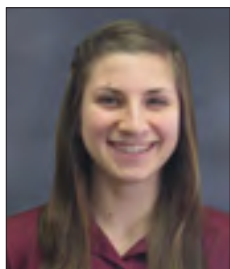


Understanding The Principles Of Calf Barn Ventilation



By Jessica Getschel, B.S.

Understanding the basic principles of calf barn ventilation is essential in evaluating the many different ventilation options available today. There is no single ventilation system that will work for every situation because each calf barn is unique in its structure and layout.

The goal of a properly designed ventilation system should be to provide clean, fresh air at all times for healthy calf development. Ventilation is responsible for removing accumulated heat, moisture, air borne pathogens and noxious gases from the animal's environment. These factors support the rationale behind ventilating year round, as moisture, pathogens and gases are constantly being released and a buildup of these factors leads to respiratory stress in calves.

Properly managing the following three basic principles of calf barn ventilation can ensure the best air quality possible for your calves:

- 1) Fresh air volume
- 2) Air speed at calf level
- 3) Fresh air distribution

Fresh Air Volume

The amount of fresh air entering the barn is called volume. Fresh air is introduced into a barn to remove and dilute accumulated heat, humidity, airborne pathogens and noxious gases. As the level of these air contaminants increase, so does the need for a greater volume of fresh air to achieve proper air quality. The rapidity at which this volume of fresh



Source: Crystal Creek®

air is introduced into the barn determines the air exchange rate. The length of time it takes for the complete volume of air contained in the barn to turn over once is called one air exchange. The recommended frequency of air exchanges will vary based upon the season.

In mechanically ventilated calf barns, the volume brought into the barn can be calculated by the fan output. Fan output is measured at a rate of cubic feet per minute. Adding the cubic feet per minute of every fan that draws fresh air into the barn will yield the total volume of fresh air coming into the barn per minute. It is necessary to know both the volume of fresh air coming in per minute and the total volume of the barn in order to calculate the total barn air

(Continued on Page 2)

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Understanding The Principles Of Calf Barn Ventilation

(Continued From The Cover)

Figure 1 AIR EXCHANGE CALCULATION

$$\frac{\text{Total fan output in CFM}}{\text{total barn volume in ft}^3} \times 60 \text{ minutes} = \text{barn air exchanges per hour}$$

EXAMPLE CALCULATION

Inlet Fans	CFM	Barn dimension: 40' x 100' x 12' (width/height/length) = 48,000 ft ³ of barn volume
A	5,200	
B	2,875	
C	2,875	
10,950 total CFM into barn		

$$\frac{10,950 \text{ CFM}}{48,000 \text{ ft}^3} \times 60 \text{ minutes} = 13.7 \text{ barn air exchanges per hour}$$

It is necessary to know both the volume of fresh air coming in per minute and the total volume of the barn in order to calculate the total barn air exchanges.

Source: Crystal Creek®

exchanges (Figure 1). Fans that are not directly tied to a source of fresh air, such as panel or basket fans, are considered recirculation fans. These fans are great at increasing air speeds and can help with heat abatement in the summer, but should not be counted when calculating the fresh air volume coming into the barn.

According to the University of Wisconsin School of Veterinary Medicine, properly ventilated calf barns should be experiencing four air exchanges in the winter, 10 to 20 air exchanges in the spring and fall, and 40 air exchanges in the summer.

The University of Wisconsin School of Veterinary Medicine also has volume recommendations based on calf stocking density. In the winter, they recommend 15 to 30 cubic feet per minute (cfm) of fresh air per calf. Unfortunately, in barns utilizing natural ventilation, there is no way to precisely quantify the volume of air brought into the barn due to inconsistent weather patterns and wind speeds.

Air Speed At Calf Level

Air speed is the measure of how fast the air is reaching the calves. Similar to air volume requirements, air speed recommendations change according to the

season. It is important to evaluate how air speeds change throughout the year, as rapid air that is necessary for heat abatement in the summer can cause a harmful draft in the winter. During cold weather, calves should not experience air speeds greater than 60 feet per minute. Summertime air speeds are less strictly guided, but experience shows that air speeds of 200 feet per minute or greater are necessary for heat abatement.

The hottest days often have little breeze and can cause heat stress. Opening the curtains in a naturally ventilated curtain sidewall barn is a great way to allow airflow. However, because this system relies on natural breezes, which can be erratic, these systems cannot provide the consistent air speeds found with mechanical fans.

