

Francis Lindauer and Sons Dairy Farm

Lung Scanning Data Collection 7/31/2020 to 1/22/2022

Total Number of Individual animals Lung Scanned: 232

- 159 animals scanned for growth data
- 74 animals scanned over multiple weeks for lung damage observation over time

Birthweight

- # of calves with Birthweight: 122
- Average birthweight: 98 pounds
- Minimum birthweight: 65 pounds
- Maximum birthweight: 126 pounds
- No effect of birthweight on the calves' chance to obtain lung damage

Respiratory Disease

- 75 of 232 calves treated for respiratory = 32%
- Average age of treatment: 73 days
- Calves treated 0-60 d old (only antibiotic treatment with resflor)
 - 40% of the calves who were treated
 - Average age of calves treated in this period: 40 days
- Calves treated 61 days and older
 - 60% of the calves who were treated
 - Average age of calves treated in this period: 94 days
- Percentage of calves with lung damage at or after 60 d old (132 heifers)
 - No lung damage: 67%
 - Single side lung damage: 13%
 - Double side lung damage: 20%
 - 15% of heifers had a 5 or 6 on one or both sides of lungs

Growth Measurements

- ~3 Week Lung Scoring Results (104 heifers)

Score	Age	Weight	ADG	% of animals
1	23	120	0.91629	26.92%
2	23	122	0.907219	41.35%
3	24	121	0.996975	11.54%
4	24	124	0.636158	14.42%
5	21	120	.	3.85%
6	.	.	.	0.96%

Lung Condition	Age	Weight	ADG	% of animals
No Damage	23	121	0.92	80%
Single Side	24	125	0.64	13%
Double Side	23	117	0.97	6%

- ADG of calves at or after 60 d old (132 heifers) broken into individual scores

Score	Average Age	Weight	ADG	% of Animals
1	72	204	1.46	6%
2	73	213	1.55	38%
3	71	199	1.39	23%
4	69	195	1.34	17%
5	74	189	1.25	9%
6	79	189	1.22	7%

Lung Condition	Average Age	Weight	ADG	% of Animals
No Damage	72	207	1.53	67%
Single Side	73	211	1.52	13%
Double Side	72	180	1.14	20%

- Heifers at Hunley Creek
 - 50 heifer's lungs scanned after arriving at Hunley Creek
 - 3 heifers had lung damage (6%)
 - Lung damage can heal over time
 - Lung damage is not always a set score but a continuum that progresses to higher scores and goes to lower scores over time
 - What are the affects left behind after lung damage heals?
 - Thoughts on heifer growth

- When heifers were scanned on arrival there was a difference in ADG and ~70-pound reduction in weight
- However, as animals grew, the inverse occurred and there was an increase in weight and ADG of animals who had lung damage at weaning.
 - This could be the case for several reason
 1. Animals were on a different diet which basically allowed ad libitum consumption once arriving
 2. Not enough number strength to support the findings

Heifer Growth Measurements at Hunley Creek				
Lung Condition	ADG from Weaning to Hunley Creek	Weight	Age	% of Animals at Weaning
Heifers between 300-400 D (39 Heifers)				
No Lung Damage	1.97	817	378	77%
Lung Damage	1.85	749	379	23%
Heifers between 400-500 D (16 Heifers)				
No Lung Damage	1.99	929	435	81%
Lung Damage	1.88	987	486	19%
Heifers between 500-600 D (44)				
No Lung Damage	1.73	975	531	64%
Lung Damage	1.91	1069	528	36%

Heifers Lung Scanned Over Time

- The first scan was within the first week of entering group housing
- All calves included were scanned at least 3 times (56 heifers)
 - 3 were treated prior to entering the first group pen
 - 8 were treated after leaving the first group pen
 - 5 did not have lung damage prior to leaving the first group pen
 - 3 had at least one scan with lung damage prior to leaving the first pen
 - 11 were treated during the first group pen
 - Average age of treatment in this group was 11 days after calves entered group housing
- The highest amount of lung damage was seen at the 2nd lung scan after entering the group housing system
- 10 Heifers scanned over time (producer was advised to monitored calves with lung damage after 2nd scan and treat with antibiotics)

