Three Thieves in the Night: subclinical diseases of dairy herds

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As a dairy vet, it is a very real risk that one might focus too much on individual cow problems and the hundreds of pregnancy diagnoses and lose perspective on the herd as a whole.

For the wellness of our dairy animals and the success of our farmers, we should always keep the following conditions in mind.

SUBCLINICAL HYPOCALCAEMIA (SCHC)

Clinical milk fever: affects 5-10% in most herds, drastically increasing with parity. SCHC likely affects 40-50% of multiparous cows. Usually defined as a total serum calcium ≤2.0 mmol/L.

Effect

> In adipocytes, Calcium is needed to regulate fat storage and metabolism
  - Hypocalcaemia may predispose to lipolysis and **type 2 ketosis**.

> Decreased immune cell function
  - Metritis and endometritis risk increases
  - Increased risk of mastitis is seen in clinical milk fever cases

> Decreased muscle tone/contractions
  - Rumen and abomasum atony
    - Gas in the abomasum leading to abomasal displacement
    - Decreased dry matter intake (DMI), weight loss
    - Decreased DMI may predispose to **ketosis**
  - Metritis
  - Retained placenta (pathogenic process is initiated before parturition. Possibly not very direct causality)
  - Uterine prolapse
  - Clinical milk fever = much higher likelihood of dystocia

Some reproduction parameters may be affected due to potential metritis and involution issues, as well as decreased blood flow to the ovaries.

Culling in the first 60 DIM is much more likely in cows suffering from SCHC.

Unclear milk production correlation, decrease possibly mainly due to decreased DMI.

There are strong correlations between hypocalcaemia and ketosis.

When to suspect

Ubiquitous in dairy herds, but the aim should still be to minimise the occurrence of SCHC.

In a herd with a high percentage of affected cows, we expect to see poor reproductive parameters, a high incidence of postpartum problems, and a high culling rate in early lactation.

How to monitor/diagnose on the herd level

The recommended method is to take serum samples of 12 multiparous cows within 48h of calving. Usually, a cut-off of 2.0 mmol/L serum Ca is used. The herd is considered to have over 30% SCHC cases if 6 or more cows are positive, borderline if 3-5 out of the 12 are positive, and negative if 2 or fewer animals are subclinically hypocalcaemic.

Prevention and control

Rations are crucial! The DCAD diet may have a slightly better effect than pre-partum Calcium limitation. Magnesium deficiency is another possible risk factor.

Monitor urine pH to assess the effectiveness of DCAD. The minimum number of days a cow should be on DCAD is 12, and urine pH should be 6.0 to 6.8.

SUBCLINICAL KETOSIS (SCK)

The classic description/definition of SCK is a blood beta-hydroxybutyrate (BHB) concentration that exceeds 1.4 mmol/L during early lactation without clinical signs of ketosis. (Some studies prefer a threshold value of ≥1.2 mmol/L.) The blood non-esterified fatty acid (NEFA) concentration can also be used as a measurement of an animal's ketotic state.

Effect

The reported incidence of SCK varies from about 10% to 40% between different herds and countries.

While the pathophysiological links between ketosis and its various complications are often poorly explained, strong statistical associations between SCK and the following conditions exist and have been convincingly proven:

- Progression to clinical ketosis
- Abomasal displacement
- Metritis

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A more vague correlation with lameness also exists.

Decreased reproductive parameters are seen, including delayed conceptions and more services per conception. High blood NEFAs lead to immune dysfunction, which can exacerbate reproductive tract inflammation post-partum. Additionally, negative energy balance (NEB) is known to be detrimental to reproductive performance.

Milk production shows positive and negative correlations, probably because, while high ketone bodies early in lactation would lead to decreased milk production, high producers will naturally be more prone to ketosis. However, when cows go on to develop clinical ketosis/abomasal displacement/metritis, milk production drops.

When to suspect

> Increased peripartum diseases, esp. clinical ketosis, LDA/RDA and metritis.
> Reduced breeding efficiency, uterine health problems
> Look at the body condition scores of cows in the dry period compared to fresh cows. Over-conditioned cows from the dry period will be more prone to type 2 ketosis.

Monitoring

> For use with milk: Ketolac BHB test strips and PINK test are most sensitive. Other ketone tests have poor sensitivity when milk is used as a sample.
> Most practical implementation in a suspect herd is to test all cows that are in the first 2 weeks of lactation on a set day of the week (i.e. every Wednesday). Cows that test positive for SCK should be treated with oral glucose precursors twice daily until the ketosis is improved.

