The Power of Frequent Measurement

Andrew Scott
on behalf of
Rob Orchard

June 2019

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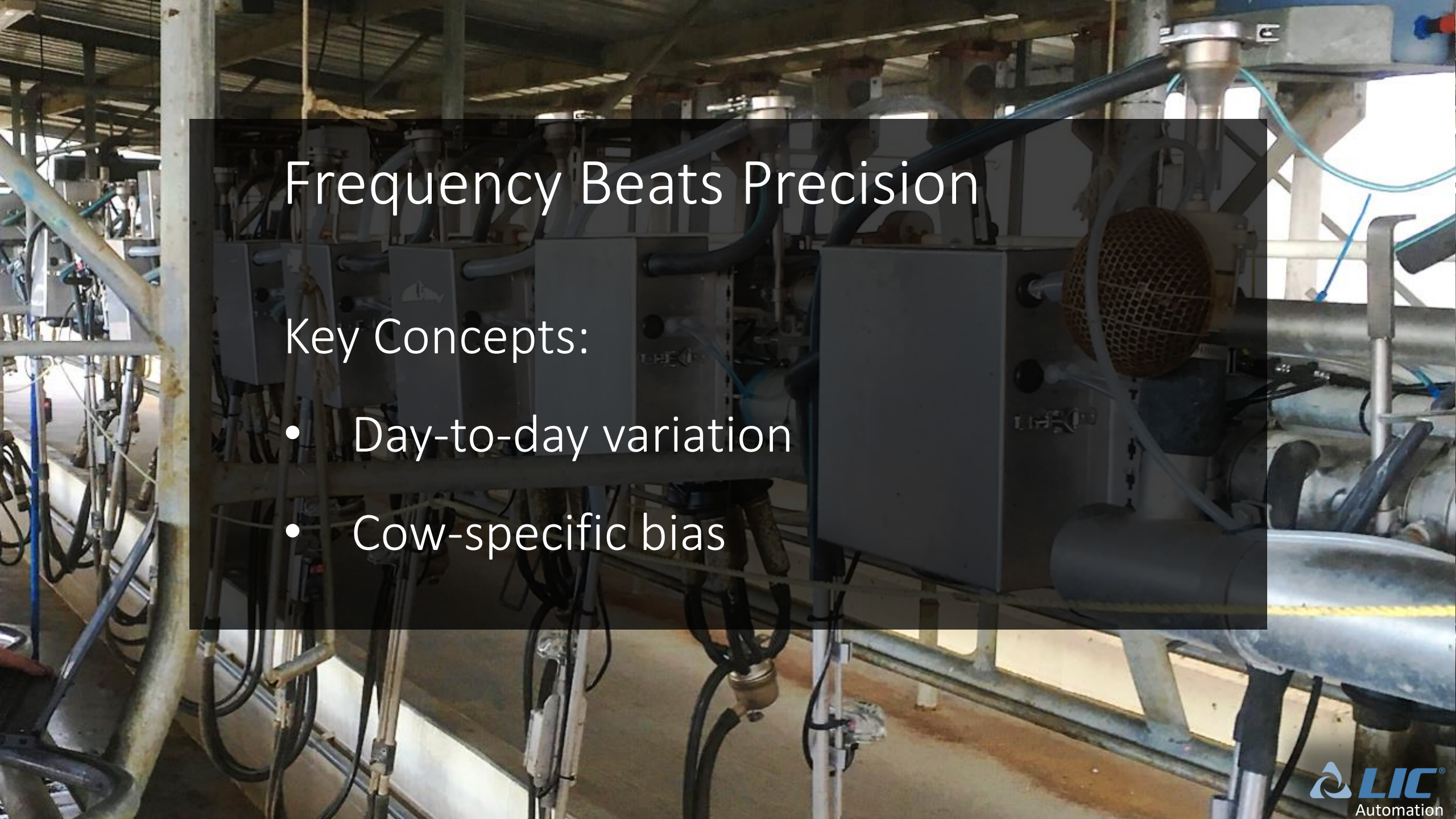

