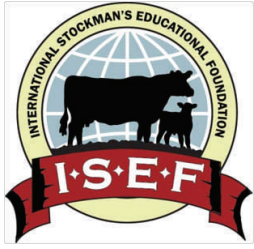


## Antibiotics: Beef Production without Antibiotics – Is It Doable?



**Mike Apley, Kansas State University**

The reason this question is asked is due to antibiotic resistance. So, the real question becomes is animal production causing an antibiotic resistance problem for producers and/or consumers? Will Rogers once said, "It ain't so much what we don't know that gets us into trouble as what we do know that ain't so."

What we know:

- Antimicrobial resistance is considered one of the most critical public health issues of the 21st century.
- Resistance results in additional health care expenditures totaling \$4 to \$7 billion annually
- The perceived veterinary contribution to resistance will influence current and future drug approvals and label indications.
- The resistance issue will be used by activist groups to lobby against production agriculture.
- There are extensive, transmissible resistance genetic elements out there, including tetracycline resistance.

What we don't know:

- The relative amounts of antimicrobials used in human and veterinary medicine.
- The relative contribution of veterinary vs. human antimicrobial use on the emergence of resistant bacteria.
- Prevalence, amplification and dissemination of genetic resistance determinants in response to antimicrobial selection pressure.
- The clinical relevance of resistant infections in veterinary medicine.

Bacteria do not plan resistance, rather mutations occur in the population that then fill the 'population hole' left by a susceptible bacteria. These mutations occur regardless of the presence or absence of an antimicrobial. J.E. Davies stated "it is not the survival of the fittest, it is the survival of what fits" (Antibiotic Resistance: Origins, evolution, selection and spread, Ciba Foundation, 1997). So, resistance really becomes a result of selection pressure.



How do we interpret a 'resistant' isolate? Selection of a resistant isolate may be on-site. However, that doesn't mean the mutation started on that site, nor does it mean that the isolate will be present in a week, a month or 6 months. When evaluating resistance, the industry needs to evaluate the risk and benefit.

**Take Home Message:** Simply said, we have to relate science and technology when a lot of groups debating this issue don't understand science and technology. The impact of antimicrobial use in therapy, prevention and growth strategies on the development of resistance must be evaluated. The issue of resistance really lies in growth and prevention; therapy right now is not a concern.

**Tom Shryock, Elanco Animal Health**

The motivation behind the question of beef production being doable without antibiotics could stem from new marketing opportunities, elimination of CAFOs by concerned groups who believe antimicrobials have to be used in conventional production, or legislative pressures to eliminate antibiotics in feed for performance, prevention and disease control.

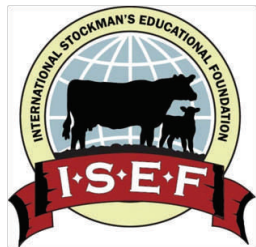
To date, several risk assessments have been completed to guide the actions of, for example, the World Health Organization and regulatory agencies. In addition to these assessments, the U.S. has developed a Public Health Action Plan, congress has brought forward legislation, the American Veterinary Medical Association and Center for Veterinary Medicine have written Judicious Use Guidelines; and the private sector has made decisions on antibiotic use. Antibiotics are approved, based on efficacy, for disease treatment, disease prevention or nutritional effects (i.e. growth promotion).

The biggest issue with antibiotics used as feed additives, is with those used in livestock production and human medicine. Those classes that overlap between uses include bacitracin, tetracyclines, lincomycin, penicillin, tiamulin, tylosin, sulfonamides, and virginiamycin. If these classes are taken off the list, there are no overlaps in hospital infections in the U.S., between feed additive products and antimicrobial resistance. In addition, the risk assessments that have been conducted on feed additives show low to negligible antimicrobial resistance food borne risk to humans.

So, what happens if in-feed antibiotics are eliminated? The three biggest livestock production issues that arise with no in-feed antibiotics are that 1) diseases and subsequent liver abscesses, condemnations and production costs, are not prevented or controlled, 2) performance return diminishes for producers as costs escalate, and 3) current production systems likely need alteration for cattle, swine and poultry which could impact sustainability, trade and human nutrition. And, while these negative impacts are seen in production, no change in human food borne bacterial disease prevalence or antibiotic effectiveness will be seen.

**Take Home Message:** Only 7% of consumers worry about agricultural production methods. In 2008, the primary concern to consumers was affordability. While consumers indicate that they want choices, and those who prefer organic deserve to have the choice, it is known that 75% of the world's population cannot afford organic foods. With this said, switching from use of antibiotics to a system without antibiotics would impact land use, grain production, infrastructure, producers and support businesses, economics, and the consumer demand for protein. Organic production may be a realistic alternative in 30 years, but only on a local level. As such, efforts to maximize choice and production efficiencies for all foods, including organics, deserve

## Beef Demand Panel



**Tom Brink, J&F Oklahoma Holdings, Inc.**

The beef industry is in unprecedented times and we are winning—there is more demand than supply and that is a good thing. If cow/calf producers have a competitive cost structure, the market favors increasing their cow herd. In 2010, the price of retail Choice beef was \$4.40 /lb and live cattle futures to retail beef prices have increased to \$5/lb. Domestic consumers will go through the shock of the price increase and domestic demand will be challenged. However, the beef supply could be rationed with an increase in exports which may 'buy' beef from the domestic market bringing the beef industry to a new equilibrium between the domestic and foreign market.



Value-added product will continue to grow and tapping into that market has the potential to uncover premiums for all sectors of the industry. Premiums may exist for telling a beef story, for how product/cattle were handled, how product was processed and for simply making a higher quality raw product. Producers need to look at programs and determine what opportunities exist in the beef industry. Age and source verification is just one example that has huge potential because of Japan and their requirement for animals to be less than 21 months of age.

