Virtual Beef

ISSN 2291-188X VOLUME NO. 15 ISSUE NO. 56 FEBRUARY 2018

In This Issue

Virtual Beef is a technology transfer vehicle of the Ontario Ministry of Agriculture, Food and Rural Affairs. Reproduction of articles is encouraged. Please cite the source and author. Please notify the editor via email regarding the articles reproduced, including the publication or website where they will appear. Content may not be altered without the permission of the author.

This publication is available in electronic format at www.omafra.gov.on.ca/english/livestock/beef/news.html. Single paper copies may be obtained by calling 1-877-424-1300.

Direct general questions and suggestions to: Megan Van Schaik, Editor at Megan.VanSchaik@ontario.ca or call 519-826-5106. For inquiries regarding content of a specific article contact the author.

Planning a New Beef Housing Facility: Some important design features to consider

Rajan Niraula, Engineering Specialist, OMAFRA, Clinton

Beef cattle production takes place mainly on three types of cattle facilities: cow - calf operations, backgrounding operations and feeding operations (finishing barn). Typically, backgrounding and feeding operations are confined areas that are an open lot, open lot with barn (shelter), or total confinement (only barn).

Siting the Facility

Many studies show that confined livestock facilities with open lots pose environmental risk to land and water. Surface runoff and leachate from manure piles in open lots make their way to land and water if not contained properly. Drainage and streams near the livestock operation act as potential conduits in transporting these nutrients. Producers should consider siting their livestock facility away from such drainage and streams to reduce environmental risk. In Ontario, any livestock facilities that house nutrients (manure) should be located at a minimum flow path distance of 50 meters from the nearest surface water (O. Reg. 267/03). Also, all subsurface tiles within 15 meters of the facilities have to be removed (O. Reg. 267/03).

Production facilities should be located in an area where there is no potential for standing water. Select an area that is sloped between 2 to 6 % to facilitate proper drainage system. Avoid slope above 6% because it is difficult to control the drainage at higher slopes, and pollutants could be released to nearby water bodies. Avoid areas with very porous soils. Soil maps should be used to examine soil properties. Also, areas with a high water table should be avoided.

Facility Orientation

Site specific weather issues (also called microclimates), such as prevailing wind, and solar radiation are other critical factors that needs to be considered while planning a livestock housing facility. Cattle can handle extreme cold but not heat combined with high humidity. Beef housing structures should be oriented to provide protection from solar radiation in summer. In Ontario, the recommended orientation of animal housing facilities with natural ventilation has been north-south. This allows prevailing westerly wind in the summer to blow in through the open side walls (east-west). However, some builders argue that facilities that have side walls open to east-west allow greater penetration of the morning and evening sun. If sunlight penetration is a concern, facilities can be oriented based on local site conditions to avoid extensive exposure to solar radiation during the summer.

The open end of a mono-slope barn should be protected from winter, wind and snow. In Ontario, since prevailing winds tend to shift northwest during the winter, smaller wall openings should face the north side. Barns that are open to the south will maximize the summer breeze, allow winter sun penetration, and will control winter wind. Locate barns away from large trees or structures to avoid draft within the building and snow load on the roof.

Facility Design

Modern cattle feeding facilities are generally wood or metal frame buildings with metal roofing. Buildings could be both mono-slope and gable roof type. Fabric covered hoop barns are also common for beef cattle housing.

A roof slope of at 1.5:12 for mono-slope or 2.5:12 for gable roof with at least 3 meters of clear sidewall openings are recommended for adequate natural ventilation for buildings up to 30 meters wide (Mid-West Plan Service - MWPS, 2013). Mono-slope barns that open at the south side have the benefit of allowing good sunlight penetration in winter, which helps to maintain dry bedding conditions.

Barns are constructed with either solid floors or concrete slats over liquid manure storage. The base for a solid bedded floor can be concrete, compacted clay or limestone. The type of floor plays an important role in the everyday operation of the facility. Producers should consider a number of factors prior to deciding which type of floor best meets their requirements:

- Solid floor bedded facilities are typically wider than the slat barns because cattle are given more floor area: 13 to 15 square meters per head versus 6 to 8 square meters per head for total slats.
- Solid floors needs to be bedded with bedding materials such as straw, sawdust, woodchips or manure pack. This adds extra cost for bedding.
- Bedded pack barn requires additional labour hours for bedding and cleaning of alleys. Manure handling is simpler in a slatted floor barn.
- In slatted floor barns, manure is stored under the barn. A separate area will be required for solid manure storage in a solid floor barn.
- Initial investment for slatted floor barns is high and these barns tend to have higher equipment costs.
- Manure from slatted floor barns has a higher nutrient value.

