North Country Ag Advisor

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Cornell Cooperative Extension

North Country Regional Ag Team

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"The North Country Regional Ag Team is a Cornell Cooperative Extension partnership between Cornell University and the CCE Associations in Jefferson, Lewis, St. Lawrence, Franklin, Clinton, and Essex counties."

Table Of Contents

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Our Mission

"The North Country Regional Ag Team aims to improve the productivity and viability of agricultural industries, people and communities in Jefferson, Lewis, St. Lawrence, Franklin, Clinton, and Essex Counties by promoting productive, safe, economically, and environmentally sustainable management practices, and by providing assistance to industry, government, and other agencies in evaluating the impact of public policies affecting the industry."

Field Crops and Soils

Evaluation of Residual Herbicides for the Control of Marestail and Common Lambsquarters in Soybeans

By Mike Hunter

Glyphosate resistant (GR) soybeans made postemergence weed control relatively easy with a single application. The use of postemergence (POST) glyphosate in GR soybeans has been the primary weed control program used by many NNY soybean growers. While this system seemed to simplify weed management, relying on total postemergence programs can be difficult to manage if not properly implemented.

The benefits of early season weed control to protect the crop yield can be lost if the single POST application of glyphosate is delayed. A single POST glyphosate application also puts considerable selection pressure in weed populations increasing the spread of resistant weed populations in NNY. In recent years, multiple resistant horseweed (a.k.a marestail) has been found in New York State and has quickly become a troublesome weed for many growers, including those in NNY.

The spread of multiple resistant marestail moving across the state, including NNY, is forcing many growers to change their current herbicide programs. This has led to a renewed interest and need to use soil residual herbicides for improved soybean weed control.

In 2020, a replicated soybean herbicide trial was conducted on a farm near Watertown, New York, in Jefferson County. This trial included 13 different herbicide programs consisting of preemergence (PRE) herbicide. The soybeans were planted May 21, 2020. These PRE treatments were applied on May 22, 2020, and visual weed control ratings were done 35 days after application (DAA). Marestail and common lambsquarters were the dominant weeds along with some yellow foxtail. The marestail at this site was suspected to be resistant to both Group 9 (i.e. glyphosate, Roundup) and Group 2 (i.e. Classic, FirstRate) herbicides.

The treatments included an untreated check, Classic (chlorimuron, Group 2), Sharpen (saflufenacil, Group 14), Tricor DF (metribuzin, Group 5), Trivence WDG (chlorimuron, flumioxazin, metribuzin, Groups 2, 5, 14), FirstRate (cloransulam, Group 2), Boundary 7.8 EC (metribuzin, S-metolachlor, Groups 5, 15), Valor SX (flumioxazin, Group 14), and Spartan Charge (sulfentrazone, carfentrazone Group 14, 14). Spartan Charge is not registered for use in New York State. This location received .87" precipitation total in the 10 days after PRE treatments were applied. This provided sufficient rainfall to activate the soil applied preemergence herbicides in the trial.

Weed control ratings taken 35 days after application of the PRE treatments applied May 22 showed good to excellent control of common lambsquarters for all treatments, with the exception of Tricor DF (metribuzin) at 5 oz/A (66.75% control) shown in Table 1. Tricor DF, a Group 5 herbicide, will not provide control of triazine resistant common lambsquarters. At this location, Tricor DF at 10.6 oz/A provided greater than 93% control of the common lambsquarters indicating a non-triazine resistant population.

Marestail control ratings taken 35 days after application of the PRE treatments applied May 22 showed Sharpen (Group 14) at 1 oz/A provided excellent control (99.75%) and all of the treatments that included metribuzin (Group 5) showed excellent control (97.5% or greater) see Photo 1. The other Group 14 herbicides, Valor SX and Spartan Charge, applied alone only provided 21.25% and 25% control respectively. *Please note that Spartan Charge is not labeled for the control of marestail but was included in the trial for evaluation.* Both Group 2 herbicides, Classic at 1 oz/A and FirtRate at 0.75 oz/A, only provided 28.75% and 32.5% control of the marestail. This was not surprising, considering the fact that this site had a suspected population of Group 2 resistant marestail. These results are shown in Table 1. Trivence WDG at 6 oz/A, Boundary 7.8 EC at 2.1 pt/A, Tricor DF at 10.6 oz/A and Valor SX at 2 oz/A tank mixed with Tricor DF at 5 oz/A all provided excellent control of both common lambsquarters and marestail.

A single postemergence application of glyphosate or a tank mix with a Group 2, ALS, herbicide will no longer control multiple resistant marestail; therefore, growers must use an effective soil residual herbicide with the preplant burndown program or apply separately just prior to planting. There are no effective postemergence herbicides to control multiple resistant marestail in glyphosate tolerant (Roundup Ready) or conventional soybeans. If multiple resistant marestail is present or suspected, growers must consider planting Xtend, XtendFlex, Enlist, or Liberty Link soybean varieties to allow for effective postemergence control options if necessary.

Continued on Page 4...

