in 1992 (Cannon et al., 1995), even greater economic losses, resulting from quality defects, were undoubtedly incurred downstream as value-added pork neared the ultimate consumer.

On average, the ham, loin and belly represent almost 52% (ham 17.4%, loin 17.7%, belly 16.6%) of the weight of a pork carcass (AMI, 1991); at the packing level, these three cuts account for approximately 56% of the wholesale value of an average (185 lb carcass with 0.80 - 0.99 inches of last rib backfat) pork carcass (USDA, 2000). When marketed at a retail level, the products from these wholesale cuts will be sold as fresh, non-enhanced loin chops (~$5.49/lb), enhanced loin chops (~$4.79/lb), bacon (~$3.94/lb) and boneless hams (~$4.36/lb). Based on USDA market reports, the cost of quality defects would be magnified from the carcass level to the consumption level by estimated factors of 7.4, 10.6 and 7.0 for hams, loins and bellies, respectively (Table 1). Upon completion of the 1992 Pork Chain Audit, solutions were recommended to the U.S. pork industry to reduce the approximate 10% of total carcass value forfeited by the industry due to defects at the packing level. It is reasonable to deduce that these

value losses could have been five to ten times greater had they been quantified at the processing or retail levels.

Table 1. Market value ($/cwt) of hams, loins and bellies on a carcass cutout value (USDA, 2000), wholesale cut value (USDA, 2000) and retail cut value (Fort Collins, CO supermarket chain) and the relative magnification (retail:carcass) of a defect as product moves through the supply chain.

Wholesale Primal	Packer (Carcass)	Processor (Wholesale Cuts)	Retailer	Retail:Carcass
Hams	58.87	121.33	436.00	7.4
Loins	78.34	146.40	514.00	10.6
Bellies	55.98	57.11	394.00	7.0

Dr. W. Edwards Deming's philosophies are founded on the knowledge that "costs continue to accelerate when defects reach the customer" (Aguayo, 1990). It is unclear what the true cost of a dissatisfied, former, customer is to an industry, but market research conducted by Ford Motor Company indicated that satisfied customers share their experience, on average, with eight people, while dissatisfied customers tell, on average, more than twenty people of their experience with the product (Aguayo, 1990).

Since completion of the Pork Chain Quality Audit, the U.S. pork industry has forged its way through the lowest market prices since 1972, with market pig prices falling to an average of $13.92/cwt in December of 1998 (NPPC, 2000). Despite the depressed pork markets, production of pork continues to increase, with growth estimates for 2001 and 2002 exceeding 3%, pushing federally inspected (FI) slaughter estimates for 2002 up to 104 million hogs (Grimes and Plain, 2000). To match this increase in production, consumer demand, which has been relatively stable over the last 20 years and ranged from a retail weight low of 48.7 pounds per capita in 1997 to a high of 51.7 pounds per capita in 1989 (NPPC, 2000), must also be stimulated by improving consumer perceptions of satisfaction received per dollar spent for pork at retail.

Objectives

1. Conduct an industry-wide (producer, packer/processor, purveyor, retailer, restaurateur) survey to characterize quality attributes of the U.S. pork supply chain.
2. Determine the impact of pork lean quality defects at the processing level on the functionality, value, quality and consistency of smoked and cured boneless hams and bellies.
3. Characterize retail products from the loin (enhanced and non-enhanced), belly (not-fully-cooked bacon) and ham (boneless, whole-muscle), and the implications of quality on prices charged by retailers.
4. Deliver results, via a strategy workshop, that the entire pork supply chain can utilize to improve the value of, and consumer demand for, retail pork, and direct future research efforts.

Plan of Work

Phase I

Researchers contacted major pork processing companies, requesting information seasonally (by quarter) relative to the number of pigs processed during calendar year 2001 and the kind and incidence of defects encountered that reduce the value of pork. Specific quantitative (average and distribution) information requested from packers includes:

Dead pigs on arrival
Adverse Drug Reactions
Pigs dead in the pens
Carcass bruising
Incidence of abscesses/injection-site lesions
Trimming/Skinning (number of hogs) by reason
Arthritis
Carcass condemnations (USDA-FSIS)
Offal condemnations (USDA-FSIS
Weight of carcasses (monthly average)
Backfat thickness by location
Lean color, ultimate pH and purge loss
Distribution of fresh ham weights
Distribution of fresh belly weights
Branded products lines

In addition to gathering this survey data, questionnaires are sent to producers and face-to-face interviews are being conducted with purveyors, processors, retailers and restaurateurs asking them to identify quality concerns that are present at different production levels. The plant-supplied data and questionnaires will be validated by data-collection visits (6 plants) and face-to-face or phone interviews with selected respondents to further characterize the functional, competitive and quality aspects of pork. The data from this phase of the study will then be combined with current market prices (USDA-AMS-LGMN) to determine the value of quality shortcomings on a per carcass basis. Subsequently (through phases II and III) the value of quality defects at the processing and retail level will be computed which will allow determination of the impact of production-related quality defects on pork retail value and consumer demand for pork.