Typical layout involves a feed alley on one side of the barn with a drive through alley to deliver feed. A second feed alley is recommended if the barn width exceeds 12 meters. The alleys should slope (6% to 8%) away from the feed bunk to keep the feed dry (MWPS, 2013). The feed alley should be 3.5 to 4 meters wide and the drive through alley at least 6 meters wide to allow movement of equipment.

A water supply system should be designed to meet the maximum demand. Consider daily water needs of 34 L per 1000 pounds live-weight in winter and 68 L in the summer (MWPS, 2013). Provide 2.5 to 7 cm of linear waterer space per animal. In barns with slotted floors, waterers should be located some distance from the feed bunk so that animal traffic improves manure passage through the slats and reduces feed deposition in the waterer. In a bedded pack barn, a waterer should be installed on concrete slabs that have a rough surface and are sloped away from the waterer to minimize animal slipping. Waterers can be located within a pen divider to serve two adjacent pens. In slotted barns, waterers can also be located at the centre of the pen providing access to more animals from all sides.

If bale feeders are being used, bar spacing in the feeder should be between 20 to 30 cm, depending on the size of cattle. Use 25 cm (larger spacing) for cattle that are above 350 kilograms. For a feed bunk, linear space required for cattle depends on the feeding frequency. The following table gives recommended linear bunk space for cattle of different sizes.

Table: Feed Bunk Dimension Guidelines for Twice – Daily Feeding*

	Calves	**Finishing**	**Cows**
Weight, lb	<600	600 – market	>1100
Minimum Linear bunk space in inches			
When limit fed	14	18	24
Feed present most of the time	6	8 – 10	12
Minimum when fed *ad libitum**	6	6	>6

Source: MWPS Publication AED 60
***Animals fed only once daily or fed a high forage ration may require a larger bunk.**

Summary

Producers need to take a holistic approach while planning a new barn for beef cattle. Investment in new facility is a significant economic decision. Consult with knowledgeable professionals and other producers before a commitment is made.

References:

1. Higgins, S., Wightman, S., Lehmkuhler, J. Feedlot Design and Environmental Management for Backgrounding and Stocker Operations. in: ID-202. Univ. Kentucky Coop. Ext. Serv., Lexington; 2013.

2. Jones D., Lemenager R., Foster K., Doran B., Euken R., Shouse S. Cattle Feeding in Monoslope and Gable Roof Buildings (revised 2013). In: MWPS Publication AED 60.

------------------ VB -----------------

Rajan Niraula, Engineering Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
rajan.niraula@ontario.ca

------------------ VB ------------------

Feed Efficiency in Feedlot Production

James Byrne, Beef Cattle Specialist, OMAFRA, Lindsay

For feedlot producers, feed costs have historically represented between 50 – 70% of the cost of production and during periods of high corn prices these costs can increase to over 80%. Improving feed efficiency is one tool to help reduce the cost of production and improve profitability. Research by Beef Cattle Research Council suggests a feed efficiency improvement by 1% across the beef sector would save the feedlot sector as much as $11.1 million annually. Weaber (2011) showed that a 1% improvement in feed efficiency has the same effect as a 3% improvement in the rate of gain. Improving feed efficiency is vital for improving beef profitability through lower input costs. It also presents an opportunity to improve the environmental sustainability of beef production through reduced use of inputs leading to reduced greenhouse gas production.

Most beef farmers have a very good understanding of growth rate. Growth rate is a measure of how fast an animal grows or gains over a set period of time. It does not take into account the amount of feed required to put on this gain. Feed efficiency, correctly called feed conversion ratio (FCR), is the amount of feed (dry matter) required to gain one unit of gain. In beef cattle this runs between 4.5 and 7.5; a lower number is desirable. Compared with other livestock, ruminants have a poor FCR. Poultry have a FCR of less than 2:1 and swine are less than 3.5:1. The average FCR for Beef cattle is 6:1. This means, on average, it takes 6 lbs of feed (dry matter) for an animal to gain 1 lb of live weight.

The following example illustrates the effect of difference in feed conversion ratio.