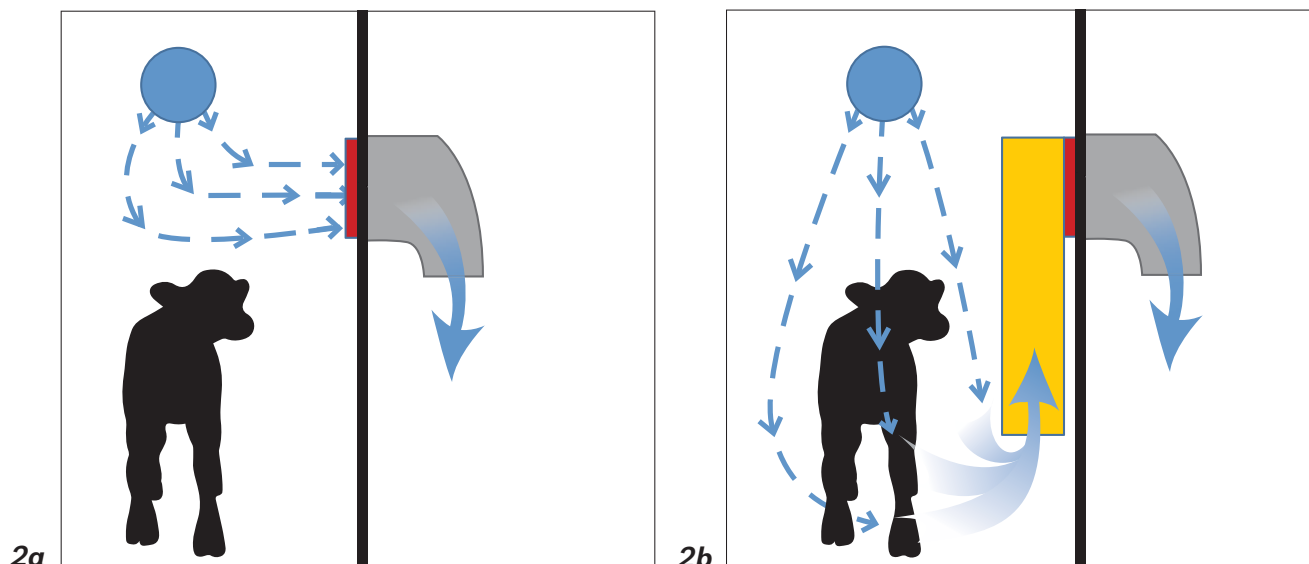
Fresh Air Distribution

Air distribution describes where the fresh air is delivered throughout the barn. The most important aspect of fresh air distribution is uniform delivery of fresh air throughout the barn at calf level. Many ventilation systems meet air volume and speed requirements but fail to deliver fresh air at the calf level due to obstructions in the barn. Air flow follows the path of least resistance, and an obstruction, such as a tall concrete knee wall or solid pen panel, can deflect air away from its intended target: your calves.

There are several techniques that can help direct air to the calf. Some ventilation systems operate with baffles in an effort to create obstructions above the calf, forcing the air to be redirected down to the calf level. Systems with positive pressure tubes can dictate the direction of fresh air by the location of the holes in the tube. Some calf raisers extend a box off the exhaust fan that reaches to calf height, pulling air directly from the calf environment (Figure 2). A plywood box placed over an exhaust fan will remove the bottom 3 to 4 feet of dirty air from the barn while also encouraging the fresh air from the positive pressure tube to flow down and through the calf level. When attaching a box to a fan, provide two square feet of inlet area for every 1,000 cfm to avoid reducing the fan's output.

Winter is the most difficult season to tell if fresh air is being distributed at the calf level, as a properly

Figure 2



A plywood box placed over an exhaust fan will help remove the bottom 3 to 4 feet of dirty air from the barn while also encouraging the fresh air from the positive pressure tube to flow down and through the calf level.

Source: Crystal Creek®

installed ventilation system should not show any visible signs of air movement, such as moving straw. To better assess airflow in the barn during winter, producers can use a fogging test as a visual tool (Figure 3). Introducing fog next to the intake of an outside fan will demonstrate the path outside air takes once it enters the barn. Producers can also introduce fog in the center of a barn to see where it exhausts and how quickly it disperses. The goal is to exhaust all fog within 15 minutes or less from the time it enters the barn. This test can also help identify areas of still air, known as dead spots.

A well-designed ventilation system that employs proper air volume, speed and distribution will benefit calf health by improving air quality. It will do this through the removal of accumulated heat, humidity, airborne pathogens and noxious gases. Understanding the principles behind calf barn ventilation will allow producers to critically evaluate the ventilation options available and ultimately enable them to provide the best air quality for their calves.

This article was originally published with the Progressive Dairyman Magazine at:
<https://www.progressivedairy.com/topics/calves-heifers/understanding-the-principles-of-calf-barn-ventilation>

Figure 3



Introducing fog next to the intake of an outside fan will demonstrate the path outside air takes once it enters the barn.

Source: Crystal Creek®

Improving Longevity In Your Dairy Herd



By Teresa Marker, B.S.

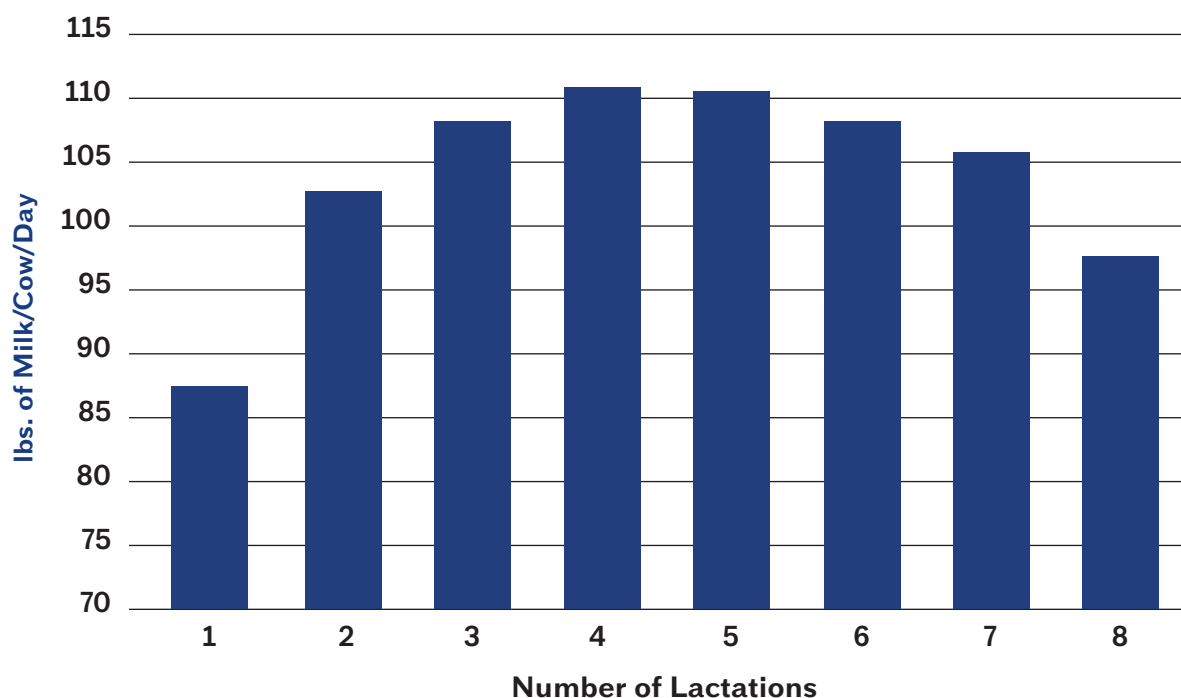
Healthy cows tend to stay in the herd longer. Currently, in the United States, the average productive lifetime for a dairy cow is 2.5 lactations. A cow does not mature until five years of age. Many cows are involuntarily

