

PROVIDING ASSURANCES OF QUALITY, CONSISTENCY, SAFETY AND A CARING ATTITUDE TO DOMESTIC AND INTERNATIONAL CONSUMERS OF U.S. BEEF

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Cattle•FAX (February 1999) reported that, from 1980 through 1998, market-share spending for beef decreased by 13.7 percentage points (from 53.9%, to 40.2%) and that almost all of the loss was attributable to an increase of 11.6 percentage points (from 16.1%, to 27.7%) in market-share spending for chicken. NCBA (February 1999) set as its "Goal" in the Beef Industry Long Range Plan, "Stabilize beef demand by the year 2001 and increase the opportunity for industry profitability."

The best news for the year 2000 is that beef demand either has stabilized, or better yet, may actually be increasing. Steve Kay (Cattle Buyer's Weekly, January 2000) said "The story of the year, without a doubt, was beef's improved demand." Bill Helming (Helming Consulting, January 2000) remarked that "It appears that the beef cattle industry is now putting into motion the necessary foundation of slowly taking back some of the market share lost to chicken over the past 25 years."

What are the "drivers" in the beef industry? NCBA (February 1999) identified as Profitability Drivers: (a) Cost Efficiencies and (b) Value Enhancement, and as Demand Drivers: (a) Food Safety, (b) Palatability (c) Health and Nutrition, (d) Consumer Friendly Products. At the World Meat Congress (Dublin, Ireland, May 1999), representatives of five countries described Demand Drivers (in categories of Economic, Non-Economic, Ethical and Ecological concerns). Common to all five countries were 2 of 2 Economic concerns (Cost; Price/Value) and 3 of 4 Non-Economic concerns (Food Safety; Eating Quality; Diet/Health/Nutrition). Unique to certain of the countries were the Non-Economic concern, Convenience (USA and EU); the Ethical concern, Animal Welfare (EU and New Zealand); and the Ecological concerns, Environment (EU and New Zealand) and Food From Genetically Modified Organisms (EU). Two other countries (Argentina and Australia) share the same Demand Driver concerns, except for Convenience, as the USA.

In 1988, when the U.S. beef industry first realized that it must do something very dramatic to arrest the decline in demand and in market-share spending, a group of business and economic experts concluded (in the Shuh/Johnson Report) that beef must be produced more

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efficiently so it can be sold at lower prices. By 1998, John Nalivka (Oregon beef economist) said “The problem is that, though the beef industry is more efficient, it’s still not producing the right kind of beef.” A part of the problem in producing the right kind of beef is that of differentiating between the customer and the consumer. A feedlot operator can say that he/she is “producing for demand” by producing the “most marketable carcass” when that carcass fits a packer’s grid relative to Quality Grade, Yield Grade, carcass weight, ribeye area and defect criteria (“outs” for hard-bones, dark cutters, bruises, bloodshots, etc.). In the latter case, the feedlot operator may well be satisfying the customer (the packer) yet not satisfying the consumer (the person who will eat the beef).

It has been said that the cattle industry is changing from being “production-driven” to becoming “consumer-driven,” yet some who say that really don’t understand that there is much about the end-product that must be changed to improve its acceptability to those who eat it. To retain market share, beef producers must learn to meet consumers’ needs, rather than try to change consumers’ minds. Mary Adolph (NCBA, January 1999) said “Consumers do not want your products and services...consumers only want their needs and wants met.” An article in Food Processing (May 1999) was entitled “Selling Is Not Telling...Your Customers Don’t Want To Be Sold Anything...They Want Someone To Help Them Buy What They Need.” Food Marketing Institute (1999) identified as the eight factors considered "Very Important" in food selection for supermarket shoppers: (1) Taste, (2) Nutrition, (3) Product Safety, (4) Price, (5) Storability, (6) Ease of Preparation, (7) Preparation Time, and (8) Recyclable Packaging. Steve Harper (HEB Supermarkets, November 1999) described the "six questions asked by consumers when they make decisions about purchasing beef" as: (1) Will it hurt me? (food safety), (2) Is it good for me? (nutrition/health), (3) Can I afford it? (value), (4) Do I know how to fix it? (cooking/preparation), (5) Do I have time to fix it? (convenience) and (6) Do I like it? (preference).

Consumers’ needs include: (a) Properties of fresh (unprocessed/unprepared) beef and factors involved in its production and processing, as well as (b) Properties of beef products (processed/prepared) that are modernized to make their use in meal preparation simple and convenient.

Properties influencing consumer demand for processed/prepared beef products include: (a) Novelty (new and different, changed in form, modernized, with added value); (b) Quality (taste, tenderness, physical attractiveness, storage stability); (c) Simplicity (quick, fast, time-saving, uncomplicated); (d) Convenience (easy to prepare, easy to serve, easy to clean-up after); (e) Safety (bacteriologically safe, chemically safe), and (f) Consistency (sameness in appearance from purchase to purchase, sameness in performance from preparation to preparation, sameness in palatability from eating experience to eating experience). The need for such properties in processed/prepared beef products is justified because: (a) Beef’s primary competitor—chicken—has changed the form in which it is marketed, from 7% (in 1975) to 43% (in 1998) further-processed product; (b) 70% of women are in the U.S. work force and 28% to 58% of women and men say they have “lack of time” or “too busy schedules” to cook, because of their lifestyle; (c) Two-thirds of all dinner decisions are made the same day; of those, 73% of dinner preparers don’t know at 4:30 PM what they’re going to have for dinner; (d) Simplicity and convenience are the most important factors driving meal preparation decisions; (e) 41% of consumers under the

age of 25, and 50% of those aged 26 to 35, say their lack of cooking knowledge keeps them from buying certain cuts of beef; (f) To satisfy home and food-service preparers, beef must be made easier to purchase, prepare, place on a menu, fit into consumers' busy lifestyles and fit into changing food-service environments, and; (g) During the week, 40% of households spend less than 30 minutes on meal preparation while 78% of households spend less than 45 minutes on meal preparation.