Table 1.	Rate	% Control[1] 35 DAA[2]	% Control[1] 35 DAA[2]
Herbicides	Amt/A	Common Lambsquarters	Marestail
Classic	1 oz	100a	28.75b
Sharpen	1 oz	82.5ab	99.75a
Sharpen Tricor DF	1 oz 6 oz	88.0ab	98.75a
Trivence WDG	6 oz	99.5a	97.5a
FirstRate	.75 oz	98.0a	32.5b
Boundary 7.8 EC	2.1 pt	94.0ab	100a
Valor SX	2 oz	94.5a	21.25b
Valor SX Tricor DF	2 oz 5 oz	93.25ab	100a
Spartan Charge	8.5 oz	90.0ab	25.0b
Spartan Charge Tricor DF	8.5 oz 5 oz	100a	98.75a
Tricor DF	5 oz	66.75b	100a
Tricor DF	10.6 oz	93.5ab	100a

[1]Visual control rating, means followed by the same letter are not significantly different (p=0.05 Tukey's HSD)

[2]Days After Application treatment evaluation

Photo 1.

Resistant Marestail Soybean Herbicide Trial in NNY flumioxazin alone applied PRE May 22, 2020

Resistant Marestail Soybean Herbicide Trial in NNY flumioxazin + metribuzin applied PRE May 22, 2020

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Short on Hay This Spring?

By Joe Lawrence, PRO-DAIRY Forages Specialist, and Kitty O'Neil

A number of livestock producers are reporting short hay inventories coming into the spring and, while the warmth of the sun has us optimistic that winter will soon be behind us, the 2021 crop season is still a ways off. Strategies for dealing with potential forage shortages started last fall with farms reducing animal numbers, extending grazing as long into the fall as possible and planting winter cereal grains for spring forage. But what about additional strategies for this spring? We present 5 ideas here, for your consideration.

1. Buy More Hay

An inherent challenge regarding the impact of weather on hay availability is that when you are short, most likely everyone else is short too. If you are able find a source of hay, just make sure you know what you are paying for. With poor quality hay, animals will often "fill up" and stop eating before they have consumed enough nutrients to meet their health and maintenance needs. In these cases, supplementing with a small amount of grain (assuming you are not restricted by something like a grass-fed-only certification) can help assure the animals' nutrient needs are met. While this may initially seem like an expensive option, the cost is often less than the loss of productivity and health problems associated with underfeeding essential nutrients.

If you operate within forage-only or grass-fed requirements, recognize that if the hay you have available cannot meet the animals' basic needs, offering them more low-quality hay will not help. As mentioned above, animals simply will not be able to eat enough of it, the hay will go to waste and the animals will lose condition. So, either spend more to get better quality (even if you can get less of it) or, if the situation is extreme, look at options to reduce animal numbers.

2. Early Spring Forage Options

Unfortunately, there are few options to produce significant amount of forage before the typical first cutting of grass-legume forages in late May. A winter cereal planted last fall may offer extra forage but will usually be harvested just 7-10 days before first cutting of perennial forages. The difference in timing alone is not enough to help in early spring.

Planting a crop like oats as early as possible this spring can help rebuild overall forage inventories, but again, will not offer much in the way of a significantly earlier forage harvest. Spring oat forage would typically be harvested in late May at the earliest.

The Agronomy Factsheet #114 (linked and referenced at the end of this article) provides information on establishing oats as an "emergency" forage, as well as other forage options for unique circumstances driven by adverse weather events. Similarly, strategies such as frost seeding and Nitrogen fertilizer on grass in the spring can offer benefits for rebuilding inventories but will have little impact at providing early spring feed.

3. Grazing Early and Using Sacrifice Areas

Early grazing is often considered when forage inventory is short. Grazing too soon in the spring can be detrimental to both the plants in the pasture and the animals. Those considerations are discussed here with ideas to reduce negative impacts, but ultimately early grazing still may be a reasonable strategy.

<u>Impact of Early Grazing on the Plants</u>

Grazing too early stresses forage plants' energy reserves as they break dormancy after winter, particularly if they are grazed too low to the ground, or it is muddy when animals are allowed in the area. This may provide some needed forage this spring, but is very likely to reduce stand productivity for the remainder of the season. The negative impacts of grazing too early, or while the area is muddy, can result in permanent loss of desirable species and encroachment of weeds.

If early grazing is nonetheless necessary, strategically pick a sacrifice paddock or field where you can accommodate this damage. This could be a field or paddock that already needs renovation or improvement. This is a scenario when grazing winter cereals or oats could offer an early forage benefit as the detrimental impacts of a punched-up field may be less costly to you on a field that will already need reseeding after the cereal crop, in comparison to a perennial field.

<u>Impact of Early Grazing on the Animals</u>

Grazing animals on lush spring growth (very high moisture content) can present some of the same problems as feeding poor quality hay. This lush spring growth is high in nutrients, but it may not be able to meet the nutrient needs of the animal as it often lacks the fiber required for balanced intake and rumen health. Furthermore, energy exerted to graze, particularly when yields are quite low and muddy conditions create changes in moving around, may in some cases exceed nutrients taken in.

Continued on Page 6...

Grazing in these scenarios should be monitored very closely and may require limiting access and/or supplementing with a combination of lower quality hay (to meet fiber requirements) or other supplements to balance nutrient needs.

4. Restoring Damaged Fields

As you assess any damage caused by the circumstances of 2020 or spring 2021, it will be time to make a plan for remediating these issues to return the affected fields to productivity. An assessment should be made as to whether a field needs to be completely renovated (terminate remaining stand and start over) or if the current stand can be improved with frost seeding or no-till drill seeding. While patching up damaged areas with an appropriate grass or legume species can alleviate the short term need for feed, it can also introduce challenges of variable forage quality.