lost during the first two months of lactation. The majority of these animals are removed from the herd due to poor transitions, lameness, mastitis and reproductive issues. There are several ways to improve longevity of a dairy herd which will ultimately lead to improved milk production and profitability for the dairy farm. Strategies to improve longevity on the dairy farm include: cull based on parity, bring in less heifers every year, improve the transition into lactation, focus on colostrum management, feed quality forage, and provide proper nutrition for all groups.

Evaluate Culling Based On Parity/Bring In Less Heifers Every Year

Approximately 30-45% of cows in an average herd are replaced each year. Of those annual culls, 70-80% are avoidable. By improving the overall health of the herd, farmers can start to evaluate and cull cows based on parity. The chart below shows that cows have the most milk production potential during their 3rd, 4th and 5th lactations. Farmers may focus on bringing heifers into the herd for their genetic potential in milk production. The current industry average includes bringing in 35% of the herd as heifers. This practice helps bring in better genetics but it also decreases overall herd age and milk production potential. The sad truth is most cows are only staying in the herd for 2.5 lactations so they are not even getting close to showing us their true milking potential. Keeping older cows that are in their 3rd, 4th and

MILK PRODUCTION BY LACTATION



Keeping a higher proportion of cows that are in their third, fourth and fifth lactations means an increase in overall milk production.

Source: Dickrell, Jim. "Six Degrees of Separation". December, 2016. DairyHerd Management.

5th lactation can improve the average age of the herd and present a chance for improved milk production due to their increased milk production potential. Reducing the heifer percentage in the milk herd down to 20% can help to increase herd age and increase milk production. There are several ways to keep heifer percentage down to 20%. One way is to raise less heifers each year. This would also reduce heifer feed cost, labor and space requirements. Another option would be to freshen in all of the heifers and sell post-fresh heifers. This option would allow a producer to keep the calves with the most genetic potential.

Improve Transition Into Lactation

Involuntary culling in the first 60 days after freshening is damaging to the pocketbook. Research shows that this involuntary culling costs anywhere from \$500-\$1,500 per cow per year not including lost milk production or extra labor cost. The first step in improving the transition into lactation involves evaluating the prevalence of fresh cow diseases such as milk fever, ketosis, metritis, and mastitis. Establishing a baseline for where the herd is currently at will help in making a game plan for future changes. Work with a nutritionist and veterinarian to create a strategy that will set the cows up for success during their transition. Areas to look at include: dry cow diet, pen changes during the dry period, bunk management pre and post-fresh, fresh cow nutrition, post-fresh management/testing for ketosis, mycotoxins, and heat stress abatement. An improved transition into lactation will help keep cows in the herd longer, increase milk production and improve dairy farm profitability.

Colostrum Management

Proper colostrum management can have major long term benefits. Research shows that calves given 4 quarts of high quality colostrum versus those given only 2 quarts of colostrum have a 0.5 lb. higher average daily gain, breed 0.5 month sooner, produce over 2,200 lbs. more milk in the first and second lactations and are 12% more likely to survive past the 2nd lactation. Crystal Creek® recommends feeding 4 quarts of colostrum containing 200

grams of IgG within 4 hours after birth. If the calf experienced a difficult delivery, increase the grams of IgG given to 250 grams. Colostrum can be measured using a digital refractometer. The readout number corresponds to the grams of IgG (immunoglobulins) per quart of colostrum. See Crystal Creek's chart "Colostrum Reading" on page 35 of the 2018 Crystal Creek® Product Catalog.

Feed Quality Forage

A sound nutrition program starts with good quality forage. Harvesting forage at the right time is ideal but weather can have a major affect on harvesting plans. Using a quality inoculant, such as Inoc-U-Lock™ will help to control the fermentation process enabling the forages to ferment properly. Using Inoc-U-Lock™ can help reduce dry matter loss, nutrient loss and decrease the risk for mycotoxin growth in storage. Better quality feed will lead to improved milk production, healthier cows and ultimately more profit.

Provide Proper Nutrition

The Crystal Creek® Dairy Nutrition Model (CCDNM) focuses on raising healthy, durable animals to increase herd longevity. Our nutritionists encourage utilizing homegrown forages to minimize purchased products. The focus is not only on proper lactating cow nutrition, but also balancing rations for heifers and dry cows, setting the stage for a good transition. Many herds on the CCDNM have seen improvements in breeding, foot health, transition cow health, somatic cell counts and improved component numbers.

There are a number of ways to improve longevity in a dairy herd and the steps outlined above are good starting points. Evaluating your current management practices to retain animals that consistently perform at a higher efficiency will have a positive economic impact on your herd. Ultimately, increasing the age of the cows in the herd will lead to improved milk production and greater producer profitability. Contact the staff at Crystal Creek® for more information on ways we can help with improving your herd longevity.

Resources: "Why We Should Care About a Dairy Cow's Lifetime Productivity". December, 2014, Retrieved from: blog.delaval.com/dairy-farming/longlivethecows.

Straw: The Counterproductive Ingredient In Dry Cow Rations



By Erik Brettingen, B.S.