Wayne Purcell (Virginia Tech University, October 1998) said "Beef prices to consumers need to go up, and go up on the strength of value-added activity, new product offerings, and modernized product lines. Boosting prices by offering consistent, delicious and easy-to-prepare beef products and by cutting cattle/beef production costs are complementary and both are needed." The Harris Ranch Beef Alliance developed a Beef Tri-Tip Roast (fully cooked, 2 lb each, feeds 4 people) from the bottom sirloin in 1992, because, in the words of Brad Caudill (July, 1999), "We had to change, or die. To meet consumer needs, sure; but also to add value for the packer and add value for consumers (convenience, home meal replacement, grab-and-go, speed of preparation)." Since introduction of their first successful value-added product, the Harris Ranch Beef Alliance has added Beef Pot Roast in 1995, Beef Stew in 1997, Beef Short Ribs and Beef Swiss Steak in 1998...and, four more products are on the way for 2000-2001. Wayne Purcell (Virginia Tech University, January 2000), commenting on the stabilization of beef demand during 1999, said "It's the most encouraging thing I've seen in 20 years. Beef checkoff programs are working and so are the efforts of private firms which are putting out more convenient precooked products."

Properties influencing consumer demand for fresh, unprocessed/unprepared beef include: (a) Quality (taste, tenderness, physical attractiveness, storage stability); (b) Consistency (sameness in appearance from purchase to purchase, sameness in palatability from eating experience to eating experience); (c) Safety (bacteriologically safe, chemically safe), and; (d) Caring Attitude (by producers, about the environment and animal welfare). Means for improving fresh, unprocessed/unprepared beef, with regard to those properties that influence consumer demand, include: (a) Source-Verification (brings promise of greater control of quality, consistency, safety and caring attitude); (b) Production Practice-Verification (brings promise of greater control of safety and caring attitude), and; (c) USDA Process-Verification (brings promise of greater control from ranch-to-retail of quality, consistency, safety and caring attitude).

What can producers do to improve the quality, consistency, safety, palatability and healthfulness of beef and to assure domestic and international consumers of U.S. beef that it was produced by cattlemen with a caring attitude about the environment and animal welfare? If it is true that the U.S. beef industry is changing from being "production-driven," to becoming "consumer-driven," it is imperative that beef producers accept the challenge of making such change...gradually...and in an evolutionary—rather than revolutionary—manner. Such change must occur gradually because, otherwise, producers could lose economic viability while chasing someone's ideal (presumed to be based on what consumers want) and not being rewarded for achieving that new standard.

To be consumer-driven means that cattle producers can no longer just produce what they (individually or collectively) think is best (or easiest, or most economical, etc.) and expect the world to come begging for more; rather, it means that at each critical juncture in the beef production sequence, consideration must be given to what the consumer wants and is willing to buy. During Meat Standards Australia meetings at which no consumer is present, an empty chair is placed prominently in the room as a constant reminder that the Australian beef industry must be “consumer-driven.” On a recent trip to Argentina, my host (Raoul Marcus Firpo of the Argentina Angus Association) responded to my query regarding the primary drivers of their beef industry by saying “For us, it is that lady (here, in Argentina, or in places like Chile, Germany or Switzerland) who buys, cooks and serves the product...she must be glad...otherwise, we are finished!”

Now and in the future, the "guarantee" that must be provided, by those in the cattle/beef industry, to consumers of U.S. beef is that of:

Assuring that domestic and international consumers receive bacteriologically and chemically safe, healthful, high quality and consistently palatable beef that was produced without compromising the environment or the animal’s welfare. Piece by piece, let’s dissect that statement.

“Assuring”...For beef producers to guarantee that all of their fresh, unprocessed/unprepared beef meets these qualifications at end-user (consumer) levels necessitates source-verification, encourages branded beef and forces partnerships/alliances. Principles incorporated in concepts of Total Quality Management (TQM), Good Manufacturing Practices (GMPs), Good Management/Production Practices (GM/PPs), Statistical Process Control (SPC), Standard Operating Procedures (SOPs), Hazard Analysis and Critical Control Point (HACCP) systems and Palatability Assurance Critical Control Point (PACCP) systems can be used by those in each sector of the beef production system as a means for measuring/monitoring/managing progress toward assuring that consumer expectations are well and truly met.

Source-verification allows for a source of a particular type/kind/quality of beef to be identified and for a supply of that beef to be sent to the next-adjacent sector (one step closer to the consumer) with a guarantee (verification) that the beef is as specified. Source-verification of beef is accomplished in some relatively small enterprises—for example, in Doc and Connie Hatfield’s “Oregon Country Beef” which is a “partnership in profit from pasture to plate”—and in some large enterprises—for example, in U.S. Premium Beef’s mission statement for their partnership with the production sector, which states “to increase the quality of beef and long-term profitability of cattle producers by creating a fully integrated producer-owned beef processing system that is a global supplier of high quality value-added beef products responsive to consumer desires.” Production practice-verification might involve assuring that--for example--no growth promotants or subtherapeutic antibiotics are used in finishing of the cattle. USDA process-verification is accreditation that the company has implemented production/processing procedures described in its "Process-Verified Program." Premium Standard Farms has a USDA Process-Verified Program that involves a 12-step process control system for pork production; included in those 12 steps are animal welfare, food safety, product quality, and environmental

management. Better Beef™, a branded beef program based on use of Piedmontese cattle, is a USDA Process-Verified Program owned by the Leachman family in Billings, Montana.

An article in Beef magazine (May 1998) quoted meat merchandising guru Joe Gordon as saying that 50% of all beef will be branded by the year 2005. National Cattlemen's Beef Association (November 1998) reported that: (a) Branded beef programs are expected to grow to 35 to 40% of the meat case in the next decade (according to NCBA estimates). (b) Consumers look for brands they know and trust; consumers would buy branded beef if they knew that branded (vs. non-branded) beef offered higher quality (based on studies by Moeller and Associates). (c) Research shows that more than one-third of consumers interviewed believe a farmer-owned brand means higher quality (concluded in the Murphy Pre-Advertising Test). James Salter of Total Research Corporation uses an integrated model to describe consumer loyalty to food products that involves the interaction of quality, price, image and value (relative to the competition), to achieve attraction and loyalty to a brand of food products. Salter believes that brand image translates to brand loyalty and that advertising/ promotion effectiveness is largely premised on increasing brand equity. "Keep the customer happy--for a lifetime," an article in USA TODAY (July 1999) discusses customer loyalty and says that the estimated lifetime value of a customer loyal to General Motors is \$276,000 and of a shopper loyal to Safeway/Albertsons is \$192,000 (based on 40 years at \$4,800 per year of grocery purchases). Tom DeMott (Safeway Stores, December 1999), discussing that article in USA TODAY (July 1999), said he believes that the value of a shopper loyal to his company is worth more than \$10,000 per year.