**Take Home Message:** look at the economics; it may be time to make some changes.

**Mark Gustafson, JBS USA**

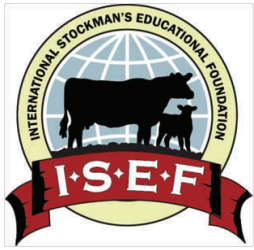
There is a reality to processing international orders that a lot of people don't see because issues/circumstances beyond the plant or company control may exist. The reality is that we have to deal with non-tariff barriers and that access issues to countries that have nothing to do with the beef industry itself do exist. For example, Europe could be classified as 'chemical phobes' and they believe that residues in meat are a big danger, however, at the same time believe that pathogens are natural and are just fine to find in product. Japan, on the other hand, is not concerned with residues. However, as you consider the international market as a whole, they want to know where their beef comes from, where it was fed, what it was fed and anything else you can tell them to paint the whole picture. If the U.S. beef industry is going to market beef overseas, we must pull everyone closer to the consumer and get a handle on traceability.

**SIDEBAR QUOTE:**

Mark Gustafson quoting Rick Landis with Keystone Foods... "The world runs on fear and greed. Fear is that there is not enough; greed is I want more."

**Take Home Message:** As we move forward as an industry, all segments must work together to tell consumers where food comes from in order to maximize our opportunities. The challenge will be what happens to the industry if exports cease or if currency rates change. In the current model, it won't work and won't be sustainable if either of these things happen.

Proceedings written by Deb VanOverbeke, Oklahoma State University



## Beef Market Globalization

Paul Clayton, US MEF



With a growing population, the question becomes will we have enough beef to feed the world. If we are going to do so,

technology will need to play a role. This technology includes communication technology that students today fully embrace - these students will be in the middle of their careers in 2030 and at the peak of their careers in 2050.

Along with a population increase, the world has had a growth in productivity. Between 1980 and 2009, world output doubled. Between 2009 and 2030, world output is expected to double again. When growth in GDP is realized, people tend to demand higher quality foods because they can afford to pay more for food. This is extremely evident in developing countries, which have the highest potential to gain from economic opportunity. One example of this is "Steak City, China". This four-story restaurant serves 4,000 steak meals a day, equivalent to the same number of steak meals served in one month in any U.S. restaurant.

Countries that have land for production, will have the economic advantage over other countries as the population continues to increase. However, in order to make the most of this advantage, those countries will need to embrace technology to have the biggest impact. The United States leads the world in productivity in beef, pork and poultry production. However, competitors are watching and gaining ground as evidenced by a 28% increase in productivity growth in the world, compared to only 11% growth in productivity in the United States.

Economics will continue to be impacted by the exchange rate. When the dollar is weak, the United States has export power for U.S. products, thereby adding dollars to the U.S. economy. In reverse, when the dollar is strong, the United States imports product.

It all relates to demand. There are parts of a beef carcass that U.S. beef consumers do not want.

For example, in the United States short ribs are sold as 50/50 trim for \$0.80/pound; however in the Asian market, they sell for ~\$4.00/pound. As such, 90% of cattle short ribs are exported. On the other side of the spectrum, the United States eats 90 million servings of ground beef and requires the raw material to produce this volume of ground beef.

The beef export market is expected to reach 2003 volume by 2013. Recovery takes time because countries have rights, beliefs, and customs. As such, agreements must be staged appropriately to help make them commercially viable; beef is just one piece of the puzzle in making these agreements.

- |         |  |
|---------|--|
| Korea:  | Agreement is moving forward and may be final by summer, 2011   |
| China:  | Technical team is still there and negotiations are underway to develop a protocol  |
| Japan:  | Is not interested in a Free Trade Agreement; a request has been made to approve 30 month of age carcasses  |
| Mexico: | Has five restricted products— weasand, sweet breads, head meat, intestines and ground beef. These five products are valued at over \$50 million per year. A report should come soon. |

The export markets want high-quality beef. High-quality beef is more than marbling, it is the eating experience. High quality also includes grain-fed, genetic management, year-long consistent production, and grading (grading is a mark of certification to foreign countries, similar to third party assessment).

Issues that need to be addressed to maintain and expand export markets include SPS trade concerns, foreign animal disease control, residues, growth promotants, foodborne illness risks, and animal welfare. Some of these concerns are viewed as U.S. production issues, some are world issues.

Either way, change in supply has occurred worldwide with more branded products, allowing companies/producers to tell a story, and trends for more private standards exist in order to supply to certain companies; and for more certification systems that include ISO certification.

**Take Home Message:** The image of the beef industry is challenged daily from consumers and activist groups. The industry must sustain a positive image and that requires utilization of Beef Quality Assurance programs and promoting sustainability. The industry also needs to elevate the image that consumers have of the industry, telling consumers not to miss a meat treat.

Proceedings written by Deb VanOverbeke,  
Oklahoma State University

## Update on Current Genetic Technologies



### *Kent Andersen, Pfizer Animal Genetics*

The challenge for the beef industry is to continue meeting production needs in the years to come,

especially as the global population continues to grow. Numerous advancements in cattle evaluation have been made in recent years including parentage verification, economic selection indexes, DNA tests and most recently use of targeted marker panels and high-density marker platforms, just to name a few.

Power is in a pedigree. Parentage technologies are important for accurate genetic evaluation, essential for managing inbreeding, and valuable for eliminating simple recessive genes. Microsatellites allow the evaluation of several alleles at one time. For example, the USDA Meat Animal Research Center (MARC) 96-marker panel uses single nucleotide polymorphisms (SNPs) to evaluate 96 different alleles. This technology is a companion feature of high-density testing for production traits. Previous to high-density marker panels, determining if an animal was a carrier of a simple recessive defect was time-consuming, expensive and resulted in devaluation of all carrier animals in an industry.

