

Research Tidbits

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Oral vaccine could reduce shipping fever

A new oral vaccine developed by Agricultural Research Service (ARS) scientists may help U.S. cattle producers cut their losses from a disease that costs more than \$1 billion annually. The cost of bovine respiratory disease (BRD), commonly known as shipping fever, is more than that of all other cattle diseases combined.

The new oral vaccine may be commercially available in about three years, according to ARS veterinarian Robert Briggs at the National Animal Disease Center in Ames, Iowa.

Briggs and co-developer, ARS microbiologist Fred Tatum, conducted a field trial by feeding the newly-developed oral vaccine to calves considered to be high- and low-risk for developing shipping fever. High-risk calves were shipped from Arkansas to a New Mexico feedlot; low-risk animals were shipped a shorter distance from a New Mexico ranch to the feedlot.

Deaths among the high-risk calves fed the new vaccine were reduced from a potential 16% to 4%. *Pasteurella haemolytica* — the main culprit behind shipping fever — killed 16% of the nonvaccinates but none of the vaccinated animals.

In the group of low-risk calves fed the oral vaccine, the average weight gain increased 25% during the first 28 days on feed. The oral dose also protected the

animals within four days instead of the usual 10-14 days required by current injectable vaccines.

The cost of BRD extends beyond animal deaths. Other losses are sustained as reduced weight gains, lower feed efficiency, antibiotics, trimming costs at the packer, and poor-quality meat and hide products. Injectable vaccines often produce lesions in animals at the site of the injection. These lesions could be avoided by use of oral or intranasal vaccination.

The research was funded, in part, by the Biotechnology Research and Development Consortium (BRDC) in Peoria, Ill. The BRDC has applied for a patent on the oral vaccine.

— ARS News Service. July 1999.

Proteins secreted by gnats may hold key to bluetongue vaccine

Several proteins that probably help a biting gnat transmit bluetongue, a virus of cattle and sheep, have now been pinpointed by ARS scientists. The gnat, *Culicoides variipennis*, is also called a biting fly, midge or a no-see-um (because of its small size). The gnat proteins increase blood flow to the bite area, prevent aggregation of platelets needed to close off the wound and inhibit immune system cells that would help a victim fight off the virus.

Researchers already knew about similar proteins in other biting insects and ticks. But the ARS team is the first to show that *C. variipennis* secretes these specialized molecules from its salivary glands. The proteins may prove to be a better tool than the virus itself for use in developing a bluetongue vaccine.

That's because the many strains or serotypes of the virus can quickly develop resistance to a virus-oriented vaccine. This problem wouldn't occur with a vaccine targeted to the gnats' salivary-gland proteins.

Bluetongue annually costs the U.S. livestock industry an estimated \$120 million in lost trade. Countries without the

disease won't accept some American livestock exports.

— ARS Quarterly Report. October-December 1998:7.

Genetic testing singles out a leanness gene

ARS scientists at the Roman L. Hruska U.S. Meat Animal Research Center (MARC) in Clay Center, Neb., report that carcasses from cattle with one copy of a gene called "inactive myostatin" typically yield about 7% more edible lean beef than those from cattle without the gene. And the untrimmed carcasses have 14% less overall fat.

According to the researchers, before birth, a calf with no copies of the inactive form produces a protein that limits the animal's potential to produce lean beef.

A calf with two copies of inactive myostatin is extremely muscular in the hind quarters. That condition, called "double muscling," is undesirable because birth assistance is often needed.

MARC research shows that cattle with the inactive myostatin produce beef with less marbling, or intramuscular fat, as well as less fat outside of muscle. But, they say, in this case less marbling doesn't always mean less tender. The scientists expect to pinpoint numerous genes that together control tenderness.

— ARS News Service. June 1999.

Technology spurs alfalfa genome mapping

Using computer technology to magnify light-microscope images, scientists are getting the closest look yet at the chromosome housing for alfalfa's genes.

The advance opens the door to genome mapping of alfalfa's 32 chromosomes for traits like winter hardiness, stand persistence and resistance to pests like potato leafhoppers.

Alfalfa is among America's most widely grown crops, generating more than \$6 billion annually, primarily as hay. Yet, compared to corn or soybeans, less is known about its complex genetic makeup, slowing breeding efforts. Over the past 30 years, for example, alfalfa's average yield has only increased by about 1%.

