

BEST PRACTICES TO MINIMIZE CARRY-OVER CONTAMINATION IN MILK RECORDING SAMPLES – BOTH FROM OPERATOR AND FROM EQUIPMENT DESIGN AND SET-UP PERSPECTIVES

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Carryover – A Significant Cause for Concern

- Carryover is comingling of milk between cows before the sample is tested
- Carryover occurs:
 - **Sample collection**
 - Cross-contamination on the dairy
 - Cross-contamination in laboratory
- Two effects of carryover:
 - **Contamination**
 - Dilution



Effect of Carryover in Milk Samples

Cow A



Actual data	
Fat %	5.00
Protein %	3.00
SCC	1,000,000
Johne's Titer	1000

1%

Cow B



True Value	
Fat %	3.00
Protein %	5.00
SCC	50,000
Johne's Titer	0

Cow B is correctly screened as negative for Johne's (MAP)

1% Carry-Over	
Fat %	3.02
Protein %	4.98
SCC	59,500
Johne's Titer	10

Effect of Carry-Over in Milk Samples

Cow A



Actual data	
Fat %	5.00
Protein %	3.00
SCC	1,000,000
Johne's Titer	1000

5%

Cow B

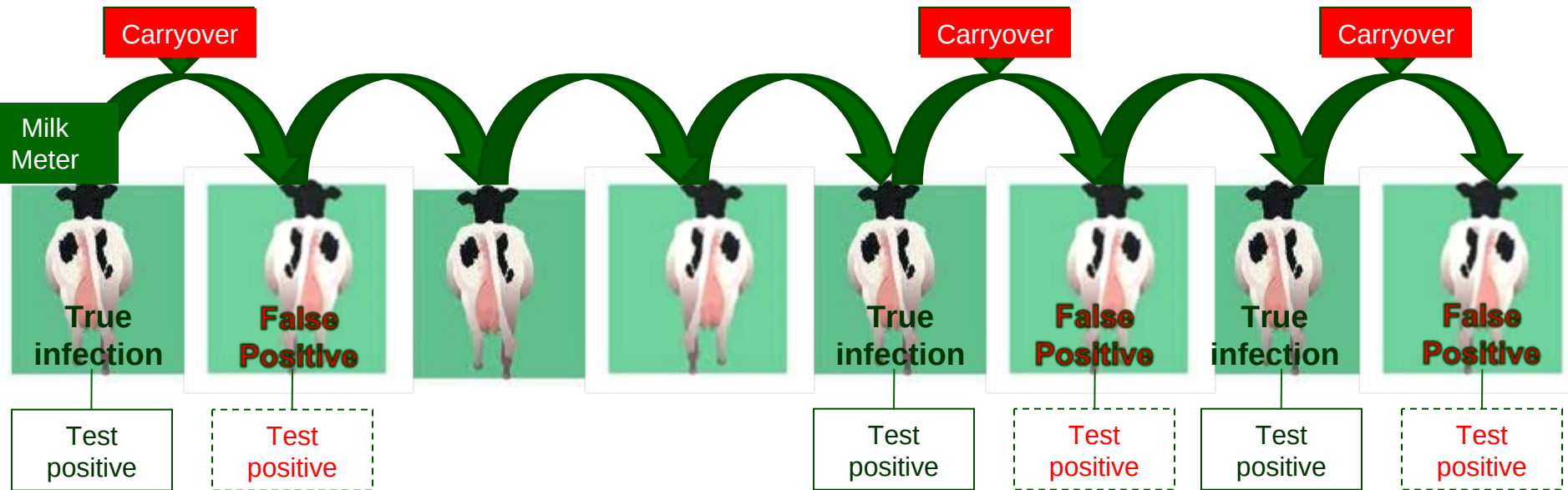


True Value	
Fat %	3.00
Protein %	5.00
SCC	50,000
Johne's Titer	0

Cow B is incorrectly screened as positive for Johne's (MAP)

5% Carry-Over	
Fat %	3.10
Protein %	4.90
SCC	97,500
Johne's Titer	100

Effect of Carryover at Herd Level



Possible effects of test false-positive results

- Unwarranted culling
- Unnecessary medical treatment
- Management intervention
- Overestimation of disease prevalence
- Additional expense and investment of time/resources

Carryover in Various Recording Devices

Monthly Meters (usually owned by milk recording organization)