The Dry Cow Diet

The dry cow diet is arguably the most important ration on the dairy farm; setting the stage for a successful lactation. Cows that freshen with metabolic problems of ketosis, milk fever or a displaced abomasum cost

time and money to treat; often preventing the cow from reaching her full potential for that lactation. The goal of the dry cow diet is to limit these metabolic issues and support optimal health and rumen function going into lactation. Dry cow diets should be balanced with the following guidelines in mind:

1. Maximize dry matter intake.
2. Keep the DCAD low and minimize the risk of milk fever by providing the cow with feedstuffs low in calcium, potassium and other cations.
3. Balance the ration for moderate energy levels (0.65 to 0.67 Mcal/lb. Nel) to maintain a stable body condition and limit the risk of subclinical ketosis from weight gain.
4. Deliver crude protein levels of 12.5% to 13.5% to support fetal growth and milk production during lactation.
5. Provide adequate and balanced levels of vitamins and minerals, especially vitamin E and selenium for mammary recovery and development.

Why Is Straw Used In Dry Cow Diets

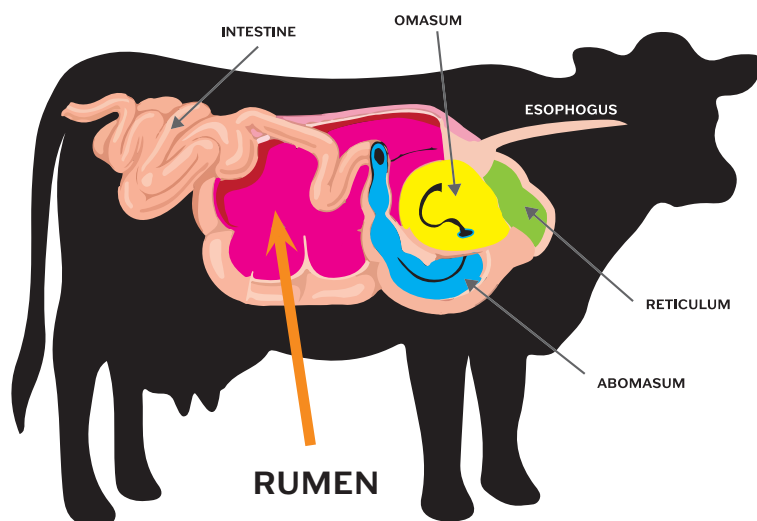
Straw is low in energy, calcium and potassium, while contributing to rumen fill. For these reasons, straw meets the requirements for dry cow rations quite well on paper. While being the perfect candidate for making a dry cow ration look good on paper, straw does not benefit rumen function. A common conventional dry cow diet consists of corn silage and straw along with supplemental protein, anionic salts, vitamins, minerals and corn. By feeding straw, which is essentially

devoid of sugar, protein, or digestible fiber, the physical space is taken up in the rumen but very little is being done to jump start rumen microbe health and productivity. Straw is extremely difficult to digest with high levels of indigestible Neutral Detergent Fiber. Rumen microbes are unable to break straw down. A typical dry cow diet consisting of corn silage and straw requires a high rate of supplemental protein which increases cost. Rumen microbes require digestible fiber, sugar, and soluble protein to proliferate.

Figure 1 GRASS HAY VS. STRAW

Requirements Needed by Rumen Microbes to Grow and Multiply	Grass Hay Provides	Straw Provides
Soluble Protein	+	-
Sugar	+	-
Carbohydrates	+	-

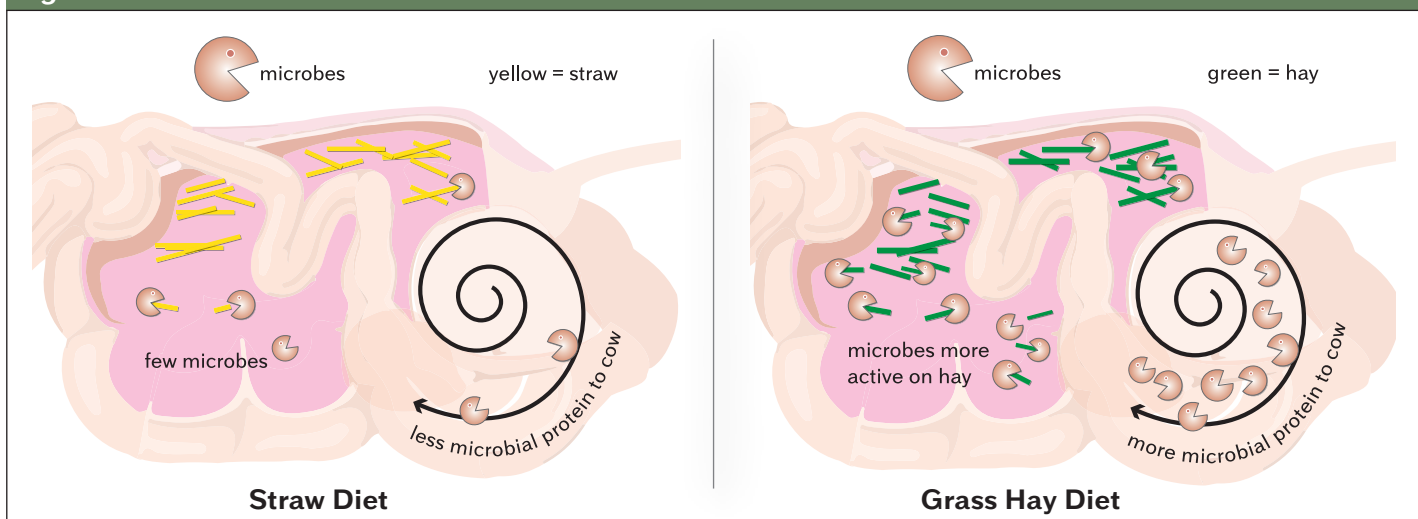
By replacing straw with a low calcium/ low potassium grass hay, the diet will deliver sugar, digestible fiber and protein to the rumen microbes (Figure 1). Rumen microbes utilize the grass hay to multiply, increasing the by-pass microbial protein to the cow which can reduce the amount of supplemental protein needed (Figure 2).