	Steer A	**Steer B**
Starting Weight (lbs)	900	900
Growth Rate (lbs/day)	3.5	3.5
Dry Matter Intake lbs/day	21	28
Feed Conversion Ratio	6:1	8:1
Ration Cost ($/lb DM)	0.085	0.085
Days on Feed	200	200
Cost per Day ($)	$1.79	$2.38
Total Feed Cost ($)	$357	$476

(BCRC: Optimizing Feedlot Feed Efficiency, 2016)

In this example two steers enter the feedlot at the same weight and grow at the same rate. Steer A consumes 21 lbs of dry matter but steer B consumes 28 lbs of dry matter to grow at the same rate. The feed conversion ratio shows that steer A is a more efficient animal as it takes less feed to grow at the same rate as steer B. If we assume a feed cost of $187 per ton (dry matter), it costs $0.59 per day more to feed steer B, the less efficient animal. If we assume both animals reach their finish weight in 200 days the less efficient steer B will have cost the producer $119 more than the more efficient steer A. As this example demonstrates, maximising feed efficiency is essential for feedlot profitability.

FCR has improved in poultry by 250% since 1957. Work by Loy on Iowa feedlots showed FCR improved by 0.047 lbs per year over the period 1978 to 1992. Further work by Loy showed on Midwestern feedlots showed FCR improved by 0.033

lbs per year over the thirty year period from 1985 to 2005. Compared to poultry and swine FCR improvements, ruminant FCR improvements have been modest. In the past 30 years, ruminant FCR has improved by about 30%. The majority of this improvement has come about through improvements in diet management. Forages have largely been replaced by processed grains in finishing rations. This development has significantly improved FCR in beef feedlots. The type and quality of grains in addition to having a balanced diet for vitamins and minerals all play a part in improving feed conversion ratio.

The use of growth promoters such as ionophores, implants and beta agonists in feedlot diets can significantly improve feed efficiency. A study by Faucitano et al. in 2008 showed that growth rates were 21% higher and feed efficiency 23% higher for feedlot animals given both an ionophore and an implant compared to those animals given no growth promoter. Why are ruminants so feed inefficient? Unlike swine and poultry, ruminants consume diets that are much higher in fibre. Ruminants are dependent upon microorganisms, through rumen fermentation, for digestion. During rumen fermentation, bacteria produce byproducts that can the efficiency of digestion. Furthermore, ruminants have a high maintenance requirement compared to other livestock. Ruminants use greater than 50% of their feed intake for maintenance. There is also a lot of variability between the feed efficiencies of individual animals. European research has shown that there can be up to a 20% difference in FCR between the most efficient animal and the least efficient in a group. This can have significant cost implications for a feedlot owner. The biological mechanisms underlying variation in feed efficiency in animals with similar bodyweights and growth rates are not well understood.

The lack of real progress in improvements in FCR for beef cattle is partially due to the preference for cow calf producers to select for animals that grow faster. Such selection produces larger framed animals that have a higher maintenance requirement and consequently a higher feed conversion ratio. Research by Teagasc at the Grange Animal & Grassland Research and Innovation Centre, Dunsany, Co. Meath, Ireland demonstrated that FCR is difficult to select for as the feed regime for the bulls under test is rarely replicated on commercial farms.

Consequently, the concept of residual feed intake (RFI, rather than FCR has become popular as a better method to measure feed efficiency. Residual Feed Intake is the difference between an animal's actual feed intake and the animals expected intake based on its body weight and growth rate. This means that animals with a low RFI (desired) eat less than expected for their weight and growth rate.

Considerable variation in RFI exists within and across breeds. As the trait is about 40% heritable, this presents an opportunity to select for animals with low RFI. Dr. John Basarab et al. at Olds College, Alberta, used the GrowSafe System to measure intake by individual animals. They showed that animals with a low RFI had 10 – 12% lower feed requirement for the same body size and average daily gain compared with animals with high RFI. This is equivalent to having a 9-15% improvement in feed conversion ratio. Dr. Basarab showed that selecting animals for low RFI had no effect on carcase quality, provided RFI was adjusted for fatness, no effect on pregnancy rates, calving rates, weaning weights, age at puberty, pregnancy or calving pattern. Selecting for low RFI means a significant improvement in feed efficiency with no effect on carcase quality or other desirable productive traits.

Methane production from beef cattle in 2011 was 14% lower than 1981 levels. This reduction is primarily due to increased feed efficiency over this period. It is estimated that by selecting for low RFI, greenhouse gas emissions could be reduced by a further 15 – 20% due to reduced input requirements.

