Third Annual Dairy Info Day

January 30, 2014

SaskMilk, Ministry of Agriculture and the University of Saskatchewan

University of Saskatchewan

Ministry of Agriculture

Saskmilk

Third Annual Dairy Info Day

Thursday January 30, 2014
Brian King Centre, Warman, SK

9:00 Registration, Trade Show and Coffee
10:00 Welcome and opening comments by Mel Foth, Chair of the Board, SaskMilk

Ergot and Mycotoxins
10:10 Ergot toxicity in dairy and beef cows - Chris Clark
10:30 Health concerns of ergot and mycotoxins in the human food supply – Natacha Hogan
10:50 Test results for ergot and mycotoxins in feeds - what to do now? - Tom Scott

Dairy Health
11:10 How do I figure out what is making my cows lame? - Chris Clark
Review the causes of lameness with pictures of each so that producers would be able to differentiate between heel warts, sole ulcers, abscesses, foot rot, etc.

11:20 What is causing mastitis in my herd? - Chris Luby
Review CMT, the DNA test and milk cultures so that producers can figure out how to differentiate between causes of mastitis and how to interpret lab results.

Research Presentations:
11:35 Feed Milk Value (FMV) and Metabolic Characteristics of the Proteins in Yellow-Seeded and Brown-Seeded Canola Meal and Presscake in Dairy Cattle. Katerina Theodoridou (Post-Doctoral Fellow) and Peiqiang Yu

Teaching of Dairy Science:
11:50 Undergraduate teaching in Animal Science and WCVM – Importance of case studies. Tim Mutsvangwa and Chris Luby

12:05 to 1:00 Lunch provided by SaskMilk

Research Presentations:
1:00 How fast can the rumen adapt to concentrate? Brittney L. Schurmann, Matthew E. Walpole, Pawel Górka and Gregory B. Penner

Corn Agronomy and Forages

1:15 Growing corn in Saskatchewan – Knee High by the 4th of July - Jamie Gruza, Pioneer Hi-Bred

1:45 Update on the Forage project – Dave Christensen and Jayakrishnan Nair

Water Quality

2:05 Importance of water quality on the farm: Minerals and Coliforms – Andrew Olkowski

Research Presentations:

2:25 Update on canola meal research performed under the canola cluster program - Matt Walpole, K. Doranalli, Tim Mutsvangwa

Manure

2:40 Can novel manure treatment technologies result in new revenue streams? – Bernard Laarveld

3:00 **General Discussion and Questions**

3:15 **Closing comments -** Jack Ford

After closing comments, speakers will be present and the Trade Show will be open until 4:00 pm. Remember to fill out and hand in the evaluation form.

Present and Recent Sources of Dairy Research Support (Grants and other forms of support)

Government of Saskatchewan
Saskatchewan Agriculture Development Fund
Government of Canada
Natural Science and Engineering Research Council
Agriculture and Agrifood Canada
Canadian Foundation for Innovation
Western Economic Diversification
Agriculture Council of Saskatchewan - CAAP
Alberta Livestock and Meat Agency
Canola Council of Canada
Saskatchewan Canola Development Commission
Pioneer Hi-Bred
Hyland Seed
O&T Farms
Saskatoon Colostrum Company
Alta Genetics
Westgen
Milligan Bio-Tech
Cargill Animal Nutrition
InfraReady Products (1998) Limited
Agricore United
Northwest Terminal
North West Bio Fuels
Husky Energy Inc.
NorAmera Bioenergy Corp.
Terra Grain Fuels
Dairysmart Nutrition, Warman Veterinary Clinic
R-Way Ag
JEFO
Canada-Saskatchewan Irrigation Diversification Centre, Outlook
Dairy Farmers of Canada

SaskMilk
Crop Development Centre
Animal and Poultry Science, University of Saskatchewan
University of Saskatchewan Scholarship Funds
Trust Funds, College of Agriculture and Bioresources
Saputo