Frequency Beats Precision

Key Concepts:

- Day-to-day variation
- Cow-specific bias

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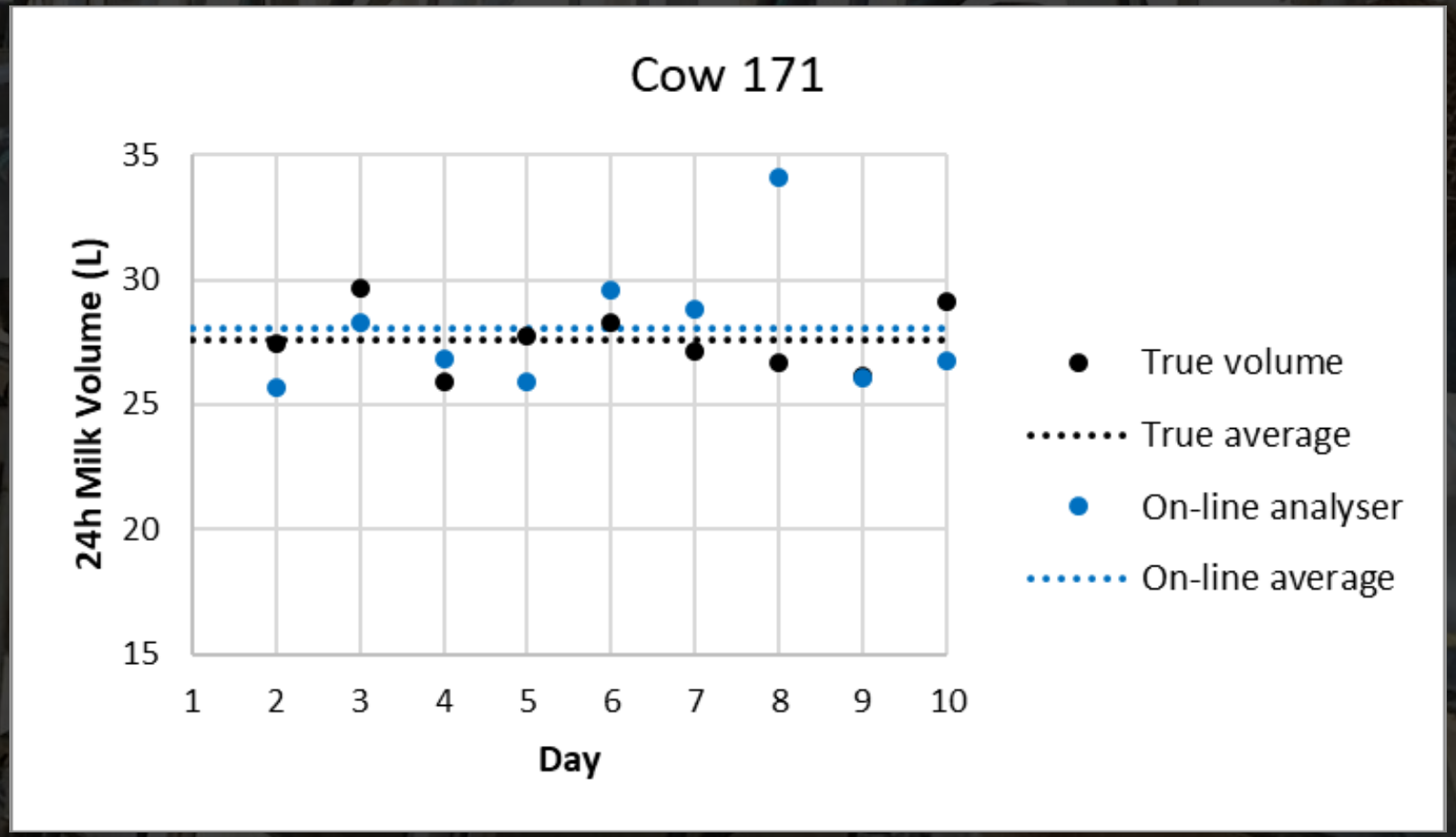
Day-to-day Variation