Part of the problem also stems from the fact that alfalfa plants are autotetraploid, meaning their traits are governed by genes residing on four chromosomes instead of two. The legume's chromosomes are also hard to distinguish and barely visible under a microscope.

Or so it was until scientists Gary Baughan and Azhar Hossain tackled the problem. With help from a Maryland firm, Loats Associates, they attached a light



microscope to a computer imaging system at their Beltsville, Md., Soybean and Alfalfa Research Lab, operated by ARS.

The result: a 10,000-fold increase in magnification, use of false-color, and the precise identification and measurement of the chromosomes' lengths — key to



karyotyping, or arranging them from largest to smallest.

Along the chromosomes' "arms," scientists observed thick bands of heterochromatin, material composed of DNA and protein. Like

chromosomal roadblocks, the bands can impede the exchange of genes during breeding.

One hope is that falcata alfalfas, which contain relatively few heterochromatin bands, will help breeders introduce new traits from wild species to domestic cultivars, broadening their genetic base.

— ARS News Service. August 1999.

Cattle prefer fescue in the afternoon

How do certain forage plants coax cattle, sheep and goats into coming back for more? ARS scientists are sleuthing the secrets of how to tempt the palates of these ruminants.

Knowing more about the culinary cues should mean healthier animals that make better weight gains and bigger profits. Research studies also should help plant breeders develop new forages that appeal to animals, according to ARS soil scientist Henry Mayland. He leads the forage-preferences investigations at the agency's Northwest Irrigation and Soils Research Laboratory in Kimberly, Idaho.

Earlier, Mayland and ARS colleagues Dwight Fisher at Watkinsville, Ga., and Joseph Burns at Raleigh, N.C., showed that cattle, sheep and goats prefer tall-fescue hays harvested in the afternoon to tall fescues cut in the morning. Their study was likely the first to show up to a 50% difference in forage preferences based on time of cutting.

Now follow-up studies by ARS scientists and their university colleagues are showing the same trend with alfalfa hay.

Animals apparently discriminate on the

basis of total nonstructural carbohydrates, that is, easily digestible starches and sugars, in the forage. Other experiments to probe chemical and physical characteristics of forages indicate that cattle prefer tall fescues with high levels of a natural chemical known as 6-methyl-5-hepten-2-one.

Investigations probing the influence of minerals like calcium, magnesium and potassium on animals' forage choices are also underway.

— ARS News Service. September 1999.

Economic values for stayability and heifer fertility

Colorado researchers evaluated the economic impact of a genetic change in cow stayability and heifer fertility.

Stayability is included in current national genetic evaluation and is defined as the probability of a cow having a calf at age 6 or later. Heifer fertility is defined as the proportion of calves weaned per heifer mated.

Economic values (EVs) were expressed as change in ranch profit per 1% increase in stayability and heifer weaning rate. EVs were affected by a number of relevant traits such as increased number of calves marketed, fewer replacement heifers and feed intake.

EVs per sire mated for a 1% change in stayability ranged from \$70 to \$79 as calves weaned per cow exposed ranged from 81% to 89%.

As calf weaning weight increased by 5% from a mean of 503 lb., EV for stayability increased from \$74 to \$80/sire, and heifer fertility EVs were \$23/sire and did not vary in value as calf weight changed.

EVs for these and other traits would enable producers to discriminate between sires based on their expected contribution to ranch profit.

— Charteris et al. 1999. J. Anim. Sci. 77 [Suppl. 1]:101*

Beta-agonist improves feedyard performance and carcass yield

In previous research, beta-agonists have shown dramatic effects on feedlot performance and carcass traits when fed to cattle during the last few weeks of the finishing period. In this trial, researchers in Mexico and California reported the following differences in crossbred steers fed the beta-agonist zilpaterol during the final six weeks of the finishing period (compared to control steers):

- 27% increase in average daily gain;
- no difference in dry matter (DM) intake;

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Whole vs. cracked corn in growing-steer diet

In a University of Nebraska 120-day wintering trial, steer calves were fed a growing diet that consisted of the following ingredients (DM basis):

- 22.8% silage,
- 48.7% alfalfa hay,
- 1.9% supplement, and
- 26.6% dry corn (85% DM).