Producers will see multiple genotyping platforms in the marketplace at the same time. These include everything from 56-marker panels, to 3,000 marker platforms, to high-density 770,000 marker platforms. In general, the more markers, the more cost and the more power associated with each platform. Each product has a different use and the customer should consider how he might use one product on one animal and a completely different product on a different animal. The Bovine SNP50 beadchip is high-density 50,000 marker technology which evaluates 14 traits for genomic-enhanced expected progeny difference 's (EPDs) and provides percentile ranks for each trait. This panel is currently used to provide breed specific profiles for Nelore cattle in Brazil.

**Take Home Message:** Producers need to consider marker panels and platforms based on their need for evaluation, not simply the number of markers available and cost associated with the platform.

### *Jim Gibb, Merial—Igenity*

Igenity is a trademark of Merial and is used to provide an evaluation of carcass traits, average daily gain, fertility/maternal traits, docility, feed efficiency/residual feed intake, polled, and multi-sire parentage, along with specialty tests. Genomic enhanced EPDs (GE EPDs) combine individual EPDs, pedigree information, progeny information and molecular breeding values into an enhanced value producers can utilize. So, if a producer has a DNA evaluation, with or without phenotype backup, GE EPDs can be determined. However, it is not recommended to stop the collection of phenotypic data as both pieces are valuable.

The advantages of GE EPDs are that they have much higher accuracy than regular EPDs for young, non-parent animals, they provide relative EPDs for traits that are difficult and/or expensive to measure, they do not require contemporary groups, they have a faster generation turnover with less risk and they are simple, less confusing and provide an all-in-one value.

From 2001 to 2010, the Gelbvieh Association documented the potential for 20% genetic progress with GE EPDs. The American Angus Association has entered an agreement with Igenity to report GE EPDs for carcass weight, fat thickness, ribeye area, marbling score, residual average daily gain (ADG), and docility. The measurement of these traits will be more accurate and will, as a result, be less likely to change with additional data because genomics are already included in the evaluation of the trait.

**Take Home Message:** Use of accurate genetic technologies results in certainty. Accuracy can and will be improved with the use of GE EPDs vs. traditional EPDs.

Proceedings written by Deb VanOverbeke, Oklahoma State University



## Food Safety, An Industry Issue



**Mandy Carr, NCBA**

The beginning of the beef checkoff-funded beef safety research program started in the early 1990's as a result of a multi-state food safety outbreak. The focus was post-harvest research and served as the investigating source of establishing commonly used post-harvest interventions. These interventions would include organic acid washes, acidified sodium chloride, steam/thermal pasteurization, carcass microbial mapping, steam vacuum, hide washing, and a combination of the above to optimize microbial control within the plant.

In 1999 and early 2000, the checkoff became involved in additional science looking further into pre-harvest interventions in order for the pathogen load to be reduced prior to arrival at the plant, thereby improving the effectiveness of post-harvest interventions. While not an inclusive list, here is a look at eight pre-harvest interventions:

- **Direct-Fed Microbials**— Typically used as a feed additive, direct-fed microbials are typically made of lactic acid-producing bacteria. These bacteria provide a competitive environment that excludes pathogens. One product approved for use is labeled for animal health and performance, and while it has the ability to decrease *E. coli* and *Salmonella*, it is not labeled as a pre-harvest intervention for pathogens.
- **Epitopix O157 Vaccine**—Numerous research has been conducted on vaccines and this is only one of several. It is known the target bacteria require iron for normal growth. This vaccine targets the ability of the pathogen to uptake or acquire iron. Epitopix was granted a conditional license in 2009 and is now involved in large scale research trials and the data will be submitted for full approval in 2011. A similar vaccine is already approved for the control of *Salmonella* in herd health for the dairy industry and is marketed by Pfizer.



- **Bioniche O157 Vaccine**—A second vaccine, by Life Sciences Inc; Bioniche, stimulates immunity against type III secreted proteins that mediate bacterial attachment to intestinal cells. While approved in Canada, it is under review in the U.S.
- **Bacteriophage**—A bacteriophage is a virus that targets specific bacteria, one of which is *E. coli* O157. It was approved in 2007 as a hide wash to spray on the exterior of the animal, controlling pathogen loads that enter the plant. However, it is most effective within 4 hours of harvest and is therefore maybe best suited for use in holding pens at the packing plant.
- **Sodium Chlorate**—Chlorate kills bacteria that have the enzyme nitrate reductase only; therefore, it will kill *E. coli* O157:H7 and *Salmonella*, but not other beneficial bacteria. Having been through several phases of research since 2000, it currently sits in review with the Food and Drug Administration because it is intended to be used as a feed additive.
- **Neomycin**—evaluated in the early 2000's, neomycin is labeled for use in cattle for the treatment and control of bacterial enteritis caused by *Escherichia coli*, but is not labeled for food safety.
- **Tasco**—Also a feed additive, this brown seaweed extract is fed at 2% of the diet on a dry matter basis. Tasco is approved for use and has been shown to improve color at the same time as improving pathogen load. However, cattle being fed Tasco need to be monitored for the impact on feed intake.
- **Orange Peel**—The most current of the list provided, orange peel does not require approval because it is GRAS—generally recognized as safe. Orange peels can be dehydrated and the oil can be added to the cattle diets at a 5-10% inclusion level.

**Take Home Message:** The pre-harvest knowledge timeline started in 2001 with the checkoff research that was focused on feed additives and direct-fed microbials and continued through investigation of on-farm management practices that impact shedding, colonization, transportation, sodium chlorate, sampling methods, persistent shedding, vaccines, bacteriophages, and environmental effects between 2002 and 2006. Pre-harvest research continues to expand the knowledge base of researchers and producers. The beef industry has also sponsored the annual Beef Industry Food Safety Summit that helps update all communities of the beef industry on the current status of interventions and regulations that apply to each group.

***Justin Ransom, OSI Group***

The Global Food Safety Initiative (GFSI) is an effort to harmonize food safety efforts worldwide. The reason for this, for example, is that OSI has 45 plants in 18 countries. Each country has different regulatory requirements and each customer of each plant has different requirements. The goal of the GFSI is to harmonize audits to meet everyone's expectations.

