Considerations for a heifer lung-scanning program

Tabby Steckler Hurst and **Conor McCabe** for *Progressive Dairy*

AT A GLANCE

Using clinical signs to diagnose BRD is not the most reliable method. Using regular lung scanning and a scoring system can help dairies be more effective at raising the healthiest calves.

Thousands of dollars are invested in every heifer from the point of birth to her first calving. With this in mind, a 100-cow dairy will invest nearly $112,000 a year, and a 1,000-cow dairy will put down over a million dollars. Due to these investments, only the right heifers should be selected to serve as herd replacements.

Bovine respiratory disease (BRD) is one of the main diseases that impact growing heifers, with over a third of the herd being treated for BRD before their first freshening. Animals diagnosed with this disease experience reduced growth rates, increased days to first pregnancy and less milk through the first lactation. Not to mention, a 2017 study from Cornell University reported that heifers with lung damage in early life had a 12% higher cull rate after their first year over their healthy pen mates. Therefore, keeping those sick heifers around leads to increased investments in raising the next generation.

Currently, BRD is mainly diagnosed by clinical signs including cough, fever and droopy appearance. However, all these metrics are qualitative, and definitions can change between the person diagnosing calves.

One new opportunity is the use of lung-scanning technology. This method assigns clinical lung scores based on lung damage and can help managers make more accurate culling decisions. Although there are numerous benefits for using this technology, several considerations about how to make it profitable, accessible and practical need to be solved before it is widely implemented on farms.

Lung-scanning machine

Lung scanning is a diagnostic tool used to identify respiratory disease using ultrasound imaging of animal lung tissue. Ultrasound waves travel through the animal's skin and onto the outermost layer of the lung. These waves bounce back to create a picture of the animal's lung. Visuals of lung scanning can identify abnormalities since unhealthy tissue (fluid-filled, bacteria cells, pus, etc.) reflects light differently compared to healthy lung tissue (air-filled).

Historically, BRD has been diagnosed in calves that present clinical disease signs. Since cattle are prey animals, they tend to hide their illnesses. Due to this, farmers are not always able to accurately diagnose and treat BRD. A 2016 study by Ollivett and Buczinski found a subclinical BRD herd prevalence rate ranging from 23%-67%. Compared to visual diagnosis based on symptoms, lung scanning provides a definitive picture of the lung and allows farmers to better identify animals with subclinical BRD.

Lung-scanning score system

Lung damage varies in size and severity. To describe this variation, producers can use a 6-point scoring system assigned to each lung. The size of lung tissue damage can impact calves differently, but in general, animals with a higher score reflect more severe lung damage covering a larger tissue area. An example of a lung-scoring system continuum with score 1 (healthy lung tissue) on the top and score 6 (high lung damage) on the bottom is shown to the right.

Calves identified with lung damage have both immediate and long-term implications. In the short term, calves have reduced growth and average daily gain (ADG) through first conception.

Lung-scanning data I collected on 274 dairy calves from one commercial farm revealed that calves with double-sided lung damage (a score greater than 4) during the first 60 days of life had a 30-pound reduction in bodyweight. Post-weaning (60 days to 5.5 months old), calves with unhealthy lungs on the same farm had over a 75-pound reduction in weight gain. These implications can also be long term as these calves have an increased risk of being culled from the herd and have lower herd performance compared to their herdmates.

Considerations to make in a lung-scanning program

Even though there are major economic, production and welfare implications for calves with lung damage, this technology has yet to be a common diagnostic tool on commercial dairy farms. According to a survey from the Indiana Dairy Producers (IDP) 2021 Dairy Forum, nearly 80% of participants had heard of lung scanning. However, identified barriers to adoption included: time to scan, labor allocation, cost, when to implement in the heifer raising cycle and knowledge-use gaps. The following will try to address some of these concerns and explain what should be considered when looking to start a lung-scanning program on a farm.

1 *Keep accurate treatment records*
When considering lung-scanning technology as a management practice on your farm, first consider if the farm keeps records of BRD treatment rates and calf bodyweight. According to the same survey from the IDP forum, 45% of farms routinely tracked antibiotic treatment rates and 40% of farms routinely tracked weight records. Farms cannot decipher if they have BRD issues if they do not keep accurate farm records, so these must be correctly recorded before any lung-scanning program is implemented.

