WHAT ARE YOU THINKING?
MANAGING EMPLOYER AND EMPLOYEE EXPECTATIONS ON THE DAIRY FARM

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Top challenges on the dairy?

• Difficulty of hiring and retaining qualified employees.

Dairy Farm Challenge:
• Increasing cost of labor.
• Second greatest expense – just behind feed expense.

Dairy Farm Challenge:
• Interface between labor productivity and cow productivity.
• Increased labor productivity = Increased cow productivity.
Challenge to Dairy Labor Productivity?

- Turnover!
- Turnover is the single factor with the biggest impact on dairy labor productivity.

Costs of Turnover?

Losses can be seen and measured in multiple categories:

- Productivity
- Recruitment
- Selection, hiring
- Safety issues
- Investment in employee orientation and training

Turnover rates?

- Employee turnover = \# of employees leaving divided by the average total number of employees, multiplied by 100 (to give a percentage value).

Turnover Cost Calculations?

- Estimates are 150 to 250 percent of an employee's annual wage.
- Employee making $10-12/hour
- Turnover cost = $37,500 to $45,000 at 150%
Add it up:

- Dairy farm with 20 employees and 10% turnover...
- Cost is $75,000 to $90,000 per year.

Reasons for Turnover?

- Research = Exit interviews and follow-up surveys
- Top reasons given?
- Compensation and benefits top the list
- Working conditions
- Lack of time off

How accurate are these reasons?

All dairy producers should give due attention to working conditions, communication, employee motivation – to retain workers.

But when do employees make a decision to leave?

- Research:
- 90% of employees make their stay-or-go decision within the first six months.
Recruitment and Hiring?

- Significant investment in the processes of recruitment, interviewing, reference checks, evaluation, selection

Without a good start on Day One . . .

. . . all those hiring efforts can quickly go “down the drain.”
What difference does Orientation really make?

• They were hired to do a job.

• Shouldn’t we just get them working and productive as quickly as possible?

• Research says otherwise:

Orientation Group A:

• Senior leader spent 15 minutes discussing ways in which “working here will enable you to express your individuality.”

• New employers ranked their individual strengths they would exhibit if stranded on a life raft at sea; spent time discussing /considering how their responses might differ from colleagues’.

• New employees answered questions about individual strengths such as, “What is unique about you that leads to your happiest times & best performance at work?” – then spent time discussing and sharing this.

• New employees were given fleece sweatshirts embroidered with their individual names, along with a name badge. They were asked to wear them throughout training.

Orientation Group B:

• Senior Leader and a lead worker spent 15 minutes talking about why this is a great place to work.

• New employees spent 15 minutes writing answers to questions such as, “What did you hear about our Company today that you would be proud to tell your family about?” They discussed their answers.

• New employees received fleece sweatshirts embroidered with the company name, along with a badge. They were asked to wear them throughout training.

Seven Months Later . . .

• Turnover rate in Group B was 47.2% higher than that of Group A.

• Group A earned higher customer satisfaction scores during the seven months than those in Group B.

What difference could it make to your cows? – to the KPIs on your dairy? Productivity?
What **Four Questions** do Millennials* ask after the **First Day on the Job**?

- Why did they hire me for this job?
- Will I enjoy working here?
- Are any of my coworkers friend material?
- Who can I talk to about . . .?

*18 to 33 years old, born 1981–1996

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**Orientation Starts Early: Establish the Start Date**

When the employment offer has been accepted, a start date should be agreed upon as soon as possible.

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**Before that start date . . .**

**Inform** the new employee of what will happen on the **first day of work**.

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**Clearly Communicate . . .**

What time they are expected to arrive – *plus other basics!*
It may seem fundamental to the producer --

-- but, focus on the new worker.
► Reduce nervousness, apprehension.
► New employees have common questions.
► Send a “Frequently Asked Questions” (FAQs) letter – by US Mail and/or email.

What should I wear?

► Many new farm employees do not have farm backgrounds, need guidance.
► Footwear, gloves, other appropriate attire.
► Biosecurity guidelines – some items may be provided.
► Inform new employee that they will be trained on biosecurity procedures.

Lunch, snacks, beverages?

► Noon or evening meal provided?
► Snacks, beverages?
► Go to town for lunch?
► Inform the new employee of your farm practices and what they should/may bring to work.
► “Welcome” lunch?

Vehicles and Parking

► Vehicle required for job?—should have been communicated during the pre-employment process.
► Where do I park?
► Areas reserved for visitors, vendors, family?
► Employee of the month?
What documents should I bring?

- Form I-9 as well as other basic forms.
- What documents will be needed to complete these forms for compliance with state and federal law.
- Consult USCIS website for the most current I-9 forms and instructions
- www.uscis.gov

What else should I bring (or not bring) to work?

- Cellphone?
- Other electronic devices?
- Tobacco-free workplace?
- Weapons?

What will I do on my first day?

- First day(s) or week(s)
- Clearly communicate work hours, break policies
- General outline of initial orientation and training activities.
- Decreases apprehension or confusion
- Helps to prepare them for a planned orientation program as well as initial and ongoing training opportunities

The First Day

- Greet & Welcome Promptly
- Introductions – with connections
- Nametags, list, organizational chart
- Restrooms, break areas
- Key supervisor, mentor, partner
- Safety, biosecurity? New employee accompanied by a trained person.
**Name Tags—Employee Badges**

- Consider laminated clip-on photo ID badges for owners & employees.
- ID fosters worker socialization
- Farm security and biosecurity protocols are enhanced

**Shirts—Uniforms**

or other printed wear?

- Identifies employees
- Pride
- Farm publicity!

**At the end of the first day . . .**

- Any questions?
- Offer assurances.
- Offer information, reminders about the days to come.
- Ask yourself: How did you do on those 4 Questions?

**Are there good answers to those Four Questions?**

- Why did they hire me for this job?
- Will I enjoy working here?
- Are any of my coworkers *friend* material?
- Who can I talk to about . . . ?
After Day One: Do you have an Orientation program in place?

- Enhances socialization, reduces natural anxiety.
- **Research:** Orientation results in an employee who develops and maintains a positive attitude toward the employer.
- Positive attitude = earlier & higher productivity, longer retention, less turnover.
- Less stress = better concentration, learning, absorbing substantive information about job tasks

Planning & Content of Orientation Program

- Planning may seem overwhelming, but resources are available.
- **Ask current employees for input.**
- “What do **you** wish you had been told when you first started working here?”
- “What do you view as important information for newcomers?”
- Every farm business is different . . . but possible content areas include:
  - Background, History, Overview of Your Farm
  - Farm Tours – repeated – perhaps over a series of days
  - Throughout process -- emphasize role & importance of employees (this employee in particular) in the farm

Background, History, Overview of Your Farm

- Your dairy farm's story
- **Key people in history to present-day**
- Your farm’s mission statement, goals and objectives.
- **Farm Tours – repeated – perhaps over a series of days**
- Throughout process -- emphasize role & importance of employees (this employee in particular) in the farm

Farm Employee Handbook or Policy Documents
Don’t make a mistake with an employee handbook!

The money a producer spends having a competent employment lawyer review employment documents and procedures may be the best money spent.

An employee handbook is – in essence – a contract with the employees.

- Producers should expect to be legally held to the language, promises made in that handbook.
- Be sure that statements made in an employee handbook is what was intended to be said.

Job Descriptions

- Orientation: Use the job description as a guideline for discussion.
- Discuss tasks including future training.
- Emphasize basic safety & importance of ongoing safety training, awareness.
- Discuss relationship and importance of position to other jobs & functions on the farm.
Who is on the Orientation Team?

- For consistent messages -- have the same person conduct orientation.
- Identify supervisors or more experienced co-workers to participate in the process.
- Assign a key Mentor
- All orientation team members should share a positive attitude.
- Constructive, upbeat messages geared toward positive, early impressions.

Orientation: From Day One

- Well-planned orientation requires time & effort.
- Sets the tone for a positive employment relationship on your farm.
- Employees treated with respect have greater job satisfaction.
- Translates into productive, long-term employees – good for the farm, good for the cows!

Thank-you!
Please see ISU Extension and Outreach websites for Farm and Dairy Management resources!

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How to use PRECISION in Day-to-Day Management

Aurora Villarroel, DVM, MPVM, PhD, DACVPM, CVA, CTP

Day-to-Day Management

What Breeding Protocol?

1st Lact  2nd Lact  3rd Lact
REPRODUCTION

What breeding protocol to calve again in 12-14 months?

How to evaluate reproduction?

Proportion of Anestrus Cows = \( \frac{\text{number of cows NOT cycling}}{\text{number of open cows}} \)

Heat Detection risk (HDR) = \( \frac{\text{number of cows detected in heat}}{\text{number of cows actually in heat}} \)

Conception risk (CR) = \( \frac{\text{number of cows that conceived}}{\text{number of cows inseminated}} \)

Abortion risk = \( \frac{\text{number of cows that aborted}}{\text{number of pregnant cows} + \text{number of cows that aborted}} \)

Risk vs. Rate

Rate is constricted to a specific time period, commonly 21 days.
Heat Detection Accuracy

Early Embryonic Death

Farm A

<table>
<thead>
<tr>
<th>Days from Calving</th>
<th>Heads lost</th>
<th>1st lact %</th>
<th>2nd lact %</th>
<th>3rd lact %</th>
<th>4th lact %</th>
<th>5th lact %</th>
<th>All cows %</th>
<th>Avg.</th>
<th>Total</th>
<th>Total</th>
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<tr>
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<td>16</td>
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<td>18-25 days</td>
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<td>0</td>
<td>8</td>
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<tr>
<td>26-33 days</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<td>20</td>
<td>25</td>
<td>24</td>
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Farm B

<table>
<thead>
<tr>
<th>Days from Calving</th>
<th>Heads lost</th>
<th>1st lact %</th>
<th>2nd lact %</th>
<th>3rd lact %</th>
<th>4th lact %</th>
<th>5th lact %</th>
<th>All cows %</th>
<th>Avg.</th>
<th>Total</th>
<th>Total</th>
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<td>18-25 days</td>
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<td>0</td>
<td>0</td>
<td>3</td>
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<td>34-50 days</td>
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<td>26</td>
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</table>
Relationship between Estrus and Ovulation duration

Proestrus 6 hr
Estrus 6 – 24 hr
Estrus start to ovulation 24 – 42 hr
Oocyte Life 10 - 12 hr
Sperm Life 8 – 24 hr

Estrus start to ovulation 24 – 42 hr

Bull Fertility

<table>
<thead>
<tr>
<th>Stage of oestrus</th>
<th>Sire fertility group</th>
<th>Group average†</th>
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<tbody>
<tr>
<td></td>
<td>Above average</td>
<td>Average</td>
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<tr>
<td>Early</td>
<td>74.3</td>
<td>62.7</td>
</tr>
<tr>
<td>Mid</td>
<td>71.1</td>
<td>70.7</td>
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<tr>
<td>Late</td>
<td>78.6</td>
<td>75.1</td>
</tr>
<tr>
<td>Post</td>
<td>73.3</td>
<td>71.3</td>
</tr>
</tbody>
</table>

† Average for all inseminations.