Harlan Ritchey (Michigan State University) reported that a group of agricultural economists concluded, at a 1998 NCBA strategy conference, that: (a) Sixty alliances will form in the next 5 years. Four to eleven of those will control the U.S. supermarket meatcase. And, once an alliance gets a foothold; it will be able to dictate animal husbandry practice as well as quality, consistency and safety, and/or; (b) By 2010, the 30 largest cattle feeders will generate 50% of all finished cattle. They will align with cow/calf producers, packers, retailers and food-service operators to produce branded, source-verified beef. Those producers who resist this paradigm shift will fall further and further behind until they have no market at all.

A December 1998 article in Beef magazine entitled, "The Alliances Yellow Pages," identified thirty beef alliances that are already in existence. A "Beef 2010" survey by BEEF magazine (January 2000) reported that 22.6% of respondents said they are "in an alliance now" while more than 50% said they'd be in an alliance by the year 2010. The advantages of alliances are these: (1) At every sector, participants are full partners (not share croppers or tenant farmers); (2) At every sector, participants need not be predatory or cannibalistic and need not have island mentality; (3) At appropriate sectors, costs of changes in genetics, production practices and technology can be recovered (e.g., costs for better seedstock, vaccination/immunization programs, correlated growth-promotion implant programs, Vitamin E supplementation, cautious animal handling, cattle/carcass evaluation instrumentation, bacterial decontamination technology); (4) At the packing/processing sector, with guaranteed supplies of high-quality raw materials and fewer discounted edible/inedible products and byproducts, attention can be focused on further processing, adding value and making beef more convenient to use, and; (5) At the customer and consumer sectors, the alliance can deliver high-quality,

consistent, safe food, produced by people with a caring attitude and with accountability (through source-verification and production practice-verification). Examples of alliances that have fulfilled these promises to customers and consumers are: (a) Farmland Supreme Beef Alliance—generates consistently palatable fresh beef (e.g., “Farmland Black Angus Beef”) and convenient, quick-and-easy, heat-and-eat, prepared beef products (e.g., “Farmland Philly Steaks”), and; (b) Harris Ranch Beef Alliance—generates certified residue avoidance fresh beef (e.g., “Harris Ranch GrainFed Beef”) and convenient, simple-to-prepare, versatile, heat-and-eat, prepared beef products (e.g., “Harris Ranch Beef Pot Roast”).

“Domestic And International Consumers”...Beef’s five markets are: (1) International markets for beef in all forms; (2) Domestic ground beef sold in food-service operations; (3) Domestic ground beef sold in supermarkets; (4) Domestic steaks/roasts sold in food-service operations, and; (5) Domestic steaks/roasts sold in supermarkets. Beef sold internationally approximates 10% of present production and nearly 20% of sales value of U.S. beef; so, we must meet the requirements of international customers (i.e., traders, wholesalers, brokers) and consumers (i.e., end-users). And, because we cherry-pick the carcasses used to supply cuts to international buyers...all of our beef must meet the minimum standards for the safety, quality and environmental/welfare constraints set by our customers in other countries.

For domestic beef customers and/or consumers, the “Top Ten Quality Concerns” were identified by the Response/ Reaction/Consensus Panel of the National Beef Quality Audit—1995. These are: (1) Low overall uniformity and consistency; (2) Low overall palatability; (3) Insufficient marbling; (4) Inadequate tenderness; (5) Excess external, seam and beef-trim fat; (6) Excessive weights of cuts and weights of boxes of cuts; (7) Too high incidence of injection-site lesions; (8) Too high price for the value received; (9) Excessive live and carcass weights, and; (10) Too frequent hide problems.

For international beef customers and/or consumers, we know that the “Most Important Reasons” that importers in other countries purchase U.S. beef (according to the 1994 International Beef Quality Audit) are: (1) Our ability to supply individual cuts (i.e., chucks, rounds or loins, etc.) and items (as opposed to selling only “full sets” i.e., whole carcass-equivalents); (2) Its exemplary tenderness and flavor; (3) Its high value perception (i.e., it is considered worth the price); (4) Its high overall quality (in both appearance and palatability); (5 tie) The desirable image of the USDA beef Quality Grading system, and; (5 tie) Their confidence in U.S. food safety.

Inasmuch as there are domestic consumers who want (or will not otherwise purchase beef) to buy “natural,” “organic,” “lean,” “extra-lean,” etc., products, it is incumbent on the beef industry to produce products of all kinds, at several value:price ratios and for diverse end-uses. Domestically, beef is sold to consumers in supermarkets (largely as steaks, roasts, ground beef and processed meat) as well as to the food-service industry (again, as steaks, roasts, ground meat and processed meat) with specific-target needs/costs differing widely. A truly “consumer-driven” industry will generate every kind and form of product that is desired by domestic and international customers and/or consumers and the raw material (fresh beef) from which to generate these kinds and forms of product.

“Bacteriologically And Chemically Safe”—Factors considered “Very Important,” to supermarket shoppers, in food selection (Food Marketing Institute TRENDS—1999) were: (1) Taste, (2) Nutrition, and (3) Product Safety. When asked, in 1997, which was more important to consumers—diet/health/nutrition vs. food safety concerns—Cary Humphries, Jr. (Excel, Inc.) said “Consumers say to themselves ‘If I consume food with too much fat, calories and cholesterol, it might kill me 30 or 40 years from now...but if I consume food with bad bacteria, it may kill me in 3 or 4 days.’ Consumers are much more concerned about the safety of food than in its nutritional content.” An article entitled “What Americans Fear” in USA Weekend (August 1997) reported that the things about which respondents were “Afraid” or “Very Afraid” were ranked: (1) Being in a car crash; (2) Having cancer; (3) Inadequate Social Security; (4) Not enough money for retirement; (5) Food poisoning from meat; (6) Getting Alzheimer’s Disease, and; (7) Pesticides on food.

The beef industry has searched diligently for pathogen control points that could be used in the feedlot or on the farm but, as Meat Marketing & Technology magazine (April 2000) reports, quoting Dr. Gary Cowman of NCBA, “We don't have a true HACCP-type program, focusing on specific, production-related critical control points because we just don't have the science yet; we need better direction on how to deal with pathogen control on ranches and at feedlots.” In another article in Meat Marketing & Technology (April 2000), Dr. James Reagan of NCBA is quoted as saying “We are interested in dehairing technology. Cattle would be stunned, hung up and treated with a chemical and then go through a washing cycle; the chemical would remove the hair and the washing process would remove all dirt and feces.”