Source: Crystal Creek®

Figure 2

RUMEN MICROBE HEALTH AND PRODUCTIVITY



Source: Crystal Creek®

Grass Hay: The Better Alternative

Feeding grass hay to dry cows accomplishes many of the same goals as straw but does so while providing nutrients and benefitting the health of the rumen. Grass hay provides the adequate particle length to fill the rumen while also often being low in calcium and potassium. This rumen fill helps decrease the risk of a displaced abomasum, while providing a higher nutrient level of sugar and digestible fiber. The low level of cations often associated with grass hay decreases the risk of milk fever in fresh cows. Grass hay has a higher level of protein when compared to straw which keeps costs down by decreasing, or eliminating, the need for supplemental protein to be fed. In **Figure 3**, a dry cow ration formulated predominately with straw has been compared to a ration balanced with grass hay to show nutrient level and cost differences:

This cost savings can be a profit maker for dairies. An easy cost breakdown example is listed below:

Figure 3 DRY COW DIET GRASS HAY VS. STRAW

Ingredient	Crystal Creek Diet with Grass Hay	Conventional Diet with Straw
Corn Silage (DM lbs.)	10.50	12.23
Grass Hay (DM lbs.)	12.68	0
Soybean Meal 46% (DM lbs.)	2.61	3.02
Soy Chlor (DM lbs.)	0	2.02
Wheat Straw (DM lbs.)	0	7.13
Corn Grain (DM lbs.)	0	1.11
Crystal Creek Dry Cow Mineral (DM lbs.)	0.21	0.21
Calcium Carbonate (DM lbs.)	0.03	0.32
Total Dry Matter Intake	26.03	26.02
DCAD	2.20	-0.62
Crude Protein %	13.5	13.5
Energy Levels (Mcal/lb.)	0.66	0.66
Total Ration Cost (hd./day)	\$2.54	\$3.51
Savings from Grass Hay Diet	\$0.97/cow/day	

100 Dry Cows x 60 Days Dry x \$0.97 Cost Savings/Cow/Day

=

\$5820.00 Savings During Dry Period on Grass Hay Diet

(Continued on Page 8)

Straw: The Counterproductive Ingredient In Dry Cow Rations

(Continued From Page 7)

Aside from being a lower cost ration for the producer, the dry cow ration based on grass hay stimulates the rumen microbes and improves rumen health leading into lactation. Optimizing rumen function helps reduce stress on the fresh cow and allows her to utilize the lactating diet more efficiently.

A properly balanced dry cow ration that is formulated with the correct cation levels, energy and dry matter intakes, is crucial to the overall profitability on a dairy and will allow the

cow to transition easier into the new lactating diet. While straw may allow the diet to meet ration criteria easily on paper, grass is a much more appropriate choice that meets pre-fresh requirements while providing the beneficial nutrients of sugar and digestible fiber to feed the rumen microbes and improve rumen function going into lactation. Crystal Creek's strong focus on using grass hay to properly balance dry cow rations increases profitability. Contact a Crystal Creek® nutritionist to learn more or have a ration balanced for your farm.



Crystal Creek® Welcomes New Employee

Dr. Stephanie Hutsko joined the Crystal Creek® team in March, 2018 as a Poultry Nutritionist. Dr. Hutsko graduated from Michigan State University in 2011 with a B.S. in animal science, received her M.S. from Ohio State University in 2014, and obtained her PhD from Ohio State University in 2017 in Poultry Nutritional Immunology. Dr. Stephanie is excited to begin building relationships with Crystal Creek® poultry producers to help them grow their business with improved bird health and production in a sustainable manner.

Dr. Stephanie was born in Michigan, but has lived in Texas, Florida and Ohio before moving and settling down in northern Wisconsin. In her spare time, she enjoys riding her horse, Moses, going on hikes with her husband and two dogs, camping and kayaking.



Which test package do you recommend?"- Wondering in Wisconsin

is not required to balance a ration. NIR forage testing is less expensive and faster than other test methods. See the chart below for package costs.

If you suspect your feed is at risk for mycotoxins, Dairyland Labs now offers a new mycotoxin test called the *Complete 17*. This test checks for 17 different types of mycotoxins and has higher detection rates than other methods offered. A more economical approach is the *Any 4 Toxins* test. The four toxins that we recommend testing for are DON/Vomitoxin, Zearalenone, T2, and Fumonisin/B1.

- By Alex Austin, B.S.

Please submit your questions to: askthvet@crystalcreeknatural.com

A Poultry Success Story

By Stephanie Hutsko, PhD

Crystal Creek® has many customer success stories, one of which belongs to an organic family farm in upstate New York. This producer started on the Crystal Creek® Poultry Program approximately three years ago and currently has 9,913 brown layers. The birds were brought in as pullets at 18 weeks of age and are housed in an unheated, open barn with 15ft peaked roofs and curtain side walls. They are allowed access to the outdoor pasture at least one day every two weeks in the winter months, as is required for his free-range market. Feeding occurs once per day, by hand, and barn walkthroughs are performed about 10 times throughout the day to monitor floor eggs and bird health. Birds are weighed weekly and feed intakes are closely monitored. There are electric lights that are used to supplement the natural daylight to give the birds at least 16 hours of light.

The two main objectives this particular farmer had when he switched to the Crystal Creek® Poultry Program were to increase his egg production and therefore increase his net profit. His first flock of pullets were not properly debeaked and were too heavy, which led to a challenging and slow start, but the birds eventually bounced back and did surprisingly well. When his second batch of pullets arrived healthy, they were immediately started on the Crystal Creek® Poultry Program. The birds are being fed on a phase feeding protocol, which customizes the protein, calcium and energy inputs to the birds' stage of production. As the birds move from one phase to another, the diet caters to their ever-changing nutritional needs. This approach not only maximizes production throughout the laying cycle, but often results in lower feed costs and a higher return on investment.