Dr. Danny Crews from Agriculture and Agri-Food Canada (AAFC) was the first to develop expected progeny differences (EPDs) for RFI. The first EPDs developed had an accuracy of 59%. It is expected this will increase as more bulls are tested. Dr. Crews developed a multi-trait index which includes RFI. The index will help producers select bulls based on how economically well their progeny perform under feedlot conditions. It is expected that bulls with low RFI will sire calves that will generate more net revenue for the feedlot industry. The increased revenue potential of these types of cattle should be reflected in higher prices for cow-calf producers who sire such cattle.

The use of feed conversion ratio and residual feed intake are very powerful tools to help drive improved feed efficiency and improved profitability for the beef industry. The production of more feed efficient cattle will help reduce the level of inputs required and can reduce greenhouse gas emissions.

References:

1. Alberta Agriculture & Forestry. (2016) Residual Feed Intake (Net Feed Efficiency) in Beef Cattle
2. Beauchemin, K. (2018) Reducing Methane Emissions for the Cow-Calf and Feedlot Sectors. AAFC Lethbridge Research & Development Centre, Saskatchewan Beef Industry Conference
3. Beef Cattle Research Council. (2016) Optimizing Feedlot Feed Efficiency.
4. Faucitano, L., Chouinard, P.Y., Fortin, J., Mandell, I.B., Lafrenière, C., Girard, C.L., and Berthiaume, R. (2008) Comparison of Alternative Beef Production Systems based on Forage Finishing or Grain-Forage diets with or without Growth Promotants. J.Anim. Sci. 86(7): 1678-89.
5. McGee, M. (2014) Feed Efficiency in Beef Finishing Systems, Teagasc, Grange Animal & Grassland Research and Innovation Centre, Dunsany, Co. Meath, Ireland
6. Shike, D.W. (2013) Beef Cattle Feed Efficiency. Driftless Region Beef Conference, University of Illinois at Urbana-Champaign
7. Weaber, R. (2011) Kansas State University, National Program for the Genetic Improvement of Feed Efficiency in Beef Cattle

------------------ VB -----------------

James Byrne, Beef Cattle Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
james.byrne@ontario.ca

------------------ VB ------------------

Exploring Opportunity Feeds

Anita Heeg, Feed Ingredients and By Products Specialist, OMAFRA, Woodstock
Megan Van Schaik, Beef Cattle Specialist, OMAFRA, Guelph

Every November, the Ruminant Feed Industry Days provide learning opportunities for feed industry professionals. Jointly held by Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and Ontario Agri Business Association (OABA), the 2017 Ruminant Feed Industry Days included keynote speaker Mary Beth Hall (USDA, Wisconsin) who spoke on rumen dynamics, resulting milk components, feed analysis, and manure evaluation. As part of the program, Anita Heeg (Feed Ingredients and By Products Specialist with OMAFRA) and Megan Van Schaik (Beef Cattle Specialist with OMAFRA) provided an overview of “opportunity feeds”, or novel feedstuffs. Featured feedstuffs included commodities that are relatively new to the feed industry, ingredients that have gained the attention of researchers for novel uses, and products/feeds that have evolved to provide greater efficacy. This article is intended to provide an overview of the feedstuffs presented at the event.

Sodium Butyrate

As antimicrobial resistance awareness increases and antibiotic-free management options are explored, this feed additive is of interest for its benefit on the immune system. Butyric acid, a short-chain fatty acid, has been studied for decades for its effect on rumen papillae development, but more recently, for its benefit on the immune system. It is commonly known as one of the volatile fatty acids (VFA) produced by microflora in the rumen. While it has been available as a feed ingredient in a salt form of calcium, potassium, magnesium and sodium for many years, the product is now also available in a micro-encapsulated form.

The form of butyrate determines its impact on the gastro intestinal (GI) tract. A micro-encapsulated form allows it to pass through the rumen because in this form, butyrate is embedded in a lipid matrix and needs lipase enzymes to release and activate it.

The effects of butyric acid have been studied in livestock across multiple species (including monogastrics). An interesting research focus has been on calves, looking at the impact of butyric acid on the developing rumen and immune system. The immune system of a newborn calf needs to build up rapidly after birth to provide protection from illness. Butyric acid production is minimal during the first week of life due to an undeveloped rumen. Whole milk contains butyric acid, and therefore butyric acid is routinely delivered through colostrum and then whole milk until weaning. If milk replacer is used, it may or may not include butyrate.