A study in the Pathogen Reduction Laboratory by Delmore *et al.* (1998) at Colorado State University identified a multiple hurdle system for reducing the probability of contamination of beef carcasses with bacterial pathogens. That study was conducted for NCBA and identified a four-step, multiple-hurdle microbiological intervention sequence that reduced total plate counts, total coliform counts and *Escherichia coli* counts by about 4 logs (i.e., by about 99.99%). Monfort, Inc. used their own information plus results of the CSU/NCBA study to devise a “Chain Of Beef Safety™,” beef carcass decontamination system that was installed in all eight of the Monfort/ConAgra beef plants (5 steer/heifer plants; 3 cow/bull plants). The Monfort, Inc. system consists of: (a) Steam-vacuuming; (b) Pre-evisceration washing (90°F water) and rinsing (2% acetic acid in 120°F water); (c) Thermal-pasteurization (165°F water), and; (d) Final-carcass washing (90°F water) and rinsing (2% acetic acid or lactic acid in 125°F water).

Bacon *et al.* (1999) of CSU completed a study of the efficacy of the “Chain Of Beef Safety™” in the 8 Monfort/ConAgra beef plants, for NCBA, that confirmed the effectiveness of the four-step, multiple hurdle microbiological intervention sequence because its use achieved reductions of 99.9% or more in total plate counts, total coliform counts and *Escherichia coli* counts, on the surfaces of chilled carcasses. Twelve beef packing plants, in a study conducted by American Meat Institute Foundation and analyzed by Bacon *et al.* (2000), collected *E. coli* O157:H7 incidence data from 2,245 cattle and carcasses and 1,342 lots of beef trimmings. The incidence of confirmed positive *E. coli* O157:H7 tests was 3.56% for hide samples, 0.44% for side samples prior to washing, 0.00% for side samples after application of final carcass decontamination interventions and 0.00% for beef trimmings samples, demonstrating the effectiveness of packing plant process control in reducing incidence of this foodborne pathogen.

A study entitled “Microbial Mapping II. Determining Microbial Counts On Beef Carcasses, Wholesale Cuts And Retail Cuts, To Assist Those In The Fabrication, Distribution And Retailing Sectors To Deliver Safe Beef To Retail Consumers,” sponsored by NCBA, was also completed in early 1999. At six U.S. locations, counts for bacteria and incidences of foodborne pathogens (*Salmonella* spp., *Listeria* spp. and *Listeria monocytogenes*) were determined; results revealed that counts/incidences of bacteria/pathogens were higher on wholesale (subprimal) and retail cuts than on the carcasses from which they originated in 3 to 5, of 6, comparisons. A study designed to identify a multiple-hurdle microbiological intervention sequence for use during fabrication of beef carcasses into subprimal cuts and beef trimmings, funded by NCBA and being conducted by Colorado State University, is scheduled for completion in May 2000. A study of microbiological interventions for use on beef variety meats, funded by U.S. Meat Export Federation and conducted by Colorado State University, has identified efficacy of use of acetic-acid solutions, hot water, lactic-acid solutions, steam and solutions of trisodium phosphate for successfully decontaminating beef offals.

A research project conducted in 1999 for NCBA by scientists from The Pennsylvania State University, University of Nevada, Oklahoma State University, University of Wisconsin and Colorado State University determined that 9% of supermarket shoppers intercepted in stores in those five states during this study took more than 2 hours after purchase of beef cuts to put them in their home refrigerator or freezer. For fresh beef sold at retail supermarkets, consumers must be educated to: (a) Cook ground beef to 160°F, measured with a thermometer or t-stick, and (b) Refrigerate or freeze beef purchased at retail as soon after purchase as is possible. The "Fight BAC!" (Keep Food Safe From Bacteria) literature has been provided (through February 2000) to 72,000 pre-schools, reaching 2.9 million moms (NCBA, March 2000). With approval of irradiation in early 2000, opportunity exists to provide a sterile beef product to those at greatest risk (infants, immunocompromised patients, etc.) to foodborne illness.

Pesticide analyses, by Food and Drug Administration in the All-Foods Study and the Total Diet Study (completed on an annual basis) helps assure that domestic and imported foods are safe to eat. Each year, the National Residue Monitoring Program of the Food Safety and Inspection Service of USDA performs nationwide chemical residue testing efforts in U.S. meat and poultry. The National Residue Monitoring Program for 1997 (reported to the public by USDA in 1999) tested for 57 chemicals in 7 classes of animal drug and pesticide compounds and reported that “Only 0.27% of the 26,626 samples of livestock and poultry meats tested by FSIS/USDA during our domestic routine residue-monitoring program showed illegal levels (violative concentrations) of pesticide, hormone, antibiotic, drug and other chemical residues.” In December 1999, FSIS/USDA released results of its domestic routine residue-monitoring program for 1997 and reported that 7,260 samples of beef (from steers, heifers, beef cows, dairy cows and bulls) were analyzed for antibiotics, pesticides, drugs, sulfonamides and clenbuterol residues; the incidence of violative residues in all beef was 0.07% while that in steer and heifer beef was 0.03%.

A Colorado State University study, for U.S. Meat Export Federation, of muscle, fat, liver and kidney samples from “conventional,” “natural,” “organic” and “realizer” (chronically ill) steers and heifers as well as “cull (beef/dairy) cows” detected no violative residues of five

anabolic steroids, two heavy metals, three stress reducers, six thyrostats/sulfa-drugs as well as chlorinated hydrocarbon and chlorinated organophosphate pesticides. A second study by Colorado State University, funded by NCBA, of muscle, fat, liver and kidney samples from “conventional,” “natural” and “organic” steers and heifers detected zero violative residues in 558 tests for three anabolic steroids, zero violative residues in 558 tests for three xenobiotics, zero violative residues in 1,810 tests of 10 sulfa-drugs/antibiotics and 15 violative residues (three in “conventional” beef; six in “natural” beef; six in “organic” beef; all of which were in liver samples and none of which were in muscle, fat or kidney samples) in 4,650 tests for 25 chlorinated hydrocarbon and chlorinated organophosphate pesticides.

Failure to detect violative residues of harmful chemicals in beef can be directly attributed to national and state Beef Quality Assurance programs. Beef Quality Assurance programs concentrate on producer and veterinarian awareness of daily management practices that influence the safety, quality and wholesomeness of beef by focusing on violative residue avoidance and prudent use of animal health products. Texas Cattle Feeders Association implemented a Feedlot HACCP Program in July 1998 that has third-party verification for four Critical Control Points: (a) Broken hypodermic needles; (b) Mycotoxins in feed; (c) Residues in feed, and; (d) Residues in cattle. The latter program does not have a Critical Control Point for microbiological contamination on cattle; the cattle/beef industry has searched diligently for preharvest pathogen control points but has not identified anything promising. The most plausible approach for decontaminating steers and heifers from feedlots as well as cull cows and bulls is use of a “cattle-cleaning system” that would remove hair, dirt, feces and debris from cattle immediately prior to harvest.