Considerations for complete vs. partial restoration decisions may include:

- ⇒ Whether the field would benefit from crop rotation
- ⇒ Presence and quantity of desirable species remaining
- ⇒ Presence of problematic weed species
- ⇒ Field conditions (is the field very rough from past grazing or equipment?)
- ⇒ Equipment available for renovating stand
- ⇒ Options allowable within system (i.e., restrictions of organic certification)
- ⇒ Intended use (grazing, mechanical harvest)
- ⇒ Ability to manage variable stand maturity and forage quality in mixed stands
- ⇒ Soil type/soil drainage
- ⇒ Soil fertility

Contact a CCE educator if you would like assistance in making this evaluation of your current field conditions and planning the best course for remediation. There are also some resources available online to aid in this process. Some excellent resources for frost seeding or improving damaged perennial forages are listed at the end of this article.

5. First Cut Hay

We will all be awaiting first cutting this spring, and while beef producers usually harvest first cutting a bit later than dairy farmers, a need for forage may change your plans this year. In New York, the timing of "dairy quality" first cutting can start as early as mid-May, for grasses with alfalfa a week or so later (and mixed stands falling in between). It is important to have equipment ready and watch the maturation of the stand, not the calendar.

As shown in Figure 1, alfalfa height is a good indicator of harvest timing for both alfalfa and grass. Similar to the issues with grazing too early in the spring, an early first cut may be

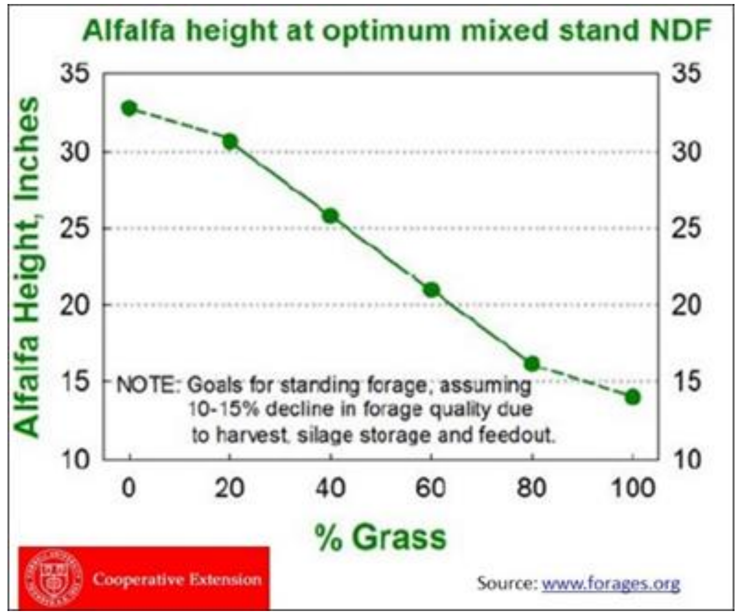


Figure 1. Alfalfa height at optimum mixed stand NDF, developed by Jerry Cherney, Cornell.

too high of quality for some beef classes. This also can be managed by mixing this with other feed sources as long as you plan for it and pay attention to animal health. A high quality, early first cutting might be a decent complement to extend inventory of mediocre quality hay from last year.

<u>Don't cut grass too short</u>

Similar to grazing too short, mowing grass short is often considered a means of obtaining more feed. However, the potential gains made from cutting short in one cutting will be negated by the long-term stress this puts on the stand. Grass should be cut at a height of 4 inches. Cutting below this minimum height will significantly reduce the speed of regrowth and overall yield potential throughout the season. A study at Miner Institute compared new seedings of Orchardgrass and Reed Canarygrass at two cutting heights. At a 2-inch cutting height the Reed Canarygrass was killed and the Orchardgrass required 38 days for the regrowth to reach a height of 16 inches. In contrast, at a 4-inch cutting height, both grasses responded quickly and reached a height of 16 inches in 21 days, in about half the time. Due to its growth habits, alfalfa can be cut shorter, at about 2-inches; however, considerations such as ash content (soil contamination), quantity of grass in a mixed stand, and field conditions all need to be taken into account when making the cutting height decision and generally a 3 to 4" height is still recommended.

<u>Cuttings per year</u>

A more intensive cutting schedule is often considered necessary for higher quality hay and while this is true, it may not be the only consideration, particularly if you have animals on the farm that do not require "dairy quality" hay. A study by

Continued on Page 7...

Jerry Cherney at Cornell investigated both the yield response to N fertility on grass as well as the impact of the number of cuttings. As shown in Figure 2, yield was optimized at approximately 200 units of N for the season and the 3-cut system out-yielded the 4-cut system.