To study the role of butyric acid on rumen development and building the immune system, researchers have added butyrate to milk replacer and calf starter. Presented in a liquid form, such as milk or milk replacer, butyrate stimulates GI tract development, mainly affecting the abomasum and small intestine. Butyrate in solid feed primarily stimulates the development of the forestomach and abomasum, and has shown to positively affect rumen epithelium development and solid feed intake. The encapsulation of butyrate enables the release of butyrate at a targeted site. In the case of the developing calf, the protected butyric acid partially escapes digestion in the rumen and abomasum, and is released in the intestinal tract. Guilloteau et al. (2010) found it to stimulate the development and repair of the intestinal tract, as well as develop and improve the function of the immune system. Other researchers had similar research findings. An interesting study done by Gorka et al. (2011) observed adding butyrate to both milk replacer and calf starter for its first 21 days of life; fed simultaneously, it displayed a positive effect resulting in greater papillae length and width, improved health status, and increased starter intake and weight gain in calves.

High Fat High Fibre Pellets

A recent study done by Dr. Katie Wood and a team of researchers at the University of Guelph looked at partially replacing starch with a high-fat, high-fibre (HFHF) pellet in an effort to evaluate alternative feeding strategies when grain-based commodities become expensive. One of the objectives of this study was to determine whether partial replacement of starch with a HFHF pellet in the ration would have an impact on the performance of fattening steers. The research looked at parameters such as animal performance, visceral fat, organ mass and carcass traits in crossbred Angus steers. This project was based on other studies which have indicated that corn or barley can be replaced by high fat pellets to increase the energy density in the diet and reduce starch content.

The control diet consisted of high moisture corn, soybean meal, haylage, salt, vitamin, and a mineral premix which included monensin. When comparing the control diet and the HFHF pellet diet (which replaced 30% of the corn in the overall diet), it contained approximately 48% versus 37% starch and 3% versus 5.6% crude fat, respectively. Between the two treatment groups, the steers did not differ in average daily gain, feed intake, or feed conversion ratio with the diet. When looking at the carcasses, the carcass characteristics did not differ with diet, but also increased with time on feed. Although the results have yet to be published, the study results suggest that partially replacing starch with a high fat, high fibre pellet did not impact growth, performance and carcass traits in steers and could potentially be used as part of an alternative feeding strategy for finishing cattle when grain-based commodity prices are high.

Camelina Meal

Camelina sativa is an oilseed within the *Brassica* family, also known as “false flax” or “gold-of-pleasure”. Camelina is known to have desirable agronomic attributes, such as modest input requirements and good disease tolerance, and is a suitable fit in a crop rotation. Typically Camelina plants grow up to 2 meters in height, have pale yellow flowers, and the seeds mature in pods. Camelina is a relatively new crop to Canada and thus far it is primarily grown and processed in the western provinces. Oil from the seeds is typically extracted mechanically and is primarily used for biofuel. Camelina meal is a by-product of the expeller extraction process. Camelina seeds contain approximately 40% oil and approximately 90% of the total oil is poly unsaturated fatty acids (PUFA). Camelina meal contains 30-40% crude protein, 12% fibre, and 10-14% oil. Nutrient specs can vary considerably due to the nature of the mechanical extraction process. Camelina meal is a good source of poly unsaturated fatty acids. Additionally, Camelina meal has a greater proportion of rumen degradable protein than canola, linseed meal, and DDGS.

At this point, camelina meal is an approved ingredient in Canada for broiler and layer feeds only. However, researchers have demonstrated that camelina meal is also a suitable ingredient for ruminant rations. Lawrence et al. (2016) showed similar growth performance between feeding camelina meal, linseed meal, and DDGS in growing dairy heifers. Similarly, Moriel et al. (2011) demonstrated that supplementing camelina meal at 0.33% of body weight did not affect gain or reproductive performance in peripubertal heifers and concluded that camelina meal is a suitable replacement for corn-soybean based supplements. Furthermore, a study by Hurtaud et al. (2007) showed that feeding camelina meal can affect fatty acid composition of milk and physical attributes of butter, but recommends limiting the inclusion of camelina meal in the diet to reduce the risk of milk fat depression. Camelina meal is currently being studied as an ingredient in dairy cattle rations by University of Saskatchewan researchers.

There are some limitations to feeding camelina meal. Like other Brassica species, camelina contains anti-nutritional compounds, including glucosinolates, tannins and erucic acid. Studies have shown that limiting inclusion of camelina meal in cattle rations can reduce adverse effects associated with the aforementioned anti-nutritional factors, such as impaired thyroid function and cardiovascular issues.