High Performance Nutrition With Poultry-Pro®

The Crystal Creek® Poultry Program is customized to each flock based on ingredient availability, production type (i.e. organic vs. conventional) and breed of chicken. For this flock, the nutrition program was designed using organic ingredients within a soybean meal and corn-based diet. A

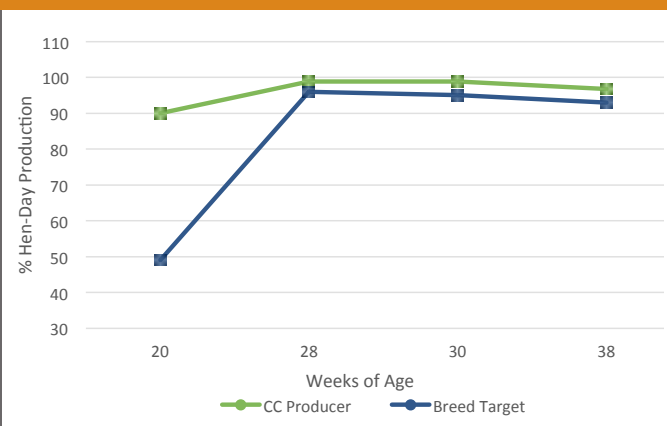
standard addition to any Crystal Creek® custom poultry diet is Poultry Pro® Mineral, which contains highly bioavailable minerals, increasing the nutritional value of the diet overall. This producer also supplements with Crystal Pellets™ to support consistent feed intake. With this supplement he also sees improved overall bird health and production and therefore feels that the combination of high-performance nutrition and the additional support of Crystal Pellets™ reduces his flock's risk of disease and allows him to remain an organic and antibiotic free production system.

Production Improvements

Hyline® brown layers, which is this producer's breed of choice, have certain production standards and targets. According to the published breed production chart, 20-week-old birds should be producing at a rate of 32-49%. During the peak phase of lay, which is generally between 28 and 30 weeks of age, the target rate of lay is 95-96%. Once on the Crystal Creek® Poultry Program, this flock's production rates skyrocketed, starting at 90% lay at only 20 weeks of age. Production continued to improve, with a peak production rate of 98.9% and a current production rate of 96.8% at 38 weeks of age. **Figure 1** compares the production curve of the flock on the Crystal Creek® Poultry

Figure 1

CRYSTAL CREEK® POULTRY PROGRAM PRODUCTION RATE VS. BREED STANDARD TARGETS



Source: Crystal Creek®

program to the breed standards, highlighting the fact that not only did the flock start peaking sooner, but they have been able to maintain higher production rates than breed standards.

Egg producers get top dollar from their buyers for large and extra-large eggs, as these are the sizes in highest consumer demand. Jumbo, medium and small sized eggs face a price penalty, making them less desirable to produce. According to the USDA Egg Market New Report¹, the price per dozen for organic, brown, free-range eggs ranges from \$1.65-\$1.75 for large, while mediums and smalls only receive \$0.54-\$0.94 per dozen eggs. That is over a dollar in additional income per dozen eggs simply based on egg size. This producer's flock produced an average of 98.2% large eggs over the course of the laying period, giving this farmer a profitable market for his eggs.

The organic, free-range markets that this farmer targets value richer, deeper egg yolk color, which is often based on the DSM YolkFan™. Consumers prefer to have a deeper yolk color, as this is often an indication of appropriate bird health and nutrition. The wholesale buyer values a deeper colored yolk as a possible indication of the birds having access to pasture. A deeper colored egg yolk can mean the potential for a higher retail price. This individual has seen an average of a 9 or 10 on his egg yolks on the DSM YolkFan™. As

shown, a 9 or 10 on the scale is a deep yellow, light orange.

Average mortality rates for these brown layers range from 1.5-3.5% for the year, but this flock is maintaining a 1% or below death loss. This is due in part to the addition of Crystal Pellets™ to the diet, which the producer supplements every day of the year. The addition of Crystal Pellets™ can improve digestion and overall intestinal health, which in turn leads to improved overall health as the intestine is the largest immune organ in the body. The active ingredients in Crystal Pellets™ have been shown to stimulate and enhance both innate and adaptive immune responses². After hearing of his successes, neighboring poultry producers have begun supplementing Crystal Creek's Whole Leaf Aloe Vera Juice through inline medicators into their water supply and have reported a consistent 2% increase in production.

Looking To The Future

This Crystal Creek® producer is also planning on reopening a mill in his community to better serve his neighbors locally. He credits his ability to reopen the community feed mill to the support he has gotten from Crystal Creek® and the improved net profit he has seen since beginning the Crystal Creek® Poultry Program.

Contact a Crystal Creek® poultry nutritionist to learn more about optimizing your flock's performance and the positive impact it could have on your net profit.

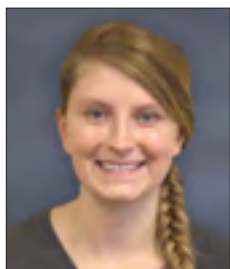
¹ Egg Market News Report, 2018. Retrieved from: ams.usda.gov/market-news/livestock-poultry-grain.

² Umar, S., Shah, M. A. A., Munir, M. T., Yaqoob, M., Fiaz, M., Anjum, S., Umar, W. "Synergistic effects of thymoquinone and curcumin on immune response and anti-viral activity against avian influenza virus (H9N2) in turkeys". *Poultry Science*, 95(7), 1513-1520.



Source: © DSM Nutritional Products

Interpreting Key Values Of A Forage Test



By Alex Austin, B.S.

Forage testing gives great insight into the quality and value of feedstuffs. Testing allows for a better understanding of the forage value, whether feeding it out or looking to sell. Understanding key feed test values can give a producer insight on how their current agronomy, harvesting and storage management plan is working.