The sight/touch/smell concepts of federal/state meat inspection have served us well for identifying unaesthetic and diseased meat but are of little use for lessening occurrence of foodborne pathogens on beef or chemical residues in beef. The National Residue Monitoring Program serves us well for “in general” assuring that “on average” there “won’t be many” harmful “residues of chemicals” (pesticides, drugs, growth promotants, antibiotics, etc.) “in the nation’s beef supply.” Consumers, though, both domestically and internationally, will be much more comfortable about the safety of beef if we can provide assurance (through source-verification, production practice-verification and USDA process-verification) that everything that can possibly be done...farm-to-table; preharvest-harvest-postharvest...has been done, to assure the bacteriological and chemical safety of specific (branded or otherwise identified) beef products. Several pork packers announced in late 1998 that they would buy hogs for slaughter only from swine producers who qualify for NPPC, Pork Quality Assurance Level III (the most stringent of NPPC’s on-farm pork safety standards). The largest supermarket chain in Australia announced in April, 1998 that they would purchase beef only from farms/ranches that qualify for the “Cattle-Care” farm safety designation. It seems highly probable that similar things will happen in the U.S. beef industry. The NCBA, Beef Quality Assurance program has served us well but may eventually move from an industry-oversight status, to one of a farm/feedlot-specific beef safety verification overseer, as customers (retailers and food-service operators) search for ways to reduce risk (and avoid litigation) of food-safety hazards and to allay fears and concerns of consumers (end-users) about the safety of beef.

“Healthful”...From the late 1970's to the year 2000, the fat cover on most beef cuts at retail has shrunk from 0.50 inches to less than 0.08 inches; that decrease resulted from changes in cattle genetics, improved production practices and more extensive trimming of cuts by packers and retailer. Not enough attention is paid to the contributions of key vitamins and minerals that are provided by one 3-ounce serving of beef; beef's contributions of key nutrients (expressed as a percentage of Daily Values in a 2,000 calorie reference diet) are 9% of calories, 50% of protein, 14% of iron, 39% of zinc, 37% of Vitamin B-12 and 16% of Vitamin B-6 (NCBA, 1996). When it comes to energy, some foods have a competitive advantage; following is the quantity (based on the USDA Nutrient Database for Standard Reference, Release 12) of other popular food sources required to get the same amount of three nutrients found in a 3-ounce cooked serving of beef; (1) Zinc--3 ounces of beef or three 4-ounce cans of tuna; (2) Iron--3 ounces of beef or 5.25 cups of spinach, and; (3) Vitamin B12--3 ounces of beef or 8.5 chicken breasts (Beef magazine, April 1999).

A five-person panel of cognition experts concluded that beef consumption plays a critical role in normal brain growth and function by guarding against iron and zinc deficiencies (Beef magazine, June 1999). Research evidence, according to M.D. Nancy Krebs (University of Colorado), shows that: (a) 40% of Americans (56% of infants) don't meet their needs for iron. (b) 73% of Americans (85% of infants) don't meet their needs for zinc. (c) Beef supplies 58% of the iron and 67% of the zinc in the American diet. Dr. Krebs said (1) "Even mild, short-term deficiencies may impair mental activity." (2) "Beef should first be introduced to 6-month old infants." (3) Beef consumption should continue through life" (Beef magazine, June 1999).

Researchers at Baylor College of Medicine have suggested that a high-protein, high-monounsaturated fat diet may favor positive changes in the lipoprotein profile (Quarterly Research Update, 1998). Research evidence indicates that overweight human subjects with Type II diabetes and dyslipidemia need a diet which includes lean beef that will result in weight loss and lower plasma LDL without adversely affecting glucose and HDL levels; the diet is composed of 25% of protein (from lean red meat), 40% from fat and 35% from carbohydrate (Quarterly Research Update, 1998). Experts have touted the "evils" of fat for two decades--many refer to it as "a guilty pleasure"--now, though, experts have begun parroting the advantages that research has uncovered (Montana Beef Council, 1999). Why? Because monounsaturated fat is protective against heart disease and because conjugated linoleic acid (CLA) has several human health benefits. Conjugated linoleic acid (abundant in meat and dairy products) has the following benefits (Montana Beef Council, 1999): (a) It inhibits development of tumors and sloughs-off existing ones. (b) It lowers total blood cholesterol and "bad cholesterol" (low density lipoproteins). (c) It reduces body fat (it is a fat that "burns" other fats). (d) It may regulate blood glucose levels thereby delaying onset of diabetes. "This research adds to the wealth of other data supporting beef's positive dietary role" said Mary K. Young, M.S., R.D. of NCBA, "CLA is one of the most exciting new discoveries in meat and will give consumers even more reasons that beef should be included in their diets" (Render magazine, October 1998).

Mary Young of NCBA (at Cattlemen's College, February 1999) reported results of the "Parity Study" (published in Archives Of Internal Medicine and described in a feature article in USA TODAY) conducted by M.D. Michael Davidson (Chicago Center for Clinical Research) which concluded that patients with high blood cholesterol levels who went on diets that included

6 ounces of lean red meat, five or more days a week, had the same health benefits as those who ate 6 ounces of white meat. Dr. Davidson summarized his findings by saying "Lean red meat is just as effective in lowering cholesterol as chicken. One of the problems of low-fat diets is that people stay on them for only a few weeks. Lean red meat gives people a greater variety of food from which to choose." Dr. Peter O. Kwiterovich (Johns Hopkins University Lipid Clinic) added that "Since lean cuts of red meat are now readily available to consumers, eliminating lean red meat is unnecessarily restrictive--and advising against consumption may actually negatively impact long-term dietary compliance."

The beef industry has identified "The Skinniest Six"—very closely trimmed retail cuts from the round and loin that have contents of calories, total fat and saturated fat comparable to those of chicken. And because 83% and 63%, respectively, of supermarket shoppers in the Food Marketing Institute TRENDS—1998 report say they "seek out and purchase" products "low in fat" and "natural," there is need to make such beef available in supermarkets. Maverick Ranch Beef (Denver, Colorado) has successfully merchandised "Natural Lite Beef" to satisfy demand for such product. Some, but not all, beef must meet the needs of consumers who seek beef that is lean to very lean, and low to very low in calories, fat, saturated fat and cholesterol, because of concerns about diet/health/nutrition as well as beef that can be defined as "Natural" or "Organic."

