Virtual Beef

ISSN 2291-188X VOLUME NO. 15 ISSUE NO. 49 May 2016

In This Issue

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: Tom Hamilton, Editor at tom.hamilton@ontario.ca or call 705-647–2087. For inquiries regarding content of a specific article contact the author.

Ministry of Agriculture, Food and Rural Affairs

Ontario

The Bloat Prevention With Cattle Grazing Alfalfa

Chloe Gresel, MSc Candidate, Department of Animal Biosciences, University of Guelph

This past summer a grazing research trial at the University of Guelph's New Liskeard Agricultural Research Station examined the effects of supplementation on pastured animals' growth performance, carcass traits, fatty acid profile and palatability traits. While research trials happen here year round, this trial was special in that the 39 Angus and Angus cross steers were grazing 80% alfalfa, and didn't have one case of bloat! How was this possible? Well, like any good producer knows, an ounce of prevention is worth a pound of cure. To know how to prevent bloat we first must know how it works and when bloat is most likely to occur.

How Bloat Works

There are two forms of bloat; free gas and frothy. Free gas bloat is caused when there is a build up of gas in the rumen because the animal is unable to eructate (burp). This can be caused by several things, including an obstruction in the esophagus or pressure on the vagal nerve. The second type of bloat is frothy bloat. Frothy bloat is more common and occurs in feedlot cattle and cattle grazing lush pasture.

The cause of frothy bloat is complex and not 100% understood yet. What we do know is that frothy bloat is a build-up of gas bubbles that become trapped in the rumen in a stable foam made from soluble proteins. It has often been thought that soluble protein level in the plant is the main cause for frothy bloat; however research has shown that soluble protein, while a contributing factor, is not the sole cause of frothy bloat as researchers were not able to correlate the amount of protein in ruminal fluid to incidences of bloat[i]. It has been suggested that chloroplasts that have been broken by chewing also play a part in the production of foam, as researchers were able to correlate the amount of chlorophyll in rumen fluid to the incidences of bloat[i].

The Plant

Legumes are generally considered bloat inducing plants, but young cereals and even lush grass can also cause frothy bloat. However, some legumes such as birdsfoot trefoil are considered bloat safe because they contain condensed tannins. Condensed tannins are considered to be anti-nutritional as they interact with proteins in feed, saliva and microbial cells which alters the digestive process and keeps the soluble protein in the plant from interacting to the same degree in the rumen, therefore preventing bloat[ii].

This article will focus on bloat with alfalfa. Alfalfa is easily broken down in the digestive tract, leading to a high passage rate through the animal. While a high passage rate is good for getting more feed into the animal, it is not good in terms of bloating risk. Plants that have a fast rate of break down lead to bloat because the microbes in the rumen can rapidly break down the cell walls of the plant, releasing the soluble proteins and chloroplasts faster. Alfalfa varieties that have a slower digestion rate are being developed to lower the bloating risk in cattle, however early research into these varieties has shown mixed results in their ability to reduce rates of bloating[iii]. It is important to keep in mind that these "bloat safe" varieties of alfalfa are still being developed and improved, as we are in the early stages of breeding and development.

Grazing alfalfa in spring usually has producers extremely worried about bloat - this is because the vegetative stage of the young alfalfa plant is especially bloat provocative. Alfalfa that is in an early vegetative state, such as pre-bloom or early bloom, is considered to be the most dangerous for inducing bloat but as the plant matures the incidence of bloat decreases[ii]. Young plants are the easiest to digest as the stalks have not yet developed much lignin (lignin is the reason that plants become "stemmy"), Lack of lignin makes the whole plant, rather than just the leaves, easily digestible.

Figure 1. Pre-bloom alfalfa

You may have heard that once a killing frost has hit alfalfa it is safe to turn cattle out into it. This is a myth. One killing frost will cause plant cells in the alfalfa to rupture while the plant is still intact, which actually increases the bloating risk. To be safe to graze after a killing frost, there must be at least a week of -9°C temperatures for the alfalfa to dry down before the risk of bloat is reduced[iv]. Remember that if the plant is still green there is a bloat risk!

Animal Management

How producers manage their animals on alfalfa and other bloat inducing forages is also important. When first introducing animals to alfalfa, make sure the animals are full of other slower digested feeds such as grass hay. This will limit the amount of fresh pasture they can gorge on and help reduce the immediate bloat risk. Once animals are on alfalfa it is also important to keep them on it rather than removing them and re-introducing it. This is easier on their digestive systems as the rumen microbes adapt to the diet the animals are consuming. The amount of precipitation alfalfa receives is also important to consider. Moving cattle in the rain is far less dangerous than 1-3 days after a rain when plants will be rapidly growing[iv]. The same goes for when weather turns from mild to warm. The increase in temperature will kick start the plant's growth mechanisms causing it to grow rapidly which results in lush plants. If you are using alfalfa in a rotational pasture setting it is advisable to move the animals after the morning dew has burned off. This is because soluble protein levels may change during the day, with the highest levels occurring in the morning[v]. By moving the animals to a fresh pasture in the afternoon, the levels of soluble protein are going to be at the lowest level for a plant of that growth stage.

Pharmaceutical Bloat Preventatives

Even when practicing good grazing management on alfalfa, it is still a good idea to use a pharmaceutical method of bloat prevention. This is an added cost, but losing animals to bloat is also costly to a producer. There are two main pharmaceutical methods on the market to control bloat and they come in a variety of delivery methods. A common feed additive for controlling bloat is monensin. Monensin works by changing the microbial populations in the rumen and can reduce the incidence of alfalfa bloat by up to 80%[iv]. Elanco markets monensin as Rumensin™ and sells it in the form of a bolus (Fig. 2). Rumensin in bolus form is convenient, as once it is inserted into the rumen producers have coverage against bloat, but there are a few factors that need to be considered before opting for this route, including the type of animal. For example, you wouldn't want to use rumensin boluses on cows year after year as the plastic casing which houses the monensin stays in the rumen and doesn't break down.

Figure 2. Rumensin bolus

However, boluses are a good choice for backgrounding or finishing animals as the number of times they have be retreated is minimal. Another thing to be aware of when using a Rumensin bolus is that you can't see when it is running out of active ingredient. There have been cases of the bolus running out before it should. This did lead to the manufacturer reducing the stated time the bolus is active for, but it is still a good thing to keep in the back of your mind. Monensin can also be added by feed mills into pellets, so if you are supplementing on pasture it is possible to feed monensin daily. A down side to feeding your bloat control is that some animals may get pushed out of the grain before consuming their needed amount of drug, or in some cases animals may choose not to eat grain at all.