Sodium Metabisulphite

There are plenty of studies in the literature about the exploration of various additives and their ability (or lack of ability) to degrade the deoxynivalenol (DON) molecule, a common mycotoxin. Sodium metabisulphite is approved for use in Canada as a preservative agent; however, recent research has shown that sodium metabisulfite effectively degrades DON to render it non-toxic. Research has shown that the formation of the sulfonated DON derivative (DON-S), which occurs in the presence of sodium metabisulfite and heat, results in a reduction in DON. The difference between sodium metabisulphite and other additives with similar end goals is that this ingredient can contribute to the degradation of DON prior to ingestion by the animal. It has been demonstrated that DON-S lacks emetic (vomit-inducing) activity and is non-toxic when consumed by pigs, a species that is extremely sensitive to DON. Frobose et al. (2017) showed that when sodium metabisulfite was added to pelleted piglet feed contaminated with DON, there was a 10-fold reduction in analyzed DON levels, a restoration in average daily feed intake, and an improvement in feed efficiency in piglets at a 1% inclusion rate. Sodium metabisulfite can increase dietary sulfur and sodium concentrations and this is something to be cognizant of when formulating ruminant rations.

Caution must be taken when using this product. Since sulphur dioxide gas can form when sodium metabisulfite is exposed to heat and moisture, care must be taken when pelleting to ensure work safety is not compromised. Sulphur dioxide can also form in the stomach. Coated forms to protect against degradation in the stomach are being investigated.

The authors would like to thank the companies that provided samples and additional product information.

References

1. Cappellozza, B.I., Cooke, R.F., Bohnert, D.W., Cherian, G., and Carroll, J.A. 2015. Effect of camelina meal supplementation on ruminal forage degradability, performance, and physiological responses of beef cattle. J. Anim. Sci. 2012.90:4042-4054.
2. Frobose, H.L., Stephenson, E.W., Takach, M.D. Effects of potential detoxifying agents on growth performance and deoxynivalenol (DON) urinary balance characteristics of nursery pigs fed DON-contaminated wheat. J. Anim. Sci. 2017.95
3. Gorka, P., Kowalski, Z.M., Kotunia, A., Jagusiak, W., Holst, J.J., Guilloteau, P., and Zabielski, R. 2011. Effect of method of delivery of sodium butyrate on rumen development in newborn calves. J Dairy Sc. 94:5578-5588.
4. Guilloteau, P., Martin, L., Eeckhaut, V., Ducatelle, R., Zabielski, R., van Immerseel, F. 2010. From the gut to the peripheral tissues : the multiple effects of butyrate. Nutrition Research Review.
5. Hurtaud, C., and Peyraud, J.L. 2007. Effects of Feeding Camelina (Seeds or Meal) on Milk Fatty Acid Composition and Butter Spreadability. J. Dairy Sci 90:5134-5145
6. Lawrence, R.D., Anderson, J.L., Clappert, J.A. 2016. Evaluation of camelina meal as a feedstuff for growing dairy heifers. J Diary Sci 99:6215-6228

7. Moriel, P., Nayigihugu, V., Cappellozza, B.I., Gocalevs, E.P., Krall, J.M., Foulke, T., Cammack, K.M., Hess, B.W. 2011. Camelina meal and crude glyercin as feed supplements for developing replacement beef heifers. J. Anim. Sci. 89: 4314-24.
8. Patience, J.F., Myers, A.J., Ensley, S., Jacobs, B.M., Madson, D. 2014. Evaluation of two mycotoxin mitigation strategies in grow-finish swine diets containing corn dried distillers grains with solubles naturally contaminated with deoxynivalenol. J. Anim. Sci. 92:620-626
9. Wood, K.M., Kim, J., and Penner, G. 2017. Abstract: The impact of time on feed and partial replacement of high moisture corn with a high-lipid, high-fiber pellet on steer performance, visceral organ weight, fat deposition, and carcass composition. J. Anim. Sci. 95:294-295

------------------ VB -----------------

Anita Heeg, Feed Ingredients and By Products Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
anita.heeg@ontario.ca

and

Megan Van Schaik, Beef Cattle Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
megan.vanschaik@ontario.ca

------------------ VB ------------------

Are there lessons from the TB investigation for cow-calf producers?

Dr. Ann Godkin, Veterinary Science, OMAFRA, Elora

The follow-up on the initial tuberculosis (TB) positive cow from Canada detected at slaughter in the United States has been complicated and expensive, but the rapid response reduced the overall impact by short-circuiting further disease spread.

Recently the Canadian Food Inspection Agency (CFIA) reported that the testing of cattle after the discovery in the fall of 2016 was completed. About 11,500 animals have been destroyed and about 30,000 head have now been released from quarantine. All cows from the original herd, plus those in 18 other herds deemed to be high-risk because of direct contact with the original herd, were included in the humanely slaughtered group. A high profile disease occurrence like this one should encourage everyone to take a look at infectious disease control programs on their own farms and areas.