It is easy to accomplish leanness, especially in ground products, but harder to do this in solid-muscle cuts while simultaneously assuring satisfactory palatability. It can best be done for solid-muscle cuts by using raw materials from carcasses that can be source-verified (as originating from genetically superior—in palatability, especially tenderness—lines of cattle that have been produced/managed to minimize production of excess fat). Healthful ground beef can originate from the trimmings from commodity cattle; healthful steaks/roasts should come, exclusively, from source-verified, branded beef programs. And, "Natural" and "Organic" beef—by definition—must come from source-verified, production practice-verified and—perhaps—USDA process-verified programs.

"High Quality"...In this context, "High Quality" is used to connote beef that is consistently and uniformly bright colored, firm, dry and capable of being stored (in vacuum packages) and displayed (in retail packages) for consistently long periods of time. Mine-run beef generated from the heterogeneous supplies in the sales cooler of any packing company is likely to be inconsistent in appearance/shelflife properties; source-verified and/or branded beef can be uniformly high in these quality attributes. For example, feeding cattle supplemental Vitamin E during the finishing period can reduce premature darkening (and, thus, discounting and discarding) of retail cuts during display in meatcases. If product is branded, there is greater probability that cattle feeders can recover costs of using technologies, like that of high-E beef, that generate revenue only at the extreme other-end of the beef production system. Ground beef is presently being merchandised in modified-atmosphere (usually, 20 to 30% carbon dioxide plus 70 to 80% oxygen) packages that have a gaseous atmosphere that preserves attractiveness of the product for extended times. Much of the ground beef sold in such packages is branded.

"Consistently Palatable"...It is the combined effect of differences in flavor, juiciness and tenderness that determines the overall palatability of, and eating satisfaction gained from, beef.

A study at Texas A&M University in 1982 confirmed that beef from grain-fed cattle, with at least 0.30 inches of subcutaneous fat (external fat, on the carcass, measured at the 12th/13th rib interface) and with higher marbling scores was more palatable than beef from forage-fed cattle, with less than 0.30 inches of subcutaneous fat and/or with lower marbling scores. Colorado State University scientists, in 1997, compared the palatability of Japanese, Canadian, American and Australian beef steaks, purchased in Japan and evaluated for palatability in the U.S., and reported that Japanese Shimofuri (“sprinkled with snow”) beef and Japanese Black Wagyu beef (those with the highest levels of marbling) was most palatable, followed by Australian Ravensworth, U.S. Certified Angus Beef and Canadian AAA beef (those with high-intermediate levels of marbling) and followed by Australian 100 Days-On-Feed, Australian 160 Days-On-Feed and U.S. Low Choice beef (those with low-intermediate levels of marbling), while Australian Grass-Fed and U.S. Select beef (those with the lowest levels of marbling) was the least palatable.

Since the outbreak of *E. coli* O157:H in the Pacific Northwest in 1993, U.S. consumers have preferred meat cooked more well-done than was the case prior to that incident. Unless beef is well-marbled, it will not be satisfactorily juicy or tender if it is overcooked. As the beef industry attempts to improve marketability of the “end cuts”—those muscles from the round and chuck—the problem with consumer cuts from those anatomical areas of the carcass is that they are often dry and tough if they are prepared by use of dry-heat cookery. Pork has very little marbling; so, the pork industry has partially solved that inadequacy by “enhancing” fresh pork—by pumping solutions of water, phosphate and/or salt and flavorings into the product at 7 to 12% gain levels. Colorado State University Scientists have mimicked what is done in fresh pork cut enhancement by marinating sirloin steaks and injecting fluids into top loin steaks. Marination of sirloin steaks with solutions of phosphate, beef flavoring and/or calcium chloride improved flavor, juiciness and tenderness. Injection of solutions of water, sodium tri-poly phosphate, sodium chloride and sodium lactate at 7.5, 10, 12.5 and 15% gain levels into top loin streaks improved flavor, juiciness and tenderness.

Tenderness is the most important determinant of overall palatability in beef. Tenderloin steaks (low in gristle and with long sarcomeres) sell—routinely—at retail, for twice as much as top sirloin steaks and for four times as much as chuck steaks (high in gristle and with short sarcomeres). Not much can be done about the gristle (actually, connective tissue) in muscle because locomotive muscles (like those in the round) need connective tissue for work and strength, while support muscles (like those in the loin) don’t do as much work and, thus don’t need as much connective tissue. There are things though, like slow/gentle chilling and use of high-voltage electrical stimulation, that will keep the sarcomeres (the contractile units in muscle fibers) long and thus tender.

The USDA beef quality grading system has served us well, especially at the extremes of “Prime” vs. “Standard” and particularly in identifying and excluding problematic carcasses (bullocks, heiferettes, hard-bones), to facilitate and enable sorting of the beef supply into groups (Quality Grades) in which customers (buyers for supermarkets and food-service operation) have confidence. The “Retail Beef Loin Palatability Study,” conducted by Colorado State University for NCBA, determined that U.S. Prime striploin steaks purchased from supermarkets in 8 U.S. cities were never unsatisfactory in tenderness, while 1 in 19 Upper Two-Thirds Choice, 1 in 9

Lower One-Third Choice and 1 in 6 U.S. Select steaks were unsatisfactory in tenderness. Based on research results conducted largely by scientists at Texas A&M University and Colorado State University during the past 15 years, the odds of having an unpleasant eating experience are greatly reduced if the steak comes from a higher-grading beef carcass. Based on results of those studies, the odds of having an unpleasant eating experience are 1 in 33 (3%) if a steak comes from a Prime carcass, as compared to 1 in 10 (10%), 1 in 6 (16%), 1 in 4 (27%), or 1 in 2 (50%), if a steak comes from a carcass of Upper Two-Thirds Choice, Low Choice, Select or Standard grades, respectively. Unfortunately, though, approximately 1%, 11%, 36%, 47% and 6%, respectively, of steer/heifer carcasses produced in the U.S. grade Prime, Upper Two-Thirds Choice, Low Choice, Select and Standard; thus, 83% (36% Low Choice; 47% Select) of U.S. beef carcasses produce steaks for which—because of within-grade variability—the odds of consumers having an unpleasant eating experience would be 1 in 5 (1 in 6 for Low Choice; 1 in 4 for Select).