The other compound used for bloat control is poloxalene, which acts as a surfactant in the rumen. Surfactants lessen the surface tension in liquid, so when used in bloating cattle, it lessens the surface tension of the foam allowing the foam to fall back into a liquid and releasing the gas, enabling the animal to expel it[vi].

Phibro Animal Health has a top dress poloxalene product available in Canada which is marketed as Bloat Guard™. Producers simply top dress grain or mix it into a loose mineral supplement. An advantage to using this method is that it is

easy to use, but like feeding Rumensin some animals may not consume enough of it to be effective. When it is consumed in the correct minimum dosage, the risk for bloat is lower using poloxalene than Rumensin. In addition, Rafter 8 sells a liquid poloxalene called Alfasure™. This product is measured into the water source using a dose-a-tron (Fig. 3). An advantage for this is since every animal has to drink, you can be sure that they are all getting a minimum dosage of poloxalene. The disadvantage is that it takes a little more work. Producers have to make sure that the cattle have no other access to water in any form, and water lines and troughs need to be checked for leaks and overflows to avoid using up the Alfasure. Using Alfasure also allows the producer to adjust the amount of poloxalene the animals are getting to reflect the bloat risk levels. It is also dyed red, allowing producers to easily see if it has mixed with the water.

Figure 3. The dose-a-tron used to add Alfasure to the drinking water

New Liskeard Trial

During the alfalfa trial in New Liskeard the researchers used several bloat management strategies. The steers were moved to a new section of alfalfa after lunch, which allowed the soluble protein levels in the plants to come down a bit. The steers were also on two forms of bloat control, as they were research animals and even one case of bloat would have been detrimental to the study. Each steer was given a Rumensin bolus and Alfasure was also used in the water. Alfasure was chosen over Bloat Guard to ensure each animal was consuming it. The study also called for 13 of the steers to just receive pasture, which would have made it harder for the researchers to get Bloat Guard into these animals. Even in the groups of steers that were supplemented with corn, top dressing would have been a poor option as there were steers that would not come and eat grain.

There are many advantages to grazing alfalfa that outweigh the risks of bloat (like an ADG of 1.9 lbs on straight pasture!), however each situation is different. Producers must look at their own operations and choose the method of bloat control will work the best for them and their cattle. With a little effort grazing alfalfa is something that can be done safely with large returns coming back to the producer. However each situation is different and producers must access which method of bloat control will work best for them.

References

[i] Majak,W., Howarth, R.E., and Narasimhalu, P. 1985. Chlorophyll and protein levels in bovine rumen fluid in relation to alfalfa pasture bloat. Canadian Journal of Animal Science. 65:147-156

[ii] McMahon, L. R., McAllister, T. A., Berg, B. P., Majak, W., Acharya, S. N., Popp, J. D., Coulman, B. E., Wang, Y. and Cheng, K.-J. 2000. A review of the effects of forage condensed tannins on ruminal fermentation and bloat in grazing cattle. Can. J. Plant. Sci. 80: 469–485.

[iii] Berg, B.P., Majak, W., McAllister, T.A., Hall, J.W., McCartney, D., Coulman, B. E., Goplen, B. P., Acharya, S. N., Tait, R. M.,and Cheng, K.-J. 2000. Bloat in cattle grazing alfalfa cultivars selected for low initial rate of digestion: A review. Canadian Journal of Plant Science. 80:493-502

[iv] http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex6769

[v] https://www.gov.mb.ca/agriculture/livestock/production/beef/prevention-of-pasture-bloat-in-cattle-grazing-alfalfa.html

[vi] https://www.ams.usda.gov/sites/default/files/media/Poloxalene%20TR.pdf

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

Chloe Gresel, MSc Candidate,
Department of Animal Biosciences, University of Guelph

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

Electric Fencing Helps Manage Cattle on Pasture

Barry Potter, Agriculture Development Advisor, OMAFRA, New Liskeard

A major limiting factor for beef production in Ontario is lack of fencing. With the spread of cash cropping across the province in recent years, perimeter fencing has been removed on many farms. Establishing, or re-establishing fencing is one of the first steps in getting into cattle farming.

Good perimeter fences are necessary for keeping cattle where you want them. Interior fencing, subdividing fields allows for increased pasture management. Perimeter fencing maintains good neighbours and safe cattle.

There are many fencing options available: page wire, barb wire, and electric being three common types in Ontario. We also have a fact sheet that compares 5 types of fence and their costs, Farm Fencing Systems, http://www.omafra.gov.on.ca/english/engineer/facts/08-035.htm. Both comparisons indicate that electric fencing is the least expensive and most effective fencing system on the market. It is quicker to build, using less labour and materials. Once properly trained, cattle show respect for the fence, and will usually not bother to challenge the fence.

Some things to consider when building a fence include:

- What distance will you be fencing
- What type of livestock
    - Cow calf
    - backgrounders
- Is it perimeter or internal fencing

Electric Fence Considerations:

Things to consider when constructing an electric fence are power, fencer, wire and posts. Power can be accessed through hydro, battery or solar. The energizer should be chosen based on the kilometres of wire to be attached to it, and the load of grass or debris that may be on the wire. Making sure you have a good ground is essential for the fencer to function properly. High tensile wire carries energy effectively. Usually 2 strands are recommended for perimeter and one strand for internal fencing.

Current on a fence can be compared to water in a pipe. The larger the pipe, the more water it can carry. Larger wire has less resistance to the current. A 12.5-gauge wire has about one-third the resistance of a 16-gauge wire. This means it will carry the current a greater distance under similar conditions. The lead-out wire from the energizer should be at least 12.5-gauge.

Polywire, polytape, 14-gauge wire and 16-gauge wire are suitable for temporary fencing.

Cattle must be trained to electric fence for it to be an effective deterrent. Have a small field or paddock with a number of strands of electric, or one of the more permanent fences such as page wire with an offset electric wire. Use this to train the cows, and especially calves to the reality that if they touch the fence they will get a shock. Once they realize that there is a painful consequence for touching the fence, this becomes implanted in their minds. Psychologically they will view any wire with skepticism and shy away from approaching it, even if it is one strand. This makes building temporary fence a relatively easy task of using pigtail posts and one strand wire to quickly build paddocks for rotational grazing.