Cows vs. Heifers

Sick Cow with Mastitis

SICK COWS
Sick Cow Detection

Sick Cow Detection

Sick Cow Detection....or not!

Sick Cow Detection
Sick Cow Detection

Sick Cow Detection

Sick Cow Detection

Sick Cow Detection
Sick Cow Detection

Ketosis using Fat:Prot Ratio and Milk

Is it Cost Effective?
Treatment Efficacy Evaluation
LDA Surgery

Disease Effect on Production
LDA

Fat:Prot Ratio for Ketosis Detection

What if we check them every day?
Sick Cow Detection
Negative Energy Balance due to Coliform Mastitis

Automatic Detection
Let the system work for you!!

Sick Cow Detection
How to check everything on every cow every day?

Thank you!
HOW TO USE PRECISION IN DAY-TO-DAY MANAGEMENT

Aurora Villarroel, DVM, MPVM, PhD, DACVPM, CVA, CTP
Afimilk, Ltd.

This conference focuses on precision dairy management, defined as the use of automation for information collection and process management to improve productivity and profitability. However, information is not collected per se, but in the form of data that then needs to be transformed into information. There are many data options to be collected on a farm: calving dates, insemination dates, whether the breeding was successful or not, dry-off dates, etc. Then, certain calculations and data combinations give us the information we need to evaluate certain areas of the farm, as in this case, reproduction. The main issue becomes in establishing what data we need to collect on each farm that will give us the required information to best manage it within the confines economic viability.

There are many areas on the dairy farm that need to be evaluated for optimal performance, but today we will concentrate specifically on reproductive management and sick cow detection and monitoring.

REPRODUCTION

The eternal question for reproduction in dairy cattle is ‘what breeding protocol do I need to follow to get cows pregnant?’ However, this is not the real question, because, what do we get by getting every single cow pregnant if later every single one of them aborts? Will be happy if we get them all pregnant after 200 DIM? So, in keeping with the focus of this conference, let’s make this question more precise: what breeding protocol do I need to follow to get all cows pregnant in time so they calve again within 12-14 months?’ To figure out this protocol, there are two different things that need to happen in series:

1. Cows needs to conceive
2. Cows need to stay pregnant

This means that we need to monitor two separate metrics to evaluate these two separate events. First we need to know how many cows of those we inseminate do conceive. This metric is called conception risk (CR) and is calculated dividing the total number of cows diagnosed pregnant at first preg check by the total number of cows inseminated. Most people are used to hear the term conception rate, which only applies when it is calculated for a specific timeframe, such as for example a 21-day period.

\[
Conception\ risk\ (CR) = \frac{number\ of\ cows\ that\ conceived}{number\ of\ cows\ inseminated}
\]
The second thing we need to know is how many cows abort. This metric is called the **abortion risk**, and it is calculated by dividing the total number of abortions by the sum of the total number of pregnant cows and the cows that aborted.

\[
\text{Abortion risk} = \frac{\text{number of cows that aborted}}{\text{number of pregnant cows} + \text{number of cows that aborted}}
\]

The rationale behind this is that, epidemiologically speaking, a risk is calculated as animals with a specific event in the numerator, divided by animals eligible to see that event in the denominator. The cows that have aborted were eligible to abort only because they were pregnant, so they need to be included in the denominator. For comparison, think for example of the following metric: if we say 15% of the people attending this conference drove to the meeting (as opposed to 85% flew in), the calculation takes into account in the numerator only those that drove, but in the denominator are all of the attendees to the conference, those that drove and those that flew in.

To complicate matters further, we know that some cows do indeed conceive, but they lose the embryo before preg check. These cows fall into a grey category called early embryonic death (EED), also called embryonic absorption. These are commonly evaluated by assuming that normal heat cycles have 18-25 days intervals, and that anything beyond 25 days is early embryonic death. This then begs the use of another metric to evaluate these cows, and that is the **proportion of insemination intervals that are greater than 25 days**. It is very important to stress that this is an assumption, and that not all cows that have insemination intervals greater than 25 days have indeed absorbed the pregnancy, but they could have had bad heat detection as seen in Figure 1. The counter part of this situation is in situations where cows are bred without being in heat but within a normal interval. This will make the metric look OK, effectively hiding the real problem on the farm (Figure 2).

Although EED and abortions can be due to infectious diseases such as BVD, IBR and leptospirosis, a weak embryo can die early without any other external factors influencing it. Part of the viability of the embryo is derived from an on-time conception with a mature oocyte and vigorous well-capacitated sperm. Other factors include genetic abnormalities and environmental conditions affecting the utero (e.g. fever and prostaglandin release due to inflammation in the cow). Therefore, correct insemination timing is important in making sure that conception happens, but also to make sure that the embryo has the best conditions to survive long-term. But **how do we determine when is the best time to breed a cow?** To answer this question we need information about reproductive physiology, specifically, the duration of certain intervals that have been evaluated with research and are presented in Table 1. Using these ranges, it becomes obvious that the largest variability is in the duration of the actual heat, which is likely the determinant for fertility, and yet it is not something that most heat detection systems are measuring.
- If we only know that the cow ‘is in heat’ (i.e. rubbed off or standing), we need to guess at which point of the heat she is. Timing to ovulation could be anywhere between 10-30 hours; obviously a very large range to determine when to breed.

- If we know when the cow started to become in heat (i.e. increased activity), we need to guess how long she is going to be in heat. Timing to ovulation could be anywhere between 24-42 hours. A narrower range to determine when to breed, but with too much lag time (although this may help farmers that can only breed once a day).

- If we know when she stopped being in heat, we need to guess how long it will be until ovulation. Narrow range of breeding time and short lag time, which doesn’t leave much time for decision making, but provides the best breeding time.

Therefore, if we have a method to determine how long a cow is in heat, we can optimize insemination time. With the advancement of activity monitors over the past recent years, it has become possible to collect data on cow activity every hour of the day, so that decisions can be made almost immediately. For example, with the new AfiAct II system from Afimilk Ltd. it is possible to, not only determine when a cow starts coming in heat (increase in activity to over twice the baseline), but it is also possible to determine when the peak of that activity happens, as well as when it ends (Figure 4). This leads to much more precise decisions on when the best time to breed a cow is. To fine-tune the best insemination time for each cow the farm can use automatic sorting gates that will place the cows in an accessible area without having to disturb the entire pen. Another viable option is to determine what the pattern of the majority of the cows is, and then adequate insemination times to the average cow in that farm. Collecting data on each cow on the farm will produce enough information to be able to customize the day-to-day management based on results on that specific farm, as opposed to basing decisions on research performed in different farms and under different conditions.

<table>
<thead>
<tr>
<th>Event</th>
<th>Avg time (hrs)</th>
<th>Range (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-estrus duration (start of activity)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Estrus duration (standing heat)</td>
<td>12</td>
<td>6 - 24</td>
</tr>
<tr>
<td>Estrus to ovulation</td>
<td>28</td>
<td>24 - 42</td>
</tr>
<tr>
<td>Oocyte life span</td>
<td></td>
<td>10 - 12</td>
</tr>
<tr>
<td>Oocyte migration to fertilization site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sperm life span</td>
<td></td>
<td>8 – 24</td>
</tr>
</tbody>
</table>

Sources:
Figure 1. Cow inseminated 56 days after previous insemination that had a normal heat 25 days after previous insemination. Notice the heats indicated by high activity in the graph at 14, 37, 65, 90, 119 and 141 DIM. Inseminations are indicated by lime green boxes next to the X axis, at 65, 130, 121 and 141 DIM. The rugged activity past 180 DIM likely indicates lameness. Notice that she was in heat at 90 DIM but was not bred. Therefore, she will count in the metric as a long interval between breedings, which will be assumed an EED, when in fact she was in heat but was not bred (breeders in this farm were not following instructions correctly). This cow conceived to the breeding at 141 DIM, as indicated by the blue box next to the X axis at 178 DIM 9day of preg check). Source: AfiFarm software, Afimilk Ltd.

Figure 2. Cow that has been in heat 3 times and has been bred 3 times, but not at the appropriate times. Heats are indicated by high activity days at 63, 86 and 119 DIM. However, she was not bred at 63 DIM (before VWP). Instead she was
bred at 86, 107 and 119 DIM, indicated by the lime green boxes (the breeders on this farm were still detecting heats visually and estimated that this cow was rubbed off). This cow will count as a normal breeding interval of 21 days (107-86) and a short breeding interval of 12 days (119-107), when in fact her real interval as determined by the high activity measured by the pedometers is 33 days (119-86), indicating a problems of early embryonic death (EED) that will be hidden from the evaluation if only numbers are being evaluated. This cow conceived to that last insemination, as indicated by the blue box at 156 DIM. Source: AfiFarm software, Afimilk Ltd.

Farm A

<table>
<thead>
<tr>
<th>Distribution of cycles: 5-17 days</th>
<th>Heifers 1st lact. %</th>
<th>Heifers 2nd lact. %</th>
<th>1st lact. %</th>
<th>2nd lact. %</th>
<th>3+ lact. %</th>
<th>All cows</th>
<th>All cows %</th>
<th>Total</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-25 days</td>
<td>5.56</td>
<td>6.07</td>
<td>6</td>
<td>56</td>
<td>5.97</td>
<td>56</td>
<td>5.97</td>
<td>56</td>
<td>5.97</td>
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<tr>
<td>26-35 days</td>
<td>2.78</td>
<td>9.62</td>
<td>14</td>
<td>14</td>
<td>15.91</td>
<td>33</td>
<td>12.50</td>
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<td>9.68</td>
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Farm B

<table>
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<tr>
<th>Distribution of cycles: 5-17 days</th>
<th>Heifers 1st lact. %</th>
<th>Heifers 2+ lact. %</th>
<th>1st lact. %</th>
<th>2+ lact. %</th>
<th>All cows</th>
<th>All cows %</th>
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<th>Total %</th>
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<td>448</td>
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<td>Average days between Breedings</td>
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<td>167</td>
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<td>203</td>
<td>21.64</td>
<td>203</td>
<td>21.64</td>
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</table>

Figure 3. Comparison of interval between breedings in two farms. Farm A has a normal profile (5-17 days <10%, 18-25 days >60%, 26-35 days <15% and 36-60 days <15%), Farm B has a problem with early embryonic death (EED) evidenced by the large proportion of cows with long intervals between breedings (target in our farms is <15%). Source: AfiFarm software, Afimilk Ltd.
SICK COW DETECTION

As any living being, cows will encounter health issues along the way, and therefore, we must maintain vigilant every day to detect which cows may be having issues, so they can be treated promptly and effectively to ensure prompt recovery. Then we need to monitor them until they recover, so we can make sure that our treatment protocols are appropriate and, if not, we have the ability to make an informed decision to change those protocols.