The audit community is changing. Three years ago, an audit agency was hired and the group/individual came to the plant to evaluate Good Manufacturing Practices, animal welfare guidelines and BSE firewalls. Some plants may have as many as, in the case of OSI, 40-plus audits per year to meet regulatory and customer requirements. The plant spent valuable time and money holding and hosting each of the required audits. The GFSI brings everyone together to one international set of standards and would result in significantly less audits to meet everyone's needs and requirements.

The goals of GFSI include decreasing food safety risks, reducing cost and serving as a platform for knowledge exchange; in essence, standardizing requirements and regulations worldwide.

While this will not happen overnight, the program is set up in a three-year initiative to get all plants/companies up to GFSI standards. Because the group is still in the middle of setting those standards, several companies have begun using the most stringent guidelines/standards and implementing that group of guidelines in the plants to get as close as possible to the standards without yet having them set.

The cost of the program is difficult to estimate. However, if you consider that an audit typically costs \$3,500, it should be looked at as an investment and the building of an infrastructure, not as a cost per se.

**Take Home Message:** From 2005-2010, business was different than it will be going forward. In the past, when audits were conducted, the audit team would look at documentation and policy to ensure the plant was following policy. From here forward, the audit team will interview and talk to line employees about situations—asking them if X, Y or Z happens, what do you do? This is an exciting time to have this change taking place, but it will carry a significant cost to execute.

***Nick Nickelson, Standard Meat Company***

A lot of meat in the U.S. is injected or blade tenderized to enhance tenderness. As such, the issue of non-intact product has been a hot topic as of late. Directive 10,010.1 defines non-intact as "ground beef, beef that has been injected with solutions; beef that has been mechanically tenderized by needling, cubing, frenching, or pounding devices; and beef that has been reconstructed into formed entrees.

For several years, the industry has been trying to explain to government that there is a difference between enhanced and blade-tenderized product and that they are two completely different operations that make each product. Considering both types of product, only 5-6 outbreaks have occurred in the last 11 years. If you further evaluate these 5-6 outbreaks, 3 clear outbreaks relate to poor sanitation practices such as not cleaning the equipment that circulates brine during the enhancement process. The question becomes, what is the risk if we consider incidence, level, cold chain management, interventions (some use them, some don't), probability of surface area and lethality.

Along with the non-intact, non-O157:H7 *E. coli* has also been a hot topic. Consider the following taxonomy of *E. coli* O157:H7:

- *Enterobacteriaceae*
- Coliform
- Fecal coliform
- *Escherichia coli* (700 different serotypes)
- *Shiga Toxin* producing *E. coli* (STEC-200 different serotypes)
- *Enterohemorrhagic E. coli* (EHEC; those that cause HUS)
  - O157:H7
  - Non-O157
    - Pathogenic non-O157:H7

According to Centers for Disease Control; non-O157s include: O26, O45, O103, O111, O121, and O145. These serotypes are very difficult to isolate and identify. In addition, these 6 produce 70% of the disease related to non-O157 outbreaks according to CDC.

The question becomes should the industry be evaluating phenotype or genotype. In other words, do you look for the O and H or do you look at what's in the bacteria's tool box determining if it is pathogenic or not? The O and H do determine the serotype of the bacteria, however, they do not determine pathogenicity. As such, it is thought that research should attempt to identify genes/bacteria that make it pathogenic and not worry about the O and H. For example, use *shiga-toxin* as a screen and then look at genes (such as the *eae* gene that is associated with attachment to the intestine) of the bacteria to determine pathogenicity.

**Take Home Message:** According to the CDC, Non-O157s are estimated to cause 37,000 diseases/cases per year; half the level of those caused by O157:H7. Approximately 70% of non-O157 human isolates belong to the six non-O157s listed above. The infectious dose for non-O157 is probably higher than for O157. The good news is that current interventions should work to control non-O157s.

**Mohammed Koohmaraie, IEH Inc.**

The industry should be concerned about two emerging pathogens: non-O157s and multiple drug resistant (MDR) *Salmonella*. Both of these pathogens could soon be considered adulterants by the U.S. government.

Between 2002 and 2003, research was conducted at the USDA-Meat Animal Research Center on MDR *Salmonella*. It was determined that these pathogens exist on cattle hides which can be treated to address the issue. However, it was also determined that these MDR *Salmonella* can be found in lymph nodes.

**Take Home Message:** It is known that *Salmonella* can be found throughout the environment. CDC estimates 4 million cases of *Salmonellosis* each year; 50,000 of these cases end with hospitalization, 5,000 end with death. The majority of these illnesses will cure themselves in 24-72 hours. However, some require hospitalization because of the severity. Antibiotic resistance is a challenge the industry is working to address.

Proceedings written by Deb VanOverbeke, Oklahoma State University



## Growing Domestic Demand

### James Mintert, Purdue University



Beef demand is difficult to measure because both price and quantity matter. The Beef Demand Index (BDI) evaluates both factors for the domestic market in one single index number and holds quality constant. The base year for the BDI is 1980 (as such it is referenced with a BDI of 100). A decline occurred in BDI for nearly two decades (BDI of 100 in 1980 to 50 in 1998). When a decline in beef demand happens, everyone suffers because it is hard to make money. And, if an industry is not making money, the industry shrinks. If the industry shrinks, it provides consumers fewer pounds of product at a higher price in hopes of bringing prices to a profitable level for those still involved. However, if demand continues to decline, those hurt most are those that remain in an industry smaller than it was during previous demand declines. Improvement in BDI was documented in the late 1990's as demand increased in five of the six years between 1998 and 2004 (BDI of 50 in 1998; BDI of 63 in 2004). However, following that increase, the beef industry has witnessed another downfall with a declining BDI in 4 of the last 5 years and it is expected that the final BDI for 2010 will be down 1 point from that of 2009.