Contact information for presenters and researchers

Christensen, David; Animal and Poultry Science	Feeds, feeding management and ration modeling	966-4152 david.christensen@usask.ca
Clark, Chris; WCVM	Dairy disease and herd health management	966-7165; chris.clark@usask.ca
Fehr, Marlene	Rayner Dairy Research and Teaching Facility	966-4140; marlene.fehr@usask.ca
Ford, Jack	Chair, Research Committee, SaskMilk	328-4700; jackford@sasktel.net
Gruza, Jamie	Pioneer Hi-Bred, 450 Ball Way Saskatoon, SK. S7K 6E7	Phone: 306 222-4863; Fax: 306 242-2530; jamie.gruza@pioneer.com
Hogan, Natacha; Animal and Poultry Science and Toxicology Centre	Toxicology, water and food, ergot and mycotoxins	966-6862; natacha.hogan@usask.ca
Laarveld, Bernard; Animal and Poultry Science	Dairy metabolism and physiology; biofuel by-products	966-4972; b.laarveld@usask.ca
Luby, Christopher; WCVM	Mastitis and dairy herd management	966-7155; chris.luby@usask.ca
Foth, Mel	Chair of the Board, SaskMilk	225-4678; fvl@sasktel.net
Mutsvangwa, Tim; Animal and Poultry Science	Protein and rumen metabolism	966-1695; tim.mutsvan@usask.ca
Palmer, Colin; WCVM	Herd health and reproduction	966-7150; colin.palmer@usask.ca
Penner, Greg; Animal and Poultry Science	Beef and dairy physiology and metabolism	966-4219; greg.penner@usask.ca
Scott, Tom; Animal and Poultry Science	Canadian Feed Research Centre, feed processing	966-4279; tom.scott@usask.ca
Olkowski, Andrew; Animal and Poultry Science	Nutrition biochemistry, water quality	966-5848; andrew.olkowski@usask.ca
Yu, Peiqiang; Animal and Poultry Science	Feed utilization and molecular structure	966-4132; peiqiang.yu@usask.ca
Van Kessel, Andrew; Animal and Poultry Science	Gut microbiology; pro and prebiotics	966-4136; andrew.vankessel@usask.ca

Ergot toxicity in beef and dairy cows

Chris Clark – Western College of Veterinary Medicine

Ergot is a fungus that most commonly affects grains and some grasses (especially rye). The fungus gets into the seed head in the spring and is most commonly spread in a wet spring. The infected seed head develops into the characteristic dark “ergot”. Up to 2% of the weight of the ergot can be a variety of related toxins. Ergot toxins generally act in two ways. Firstly they cause blood vessels spasm reducing blood flow to peripheral tissues such as tails, ears and feet. This coupled with the cold can result in severe frostbite and loss of tissue. Secondly, the toxins can act on the brain, in humans they cause hallucinations, in cattle they can cause some behavioral change. One of the most important actions of the toxins can be to block the release of prolactin, which can essentially shut down milk production.

Federal regulations limit ergot in cattle feed to 0.3% based on a visual inspection of the grain. Mixing it with uncontaminated feed can dilute feed contaminated by ergot. Rotational cropping and managing weeds at the periphery of the field can minimize ergot contamination of grains. The Toxicology lab at the University of Saskatchewan can now measure ergot toxins in feed directly.

Health concerns of ergot and mycotoxins in the human food supply

Natacha Hogan, Animal and Poultry Science and Toxicology Centre

Mycotoxins are substances produced by fungi that contaminate various agricultural commodities either before harvest or under post-harvest conditions. Exposure to mycotoxins, for humans, is mainly through the consumption of contaminated foods. In general, mycotoxin exposure is more likely to occur in parts of the world where poor methods of food handling and storage are common, where malnutrition is a problem, and where few regulations exist to protect exposed populations. However, even in developed countries, specific subgroups may be vulnerable to mycotoxin exposure. For example, the excretion of mycotoxins with milk is generally reviewed with respect to potential adverse effects on children, who are high milk consumers. There is also concern regarding intake of mycotoxin-contaminated food during pregnancy and potential effects on the developing fetus. The consumption of mycotoxin-contaminated commodities is related to several acute and chronic diseases in humans. Acute toxicity generally has a rapid onset and an obvious toxic response, while chronic toxicity is characterized by low-dose exposure over a long time period. Almost certainly, the main human health burden of mycotoxin exposure is related to chronic exposure and effects such as cancer induction, kidney toxicity, and immune suppression. Many countries around the world have regulations in place to deal with mycotoxin contamination of food – for example, the Canadian Food Inspection Agency sets limits and tolerance levels for certain mycotoxins in foods/ingredients for human consumption. However, established regulatory limits will certainly be revised as we develop more sensitive testing methods for mycotoxins and further our understanding of human health risks.

Test results for ergot and mycotoxins in feeds – what to do now?