- 8/10 lung damage 2nd scan
- 3/10 lung damage 4th scan

Survival to first breeding

- 13 calves died out of 232 calves scanned
 - 5.6% death rate

Heifer Breeding

- 74 who went through the lung scanning program had been bred as of January 2022
- **Breeding Age**
 - 62 heifers had weaning lung scans and their first breeding date

Lung Scores by Side (>4 is Lung Damage)	% of Heifers	Breeding Age (days)
No Lung Damage	68%	466
Single Side Lung Damage	14%	474
Double Side Lung Damage	18%	469

Score (on one or both sides)	% of Heifers	Breeding Age (days)
1 to 3	68%	466
4	16%	469
5 or 6	16%	473

- Pregnancy to First Service
 - 47 heifers had weaning lung scans and were confirmed pregnant/not pregnant at first service
 - 36% total pregnancy to first service

Lung Scores by Side (>4 is Lung Damage)	% of Heifer in Category	1st Service Conception Rate
No Lung Damage	60%	36%
Single Sided Lung Damage	19%	67%
Double Side Lung Damage	21%	10%

Score (on one or both sides)	% of Heifer in Category	1st Service Conception Rate
1 to 3	60%	36%
4	19%	56%
5 or 6	21%	20%

Antibiotic Treatment	% of Heifer in Category	1st Service Conception Rate
Not Treated	66%	48%
Treated	34%	13%

- Conception Age
 - 29 heifers had weaning lung scans and were confirmed pregnant
 - Age of conception was calculated based on days pregnant at pregnancy check
 - If you compare animals treated for respiratory disease with antibiotics to their age at conception
 - Not Treated: 482 days
 - Treated: 481 days

Lung Scores by Side (>4 is Lung Damage)	% of Heifers	Conception Age (days)
No Lung Damage	55%	479
Single Side Lung Damage	28%	485
Double Side Lung Damage	17%	485

Score (on one or both sides)	% of Heifers	Conception Age (days)
1 to 3	55%	479 (15.7 months)
4	24%	470 (15.4 months)
5 or 6	21%	503 (16.5 months)

Thoughts based on the year of lung scanning

1. Lung Scanning Timepoints
 - a. 3-week lung scan
 - i. Not many calves were being diagnosed with respiratory disease while calves were in the hutches
 - ii. If calves were sick, they showed more visible signs of respiratory disease
 - iii. Weight and ADG were not impacted by the lung scores during this phase
 - b. Weaning/Post-weaning
 - i. There was a difference in weight and ADG at weaning of calves specifically with lung scores of 5 or 6 or lung damage on both sides of their lungs
 - ii. First group pens around old milk parlor
 1. Calves are getting lung damage during this time period especially during large temperature changes but they are not showing visible symptoms
 - a. The majority of lung damage is seen on the 2 weeks after entering this group housing
 - b. 40% of calves treated up to 61 days of age
 - iii. Second group pens, old barn with dry cows etc.
 1. Some calves leaving with residual lung damage from first group pens and visual symptoms are showing up later in age
 - a. 60% of calves are treated after 61 days old with an average of 94 days old
2. The most ideal time period to lung scan calves to most accurately diagnose disease during these timepoints would be 2 weeks after entering the first group housing system.
 - i. Catch those subclinical calves with lung damage early and have fewer animals entering the next phases with lung damage
 - b. Areas of improvement to reduce lung damage in the group housing phase
 - i. Consider intranasal vaccination prior or at grouping (talk with veterinarian) to help with viral spread of respiratory disease. Calves in hutches are in their own individual biome, so when they are grouped together, they are sharing germs even if from one hutch down.
 - ii. Consider monitoring ventilation especially during the times of year with large weather changes
 1. Lung scans of calves increased when curtains were down in the group pens by old milk parlor, consider starting a group with the curtains up to see how calves adjust
 2. Calves in old barn by dry cows during the summer months have increase amount of lung damage.
3. Thoughts on heifer growth