Dry Matter

Dry Matter is what remains after all the moisture is removed from a feed. The Dry Matter (DM) value on a forage test can say a lot about how it was harvested. The DM of harvested forage coming off the field will affect the fermentation process; further impacting nutritional quality. Forage that is too dry does not pack well leaving excess air during the fermentation process. The presence of air increases the risk of mold and yeast growth in storage, as well as increasing further loss of dry matter and nutrients. Too much moisture in a forage can result in seepage, decreased storage life and increased risk of spoilage and/or butyric acid production. If forage has been harvested at a less than ideal DM content due to weather or other delays, using a quality forage inoculant such as Inoc-U-Lock™, will help retain

Figure 1 IDEAL DM VALUES	
Hay	88-90%
Cornsilage Bunker	35-30%
Cornsilage Bag	40-30%
Cornsilage Upright Concrete Silo	37-32%
Cornsilage Oxygen Limiting Silo	45-40%
Haylage	60-40%
High Moisture Corn	76-67%

See Sources 1 and 2

forage quality and save a minimum of 4% DM loss. If the DM value is too high or too low, poor palatability, reduced DMI and poor livestock performance can result. Proper harvest management is key for DM quality.

pH

The pH value is a measurement of acidity or alkalinity of a substance. The pH of a forage test gives insight into how well the forage has fermented. There are a number of factors that can affect a forage pH value such as ash content, % DM and inoculant use. It can take three weeks or more for silages to reach a pH of < 4 with unassisted fermentation. Some forages may never reach the targeted pH. This can lead to mold, yeast and mycotoxins, loss of dry matter, decreased palatability and loss of feed quality. Using Inoc-U-Lock™ can be a great tool on any fermented feed stuffs. Inoc-U-Lock™ will accelerate the fermentation process in a controlled manner, dropping the pH to insure stability during storage.

Protein

There are several key protein values to consider:

1. Crude Protein: The total protein in a feed, which can indicate plant maturity at harvest.
2. Adjusted Crude Protein: A low Adjusted Crude Protein level can indicate if damage occurred during fermentation from improper heating resulting in a protein loss.
3. Soluble Protein: This protein is readily available to rumen microbes and a key component for good dairy cow nutrition.

Fiber

There are different values on the forage test report that show fiber levels:

1. NDF (Neutral Detergent Fiber): The residue left after boiling forage in a neutral detergent is called NDF. NDF represents the indigestible and slowly digestible components of the cell wall. This includes cellulose, hemicellulose, lignin, and ash. NDF can be further broken down into NDFa, NDFom and dNDF.
2. ADF (Acid Detergent Fiber): ADF measures cellulose, lignin and ash. This measurement is obtained by boiling forage in acid detergent. ADF is the least digestible form of forage.

Protein and fiber values can depend on plant variety, disease/insect management and the timing of harvesting and storage practices. Selecting a plant variety suitable for your area and climate will insure high quality forage.

Protein and fiber are also a reflection of any disease/insect pressure and crop management. Later cuttings will have higher fiber and lower protein readings and earlier cuttings will have lower fiber and higher protein readings. Cutting too late will not only decrease the forage quality but can impact plant recovery. For example, if alfalfa is allowed to flower before cutting, the plant will use up a majority of root reserves to enter its reproductive phase. Using up the root reserves will cause slower plant recovery and re-growth. Using Inoc-U-Lock™ can help insure proper storage and fermentation by retaining an additional 1% or more in protein.

Sugar (WSC)

The two methods used for measuring sugar content in a forage are ESC (Ethanol Soluble Carbs) and WSC (Water Soluble Carbs). WSC is the preferred measurement method because it evaluates all sugars relevant to ruminant digestion including monosaccharides, disaccharides, oligosaccharides, and fructans, whereas, ESC only shows a small fraction of the fructans³.

Sugar values reflect harvest and storage management. If the sugar is low, the crop may have been rained on after cutting or the fermentation process may not have gone well. If fermentation was too slow or never reached the desired pH, a large amount of the forage sugar will be used up by microbes, resulting in a poorer feed quality.

Ash

The amount of total mineral that remains after all organic matter is burned off when the sample is tested is called ash. High ash content can decrease palatability. Ideally, ash content should be less than 10%. Levels higher than this can indicate an excess of dirt on the forage at harvest. Merging or raking techniques and cutting too low can increase the ash content.

Calcium

Calcium is a key macro mineral that can affect smooth muscle and skeletal muscle functions in cows as well as general body function and production. Calcium values in forages can be an indicator of overall nutrient density of the plant. For example, high calcium uptake in alfalfa can result in higher trace mineral levels, sugar levels, protein, and increase yield/acre.

Calcium in the soil can help with water penetration and plays a vital role in soil structure. Adequate soluble calcium in the soil can support healthy, nutrient dense forages that are excellent feed for livestock. In plants, calcium is essential for plant growth and formation of cell walls. Calcium levels in forages can vary geographically. Western alfalfa often has levels around 1.8 to 2.0%, whereas alfalfa from the Midwest often has calcium levels around 1.0 to 1.2%.

There are many factors and strategies that can be implemented to help provide nutrient dense forages for livestock. Using good agronomy, harvest and storage management practices are crucial to producing valuable feedstuffs. Providing quality feedstuffs to livestock can help improve animal health and overall producer profitability.

Quality forage starts with soil fertility. Soil sampling can help properly manage and maintain a healthy, nutrient rich soil that will yield quality forage. Forage quality can also be manipulated by selecting the best plant varieties for the producer's situation and goals.

When harvesting, producers should make sure crops are not cut too low. Cut for quality not quantity. Minimize dirt being stirred up in the forage when raking or merging. Keeping soil off forages will decrease ash levels and potentially harmful bacteria.