Tom Scott, Research Chair in Feed Processing Technology, Animal and Poultry Science

Ergot and mycotoxins are associated with fungal infections of small cereal grains as well as forages and can occur pre-harvest, during harvesting and post-harvest (storage). As a consequence there can be many sources of toxins that may increase the challenge to the animal and impact the safety of the milk produced. Specifically for ergot contaminated grains, contamination can be confirmed by visual inspection (allow 1 ergot body / 1000 kernels or 0.1%); however, analysis will provide more detail regarding specific ergot alkaloids and levels within the sample. The choices are to: avoid using it; dilute it with uncontaminated grain; or to use seed cleaning equipment to reduce the ergot bodies from the grain. Note: this is also relevant to DDGS as the toxins are concentrated by fermentation of the starch into ethanol. Seed cleaning and color sorting are being used to clean up ergot contaminated grain and highly contaminated screenings should be disposed of by burning or landfill and use as feed avoided. The literature also suggests that the ergot alkaloids are relatively heat sensitive and are significantly reduced during baking, however, this level of heat is not reached during drying of DDGS. A study on conserved ergot infested tall fescue hay or silage indicates that ergot alkaloids tend to decrease in hay as compared to fresh pasture, particularly if hay is treated with ammonia (3.1% ammonia on a hay DM basis). The recommendation is to delay feeding ergot contaminated hay for at least one month after harvest as levels decline over time. Ensiling the fescue hay resulted in a total increase in ergot alkaloids, but results between reports are not consistent. The general recommendation for feeding forage contaminated with ergot is “caution”. Several reports have evaluated ergot binders for grazing and preserved forages, and these applications need to be carefully monitored for effectiveness. Similar recommendations for other mycotoxin contaminated grains are avoidance and dilution, use of binders is not effective for all mycotoxins that would be encountered in our locally produced grains. Attention also needs to be paid to potential contamination during storage or from build-up of spoiled or moldy material in feed bins, feed lines and/or feeders. Keep your feed dry and your feed holding and delivery systems clean.

How do I figure out what is making my cows lame?

Chris Clark – Western College of Veterinary Medicine

The only way to determine why a cow is lame is to look at the foot. This has to involve lifting the leg. There is no other way.

First examine the skin. Foot rot is found in the skin between the claws. It looks like a grey/green wound, it is associated with severe symmetrical swelling centered around the wound and has a characteristic smell.

Digital dermatitis (hairy heel warts) is typically found between the heel bulbs as a superficial looking abrasion. It is typically hidden under a mat of fecal matter. It is extremely painful when touched. Heel warts can also be found between the toes and on the coronary band at the top of the hoof.

Hoof lesions; most hoof lesions require some trimming to expose the lesion.

White line abscesses; the cow will be severely lame, one tow will typically feel very hot and the cow will respond to pressure. Trim the sole and try to identify the site of entry in the white line.

Sole ulcers; lameness may be variable, trim the sole concentrating on the inside. Sole ulcers start as a bruise that develops into a bleeding hole.

Finally deep sepsis can follow a severe sole ulcer. The cow is very lame and the toe become massively swollen on one side and treatment is extremely difficult.

What is causing mastitis in my herd?

Chris Luby, Western College of Veterinary Medicine

Many tests to diagnose mastitis are available. Each has its own advantages and disadvantages and these should be taken into account when deciding which one to use. Correct interpretation of test results is crucial for appropriate management of mastitis in the individual cow and the herd. The major tests available are the California Mastitis Test (CMT), somatic cell count (SCC), milk cultures and the DNA test (Mastitis 3 DNA test).

The CMT aims to give an idea of SCC for that particular quarter. Unfortunately, it is a relatively blunt test and the evidence suggests that CMT is not ideal for detecting infected cows. Any quarters with a CMT score greater than zero should be suspected of having an infection. The SCC test is more accurate than the CMT. Animals with a SCC greater than 200,000 cells/ml should be suspected of having an infection.

Milk cultures identify most of the causes of mastitis. Samples have to be collected aseptically and the test takes 48-72 hours to complete. The DNA test only detects three of the contagious causes of mastitis. It detects mycoplasma which is difficult to detect on milk culture. It is most accurate when samples are collected aseptically however results are generally available faster than for milk cultures. When reviewing the results of any tests, it is always wise to consult with your veterinarian.