One of the keys to a good electric fence is the effectiveness of the grounding system. To test for sufficient grounding, operate the energizer and short out the fence by laying a number of steel rods (or T-posts) on the wires at least 91 m (300 ft) away from the energizer. The voltmeter connected to a live wire should show less than 1,000 volts. Take a reading between the grounding rod and the soil at least 1.2 m (4 ft) away from the rod. The voltmeter should read less than 400 volts. If a voltmeter is not available, touch the ground rod with one hand and the soil with the other. You should not feel a current if the fence is operating properly. If there is a problem, it is because more ground rods are needed, ground rods are too close or there are poor connections between wires and ground rods.

For perimeter fence, traditional wooden posts can be used, with insulators attached to the posts, through which the wires carrying the electric charge. Spacings of 25 to 30 feet will usually carry the fence if the ground is relatively flat. Adjustments can be made for uneven topography to make sure the wires remain relatively parallel to the ground. Other options as posts could be plastic recyclable posts, or steel t-posts.

When dividing paddocks for rotational grazing pig tail posts are effective, and easily shoved into the ground and taken up again (see Fig. 1). This allows grass to be managed more effectively by quickly adjusting paddock sizes based on forage growth.

Figure 1. Polywire with pigtail posts makes it an easy to move interior fence.

Another thing electric fence can be used for is to extend the life of page wire or barb wire fencing. By offsetting the electric wire with an extender insulator, the cattle will get a shock prior to approaching the older fence to rub or push on. A good extender is 1.3 cm 2 cm (½ inch or ¾ inch) PVC pipe bent into a V and nailed to the post.

OMAFRA has an excellent fact sheet on different fencing systems. You can compare and choose the one that is best for you. As well, we have developed an interactive calculator, where you can put in the cost of fencing in your area. This will give you an accurate cost for your farm for each type of fencing.

But electric fencing will be the least expensive, most effective fence you can put up. It opens up pasture management to a new level that will keep your cattle safe and growing all summer long.

References:

Farm Fencing Systems, OMAFRA Factsheet, Ontario.ca/livestock
Publication 19, Pasture Production, OMAFRA Publication, Ontario.ca/livestock

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

Barry Potter, Agriculture Development Advisor
Ontario Ministry of Agriculture, Food and Rural Affairs
barry.potter@ontario.ca

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

Ontario Livestock Manifest: Recording livestock movements for a stronger traceability system

www.ontario.ca/traceability

Livestock traceability systems include standardized tools and resources to protect livestock business owners, the public and animal health in the event of a food safety or animal health emergency. Traceability ensures that these risks can be identified quickly and managed effectively to minimize impact to the public and to the industry's reputation.

New federal regulations are coming, and a movement document is expected to be a requirement when they are in place. In the meantime, the popular Ontario Livestock Manifest is a voluntary tool that is used by many in the livestock industry to record animal movements.

Am I required to use the manifest?
Using the manifest is a voluntary best practice you can adopt to strengthen your business' traceability success. Using the Ontario Livestock Manifest brings Ontario in line with the national Cattle Industry Traceability Plan and prepares the livestock sector for proposed federal traceability regulations.

Why should I track shipping details with the Ontario Livestock Manifest?

- It protects your business by documenting proof of shipment, providing verification in the event of a non-payment or in disputes over the number or type of animals shipped and received. It also facilitates more effective traceability to identify and address animal health emergencies to protect the public and the industry's reputation.

Where can I find it?

- The manifest is being distributed through Service Ontario at no charge (shipping charges apply).
- To order, contact Service Ontario at www.publications.serviceontario.ca or 1-800-668-9938 and order:
    - Publication Number 020297: Ontario Livestock Manifest for Direct Shipments and
    - Publication Number: 020298: Ontario Livestock Manifest for Auction/Dealers Shipments
- The manifest will also be available from some auctions, dealers and producer organizations.

Ontario's traceability system is based on three pillars:

1. Animal Identification: using the Canadian Food Inspection Agency (CFIA) approved Radio Frequency Identification (RFID) tags for individual animal identification for cattle, bison and sheep and other approved identifiers for grouped animals such as poultry and hogs.
To order CFIA approved tags visit: http://tags.canadaid.ca

2. Premises Identification: the Provincial Premises Registry (PPR) issues Premises Identification Numbers (PID), which are unique identifying numbers assigned to parcels of land on which agri-food activities take place. The PPR is the only official provincial registry where Ontario agri-food businesses can obtain a PID.
To register your business visit: www.ontarioppr.com

3. Movement recording: recording and reporting movement and events of identified animals between identified premises allows traceability information to benefit to the livestock industry as a whole. This reduces the time it takes to respond to an animal health event or possible food product contamination. Collected information can also be used to meet the growing information demands of consumers, enhance consumer confidence and increase the overall competitiveness of the industry.

Information on how to order the Ontario Livestock Manifest is below

What is the Ontario Livestock Manifest?

- The Ontario Livestock Manifest is a voluntary traceability tool that includes key business ownership and traceability information to record commercial livestock movements, as well as information that may be required under proposed federal traceability regulations.
- It can be used by anyone shipping beef, veal, dairy, bison, sheep or goats.

The manifest is a triplicate form provided in books of 25 sets. A copy should be kept by the shipper, transporter and receiver of the animals to document livestock movements.

Who developed the Ontario Livestock Manifest?

The industry-led group that developed the Ontario Livestock Manifest included representatives from:

- Beef Farmers of Ontario
- Ontario Cattle Feeders Association
- Ontario Livestock Dealers Association
- Ontario Livestock Auction Markets Association
- Ontario Trucking Association
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Agriculture and Agri-Food Canada

Why are there two versions of the Manifest form?

- **Ontario Livestock Manifest for Direct Shipments:** records shipments from farm to feedlot, farm to farm or farm/feeder to processor.
- **Ontario Livestock Manifest for Auctions/Dealer Shipments:** records shipments of livestock to auctions, dealers, assembly yards, etc.

Both forms meet the requirements of the Feeder Finance and Breeder Co-op Programs for beef cattle. As a suggested best practice, attach a list of the individual animal identification numbers for animals included in the load. Examples include Canadian Cattle Identification Program (CCIA) tags and Canadian Sheep Identification Program (CSIP) tags.

The Ontario Livestock Manifest includes sections for each party to provide information to meet National Cattle Industry Traceability Plan traceability requirements.

- Each manifest has its own pre-printed and unique identifier number for document tracking.
- The date field shows when the livestock were loaded.
- Each party is responsible for the information collected in their respective section of the manifest.