Cattle are at risk of many infectious diseases that can cause varying levels and degrees of impact. Fortunately TB in cattle in Canada is rare and has occurred only very sporadically, but when it does occur, it is one of the most impactful. To protect human health and the health of our country's cattle herd, routine screening for TB at slaughter occurs to detect a mainly subclinical disease and provides the greatest opportunity for preventing further spread. Unfortunately we don't have this level of surveillance on farms for other less dramatic infectious diseases of cattle, although some of these can have a very significant negative impact on the individual herds they infect.

There is a perception that cow-calf herds are at a lower risk of infectious diseases compared to other commodities, perhaps because of the extensive and predominantly outdoor manner of rearing beef cattle. This may give producers a false sense of confidence in the level of biosecurity they currently practice. The TB investigation reminds us that cow-calf herds too can face significant infectious disease problems. The extent of the TB investigation was greatly increased because cattle from 18 herds were commingled on community pastures. Returning cattle or new cattle added to the cow-calf herd, such as bulls, potentially puts many herds at a higher risk of infectious diseases than they may suspect. By reviewing current herd biosecurity programs we can evaluate if the programs we have in place can protect our cattle

herds from the risks they confront. TB is a “headline” disease, but other less news worthy diseases may commonly be present in Ontario herds and have a negative impact on productivity and health.
A basic starting point for developing a good specific herd biosecurity program is to know which diseases a herd owner should be concerned about. These could be diseases that are known to be present in the herd already and/or diseases that could be newly introduced.

To monitor the occurrence of disease, routinely conducting post-mortems on all animals that die should be a core component of a cow-calf herd’s biosecurity program. Often why cattle die is not apparent or the cause of death is something different than what was suspected when the animal was alive. A post-mortem can be conducted on the farm or at a dead stock operation depending on the farm’s location. Many times the post-mortem itself will provide answers, or laboratory testing of samples can be done if recommended by the herd vet and desired by the owner.

The recently completed Calf Health Surveillance Project highlighted the value of post-mortems on calves for more accurately pin-pointing the causes of infectious diseases that beef producers and their veterinarians did not always know were occurring. For example, calves were detected with underlying White Muscle Disease that had looked like cases of infectious diarrhea. Some were found to have died acutely from pneumonia, and other calves found dead were diagnosed as having septicemia due to undetected umbilical infections. About a third of all the calves that were post-mortemed had diarrhea as a suspected cause of death. On follow-up lab testing, six different diarrhea-causing infectious agents, including viruses, bacteria and/or protozoans, were identified. Many of the infectious disease conditions diagnosed by the post-mortems pointed at specific actions a producer could take to prevent future calf sickness and death in their herd. The use of vitamin E/selenium injections, more targeted vaccination programs for respiratory disease and calf diarrhea, management of the calving area and a heightened awareness of umbilical infections to allow early treatment are all practical actions producers could undertake to improve calf health and survivability, based on the post-mortem results.

Having post-mortems done on cattle that die, particularly calves, can prevent future losses and should be a part of any basic biosecurity program, yet it appears this is an under-utilized service that veterinarians can provide. Working on an animal that has already died may not sound like “preventive medicine” but it can be if infectious disease conditions are accurately identified and the diagnosis leads to constructive management changes.

As we approach spring calving, consider talking to your vet about what conducting post-mortems on cattle that die would entail. Calves may be the easiest way to start and probably give the most immediately rewarding and timely information for instituting management changes.

Surveillance at slaughter for TB has been a very effective monitor for an important national disease; surveillance by post-mortem of calves that die may go a long way towards improving your herd’s biosecurity program by enabling you to implement cost-effective and herd-specific infectious disease preventive practices.

------------------ VB -----------------

Dr. Ann Godkin, Veterinary Science
Ontario Ministry of Agriculture, Food and Rural Affairs
ann.godkin@ontario.ca

------------------ VB ------------------

Feeding Ruminants Frozen Feed

Megan Kitts, Research Assistant, OMAFRA
Anita Heeg, Feed Ingredients and By Products Specialist, OMAFRA, Woodstock

Depending on the year and location, Ontario can be quite cold with variable precipitation across the province. Feeding out forages in the winter months certainly comes with some challenges. One challenge is the potential to feed snow and ice along with the forages that are being prepared for feeding.