Prevention

The herd's rations may need to be adapted if a large proportion of the herd is affected by SCK, with a focus on energy-dense feed during periods of NEB. Poorly fermented silage should also be avoided as it can be ketogenic.

SUBACUTE RUMINAL ACIDOSIS (SARA)

In dairy animals, SARA is commonly defined as a rumen pH below 5.5 for transient periods of time, due to a high concentrate diet that the rumen environment is not adapted to. In fresh cows (first 21 DIM), it is usually due to poor transition diet management.

The rumen microbiota take 3 weeks to adapt to a highly fermentable diet, and the rumen papillae take 4-6 weeks. The condition may likely be exacerbated by cows selecting out concentrates in a generally low-intake period.

In mid-lactation, the rumen is already adapted, and SARA is usually due to a mistake in feeding management. Since the fibre to concentrate ratio is already narrow in a lactation diet, any minor error can have widespread consequences.

Sorting, overeating and dry matter miscalculation, as well as overmixing (mixing too long = roughage chopped too fine) of the ration can lead to SARA. To investigate the mid-lactation possibility, cows 45-150 DIM should be screened.

Effect

> Parakeratosis-rumenitis-liver abscess complex: Excessive short-chain fatty acids in the rumen lead to parakeratosis of the mucosa and papillae (which in turn further hinders effective absorption). Micro-abscesses form in the rumen mucosa, and bacteria translocate via the bloodstream to form new abscesses in other tissues.
  - Can lead to a low body condition score and a high culling rate.
> If no parakeratosis, high blood SCFA and a narrow acetate-to-propionate relation can cause a high body condition score and fatty liver, which is associated with **type 2 ketosis**. Not seen in early lactation, but rather later lactation and dry period.
> Laminitis: unclear pathophysiological link, but correlated with high concentrate ration (worse if intake over a short period of time).
> Decreased DMI (possibly associated with lower rumen motility
  – short-chain fatty acids (SCFA), endotoxins, histamine effect?
  – high blood butyrate, and increased rumen osmolarity and fill)

Impact

Present in about 20% of US dairy cattle

Contributes to a higher culling rate. A drop in DMI may also predispose to other disease complexes like milk fever and ketosis. Likely to have some association with type 2 ketosis.

Reduced rumen function and reduced fermentation efficiency would likely also mean that the animals affected are not as feed efficient as possible for the amount of milk they produce.

When to suspect

Decreased dry matter intake

Increase in diarrhoea, faecal changes (brighter/yellowish, slightly acidic, smells sweet-sour, whole grains seen, fibre particles 1-2cm or even >2.5 cm in length).

Increased locomotive issues in the herd (classically associated with laminitis)

Decreased milk fat seen in individuals should usually not affect bulk tank values.

High culling rate due to vague causes, i.e. drop in BCS, decreased performance, and inflammations.

High proportion of caudal vena cava syndrome lesions at slaughter/PM.

Monitoring

One must be aware that the consequences of SARA can sometimes only be noted some time after the initial insult.

The rumen fluid of 12 cows in the at-risk group is sampled, ideally via rumenocentesis. A pH value of ≤ 5.5 is considered a SARA positive for an individual, while ≥ 5.8 is considered negative. The at-risk group is considered to suffer from SARA if 3 or more of the 12 cows are affected.

Timing of sampling: In TMR herds, samples should be taken 5-8h after a meal. In component-fed herds, 2-4h after the concentrate meal is the ideal window period.

Early lactation group: cows that are up to 3 weeks in milk. Mid-lactation group: sample cows that are 45-150d in milk.

Prevention and Rx

> Good steam-up diet for at least 3 weeks to get rumen adapted
> Direct-fed microbials: lactate producers have a greater effect than lactate users
> In-feed buffers (usually bicarbonates)
> Feeding management (good ration, not overmixing TMR, roughage fed before concentrate)

Sources:

- Seifi, H.A., Kia, S. (2017) 'Subclinical Hypocalcemia in Dairy Cows: Pathophysiology, Consequences and Monitoring', *Iranian Journal of Veterinary Science and Technology*, Vol. 9 (2), p1-15.
- Raboisson, D., Mounié, M., Maigné, E. (2014) 'Diseases, Reproductive Performance, and Changes in Milk Production Associated with Clinical Ketosis in Dairy Cows: a Meta-Analysis and Review', *Journal of Dairy Science*, Vol. 97 (12), p7547-7563.
- Kleen, J.L, Hooijer, G.A., Rehage, J., Noordhuizen, J.P.T.M. (2003) 'Subacute Ruminal Acidosis (SARA): a Review', *Journal of Veterinary Medicine Series A*, Vol. 50, p406-414.
- Nasr, M.Y, Elkhodary, S.A., Beder, N.A., Elshafey, B.G. (2017) 'Epidemiological and Diagnostic Studies on Subacute Ruminal Acidosis in Dairy Cows', *Alexandria Journal of Veterinary Sciences*, Vol. 53 (2), p 83-90.
- Geishauser, T., Leslie, K., Tenhag, J., Bashiri, A. (2000) 'Evaluation of Eight Cow-Side Ketone Tests in Milk for Detection of Subclinical Ketosis in Dairy Cows', *Journal of Dairy Science*, Vol. 83 (2), p296-299.
- Suthar, V.S., Canelas-Raposo, J., Deniz, A., Heuwieser, W. (2013) 'Prevalence of Subclinical Ketosis and Relationships with Postpartum Diseases in European Dairy Cows', *Journal of Dairy Science*, Vol 96 (5), p2925-2938.
- Geishauser, T., Leslie, K., Kelton, D., Duffield, T. (2001) 'Monitoring for Subclinical Ketosis in Dairy Herds', *Compendium*, Vol. 23 (8), p65-71.
- Holm, D. (2020) 'Production Diseases Notes for RUM 510', *University of Pretoria*.

QUESTION 1

When monitoring for SCK, the focus lies on…

a. Determining a herd to be SCK-positive or -negative and adapting the ration if needed
b. Identifying animals with blood BHB concentrations < 1.4 mmol/L
c. Identifying animals with blood BHB concentrations ≥ 1.4 mmol/L
d. Determining the proportion of cows with a blood BHB concentration ≥ 1.4 mmol/L
e. Identifying animals with milk BHB concentrations ≥ 1.4 mmol/L

QUESTION 2

What is a sign of SARA but not the other two diseases?

a. Reduced reproductive efficiency
b. Metritis
c. Predisposes to type 2 ketosis
d. Laminitis
e. Large particles in faeces

QUESTION 3

Which of the diseases is linked to clinical ketosis?

a. Subclinical Ketosis
b. Subclinical hypocalcaemia and subclinical ketosis
c. SARA and subclinical ketosis
d. All three subclinical diseases
e. Subclinical hypocalcaemia and SARA

QUESTION 4

Which of the following is NOT a likely cause of SARA in mid-lactation?

a. TMR overmixing
b. Mistake calculating true DM value of roughage
c. Rumen papillae not adequately developed
d. Sorting
e. Overeating after being bullied away from feed bunk

QUESTION 5

What do both SCHC and SCK predispose to?

a. Displaced abomasum
b. Metritis
c. Ketosis
d. Reduced fertility
e. All of the above

QUESTION 6

Which hypocalcaemia-related effect likely has the greatest impact on the development of LDAs?

a. reduced muscle tone/contractility
b. reduced regulation of fat metabolism
c. decreased immune cell function
d. reduced blood flow
e. Increased acetylcholine release

QUESTION 7

Subclinical ketosis is correlated to a higher milk production…

a. in multiparous cows
b. possibly because higher producers are more likely to develop SCK
c. never
d. when diagnosed prepartum
e. when diagnosed week 1 postpartum

QUESTION 8

Apart from diagnosing SARA, when can pH measurement be a useful tool?

a. Milk pH is increased during ketosis
b. Monitoring for hypocalcaemia by measuring urine pH
c. SARA increases urine pH
d. Monitoring the effect of a DCAD diet
e. Serum pH is increased in the presence of high NEFA concentrations during SCK

QUESTION 9

Which ketone test is a good choice for detecting ketones in milk?

a. Urine dipstick
b. Ketostix
c. SUPAketo
d. PINK
e. Acetonreagenz

QUESTION 10

4 out of a sample of 12 cows have a rumen pH below 5.5. This means that the herd is…

a. Positive for SARA
b. Not suffering from SARA
c. Not suffering from SCK
d. Borderline with regards to SARA
e. Showing a positive reaction to the DCAD diet

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