- | | |
|----------------------------|---|
| •Flask | Manual sampling via alternating flasks |
| •Valve Meters | Manual mixing and sampling through valve |
| •Valve Meters with Sampler | Direct automatic sampling with/without mixing prior to sampling |

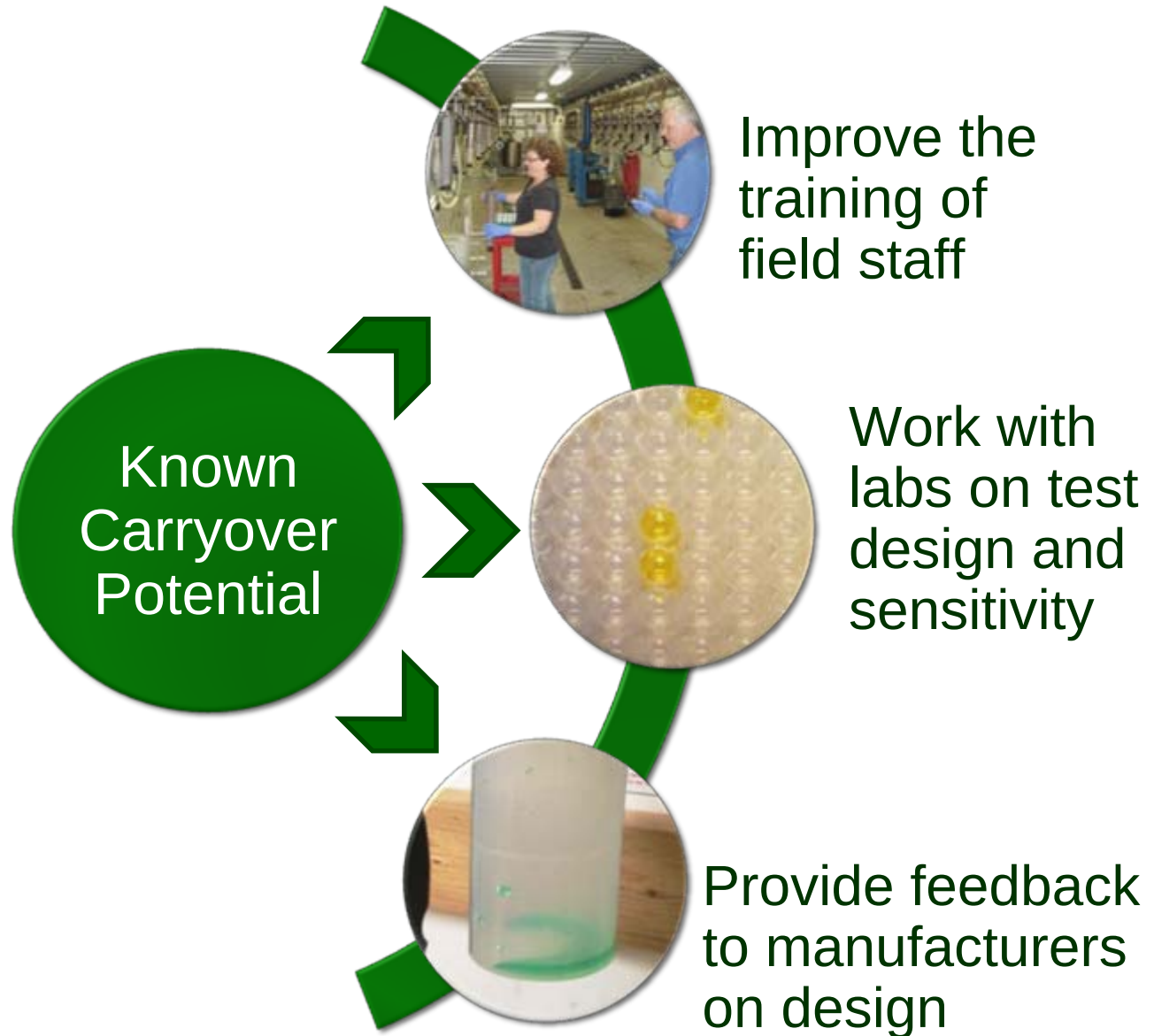
Daily Meters (usually installed on the dairy)

- | | |
|----------------------------|---|
| •Weigh Jars | Total milk collection followed by mixing and subsampling |
| •Fill and Dump Meters | Incremental (cycle) yield measurement with proportionate sampling via manufacturer's device |
| •Continuous Flow Meters | Yield measurement by sensor, proportionate subsampling |
| •Automatic Milking Systems | Direct sampling using external shuttle |