In recent winters, the question ‘does frozen feed affect ruminants?’ has come up in discussion. If so, what does it affect? Looking at research that has been done with regards to feeding frozen feed, or allowing animals to obtain their water intake from snow or ice, we noticed the lack of data on this topic, especially for goats but also for ruminants such as sheep and cattle. This article presents a summary of research conducted on this topic.

For a rumen to function properly, it is important that the temperature remains consistent, as rumen microbes are more efficient in a consistent environment. Studies show that ingestion of frozen feed and water can cause the rumen temperature to drop rapidly but not return to a normal temperature for several hours. The ingestion of frozen feed not only affects the ruminal temperature, but the overall body temperature of the animal itself, as demonstrated by a decreased rectal temperature. These same studies show that even if the ruminant is kept in a warm barn but only given access to frozen water sources, they can be observed shivering and bellowing to express discomfort. This indicates that ingestion of frozen water or feed can cause a “cold shock”, a rapid decrease in internal temperature and induction of shivering, regardless of other factors. The long term effects on the health and production of the animals experiencing such cold shock has not been evaluated. Suggested methods to reduce this cold shock include providing dry roughage along with frozen feed to buffer the rumen, or providing warm water to counteract the effects of the frozen feed.

Studies show that another concern associated with feeding frozen feed to ruminants is that it decreases their dry matter intake (DMI). The exact reason why DMI drops with frozen feed is unknown, although there are a few theories. One researcher concluded that DMI decreases due to the increased effort needed to break off and chew frozen feed compared to thawed feed. Simply chopping the feed into more manageable pieces could be a solution to this problem. Another researcher came up with a more complex theory. If feed has poor digestibility, the animal will spend a significant amount of energy warming it up and digesting it with little energy available for maintenance or gain. For this reason, ruminants decrease their feed intake to conserve energy. This theory highlights the importance of providing ruminants with high quality feed, especially in the winter months when the feed is expected to be cold or frozen. It has been demonstrated that supplementing frozen feed with unfrozen roughage can result in a normal level of DMI. Therefore, studies suggest when frozen feed must be fed, there are several ways to maintain DMI, including chopping the feed into manageable chunks, providing highly digestible feed, and supplementing frozen feed with unfrozen roughage.

The upkeep of the body temperature, regardless of external influences, is called thermoregulation. Once the body temperature falls below the lower critical temperature, the animal must increase its metabolic heat production to sustain itself. When ingested feed or water is frozen, the ruminant must first warm the feed to the ruminal temperature before it can begin to digest. This warming of feed increases the ruminant’s metabolic heat production. The feed begins to be warmed by the mouth and esophagus when it is being chewed and then swallowed. Once it has reached the rumen, blood flow to the rumen is increased and energy is diverted towards the rumen. Some of the energy that was once stored as fat or used for other processes such as lactation is now diverted to the rumen. It is unknown exactly how much energy is needed to heat frozen feed as it varies by rate of feed intake and quality of diet, but it is known that this extra energy requirement increases the maintenance energy demands of the animal. For this reason, it is important to ensure that all animals are in good body condition and have access to energy-dense feed when feeding frozen feed or water.

Other questions that arise when feeding frozen feed include “is the quality of the feed being affected?” and “are ruminants capable of extracting the same amount of nutrition from frozen feed as they do thawed feed?” Unfortunately, there is not a lot of research in this area. However, the research that we do have suggests that frozen feed has lower crude protein content than thawed feed. This study noted that frozen feed also appears to have increased lignin, the indigestible portion of plants, therefore suggesting a decrease in the digestibility of the frozen feed. However, this is only one single study and more research is needed to conclude exactly how feed quality is affected by freezing.

Managing the feeding of frozen feed to ruminants can be a challenge in Ontario winters. Of course, it should never be the sole source of feed the animal has access to. Research has been conducted to illustrate the short term effects the ingestion of frozen feed has on ruminants. Although some studies have concluded that there are negative effects of feeding frozen feed to ruminants, these negative effects can be easily overcome. By simply providing ruminants with unfrozen roughage and high quality feed we can counteract the drop in both body temperature and DMI. Ensuring all animals are in good body condition prior to the winter months also aids in counteracting these negative effects. The long term effects on the health and production of feeding ruminants frozen feed have not yet been evaluated. More research is needed to investigate these long term effects and their possible mitigation.

References for this article are available upon request.
*A version of this article also appeared in the December issue of the Livestock Alliance magazine.

------------------ VB ------------------

Anita Heeg, Feed Ingredients and By Products Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
anita.heeg@ontario.ca

------------------ VB ------------------