When evaluating sick cows, typically most farmers look at milk production. Although it is a good indicator, it is not very specific, so we can see milk drops in cows that have changed pens or cows that are in heat. This means that, in addition to milk information, we now need event information and activity (for heat detection). Compare for example the cow in Figure 5 and Figure 6; both have dropped milk by more than 30% in the last 1-2 milkings. The difference is that the cow in Figure 5 is in heat, so that the drop in milk can be explained by the increased activity and lack of resting /eating times, while the cow in Figure 6 has mastitis, as evidenced by the increased conductivity. Figure 7 shows a cow that has dropped in milk, but is not in heat and does not have mastitis; she is off-feed, which can be due to a digestive issue or pneumonia (can’t eat well because she can’t breathe well). Finally, Figure 8 shows a cow that is lame, as evidenced by the ragged activity graph. Therefore, with a milk meter that provided information on milk production and conductivity, and a pedometer that measures activity, we can now detect not only that a cow is sick in general, but actually hone into what the likely diagnosis is. The addition of other sensors that can measure milk components such as butterfat, protein and lactose, can help fine-tune the diagnosis even further.
Figure 5. Graph showing milk production (blue) at each milking (2x) and activity (green) for a cow that has dropped in milk production because she is in heat. Conductivity (red) shows a small rise typical of cows that retain their milk (heat). Source: AfiFarm software, Afimilk, Ltd.

Figure 6. Graph showing milk production (blue), activity (green) and conductivity (red) at each milking (2x) for a cow that has dropped in milk production because she has mastitis. Conductivity shows a sharp rise and activity is flat or slightly decreased. Source: AfiFarm software, Afimilk, Ltd.
Figure 7. Graph showing milk production (blue), activity (green) and conductivity (red) at each milking (2x) for a cow that has been gradually dropping in milk production due to being off-feed (digestive issue or pneumonia). Conductivity and activity are relatively flat, while milk production dropped over a span of at least 3 days. Source: AfiFarm software, Afimilk, Ltd.

Figure 8. Graph showing milk production (blue), activity (green) and conductivity (red) at each milking (2x) for a cow that has dropped milk production because she is lame. Activity shows a ragged increase as opposed to a flat line or quick up and down (heat) as in the other graphs. Source: AfiFarm software, Afimilk, Ltd.
In conclusion, the use of automatic data collection tools and the evaluation of specific combinations of the data provided by these tools can give us the necessary information to manage a farm on a day-to-day basis. Having more sensors and more data, however, is not useful if the data provided by these technologies is not integrated to provide information on which one can base decisions such as when to breed a cow to optimize pregnancy to term, or how to optimize the ability to provide an accurate diagnosis for a sick cow within 1 or 2 milkings so the cow can be adequately treated and promptly recover.

There are many options of technology available to dairy farmers nowadays, anywhere from automatic calf feeders to automatic in-line milk components sensors. To determine what fits within a farm, all technology needs to be evaluated trying to answer the question of 'what information will we get from the data provided by this tool and how will we change the management in response to that information?' That is what provides precision in day-to-day management.
New York Law Requires Farms To Put It In Writing

- NY Labor Law Section 195 – Pay Notice
- NY Farm Minimum Wage Order Part 190
- Pay Notice and Work Agreement for Farm Workers (LS309)

Minimum Wage Standards for Farm Workers – 12 NYCRR Part 190

- The Minimum Wage Order for Farm Workers applies only to farm workers employed on farms where the total cash remuneration paid all persons employed on the farm exceeded $3,000 in the previous calendar year.
- The Minimum Wage Order for Farm Workers provides that all workers, with certain exceptions, must be paid at least $9.00 per hour. This does not include:
  - Members of the employer's immediate family

The wage order permits employers to deduct specified allowances from the minimum wage for:

- Meals
- Lodging (except for seasonal migrant workers)
- Payments in kind must cost no more than the farm market value.

Employers must post these items in a conspicuous place in their establishment:

- A summary of the wage order
- A copy of the general work agreement
Pay Notice & Work Agreement – Form LS118

- NYS Labor Law requires you to give employees a written pay notice:
  - At hiring
  - On or before February 1st of each subsequent year
    (The law does not say this! The Form has been changed)
  - In advance of any reduction in the rate of pay; and
  - Whenever there is a change in any of the information, unless it will be shown on the next paystub

- Pay Notice:
  - Employer Information
    - Name
    - Address
    - Telephone
  - Employee Information
    - Name
    - Address
    - Telephone
  - Employment Period of Employment:
    - From...
    - To...
  - Employment Information
    - Position
    - Hours
    - Rate
    - Deductions
    - Exempt Hours
  - Employment Certification
    - Signature
    - Date
  - Record of Payment
    - Pay Period:
    - Rate
    - Hours
    - Gross
    - Net
  - Leave Accrual
    - Details
  - Termination
    - Date
  - Notice given:
    - At hiring
    - Before a change in pay rates, allowances claimed, or payday
  - Notice:
    - Notice given:
      - At hiring
      - Before a change in pay rates, allowances claimed, or payday
    - Notice:
      - At hiring
      - Before a change in pay rates, allowances claimed, or payday

- Work Agreement:
  - Work Agreement
    - Name
    - Address
    - Telephone
  - Employment Information
    - Position
    - Hours
    - Rate
    - Deductions
    - Exempt Hours
  - Employment Certification
    - Signature
    - Date
  - Record of Payment
    - Pay Period:
    - Rate
    - Hours
    - Gross
    - Net
  - Leave Accrual
    - Details
  - Termination
    - Date
  - Notice given:
    - At hiring
    - Before a change in pay rates, allowances claimed, or payday
  - Notice:
    - Notice given:
      - At hiring
      - Before a change in pay rates, allowances claimed, or payday
    - Notice:
      - At hiring
      - Before a change in pay rates, allowances claimed, or payday

- Description of Housing: If Any, Including Number of Rooms and Cooking Facilities:
  - Each worker will share a bedroom in a single-family, wood-framed house with five bedrooms, two people per room. The house includes two full bathrooms, washer and dryer. The owner will provide and serve 3 meals per day to the workers. Transportation to and from the work site will also be provided by the employer, at no cost to the workers.
Housing Arrangements

- Single Occupancy (private room in a shared residence)
- Multiple Occupancy (shared room/dorm arrangement)
- Individual Apartment
- Individual Apartment (with family)
12 NYCRR § 190-3.1 Allowances

- Meals
- Lodging and utilities
- Payments in kind acceptable to the employee may be considered as part of the minimum wage, but shall be valued at not more than the farm market value at the time such payments were provided.

## Allowances for Housing Arrangements

- **Single Occupancy (private room in a shared residence)**: $18.95/Week
- **Multiple Occupancy (shared room/dorm arrangement)**: $12.65/Week
- **Individual Apartment**: $5.00/Day
- **Individual Apartment (with family)**: $8.00/Day
NY Labor Law §193 Deductions from wages*

1. No employer shall make any deduction from the wages of an employee, except deductions which:
   a) are made in accordance with the provisions of any law or any rule or regulation issued by any governmental agency; or
   b) are expressly authorized in writing by the employee and are for the benefit of the employee; provided that such authorization is kept on file on the employer's premises. Such authorized deductions shall be limited to payments for insurance premiums, pension or health and welfare benefits, contributions to charitable organizations, payments for United States bonds, payments for dues or assessments to a labor organization, and similar payments for the benefit of the employee.

* NB Effective November 6, 2015

 NY Labor Law §193 Deductions from wages* (Cont'd…)

2. No employer shall make any charge against wages, or require an employee to make any payment by separate transaction unless such charge or payment is permitted as a deduction from wages under the provisions of subdivision one of this section.

* NB Effective November 6, 2015

Deductions

- Deductions that the worker has authorized in writing and for his or her benefit
- In order to make deductions for housing the employer must have the agreement in writing
- In order for the housing to be for the employee’s benefit, it must be voluntary, and must not be for the employer’s benefit
12 NYCRR § 195-2.1 Prohibited Practices

(a) Wage deductions. No employer shall make any deductions from wages except those that fall within the following four categories:

1. Any deductions made in accordance with any law, rule or regulation issued by any governmental agency;

2. Deductions specified by, or similar to those specified by, section 193 of the Labor Law, authorized by, and for the benefit of, the employee;

3. Deductions for the recovery of overpayments made in accordance with this Part; and

4. Deductions for the repayment of wage advances made in accordance with this Part.

(b) Separate transactions. No employer shall make any charge against wages, or require an employee to make any payment by separate transaction unless such charge or payment is permitted as a deduction from wages under this Part or is permitted or required under any provision of a current collective bargaining agreement.

II. Chart of Laws Governing Wage Deductions

<table>
<thead>
<tr>
<th>Deduction / Benefit</th>
<th>NYDOL Position</th>
<th>Statute and Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSA</td>
<td>Allowed as a voluntary deduction expressly authorized in writing by the employee and for the benefit of the employee</td>
<td>12 NYCRR 195-2.1; NY Labor Law 193</td>
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<tr>
<td>IRA</td>
<td>See above</td>
<td>See above</td>
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<tr>
<td>Health Insurance</td>
<td>See above</td>
<td>See above</td>
</tr>
<tr>
<td>Child Support</td>
<td>Allowed as a deduction in accordance with any law, rule or regulation</td>
<td>12 NYCRR 195-2.1; NY Labor Law 193</td>
</tr>
</tbody>
</table>
II. Chart of Laws Governing Wage Deductions
(Continued…)

<table>
<thead>
<tr>
<th>Deduction / Benefit</th>
<th>NYDOL Position</th>
<th>Statute and Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Housing and utilities may not be deducted from wages except as an allowance permitted under NYDOL Minimum Wage Order 190; NY Labor Law 193; NYCRR 195-2.1, 195-4.4, and 195-4.3</td>
<td>Minimum Wage Order 190; NY Labor Law 193; NYCRR 195-2.1, 195-4.4, and 195-4.3</td>
</tr>
</tbody>
</table>

For workers who are not migrant or seasonal farm workers, you may consider a housing allowance (that includes utilities) towards meeting the minimum wage, as follows:
- $18.95/week for single occupancy (private room in shared residence)
- $12.65/week for multiple occupancy (shared room/dorm arrangement)
- $5.00/day for an individual apartment
- $8.00/day for individual apartment with family

See above. Limits on housing deductions also restrict what can be deducted for utilities. For example, the $5/day limit on deductions for individual apartments includes both rent and utilities.