It is difficult to explain the declines and the increases in beef demand. Some impacts on demand include beef quantity, beef price, competing meats and the price of competing meats, consumer expenditures, and a whole host of other issues/items. Given all of these factors, the beef industry needs to focus on those things which the industry can impact: food safety, health, nutrition and convenience.

**Food safety.** Consumers pay attention to food safety. Along with the spike of recalls in 2007, a 2.6% decline was seen in demand. Research shows two levels of impact during a recall—the immediate quarter as well as 2 quarters with a lagged response. Research shows a 10% increase in recalls results in a 0.2% decline in demand. This implies that consumers expect their food to be safe and that a sharp increase in recalls does have a significant impact on demand. As such, the industry needs to be proactive regarding food safety.

**Health.** Consumers are concerned about health in general and heart disease and the relationship of each with beef consumption. This relationship is evaluated based on the number of medical journal articles published which reference heart disease and diet and/or beef in the diet. A long term rise in the number of articles published occurred between 1980 and 2002. Articles are still being published, although at a decreasing rate. The data show a 10% increase in journal articles results in a 0.2% decrease in beef demand; looking back from 1982 to 2004, this was equivalent to a 9% reduction in beef demand. This implies that the beef industry needs to communicate beefs positive/strong nutritional properties and emphasize these properties to consumers and health/nutrition professionals.

**Nutrition.** Consumers respond to nutrition information. The nutrition message having the most positive impact for the beef industry was through stories about the Atkins Diet (positive Atkins Diet articles minus negative Atkins Diet articles) in U.S. newspapers. By monitoring articles, the industry has been able to document the impact of nutrition messages. From the 1980's to the early 1990's—no articles, no impact; from the mid 1990's to late 1990's—increase in positive articles resulting in peak interest; in the late 1990's—onset of negative articles; now—nothing. The results did support an increase in beef demand and documented that if you double the net number of positive articles demand would increase 0.8%. From 1998 to 2003, the support media relative to the Atkins Diet resulted in a 0.25% increase in demand. These examples indicate that the beef industry needs to identify healthy lifestyle fits for consumers, research and discuss other nutritional benefits and emphasize nutritional properties to consumers.

**Convenience.** Convenience is the most difficult factor to measure directly and finding a good trait by which to measure convenience is a challenge. Two trends that can be measured include female employment and food consumed away from home. Female employment surged in the 1980's and 1990's, but has leveled in the last decade. Food consumed away from home has increased over the last 20 years, but has also leveled recently. Beef demand declined with the increase of females working outside the home and with the number of meals consumed outside the home. A 1% increase in female employment results in a 0.6% decline in demand, while a 1% increase in food consumed outside the home results in a 1.6% decrease in beef demand. If you consider poultry demand with the same two factors, because of the new product proliferation and the emphasis on convenience in the poultry industry, both trends increase demand. It is evident that the poultry industry is outpacing the beef industry with innovation. If you compare the meat case of 1980 to the meat case today, the beef case more closely resembles the 1980 case than the poultry case does, and for every new beef item with convenience embedded within it, there are 1.5 to 2 poultry products in the marketplace with the same or more convenience. Coming out of a tough recession, it is evident that consumers value convenience as shown by the recent increase in investments in McDonald's, for example, compared to Ruth's Chris Steakhouse. The beef industry can respond to all this by developing and marketing more new products and providing more convenient, tasty, nutritious products for consumers.

**Take Home Message:** Demographics both domestically and internationally are changing. Because the United States will increase the number of people on Social Security by nearly 30 million people in the next 20 years, there will be an increasing concern about diet, price and smaller portion sizes. Nonetheless, consumers in the United States will continue to value convenience and be receptive to information about health and nutrition. The safety of beef will remain extremely important.

Proceedings written by Deb VanOverbeke,  
Oklahoma State University

## Growth Promotants and Beta Agonists – Upside and Down-



**Daryl Tatum, Colorado State University**

Several milestones have occurred in growth enhancement of cattle.

In 1954, oral diethylstilbestrol (DES) was approved. Between 1956 and 1958, estrodiol benzoate and DES implants for steers and heifers were approved. In 1979, DES was banned. Zeranol implants were approved in 1969, trenbolone acetate (TBA) implants in 1987, estradiol trenbolone acetate (E+TBA) implants were approved in 1991 for steers and in 1994 for heifers. And, most recently,  $\beta$ -agonists were approved for use in 2003 and 2006. The result of these approvals is an increase in net protein accretion. Today, the U.S. produces twice as much as we did in 1955 with a similar number of cattle. If you compare production in 1975 to production in 2009, beef production was 2.5 million pounds greater in 2009 despite a 37.5 million head reduction in cattle numbers. While the increase in production is not all due to growth technologies, it could not have been done without the them.

**Take Home Message:** Growth technologies are among the most effective management tools available to beef producers for adding value to cattle. Research shows implants add \$71 per animal, ionophores \$20, antimicrobials \$9,  $\beta$ -agonists \$15, and de-wormers \$35 per animal. Cumulatively, feedlot technologies add \$155 per animal in the feedlot, not accounting for impacts in the packing, retail and foodservice sectors of the industry. However, concerns such as increased carcass weight, increased ribeye area, reduced tenderness, and potential negative impact on beef demand domestically and internationally have been expressed over the use of growth promotants.

**Tony Bryant, JBS/ Five Rivers Cattle Feeders**

Steroidal implants such as estrodials, zeranols, and trenbolone acetate (TBA) have been used for over 60 years. Modern implant practices increase feed efficiency by 5-15%, increase average daily gain by 10-30%, increase carcass leanness by 5-8%, lower quality grade and have mixed effects on tenderness.  $\beta$ -agonists such as ractopamine and zilpaterol are in a different family of compounds and have a different mode of action compared to steroidal implants.



