Winter research highlights: Part 2

The following research highlights are presented by Harlan Ritchie, Steven Rust and Daniel Buskirk, beef cattle specialists at Michigan State University (MSU), East Lansing. The reviews summarize studies reported at scientific meetings or in scientific and industry publications.

BREEDING/GENETICS

Ranking of relative intelligence

Kenneth Eng reviewed some of his "Bottom Line" columns written during the years for *Feedstuffs* magazine. Of particular interest was a ranking of relative animal intelligence by two different groups — zoologists and animal scientists. Table 1 presents a summary of their rankings.

As indicated, both groups ranked the species in the same order, with dogs and pigs at the top, poultry at the bottom, and other species in the middle.

(Feedstuffs *magazine)*

Table 1: Ranking of intelligence, by species[a]

Species	By animal scientists	By zoologists
Dogs	2.25	1.53
Pigs	2.50	1.67
Horses	2.80	2.00
Cats	2.81	2.40
Cattle	3.40	2.83
Sheep	3.42	3.00
Chickens	3.67	4.50
Turkeys	4.00	4.83

[a]Ranking of intelligence (1=Highest; 5=Lowest).

Bulls used in multiple-sire breeding herd varied in calf output

Little is known about the serving capacity or calf output of bulls in large, multiple-sire commercial herds. The objective of this Washington State University study was to evaluate the calf output of 19 mature Wagyu bulls in a multiple-sire setting through the use of DNA parentage verification. The bulls were turned out with 420 first-calf Angus-cross heifers on a western Montana ranch for a 45-day breeding period. The 392 calves that resulted from these matings were tested for paternal identity.

Of the 19 bulls used, 10 (52.6%) sired 70.6% of the calves to which parentage was assigned. Among those 10 bulls, five (26.3% of all bulls) sired 42.6% of the calf crop. Conversely, the five (26.3%) least prolific bulls sired only 12.4% of the calves, with the two bottom-ranking bulls siring only six (1.6%) calves each. Scrotal circumference (SC) measurements were available for 15 of the 19 bulls; there was no correlation between SC and the number of calves sired.

The study clearly shows there are dramatic differences in the servicing capacity of individual bulls used in multiple-sire herds.

(Wells et al. 2006. J. Anim. Sci. *89 [Suppl. 1]: Abstract 534*

Effects of breed type, diet on steer performance, carcass

In spite of the fact that Brahman (*Bos indicus*) crosses contribute to a sizeable percentage of the U.S. beef cattle population, relatively little information is available on their response to diverse feed resources compared with European (*Bos taurus*) cattle. In this Roman L. Hruska U.S. Meat Animal Research Center (MARC) study, varying genotypes were grown on either chopped bromegrass hay or a corn silage-based diet for 119 days. Steer genotype consisted of 0, ¼, ½ and ¾ Brahman. The non-Brahman portion of the genotypes consisted of MARC III composites (⅛-Angus, ⅛-Hereford, ¼-Red Poll and ¼-Pinzgauer). After the growing period, all steers were fed a high-corn diet to a target final weight of 1,235 pounds (lb.).

The zero- and ½-Brahman steers gained faster and weighed more at the end of the growing period than ¼- or ¾-Brahman steers. During the finishing period, the 0- and ½-Brahman steers gained faster and consumed more dry matter (DM), but feed efficiency did not differ among genotypes. Marbling scores and quality grades (QG) were significantly greater for 0- and ¼-Brahman steers than for ½- and ¾-Brahman steers.

During the growing period, daily DM intake (DMI) was similar for bromegrass and corn silage, but feed-to-gain was strongly in favor of steers fed corn silage (7.43 lb. vs. 22.3 lb. feed per 1 lb. of gain). Average daily gain (ADG) was significantly lower for steers fed bromegrass compared to those fed corn silage (0.77 lb. vs. 2.12 lb. per day).

When they were switched to the finishing diet, steers grown on bromegrass compensated and gained faster than those grown on corn silage. However, during the entire study, the compensatory response was not adequate to totally overcome the lower performance during the growing period.

(Ferrell et al. 2006. J. Anim. Sci. *84:2515)*

Genetic parameters for growth, ultrasound traits in bulls, steers

University of Guelph scientists determined genetic parameters for 10 growth and ultrasound traits in 2,172 yearling beef bulls and four carcass traits in 1,031 finished feedlot steers. Following is a summary of results.