Clothing / Uniform
NYDOL has taken the position that no such deductions are allowed.

See above. Limits on housing deductions also restrict what can be deducted for utilities. For example, the $5/day limit on deductions for individual apartments includes both rent and utilities.

Wage Advances
Allowed in accordance with NYDOL’s Written Authorization for Wage Advances form

NY Labor Law 193; NYCRR 195-5.2
provided in English and in the employee’s primary language, if other than English,

employers preserve their payroll records for 6 years

a copy of any generally applicable work agreement

in writing or by publicly posting their policy on sick leave, vacation, personal leave, holidays and hours.

The Minimum Wage Order for farm laborers requires that employers post, in a conspicuous place on the farm, a copy of any generally applicable work agreement as a posting required by the Department of Labor following the model form in Minimum Wage provisions.

The Minimum Wage Order for farm laborers requires that employers post, in a conspicuous place on the farm, a copy of any generally applicable work agreement as a posting required by the Department of Labor following the model form in Minimum Wage provisions.
Is a Lease Required?

- Lease is a contract – must be signed
- Employment is at-will
- A lease changes your relationship relative to housing rights

What if No Lease?

- Without a lease, renters who pay monthly rent are “month to month” tenants
- Tenants who stay past the end of a lease are “month to month” tenants if the landlord accepts the rent.

Lease Requirements

- Use words with common and everyday meanings
- Clear and coherent
- Sections appropriately captioned
- Print must be large enough to be read easily
Lease Prohibitions

- Exempting landlords from liability for injuries to persons or property caused by the landlord's negligence, or that of the landlord's employees or agents
- Waiving the tenant's rights to a jury trial in any lawsuit brought by either of the parties against the other for personal injury or property damage
- Requiring tenants to pledge their household furniture as security for rent
- If lease states that landlord may recover attorney's fees and costs incurred if a lawsuit arises, a tenant automatically has a reciprocal right to recover those fees as well

Eviction

- Tenant protected from eviction during lease term (Except for significant violations of lease or local housing laws or codes)
- Tenant can be legally evicted only after landlord has brought a court proceeding and obtained judgment of possession
- Only a sheriff, marshal, or constable can carry out court warrant to evict
- Don't take the law into your own hands, use force or other unlawful means (Triple damages)

Eviction (Continued...)

- Must give tenant reasonable amount of time to remove belongings
- You may not retain personal belongings or furniture
- Month to Month – one month’s notice required

Conclusions about Leases

Is Housing Free?

- Yes
  - Use Rules Attached to Work Agreement
  - Not Lease

- No
  - Paid by Allowance from Payroll?
    - Yes
      - Use Lease
    - No
      - Paid Directly by Employee?
        - Yes
          - Use Lease
        - No
          - Use Lease
Right's of Tenants

Privacy and Guests
Warranty of Habitability
Specific Safety and Health

List of Standards that Affect Farmworker Housing

- Bathing Facilities
- Fire and Smoke Detection
- Flooring Requirements
- Garbage
- Heating
- Laundry
- Light and Ventilation

List of Standards that Affect Farmworker Housing

- Public Health Hazards
- Screening
- Sewerage
- Sleeping Quarters
- Toilet Facilities
- Water Supply

Questions?
How do We Make Better Decisions in Dairy Cattle Diets and Management with Forages and Nitrogen

Mike Van Amburgh, Rick Grant, Kurt Cotanch, Ryan Higgs
Debbie Ross, Marcelo Gutierrez, Alessandro Zontini, Larry Chase, and Andreas Foskolos
Dept. of Animal Science
Chazy, NY

Outline

• New approaches to describing NDF
  – aNDFom – why and what it means
  – aNDFom digestibility
  – uNDF – definition
  – uNDF and NDF pools
  – Implications of using this information
• Updates to the CNCPS related to N efficiency
• Summary

High Forage Diets: Cows Can Do It

• Two case studies in New York
  – Herd 1 – entire herd
    • 73-75% forage (includes corn silage)
    • 80-85 lb/d milk (2x), 3.7% fat, 2.9% protein
    • NE\textsubscript{L}=0.76 Mcal/lb
  – Herd 2: high pen
    • 82% forage (includes corn silage)
    • 100 lb/d milk (3x), 3.6% fat, 3.0% protein
    • NE\textsubscript{L}=0.77 Mcal/lb

(Chase, 2012)

NDF analyses

• Nutrition models/software have an input for NDF that is used primarily to calculate energy from available carbohydrates and effective fiber

• Mertens (2002) published the NDF method and gained AOAC approval – there are many approaches to measure NDF

• We want everyone to use of aNDFom – NDF with amylase, sodium sulfite and ash correction – we are working to move labs in that direction

• Sniffen et al. 1992...
Why aNDFom?

- Hay in a hurry – wide swathing picks up dirt
- 600-800 hp choppers and big equipment that move fast make dust and dirt fly
- Flood irrigation moves soil
- Dirt/soil does not solubilize in NDF solution, thus if not corrected will inflate the NDF content
- Inflation of the NDF content means the diet as formulated is lower in actual NDF – intake and rumen health can be compromised (e.g. SARA)

### 27 FIELD 316 SORGHUM X SUDAN

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<th>% NDF</th>
<th>% DM</th>
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<td>peNDF</td>
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<td>2.98</td>
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### 26 FIELD 308 TEST 2 SORGHUM X SUDAN

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<td>NDF Digestibility (48 hr)</td>
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<td>NDF Digestibility (240 hr)</td>
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<td>uNDF (30 hr)</td>
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<tr>
<td>uNDF (240 hr)</td>
<td>23.0</td>
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Example of the Impact of Ash Contamination on NDF and NDF Digestibility Recovery

<table>
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<tr>
<th>Sample</th>
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<th>NDFD30om</th>
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<tr>
<td>15081-68</td>
<td>54.6%</td>
<td>48.3%</td>
<td>56.3%</td>
<td>65.9%</td>
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<tr>
<td>15085-56</td>
<td>60.1%</td>
<td>50.9%</td>
<td>49.7%</td>
<td>61.9%</td>
</tr>
</tbody>
</table>

Ralph Ward

The Take Home

- aNDFom is becoming the new standard assay
- Will take time to develop all of the NIR equations, but commercial labs are making great progress (time and $$$)
- Continue to use the “benchmarks” that we have always used just replace NDF with aNDFom (1.1–1.2% BW aNDFom intake, etc.)
- Side benefits are better rumen health through greater rumen fill (using real value) and better predictions of energy and protein supply due to more accurate numbers
aNDFom Digestibility and Implications

Cows, acres, digestible aNDFom per acre, light, heat and water...

“Lignification” = cross linking between lignin and hemicellulose

- Light, heat and water interact at various stages of development to affect digestibility
- For example, water stress causes ~ 7x greater cross-linking between lignin and hemicellulose
- Similar to the effect of building a very tall building – to keep it standing, the building needs crossbeams to provide rigidity

NDF Digestibility as Affected by Lignin (GDD and Water)

1988 GDD – 2387
water- 9.8 in

1989 GDD – 2089
water- 16.1 in

2003 GDD – 2382
Water – 17.14 in

Factors Affecting Plant Development and Digestibility

From Van Soest, 1996
Estimating iNDF ... Measuring uNDF

- ADL x 2.4/NDF (Chandler et al., 1980)
- ADL/NDF^{0.67} (Weiss et al., 1992)
- 288-h in situ (Huhtanen et al., 2007)
- 240-h in vitro fermentation (Raffrenato and Van Amburgh, 2010)

Van Soest and Lane Moore, 1963
USDA, Beltsville, MD right after
Pete characterized NDF

NDF Digestibility/Indigestibility

- Nousiainen et al. (2003; 2004)
demonstrated in grasses that the relationship between
lignin and digestibility was highly variable

- This was confirmed by Rinne et al. 2006 on legumes
methods used to determine this included 288 hr
in situ (in a bag in the rumen) fermentations

- We were/are doing similar work at Cornell
  - Working to develop a procedure that
could be used in a commercial lab
  Ph.D. work of Raffrenato (2011)

uNFD – Another New Term

- Unavailable NDF
- Determined after a 10 day (240 hr) in vitro incubation
under specific conditions and proper filtration
- Commercial labs are providing this value now via NIR
analysis, so you don’t need to wait 10 days

It doesn't stay in the cow that long, does it?

Corn silage example: NDF\textsubscript{digestibility}

P1+P2+iNDF
Corn silage example for uNDF 240 vs lignin*2.4 – 2013 corn silages

<table>
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<tr>
<th></th>
<th>CS 1</th>
<th>CS 2</th>
<th>CS 3</th>
<th>CS 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDF, %DM</td>
<td>45.4</td>
<td>44.5</td>
<td>40.3</td>
<td>50.2</td>
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<tr>
<td>aNDFom, %DM</td>
<td>44.4</td>
<td>43.8</td>
<td>38.8</td>
<td>49.3</td>
</tr>
<tr>
<td>Lignin, %DM</td>
<td>3.40</td>
<td>3.43</td>
<td>2.87</td>
<td>4.26</td>
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<tr>
<td>Lignin*2.4/NDF</td>
<td>18.4</td>
<td>18.7</td>
<td>17.9</td>
<td>20.7</td>
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<tr>
<td>uNDF, %NDF</td>
<td>11.8</td>
<td>10.7</td>
<td>10.9</td>
<td>14.2</td>
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</tbody>
</table>

Corn silage chemistry and uNDF by three methods, 240 hr uNDF, Chandler et al. (1980) and Conrad et al., 1984 equations

<table>
<thead>
<tr>
<th>Corn silage</th>
<th>aNDF, %DM</th>
<th>aNDFom, %DM</th>
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<th>Chandler et al., 1980</th>
<th>Conrad et al., 1984</th>
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<tr>
<td>1</td>
<td>38.1</td>
<td>37.5</td>
<td>23.6</td>
<td>42.3</td>
<td>16.4</td>
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<td>2</td>
<td>39.5</td>
<td>38.9</td>
<td>25.6</td>
<td>39.2</td>
<td>16.9</td>
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<tr>
<td>3</td>
<td>41.5</td>
<td>40.9</td>
<td>27.3</td>
<td>43.4</td>
<td>17.7</td>
</tr>
<tr>
<td>4</td>
<td>43.7</td>
<td>41.9</td>
<td>22.8</td>
<td>42.8</td>
<td>31.8</td>
</tr>
</tbody>
</table>