The two  $\beta$ -agonists used in the industry today are Optaflexx and Zilmax. When compared to control steers, Optaflexx and Zilmax have, in general, similar results in improving outweigh from the feedlot, increasing carcass weight, increasing dressing percentage, increasing ribeye area, decreasing percent Prime and Choice carcasses, increasing number of carcasses weighing over 1000 lbs, increasing red meat yield and decreasing tenderness as measured by Warner Bratzler shear force. However, while directionally they have similar results, the magnitude of such changes differs between the two products. In addition, dollars returned to the feedlot are increased with both products, with Zilmax returning more to the feedlot as compared to Optaflexx. When evaluating the impact on tenderness, while all studies show a significant decrease in tenderness, it is important to note that all shear force values are still well below the 4.5 kg threshold that has been discussed in the industry for years.

Differences in tenderness with  $\beta$ -agonists exist with aging time, feeding duration and concentration of the  $\beta$ -agonists that are fed during finishing. Although a difference in shear force exists (+0.7 to 3.0 lb with Zilmax and +0.3 to 0.6 lb with Optaflexx), the effect is less dramatic when tenderness is rated by consumer sensory panels. When  $\beta$ -agonists pose a challenge to tenderness, environmental benefits do exist with their use as a result of increasing efficiency of inputs and nutrient utilization per unit of pounds produced.  $\beta$ -agonists also decrease circulating urea nitrogen.

With all this said, challenges exist for feedyards using  $\beta$ -agonists. Feeding  $\beta$ -agonists results in additional diets which means more feed and mill logistics to manage, challenges in scheduling cattle for harvest 3 to 5 weeks out to use each product appropriately, challenges with being able to change shipment dates based on the market while maintaining FDA requirements, and managing withdrawal for the cattle fed Zilmax.

**Take Home Message:** The upsides to  $\beta$ -agonists use include dollars returned, cheaper price to consumers, efficiency, increased leanness, increased red meat yield and nutrient utilization.

The potential downsides include ribeye area/portion size, quality grade, tenderness, withdrawal, and potential abuse of the products in the industry. The opportunities include specifications on carcasses/ beef, feeding cattle longer and managing endpoints, prescriptive feeding to certain types/breeds/genetics, sorting, and aging of meat products.

### ***Glen Dolezal, Cargill Meat Solutions***

Cargill Meat Solutions (CMS) tries to manage quality vs. quantity. The first week of June, 2010 the grade mix for CMS was 2% Prime, 62% Choice and 32% Select. Approximately 3 of every 4 (77%) carcasses at CMS is destined for a branded beef program; programs include Certified Angus Beef, Sterling Silver, Angus Pride, Ranchers Registry and many others.

Because of this high percentage being destined to branded programs, CMS prefers cattle produced with no growth promotants because these cattle will grade the highest in quality, are less extreme in weight and provide the most flexibility and marketing alternatives. The system can tolerate use of growth technologies as long as they are used in moderation so that carcasses still meet branded beef program demands.

The meat industry has accommodated escalating carcass weights with the use of muscle profiling work and other research initiatives. However, CMS believes, with input from CMS customers, that weights have hit a ceiling and that future increases in carcass weights will likely result in sizeable discounts. Because of this we need two things in the industry: 1) innovative management strategies to decrease endpoint weights and 2) new growth technologies that improve carcass qualitative traits at reasonable carcass weight endpoints.

If growth technologies are going to be used, producers should implement “best practice protocols” using existing growth technology products to optimize production performance and carcass merit for specific, well defined cattle types (such as dairy, quality, red meat yield, etc.) and not use one

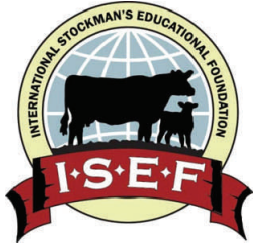
strategy for all cattle types in the feedyard. In addition, CMS prefers growth technologies that do not have a mandatory withdrawal immediately prior to harvest. If technologies do have a withdrawal, CMS believes that a rapid and reliable residue test should be available with the product launch for use by packers and others.

A residue recall could lead to significant losses due to the size and complexity of beef plants in North America. If a residue recall is issued, the question becomes who is liable for such a recall – the cattle owner, feeder, pharmaceutical company, packer? Today, growth technologies are available in even higher doses and may be administered in conjunction with  $\beta$ -agonists to achieve additive effects on pre-harvest efficiencies, increased carcass weights, and larger subprimal/cut sizes often at the expense of carcass quality.

**Take Home Message:** Cargill Meat Solutions is concerned with feedyards managing cattle with multiple growth technologies for different packers in the same feedyard. As a company, CMS feels strongly that most customers and consumers are unaware of new technologies and practices being used in the industry. Cargill is focused on branded beef quality to preserve the taste and tenderness of beef for long term demand. And, CMS appreciates production efficiencies, as long as they are balanced with carcass merit and beef quality. With that said, maximizing performance and efficiency pre-harvest at the expense of beef taste and tenderness is not in the best interest of the beef industry long term.

Proceedings written by Deb VanOverbeke, Oklahoma State University

## Marketing New Cuts for the Marketplace



**Bridget Wasser, NCBA and Jim Ethridge, NCBA**

If you compare Cattle Fax data from 1993 to 1998, beef checkoff programs have added value to cuts from the chuck and round. Between these years, 26% of the carcass (including the rib and loin) increased in value by a total of 7% (loin increased 4%, rib increased 3%). The remaining 69% of the carcass (chuck, round and trimmings) decreased in value by 24% to 28% each. If this trend had continued, the beef industry would not be sustainable.

To reverse this trend, the beef checkoff funded research, called Muscle Profiling, which evaluates cuts from the chuck and round. The goal was to find “diamonds in the rough” that may have further applications as a value-added cut and to be innovative and make something new out of something old. The applications identified during this research are being marketed under a program called Beef Value Cuts.