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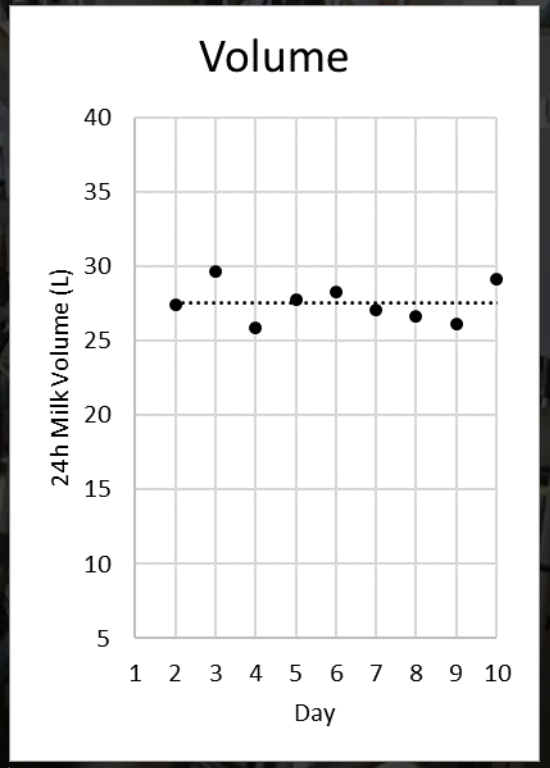
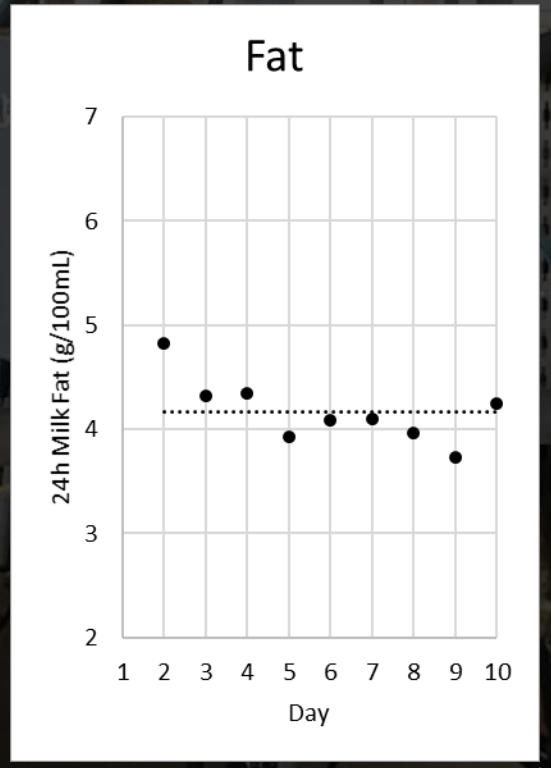
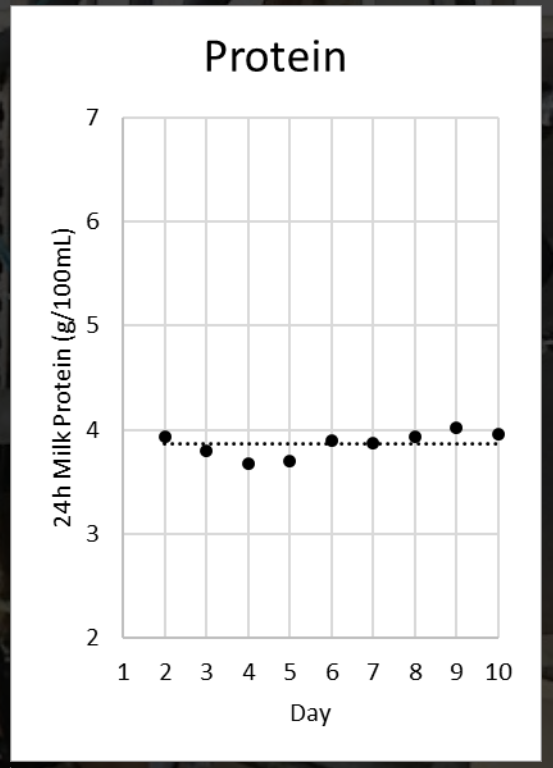
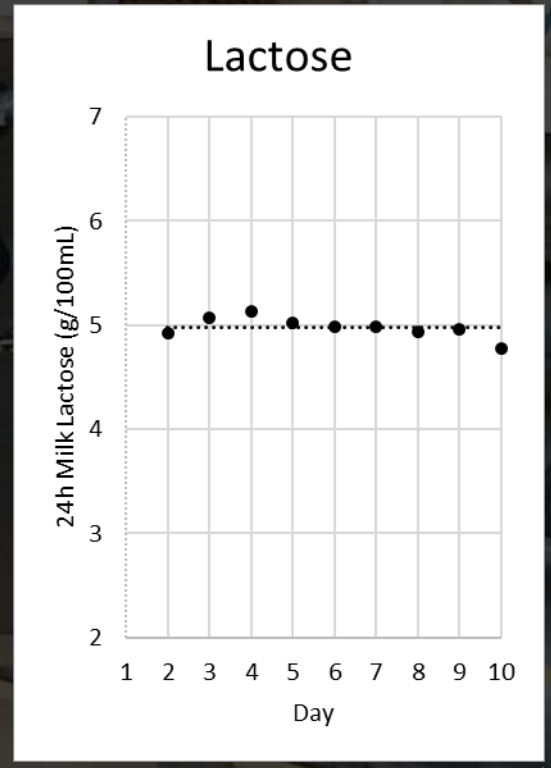
Day-to-day Variation