Ratio of lignin to uNDF

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>NDF %DM</th>
<th>ADL g/kg NDF</th>
<th>uNDF g/kg NDF</th>
<th>Ratio (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional C.S.</td>
<td>30</td>
<td>42.7</td>
<td>72.4</td>
<td>316.8</td>
<td>4.72 (1.73-7.59)</td>
</tr>
<tr>
<td>BMR C.S.</td>
<td>15</td>
<td>39.1</td>
<td>43.6</td>
<td>171.7</td>
<td>4.01 (3.14-5.45)</td>
</tr>
<tr>
<td>Grasses</td>
<td>15</td>
<td>47.2</td>
<td>62.1</td>
<td>222.8</td>
<td>3.63 (2.51-4.73)</td>
</tr>
<tr>
<td>Mature grasses</td>
<td>11</td>
<td>64.5</td>
<td>84.4</td>
<td>313.8</td>
<td>3.89 (2.60-5.64)</td>
</tr>
<tr>
<td>Immature grasses</td>
<td>13</td>
<td>44.1</td>
<td>59.3</td>
<td>232.2</td>
<td>4.16 (2.59-7.40)</td>
</tr>
<tr>
<td>Alfalfas</td>
<td>18</td>
<td>36.6</td>
<td>172.6</td>
<td>461.4</td>
<td>2.70 (2.43-2.95)</td>
</tr>
</tbody>
</table>

Corn silage example: NDF digestibility

Raffrenato 2011
Larger fast pool appears to result in:
- Faster eating
- Faster ruminal disappearance
- Higher intakes
- More ruminal buoyancy

Larger slow and uNDF pools:
- More “ballast”
- Greater chewing and rumination
- Slower intake
- Slower eating speed

For comparison
- 2.4*3% lignin/42% NDF = 17% unavailable NDF
uNDF Study @ Miner Institute

- What does it mean and how do we take advantage of the information?

## Composition of diets used in uNDF study at Miner Institute.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>LF-LD (Low CS)</th>
<th>HF-LD (High CS)</th>
<th>LF-HD (Low BMR)</th>
<th>HF-HD (High BMR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional corn silage</td>
<td>39.2</td>
<td>54.9</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Brown midrib corn silage</td>
<td>---</td>
<td>---</td>
<td>36.1</td>
<td>50.2</td>
</tr>
<tr>
<td>Hay crop silage</td>
<td>13.4</td>
<td>13.4</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td>Corn meal</td>
<td>17.3</td>
<td>1.6</td>
<td>20.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Grain mix</td>
<td>30.1</td>
<td>30.1</td>
<td>30.2</td>
<td>30.2</td>
</tr>
</tbody>
</table>

## Chemical composition

- Crude protein, % of DM: 17.0, 17.0, 16.7, 16.7
- NDF, % of DM: 32.1, 35.6, 31.5, 35.1
- Starch, % of DM: 28.0, 21.2, 27.8, 23.8
- 24-h NDF digestibility, %: 56.3, 54.0, 62.0, 60.3
- peNDF, % of DM: 17.3, 23.1, 18.5, 21.5

## uNDF study – Miner Inst.

<table>
<thead>
<tr>
<th>Diet</th>
<th>High CCS</th>
<th>Low CCS</th>
<th>High BMR</th>
<th>Low BMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI lb/d</td>
<td>58.43</td>
<td>63.95</td>
<td>64.39</td>
<td>64.61</td>
</tr>
<tr>
<td>SCM lb/d</td>
<td>92.17</td>
<td>99.67</td>
<td>100.77</td>
<td>102.31</td>
</tr>
<tr>
<td>Efficiency</td>
<td>1.58</td>
<td>1.56</td>
<td>1.57</td>
<td>1.58</td>
</tr>
</tbody>
</table>

## uNDF Intake, Rumen content and Fecal excretion

<table>
<thead>
<tr>
<th>Diet</th>
<th>High CCS</th>
<th>Low CCS</th>
<th>High BMR</th>
<th>Low BMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>uNDF Intake lb/d</td>
<td>5.80</td>
<td>5.27</td>
<td>4.87</td>
<td>4.48</td>
</tr>
<tr>
<td>uNDF Rumen lb</td>
<td>9.17</td>
<td>8.42</td>
<td>7.63</td>
<td>7.06</td>
</tr>
<tr>
<td>uNDF Fecal lb /d</td>
<td>5.80</td>
<td>5.27</td>
<td>4.87</td>
<td>4.48</td>
</tr>
</tbody>
</table>
Can we use this to better predict DMI and adjust diets to allocate forages better?

<table>
<thead>
<tr>
<th></th>
<th>High CCS</th>
<th>Low CCS</th>
<th>High BMR</th>
<th>Low BMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>uNDF, %DM</td>
<td>9.92%</td>
<td>8.24%</td>
<td>7.57%</td>
<td>6.93%</td>
</tr>
<tr>
<td>uNDFi:uNDFf</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>uNDFi: NDFr</td>
<td>0.63</td>
<td>0.63</td>
<td>0.64</td>
<td>0.63</td>
</tr>
<tr>
<td>uNDFr:uNDFi</td>
<td>1.58</td>
<td>1.60</td>
<td>1.57</td>
<td>1.58</td>
</tr>
</tbody>
</table>

uNDFi, uNDF Intake
uNDFf, uNDF Fecal
uNDFr, uNDF Rumen content

Interpretation

- Need to understand what changes uNDF Rumen content
- 4.48 – 5.80 lbs. or 7% - 10% DMI is significant
- Rumen content appears to determine intake and fecal output of uNDF
- What causes variation of uNDF Rumen content?
- “Working hypothesis”: the disappearance of the fast and slow pools of pdNDF determines volume of uNDF Rumen content and capacity along with the “ballast and rumen fill of the slow and uNDF fractions.

Perspective

<table>
<thead>
<tr>
<th></th>
<th>High CCS</th>
<th>Low CCS</th>
<th>High BMR</th>
<th>Low BMR</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>uNDF, %DM</td>
<td>9.92%</td>
<td>8.24%</td>
<td>7.57%</td>
<td>6.93%</td>
<td>7.90%</td>
</tr>
<tr>
<td>uNDF Intake lb</td>
<td>5.80</td>
<td>5.27</td>
<td>4.87</td>
<td>4.48</td>
<td>5.07</td>
</tr>
<tr>
<td>uNDF Rumen, lb</td>
<td>9.17</td>
<td>8.42</td>
<td>7.63</td>
<td>7.06</td>
<td>8.03</td>
</tr>
<tr>
<td>uNDF Fecal/d</td>
<td>5.80</td>
<td>5.27</td>
<td>4.87</td>
<td>4.48</td>
<td>5.07</td>
</tr>
<tr>
<td>uNDFi:uNDFf</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>uNDFi:uNDFr</td>
<td>0.63</td>
<td>0.63</td>
<td>0.64</td>
<td>0.63</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Take into account current uNDF% and intake while rebalancing diet. If you know current capacity based on current feeds you should be able to optimize better diet.

Summary of 2008 and 2011 studies: uNDF240om rumen fill relative to intake

- 7 of 8 rations show similar ratio of rumen fill:intake of uNDF240om
  - 1.6x
- Suggests uNDF240om as viable predictor of DMI across various diets
- Considering 2008 and 2011 data; suggests
  - 0.40% BW as possible fill max, DMI max
  - 0.30% BW as possible fill minimum for rumen health and functioning.
Digestible aNDFom per Acre

- Cost effective, high quality land availability is tight
- Growth of the business is paramount to future success – so more cows
- Cows run on forage and high quality forage is the key to high milk yield, lower income over purchased feed costs and reduced environmental impact
- Question: How much digestible aNDFom do you yield per acre with your current forage program?
  - for corn silage have to recognize starch contribution for energy and purchased grain, but forage digestibility is still key

Forage Rotation and Selection to Optimize Digestible aNDFom per Acre

- Alfalfa is good example – traditional forage for lactating dairy cattle
- Drought resistant due to root structure and capability
- High nitrogen content for a forage
- Good digestibility?

Forage Rotation and Selection to Optimize Digestible aNDFom per Acre

- uNDF content of alfalfa ranges from 43% to 53% depending on cutting and leaf to stem ratio
- 2012 Large Herd DFBS data – Haycrop yields 3 to 3.3 tons DM/acre
- Assume this is alfalfa at 40% NDF and 47% uNDF, that means tons digestible aNDFom per acre on average is 0.7 tons per acre

Forage Rotation and Selection to Optimize Digestible aNDFom per Acre

- Corn silage by comparison can range from 9 to 17% uNDF and will yield ~7.5 DM ton per acre.
- At 42% NDF, that is 3.2 tons aNDFom/acre and ~2.3 tons of digestible aNDFom per acre
Predicting AA Balance and Protein Supply – Four Pieces To The Nitrogen/AA Part of the Puzzle

Nitrogen components at the duodenum

What is most limiting?

To Total amino acid requirements

Digestibility in the small intestine

Amino acid profile of each component

Comparison of ADIN and Ross in-vitro indigestible N

<table>
<thead>
<tr>
<th>Feed N (% DM)</th>
<th>ADIN (%N)</th>
<th>Ross In-vitro indigestible N (% N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular blood meal</td>
<td>16.2</td>
<td>4.7</td>
</tr>
<tr>
<td>Heat damaged blood meal</td>
<td>16.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Soybean meal solvent extracted</td>
<td>7.6</td>
<td>6.7</td>
</tr>
<tr>
<td>Soybean meal heat treated</td>
<td>7.3</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Source: Ross, 2013

Does The Cow Care?