Phase II

Due to the unique nature of the pork industry and the large value discrepancies between carcasses, fresh muscle items and processed products, it is necessary to characterize further the cost of quality defects at processing levels downstream to the packer in the marketing chain. In order to satisfy this objective, a commercial manufacturer of cured ham and bacon (International Trading Company, Houston, TX) is assisting with processing and data collection.

Bins (~1,000 lb) of boneless fresh hams (3-piece) characterized (NPPC, 1999) as pale, soft and exudative (PSE), as red, firm and non-exudative (RFN) and as dark, firm and dry (DFD) will be identified for shipment to the commercial manufacturer for processing. Bins (~1,000 lbs) of fresh bellies characterized (belly thickness evaluated according to the protocol of Stites et al., 1991) as thin (average thickness < 2.54 cm), desirable (average thickness 2.54 – 5.08 cm), thick (average thickness > 5.08 cm), PSE (NPPC, 1999), RFN (NPPC, 1999), and DFD (NPPC, 1999) will be identified. Bellies will be characterized by thickness, pH, WHC, color and other quality influencing defects/characteristics and then shipped to the commercial manufacturer for processing. Finished hams and bellies will then be evaluated for uniformity of color and shape, WHC, finished product yield, sensory-panel palatability (Berry, 1980) and other quality influencing defects/characteristics. Using this information, value differences per pound of raw

product, for each level of subprimal quality, will be calculated based upon finished product yield and marketability (i.e., premium product vs. commodity product).

Phase III

Retail stores (N = 200) located in eight (25 stores/city) major U.S. cities (Atlanta, Chicago, Houston, Philadelphia, Phoenix, San Francisco, and Seattle) will be visited in an attempt to obtain packages of sliced, not-fully-cooked bacon (n = 600), boneless hams (n = 600), non-enhanced boneless loin chops (n = 600) and enhanced boneless loin chops (n = 600). Selection procedure will be such that samples from each retail market will be representative of the products offered in that location, irrespective of price or packaging. From each selected package/product, data to be recorded will include price/pound, total package price, total package weight, USDA Establishment Number and sell-by date; box dates will be obtained in storage coolers when possible. In addition to individual product information, retail demand will be determined through a nominal estimation of retail case (proportion) dedicated to each type of product, on-hand inventory of each product (backroom) and amount of each product on display.

Fresh retail products will be shipped overnight to Colorado State University for further evaluation of subjective color (NPPC, 1999), objective color (Hunter L*, a*, b*), firmness, texture, water holding capacity (expressed as purge in the retail package), and palatability (AMSA, 1995). This information will be utilized to determine the physical differences and palatability differences found at the retail level and will be used to further describe the economic impact of quality defects that occur at the production level of the industry and their potential impact on consumer satisfaction.

Status of Research (May 1, 2002)

As of this writing, agreements have been reached with packers representing over 80% of the hog slaughter to participate in Phase I the survey. Data collection is proceeding rapidly. A number of genetics companies have also agreed to supply data that will be used to help validate the survey results.

Phase II researchers are finalizing protocol details. A processor has been identified to cooperate in the study, providing product and facilities for the research.

Retail store sampling (Phase III) is completed. Sensory analysis and data compilation is expected to be completed by August, 2002.

Final results of the audit will be presented in an industry-wide forum to be held between December, 2002 and March 2003. For more information, please contact the American Meat Science Association.

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Dr. Thomas Powell

Thomas Powell started with the American Meat Science Association in 1997 directing the intercollegiate meat judging program. Since 1998, he has served as AMSA's Executive Director. During his tenure at AMSA, the association has undergone a radical change from its beginnings at the former National Live Stock and Meat Board to its current status as a stable autonomous organization. A native of Knoxville, Tennessee, he completed his B.S. in Animal Science and M.S. in Food Technology and Science at the University of Tennessee. He went on to complete his Ph.D. in Meat Science at Kansas State University. While at Kansas State, he served as coach of the meat judging team and as Instructor in the Department of Animal Sciences and Industry. Thomas, his wife Joyce and their two girls currently reside in Champaign, Illinois.

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