In 1997, the NCBA Beef Palatability Task Force issued “Preharvest Means For Improving Beef Palatability”; in that list are recommendations related to genetics, time-on-feed, anabolic implants, intramuscular injections and age-at-castration. In addition, there are many postharvest interventions (e.g., electrical stimulation of carcasses, pelvic-suspension of carcasses, aging of carcasses or cuts, blade/needle tenderization of cuts, calcium-chloride injection, etc.) that will increase tenderness of beef. Recent CSU studies of electrical stimulation involving 2,126 steer/heifer carcasses in a commercial beef packing plant (Cannell *et al.*, 1999): (a) Demonstrated dramatic improvements in USDA Quality Grade and, (b) In tests of 450 steaks from ES vs. non-ES carcasses, documented improvements in flavor, tenderness and overall palatability. Several instruments (Nip Tenderometer, Armour Tenderometer, TenderTec, Swatland’s CT Probe, USMARC System, Color Difference Meters, Hunter/CSU BeefCAM) have been tested as means for sorting carcasses according to toughness/tenderness of their cuts and only the Hunter/CSU BeefCAM has emerged as being both practical and useful for that purpose. A study by Colorado State University (Cannell *et al.*, 2000) using the Hunter/CSU BeefCAM technology on 296 steer/heifer carcasses found that "of those carcasses certified as expected to produce tender beef, 98.6% produced tender steaks (based on Warner-Bratzler shear force data and consumer sensory panel ratings). Consumers will pay more for guaranteed tender beef and they will buy beef (among animal-protein foods) more often if it is more tender. NCBA has just completed a study of guaranteed-tender (“TenderSelect”) beef; 40% of those consumers involved in that investigation said they would pay an extra \$0.50 per pound for guaranteed-tender beef and 36% of those said they would buy more beef and less pork and poultry if the beef they buy is truly tender.

In November 1998, Texas and Southwestern Cattle Raisers Association passed a Resolution asking packers to: (a) Employ high-voltage electrical stimulation; (b) Segment carcasses into tenderness groups by use of sorting technology; (c) Age middle meats for at least 14 days, and; (d) Use tough meat in non-retail markets or tenderize it by use of tenderization technologies. Colorado State University scientists recently completed a study for Monfort, Inc., which identified an ideal protocol for using high-voltage electrical stimulation of beef carcasses in its beef plants. And, Monfort, Inc. will soon install CSU BeefCAM in its plants for use as a sorting technology for segmenting carcasses into tenderness groups.

Research indicates that efforts to control beef tenderness should begin with the seedstock producers' genetic decisions. Evidence supporting successful exploitation of genetics plus carcass-selection criteria to develop and merchandise branded beef includes the dramatic growth of sales for Certified Angus Beef as contrasted with the decline in sales (proportionate to sales of pork and poultry) for beef as a commodity from 1979 through 1998. As of April 2000, USDA has certified 41 branded beef programs; of those 41 "brands": (a) 34 "name" a breed; (b) 38 use a minimum marbling score, (c) 36 have a maximum maturity score; (d) 32 specify a minimum muscling score, and; (d) 34 have a maximum hump height.

A NCBA study, conducted by Colorado State University, investigated use of a PACCP (Palatability Assurance Critical Control Point) system for optimizing beef tenderness. Use of genetic selection (the 25% of sires that produced progeny with the most tender beef) reduced the percentage of tough top sirloin steaks from 17%, to 5%, and the percentage of tough top loin steaks from 18%, to 1%. In the Final Report of the PACCP study, CSU scientists described the importance of high-quality raw materials (using that as a corollary to improved cattle genetics) by quoting Bob Reed of the Llano Estacado Winery as saying "Once the grapes hit the dock, it's too late for us to correct the fruit. You can make good or bad wine from good grapes...but you can't make good wine from bad grapes! So, we try to help farmers grow premium grapes for our wines." A major U.S. supermarket chain is presently in the terminal stages of a test of source-verified branded beef ("Future Beef") produced in a vertically coordinated, strategic alliance program (cow/calf operators, feedlot, packing plant, fabrication facility, retail supermarket chain) that includes genetic interventions, feeding of Vitamin E (to improve retail caselife) plus Vitamin D₃ (in an attempt to increase cooked-beef tenderness), postmortem-treatment interventions and implementation of the latest technological advancements to assure a low rate of nonconformance in physical appearance and palatability in beef steaks and roasts. Brad Graham (Harris•Teeter Supermarkets), at the North Carolina Cattlemen's Association convention, in February 1999, said: (a) Complaints about beef in our supermarkets have increased from 1 per 100 customers in 1975 to 1 per 10 customers in 1998; (b) We sell cuts from the middle-meats at four times the rate that we sell cuts from the chuck and round—we can't sell the whole animal, and; (c) We can sell "Genetically Defined, Source-Verified Beef" for 30 to 80 cents more per pound than Choice beef.

Seedstock producers can identify bulls likely to sire progeny with tender beef by use of: (a) Progeny testing (this is time-consuming and costly because 35 progeny per sire and cooked-steak shear force analyses are required); (b) Expected Progeny Differences For Tenderness (eventually, if enough progeny testing is done, it will be possible to compute EPDs for tenderness), and; (c) Marker Assisted Selection (if gene markers prove useful, DNA analysis of blood or semen will identify superior cattle). NCBA is sponsoring a National Tenderness EPD Project (conducted by scientists from Kansas State University, West Texas A&M University and Colorado State University) involving: (a) 10 to 17 breeds and 12,000 to 20,000 progeny of about 15 heavily used sires per breed; (b) From 35 to 40 progeny per sire, carcass data plus cooked-loin tenderness evaluations and blood samples will be collected, and (c) Carcass-trait EPDs, tenderness EPDs and validation of gene markers for tenderness will be determined.