IVNIDA Procedure

Procedure

Sample

Fermentation

Acidify

Gastric Digestion

Neutralize

Mix enzymes

Incubation

Filter

Rumin buffer pH 6.2

Rumen fluid

→Filter → RUP

pH 1.8 - 2

pH 2.0 HCl + Pepsin

2 M NaOH

39°C, 24-h Shaking bath

Anaerobic 16-h, 39°C

kp = 6.25 %/h

Filter Sample → Filter → RUP

IVNIDA Procedure

uN %TN

Does The Cow Care?
Objectives

- To evaluate the performance of lactating dairy cattle fed two different levels of uN as determined by the IVNIDA
- To compare MP allowable milk predictions of the CNCPS using the detergent system or uN IVNIDA with the study data
- Economic evaluation of the outcome

<table>
<thead>
<tr>
<th>Ingredient, % N</th>
<th>NDIN</th>
<th>ADIN</th>
<th>uN det.</th>
<th>uN IVNIDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW uN Blood Meal</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0 →</td>
<td>9.0</td>
</tr>
<tr>
<td>HIGH uN Blood Meal</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0 →</td>
<td>33.8</td>
</tr>
</tbody>
</table>

### Diet Formulation

<table>
<thead>
<tr>
<th>Ingredient, % DM</th>
<th>Treatment</th>
<th>LOW uN</th>
<th>HIGH uN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa haylage</td>
<td></td>
<td>11.5</td>
<td>11.5</td>
</tr>
<tr>
<td>BMR corn silage</td>
<td></td>
<td>49.3</td>
<td>49.3</td>
</tr>
<tr>
<td>Bakery byproduct</td>
<td></td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Blood meal (9% uN)</td>
<td></td>
<td>3.7</td>
<td>---</td>
</tr>
<tr>
<td>Blood meal (34% uN)</td>
<td></td>
<td>---</td>
<td>4.0</td>
</tr>
<tr>
<td>Canola meal</td>
<td></td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Corn grain</td>
<td></td>
<td>16.1</td>
<td>16.1</td>
</tr>
<tr>
<td>Energy Booster 100</td>
<td></td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Molasses</td>
<td></td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Smartamine M</td>
<td></td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Sodium bicarbonate</td>
<td></td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Soybean hulls</td>
<td></td>
<td>4.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Urea</td>
<td></td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Wheat midds</td>
<td></td>
<td>4.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Min/vit mix</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Chemical Composition of Initial Diets Fed

<table>
<thead>
<tr>
<th>Item</th>
<th>Treatment</th>
<th>LOW uN</th>
<th>HIGH uN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM, % as fed</td>
<td></td>
<td>50.0</td>
<td>50.5</td>
</tr>
<tr>
<td>CP, % DM</td>
<td></td>
<td>15.2</td>
<td>15.2</td>
</tr>
<tr>
<td>NDF, % DM</td>
<td></td>
<td>31.9</td>
<td>32.3</td>
</tr>
<tr>
<td>ADF, % DM</td>
<td></td>
<td>21.3</td>
<td>20.5</td>
</tr>
<tr>
<td>Fat, % DM</td>
<td></td>
<td>4.3</td>
<td>3.9</td>
</tr>
<tr>
<td>Starch, % DM</td>
<td></td>
<td>30.4</td>
<td>31.2</td>
</tr>
<tr>
<td>Sugar, % DM</td>
<td></td>
<td>3.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Ca, % DM</td>
<td></td>
<td>0.65</td>
<td>0.60</td>
</tr>
<tr>
<td>P, % DM</td>
<td></td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>ME*, Mcal/kg DM</td>
<td></td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Lys/Met*, % MP</td>
<td></td>
<td>3.21</td>
<td>2.89</td>
</tr>
</tbody>
</table>

* calculated CNCPS
### Results

<table>
<thead>
<tr>
<th>Item</th>
<th>Treatment</th>
<th>LOW uN</th>
<th>HIGH uN</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, lb</td>
<td>LOW uN</td>
<td>60</td>
<td>60</td>
<td>1.34</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>671</td>
<td>664</td>
<td>14.8</td>
<td>0.77</td>
</tr>
<tr>
<td>N Intake, g</td>
<td>LOW uN</td>
<td>35</td>
<td>37</td>
<td>2.78</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>39</td>
<td>41</td>
<td>2.71</td>
<td>0.02</td>
</tr>
<tr>
<td>Milk production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk, lb</td>
<td>LOW uN</td>
<td>93</td>
<td>92</td>
<td>0.04</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>89</td>
<td>88</td>
<td>0.33</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ECM, lb</td>
<td>LOW uN</td>
<td>3.33</td>
<td>2.78</td>
<td>2.71</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>3.13</td>
<td>2.71</td>
<td>2.71</td>
<td>0.02</td>
</tr>
<tr>
<td>Fat, lb</td>
<td>LOW uN</td>
<td>3.6</td>
<td>3.6</td>
<td>0.03</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>3.5</td>
<td>3.5</td>
<td>0.03</td>
<td>&lt;0.03</td>
</tr>
<tr>
<td>Protein, lb</td>
<td>LOW uN</td>
<td>3.03</td>
<td>3.06</td>
<td>0.02</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>3.06</td>
<td>3.06</td>
<td>0.02</td>
<td>0.20</td>
</tr>
<tr>
<td>Milk composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat, %</td>
<td>LOW uN</td>
<td>4.9</td>
<td>4.86</td>
<td>0.94</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>4.86</td>
<td>4.86</td>
<td>0.94</td>
<td>0.18</td>
</tr>
<tr>
<td>Protein, %</td>
<td>LOW uN</td>
<td>4.9</td>
<td>4.86</td>
<td>0.94</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>4.86</td>
<td>4.86</td>
<td>0.94</td>
<td>0.18</td>
</tr>
<tr>
<td>Lactose, %</td>
<td>LOW uN</td>
<td>9.4</td>
<td>8</td>
<td>0.18</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>8</td>
<td>8</td>
<td>0.18</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

1 DMI: dry matter intake, ECM: energy corrected milk (Tyrrell and Reid, 1965), MUN: milk urea nitrogen

### Energy Corrected Milk

#### Results

<table>
<thead>
<tr>
<th>Item</th>
<th>Treatment</th>
<th>LOW uN</th>
<th>HIGH uN</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW and BCS</td>
<td>LOW uN</td>
<td>1508</td>
<td>1525</td>
<td>22.26</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>1525</td>
<td>1525</td>
<td>22.26</td>
<td>0.58</td>
</tr>
<tr>
<td>BW initial, lb</td>
<td>LOW uN</td>
<td>1508</td>
<td>1525</td>
<td>22.26</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>1525</td>
<td>1525</td>
<td>22.26</td>
<td>0.58</td>
</tr>
<tr>
<td>BW change, lb</td>
<td>LOW uN</td>
<td>76</td>
<td>65</td>
<td>4.96</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>65</td>
<td>65</td>
<td>4.96</td>
<td>0.12</td>
</tr>
<tr>
<td>BCS change</td>
<td>LOW uN</td>
<td>0.44</td>
<td>0.35</td>
<td>0.07</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>HIGH uN</td>
<td>0.35</td>
<td>0.35</td>
<td>0.07</td>
<td>0.29</td>
</tr>
</tbody>
</table>

#### Efficiency

- Gross feed efficiency\(^2\): 1.56 1.50 0.03 0.34
- Milk N efficiency\(^3\): 30.0 29.7 0.70 0.76

1 BW: body weight; BCS: body condition score
2 calculated as kg milk / kg DMI
3 calculated as milk N / N intake * 100
CNCPS Prediction Evaluation

• Full chemical composition in all feeds

• Inputted all environmental, barn and animal characteristics from experiment
  – BCS change was inputted as measured
  – Target ADG was allowed to estimate nutrient requirements for growth based on mature size

• The uN values from the blood meals were the only values changed and were used in place of ADIN

CNCPS v6.5 predictions for ME and MP allowable milk

<table>
<thead>
<tr>
<th>Item</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy corrected milk, lb</td>
<td>LOW uN 92</td>
</tr>
<tr>
<td>Predicted ME allowable milk, lb</td>
<td>HIGH uN 88</td>
</tr>
<tr>
<td>Predicted ME allowable milk, lb</td>
<td>LOW uN 102</td>
</tr>
<tr>
<td>Predicted ME allowable milk, lb</td>
<td>HIGH uN 101</td>
</tr>
<tr>
<td>Predicted MP allowable milk, lb</td>
<td>LOW uN 99</td>
</tr>
<tr>
<td>Predicted MP allowable milk, lb</td>
<td>HIGH uN 99</td>
</tr>
<tr>
<td>Predicted MP supply, g</td>
<td>LOW uN 3,105</td>
</tr>
<tr>
<td>Predicted MP supply, g</td>
<td>HIGH uN 3,144</td>
</tr>
</tbody>
</table>

Using ADIN and NDIN

Using uN assay data

N indigestibility study

• Final difference in predicted N supply was 32 g or 4.8% of N intake.
• Suggests that with adequate and correct N digestibility information, we can refine diet formulations to a small margin
• Challenge is getting variation in feed and management accounted for properly
• Understanding what is first or most limiting is important as we refine our formulation strategies

BALANCING FOR MET – UPDATED AA PROFILES – MILK PROTEIN YIELD v6.5

Source: Van Amburgh et al., JDS 2015
Methionine and Lysine and Relative to Energy

If 60 Mcals ME, then (60 mcal*1.12 g/Mcal) = 67.2 g Met

The lysine requirement should be (7/2.6 = 2.69)

Therefore 2.7 (Lys:Met) * 67.2g = 181.4 g Lys

Always calculated Met first – what the gram/energy relationship was derived from

Then calculate lysine otherwise the ratio will provide incorrect values

Thank you for your attention.
Use of Rumination and Activity Monitoring for the Identification of Dairy Cows with Health Disorders

Julio Giordano, DVM, MS, PhD & Matias Stangaferro, DVM, MS
Dairy Cattle Biology and Management Laboratory

Health Monitoring SOPs
- Substantial variation across farms – frequency of checks, type of evaluation, labor demand and aids used
- Health monitoring programs – costly, time consuming, require qualified labor
- Monitoring technologies: reduce or eliminate the burden associated with health monitoring programs

Early Lactation Challenges

- Health conditions to monitor post-partum period:
  - Retained placenta
  - Metritis
  - Mastitis
  - Displaced abomasum
  - Ketosis
  - Hypocalcemia
  - Diarrhea
  - Pneumonia

Immune Response & (-)EB

Disease

Identify sick cows → Treatment decisions → Improved well-being and productivity

Sensor Data
- Active Bolus
- Monitoring technologies reduce or eliminate the burden associated with health monitoring programs
Rumination-Activity Monitoring

**HR-Tag, SCR Dairy**

(1) Performance of the HR system to identify cows with health disorders (HD).

(2) When does the HR system identify cows with CD compared to farm personnel?
**Health Monitoring SOP**
- Daily monitoring - all cows 1 to 10 DIM
  - Direct observation
  - Body Temperature
  - Ketostix (urine ketones)
  - Daily milk weights
- Rumen auscultation, check for DA
- Vaginal discharge - all cows at 8 DIM
- Milk culture - all cows at the beginning of lactation and mastitis cases
- Monitoring after 10 DIM: 3X milk weights and milk conductivity

**Cornell University Research**
Observational Prospective Cohort Study

(1) **Performance** of the HR system to identify cows with health disorders (HD).

(2) **When** does HR system identify cows with CD compared to farm personnel?