The first step was to understand the muscles that were identified in the chuck and round and have complete characterization of each including size, weight, pH, shear force, and sensory characteristics, just to name a few.

The chuck is typically marketed as two major subprimals: the Beef Chuck, Shoulder Clod and the Chuck Roll. The Shoulder Clod is comprised of four muscles and muscle profiling research identified four single-muscle, value-added products including the Flat Iron, Rancher Cut, and Petite Tender. The Chuck Roll is comprised of eight muscles and resulted in eight single-muscle or multiple-muscle, value-added products.

The round, because of the typical fabrication method, is a little more complex. The round is typically marketed as five subprimals and has fourteen muscles. One subprimal is the top round. Research identified that fabricating the top/inside round into the cap, soft side and COSMO (cap off, side muscle off top round) resulted in more user-friendly products.



- The cap muscle is called the gracilis and is being marketed as the Santa Fe Cut. This cut is not steak material, but is better than grind. The performance of the cut is similar to that of the inside skirt or better if it is used as a further processed/fully cooked item. It also has a fajita application, can be used for cube steak in foodservice or can be used to replace flank steak.
- The side muscles of the top round include the pectineus and the sartorius. The sartorius is fairly tough and small so it has no individual application. However, the pectineus, if aged to its optimum (~ 25 d) is rated as the most tender muscle in the carcass. The pectineus can be used in a whole roast, ½ -inch medallion, or 1 ½ -inch-steak applications and has a similar size and shape to the teres major (chuck petite tender). Because of this value, it should never be ground.
- If you separate the COSMO into the two muscle groups that exist, you have the adductor and the semimembranosus. The adductor is the more tender of the two muscles in the COSMO. The adductor is being marketed as the San Antonio Steak and can be used in casual or semi-casual applications as a center of the plate item. From a sensory perspective, the adductor received high overall-like ratings from consumers and had desirable flavor; chefs indicated that it could even serve as a potential replacement for other steaks. The semimembranosus is being marketed as the Tucson Cut and is being used in a typical roast beef application or can be cut into round steaks (London broil-style) or cube steaks.

Another subprimal from the round that has been investigated is the bottom round. The bottom round can be fabricated into the bottom round flat log (weighing nearly 10 lbs) and the flat triangle (weighing nearly 2 lbs). The round flat log, which is the biceps femoris muscle, can be used as a precooked roast beef, precooked value steak or as a new raw material for retail.

- If you slice the log into 0.15-inch slices, it becomes a very convenient and versatile product that cooks quickly, is lean, and could potentially be a replacement for chicken breast. Nearly 80% of consumers indicated an intent to purchase the product at retail and 73% indicated an intent to purchase for foodservice applications. This product could be sold for \$3-4 per pound and could be used for breakfast, lunch or dinner.
- The flat triangle contains the biceps femoris and the ischiatic head. These muscles could be used in precooked formats (shredded, diced, or tips), cube steak or could replace the rib lifter meat for further processing.

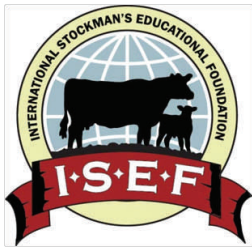
The last subprimal that has been evaluated from the round is the heel. The heel can be fabricated into the gastrocnemius and digital flexor.

- The digital flexor is being marketed as the Braison Cut. When braised, this cut is very versatile and has rich, juicy flavor. It could be a brand new cut for foodservice applications and will provide a niche, unique product for upscale restaurants. This cut makes a delicious boneless Osso Bucco for fine dining, is perfect for a pot roast, and has many options for ethnic cuisine.
- The gastrocnemius can be further fabricated into the Gastroc Medial Portion which is being marketed as the Merlot Cut. The Merlot Cut has unlimited ingredient applications and can be used as a center of the plate option and in a variety of ethnic dishes. The Merlot Cut should be tenderized for optimum eating experience and seasoned with a wet or dry rub to heighten flavor.

**Take Home Message:** A research foundation provided key knowledge for numerous applications of beef value cuts such as steaks, roasts, fajitas, shredded beef, and pulled beef just to name a few. Cutting guides, culinary fact sheets and sell sheets have been developed to help further enhance the Beef Value Cuts in the marketplace.

Proceedings written by Deb VanOverbeke,  
Oklahoma State University

## Traceability: Can We Do It On A Voluntary Basis?



**Paul Clayton, USMEF**

Several world guidelines exist for food animal traceability. These include guidelines from the World Trade Organization (WTO),

International Organization for Standardization (ISO), Office International des Epizooties (OIE) and Codex. The basis behind these guidelines is if 'you do it', then, you can request other countries to 'do it'.

Animal traceability is used in international markets from a regulatory perspective, for the implementation of private standards, and for commercial programs. Currently, the USDA Agricultural Marketing Service has a Process Verified Program with an animal traceability component to meet trade requirements of international partners. Japan requires that cattle are less than 21 months of age, Europe mandates birth origin for the non-hormone treated cattle program, and Hong Kong dictates that slaughter companies must maintain records that are sufficient to initiate trace back to previous locations for all livestock included in the program.

Other countries, which compete with the United States for the international business of Japan, Europe and Hong Kong, have voluntary or mandatory programs. Denmark has EU requirements in place, Canada has the guiding principles of traceability in place, Australia has a National Livestock Identification System in place and advertises such in Japan and Korea, and South America also meets EU standards.

A study has been completed looking at the impact of Korea's and/or Japan's required mandatory traceability on the value of the beef and pork markets. In 2003, the United States provided 52% of the volume or 67% of the value of beef exports to Korea and Japan. In 2008, the United States supplied 28% of the volume or 37% of the value of pork exports to Korea and Japan. Approximately 90% of the cattle harvested in the United States contribute short ribs and short plates to the export market. The impact of not implementing traceability is obvious; the impact of implementation is simply cost.