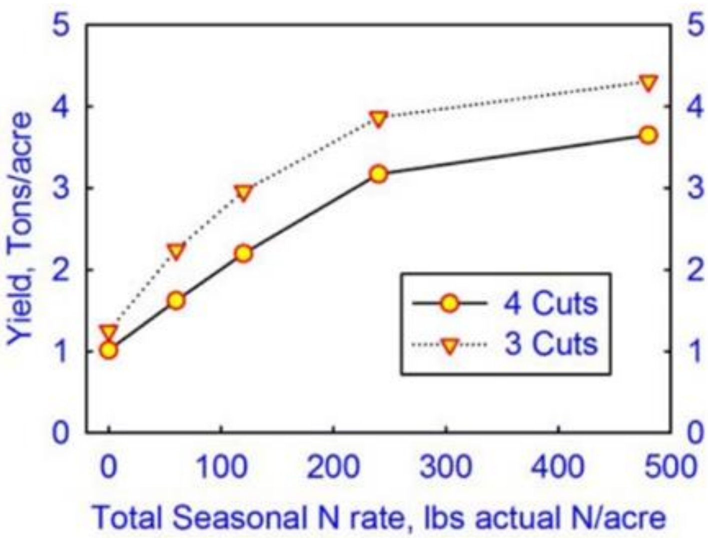


Figure 2. Grass yield vs N rate in a 3-cut and 4-cut system.

This does not suggest that we need to take 3 cuttings of mediocre forage; there is a better timing strategy than that. The best approach is likely to take 2 cuttings of higher quality forage (as weather permits) and then the remaining cutting would be left longer to bolster yield with this last cutting best suited for non-lactating dairy or to balance out higher quality hay for livestock.

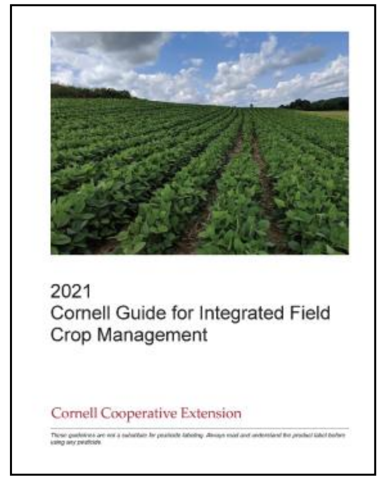
Conclusions

- Few to no options are likely to shift forage harvest earlier this spring.
- Many options exist to increase forage yields this year to recover from low inventories resulting from poor forage yields in 2020.
- Consideration of these options should be balanced with farm priorities, opportunities to reseed or rotate fields, animal nutritional requirements, and animal health.

Additional Resources:

- O'Neil, K., M. Hunter, J. Cherney, J. Lawrence, T. Kilcer, T. Bjorkman, and Q. Ketterings. 2020. "Emergency and Alternative Summer Annual Forages," Factsheet #114. Cornell University Nutrient Management Spear Program. http://nmsp.cals.cornell.edu/publications/factsheets/factsheet114.pdf
- Darby, H. 2005. "Frost Seeding – a Cheap Alternative to Improve Pastures." UVM Extension. https://nodpa.com/files/Frost_Seeding_Feb_2005.pdf
- CCE NWNY Regional Team. 2021. Frost Seeding Pastures, Hayfields or Small Grains" (video). https://youtu.be/8EmWOVZ6Sh0
- Schuster, B., Q. Ketterings, K. Czymmek J. Cherney, J. Degni, K. Ganoe, and J. Lawrence. 2019. "Restoring Perennial Hayfields", Factsheet #109. Cornell University Nutrient Management Spear Program. http://nmsp.cals.cornell.edu/publications/factsheets/factsheet109.pdf
- Hunter, M. and J. Lawrence. 2020. "Weed Control in Grass Hayfields". https://nydairyadmin.cce.cornell.edu/uploads/doc_872.pdf

2021 Cornell Guide for Integrated Field Crop Management Now Available



The Pesticide Management Education Program (PMEP) at Cornell University is pleased to announce the availability of the *2021 Cornell Guide for Integrated Field Crop Management.* Written by Cornell University Specialists, this publication is designed to offer producers, seed and chemical dealers, and crop consultants practical information on growing and managing field corn, forages, small grains, and soybeans. Topics covered include nutrient management, soil health, variety selection, and common field crop pest concerns. A preview of the *Field Crops Guide* can be seen online at https://cropandpestguides.cce.cornell.edu. Highlighted changes in the *2021 Cornell Field Crops Guide* include:

- Revised pesticide options for economically important field crop pests.
- Updated corn, forage, and small grain variety trial and research data.
- New information on barley disease control.
- Revised insect IPM information and insecticide tables throughout the guide.

Cornell Crop and Pest Management Guidelines are available as a print copy, online-only access, or a package combining print and online access. The print edition of the *2021 Field Crops Guide* costs $32 plus shipping. Online-only access is $32. A combination of print and online access costs $45 plus shipping costs for the printed book.

Cornell Guidelines can be obtained through your local Cornell Cooperative Extension office or from the Cornell Store at Cornell University. To order from the Cornell Store, call 844-688-7620 or order online at https://www.cornellstore.com/books/cornell-cooperative-ext-pmep-guidelines.

NNYADP Research Results Highlight an Opportunity for Improved Antibiotic Stewardship on Dairy Farms

By Casey Havekes

Calf diarrhea (scours) is reported to be one of the two biggest challenges on U.S. dairy farms and likewise, on NNY dairy farms. A 2017 Northern New York Agricultural Development Program (NNYADP) research project titled "Calf Health Treatment Protocols, Compliance, and Economic Impact on NNY Dairy Farms" indicated that calves between the ages of 8 and 31 days were most commonly treated with antibiotics for diarrhea.