Feed Milk Value and Metabolic Characteristics of the Proteins in Yellow and Brown-Seeded Canola Meal and Press Cake in Dairy Cattle

Katerina Theodoridou and Peiqiang Yu, Animal and Poultry Science

The objective of this study was to evaluate the nutritive value of the yellow (B. juncea) and the brown-seeded (B. napus) canola meal and the brown-seeded (B. napus) canola press cake for dairy cattle in terms of nutrient profile, feed milk value, and metabolic characteristics of the protein and the energy. The yellow canola meal has higher crude protein and lower fiber content compared to the brown meal. However, no differences were found for the net energy for lactation between the yellow and brown meals. The highest feed milk value was obtained for the yellow canola meal. The portion of protein that was not broken down in the rumen and digested directly in the small intestine was higher for the yellow canola meal compared to the brown meal. On the other hand, canola press cake has lower crude protein content and a lower metabolizable and net energy content compared to the average value of both canola meals. The undegradable protein in the rumen was lower for the canola press cake compared to the yellow canola meal but no difference was obtained compared with the brown canola meal. Finally, no differences were found in total digestible nutrients among the press cake and yellow and brown canola meals.

Take Home Message: Canola press cake has a lower protein content compared to canola meals and but is a potentially great energy supplement source for ruminants (dairy cattle). The crude protein and the metabolizable energy content were higher for the yellow canola meal compared to the brown canola meal. The yellow canola meal provides more available protein for absorption and utilization and has the highest feed milk value. [Acknowledgement: Ministry of Agriculture Strategic Research Chair Program in Saskatchewan]

The Importance of Case Studies in Teaching Dairy Management

Tim Mutsvangwa and Matt Walpole, Department of Animal and Poultry Science

Students enrolled in the Bachelor of Science in Agriculture (B.S.A.) program at the University of Saskatchewan take a dairy management course typically during their 4th year of study. The purpose of this course is to provide to students an overview of the Canadian dairy industry and the science of producing milk. This dairy management course is designed to offer both lectures and laboratory sections so that students can obtain both theoretical knowledge and practical ("hands-on") experience of dairy production practices. A major course outcome is that students that have successfully completed the course should be able to "trouble-shoot" problems that modern dairy enterprises may encounter and be able to recommend changes in management practices in order to improve farm performance. This is considered to be a particularly important aspect of the course as it brings students into the real world and shows them how things are done in practice. To achieve this aspect of the course, we recruit a couple of dairy farmers each year that are willing to participate as case studies. This participation involves two visits to the farm. There is an initial visit to the farm by the course instructor and teaching assistant to interview the producer and collect background information on the farm (e.g., number of cows milked, how many TMRs, TMR formulations for the different milking groups, feed ingredient analysis, DHI records etc.). This usually takes about 1.5 to 2 hours. ALL information that is collected is considered as STRICTLY CONFIDENTIAL. The second visit involves bringing the students (typically 30 to 40 in number) out to the farm. On this visit, the students have the first 45 to 60 minutes to do a self-guided tour of the farm (i.e., walk through the dairy barn, feed mixing area, calf-rearing units etc.) and then come back and interact with the producer for about 30 minutes. This gives the students the opportunity to ask questions to the producer. After the farm visit, the students (working in groups of 4) prepare a report on the farm that they present to the rest of the class. This report focuses on the strengths of the dairy enterprise and any areas that might need improvement. For areas that students consider need improvement, they are required to clearly indicate what they would change, how they would implement the change, and how they would monitor the impact of the change on cow productivity and the economic well-being of the dairy farm. After the student presentations, the course instructor and teaching assistant summarize the students' recommendations and then meet with the dairy producer to discuss them. Students find this case study approach to be an excellent learning exercise. If you would like to participate as a case study farm, please contact Tim Mutsvangwa (by telephone at 306-966-1695 or e-mail at tim.mutsvan@usask.ca). We look forward to hearing from you and thank you in advance for opening the gates to your farm to us.

How fast can the rumen adapt to concentrate?