Storage management is important in creating an ideal environment for fermentation. Monitoring dry matter levels and proper packing will result in an improved feed stuff. Using a quality inoculant can help preserve forage quality by retaining up to 4-10% of DM and up to 1% protein.

Taking a deeper look at forage test results can give producers a better understanding of the forage quality and the management of the crop in general. Using these tips can help produce quality forages reducing the need to purchase additional supplements. To learn more about forage testing, call Crystal Creek® at 1-888-376-6777.

¹ Israelsen, Clark, et al. "Harvesting Corn Silage by Plant Moisture". Utah State University Extension. December, 2009.

² Gay, Susan W., et al. "Determining Forage Moisture Concentration". Virginia Tech Publications.

³ *Understanding your results*. Dairyland Laboratories, Inc., Retrieved from: www.dairylandlabs.com/feed-and-forage/understanding-your-results/wsc-water-soluble-carbohydrates.

Electrolyte Use



By Kelly Hubert, B.S.

Electrolytes are an important tool to use when supporting scouring and dehydrated calves. Scours are the leading cause of death in young calves, primarily because scours cause calves to rapidly dehydrate. It is important to monitor calves daily and treat them quickly when needed.

A calf needs to receive 10% of its body weight in fluids each day for maintenance, while a growing calf will require even more¹. Scouring calves need the calories from milk feedings as well as the extra fluids and nutrition that electrolytes provide. Electrolytes should be fed between the normal milk feedings. Mixing milk and electrolytes together interferes with the clotting mechanism of the milk and is not recommended¹. It is best to start with a higher feeding rate of electrolytes and reduce it as the calf's condition improves. If a calf is not drinking on its own, the use of an esophageal feeder may be required.

There are two main types of scours: nutritional and pathogenic. Nutritional scours are caused by changes to the calves' diet such as a change in milk solids, temperature, volume or a change in the feeding schedule². If milk replacer is being fed, producers can inadvertently cause scours by varying the solids concentration of the mix. Sometimes calf feeders will add extra milk replacer powder to the mix in effort to produce additional calories during cold weather. This will negatively alter total solids percentage of the mix, often leading to scours. Optimal total solids concentrations for milk or milk replacer solutions are 12.5%- 14%. Remember to keep mixing procedures, temperature, and time consistent to help prevent gastrointestinal upset. Another important protection against scours is feeding an adequate amount of colostrum in a timely fashion. Four quarts of colostrum should be fed to a newborn calf within four hours. It is important to test colostrum to ensure it has a level of 200 grams IgG or above. Proper freezing and thawing practices should be reviewed with all personnel responsible for calf care.

Pathogenic scours are caused by bacteria, protozoa, or viruses. Infection occurs from contact with other calves, equipment or through the environment.

Working with a veterinarian will help to determine the type of scours calves are experiencing. Fecal samples can be taken to diagnose the type of scours. It is important to help reduce exposure to pathogens by bedding with 25 pounds of long stem wheat straw everyday for every 1,000 pounds of calf bodyweight. Proper cleaning and sanitizing of feeding equipment, hutches or pens, and barns is essential for calf health. A vaccination protocol should be discussed with a veterinarian to determine the best plan for each farm. Proper ventilation can also be helpful in reducing respiratory issues in calves. Crystal Creek[®] has several effective supplements that support calves experiencing dehydration and scours.

Calf 180[®] is a dietary supplement providing electrolytes, fibers, and vitamins for pre-weaned calves. This product contains plant pectins, which help to firm up the stool. While pectins are beneficial for the majority of calf scour cases, they are not recommended for calves with *E. coli* or *Salmonella* scours. For *E.coli* and *Salmonella* scours, the bacteria need to be shed out of the calves' digestive system rapidly, so an electrolyte without pectins such as Replena-Lytes[®] is a better choice.

Replena-Lytes[®] is another dietary supplement providing a source of electrolytes and energy for calves needing extra nutrition. It is a balanced and proven formulation of highly available ingredients to provide dietary support to dehydrated calves. Replena-Lytes[®] helps to counteract dehydration and increase nutrient absorption.

Providing proper hydration can help shorten the severity and duration of calf scours. Consider the type of electrolyte best suited for the variety of scours being experienced. When caring for a scouring calf, remember to add extra feedings of electrolytes in addition to the normal milk feedings. Electrolytes should be fed independent of the milk and not mixed in with the milk. It is imperative to keep feeding time, volume, temperature and milk solids consistent. Lastly, remember that electrolyte therapy needs to be paired with a prevention plan to address the cause of the scours.

¹ Lewis, Roy. "Electrolyte Replacement Best Treatment for Scouring Calves." *The Western Producer*, 30 Jan. 2013.

² *Electrolytes for Dairy Calves*. Retrieved from: www.extension.psu.edu/electrolytes-for-dairy-calves.



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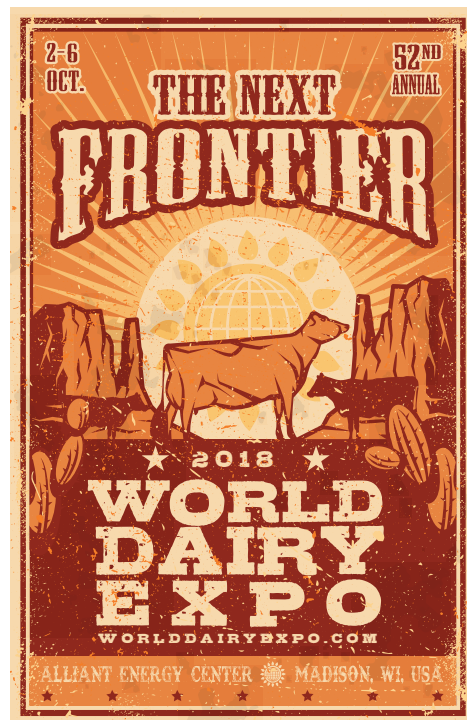
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