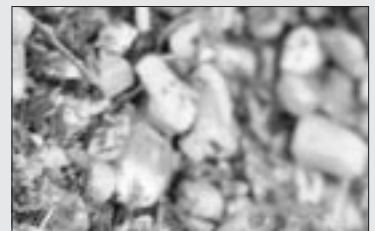
Crossbred steer calves (564 lb.) were allotted to one of four treatments in which they were fed either whole or cracked corn and either a total mixed diet or fed corn separate from the other ingredients. Diet intakes were managed to be the same among treatments with the mixed diets fed ad lib, thereby setting the intake for the separate-fed diets. Corn DM intake averaged 5.1 lb./steer/day.

Results are summarized in the following table.

Corn physical form:	Cracked	Whole	Cracked	Whole
Corn feeding method:	Mixed	Mixed	Separate	Separate
No. of steers	29	29	29	29
Daily gain, lb.	2.73	2.76	2.71	2.58
DM intake, lb./day	19.21	19.22	19.27	19.29
DM/gain, lb./lb.	7.03	6.96	7.11	7.47

Daily gains and feed conversions were not different between the two mixed diets. Although not statistically significant, gain and feed conversion of steers fed the whole corn separately were slightly poorer than those fed the cracked corn. The authors concluded that it is doubtful if it would pay to crack corn regardless of how it is fed.

— Rush et al. 1999. J. Anim. Sci. 77[Suppl. 1]:240*



- 28% improvement in DM intake/gain;
- 3.6% increase in dressing percentage;
- 4.5% increase in carcass weight;
- no difference in fat thickness or marbling score; and
- 3.2% increase in boneless, closely trimmed retail cuts.

The authors reported that enhanced growth performance accounted for 55% of the net economic value of zilpaterol supplementation (benefit to the feeder), while increased carcass cutability accounted for 45% (benefit to the packer). The authors concluded that zilpaterol supplementation can have a marked beneficial effect on feedyard performance and carcass yield.

To date, beta-agonists are not yet approved for use in the United States or Canada.

— Plasencia et al. 1999. *J. Anim. Sci.* 77 [Suppl. 1]:114*

Little improvement in beef tenderness since 1990

Researchers at Colorado State University recently reported results of their national audit of retail loin steak tenderness conducted in late 1996 and early 1997 in eight U.S. cities. Following is a brief summary of their findings:

- Shear force averaged 7.63 lb. for top sirloins and 6.72 lb. for strip loins.
- Postfabrication (aging) periods shorter than seven days were associated with significantly reduced tenderness.
- 21% of top sirloin steaks and 13% of strip loin steaks had shear-force values



above 8.8 lb. This represents little improvement over the 1990 National Beef Tenderness Survey.

- When evaluated by a sensory panel, 24% of strip loin steaks were rated less than “slightly tender.” The odds of obtaining a “slightly tough” or tougher strip loin steak differed by grade as follows:

- 0 for Prime,
- 1 in 10 for “certified” Choice,
- 1 in 5 for “commodity” Choice, and
- 1 in 4 for Select.

The authors concluded that the beef industry has made little progress in improving tenderness since the 1990 survey and that the primary focal points for future efforts should be:

1. To prevent short-aged (<7 days) product from reaching consumers; and
2. To identify methods for enhancing tenderness of Select and “commodity” Choice beef.

— George et al. 1999. *J. Anim. Sci.* 77:1735*

Vitamin E supplement offsets gossypol toxicity

Researchers have found that adding vitamin E to the diets of developing bulls can offset the fertility problems associated with feeding whole cottonseed and cottonseed meal. This effect on fertility is due to the presence of the toxin gossypol.

University of Florida and Texas A&M University researchers found that a diet containing gossypol (at 6.35 mg free gossypol/1 lb. body weight/day) reduced sperm production, increased the percentage of abnormal sperm cells and decreased sex drive.

The experiment was done on 24 Holstein bulls fed from 6 to 16 months of age. It consisted of a control group, a group fed gossypol, and a third group fed gossypol with vitamin E supplemented at 4,000 international units (IU)/bull/day. The vitamin E supplementation was able to counteract the effects of gossypol toxicity. Sperm production and sex drive measured highest in the bulls fed extra vitamin E.