Traceability is also being used in private standards. And, typically, private standards may take precedence over regulatory programs. Either you complete requirements x, y and z to maintain the company's business, or you lose their business. This is evident when you look at the global supermarket leaders – Wal-Mart, Carrefour, Ahold, Kroger, Metro, Tesco, Costco, and Albertsons and evaluate the number of countries in which the companies operate.

**Take Home Message:** U.S. meat exports provide additional value to the beef and pork industries. Traceability is simply one requirement that has been put in place in various international markets via regulatory, private or commercial channels. As such, traceability poses both opportunities and challenges, in the United States, if we wish to maintain business opportunities with some foreign markets.

**Brian Bolton, Allflex, North America**

Allflex has 1,000 people working globally with approximately 40 different regulatory identification programs. Drivers in each program have some commonality. Couched typically as epidemiological or animal disease control related, the real drivers behind each program are the economics of: 1) food security (if animals die or are unfit for consumption then we go short of food), 2) preservation of the local economy (if a region is unable to produce for a period of time, it causes social restructure), 3) market access (non-tariff trade barriers dictate if our farmers have to do it, then so do you or you won't sell your product to me), and 4) consumer confidence (BSE in the UK was the first driver for traceability to restore consumer confidence).

Europe: All 27 countries with sheep and cattle have common rules for traceability. Individual animals must be tagged at birth and animal movement must be recorded. The sheep industry uses Radio Frequency Identification (RFID) and the cattle industry, which started with double visual tags, is moving to RFID.

Australia: Producers have been extremely well educated on the “how and why” of animal identification, partly through signs at sale locations stating if animals aren’t tagged, they won’t be sold. Hundreds of packing plants and sale locations equipped with electronic identification record millions of animal movements with more than 90% accuracy. They are beginning to implement the system in the sheep industry. Export is crucial for Australia and this system increases the potential of the export market.

Canada: The Canadian Cattle Identification System has been mandatory since 2002. Visual identification was replaced by electronic identification in 2005. The system does have provincial differences in recording of animal movements.

South America: Differences exist among countries within South America. Brazil and Argentina have traditional lot identification; however, they also have individual identification for specific programs such as export to the EU. Uruguay has an electronic identification program.

Mexico: The program in Mexico is animal disease control based and was originally dairy oriented and partially subsidized. As a subsidy, the program paid for half the tags; as a result, producers tagged half the cattle. A national program will likely follow.

United States—Michigan: In 2007, Michigan was the first state in the United States to initiate a mandatory Electronic Identification (E..I.D.) program. Approximately 1 million cattle are tagged and movements are recorded in sale barns and packing plants. The program was driven by intra- and inter-state trade needs as a result of positive tuberculosis results in the state.

Implementation in a country/state follows a typical pattern: demand, rules/standards, and timelines. Demand is a response to a local driver. If the program is voluntary, it typically expects the individual to meet requirements for a process-verified or age-verified program; if the program is regulatory or mandatory, it typically expects the need of many to solve/meet the requirements of an industry/government partnership. Everyone needs

to know the rules and standards: who is accountable, what do we need to do, where does it need to be done and when does it need to be done. The how is also very critical and needs to be included in producer education in order for the program to be a success. This also involves technology selection for date, identification devices, recording devices, and distribution methods. Many programs have determined that there is no such thing as technology neutrality, as that simply leads to confusion among producers. Lastly, timelines must be established because without timelines, there is no program.

**Take Home Message:** Participation is determined either by individual economic need or by the need of many, which typically means regulatory policy is involved. Programs are met with a high degree of resistance by producers; however, countries that have programs would never give them up now that they have them. A future driver of animal identification and traceability will be sustainability. In order to feed 9 billion people, production will intensify and producers will use more technology, not less. Producers will need to be more efficient users of resources and more accountable to consumers and animal identification is at the beginning of that accountability system.

***David Moss, Livestock Identification Services, Ltd.***

Why is traceability needed? Canada is the 10<sup>th</sup> largest beef producer in the world, however, it is the third largest beef exporter. So, for Canada, traceability is needed to maintain this market equilibrium. While the United States is a net exporter, exporting 6-7% of production, Canada, whose herd is 12% of the size of the United States, exports 50% of production. The losses that the Canadian beef industry suffered from BSE between May 2003 and May 2005 were estimated to reach over \$4 billion by 2010, this number was estimated to have reached \$7 billion.

The Foot and Mouth (FMD) outbreak in the UK in 2001 also points to a need for traceability. A report from the UK indicates that more money was lost to the UK economy as a result of the outbreak's effect on tourism than as a result of its effect on agriculture. The UK learned a lot about traceability in the 2001 outbreak. As a result, their second FMD outbreak in 2007, cost a lot less than the first outbreak in 2001. In the 2007 outbreak, only 8 confirmed cases of FMD were identified and after approximately 4 months, animal movement restrictions were lifted. This success was accomplished because of the paper-based passport system that was put into place in the UK after the initial outbreak in 2001.

Private standards put in place by multinational-based companies will also set the agenda for traceability. McDonald's will likely be a key player in setting this agenda. McDonald's has been quoted as stating, "our definition of source-verification is knowing the season of birth, the farm of origin and every location of the animal between the farm and the packing house. And, this information must be auditable." Nike has already documented that private industry can put standards in place as they won't use leather from Amazon-bred cattle, saying that the move is part of the company's commitment to curbing the region's deforestation. Private standards will also provide support for sustainable production on a social and economic level.

Traceability tends to work if producers ask for it and legislation follows, if it is a collaborative effort between industry and government with government commitment, and if incentives or penalties are in place to sustain producer participation. Traceability must be tied to existing commerce and use technology in order to be successful.

**Take Home Message:** Private standard needs will pull traceability through, legislative standards will push traceability through, commerce- and management-based systems will be producer supported and long-term incentive-based reporting systems will make traceability systems sustainable. If a traceability system is built for the right reasons, producers will participate over the long term.