- Cows grouped based on occurrence of HD (health disorder) and HI (health index) score
  - HD+ and HI+ (HI <86) - disorder and flagged
  - HD+ and HI- (HI ≥ 86) - disorder and NOT flagged
  - HD- (Healthy) - healthy

**Ability of HI Score to Identify Cows with Health Disorders**
DA, KET, & IND

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Cows detected Se, % (95% CI)</th>
<th>HI &lt;86 to CD (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA (n = 41)</td>
<td>98 (93-100)</td>
<td>-3 (-3.7 to -2.3; P&lt;0.01)</td>
</tr>
<tr>
<td>Ketosis (n = 54)</td>
<td>91 (83-99)</td>
<td>-1.5 (-2.3 to -1.0; P&lt;0.01)</td>
</tr>
<tr>
<td>Indig. (n = 9)</td>
<td>89 (68-100)</td>
<td>-0.5 (-1.5 to 0.5; P=0.28)</td>
</tr>
<tr>
<td>All metabolic &amp; dig. (n = 104)</td>
<td>93 (89-98)</td>
<td>-2.1 (-2.5 to -1.6; P&lt;0.01)</td>
</tr>
</tbody>
</table>
Conclusions

- The HR system was effective to identify cows suffering metabolic and digestive disorders (DA, KET, IND).
- Cows with DA and KET identified earlier than farm personnel.
- No difference in milk for cows not flagged by HR (HD+ and HI-) and Healthy cows for 5 d prior to CD.

Ability of HI Score to Identify Cows with Health Disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Cows detected Se, % (95% CI)</th>
<th>HI &lt;86 to DCD (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metritis ALL</td>
<td>55 (49-60)</td>
<td>-1.2 (-1.6 to -0.7; P=0.01)</td>
</tr>
<tr>
<td>≤39.4°C (n = 165)</td>
<td>56 (48-64)</td>
<td>-1.4 (-1.9 to -1.0; P=0.01)</td>
</tr>
<tr>
<td>39.5-39.9°C (n = 79)</td>
<td>49 (38-61)</td>
<td>-1.3 (-2.9 to 0.4; P=0.17)</td>
</tr>
<tr>
<td>≥40°C (n = 74)</td>
<td>58 (46-70)</td>
<td>-0.2 (-0.9 to 0.4; P=0.46)</td>
</tr>
<tr>
<td>Antibiotic treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalosp. (n = 292)</td>
<td>49 (43-55)</td>
<td>-1.1 (-1.6 to -0.6; P=0.17)</td>
</tr>
<tr>
<td>Ampi./Oxytet. (n = 57)</td>
<td>83 (70-91)</td>
<td>-1.4 (-2.1 to -0.7; P=0.17)</td>
</tr>
</tbody>
</table>
**HI patterns**

**Metritis (Healthy, HI-, HI+)**

**HEALTH INDEX**

![Graph showing HI patterns](image1)

- Healthy (n = 451)
- HI (-) (n = 156)
- HI (+) (n = 184)

Group: P < 0.001

Day: P < 0.001

Group * Day: P = 0.005

**Milk Production – MET**

**Primiparous**

![Graph showing milk production for primiparous](image2)

- Healthy (n = 171)
- HI (-) (n = 98)
- HI (+) (n = 110)

Group: P = 0.11

Day: P < 0.001

Group * Day: P = 0.006

**Milk Production – MET**

**Multiparous**

![Graph showing milk production for multiparous](image3)

- Healthy (n = 264)
- HI (-) (n = 57)
- HI (+) (n = 77)

Group: P < 0.001

Day: P < 0.001

Group * Day: P < 0.001

**Culling Dynamics and Repro**

By HI Score (+ vs -)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Healthy</th>
<th>HI-</th>
<th>HI+</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNB/Sold &lt;60</td>
<td>2.5a</td>
<td>3.3a</td>
<td>7.0b</td>
<td>0.03</td>
</tr>
<tr>
<td>(n/n)</td>
<td>(11/451)</td>
<td>(5/153)</td>
<td>(13/187)</td>
<td></td>
</tr>
<tr>
<td>DNB/Sold total, %</td>
<td>18.6a</td>
<td>14.4a</td>
<td>31.0b</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>(n/n)</td>
<td>(94/551)</td>
<td>(33/153)</td>
<td>(56/187)</td>
<td></td>
</tr>
<tr>
<td>DIM at 1st AI, days (n)</td>
<td>79</td>
<td>79</td>
<td>80</td>
<td>0.73</td>
</tr>
<tr>
<td>(n)</td>
<td>(600)</td>
<td>(140)</td>
<td>(157)</td>
<td></td>
</tr>
<tr>
<td>P/AI at 1st AI, %</td>
<td>46.0</td>
<td>42.9</td>
<td>45.9</td>
<td>0.80</td>
</tr>
<tr>
<td>(n/n)</td>
<td>(164/400)</td>
<td>(80/140)</td>
<td>(72/157)</td>
<td></td>
</tr>
</tbody>
</table>

Cows in HI+ group twice as likely to leave the herd than cows in the HI- and Healthy group.
### Ability of HR System to Identify Cows with Disease

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cows detected</th>
<th>% Se (95% CI)</th>
<th>HR Flag to DCD (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastitis (n = 165)</td>
<td>53 (45-61)</td>
<td>-0.6 (-1.1 to -0.2; P&lt;0.01)</td>
<td></td>
</tr>
<tr>
<td>Clinical (n = 123)</td>
<td>58 (49-67)</td>
<td>-1.2 (-2.7 to 0.3; P=0.12)</td>
<td></td>
</tr>
<tr>
<td>Subclinical (n = 42)</td>
<td>41 (26-57)</td>
<td>-0.5 (-1.0 to -0.1; P=0.02)</td>
<td></td>
</tr>
</tbody>
</table>

By Pathogen:
- E. Coli. (n = 31): 81 (67-95) -0.5 (-1.1 to 0.2; P=0.18)
- Gram + (n = 39): 49 (32-65) -0.5 (-1.4 to 0.5; P=0.31)
- Staph. Aureus (n = 11): 46 (17-77) -1.4 (-4.1 to 1.3; P=0.23)
- No growth 48 h (n = 25): 48 (28-69) -0.2 (-1.4 to 1.1; P=0.78)

Stangaferro et al., 2015 (Abstract: J. Dairy Sci. 98, E-Suppl 1)

### Change in Rumination, Activity, HI Score, and Milk

#### 5 d preceding to Nadir

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Percent change 5 d preceding CD to nadir</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRT (min/day)</td>
<td>Healthy</td>
</tr>
<tr>
<td></td>
<td>0.6 ± 0.9&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>ACT (AU/day)</td>
<td>4.0 ± 1.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>HI Score (AU/day)</td>
<td>0.4 ± 0.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Milk (kg/day)</td>
<td>4.1 ± 0.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Stangaferro et al., 2015 (Abstract: J. Dairy Sci. 98, E-Suppl 1)

### Milk Production - MAST

- Milk production (kg/d) vs. Days relative to clinical diagnosis
- Group: P<0.001
- Day: P<0.001
- Group *Day: P<0.001

Stangaferro et al., 2015 (Abstract: J. Dairy Sci. 98, E-Suppl 1)

### Health Index Score Performance

<table>
<thead>
<tr>
<th>% (n/n)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>False positives</td>
<td>2.4 (1,955/72,423)</td>
</tr>
<tr>
<td>Specificity</td>
<td>97.6 (70,695/72,423)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>95.6 (73,111/76,519)</td>
</tr>
</tbody>
</table>

- Each day was considered a new test
- Total number of days in the study was determined for individual cows until 80 DIM or DIM at which cows left the herd (sold or died)

Stangaferro et al., 2015 (Abstract: J. Dairy Sci. 98, E-Suppl 1)
The HR system is most effective to identify cows suffering metabolic and digestive disorders.

A relatively lower Se to identify cows with MET and MAST might be explained by less severe systemic illness and type of mastitis-causing pathogen.

The HR system identified cows with DA, KET, MET and MAST earlier than farm personnel.

Opportunities
- Improved response
- Improved well-being
- Prevent associated disorders

Challenges
- Treatment decisions in the absence of clinical signs?
- Prophylactic treatment?

On-farm use...
- Farms with little-to-no intervention identify more cows with health disorders
- Farms with intensive health monitoring reduce labor & cow manipulation
On-farm use...
- Add HI report to fresh cow check list
- Greatest benefit for DZ that occur after 3 DIM

Reduce number of cows to monitor

---

Acknowledgements
- Collaborating dairy farm
- SCR Dairy
- Students and technicians

Julio Giordano
http://blogs.cornell.edu/giordano/
jog25@cornell.edu
FAMILY FARM TRANSITIONS: KEY DECISIONS

We have about 30 minutes together in this breakout session

We’ll talk about . . .
- Key decisions
- Family expectations
- Communication points
- Family conversation skills, approaches
- Resources
- Homework (see handout)
PDF format of articles on Ag Decision Maker

(1) Decide to stop procrastinating.

Don’t put off conversations about farm transition and estate planning!
Do you keep your dairy updated?—
Or do you get behind the times because that’s the way we’ve always done it?

When was the last time you updated your estate plan?
- University studies –
  - 60% do not have an updated estate plan
- 89% do not have a farm transfer plan
- Many keep waiting for the “perfect” plan.
- Others avoid the difficult conversations

Is your family holding onto old – outdated methods and thinking?
- In years past, families made assumptions – that things would just go on as they had before.
- Without purposeful planning, the operation may cease to exist.

(2) Decide what your plans are for when you don’t die -- (well, at least not right away . . . .)
What happens when you can’t speak for yourself, make your own decisions?

**Substitute Decision-Making: Powers of Attorney (POA) –and– Health Care Planning & Directives**

- **Incapacity** = lack of physical or mental abilities that results in a person’s inability to manage personal care, property or finances.

**Power of Attorney for Business/Financial Purposes**

- Allows your “agent” to act in your place if you’re unable to handle your own business/financial matters.
- **Health care decisions? NO!**
- Spells out agent’s powers such as:
  - Pay bills, file income taxes
  - Sell, lease assets
  - Collect money due

“But I’m healthy and active, and besides – isn’t 80 the new 40?”

- After age 65, chances of becoming incapacitated rise to 50%+.
- At age 80, chance of becoming incapacitated rises to 75%.
- In any year, at any age, your chance of becoming incapacitated is greater than your chance of dying.
Power of Attorney for Medical/Healthcare Purposes

- Allows “agent” to make health care decisions if you’re not able to express those decisions.
- Spells out powers such as:
  - Hospitalization
  - Consent/reject treatment
  - Organ donation

Powers of Attorney guidelines:

- Name at least one alternate agent – and avoid “co-POAs”.
- Consider people younger than you!
- Healthcare/Medical and Business/Financial may be different agents.
- You must be “competent” (have legal capacity) when you sign.
- Power of Attorney only good during lifetime.

