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Dairy Pipeline

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Transition Cow Health Affects Pregnancy Loss

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We all realize the importance of getting cows pregnant as soon as the voluntary waiting period ends, but, the work is not over after the cow has been inseminated. Only 30 to 40 percent of cows will generate a calf from their first insemination. Producers are becoming adept at identifying cows that are not pregnant through heat detection, early pregnancy diagnosis, and using re-synchronization programs. Unfortunately, those cows diagnosed as pregnant still require attention. Substantial farm-to-farm variation exists, but one can expect that 10 to 15 percent of lactating dairy cows diagnosed pregnant at day 28-35 will not be pregnant one to two months later. The good news is that nearly all of these late embryonic and early fetal pregnancy losses will have occurred by the end of the second month of gestation (day 60). Only approximately 5 percent of cows will abort their fetuses thereafter. The bad news is that although we know when to expect these pregnancy losses, we do not know how to prevent these pregnancy losses.

One thing we do know is that transition cow health is one of the largest contributing factors in these late embryonic and early fetal pregnancy losses. Pregnancy loss is associated with various inflammatory diseases, including retained fetal membrane syndrome, metritis, mastitis, as well as with several metabolic problems (ketosis, hypocalcemia, displaced abomasum). Cows that experience two or more of these problems are four times more likely to experience pregnancy loss after their first service[1]. We suspect a reason why such losses occur is because these cows experience a longer lasting and more severe period of early lactational body weight loss than healthy cows. This negative energy balance state has long-lasting effects, one of which is the likelihood that cows will underperform in the parlor. Contrary to popular belief, these cows fail to reach the milk yields needed to consider them as top producers. Top producers usually only experience a slight degree or no negative energy balance. They also usually do not experience any transition health disorders. Based on this information, it is not difficult to understand why top producers represent some of the most fertile cows in the herd.

Inflammatory diseases seem to be especially problematic when considering linkages between transition period health and late embryonic and early fetal pregnancy losses. A recent study published in JDS Communications[2] noted that pregnancy losses were most prevalent in cows that experienced retained placenta, metritis, and/or mastitis. These diseases will usually induce a negative energy balance state, but they also appear to cause other problems. The inflammatory response to pathogens, such as bacteria and viruses, produce various factors including hormones and cytokines which can be detrimental to the embryo and placenta. In addition, this inflammatory response can have long-lasting effects on the cow. A report from the University of Florida[3] discovered that cows exposed to inflammatory stress harbored oocytes that were less competent at producing viable embryos, and this problem persisted for several weeks after the inflammatory response had subsided.

Although we cannot yet prevent pregnancy loss, there ARE strategies to minimize the risk in your herd.

Focusing on transition cow health is an obvious recommendation. Nutrition is also key during the transition period. Many of the best herds will contain cows that do not undergo negative energy balance thanks to proper nutrition and close attention to cow health.

The key for limiting the financial burden of pregnancy loss is to minimize the time cows that undergo pregnancy loss will remain open. The two best ways to accomplish this are to 1) continue to heat detect after the first pregnancy diagnosis, and 2) complete a second pregnancy diagnosis at day 60 or soon thereafter. Completing the first pregnancy diagnosis at day 28-35 will identify cows that have either never been pregnant or have already lost their pregnancy. This will allow you to re-synchronize these cows for another insemination. Early pregnancy diagnosis usually requires the use of a blood-test or transrectal ultrasonography. Do not shy away from using blood tests. They are highly accurate on and after day 28 of gestation. A blood test may also be used for the second pregnancy check at day 60. These tests are economical, but they do contain a small risk of misdiagnosis, so a follow-up rectal palpation examine is suggested on or after day 90.

The protocol described should be completed for the entire lactating herd, but producers may also want to pay special attention to cows at risk for pregnancy loss. This group includes those that have suffered from one or more transition cow disorders—especially if an inflammatory disorder occurred. Remember, these at-risk cows likely will have also lost a substantial amount of body weight during the transition period and they are probably not considered top producers in your herd.

Tips for Minimizing Pregnancy Losses

- Focus on optimizing transition cow nutrition and health
- Be especially aggressive with treating cows with retained placentae, metritis, mastitis and other inflammatory diseases
- Complete the 1st pregnancy diagnosis at day 28-35
- Continue to heat detect after the 1st pregnancy diagnosis
- Complete the 2nd pregnancy diagnosis at day 60
- Pay close attention to cows that experience one of more of the following:
  - Inflammatory or metabolic disorders
  - Substantial body weight loss
  - Low milk production coupled with transition cow disorders

[1] http://dx.doi.org/10.3168/jds.2015-10595
[2] https://doi.org/10.3168/jdsc.2023-0397
[3] 10.1093/biolre/ioaa069

Refining Nutrient Efficiency in Dairy Farming through Precision Feeding Practices

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Reinventing the wheel? No, just refining existing practices taking advantage of the new technologies launched at the dairy operation in the recent years.