Except for loin muscle width, heritabilities for most traits were moderate to high, ranging from 0.25 for loin muscle depth to 0.83 for hip height. This suggests selection for these traits would be quite effective.

Genetic correlations indicated selecting yearling bulls for increased growth rate and hip height would result in greater carcass weight, increased loin muscle area, and reduced carcass marbling in steers.

Bull ultrasound fat depth was positively correlated with both carcass fat (0.78) and carcass marbling (0.73).

Bull ultrasound intramuscular fat content was negatively correlated with bull loin muscle area (-0.49) and width (-0.79).

(Bergen et al. 2005. Can. J. Anim. Sci. *84:37)*

EPDs comparable to realized progeny differences

University of Kentucky and University of Florida researchers conducted a summary of studies comparing expected progeny differences (EPDs) with actual progeny differences for various traits. The summary involved data from six breeds: Angus,

Brangus, Charolais, Limousin, Polled Hereford and Simmental. Traits included were birth weight (BW), weaning weight (WW), yearling weight (YW), marbling (MARB), carcass weight (CW), fat thickness (FAT), loineye area (LEA), percent lean yield (%LY), milk (MILK), maternal (MAT) and SC. Following is a summary:

- Realized progeny differences agreed well with EPDs for BW and WW. For YW, realized progeny differences tended to be greater than EPD, especially when YW was the primary sire selection criterion.
- Relative to sires with low EPDs for MARB, CW, FAT, LEA and %LY, sires with high EPDs sired progeny with higher MARB scores and greater CW, FAT, LEA and %LY.
- Sires with high EPDs for MILK and MAT sired daughters that produced more milk and weaned heavier calves than sires with low EPDs.
- Sires with high EPDs for SC sired daughters that reached puberty earlier.

The authors noted that the similarity between expected and realized progeny differences should be greater when high-accuracy sires are used, but when a small number of low-accuracy yearling bulls are used, expected results may not be realized.

(F.A. Thrift and T.A. Thrift. 2006. Prof. Anim. Sci. *22:413)*

CARCASS/MEAT SCIENCE

Less connective tissue explains greater tenderness in double-muscled cattle

Scientists at the Animal Research Institute in Dummerstorf, Germany, used young bulls of four diverse breeds of cattle to study potential differences in muscle bundle structure during growth. The breeds used included two beef breeds, German Angus and Galloway; a dairy breed, Holstein-Friesian; and a double-muscled breed, Belgian Blue. Bulls of each breed were slaughtered at 2, 4, 6, 12 and 24 months of age, and slices of *semitendinosus* muscle were taken. Computerized image analysis was used to determine muscle structure characteristics.

During growth, muscle cross-sectional area increased about fivefold in the Belgian Blue and about fourfold in the other breeds. This resulted from enlargement of the primary muscle bundles as well as the muscle fibers within the bundles. Bundle size was smallest in the Holstein-Friesian, intermediate in the Angus and Galloway, and largest in the Belgian Blue. Number of muscle fibers per bundle and number of bundles per muscle were nearly constant throughout growth, supporting the existing view that muscle structure is determined prenatally.

The Belgian Blue bulls showed a more than 2.5-fold greater number of muscle fibers per bundle than the other three breeds. The large muscle fiber bundles resulted in less connective tissue per muscle area in the Belgian Blue.

The authors noted previous research had shown that the coarser-grained meat of the Belgian Blue was not related to greater shear force values because of the reduced amount of connective tissue per unit of muscle area. They went on to say that this should contribute to a greater degree of tenderness, despite the fact that intramuscular fat (marbling) is very low in double-muscled cattle.

(Albrecht et al. 2006. J. Anim. Sci. *84:2959)*

Mergers, acquisitions result in greater productivity in meat plants

A study recently released by the U.S. Department of Agriculture's (USDA's) Economic Research Service (ERS) found that food-processing companies (including meat packers and processors) become more productive after being merged with, or acquired by, a competitor. The study looked at the performance of thousands of acquired plants during a period of 16 years, with 226 of them being meat packers and 381 being meat processors. It included a mixture of all sizes of plants, from very small to very large.