Brittney L. Schurmann, Matthew E. Walpole, Pawel Górka and Gregory B. Penner, Animal and Poultry Science

Weaning and parturition are two critical stages where dairy cattle are at high risk for rumen acidosis; partially caused by abrupt dietary change. The severity of rumen acidosis could be minimized if the absorptive capacity of the rumen wall is promoted. Adaptation of the rumen wall involves both increases in the functional activity of the cells and increases in surface area. The time required for functional adaptation is currently not known. The objective of this study was to determine the rate of adaptation of the rumen wall following an abrupt increase in dietary concentrate. Twenty-five weaned Holstein bull calves were randomly assigned to 1 of 5 treatments. Calves were either fed the control diet (**CON**; 91.5% hay and 8.5% vitamin and mineral supplement) or were fed a diet consisting of 41.5% barley grain, 50% hay, and 8.5% vitamin and mineral (DM basis) for 3 (**G3**), 7 (**G7**), 14 (**G14**), or 21 d (**G21**). All calves were fed at 2.25% BW at 0800 h. Reticular pH was recorded every 5 min for 48 h prior to killing (1000 h). Rumen tissues were analyzed for papillae density and dimensions, and the absorption rate of acetate and butyrate (two important energy substrates) were measured. Mean reticular pH decreased (quadratic $P < 0.01$) from 6.90 for CON to 6.59 for G7 but increased thereafter. The proportion of large papillae decreased cubically ($P = 0.04$) from 67.7 for CON to 63.2% for G21, with the lowest being 48.8% for G14. Papillae surface area (mm^2) and total surface area (mm^2/cm^2) was not affected ($P > 0.05$). The absorption rate of acetate increased cubically ($P = 0.045$; greatest rate on d 14) and the absorption of butyrate increased linearly ($P < 0.01$; greatest rate on d 21).

Implications: This study indicates that functional adaptation (increased rates of absorption) of the rumen wall occurs rapidly with measurable changes apparent within one week after a change in diet fermentability. Comparatively, increases in the absorptive surface area were not observed within 21 d. Future work is required to develop dietary adaptation strategies that minimize the risk of rumen acidosis.

Growing corn in Saskatchewan – Knee High by the 4th of July

Jamie Gruza, Pioneer Hi-Bred

The presentation will be on corn agronomy covering fertility, hybrid selection, planting populations and planting tips. Corn is a relatively new crop to producers in Saskatchewan. In order to produce a successful corn crop, growers need to take into account a few key factors. Choosing the right hybrid specific to the number of corn heat units for the given area. Plant population has a direct correlation to maturity, therefore selecting that desired population to maximize agronomic and economic efficiencies. Using an appropriate fertility package that has a targeted yield allows for optimal returns. Finally, specific herbicide options for weed control that will allow the corn crop to reach optimal maturity for grain, silage or grazing.

Update on the Forage Project: Barley Silage Quality

David Christensen, Jayakrishnan Nair, John McKinnon, Daalkhaijav Damiran, Peiqiang Yu, Tim McAllister, and Leland Fuhr

The objective of this research is to identify desirable barley silage cultivars and the characteristics of superior silage. This research is supported by SADF, The Canadian Cattleman's Association and Saskatchewan Cattleman's Association based on the interest of dairy and beef producers. Eighty barley silage samples (DairySmart Nutrition) were collected from the 2012 growing season from Saskatchewan dairy farms and nine from Alberta (AAFC). Detailed analysis based on Cumberland Valley Analytical Service (CVAS) and our laboratory are being summarized by J.K. Nair as part of his PhD project. Ninety three samples have been collected by DairySmart Nutrition from the 2013 growing season. Detailed analyses from CVAS are available on these samples. Our laboratory is measuring 30 hour NDF rumen fermentation. This measure is not currently used in estimating TDN. However, the variation among samples in this trial can change the TDN estimate by 5 percentage units. The 93 2013 year samples averaged 66.4% TDN, 10.3% CP, 27.4% ADF, 44.0% NDF and 21.9% starch. Sixty seven percent of NDF values were between 39 and 49%, with a starch range of 16 to 28%. Of the 2013 samples, Falcon, Legacy and Conlon had the highest starch content (26%) while Falcon and Conlon tended to have lower NDF (38-39%). Cowboy and Sundre had the lowest starch and highest NDF content. Fifteen Saskatchewan corn samples averaged 28 % starch and twelve Manitoba samples 32% starch.

Importance of water quality on the farm: Minerals and Coliforms

Andrew Olkowski, Animal and Poultry Science

Water (*per se*) is an essential nutrient unreservedly required for all basic physiological and metabolic functions of the body. However, it is important to understand that water that we offer to animals is not just water, but rather a complex mixture of various compounds and elements, where water is merely a solvent. It is also important to note that water, relative to other nutrients, is consumed in disproportionally large quantities.

The water requirement and intake in dairy livestock may vary depending on breed, animal status, production mode, environment or climate in which animals are raised. All these variables are directly or indirectly relevant to several aspects of water metabolism and physiology, which are of utmost importance in highly producing animals such as modern dairy cows.

