Carryover in the milking parlour and AMS; learning from the past to improve sample quality in the future, and what ICAR can do to help.

Justin Frankfort, NMR, UK
Kees de Koning, WUR / ICAR TC, NL
Christian Ammon, ATB, DE
Rene van der Linde, ICAR, NL
What’s the MRSD Sub Committee doing?

• The Measuring, Recording and Sampling Devices (MRSD) Sub Committee, has been asked to review and produce some tangible practical actions, that will enable ICAR to help MRO’s on a day to day basis.

• A subgroup consisting of Christian Ammon, Kees de Koning, Rene van der Linde and Justin Frankfort:
  – will be building a survey of ICAR members to then produce a ‘best practice’ guidelines document to mitigate carryover, that can be used as required
  – Have produced a new statistical model to check carryover in AMS parlour.
What is carryover, and why bother now?

• Carryover can be defined as ‘something that comes from the past’.
• In this case part of a milk sample from a previous animal using the same milking unit – be it from a conventional parlour or AMS.
• Undetected carryover gives distorted results and diminishes the value milk recording brings to the farm business.
• Johne’s and PAG also carry higher risk of misdiagnosis with poor outcomes for the animal as there are smaller carryover margins.
## Different tests carry different risks

<table>
<thead>
<tr>
<th>Milk component</th>
<th>Service affected</th>
<th>Carry-over risk</th>
<th>Negative outcome (cow dies too soon)</th>
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<tr>
<td>Protein</td>
<td>Core milk recording</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Butterfat</td>
<td>Core milk recording</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>SCC</td>
<td>Cell count services</td>
<td>Medium</td>
<td>Medium</td>
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<tr>
<td>Johne’s (MAP)</td>
<td>Johne’s services</td>
<td>Medium</td>
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<tr>
<td>BVD</td>
<td>BVD services</td>
<td>Medium</td>
<td>High</td>
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<tr>
<td>PAG</td>
<td>Pregnancy services</td>
<td>High</td>
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</table>
How does carryover affect a farm business?

• False positive test results could:
  – Generate unneeded medical intervention – e.g. antibiotics
  – Cull healthy animals
  – Make milk recorded data less trustworthy
  – Increase management time reviewing data.

• All the above directly affect the farm’s bottom line making them less profitable.
How carry over is affected: guidelines, technology & technicians.

• Guidelines for milk recording and sampling
  o Cow ID and representative sample needed.
  o Standard operating procedures, maintenance of equipment.
  o Training of MRO technicians or farmers.

• Effect of technology & technician
  o Get rid of milk left-overs after sampling a cow;
  o Careful sampling, however, some carry-over is inevitable;
  o Capacity vs quality, carry over can be doubled when in hurry.
Real world carry over during milk recording

Measuring carry-over by determining Chemical Oxygen Demand (COD), lab testing, yield 12.5 kg and standard milk recording equipment used by MRO technicians (1997)

<table>
<thead>
<tr>
<th></th>
<th>Tru Test Correct sampling</th>
<th>Tru Test 'speedy' sampling</th>
<th>EMM Correct sampling</th>
<th>EMM 'speedy' sampling</th>
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<tbody>
<tr>
<td>Milking</td>
<td>0.09%</td>
<td>0.31%</td>
<td>0.09%</td>
<td>0.31%</td>
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<tr>
<td>Device</td>
<td>0.95%</td>
<td>1.82%</td>
<td>0.92%</td>
<td>1.80%</td>
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<tr>
<td>Sampling</td>
<td>0.47%</td>
<td>0.84%</td>
<td>1.04%</td>
<td>1.84%</td>
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<tr>
<td>Total</td>
<td>1.51%</td>
<td>2.97%</td>
<td>2.05%</td>
<td>3.95%</td>
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</table>
Carry Over: Effect of previous milking on next sample

- Data of a test in figure 1
- Higher fat in previous milking will result in positive effect, lower fat gives negative effect on next sample,
- Reference milk is collected and ref_sample is compared with device sample (result A),
- Result A is plotted against difference with previous milking (X-axis),

![Figure 1. Relation between difference in consecutive samples and fat difference with reference](image)
Carryover survey -

• The MRSD SC will be producing a survey to go to the ICAR family, asking for examples of the documentation you use, so that a generic best practice investigation form/SOP can be produced.
• This will improve the quality of samples coming into labs, off farm.
• ICAR’s role is to provide toolkits for MRO’s so that templates, working practices and error rates by test type can be produced.
• This will elevate the value of ICAR to the dairy industry
The MRSD SC survey will consider:

- Why carryover is important
- How to build in parlour sampling supervision into regular on-farm practices.
- How does the in-parlour sampling techniques compare to the ideal?
- Help provide the ‘right’ questions to ask when looking at meter and sample device maintenance.
- What if carry over cannot be eliminated?
- What are the clues to spotting carryover at a lab level
### MRSD survey to consider:

<table>
<thead>
<tr>
<th></th>
<th>Why do farmers want to record/sample</th>
<th>Parlour sampling system</th>
<th>Parlour checked and serviced - date</th>
<th>Staff trained and motivated to sample correctly</th>
<th>Outputs / reports explained and understood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIY Service</strong></td>
<td>Legislation, milk buyer quality requirements</td>
<td>Jars, meters and samplers</td>
<td>Clean, operational and accurate. Annual check / service</td>
<td>Enough people to do a timely job. Do they know why they are sampling?</td>
<td>Where to find the results and then take action</td>
</tr>
<tr>
<td><strong>Supervised</strong></td>
<td>Legislation, milk buyer requirements, breed society, personal satisfaction</td>
<td>Jars, meters and samplers</td>
<td>Clean, operational and accurate. Annual check / service</td>
<td>MRO’s own staff should be motivated to do a good job, but we all have off days.</td>
<td>Customers paying for a milk recorder still need to be shown where the results are</td>
</tr>
<tr>
<td><strong>AMS</strong></td>
<td>Legislation, milk buyer quality requirements, MRO’s can do things the AMS cannot e.g. Johne’s testing</td>
<td>Automated</td>
<td>Hopefully</td>
<td>Once trained, usually works well</td>
<td>AMS reports normally suffice</td>
</tr>
</tbody>
</table>
The survey will ask:

• The largest area of risk for carry over is from within the milking parlour.

• Sample quality can be delivered by:
  – Ensuring plant is installed and maintained to original (ICAR) standards
  – Milk sample and animal identification routines are robust and effective.
  – Recognizing that some parlour sampling systems will not be able to take an accurate sample, how are those results flagged?
Milk sampling training, the soft interface

• Training milk samplers, farm staff or contractors to take a representative milk sample is critical.

• It can be compromised by:
  – Farm staff pressurizing samplers to speed up
  – Not allowing enough time to agitate a jar or meter (10 seconds is a long time)
  – Working with substandard sampling equipment, and not reporting it.

• Everyone needs to know why a representative sample is important, we too often focus on the how.
We all know

• When a cow is being milked:
  – Low fat milk is released first
  – The high fat milk comes towards the end
  – SCC’s are attached to fat globules
  – Milk protein is distributed throughout the milking process

• Good agitation of the milk sample before subsampling therefore ensures the mixing process of the entire milking

• Do the sampling teams know this cow biology? Many will not.
Anatomy of the mammary gland

- Alveolair and cisternal part of udder
- 4 independent 'quarters'
- Milk production in alveoli
- Oxytocin release compresses alveoli cells
- Milk flows to cisternal part
- Milk composition differs during milking
- Well-known link between Fat and SCC
- Need for homogenization before sampling
  (Part of ICAR test procedure for MRO measuring & sampling devices)
Survey questions around Milking parlour maintenance

• How does one ask a farmer when was the sampling equipment last serviced? (tone of voice, we are not the police!)
• What questions do you ask – why it’s important, you need accurate data to make accurate decisions
• If the farm refuses to get the sampling equipment serviced, do you withdraw or down grade the service, lose income and reputation?
What if there is no positive outcome?

• Do you withdraw or downgrade the service level?
• What is the farm sampling for? Milk processor contacts, pedigree certification etc. – Does it matter?
• Johne’s and PAG testing demand high sampling standards
• Flag as ‘non authentic’ records??
Survey questions around Lab discrepancy reports

- Automation – what do you use?
- Herd average compared to bulk tank results
- How long do you ‘let it ride’ before escalating?
A heads up, we need your help!!

- An on-line survey will be produced and dispatched following this meeting.
- Responses (this means you), will be gathered, reviewed and summarized. -
- A best practice document will be produced by 30th Oct 2024.
Final thoughts - Milk components and why carry over matters. Testing for Johne’s as an example.

• What is it - an incurable wasting and scouring disease of the dairy cow, acquired at birth, but not detectable through a milk sample until about 4-5 years old.

• Possible links to Crohn's disease in humans.

• Johne's testing in the UK.
  o NMR tests about 150,000 Johne's samples a month, having started about 15 years ago.
  o UK Milk buyers have Johne's testing as one of the criteria of farm assurance.
Johne's and carryover

• We recognised that giving the wrong result to a cow would have terminal conclusions.
• Needed a way of reporting Johne's over a period of time.
• Based on the Danish model, we use a traffic light system over a period of 3 tests built up over a 9 month period.
• It's a case of managing out, rather than culling out straight away.
• Having a good quality sample to test, is the bedrock that all decisions are made
Johne’s reporting through NMR.

Johne's Historical Data Percentage

- Red J5
- Amber J2, J3, J4
- Green J0, J1

Population over time from 17/12/2012 to 21/03/2024.
Johne’s action list

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<tr>
<th>Line No</th>
<th>Lactation</th>
<th>Days in Milk</th>
<th>Fertility</th>
<th>Predicted Calving Date</th>
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Data that vets like to look at

Average Test Value

Average test value and 95%
The bottom line:

• We would like to understand what other MRO’s are doing to reduce carry over and share best practice.
• This will help ensure ICAR remains relevant and useful to the dairy industry.
Thank you,
Best Practice – Sampling Checklist (might be useful)

1. Before adding a herd to additional testing services, ensure that the technician has carried out a review of sampling equipment and addresses potential areas of carryover contamination

• 2. Verify that cow identification systems have been checked for suitability prior to testing

• 3. Collect samples using an ICAR certified milk meter and ensure that milk sample collection equipment and milking equipment are optimized to reduce carryover

• 4. Dispense samples into clean vials that contain approved preservative

• 5. Mix the sample thoroughly to ensure complete dissolution of preservative in the milk

• 6. Thoroughly drain meter flasks, lines and clusters between samples to reduce carryover contamination

• 7. Follow best practice process for recording of cow IDs and sample identification to ensure correct assignation of results at the laboratory

• 8. Modify result interpretation if appropriate and look for indicators that carryover may be affecting results