The Real World

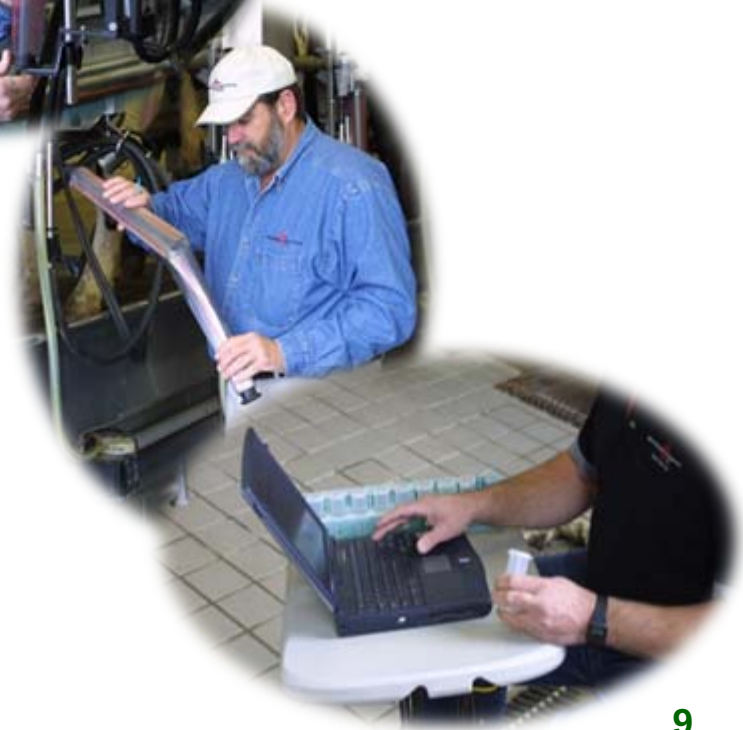
- Meters and samplers are tested and ICAR-approved for yield and milk fat
- Cannot eliminate carryover in recording devices
- There is a human component to milk sampling, even in automated systems
- Certain recording devices may not be suitable for collection of samples for specific tests

Knowledge and Partnership



Ideal Milk Sampling vs. The Actual Test Day

- Read the Cow ID
- Read the Milk Weight
- Adequate Mixing
- Sampling & Data Entry



In a perfect
world

Ideal Milk Sampling vs. The Actual Test Day

- Read the Cow ID
- Read the Milk Weight
- Adequate Mixing
- Sampling & Data Entry

But in reality –
speed and
volume are key



Source of Carryover – Visible Residues

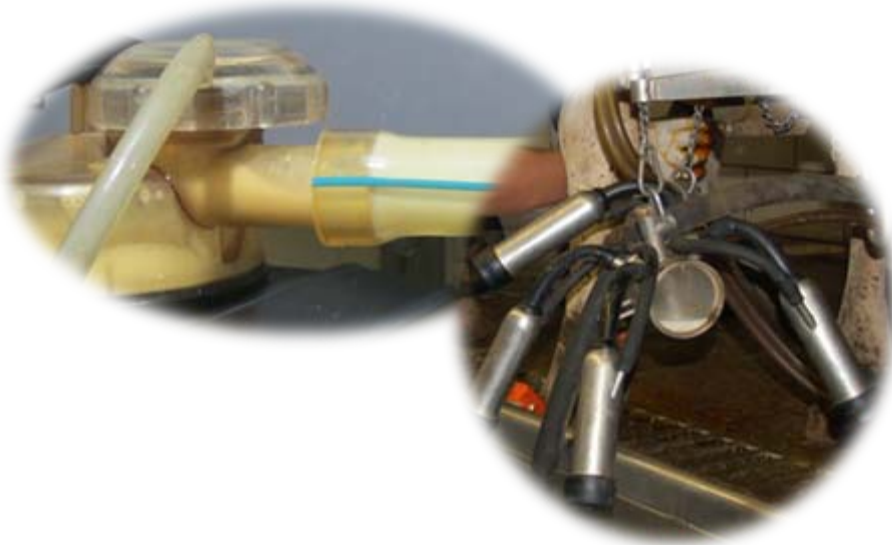
Presence of milk from previous cow(s) in:

- Milking cluster
- Hoses
- Milk meter
- Flask
- Sampler



Low Carryover Concern in Cluster and Line

In the Milking Line



150 ml milk remaining in the line
Subsequent cow yield of 18.1 kg

Min. carryover estimate – 0.85%
(150ml/17,674ml)

Best Practices

Minimal concern to DHI programs

- ☐ Carryover in milk line prefaces the meter & sampler
- ☐ Minimize hose length
- ☐ Record milking order
- ☐ Low volume cows may not have desired dilution effect
- ☐ Be cognizant of outwardly sick COWS

Moderate Carryover Concern in Meter Flask

In the Meter Flask



1.5 lbs. milk remaining in flask
Subsequent cow yield of 40lb (18.1kg)

Min. carryover estimate – 3.8%

Best Practices

Moderate concern to DHI programs as carryover directly related to technician behavior

- ❑ Proper mixing procedures in flask
- ❑ Fully empty flask between cows
- ❑ Rotate with spare flask to ensure complete drainage
- ❑ Record milking order
- ❑ Understand impact of low producing cows – carryover will be increased

Strong Carryover Concern in Meter Body

In the Meter Body



Best Practices

Strong concern to DHI programs

- ❑ Carryover level a factor of design and production level
- ❑ Note visible residues
- ❑ Rotate with spare sampler to ensure complete drainage
- ❑ Record milking order
- ❑ Understand impact of low producing cows – carryover will be increased

High Carryover Concern in Sampler

In the Sampler



2ml in 25-30ml
sample vial
**Min. carryover
estimate – 8-12%**

2ml in 80ml
sample vial
**Min. carryover
estimate – 2-3%**



Best Practices

Highest concern to DHI programs

- ☐ Milk from previous cow in meter sample tube (inside the meter)
- ☐ Larger sampler dilutes carryover but adds labor
- ☐ Remaining milk residue in larger sample vial
- ☐ Sampler settings and functionality
- ☐ Sample identification/linkage
- ☐ Record milking order

Working with Sub-Samplers



These samplers provide a representative sample but

- ☐ Must allow adequate time to drain
- ☐ Think about hidden residues
- ☐ Cleaning and maintenance

Making Wise Equipment Choices



**Minimize carry-over potential with
the right sampler**

Good Practice – Spare Samplers

❑ Suspect Cows

- Abnormal milk
- Treated cows
- Small sample volume

❑ Allows for 'Swap and Clean' without affecting milking or sampling

❑ Protect the 'next cow'



Hidden Residues Are A Challenge

- Connectors & turns
- Tubes and hoses
- Sampler design
- AMS Pumps
- Environmental
- Laboratory equipment



Hidden Residues – Hoses Are A Culprit



- ❑ Meter installation guidelines
- ❑ More critical on meter inlet than outlet



Carryover in AMS Systems and Shuttles

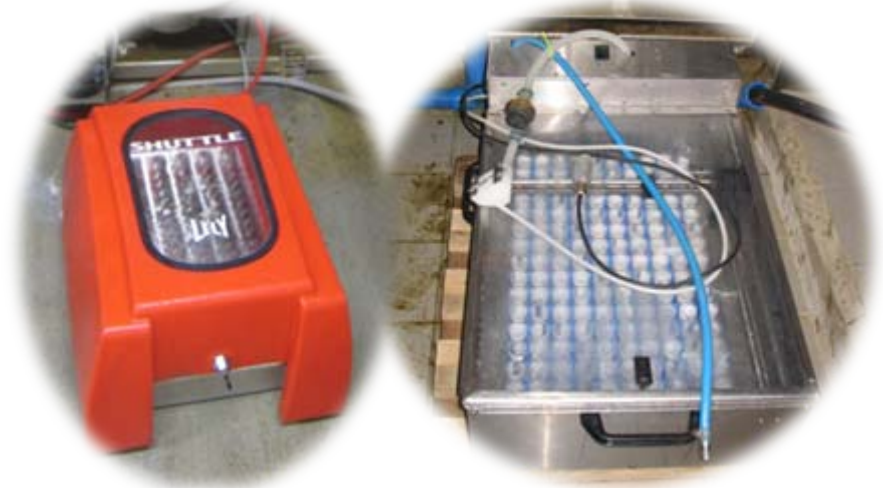
AMS Systems



Best Practices

- ❑ Test-day system settings
- ❑ Mixing, flushing, air pressure
- ❑ Tubing, turns, valves