Diarrhea can be caused by a variety of different enteropathogens, including bacteria (*E. Coli, Salmonella)*, viruses (coronavirus, rotavirus), and protozoa (cryptosporidium). Identification of the diarrhea-associated pathogen(s) can be difficult to achieve on-farm, yet many producers make the decision to treat affected calves with antibiotics. Broad-spectrum antibiotics have proven to be an effective treatment plan for calves affected by some bacterial diarrhea; however, antibiotics will not treat viral, protozoal, or parasitic agents. Antibiotic treatment of viral, protozoal, or parasitic diarrhea is not only an ineffective and unnecessary cost to the farm, but also may increase the chance of antibiotic resistance on-farm. Despite this, research conducted in 2019 in NNY confirmed that the most common use for antibiotics on-farm was for the treatment of diarrheic calves.

Over the past decade, considerable focus has been placed on antibiotic use in production animals with a heavy focus on antibiotic resistance. It is important to note that the aim of this research was not to discredit the efficacy of antibiotic treatment or to suggest that antibiotics should not be used for diarrheic calves. Rather, the objective of this research was to identify an opportunity to minimize antibiotic use in situations where the animal will not benefit. Lastly, it is universally recommended that free choice water provision and electrolyte therapy are offered as supportive care of calves with diarrhea. Therefore, a secondary objective was to characterize how often each of these practices (antibiotic use, and water and electrolyte therapy) are part of normal calf management and if there is opportunity to apply these practices more efficiently on NNY farms.

This research was funded by the NNYADP in 2020. Overall, 90 fecal samples were collected from diarrheic calves and submitted for diagnostic testing. Of those 90 samples, 72 were from calves that were treated with antibiotics, and 18 were from calves that were not treated with antibiotics. The prevalence of pathogens infecting pre-weaned calves was variable across the region (Figure 1). The most prevalent pathogen across farms was Rotavirus, with 61.1% of calves sampled testing positive. The least common pathogen was *Salmonella* with only 5.6% of calves sampled testing positive. The Salmonella isolates included *Salmonella muenster* and *Salmonella kiambu*.

Interestingly, of the calves that were sampled and treated with antibiotics (n=72), only 33% of those calves required antibiotic treatment based on the identified pathogen, i.e., bacterial species (Figure 2). However, this assumes that all cases of *E. Coli and Salmonella* were suitable candidates for antibiotic treatment, which is not necessarily the case. Out of all the calves sampled (n=90), 89.6% had free choice access to water, and approximately 61.7% were administered electrolytes (Figure 3).

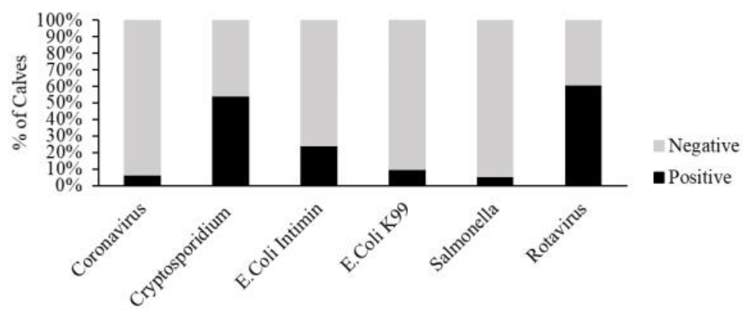


Figure 1. Prevalence of various pathogens infecting neonatal calves on NNY dairy farms, NNYADP project, 2020.

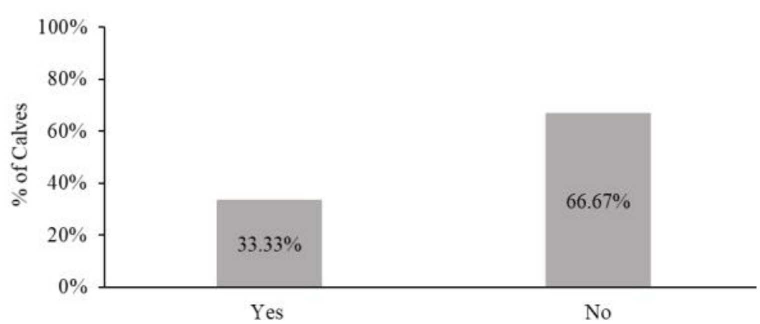


Figure 2. Percentage (%) of calves sampled and treated that required antibiotic treatment based on pathogen identified in the fecal sample.

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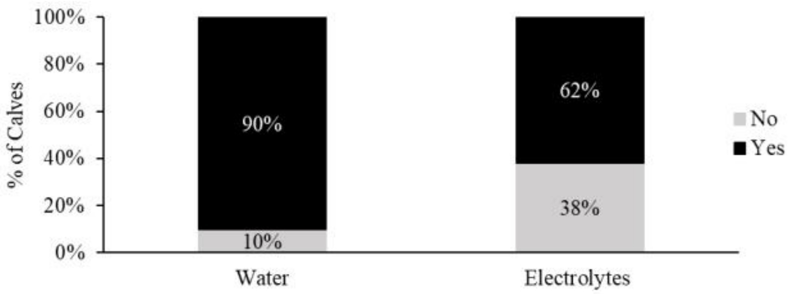

Figure 3. Water and electrolyte administration for diarrheic neonatal calves on participating NNY dairy farms.

Photo credit: CCE NCRAT.