Cow 171









High variation

Low variation

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Day-to-day Variation

within cow CV or SD

	Mackle 1999
Volume (L)	8.9%
Fat content (g/100mL)	0.27 (5.2%)
Protein content (g/100mL)	0.12 (3.4%)
Lactose content (g/100mL)	0.06 (1.3%)
SCC (<200 kcells/mL)	
SCC (≥200 kcells/mL)	

Mackle, T. R., A. M. Bryant, S. F. Petch, R. J. Hooper, and M. J. Auldist (1999). Variation in the composition of milk protein from pasture-fed dairy cows in late lactation and the effect of grain and silage supplementation. New Zeal J Agr Res 42(2): 147-154.

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Day-to-day Variation

within cow CV or SD

	Mackle 1999	Current trial
Volume (L)	8.9%	7.0%
Fat content (g/100mL)	0.27 (5.2%)	0.31 (5.9%)
Protein content (g/100mL)	0.12 (3.4%)	0.10 (2.4%)
Lactose content (g/100mL)	0.06 (1.3%)	0.07 (1.3%)
SCC (<200 kcells/mL)		21
SCC (≥200 kcells/mL)		61%

Mackle, T. R., A. M. Bryant, S. F. Petch, R. J. Hooper, and M. J. Auldist (1999). Variation in the composition of milk protein from pasture-fed dairy cows in late lactation and the effect of grain and silage supplementation. New Zeal J Agr Res 42(2): 147-154.