Feed cost and milk price oscillations must be managed by dairy operators to maintain farm profits while producing milk in a sustainable manner. Milk is produced with fewer resources and impact today than

in past decades due to significant gains in productivity and reduced use of human edible resources. Even so, general public concerns regarding natural resource use have not diminished. Therefore, dairy farms must not only manage feed costs, but also manage food for human consumption and environmental impact.

Efforts to improve efficiency in dairy production with indirect environmental benefits are no longer sufficient. Refining on-farm strategies directly targeting nutrient load reduction is considered a better approach to sustainability. This can be achieved by refining management practices based on a better understanding of the animal at the individual level. In this sense, technologies have been progressively implemented on farms to monitor individual productive and reproductive performance, behavior, and health status. However, applied approaches to feeding animals more precisely to improve herd production efficiency through nutrition have not followed the same pace. This paper discusses how energy and nitrogen efficiency can be used with precision feeding equipment to fine-tune production efficiency and further mitigate nutrient loading.

Feed efficiency is a well-established and commonly used metric to quantify dairy production performance. It is the relative ability of cows to turn feed nutrients into milk nutrients or components. It is calculated as the ratio between nutrient or resource, such as energy, nitrogen, phosphorus, and water consumed per unit of milk nutrient or component output. Due to its economic significance, it has recently gained greater attention in the context of genetics as a valuable trait to be used in animal selection.

Residual feed intake (RFI) has been explored as a feed efficiency trait by the calculated difference between actual vs. predicted intake. The latter refers to a projection on intake made for the average animal in the population. Thus, the residual measures how much better or worse the animal does compared to the average animal. For example, consider two Holstein multiparous cows that are currently 150 days in milk, pregnant, and weighing 1500 lbs. They both produce 100 lbs. of milk with exact percentages of 3.10%, 3.80%, and 4.85% for milk protein, fat, and lactose components, respectively. According to the nutrient requirements for dairy cattle released in 2021, both cows are expected to have dry matter intake equal to 55 lbs. However, the actual intake for cow one was recorded as 53 lbs., and for cow two, 55 lbs. Observed residual feed intake for cow one is then -2, while cow two's score is zero, suggesting that cow one utilized nutrients more efficiently than cow two.

Numerous discoveries have been made around the energy efficiency aspects of this trait, but a full exploration has not been completed for protein efficiency. Compared across livestock species, dairy cattle have one of the lowest efficiencies in converting protein consumed into milk. While excess energy is stored in the animals' bodies, protein is not. Unutilized, it will be mostly excreted in urine and feces, directly impacting farm profitability and nutrient loads—a matter that warrants further consideration concerning general sustainability issues.

In the past ten years, researchers at Michigan State have studied residual feed intake in dairy animals when fed varying dietary starch and protein levels. They found that those with lower RFI values more efficiently utilized protein. However, they did not further investigate or quantify the nitrogen excretion load. From another perspective, European researchers recently attempted to segregate and develop a protein efficiency index demonstrating potential application in dairy cattle breeding.

An alternative way to fine-tune RFI as a trait was outlined in a recent invited review. A key point discussed was the need for more precise measurements of actual and predicted intake. Adopting automatic milking systems linked with parlor auto-feeders or pen grain feeders can provide on-farm individual intake opportunities. This implies that obtaining measurements of a portion of each animal's intake would be more accurate and cost-effective for commercial applications than current methods requiring electronic feeding systems to quantify full individual intakes.

To enhance the accuracy of intake forecasting projections, on-farm nutrient titration is an alternative to discover individual animal requirements rather than ranking animals solely based on their current efficiencies. Normal animal variation within and between groups can be quantified through individualized response analysis rather than relying on estimated requirements based on average animal responses. In addition, phenotypic measures can be utilized to further calculate breeding values.

In summary, precision feeding opportunities can be achieved by refining nutrient efficiency methods while taking advantage of on-farm feeding technologies. Despite advancements in the precision context, a lack of applied studies addressing the data integration gap in a continuous and automated way is still persistent. Research opportunities encompass algorithm development able to apply precision feeding in commercial dairy operations and deeper investigation into return on investment of implemented technologies.

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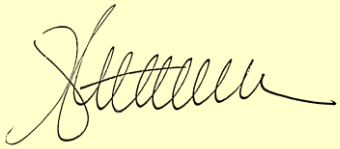

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Upcoming Events

February 7, 2024
No-Till Conference

February 17, 2024
Dairy Quiz Bowl (Youth)

April 13, 2024
Hokie Dairy Day (Youth)

May 3, 2024
Dairy Skillathon (Youth)

May 4, 2024
VA Spring Holstein Show

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