2 *Time and cost allocation*
Throughout the heifer growing phase, calves are run through a chute system when vaccinated or weighed. With an experienced technician, lung scanning can be performed in this time frame in two to three minutes or less. Minimizing stress on the animal and the number of times it needs to be handled can be a benefit of weighing and lung scanning calves at the same time.

While time allocation is a big issue, the cost of lung scanning is equivalent to having a veterinarian pregnancy test cattle. For a 1,000-cow dairy, if lung scanning is implemented one time for each heifer on the farm, it only takes retaining or removing two additional heifers to justify using this technology. With training, the technique can be taught to on-farm personnel if a farm has access to the same type of ultrasound used for pregnancy testing. Although practice kinks need to be worked out for each farm, the overlap of lung scanning with other on-farm daily routines makes multiple opportunities for implementation.

3 *Treat the right animals*
Every farm has different management styles, so upon implementing lung scanning, calves should be scanned weekly to determine when they are most susceptible to lung damage. Once this baseline is established, calves could be scanned at the critical timepoints of 3-5 weeks old, at weaning or when leaving for a heifer raiser.

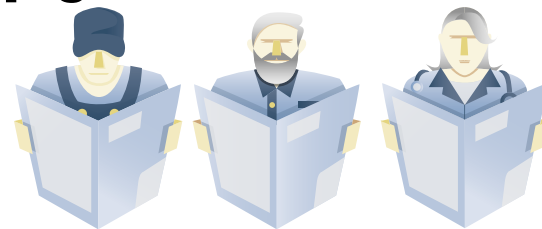By scanning calves between 3-5 weeks old, producers can treat

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calves based on their lung-scan scores instead of clinical signs alone. The 23%-67% herd subclinical BRD rate described by Ollivett could be drastically reduced with implementing this technology. In some cases, there are also instances where calves will present signs of clinical illness but don't have BRD (false positives). Therefore, this technology allows farms to treat only the calves that would benefit from it.

4 *Pen movement and culling decisions*
Along with animal health status and weight, lung scanning is also a beneficial way to group calves at weaning. At this time point, calves with unhealthy lungs and similar weights could be grouped together and given optimal housing conditions. Some calves, if treated early, can recover fully from this disease and regain normal lung function. Several weeks after regrouping, these calves could be rescanned to determine current lung damage before making culling decisions.

Outside of weaning, the time at which heifers are sent to a grower can be another key point to make your culling decisions. Unfortunately, lung damage in some heifers will not heal, and since heifers with lung damage have reduced growth and production at the time of diagnosis and later in life, it does not make economic sense to raise them as replacement heifers. By implementing lung scanning as another piece of information in culling decisions, it can help make the decision about which heifers to keep for the future of your herd.

Future of lung scanning
Lung scanning remains one of the greatest emerging technologies on farms today, with the possibility to help dairies reduce antibiotic use, treat the right heifers and make better-informed culling decisions. While there are still some producer questions surrounding lung-scanning implementation, increased industry awareness, improved ultrasound affordability and research on timely lung scanning timepoints are bound to make it more accessible for the heifer-raising cycle. ✐

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Lung scoring system

Lung scoring system continuum ranges from a score of 1 (healthy lung tissue; top) to a 6 (severely unhealthy lung tissue; bottom). Each calf lung scores differently based on size/severity of lung tissue damage. Using this scoring system, a score of 4, 5, and 6 are considered lung damage. Research has suggested that calves with lung damage have lower performance in growth rate and milk production.

Score	Description	Lung scan score photo
1	Healthy lung tissue: The outer lung lining is represented by the illuminated horizontal white line spanning the entire machine screen.	
2	Comet tails represent a slight disruption in the outer lung tissue lining. They are similar to scratches and do not cause any performance differences.	
3	An increased number of comet tails are viewed when scanning compared to a score of a 2.	
4	Lung lesion reaches the size of a penny to a quarter in diameter.	
5	Lung lesion spans half to three-quarters the length of the machine screen.	
6	The lung lesion spans the entire length of the machine.	

Images provided by Tabby Steckler Hurst.