Living Will: also known as a “Declaration Relating to Use of Life-Sustaining Procedures”

- Purpose: Express what “life-sustaining” procedures are desired.
- Can guide a Healthcare POA.
- Many states have standardized forms for POAs and Living Wills and DNRs (Do-Not-Resuscitate Orders) which may or may not be right for you. Please consult with an attorney!

Do Not Resuscitate (DNR) Orders – 2 Types

- Physician-issued: Allows emergency care providers and others outside a hospital to rely upon a physician-issued DNR order for an adult in a terminal condition.
- Patient-issued: Directs medical providers to not attempt resuscitation (CPR) if the patient’s heart stops.

Please consult with an attorney!
Read more about it! – on Ag Decision Maker:

(3) Decide to establish ongoing family communication --

and take steps to start and continue this practice!

Research: Communication Barriers to Family Farm Succession Conversations

- Penn State study
- Found several key barriers in farm families that kept them from talking about future plans for the family farm

Passive Communication

When responding to questions about how families reached mutual understanding on issues related to family relations and plans for the family farm, respondents placed more emphasis on what was implicitly understood rather than explicitly communicated.
**Delays in Planning – due to unresolved issues in lives of adult children**

- Waiting for children to make career decisions
- Concern about stability of adult child’s marriage
  - Current marriage or possible future marriage

**Hold Regular Family Meetings: Guidelines**

- Not over Thanksgiving or Christmas Dinner
- Schedule, commit the calendar
- Establish agendas.
- Keep minutes.
- Consider meeting facilitation

**Varying efforts to incorporate children’s perspectives into future planning**

- Most parents understand that farm succession planning can’t be driven unilaterally by senior generation – but varied in how they went about accommodating children’s perspectives and concerns.
- Some parents tried to be subtle in their efforts to exert influence with their children.
- Other parents were more direct in their efforts.

**No “family secrets” in estate or succession planning!**

Everyone should know what’s going on!
“Reading of the Will?”

This is an outdated concept!

Communicate, Communicate, Communicate

• Head off conflict, hard feelings among family members.
• Technical details? Involve lawyer, other professionals.
• Include discussions regarding distribution of personal property.

Advantages of Communication

• All may not agree – but it’s better to share, explain your rationale.
• Provides everyone an opportunity to understand and respect decisions.
• Communication allows hurt feelings to heal, jealousy to diminish.
• Avoid estrangement or court battles among heirs.

(4) Discuss and decide strategies for how various heirs or family members may be treated – focusing on what’s fair, not necessarily equal.
Make decisions about what is **fair** or equitable to all . . .

. . . even though it may not be **equal**.

> How to pass the farm business to the next generation—but not create animosity among heirs?

> If we divide assets equally among all, will it create such small pieces that successor child(ren) can’t make a living operating the family farm?

Non-Farm Children may have received:

- College tuition, down payment on a house, other compensation — receiving some inheritance early.
- Who truly helped to create part of parents’ final estate of by actively contributing to the parents’ business over the years?
- Again — issues of “Contribution versus Compensation” — fair does not always mean equal.

Read more about it: University of Minnesota Extension – Transferring the Farm series
(5) Decide how to own property and coordinate estate plans and property ownership strategies.

HOW Property is owned may be part of an estate plan or farm succession strategy.

Real Property

- Land + anything attached to it
- Buildings, fencing, subsurface tiling

Personal Property: Tangible and Intangible

- Tangible = anything you can touch
- Intangible = has value that you can't touch, but you can use it
Raise your hand if . . . You have **TOO MUCH STUFF**?

**Real Property or Intangible Personal Property may be owned individually or jointly**

➢ Most common for real estate = fee simple ownership → Unconditional power to use or transfer the property.

**Have a plan to dispose of or pass on personal property:**

- Pass on or dispose of some items during lifetime.
- “De-Clutter” your life!
- Example workbook →
- Possessions you want to pass on after death?
  - List
  - Mark
  - Round-robin
  - Auction

**Property Co-Ownership**

- Joint tenants with right of survivorship (JTWROS)
- Tenancy in Common (TIC)
Joint Tenancy with Right of Survivorship (JTWROS)

- Two or more people
- Equal shares
- Can’t sell, transfer, mortgage without consent of others
- Right of survivorship = like a “built-in” will
- When an owner dies, ownership interest ceases.

Tenancy in Common

- Two or more owners
- Separate but undivided interest
- Shares may be equal, or unequal
- No right of survivorship – shares pass to heirs.

Fred & Wilma had 3 sons:

As part of their estate plan—they told their lawyer that when Fred died, they wanted each of those 3 sons to get one of the 80-acre parcels owned solely by Fred. Fred died – and then they found out:

Those three 80-acre parcels were owned by Wilma.

Farmland: Keeping it “in the family”?

What are the consequences?

Grandma & Grandpa: Own a section—640 acres
4 Kids – Allan    Bill    Cathy    Donna
Equal Shares—25% each

- Allan: To 4 kids equally, each own 6.25% of 640 acres
- Bill: To 5 kids equally, each own 5% of 640 acres
- Cathy: To 3 kids equally, each own 8.333% of 640 acres
- Donna: 0 kids, leaves to the church (25% share)

► None of the grandkids live in the area.
► Land is rented, farm manager takes 10%
► Checks (income) to grandkids leaves the state
(6) Decide whether you have a Federal Estate Tax or State Inheritance Tax issue.

Quick review of the rules:

- Federal Estate Tax: Based on date-of-death estate value.
- **Unified Credit** = Amount of property that can be transferred at death without FET obligation.
- **Unlimited** transfers to surviving spouse & charities.

ATRA – FET Impact on Farms and Small Businesses:

- USDA estimates that with the exemptions, only 0.6% of farms would have to pay an estate tax. (Another 2.1% would file returns but owe no taxes.)
- Tax Policy Center estimates: For 2013 deaths, only 120 farms & small business (at least 1/2 assets are in farm or business assets) would pay FET.

Check YOUR State laws re: State Inheritance Taxes

- Example: New York recently doubled its exemption amount from $1 million for deaths before April 1, 2014 to $2,062,500 for deaths from April 1, 2014 thru April 1, 2015.
- New York exemption will rise gradually thru 2019 to match the federal exemption.
- April 1, 2017: New York exemption will be $5.25 million.

Here’s the point regarding FET:

- Do the math: 950 acres of land @ average value of $11,000 per acre approaches $10.5 million – hovering close to a level that could trigger federal estate tax.
- Farmland owners may have a false sense of federal estate tax security because they think their share of the farm is worth less than $5.43 million.
- But adding up all the assets on the balance sheet and estimating increasing farmland values may paint a different picture at the time of death.
- Even considering Special Use Valuation – farmland owners should maintain an accurate balance sheet that reflects the fair market value of assets.

(7) Decide to plan for the time of death – with liquidity and final disposition plans.

- Farmers accumulate assets: land, equipment, farm buildings, livestock.
- Costs of illness, medical care, funeral expenses add up.
- Settlement (probate or trust administration) has a cost.
- Cash may be needed to continue farm operations at the time of death prior to final estate settlement.
- Maintain assets with sufficient liquidity to convert to cash and cover these costs; or consider life insurance.
- Related: If an heir(s) will want to buy out other heirs’ land interests at the time of death, provisions need to be made for sufficient cash or credit to achieve those purposes.
Have you made final disposition plans?

Funeral Planning Checklist

A list of all the issues to consider when planning a funeral.

Planning a funeral is a complicated process, which is made even more difficult by the emotional stress that accompanies the death of a loved one. Fortunately, many of the arrangements can be made ahead of time, which will decrease the burden on those left behind. Use the checklist below when discussing funeral plans with your loved one, to make sure that his or her final wishes are carried out.

Pre-Planning

All of these items can be arranged in advance of a person's death.

General Preparations

- Assemble personal information for obituary
- Choose a charity to direct donations to
- Decide if jewelry is to remain or be returned
- Choose a funeral home

Iowa: There's a specific form to designate a person to have authority to make “final disposition” plans.

Check your state and talk to your attorney about this—if it’s important to you.

NEW YORK appears to have a similar law & form.

Plan ahead – buy your casket or urn before you need it.

Reverence for Nature

As Trappist, we are committed to responsible stewardship. Preserving the natural world is important to us. None of the wood we use comes from our own forest. To continue the cycle, we plant a tree for a living memorial to each person who is buried in a Trappist Casket.

Caskets

Starting at $1,300

Child Casket Fund

The Child Casket Fund enables the financial burden to family to take on the cost of a child's casket.

Urn

Starting at $225

NORTHWOODS CASKET COMPANY

STARTS WITH YOU

Simple Pine Box $1,079.00

Plain Pine Box $1,199.00

Build-Your-Own Casket Kit $399.00
(8) Decide to be organized and maintain good records

Records that can be found, referred to and used by you and other for ongoing conversations, planning, or at incapacity or death.

- Safe place, yet still accessible.
- Safe deposit box, fireproof filing system?
- Have show-and-tell session with others.
- Hard (paper) copies are most accessible.
- Well-organized records, documents? Procedures following death are less time-consuming, expensive and frustrating for others.

Consider organizing documents in files or 3-ring binders
(9) Decide to build your estate and transition planning team.

Build a team of professionals to support your planning process.

Who should be on your team?

- Legal Professional
- Tax and/or Accounting Professional
- Financial Planning or Banking Professional
- Other professionals? - Insurance - Real Estate - Spiritual

Read more about it: Ideas on how to find an attorney or other professional.
(10) Decide to continuously discuss your plans and maintain your estate or transition plan documents.

Farm Transition and Estate Planning is never “done.”

- Goals and Circumstances Change.
- Have regular, annual reviews with professionals – legal, tax, financial, insurance.
- Review beneficiary designations on intangible assets – retirement accounts, CDs, bank accounts, life insurance.
- Life event triggers: Births/adoptions, incapacitation or deaths, marriages, divorces/separations of anyone who may be impacted in your estate plan. Moving, changes in income or wealth.
- Don’t expect professionals to call you to come in for a review.
- Schedule annual check-ups – just like you would with your physical health – to review plans and circumstances.

What are your next steps?

- Set Goals
- Seek Resources
- Communicate
- Get Organized
- . . . Take advantage of Extension programs and resources!
- Program options:

CONTINUE OR GET STARTED ON YOUR FAMILY FARM TRANSITION PLAN

Conference & Annual Meeting
March 8-9, 2017  Liverpool/Syracuse, New York

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