- i. When heifers were scanned on arrival there was a difference in ADG and ~70-pound reduction in weight
 - ii. However, as animals grew, the inverse occurred and there was an increase in weight and ADG of animals who had lung damage at weaning.
 - 1. This could be the case for several reasons
 - a. Animals were on a different diet which basically allowed ad libitum consumption once arriving
 - b. Heifers who have lung damage focus their energy on weight gain instead of reproductive purposes
 - c. Not enough number strength to support the findings
- 4. Summary of Heifer Breeding
 - a. There was not a major difference in heifer age at first breeding
 - b. 1st service conception rate shows how many heifers are getting pregnant off the first AI
 - i. All scenarios showed that heifers who were treated for respiratory or had a large amount of lung damage had a lower 1st service conception percentage
 - ii. If heifers had lung damage on a single side or scored a 4 they had a higher first service conception rate
 - 1. 9 heifers in analysis
 - 2. Single sided lung damage and score of 4 does not affect future heifer productivity
 - c. When analyzing age at conception and calves with lung damage on a single side versus both sides had a 6-day increased age of conception. When looking at individual scores, calves who score a 5 or 6 on one or both sides of their lungs had up to 33-day differences in age at conception. Therefore, focus on those animals who have lung score of 5 or 6.
- 5. What is the most ideal time to lung scan calves and cull animals based on lung score?
 - a. Neither 3 weeks or weaning should be the time in which animals are identified for culling. Because lung damage can change over time (proved by the calves scanned over time and pictures) the farm may not accurately identify the correct animals to cull.
 - i. Suggestion: lung scan calves when you are vaccinating to identify those who should be kept for replacement heifers and those who should be culled
 - ii. Because lung damage can heal over time and the animals will adapt and grow efficiently but not reproduce efficiently you could consider putting those heifers with a 5 or 6 score in a feed lot scenario instead breeding them as a replacement heifer.

Averages

2018 Study: Preweaned heifer management on US dairy operations: Part VI. Factors associated with average daily gain in preweaned dairy heifer calves

Parameter	Average
Birth Weight	95 lb.
Weaning Weight	200 lb.
Preweaning weight gain	106 lb.
Age at weaning	65 days
ADG	1.63 lb./day

104,100 BRD animals diagnosed up to 120 d (Overton, 2019)

- Average antibiotic treatment rate: 36%

Breeding and Lung Damage

- Age at first calving
- Pregnancy to first service

Table 1. Age at first breeding; age at first calving; gestation length; offspring weight; and percentage of pregnancy to first service, abortion, stillbirth, twins, and assisted parturition when thoracic ultrasonography was performed at 60 d of life and heifers were classified as having no lung consolidation (only clear pleural surfaces or comet tails were observed) or lung consolidation (any detectable consolidation in one or more lung lobes)

Item	No lung consolidation [Mean (SE)]	Lung consolidation [Mean (SE)]	<i>P</i> -value
Age at first breeding (d)	386.7 (0.6)	386.0 (1.0)	0.42
Age at first calving (d)	679.8 (1.4)	687.4 (2.0)	0.04
Gestation length (d)	277.6 (0.2)	277.2 (0.5)	0.48
Offspring weight (kg)	37.5 (0.2)	37.4 (0.5)	0.76
Pregnancy to first service (%)	62.0	52.5	0.06
Abortion (%)	2.2	2.9	0.63
Stillbirth (%)	6.9	9.1	0.12
Twins (%)	2.7	2.5	0.69
Assisted parturition (%)	17.3	20.3	0.35

- Dairy Calf and Heifer Association Gold Standards

Semen Type	Target First Service Conception Rate	Target Pregnancy Rate*
Conventional	70%	47%
Sexed	60%	37%

*Percent of heifers that become pregnant out of the total number of heifers eligible to become pregnant in a given 21-day period

- Heifer Study (1.3 Million Breedings) (Use of sexed semen and its effect on conception rate, calf sex, dystocia, and stillbirth of Holsteins in the United States, 2010)
 - Mean conception rate for heifers was 56% for conventional and 39% for sexed semen

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THANK YOU SARE for providing the funding for this project!