Below is a summary of the information for each section of the forms, and the party responsible to complete the section:

Section	**Party Responsible**	**Information to be Collected**
Purchaser/Agent Name	Person making the payment	Premises ID, Name, Mailing Address & Telephone Number
Transporter Company Name	Trucker	Name of Transporter, Name of the Trucker and the Trailer Licence Number
Owner Name	Owner/Seller	Premises ID, Head Count, and the species, Name, Mailing Address & Telephone Number
Shipper Name (*if shipped on behalf of Owner*)	Party shipping on behalf of owner	Premises ID, Name, Mailing Address & Telephone Number
Receiver Name	Person receiving the animals	Premises ID, Head Count, Name, Mailing Address & Telephone Number

A view of both forms is below:

Ontario Livestock Manifest for Direct Shipments

Ontario Ministry of Agriculture, Food and Rural Affairs

ONTARIO LIVESTOCK MANIFEST
DIRECT SHIPMENTS

Date (yyyy/mm/dd): _____ Manifest Number: 45751

PURCHASER/AGENT NAME:			
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:
TRANSPORTER COMPANY NAME:			
Address:			Fee:
City/Town:	Province:	Postal Code:	Phone Number:
Trailer Unit or License Plate:		Driver Name:	
OWNER NAME (payee, co-operative):			
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:
Ontario Corn-Fed Document Attached: ☐ Yes ☐ No		Deduct Transit Insurance Fee: ☐ Yes ☐ No	
Individual CCIA Tag Numbers Attached: ☐ Yes ☐ No		Breeder/Feeder Finance Program: ☐ Yes ☐ No	

Head Count	Species	Breed/Colour	Gender/Type	Contract Number	Cash	P.O Number

SHIPPER NAME (e.g. Feeder):			**Same as above** ☐
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:
RECEIVER NAME:			
Address:			
City/Town:	Province:	Postal Code:	Phone Number:
Premises ID:	Date Received (yyyy/mm/dd):		# of Head Received:

Comments:

Owner/Agent Signature:	Receiving Agent Signature:	Transport Driver Signature:

White - Receiver Pink - Transporter Yellow - Owner or Shipper

Ontario Livestock Manifest for Auction/Dealers Shipments

Ontario Ministry of Agriculture, Food and Rural Affairs

ONTARIO LIVESTOCK MANIFEST
e.g. AUCTION/DEALER SHIPMENTS

Date (yyyy/mm/dd): _____ Manifest Number: 45751

PURCHASER/AGENT NAME:			
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:

TRANSPORTER COMPANY NAME:			
Address:			Fee:
City/Town:	Province:	Postal Code:	Phone Number:
Trailer Unit or License Plate:		Driver Name:	

OWNER 1 NAME (payee, co-operative):			
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:
Ontario Corn-Fed Document Attached: ☐ Yes ☐ No		Deduct Transit Insurance Fee: ☐ Yes ☐ No	
Individual CCIA Tag Numbers Attached: ☐ Yes ☐ No		Breeder/Feeder Finance Program: ☐ Yes ☐ No	

Tag/Lot/Pen #	Head Count	Sale Ring	Breed/Colour	Gender/Type	Species	Trucking Rate

Is the Shipper the Owner? ☐ Yes (if No please refer to the Comments section)

OWNER 2 NAME (payee, co-operative):			
Address:			Premises ID:
City/Town:	Province:	Postal Code:	Phone Number:
Individual CCIA Tag Numbers Attached: ☐ Yes ☐ No		Ontario Corn-Fed Document Attached: ☐ Yes ☐ No	

Tag/Lot/Pen #	Head Count	Sale Ring	Breed/Colour	Gender/Type	Species	Trucking Rate

Is the Shipper the Owner? ☐ Yes (if No please refer to the Comments section)

THIS SECTION MUST BE COMPLETED BY THE RECEIVER (auction market/assembly yard/dealer)			
Name:			
Address:			
City/Town:	Province:	Postal Code:	Phone Number:
Premises ID:	Date Received (yyyy/mm/dd):		# of Head Received:

Comments:
If the Shipper is not the Owner, please include the name, complete mailing address, premises identification number and telephone number of the Shipper(s) here.

Owner 1 Signature:	Owner 2 Signature:	Receiver Signature:	Driver Signature:

White - Receiver Pink - Transporter Yellow - Owner or Shipper

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

Visit us online at: www.ontario.ca/traceability
Or contact us: traceability@ontario.ca or 1-877-424-1300

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

Blood Profiling to Indirectly Assess Feed Efficiency in Grass-Fed Beef Heifers

Ellen M. Crane, Jasper C. Munro, Stéphanie L. Bourgon, Yuri R. Montanholi
Department of Plant and Animal Sciences, Dalhousie University

Expensive feed costs for beef producers can be minimized by increasing feed efficiency. Improvement in the efficiency of feed utilization by the cow herd can lead to benefits in productive efficiency across all sectors of the industry, since this trait is heritable[i]. Residual feed intake (RFI) is a measure of feed efficiency that requires the assessment of feed intake, which is too expensive and time consuming to implement on commercial beef farms. However, indirect measures such as a blood component profile may serve as proxies for feed efficiency, due to their associations with energy metabolism. Specific blood parameters include complete blood cell count (CBC), immune system challenge and blood plasma metabolites.

Heifers and Experimentation

A group of 107 crossbred replacement heifers (**Figure 1A**) were consigned from 16 Maritime beef producers (**Figure 1B**) and housed at the Maritime Beef Testing Society in Nappan, Nova Scotia. Heifers were evaluated for productive performance (individual feed intake, growth and body composition) for 124 days, while consuming a grass-silage based diet. A CBC assessment was implemented at the start and the end of the performance test, while analysis of blood plasma metabolites was performed every 28 days throughout the performance evaluation. Additionally, heifers were vaccinated with ovalbumin (OVA), which was followed by a booster shot 14 days later. This regime of immunization enabled this study to assess the specific primary and secondary immune responses of immunoglobulin (Ig) IgG1 and IgM to OVA.

Heifers were classified as either efficient (54 heifers; low-RFI = -1.02 kg/day less dry matter consumed than expected) or inefficient (53 heifers; high-RFI = +1.06 kg/day more dry matter consumed than expected) and the means of these feed efficiency groups were compared. All reported results were statistically different.