Overall, it was impactful to determine the frequency of potentially unnecessary antibiotic usage for diarrheic calves on these NNY dairy farms. Antibiotic usage in agriculture is a topic that has received a lot of attention over the past several years as consumers are becoming more aware, and concerned, about antibiotic resistance. A recent study surveyed 1,000 U.S. public citizens on their perceptions of antibiotic usage in the dairy industry. Of those that responded, 90.7% reported that "antibiotic usage on dairy farms pose some level of threat to human health" and 71.5% reported that "they would be willing to pay more for milk produced from cows raised without antibiotics" (Wemette et al., 2021). These findings highlight the importance for dairy farmers to improve their antibiotic stewardship and present an opportunity for herds to continue to work with their veterinarians on treatment protocols for calves with diarrhea.

A second objective of this research was to determine the frequency of electrolyte usage and water provision for diarrheic calves. Overall, the results from this portion of the study are promising as 89.6% of calves had access to water, and 61.7% were given electrolytes. Dairy producers should be reminded that water provision starting at 3 days of age is now a mandatory requirement according to the FARM Program Version 4.0 requirements. Additionally, keeping calves hydrated using electrolytes is a very cost-effective and efficient way of helping calves recover from a case of infectious diarrhea.

Acknowledgements:
Thank you to the Northern New York Agriculture Development Program for funding this project, to the collaborating staff from the CCE County Associations, Miner Institute, Cornell PRO-DAIRY, and the participating producers across NNY.

Raising Pigs: From Piglet to Pork Chop

Wednesday, April 21st, 2021

7:00pm — 8:30pm

Free!

Springtime is a common time of year when North Country farmers begin raising piglets. This introductory online class, through Zoom, will go over the basics in raising pigs from start to finish, including best management practices, hog care and marketing of pigs.

Please register for the webinar by following the link below:

https://cornell.zoom.us/meeting/register/tJUtcOmvrDgvE9yE5jZamexUpS3zWuKwy1e

or call/email Gabby Wormuth at 315-788-8450 or grw67@cornell.edu

Betsy Hodge at 315-379-9192 or bmf9@cornell.edu

Cornell Cooperative Extension
Jefferson County

Cornell Cooperative Extension
St. Lawrence County

ATTENTION NORTHERN NEW YORK DAIRY FARMERS...

NCRAT Dairy Specialists want to help you track progress as you make changes to your dairy!

Example Projects:

- monitoring lying time and lameness scoring following a foot bath change
- tracking cow comfort metrics following a stall update, or new barn build
- measuring average daily gain of calves following a dietary change
- tracking passive transfer of calves following a colostrum management change
- analyzing sorting activity following a forage particle size reduction
- ... and more!

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Antibiotic Usage & Pathways: On-Farm Perspectives from CNY Dairy Producers

By Christine Georgakakos, Cornell University Department of Biological and Environmental Engineering, and Betsy Hicks, CCE South Central NY Dairy and Field Crops Program

This article is part of a series, written from a peer-reviewed article entitled "*Farmer perceptions of dairy farm antibiotic use and transport pathways as determinants of contaminant loads to the environment" published in the Journal of Environmental Management (*https://doi.org/10.1016/j.jenvman.2020.111880*). The work focused on twenty-seven interviews of dairy farmers in Central NY from March through October of 2019, completed and summarized by the authors. Eight of the farms included managed their farms according to USDA Certified Organic standards, and the remaining nineteen farms managed their farms conventionally. Farm size ranged from under 50 mature cows to over 1000 mature cows. This series talks about the nuances between farm size and management, specific to findings interesting to the dairy farmer. This article highlights farmer perspectives of antibiotic usage on-farm as well as subsequent pathways of antibiotics after administration to their herd.*

Contaminants of Emerging Concern

Pharmaceuticals, pesticides, and other emerging contaminants have been gaining attention across agricultural, environmental, and public health sectors. Slowly, we have expanded our understanding of the broader impacts of these compounds and how they can potentially move in our food, water, soil, and air. As consumers, as well as farmers, many of us contribute to the movement of some of these compounds into the environment on a daily basis, whether through ingredients in cleaning supplies, laundry detergents, or yard and lawn products, as well as the prescriptions and over the counter drugs we take or give to our pets or livestock to alleviate ailments. It comes as no surprise that agriculture is scrutinized as a potential source of pharmaceutical contamination – our industry is widespread and many antibiotics are dosed on a per-weight basis. We aim to use our findings from the interviews to help inform any future potential regulation so that the agricultural industry is better understood by policy makers, as well as uncover areas where the ag industry could feasibly implement strategies to help mitigate potential environmental contamination from farms.

Dairy Products: Milk and Meat

Use of pharmaceuticals in animal agriculture has focused on reducing antibiotic residues in food products. As such, there are strict regulations to which farmers must adhere to ensure the antibiotic concentration in animal food products falls under the required levels. Regulations like the Veterinary Feed Directive (VFD), improved veterinary client patient relationships (VCPR), and required prescriptions for antibiotic usage have all dramatically reduced the amount of antibiotics used in animal agriculture. In our study, not surprisingly, we found that tracking antibiotic usage as a means to minimize and eliminate milk and meat residues is a part of day to day operations for many dairy farmers. We also found that the systems used for tracking cows treated with antibiotics varied between farmer ages. Gen X farmers were very concerned with antibiotic presence in meat and milk and stressed the animal tracking systems that they use to ensure milk separation. One Gen X farmer we spoke with stated that with tracking, *"One of the things we're super sensitive to is making sure we stay on top of [documenting usage]. I created a book with anytime an animal gets treated with anything that has a withhold. So we put it in here. Anytime an animal gets sold or moved, we make sure we know exactly what's been in them."* Millennial famers tended to emphasize on-farm testing, with one millennial conventional farmer stating *"Well, there is a level of antibiotics in milk, you know. It's just whether it's met that [testing] threshold."* Several millennial farmers we spoke with highlighted the practice of *"always test[ing] it here until it's negative"* before returning a treated cow's milk to the bulk tank.