The study noted that while all the plants studied were above average in productivity prior to the merger or acquisition, they all improved in terms of worker output afterwards. In addition, the study revealed that acquired plants were more likely to survive over time than nonacquired plants. Accordingly, the productivity of nonacquired plants was significantly lower than that of acquired plants.

(Meatingplace.com)

FOODSERVICE

A shift in where beef is sold

During the 1980s, about 70% of total beef sales took place at retail supermarkets. Recent data would indicate that this percentage has declined to 52%, which illustrates the dramatic growth in beef sales at foodservice outlets and restaurants (nearly 1% growth in market share per year compared to retail).

During the past decade, U.S. consumers have reduced at-home per capita servings of beef by 11, while increasing per capita servings at restaurants by about the same amount. Cattle-Fax analysts suggest this may be the reason that the demand for USDA Choice and higher quality grades of beef is increasing.

(Randy Blach, Cattle-Fax Update)

CONSUMERS/FOODS

Organic food sales continue to increase

For several years, sales of organic food products have been increasing at a rate of about 20% at both retail and foodservice levels. In 2005, organic sales accounted for 2.5% of retail sales and 2% of foodservice

CONTINUED ON PAGE 349

Table 2: Top 10 Cattle Feeders, 2005

Company	One-time capacity
1. Five Rivers Ranch Cattle Feeding LLC, Boulder, Colo.	811,000
2. Cactus Feeders Inc., Amarillo, Texas	520,000
3. Cargill Cattle Feeders LLC, Wichita, Kan.	300,000
4. Friona Industries LP, Amarillo, Texas	275,000
5. AzTx Cattle Co., Hereford, Texas	232,000
6. J.R. Simplot Co., Boise, Idaho	230,000
7. Four States Feedyards, Lamar, Colo.	195,000
8. Heritage Feeders LP, Oklahoma City, Okla.	190,000
9. Agri Beef Co., Boise, Idaho	185,000
10. Cattle Empire LLC, Satanta, Kan.	170,000

Source: Steve Kay, *Cattle Buyers Weekly.*

Table 3: Top 10 Beef packers, 2006

Company	Daily capacity
1. Tyson Foods, Springdale, Ark.	32,600
2. Cargill Meat Solutions, Wichita, Kan.	29,000
3. Swift and Co., Greeley, Colo.	15,850
4. National Beef Packing Co., Kansas City, Mo.	14,800
5. Smithfield Beef Group, Green Bay, Wis.	7,600
6. American Foods Group LLC, Alexandria, Minn.	6,500
7. Greater Omaha Packing Co., Omaha, Neb.	2,700
8. Nebraska Beef Ltd., Omaha, Neb.	2,600
9. AB Foods LLC, Boise, Idaho	1,600
10. FPL Food LLC, Augusta, Ga.	1,500

Source: Steve Kay, *Cattle Buyers Weekly.*

RESEARCH UPDATE

CONTINUED FROM PAGE 347

sales. Organic meat sales increased by 55.4% in 2005 compared to 2003, according to a survey conducted by market researcher Packaged Facts. Don Montuori, publisher of Packaged Facts, said natural and organic food sales at retail stores are predicted to grow 63% to nearly $50 billion by 2010.

Whole Foods Market, a supermarket chain specializing in organic and natural foods, recently conducted a survey that asked consumers what would influence them to increase meat and poultry purchases. Seventy-seven percent answered a guarantee of consistent flavor, 59% said knowing the source and knowing that the product was produced in a natural and/or organic system, and 43% said knowing that the animals were raised humanely in optimal living conditions. Another survey found that consumers are willing to pay 30% more for organic milk vs. conventionally produced milk.

(Rod Smith, Feedstuffs*)*

Top five most-liked flavors with beef

A National Cattlemen's Beef Board (CBB) survey asked consumers, "What are your most-liked flavors with beef?" Results are shown below, based on the percentage of respondents who "strongly liked" the flavor with beef, giving it a rating of 8, 9 or 10 on a 10-point scale.

Flavor	% who strongly liked
1. Onion	58%
2. Garlic	52%
3. Herb	33%
4. Worcestershire sauce	26%
5. Lemon/citrus juice	19%

(2005 Beef Flavor Preferences Study)

Per capita consumption

As shown in Table 4, beef consumption peaked in the 1970s. Pork and total meat consumption peaked in 1980. Poultry consumption has been on a rather steady increase since 1940; the same is true for seafood. Total meat, poultry and seafood consumption bottomed out during the Great Depression years of 1930-1939, and has increased since then.