A

B

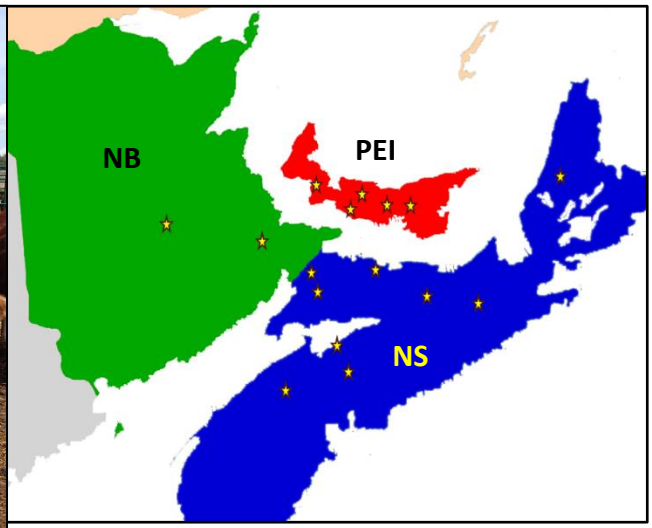


Figure 1A: Heifers evaluated during the experiment
Figure 1B: Maritime beef producers, across the three provinces who had 107 heifer calves tested in this study.

Complete Blood Cell Count

The CBC is an assessment routinely used to evaluate health status in cattle. The analysis includes red blood cell count, white blood cell counts, platelets and concentrations of proteins such as hemoglobin, which are related to energetic fluctuations associated with variation in feed intake. The results indicated that efficient heifers had a lower mean cell hemoglobin (**Figure 2A**), but no difference in red blood cell count. This suggests that efficient heifers may have lower

oxygen carrying capacity, which complements the previous findings of our lab[ii], where a lower blood plasma CO_2 concentration was observed in inefficient beef heifers (Gonano et al 2014), since these two blood gasses are closely related to metabolic rate.

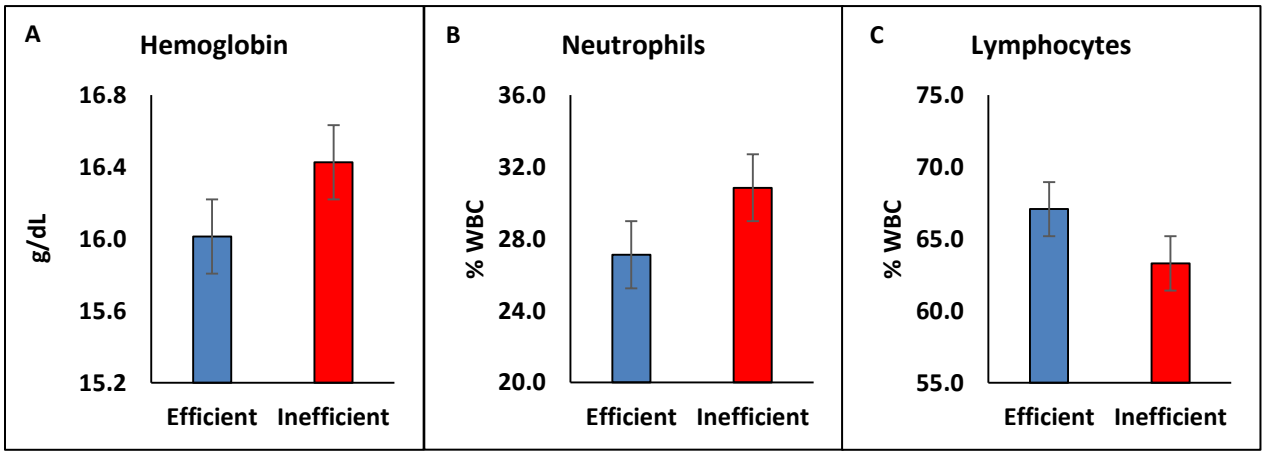


Figure 2: (A) Mean cell hemoglobin, **(B)** neutrophil and **(C)** lymphocyte values of the efficient and inefficient heifers at the start of the trial with 287 ± 27.6 days of age.

The CBC analyses also identified differences in white blood cells (**Figures 2B** and **2C**), in relation to feed efficiency, suggesting differences in cellular immune function. The lower oxygen requirements in the feed efficient heifers may offer a greater amount of oxygen to be metabolized by the lymphocytes, which could lead to the larger number of lymphocytes observed. Higher abundance of segmented neutrophils in inefficient heifers could be related to susceptibility to stress. Increased segmented neutrophil abundance in mildly stressed cattle is related to a cortisol surge, causing the release of neutrophils from blood vessel walls.

Immune System Challenge Using Ovalbumin

Maintenance of the immune system requires a considerable amount of energy that may reduce energy allocations toward growth and reproduction, among other metabolic sinks. It has been observed that response to an infection can reduce protein accretion in muscle, resulting in decreased productive performance[iii]. In cattle, Ig M and G1 are primary responders of the humoral immune system required to detect pathogens. Efficient heifers displayed **43%** greater secondary IgM response to OVA, indicating a superior immune function, which may relate to their improved feed efficiency. Despite the lack of differences in IgG1, the results of IgM are encouraging, given the well-known association of IgM with first detection of a novel antigen.

Blood Plasma Metabolite Profile

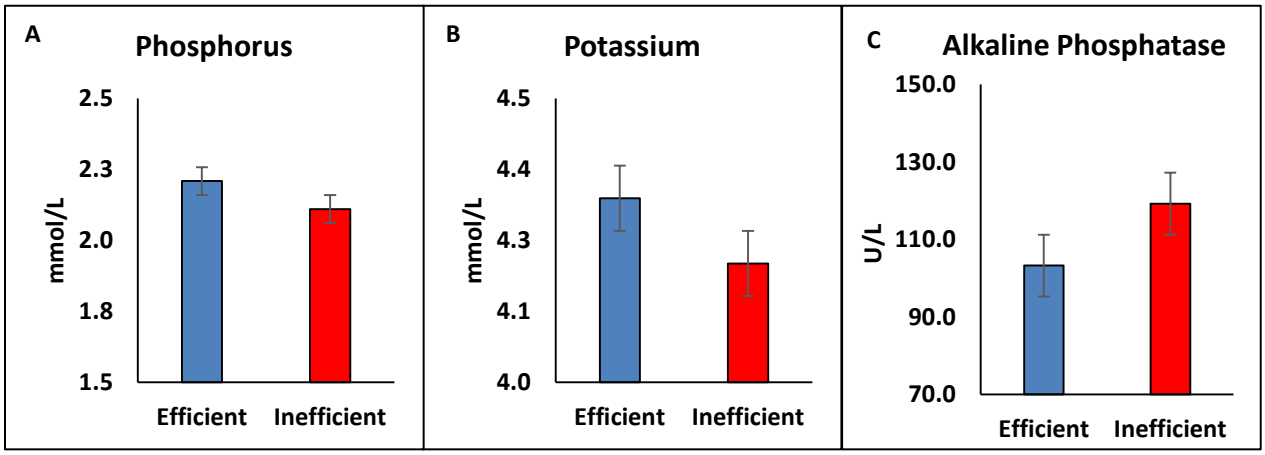


Figure 3: Blood plasma metabolite concentrations in relation to feed efficiency, (**A**): phosphorus; (**B**): potassium and (**C**): alkaline phosphatase.