"Without Compromising The Environment Or The Animal's Welfare"...Especially in Europe but also in the Orient and emerging in the USA, is a commitment on the part of some

individual citizens to do whatever he/she/they can to show disapproval for certain industries or companies—by not buying their products—that: (a) cannot be traced-back to the farm or ranch of origin; (b) befoul the environment, and/or; (c) tolerate the mishandling or mistreatment of farm animals. Evidence that this trend is not just a passing fancy is provided by: (a) Demand for identification--individually--of all farm animals in the European Union; (b) Mandatory individual-animal identification of market cattle in Canada; (c) Emphasis on animal welfare by a major grocery company (Tesco) in the United Kingdom, and; (d) McDonald's Corporation creating a staff position with responsibility to assure that no beef used in a McDonald's burger—worldwide—was derived from beef trimmings generated in situations or under conditions that compromised the welfare of the animals from which that beef originated. An article in Meat & Poultry magazine (October 1999) by Dr. Temple Grandin (Colorado State University) reported that the McDonald's Corporation Audits have motivated beef packers, in the U.S. and globally, to dramatically improve their animal handling practices. The terms "traceback," "traceability" and "source-verification" are used to refer to the ability to identify animals or meat products according to their origin, as far back in the production sequence as is necessary to accomplish the intended purpose. Traceability can be important for ascertaining ownership, identifying parentage, improving palatability, assuring meat safety and determining compliance in "branded beef" programs. Horn branding, hide branding, ear tagging (metal, plastic, electronic), tail tagging and retinal scanning, work for Individual Animal Identification (IAID) up to the point of slaughter. In the United Kingdom, each bovine animal must have a "passport"; this method of IAID is used to help allay consumer fears about BSE and nvCJD. IAID can be maintained through slaughtering/dressing by use of animal/carcass tagging or trolley tracking. IAID can be maintained through fabricating/boning by keeping units separated (small plants), tagging and bagging (medium-size plants) and DNA fingerprinting (large plants). DNA fingerprinting is the only reasonable method for maintaining IAID of steaks, roasts, trimmings and ground product through retail sales and is being used for example, by Superquinn Supermarkets in Ireland and by Meat Standards Australia.

In the USA, Merial, Allflex and AgInfoLink have formed "Beef Results Network" based on IAID using electronic eartag technology, National Cattlemen's Beef Association has developed "USA Cattle Identification System" based on IAID using metal, plastic or electronic eartag technology and Colorado State University has developed "Optibranding" based on IAID using retinal scanning. All three of those programs are voluntary and encompass birth to carcass IAID. Animal Group Identification (AGID) is being used in the USA for "branded beef," beef from "alliances" and beef from "supply chains" for purposes of source-verification, production practice-verification and USDA process-verification for purposes of: (a) assuring palatability, (b) assuring chemical food safety and (c) assuring microbiological food safety. Traceability requirements in the European Union are a moving target, but at the time (May 1999) of the World Meat Congress (Dublin, Ireland) were explained as "If a claim is made about meat in the EU, groups--not individual animals--must be traceable, and identity must be established by traceback for steaks, roasts and stew meat--but not for cured or fresh minced (ground) meat." Inasmuch as come U.S. export markets may eventually have mandatory traceback (perhaps even IAID through retail) for food safety purposes, the U.S. beef industry maintains an open mind on this issue and continues to explore possibilities. Source-verification and branding of beef will be the means for providing assurances to both customers and consumers that neither the environment nor animal-welfare were compromised by producers of beef. Texas A&M

University scientists just completed a “Texas First” Trace-Back Study that concluded that supermarket shoppers would pay 4 to 10 cents more per pound for source-verification.

Five conclusions were reached at the 1998 Alltech Symposium on Biotechnology in the Feedlot Industry, the first of which was “Consumers have specific and challenging demand regarding food safety and the environment.” During the World Meat Congress in Dublin, Ireland (May 1999) the two topics discussed most were meat safety and ecological concerns (e.g., use of GMOs—genetically modified organisms—like “Roundup-Resistant Soybeans” and “Bt Corn”). Concerns about GMO's arose because of concerns that Bt corn threatened lepidopterans, like the Monarch butterfly (Genetic Engineering News, June 1999). Articles began to appear in the U.S. print media (e.g., "Who's Afraid Of Frankenfood?, Time magazine, November 1999) causing three U.S. organic-food supermarket chains (Whole Foods, Alfalfas, Wild Oats) to ban the sale of genetically modified food in their retail outlets. Charles Margulis, head of Greenpeace's Genetic Engineering Campaign in the EU said "The FDA needs to stop providing cover for biotechnology companies and take these genetically modified products off the market" (Meat Marketing & Technology magazine, January 2000).

Food Technology (January 2000) countered with the following question/answer series developed by scientist-members of the Institute of Food Technologists: (1) What is genetic modification? Recombinant DNA technology. (2) What are the benefits? Resistance, adaptability, tolerance, functionality. (3) Is such technology safe? Yes, according to National Academy of Sciences, Food and Agricultural Organization and World Health Organization. (4) Are foods from GMO's Safe? Yes, according to FDA. (5) Who ensures no environmental threat? USDA, EPA and State Agricultural Experiment Stations. (6) Can outcrosses to weedy relatives occur? Yes, but APHIS guards against this. (7) Will this cause super-pests? Resistant-pests, Yes; super-pests, No. (8) Will Bt corn harm Monarch butterfly larvae? Yes, but less than pesticides. (9) Are there non-plant applications? Yes, BST, chymosin, human insulin. (10) Should foods derived from GMO's be labeled: Yes, but it will be costly and misleading. Genetic Engineering News (January 2000) presented new scientific information and research findings suggesting that "Recombinant corn is viewed as no great threat to Monarch butterflies."

Key findings in a report released in early April 2000 by the National Academy of Sciences could help reassure consumers about the safety of foods made from GMO, pest-protected crops. A NAS Committee, headed by Dr. Perry Adkisson (Chancellor Emeritus of the Texas A&M University System), reported that: (a) Pest-protected transgenic plants such as Bt corn present no human health risks. (b) The committee could find no evidence suggesting that foods on the market today are unsafe to eat as a result of genetic modification. (c) The committee found no strict distinction between the health and environmental risks posed by plants modified through modern genetic engineering techniques and those modified by conventional breeding practices (Feedstuff magazine, April 2000). But, don't expect this issue to die, another article in Feedstuffs magazine (April 2000) states that the EU is expected to enact, in the near-term, legislation that will undoubtedly restrict movement and sales of GMO feedstuffs--and perhaps, products from animals fed GMO's--in member countries.

CONCLUSION

It now seems certain that, in the future, most of retail beef will be source-verified, production practice-verified, USDA process-verified, branded and produced in supply chains by partnerships and alliances. And, there will likely be three or four quality/palatability categories (including "guaranteed tender") of branded beef (determined by use of genetics, carcass trait-selection, instrument grading and sorting, tenderization technology, and/or aging specifications) plus other branded beef categories emphasizing "Natural," "Organic," "Nutritional" and perhaps "Humanely Produced" or "Environmentally Friendly." One of the really great benefits of a beef industry predicated on source-verification and branded beef is that, with such change will come value-based marketing. Just imagine...a beef industry in which the targets are agreed-upon in the beginning and based upon what customers want and what consumers will purchase, and eat, and enjoy. Just imagine...a beef industry in which you are paid for producing cattle that hit the targets and discouraged, economically, if you produce cattle that do not. Just imagine...