— McDowell et al. 1998. *J. Anim. Sci.* 76:2894

Researchers search for chemical treatment to offset fescue toxicity

Researchers from the University of Tennessee and New Mexico State University have identified one means by which fescue endophyte adversely affects an animal’s metabolism. Their hope is that this may be



an early step in finding a chemical treatment to improve performance of cattle grazing infected fescue pasture.

Their finding is that a specific type of adrenergic receptor (alpha 2) is made more reactive by endophyte. The effect of this reactivity on blood vessels is increased vasoconstriction, or contraction of the blood vessels. This constriction would decrease the flow of blood through the vessels and cause various changes in the metabolism of the surrounding tissues. For example, this could well be the mechanism behind the decreased blood flow to the extremities that makes heat release difficult for cattle grazing endophyte-infested pasture.

The researchers point out that this is likely to be just one of several metabolic effects of the toxic alkaloids involved in endophyte poisoning. However, it does provide hope that treatment solutions will one day be available. More research is needed to identify other cellular mechanisms of fescue toxicity.

— Oliver et al. 1998. *J. Anim. Sci.* 76:2853

Deer collar could help harness Lyme ticks

An automatic device that puts a pesticide-impregnated collar around a white-tailed deer’s neck may help reduce Lyme disease in the northeast and help control cattle fever ticks along the Texas-Mexico border.



Pesticide collars are commonly used for controlling ticks and other parasites on domestic animals. But, until now, collaring wildlife has meant trapping or tranquilizing them. The new collaring unit, patented by ARS scientists, lures deer to a specially designed feeder filled with corn. To eat, the animal must place its neck near a mechanism that releases a self-adjusting, flexible collar, which is similar to flea collars worn by cats and dogs.

ARS researchers based in Kerrville, Texas, have used the collars on captive deer behind fences at the Texas Department of Parks and Wildlife's Kerr Wildlife Management Area in Hunt, Texas. They have not seen any ticks attached and successfully feeding on the neck and head of collared deer. Without collars, these deer typically have hundreds to thousands of ticks feeding on them.

The collars were impregnated with amitraz, a pesticide approved for livestock that also kills ticks on the deer's hair and skin. The pesticide currently is not approved for use on deer, but — if labeled for this use — it would be safe to use during the hunting season from October through December. That's when most adult black-legged ticks — the culprits behind Lyme disease — feed on deer.

Lyme disease is the most prevalent tickborne human disease in the United States. About 90% of the cases reported to the Centers for Disease Control and Prevention occur in Northeastern states.

ARS and Wildlife Management Technologies of Noank, Conn., have signed a cooperative research and development agreement to develop a commercial prototype collaring unit and evaluate its effectiveness in a variety of situations.

The scientists have developed an electronic device to prevent double-collaring. And they are working to design the collars to biodegrade or fall off once the insecticide breaks down.

— ARS News Service. September 1999.

Is there a link between copper and fescue toxicity?

The unhealthy hair coats associated with fescue toxicity may point to a link between endophyte-infected fescue and copper (Cu) deficiency in cattle.

In several experiments, both in the field and in the greenhouse, endophyte-infected fescue plants were lower in copper concentration than endophyte-free plants. However, the actual difference in

concentration of copper was not sufficient to account for observed symptoms of deficiency in grazing animals. Researchers assume the problem is worsened by the reduction of forage intake also associated with endophyte-infected fescue.

Copper concentration tended to be lower as the plants became more mature. Thus the difference in concentration was

most pronounced late in the growing season.

Nitrogen fertilization was able to increase copper levels in both endophyte-free and -infected fescue plants in this trial. However, the researchers point out that this was not the case in previous experiments.

— Allen et al. 1998. *J. Anim. Sci.* 76:2687

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Researchers to help restore burned Nevada lands

Experts on rangelands at the Agricultural Research Service (ARS) have joined a 33-agency emergency rehabilitation team to revegetate some of the more than 1.5 million Nevada acres that burned during the summer. On Sept. 3, the U.S. Department of Agriculture (USDA) declared five counties in Nevada as agricultural-disaster areas.