Limiting water availability to animals will depress production rapidly and severely, and poor quality drinking water is often a factor limiting intake. Furthermore, considering that water is consumed in large quantities, there is a real and present risk that intake of any of the water contaminants could reach a level that may contaminate the product (milk) or be harmful to the animal.

The key factors that must be taken into consideration while assessing water quality for dairy include: 1) sensory attributes such as odor and taste, 2) physiochemical properties (pH), 3) chemical contaminants (minerals, hormones, drugs), and 4) biological contaminants (protozoa, bacteria, algae, viruses)

Water quality can be affected by factors such as organic contaminants (decaying organic matter, sewage, industrial waste contaminants etc.), chemical contaminants (naturally present or industrial), dissolved gases such as hydrogen sulfide (give a rotten-egg odor), and water treatment and disinfection chemicals (disinfection by-products). More recently there is a growing concern with water borne pathogens, contaminants that are metabolically active (endocrine disruptors), and veterinary drugs (antimicrobials).

Availability of good quality water is extremely important for animal health and productivity. Therefore, knowledge and ability how to recognize the complex issues associated with water contaminants is essential for the rapid detection of problems and effective management of the adverse effects.

Comparing Canola Meal and Wheat Dried Distillers Grains as Sources of Dietary Protein in Dairy Diets

Matt Walpole, Kiran Doranalli, and Tim Mutsvangwa, Animal and Poultry Science

Canola meal and wheat distillers grains with solubles are high quality protein sources for dairy cattle, which are readily available for use in western Canada. When comparing the amino acid profile of canola meal and wheat DDGS, canola meal generally has higher levels of lysine. Two experiments were completed to examine the use of canola meal compared to wheat DDGS in dairy cattle diets. The first experiment compared the effects of high (17%) and low (15%) crude protein diets using either canola meal or wheat DDGs as the main source of dietary protein. Dry matter intake was not affected by either dietary protein source or level. Ruminal pH was unaffected by protein level or source; however, ruminal ammonia was higher in high protein diets but was unaffected by protein source. There was a numeric increase in daily milk yield as well as 3.5% energy corrected milk of 1 kg per day in cows that were fed canola meal diets as well as a significant increase in milk lactose percentage. The second study examined the relationship between high (55:45) and low (45:55) forage:concentrate diets with either canola meal or wheat DDGS as the main protein source. Dry matter intake was numerically higher (~0.7 kg per day) for cows fed canola meal diets. Ruminal pH and ruminal ammonia concentration were unaffected by either protein source or level dietary of concentrate. Cows fed the low forage:concentrate diet tended to have higher milk production than high forage:concentrate treatments (2-5 kg/day); however, there was no effect of forage:concentrate ratio on energy corrected milk. Milk fat percentage was significantly higher in cows fed high forage:concentrate diets; however, fat yield was not affected. Milk protein yield and milk urea nitrogen were both higher in low forage:concentrate diets. In all, canola meal is a suitable replacement for wheat DDGS as a source of dietary protein.

Can novel manure treatment technologies result in new revenue streams?

Bernard Laarveld, Animal and Poultry Science

Profit margin on dairy farms is continuously under pressure and this requires a careful look at costs and the use of all potential revenue streams. Dairy manure is considered a waste product with many negative attributes including odour, environmental impact such as emission of greenhouse gases methane and nitrous oxide, environmental impact such as ground and surface water contamination with nitrogen, phosphorous, hormones, antibiotics, and the presence of pathogens including E. Coli O157:H7, which are spread into the environment. Dairy manure is used for fertilizer and organic matter application in the field, but economic value is marginal given the cost of transportation. The increasing concern about environment and public health will create significant pressure to increase regulatory requirements and emission standards for manure. Many manure processing technologies that aim to address the negative attributes of manure have variable results, are not cost effective and may only be viable with subsidies or when applied on a very large scale. This includes biogas production. For a new manure processing technology to be successful, it must not only address many of the concerns, but it must also be economically attractive such as generating a profitable revenue stream. One approach might be to consider manure as a bioresource that contains many high-value bioproducts such as lignin, cellulose and useful chemicals than can be removed through biorefining. Biorefining uses pre-treatment, fractionation and separation techniques to produce the high value bioproducts. In this presentation I will briefly review some new emerging concepts with respect to manure processing technologies currently in the research phase.