(USDA/ERS)

FUTURE TRENDS

World meat demand increasing

World meat demand is projected to continue to grow in 2007, driven by global economic growth. USDA data indicate we have seen the fastest pace of world economic expansion of the last 30 years, with four straight years of 4% annual growth. Rising incomes in countries of high population concentration will continue to drive higher levels of meat consumption. Global population growth rates near 1.2%, together with expected income growth rates of 4%, point to stronger meat demand in years to come.

(Cattle-Fax)

Projected cattle price lows

In a recent analysis of the cattle cycle, agricultural economist Harlan Hughes projected that current cycle price lows would be approximately as follows: $100 per hundredweight (cwt.) for feeder steer calves, $90 per cwt. for feeder steer yearlings, and $80 per cwt. for fed cattle. These lows are projected to occur in about the year 2011. The projections are based on the assumption that U.S. beef exports to Japan will return to their 2003 level.

(Harlan Hughes, contributing editor, BEEF *magazine)*

HEALTH/WELL-BEING

World-Wide obesity increasing

Phillip James, chairman of the International Obesity Task Force, recently stated that international trade policies favoring high-fat, high-energy food products over nutritional balance are promoting obesity worldwide. James noted that some meat products, along with soy- and palm-based oils, sugar and other fattening foods, are getting cheaper while produce is getting more expensive due to trade policies. He went on to say that China, which historically has never had an obesity problem, now reports 10% of its population is obese, and rates of heart disease and diabetes are on the increase. Pakistan, India and several South Pacific countries are reporting similar problems, he said.

(Pete Hisey, Meatingplace.com)

An obese United States

In a recent study by Trust for America's Health (TFHA), it was reported that the obesity rate rose in 31 states in the past year. While 18 states and the District of Columbia remained statistically the same from 2005, every state still exceeds the government's national goal to reduce obesity rates to 15% by the year 2010. The study showed that no state experienced a decrease last year.

Regionally, the South was found to be the "Biggest Belt." Following are the 15 states having the highest rates of obesity: Mississippi, Alabama, West Virginia, Louisiana, Kentucky, Tennessee, Arkansas, Indiana and South Carolina (tie), Texas, Michigan, Georgia, Oklahoma, Missouri, and Ohio and Alaska (tie).

(F as in Fat: How Obesity Policies are Failing in America, *2006.)*

Table 4: Per capita consumption of meat, poultry, seafood, 1910-2006 (lb. per person, boneless equivalent basis)

Years	Beef	Veal	Lamb	Pork	Total Meat	Chicken	Turkey	Total poultry	Seafood	Total all
1910-19	44.0	4.7	4.1	39.9	92.7	10.2	0.9	11.1	11.3	115.1
1920-29	39.0	5.3	3.6	41.9	89.8	10.1	1.0	11.1	11.4	112.3
1930-39	37.0	5.3	4.5	38.2	85.0	9.9	1.5	11.4	10.1	106.5
1940-49	44.6	6.6	4.2	45.2	100.6	13.5	2.5	16.0	10.1	126.7
1950-59	52.8	5.7	2.8	45.4	106.7	16.4	4.1	20.5	10.9	138.1
1960-69	69.2	3.4	2.8	46.9	122.3	22.7	6.0	28.7	10.7	161.7
1970-79	80.9	2.0	1.5	45.0	129.4	28.4	6.8	35.2	12.5	177.1
1980	72.1	1.3	1.0	52.1	126.4	32.7	8.1	40.8	12.4	179.6
1985	74.6	1.5	1.1	47.7	124.9	36.4	9.1	45.6	15.0	185.5
1990	63.9	0.9	1.0	46.4	112.2	42.4	13.8	56.2	14.9	183.4
1995	63.5	0.8	0.9	48.4	113.6	48.2	13.9	62.1	14.8	190.4
2000	64.5	0.5	0.8	47.4	113.7	54.2	13.7	67.9	15.2	196.8
2006	62.9	0.4	0.8	46.3	110.4	61.0	13.1	74.1	16.5	201.0