The fires have wide-ranging effects. Forage for cattle and wildlife has gone up in smoke on private and public grazing lands. Wind erosion on burned desert soils has caused traffic fatalities. Denuded watersheds will be at greater risk for flooding when rains begin.

ARS scientists in Reno, Nev., have more than 50 years of research experience in the delicate, high-risk process of revegetating semidesert rangelands. They are helping the interagency team decide where to reseed and which plants to use.

Over the long term, the scientists are working on ways to keep a fire-feeding weed called *cheat grass* from getting a stranglehold on rangeland. The scientists are part of the ARS Exotic and Invasive Weeds Research Unit headquartered at the Western Regional Research Center in Albany, Calif.

Summer lightning typically starts fires on Nevada rangeland, but an abundance of cheat grass has helped fuel a greater number of fires that are more destructive than usual. Some cover hundreds of thousands of acres.

Native shrubs like sagebrush and shadscale grow several feet apart, reducing a fire's ability to spread. But fire spreads rapidly when cheat grass proliferates. After a fire, cheat grass returns before most other plants.

ARS researchers determined that the first time cheat grass rangeland burns, there is a chance for rehabilitation if the site is seeded to perennial grasses that year. Otherwise, it will reestablish and become increasingly difficult to control. Therefore, land management agencies will focus their revegetation efforts on those areas that have burned for the first time.

Public-land managers plan to seed 5 million pounds of seed using highly specialized equipment designed for use in rocky, semidesert soils.

The seed mix includes native shrubs and grasses, as well as HyCrest, an ARS crested wheat grass variety developed at the ARS Forage and Range Research Unit in Logan, Utah.

— ARS News Service. October 1999.



Effect of feeding organic minerals to ET recipients

Mississippi researchers reported that supplementing recipient beef cows with an organic mineral source, starting 45 days prior to estrous synchronization and ending 60 days after embryo transfer, did not affect pregnancy rate from frozen embryos compared to cows maintained on a standard inorganic mineral source.

— Jones et al. 1999. *J. Anim. Sci.* 77 [Suppl. 1]:16*

Heritability of heifer pregnancy may be higher than expected

Colorado researchers analyzed data on 2,665 cattle in the North American Limousin Foundation database to determine if heifer pregnancy is a heritable trait in the Limousin breed and to evaluate the feasibility of developing an expected progeny difference (EPD) for heifer pregnancy.

Their analysis provided an estimate of heritability for heifer pregnancy of 0.28, which is somewhat higher than expected. This suggests that selection for the trait could be effective in improving heifer reproductive rate. However, the authors cautioned that the estimate may not be different from zero due to a high standard deviation of ± 0.29 .

— Summers et al. 1999. *J. Anim. Sci.* 77 [Suppl. 1]:100*

Effects of feeding supplemental fat to first-calf heifers during late gestation

In a three-year study Montana researchers fed added dietary fat in the form of safflower seeds, soybeans or sunflower seeds (4.2%, 3.3% or 4.5% fat, respectively). Oilseeds were processed through a roller mill to lightly crack the hulls but without oil loss. These diets, in addition to a control diet (2.0% fat), were fed for 68 days prior to calving.

Fat supplementation had no effect on cow weight, cow condition score, birth weight, calving ease or cow estrous cyclicity at the start of breeding. However, fat supplementation improved cow pregnancy rate (91.7% vs. 79.0% for controls) and fall calf weights (432 lb. vs. 402 lb. for controls).

The authors concluded that fat supplementation of the gestation diet of first-calf heifers could have a positive effect on subsequent reproductive rate and calf weaning weight. Similar results have been reported by Texas and New Mexico researchers.

— Bellows et al. 1999. *J. Anim. Sci.* 77 [Suppl. 1]:236*

Early vs. conventional weaning

Calves weaned at 7 months of age and conditioned on pasture for 14 days prior to feedlot placement had higher initial feedlot performance than calves weaned at 4 months of age and conditioned on pasture for 77 days. Both groups got a better feedlot start than calves abruptly weaned and placed on feed.

That's according to Pennsylvania State University researchers who conducted trials to evaluate weaning behavior and growth performance in beef calves weaned early (at 4 months) vs. conventionally (at 7 months). The trials were conducted over two years and involved 100 crossbred Angus-Simmental cow-calf pairs.