The tracking, testing, and required withhold time seems to have pushed some dairy farmers away from using antibiotics at all. One organic dairy farmer told us, *"Well we don't have to worry about contaminating our milk and our beef. We don't have to watch withholding times and so for that, that's a big thing. And mistakes happen"*, as antibiotic usage is prohibited in animals producing organically marketed products. But regardless of management practice or farmer age, farmers highlighted their efforts to minimize antibiotic usage. While the reasons to reduce antibiotic usage varied across farm size and practice, the outcome of reducing antibiotic usage remained consistent across the industry. Organic producers tended to align with the ideology of contaminant reduction (i.e. viewing antibiotics and pesticides as environmental contaminants), while large conventional farmers tended to mention economic reasons, and smaller conventional farmers identified their usage of non-antibiotic treatments like topical udder creams and probiotic treatments.

Continued on Page 13...

Other Dairy Pathways: Waste Milk, Manure, Mortality
To be clear, the total life cycle of an antibiotic can go in many directions other than into food products. Historically, these other pathways are less frequently studied and more poorly understood. We found extremely variable perceptions amongst farmers when discussing transport of antibiotic residue into waste milk, manure, and through mortality or carcass disposal, none of which have industry wide regulations.

The practice of feeding waste milk to calves and heifers is widespread across the industry. However, concern about transport of antibiotics with this milk is less consistent between farmers. Though we found variable perceptions and practices around feeding waste milk, there were no discernable differences between farm sizes or farmer ages, with high and low levels of concern present in each category. Some farmers explained nuanced approaches to feeding waste milk, recognizing that waste milk *"does have some [antibiotic] residue in it. So you can't use that milk for calves that we plan on selling"*. Other farmers have explained *"I'm not concerned about the level of antibiotics that would be in the waste milk, because we dilute that anyways with untreated milk".* The process of feeding waste milk to other animals cycles undegraded antibiotic residues back into livestock, which can be a cause for concern further down the line.

Some waste milk from antibiotic treated cows is disposed of with manure, rather than fed to animals, which pushes these residues to the transport pathway shared with manure. Some manure management systems reduce antibiotic residues and antibiotic resistant bacteria (e.g. high heat systems like aerobic composting, high temperature digestion, and bedding recovery units) while other systems transport these contaminants, unchanged, with manure (e.g. daily spreading). In our study, farmers were less likely to consider this transport pathway. Of those that did, organic farmers were more likely to consider this potential outlet, explaining *"it is in our manure…you give whatever to an animal, it comes out somewhere. It wasn't until [we went] organic that I realized about all the microscopic activity of a handful of soil"*, suggesting that manure with antibiotic residues may negatively interact with soil microbiota. Some conventional farmers explained their lower levels of concern by their usage rates*: "I don't use much…if we had tons of cows on it, I would be worried"*. None of the farmers we spoke with managed their manure specifically to reduce antibiotic residue and resistant bacteria transport.

Perhaps most interesting, none of the farmers we spoke with identified animal mortality and carcass disposal as a possible pathway of antibiotic residue into the environment. On dairy farms, farmers often reduce on-farm mortality by culling cows and selling them for beef rather than treating them multiple times with antibiotics. It is therefore possible that this reduction of on-farm mortality reduced attention to the topic. Some research has shown that the high temperatures achieved in mortality composting, when carried out effectively, can reduce residue and resistant bacteria concentrations.

There are many decisions that farmers take that can lead to reduced loading of antibiotics into the environment. Those decisions, though generally made to further another goal, lead to the reduction of antibiotics in the environment at each step of the dairy farm process. From cow and calf nutrition, comfort, and health to non-antibiotic treatments, bacteria testing, and waste management systems, incremental decisions contribute to reduced environmental antibiotic loadings. Other articles in this series delve into these topics and the nuances our interviews revealed.

Antibiotic Residue Sources: Anthropogenetic & Agricultural
It is important to highlight that dairy agriculture is not the only user of antibiotics nor contributor to antimicrobial resistance (AMR). Across conventionally managed agriculture, antibiotics are used to varying degrees, and even occasionally on organic farms. Human antibiotic usage also contributes to environmental antibiotic loads through discharge of our waste water treatment systems. Some wastewater sources, such as hospitals, contribute more concentrated streams, while others, such as individual septic systems, likely contribute far lower concentrations. However, tackling the growing threat of AMR requires actions taken from all contributors, rather than associating blame for environmental contamination on one sector over another. The rising global threat of antimicrobial resistance is a result of combined global antibiotic usage, across both agriculture and human applications. Understanding animal ag's evolving usage of antibiotics and working to inform both the ag and non-ag industry on this usage are good initial steps. Management decisions made by dairy farmers and animal ag can contribute positively to this effort, both locally and on a greater scale.

Photo credit: CCE NCRAT.