Sampling Shuttles



Best Practices

- ❑ Alignment of sample vials
- ❑ Shuttle level, tube length/condition
- ❑ Vial handling and re-racking
- ❑ Evidence of cross-contamination
- ❑ Routine maintenance



Training for DHI Field Technicians

[Introduction](#)[John's Review](#)[Sample Acquisition](#)[Role and Responsibility](#)[Quiz](#)

MAP Screening:

Essentials for DHI Field Technicians

This course contains four sections. You will need to complete each section and then take the short quiz at the end to receive your certificate. Click the arrow buttons on the bottom of the screen to continue or use the tabs above to navigate through the course.



Training for DHI Field Technicians

Introduction	Johne's Review	Sample Acquisition	Role and Responsibility	Quiz
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Sample Acquisition

Upon completing this section you will be able to:

- Demonstrate the proper milk sample collection and handling procedures required for milk ELISA testing, and
- Explain why following proper milk sample collection and handling procedures for ELISA testing is essential.



Training for DHI Field Technicians

Introduction
Johne's Review
Sample Acquisition
Role and Responsibility
Quiz

Milk Sampling Procedures

- Mix sample thoroughly to ensure the complete dissolution of the preservative.
- Store and handle milk samples in the same fashion as normal.
- Thoroughly drain the meter flasks between sampling periods to reduce carryover contamination. To do this with pull-out meters, hold the flask upside down as you move between cows.
- Label caps of the vials with the animal's visible ID (ear tag, neck transponder or leg band). In the event that an "official" ID is required for reporting, the official ID should be entered and/or transmitted with the dairy's records for use by the laboratory conducting the analysis.
- Milk sample(s) requiring ELISA analysis must also have a distinguishing mark. Examples:
 - a different color marker for individual samples
 - an alphabetical letter or symbol for individual samples





Instructions for Unsupervised Herds

Owner-Sampler Herds



IMPORTANT!

PROPER SAMPLE COLLECTION PROCEDURES

In order for us to provide you with the most accurate components, SCC and lab tests' information, it is very important that a **representative** sample from each cow is collected.

To help collect the best sample possible, we want to remind you of the following:

REDUCING THE RISK OF MILK 'CARRY OVER'

With the increasing popularity of health and pregnancy testing, it is IMPORTANT to minimize the risk that milk from one cow gets 'carried over' into the next cow's sample.

While there is no need to flush lines or rinse containers during routine sampling, you must take care to:

- Fully empty the sample jar/flask/bottle, etc. between cows.
 - For removal flask/bottle, we recommend having at least one extra available that can be rotated in and out during sampling so they can be turned upside down between cows, in order to fully drain.
- Fully empty the mixing pitcher jar between cows. Turn them upside down between cows so they can fully drain.
- After a cow is done milking, be aware of farm specific issues that could lead to significant residual milk being trapped, or left over, in hoses, claws, meters, etc.
- Ensure the correct cow ID is captured for each sample (very important!)

Minimizing Carryover is a Balancing Act

Best Sampling Practices

- **Training** of field technicians
- **Instructions** for sampling on the dairy
- **Decision tree for suitability of samples** for health screening tests

Sound Equipment Choices

- **Choice of meter and sampler**
- **Proper installation**
- **Guidelines** for use of sampling equipment

Is the Best Option an Independent In-Line Sampler?

Why consider?

Sampling Use

- Non-Proportionate Sampling
 - *Not for Fat, Protein, SCC*
 - *Multiple samples for testing*
 - *Disease (i.e. MAP, BVD, BLV)*
 - *Mastitis*
 - *Health (i.e. Ketosis, Pregnancy)*

**THIS SAMPLER
DOES NOT EXIST
(YET?)**

Design Checklist

- Construction – Stainless? Plastic?
- Initial Cost
- Useable Lifetime/Longevity
- Easy In-Line Installation
- Simple, Direct to Vial Sampling
- Minimal Carryover
- Minimal Effect on Milking (Vacuum)
- Easy to Clean & Sanitize
- Meets Milk Market Regulations

Inherent Design
Limitations

*There will always
be carryover at a
certain level*

The Bottom Line



- Wealth of information in each milk sample
- Revenue stream for recording organization
- Increased value of program for dairy herd management

**We need to Over-Deliver on the Program,
not Over-Sell the Test**

Questions?