Early-weaned calves vocalized distress and paced more than animals weaned conventionally.

Regardless of weaning age, calves weaned within sight and earshot of their mothers bawled more during the first three days, but then seemed to relax and had a shorter time of weaning distress than those weaned on separate farms from their dams.

Researchers suggest that feedlot performance in early-weaned calves may be heightened by supplementing with some grain while on pasture in order to increase on-test weight and feed intake. Early weaning reduces a cow's feed consumption by 20%, making it a beneficial practice in times of drought.

— Penn State University news release

Fescue toxicosis and copper deficiency

Fescue toxicosis and copper (Cu) deficiency exhibit many of the same clinical symptoms in beef cattle. This leads researchers to believe that the endophyte fungus *Neotyphodium coenophialum* may be linked to Cu deficiency in animals through (1) differences in forage Cu concentrations, (2) reduced bioavailability of Cu or (3) simply reduced forage intake.

The research was conducted over three years using beef steers on endophyte-infected (E+) and endophyte-free (E-) tall fescue pastures at the Southwest Virginia Agricultural Research and Extension Center at Glade Spring.

A decreased immune response was observed in steers on E+ pastures. Steers on E+ fescue had lower weight gains, elevated body temperatures and rougher hair coats compared to steers grazing E- fescue.

Serum and/or plasma Cu levels and ceruloplasmin (a Cu-dependent enzyme) activity were reduced in steers grazing E+ fescue.

However, immune response and serum Cu levels were improved in all steers (both

E+ and E-) when supplemented with a copper-oxide bolus at the beginning of the season. There seemed to be a 120-day time limit on the copper-oxide treatment, and the researchers recommend further investigation into the relationship of the endophyte fungus and the Cu status of fescue and beef cattle.

— Saker et al. 1998. *J. Anim. Sci.* 76:2694

Size and milking ability vs. economic efficiency

Alberta researchers used a simulation model to evaluate the effects of cow size (group averages: 992 lb., 1,213 lb. and 1,433 lb.), milk production (group averages: 11.9 lb., 18.1 lb. and 24.0 lb./day peak milk production), and market price (low, medium and high) on the efficiency of cow-calf production. Economic efficiency was defined as net return per cow (total return minus total cost).

Total cost per cow increased with increasing size because of greater dry matter intake. Medium-size cows had the highest efficiency at the low market price level when comparisons were made at a weaning age of 200 days. However, large cows were most efficient when the market price was high.

Total cost per cow increased as milk production increased, but the high-milk cows were most efficient because of their heavier calves at weaning, regardless of market price and cow size.

— Makarechian et al. 1999. *J. Anim. Sci.* 77 [Suppl. 1]:97*

Dogs carry parasite dangerous to calves

Dogs have been identified as carriers of a parasite dangerous to prenatal calves.

Agricultural Research Service (ARS) and university scientists have found the parasite *Neospora caninum* in dog feces. Dogs transmit the disease by defecating near the bovine food source, on pastures near hay bunks or near open-stored grain.

Scientists noted dairy herds in California have a high rate of infection, which has caused many abortions.

Currently there is no vaccine or antibiotic available for treating the animals. The most common way to rid the infection is by culling, which can be costly to the producer.

It is recommended to fence dogs out of feedlots, pastures and hay-storage areas, as well as to store grain in closed containers to help prevent the infection. Severe infection in puppies will cause paralysis and death. Normally a mature dog is more tolerant.

— Dubey. *JAVMA.* 1999. 214:8, p. 1160

Genome research holds essential potential

Three issues can mean life or death for a beef production operation or even an entire sector of agriculture, according to Chuck Schroeder, CEO of the National Cattlemen's Beef Association (NCBA). The products of genome research have the potential to limit the risks these issues pose and to aid beef producers as they continue to improve both beef products and operating practices.

Speaking before an ARS workshop on agricultural genomics, Schroeder identified the three areas as food safety, the environment and marketplace economics.

Knowledge and products that can grow from genomics research hold essential potential in at least five areas: productivity, production efficiency, improved and predictable quality traits, product safety, and environmental protection and improvement, according to Schroeder.

"It is timely for us to stop and consider one of the most complex and, in some dimensions, high-risk opportunities facing agriculture and our partners in public and private sectors," Schroeder said. "The products of genomics research have already become controversial in international trade, as well as domestic debates. . . . But the issues we need to address are even more fundamental than politics and attitudes.