Blood metabolites may provide information about the underlying biochemistry associated with individual variation in feed efficiency. Blood plasma measurements, such as mineral ions, proteins, compounds, enzymes and hormones, can be related to processes that affect energy use. Efficient heifers had greater concentrations of phosphorus (**Figure 3A**). Plasma phosphorus contributes to the production of muscle storage molecules, including creatine phosphate and ATP, which serve as readily available energy sources. Efficient heifers also had greater potassium levels (**Figure 3B**) that may be related to a lower rate of protein turnover, leading to more efficient growth in efficient heifers; however, this explanation still requires further research. Inefficient heifers had higher levels of alkaline phosphatase (ALP) (**Figure 3C**), which may relate to the increased transport of phosphates across cellular membranes, supporting a greater demand for background metabolic processes, rather than for growth. Efficient heifers also had lower levels of T_3 (triiodothyronine), in comparison to the inefficient heifers (1.8 vs. 1.9 mmol/L). This hormone, produced by the thyroid gland, is key in the regulation of metabolism.

Implications

- Parameters of the CBC analysis, including hemoglobin concentration and white blood cell profile, may constitute simple assessments of the intricate biology underlying feed efficiency.
- Heifers with improved feed efficiency may have superior humoral immune capacity, based on the specific response of immunoglobulin M to a novel antigen (ovalbumin).
- Blood plasma metabolites such as T_3, ALP, potassium and phosphorus may contribute to the indirect assessment of feed efficiency, as part of routine beef cattle testing protocol.

Acknowledgements

We thank the Beef Cattle Research Council, Agriculture and Agri-Food Canada, Nova Scotia Department of Agriculture, New Brunswick Cattle Producers, Nova Scotia Cattle Producers, Prince Edward Island Cattle Producers and the Maritime Beef Testing Society for their support.

References

[i] Pitchford WS (2004) Genetic improvement of feed efficiency of beef cattle: what lessons can be learnt from other species? Australian Journal of Experimental Agriculture 44, 371-382.

[ii] Gonano CV, Montanholi YR, Schenkel FS, Smith BA, Cant JP, and Miller SP (2014) The relationship between feed efficiency and the circadian profile of blood plasma analytes measured in beef heifers at different physiological stages. *Animal* 10, 1-15.

[iii] Klassing KC (1988) Nutritional aspects of leukocytic cytokines. *Journal of Nutrition* 118, 1436-1446.

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

Ellen Crane, M.Sc. Candidate
Dalhousie University, Department of Plant and Animal Sciences
emcrane@dal.ca

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

Rapid Progress in Canada's Beef Industry

Tom Hamilton, Beef Systems Program Lead, OMAFRA, New Liskeard

Historically, the beef industry has been considered slow to change and adopt new technologies or management strategies. But is this still the case? Feedlot management is intensive and increasingly sophisticated. These operations are supported by a team of professionals including nutritionists and veterinarians. Feed rations are balanced and fine-tuned for cost effective performance. And some of these operations are using advanced computerized systems to monitor feed and water intake and animal weight on a daily basis. Information on carcass measures is starting to flow back to feedlots. Together, these indicate a high level of technology adoption and innovation in the feedlot sector.

In contrast, the cow-calf sector, which is based on extensive production practices, has generally been guided by the principle of minimizing costs in a low input/ low output system. To a large extent this has restricted the application of new

technology. More recently, however, there seems to be an accelerated trend of adoption of progressive practices such as more intensive grazing management, extending the grazing season and out-wintering of cows. Do these observations indicate a new pace of change in the cow-calf sector?

Survey of Management Practices

A recent research paper by Sheppard and coworkers[i] provides an excellent evaluation of the rate of change of some management practices on Canadian beef farms. The 5 year time frame of the study is a **very short** interval for measuring management changes on an industry wide basis, so any significant changes would be very notable.

The data for this study was collected by surveying beef operations across Canada in 2005 and again in 2011 (see original paper for details of survey and analysis). Participants were selected to provide cross-sections of operations by size and type in each region. There were a total of 1380 operations sampled in 2005, and 1009 in 2011. Table 1 gives a breakdown of the data by type of operation.

Table 1. Number of operations sampled by type and year.

Operation Type	2005	2011
Not specified	25 (1.8%)	--
Finish only	140 (10%)	33 (3.3%)
Background only	69 (5.0%)	46 (4.6%)
Finish and background	25 (1.8%)	12 (1.3%)
Cow-calf only	824 (60%)	575 (57%)
Cow-calf + finish	51 (3.7%)	22 (2.2%)
Cow-calf + background	175 (13%)	261 (26%)
C-c + bkgrd + finish	71 (5.1%)	60 (5.8%)
Total operations	1380 (100%)	1009 (100%)
Total cattle	75,000	14,000
Median # hd per operation	165	107

The majority of operations surveyed were cow-calf only (60% in 2005 and 57% in 2011), more than double the percentage of the next ranked type, cow-calf + backgrounding. There were proportionally fewer large feedlots in 2011.

The surveys collected information on a large number of parameters including types of forages grown, their harvesting and storage methods, grazing management, fertilizer use, manure storage and spreading, feedlot rations, structures and shelterbelts. For this article, only a selection of practices are discussed (see original paper for full analysis).

Initial analysis showed that in general, the significant geographic differences were among 4 regions (see Fig. 1):

1. Atlantic
2. East Region (southern Quebec and Ontario)
3. Boreal Shield (northern areas, Newfoundland to Saskatchewan)
4. Prairies (areas of Manitoba to British Columbia).