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Online Farm Financial Management Tuesdays: Farm Business Education in April, 2021

Short, farm financial education programs online this spring!

Join us online on April 13, 20 & 27, 2021 from 12:30 to 1:30 PM.

April 13, 2021, Assessing Farm Capital Investment Decisions: 12:30 – 1:30 PM EDT

$5.00 per person, which includes a link to the recorded webinar.

To register: https://caahp.ccext.net/civicrm/event/info?reset=1&id=122

Farm business owners and managers regularly spend money on capital items - equipment, buildings, and land. How do you know whether these investments are good financial decisions? Join CCE ENYCH Ag Business Educator, Elizabeth Higgins, and CAAHP Ag Business Educator, Dayton Maxwell, to learn methods for evaluating capital investment decisions.

April 20, 2021, Farm Business Transfer Planning: 12:30 – 1:30 PM EDT

$5.00 per person, which includes a link to the recorded webinar.

To register: https://caahp.ccext.net/civicrm/event/info?reset=1&id=123

Transferring a farm business to the next generation or to another owner is one of the most challenging and important activities a business owner will ever undertake. Maintaining business viability while meeting the needs of the exiting and entering members is paramount. Join Gabriel Gurley of New York FarmNet, for a one-hour program focused on initiating, planning and directing farm business transfer for your business.

April 27, Insurance and Liability Protection: 12:30 – 1:30 PM EDT

$5.00 per person, which includes a link to the recorded webinar.

To register: https://caahp.ccext.net/civicrm/event/info?reset=1&id=124

These days, the amount of money farm businesses spend on various types of insurance is staggering. At the end of the day, are these insurances and levels of insurance really necessary? Join CCE Central New York Dairy, Livestock & Field Crops Ag Business Educator, Nicole Tommell for a one-hour overview of insurance and liability protection with the goal of maximizing insurance effectiveness while balancing insurance costs.

This series is supported by agriculture business management specialists from these Cornell Cooperative Extension and Cornell University programs:

Capital Area Agriculture & Horticulture Program
Central New York Dairy
Livestock & Field Crops Team
Eastern NY Commercial Horticulture Program
NY FarmNet

Cornell Cooperative Extension | **Central New York Dairy, Livestock and Field Crops**

Digital Agri-Marketing

How Technology Can Boost Agricultural Sales

Dates: April 12, 26 and May 10
Time: 6:30pm - 8pm
Via Zoom
Click here to register.

Price: $10 per session or
$25 for all sessions

Marketing has transitioned from traditional methods to incorporating integrated online platforms. This course will focus on learning how to utilize technology and content creation to optimize a farms marketing presence. Join us for 3 sessions for an in depth look at the following topics:

Week 1: April 12 - **Basics of Facebook, QR Codes, Basic Website Platforms (WIX, WEEBLY, etc.), Google AdWords and Use of Instagram** - Myron Thurston, Ag Economic and Marketing Specialist CCE Madison

Week 2: April 26 - **E-Commerce (Meat Suite, Barn to Door, Shopify), Website payments (Stripe, PayPal, Venmo), FB Marketplace** - Laura Biasillo, Agricultural Economic Development Specialist, CCE Broome and Alicia Luhrssen-Zombeck, New Ventures, Fresh Markets & Community Coordinator, CCE Oneida

Week 3: May 10 - **Content Creation: Importance of good photos, videos, FB Live, graphic design, hashtags, incorporating virtual tours** – Melissa Jo Hill, Writer/ New Media Specialist, Cornell University / CALS / CCE

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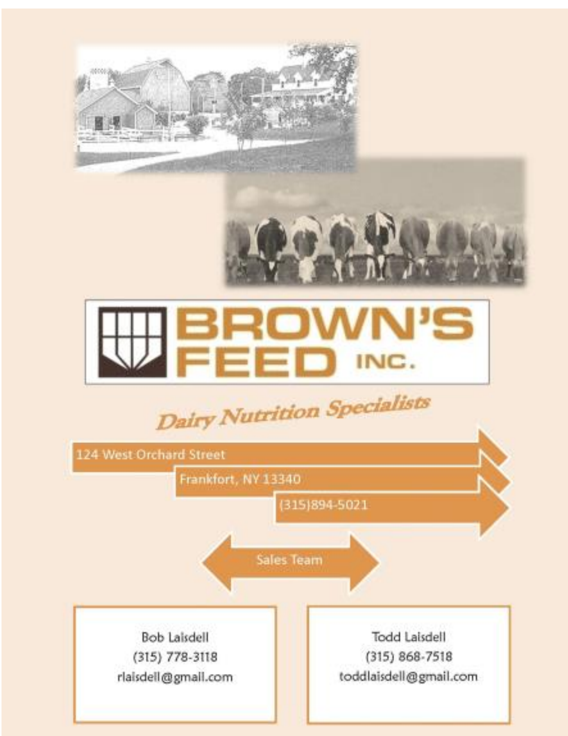

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What's Happening in the Ag Community

Due to COVID-19 social distance restrictions, all in-person CCE NCRAT programs have been postponed until further notice. Several virtual programs will be offered through the Fall and Winter. Also, check out our CCE NCRAT Blog and YouTube channel for up to date information and content.
Digital Agri-Marketing, see page 15 for more information.
Raising Pigs: From Piglet to Pork Chop, see page 11 for more information.
Online Farm Financial Tuesday, see page 14 for more information.