"We face a phenomenal mix of challenges — next month we will have 6 billion people on this planet asking to be fed; there are declining acres available for production; there is a demand for food safety that often disregards reasonable risk assessment; and there are increasingly higher standards for environmental protection and quality."

Meeting the food quality and safety demands of the marketplace, as well as fundamental human needs for adequate nutrition, while satisfying the sensibilities of a politically active public, requires aggressive generation and exploitation of knowledge in plant, animal and microbial genomics. Beef producers are both excited about this exploding field of science and technology and anxious about being caught powerless on the wrong side of intellectual property rights and public impressions.

Schroeder emphasized the importance of using limited resources efficiently as investments are made in agricultural ventures, including plant and animal genomics.

"Reasonable coordination of research and strategic collaboration can allow us to

collectively address areas of basic research covering broad common interests," said Schroeder.

He also emphasized the importance of broadening the understanding of this technology and its potential for the public good. "The public, particularly policy makers, must have a higher level of understanding and trust in this technology and its practitioners than they do today if we are to avoid costly, even fatal, hurdles down the road. This is not a task that should or could be handled by a single firm, agency or institution."

— NCBA news release. September 1999.



Study shows hay diet is not a cure for lethal *E. coli*

University of Idaho (UI) researchers say a change from grain to hay in cattle diets as a way to eliminate the threat of lethal *E. coli* in beef won't work.

The Idaho research refutes an earlier study by a team of Cornell University researchers that suggested switching to a hay diet would significantly reduce the *E. coli* threat to humans.

"That study claimed that if cattle were fed hay, the *E. coli* they shed would be sensitive to acid and would be killed in the acidic conditions in the stomach," says Carolyn Hovde Bohach, a UI associate professor of microbiology.

Idaho research on a test group of eight Holstein steers experimentally dosed with *E. coli* O157:H7 revealed that the steers harbored the bacteria longer while fed a hay diet than while fed a grain diet. The grain diet was similar to the traditional finishing diet fed before slaughter.

The Idaho study also showed no difference as a result of the two diets in the

acid resistance of *E. coli* O157:H7 passed by the cattle in feces.

The bacteria can contaminate meat during slaughter. Meat-packing companies take precautions to prevent contamination and have adopted new methods, such as steam-sterilizing carcasses, to kill bacteria.

E. coli O157:H7 can be lethal to people, particularly children, the elderly and those with weak immune systems. Unlike people, cattle carrying the bacteria show no symptoms and only a small percentage of cattle test positive for it.

The diet switch suggested last fall attracted widespread attention because it promised a new way to further control or eliminate the problem. "Many people thought the problem of cattle carrying *E. coli* O157:H7 had been solved by switching animals to a hay diet," Bohach says.

Laboratory testing showed the suggested dietary cure was a false hope. "We think it would actually be detrimental to feed cattle hay just before slaughter because the cattle would likely shed more of the bacteria if they are carrying it in their intestinal tract," she says. More importantly, the acid resistance of *E. coli* O157:H7 from grain-fed cattle was the same as the acid resistance of *E. coli* O157:H7 from hay-fed cattle.

In the UI trials, consistent high-quality diets similar to those now fed to cattle before slaughter appears to minimize the presence of *E. coli* O157:H7, Bohach says.

The research is the most comprehensive to date on the link between diet and the presence of *E. coli* O157:H7 in ruminants. However, Bohach says continuing research needs to be done to confirm these initial findings.

In the Idaho study the eight steers were rotated between a hay diet and a grain diet. Cattle fed the grain diet harbored the bacteria for a shorter time than those on the hay diet. The *E. coli* O157:H7 from the feces of steers on either diet were equally able to survive in an acidic environment similar to the human stomach.

The research was funded by the USDA, Idaho Agricultural Experiment Station, Idaho Beef Council and United Dairymen of Idaho.

— University of Idaho news release. July 1999.



Editor's note: The research summaries in this section were contributed by several authors. Those items denoted with an (*) behind the credit line were provided by Harlan Ritchie, Steven Rust, Dan Buskirk and Joel Cowley, beef specialists at Michigan State University.