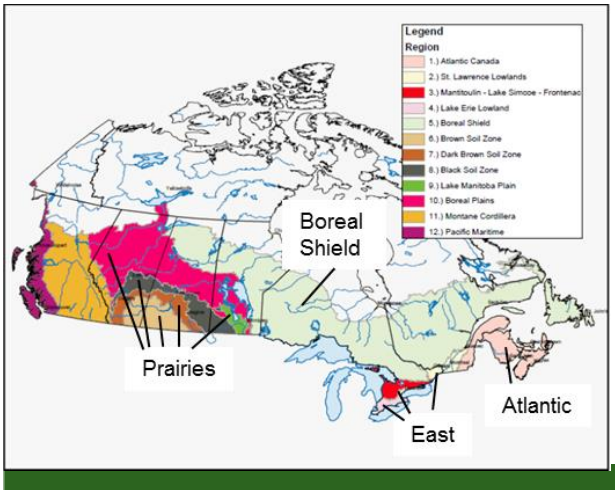


Figure 1. Regions of comparison[ii]

Unchanged Practices

Improved grazing management has been a long term focus of extension due to its benefits in improving carrying capacity and feed quality. On a national basis, the % of operations using **rotational grazing** was **high** (70%) in 2005, and similar to 2011 (tame=75%; native=65%). This shows that increased grazing intensity is well accepted by beef producers, with two thirds to three quarters of operations utilizing it.

In addition, a very low % of operations (6-11%) supplied supplemental feed on pasture June-August, showing that during the growing season pasture was adequate to meet the needs of most cattle.

Although unchanged within region, there was a dramatic difference between the East and Prairies in the proportion of hay stored under cover (tarp or roof). In the East about 75% of bales were covered, vs only 15% in the Prairies. This reflects the much wetter climate in the East, which leads to excessive spoilage of uncovered bales.

The % of operations harvesting perennial forages with either a 1-cut or 2-cut system was constant across years (1-cut=66%; 2-cut=28%). In addition, the vast majority (94%) of operations in both years stored **solid manure** in **uncovered piles**, while about 29% of the manure was covered after tillage incorporation.

Practices That Changed

Forage management

Increasing legume content is promoted to improve forage quality and quantity, reduce the need for N fertilization and improve growth during dry periods. On a national basis, there was a 48% increase in legume-dominant perennial forages (Table 2). Both the East and the Prairies followed this trend with numerical increases (+12% and +60%).

On a national basis, there was a large, significant decline in the use of nitrogen fertilizer on forage acres (25-50% less). In the East region, **N usage** on both annual and perennial forages was **reduced** by about **50%[1].** In the Prairies, there was an apparent decline in use of N on perennial forages, while N use on annual forages appeared to increase[1]. It is likely that at least some of the reduction in fertilizer N applied was due to increased legume content, although the study authors also point out that lower fertilizer prices in 2005 could account for some of the change

Forage silage management showed a major shift away from bunkers to the use of plastic covered bales and silage bags (PBSB). Nationally, in 2005, the PBSB use for all forage types was 24%, with the remainder in bunker silos. This contrasts with 2011 when PBSB was 64% for perennial forage crops and 30% for annual crops. Although not evaluated statistically, the trends in the East and Prairies reflected the national picture for perennial forage, with PBSB use in 2011 more than double that for the combined value in 2005. In 2011, the East region had a significantly greater use of PBSB for annual forage silage than the Prairies (36% vs 21%).

[1] not tested statistically

Table 2. Forage management practices in 2005 and 2011.

Attribute	East	Prairies	Canada
% forage fertilized with Mineral N			
2005	51[a]	41[b]	44[x]
2011 (perennial)	19[a]	19[a]	20[y]
2011 (annual)	27[a]	53[b]	31[y]
% of perennial forage that was >50% legume			
2005	49[a]	32[b]	34[x]
2011	55[a]	51[a]	48[y]
of all ensiled forage, the % plastic covered bales or in silage bags (remainder in bunkers)			
2005	18[a]	21[a]	24[x]
2011 (perennial)	57[a]	46[a]	64[y]
2011 (annual)	36[a]	21[b]	30[x]

[a,b] Values in the same row with different superscripts are statistically different.
[x,y] Values in the same column, for a given attribute, with different superscripts are statistically different (p<.001)

Prairie Region

A higher number of respondents in the Prairie Region allowed more detailed analysis, with a few of the results shown in Table 3. Winter grazing has been an extension focus as it can lower both feed costs and expenses related to manure management. Winter grazing in the Prairies increased dramatically in 2011, by a factor of 1.8X over 2005 (an increase of 180%). This shows very rapid adoption of a progressive management strategy.

The % of feedlots using shelter structures increased by 43%, while the % of feedlots with no roof cover decreased by 36%. This could imply that more feedlots were investing in roofed shelter; however it could also be due to the reduced number of large feedlots in the 2011 sample, which tend to use mounds and windbreaks. It is possible that some of the increase in shelters could reflect a greater use of windbreaks, but this was not specifically included in the survey.

Table 3. Prairie region winter grazing and feedlot shelters.

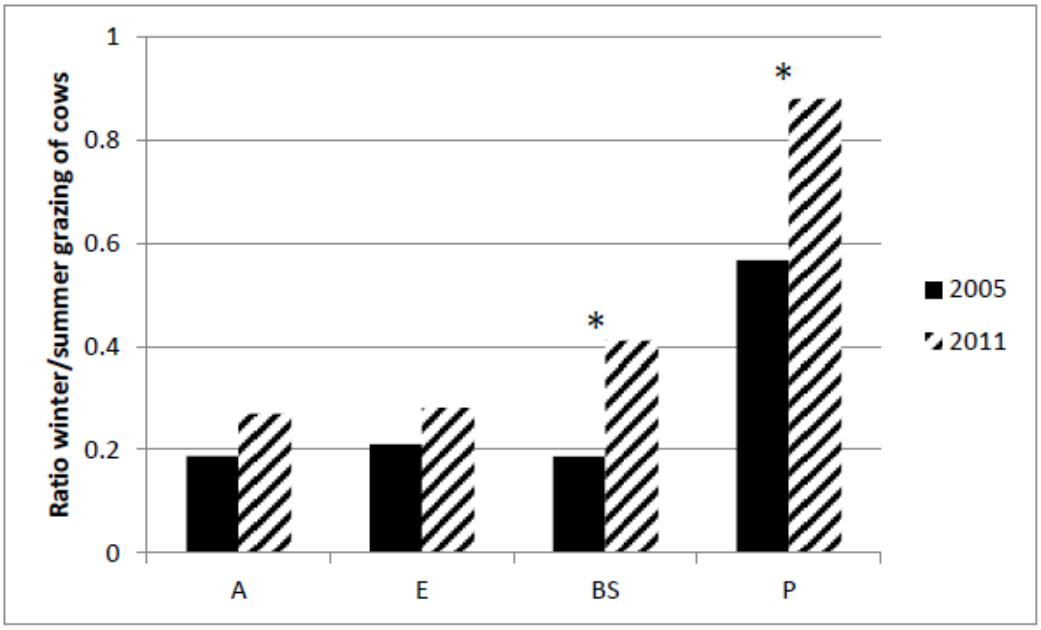
Attribute	2005	2011
% of all cattle using winter grazing	24[a]	67[b]
% feedlots using shelter structures	63[a]	90[b]
% feedlots with no roof cover	88[a]	56[b]

[a,b] Values in the same row with different superscripts are statistically different (p<.001)

Winter Grazing of Cows on a Regional Basis

Extending the grazing season has been a popular research and extension topic, resulting in large cost savings through reduced forage harvesting, transport and manure handling. It has been shown to be feasible in many locations across Canada but its use may be restricted due to wet soil conditions and excessive snow cover. Figure 2 gives a measure of its adoption with cows, on a regional basis. Winter grazing was at a high level of adoption (57%) in the Prairie Region in 2005 and increased significantly to about 86% in 2011, and also increased significantly in the Boreal Shield Region. The Atlantic and East Regions followed this trend, but the change was not significant. This shows a very high level of adoption on a regional basis of a strategy which is particularly well suited to the drier areas of the West.

Figure 2. Ratio of winter/summer grazing of cows by region.



Summary

Over a **very short** (5 yr) time span, beef operations in Canada showed **rapid adoption** of several **progressive** strategies and technologies. It is likely that this was partially stimulated by the occurrence of BSE in 2003 which severely depressed prices. The beef industry demonstrated a much greater capacity for technology adoption over a short time frame than has been traditionally assumed.

References

[i] Sheppard, S.C., S. Bittman, D. Macdonald, B.D. Amiro and K.K. Ominski. 2016. Changes in land, feed and manure management practices on beef operations in Canada between 2005 and 2011. Can. J. Animal Sci. (in press).

[ii] Sheppard, S.C., S. Bittman, M. Beaulieu, and M. I. Sheppard. 2009. Ecoregion and farm-size differences in feed and manure nitrogen management: 1. Survey methods and results for poultry. Can. J. Animal Sci. 89: 1-19.

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

Tom Hamilton, Beef Systems Program Lead
Ontario Ministry of Agriculture, Food and Rural Affairs
tom.hamilton@ontario.ca

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

Surveillance and Biosecurity – Active engagement with *Salmonella* Dublin Bovine Network Surveillance Project 2016

Ann Godkin, Cattle Veterinarian, OMAFRA, Elora

To date, in 2015 and 2016, there have been almost 40 isolations of *Salmonella* Dublin from Ontario herds at the Animal Health Laboratory (AHL) in Guelph. Until 2012 the infection had never been identified in Ontario cattle. The positive samples have come from calf mortalities in about 10 veal and two dairy operations. This doesn't sound like a lot but judging by what has happened in New York State and Quebec over the last 10 years, this could be the beginning of a larger invasion.

Outbreaks of disease with *S.* Dublin can be very severe. Typically calves between the ages of 2 weeks and 4 months are most affected. In some reports 40 to 50% of exposed calves die. In most Ontario situations the most visible sign has been pneumonia. Diarrhea is far less prominent than one would expect. In young calves the *S.* Dublin bacteria enter the blood stream and circulate to a variety of organs such as the lungs, liver, spleen, joints and stomach lining. A very poor response to antibiotic treatment and an increase in calf deaths is what prompts herd owners and their vets to submit samples to the lab.

A concerning aspect of the current *S.* Dublin isolates is the multi-drug resistance (MDR) of the current strain. So far the Ontario isolates, like the ones in New York and in Quebec, are resistant to most antibiotics available for calf treatment. Few calves that become sick during a *S.* Dublin outbreak are successfully treated.

Cattle movement is how *S.* Dublin enters a dairy, beef or veal operation. Typically the infection moves from farm to farm via carriers, infected yearling or mature cattle that show no signs, or in young calves that are already infected but not yet showing signs. As over 70% of Ontario dairy producers reported introducing cattle into their herds over a recent five year period we suspect that more herds are infected than those who have had disease detected in laboratory submissions so far.

S. Dublin can infect people as well as cattle. And in people as in cattle, *S.* Dublin infection is both invasive and multi-drug resistant. On farms where *S.* Dublin could be present everyone working with cattle should take basic biosecurity precautions to avoid infection. Biosecurity practices should be reviewed. Frequent hand cleaning or gloves, protective clothing that stays in the barn, sanitation of feeding and handling equipment and so on will help to protect people and calves. Young, immunocompromised and older people are more vulnerable to infection. People access to the calf area should be restricted, especially if calves have been sick.

As part of the provincial disease surveillance strategy, a bovine health network group has been formed to communicate with industry, government, researchers and laboratory services regarding important cattle disease issues. The group has recently initiated a project to investigate calf health and, in particular, *S.* Dublin. The project has two parts. In Part One a dairy producer can sign up to have a bulk tank milk sample tested for antibody to *S.* Dublin to check for carrier cows. Testing bulk tank milk is a first step to evaluate how prevalent *S.* Dublin is within Ontario's dairy herd population.

In Part Two, project funding offsets the charges for veterinarians to do, or submit, calves from dairy, veal or cow-calf farms for post-mortem examination. PM's can be done by the herd vet at the farm, with samples submitted to the lab, or the entire calf can be submitted to the Animal Health Laboratories in Guelph or Kemptville.

If you are interested in participating in the calf PM part of the project, contact your herd veterinarian to find out how to enroll in this surveillance project. Project details are also available from Ann Godkin (ann.godkin@ontario.ca or 519 846 3409).

This project is funded by the OMAFRA-University of Guelph Strategic Partnership, under the Disease Surveillance Plan, which is a joint federal-provincial Growing Forward 2 project.

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

Ann Godkin, Cattle Veterinarian
Ontario Ministry of Agriculture, Food and Rural Affairs
ann.godkin@ontario.ca

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