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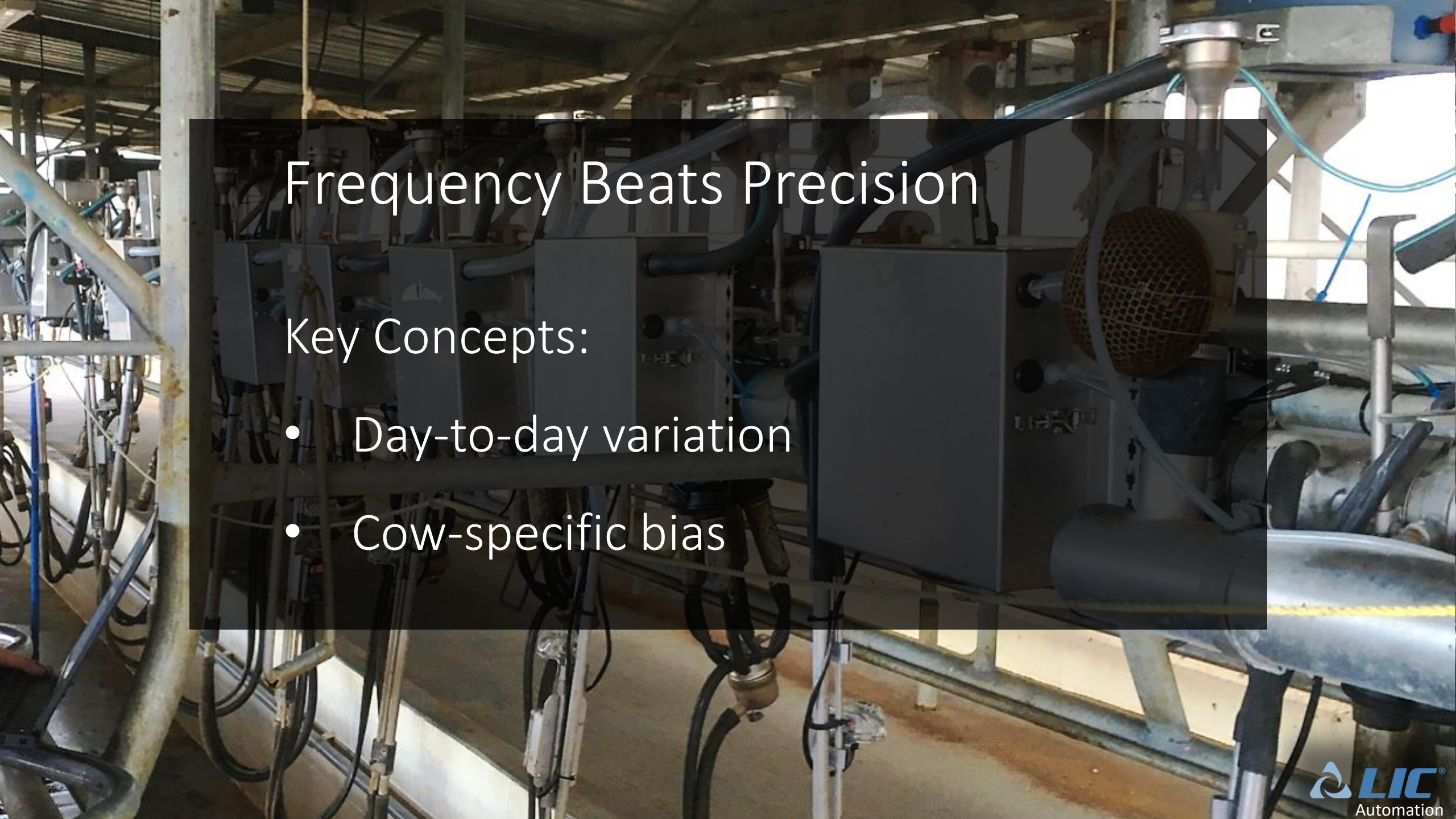

Frequency Beats Precision

Key Concepts:

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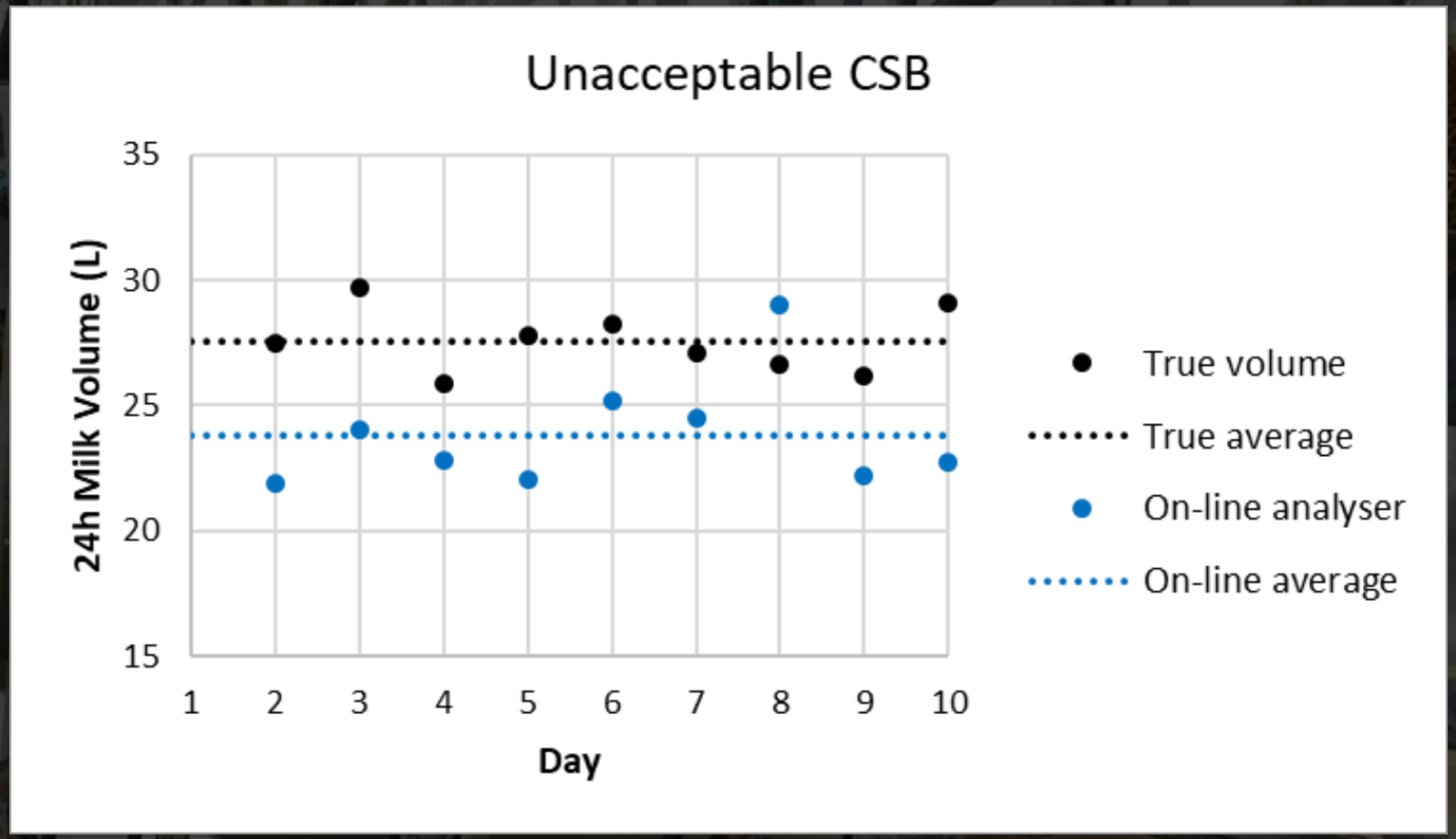
Cow-specific Bias



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Trial Aim

Using a real on-line milk analyser…

…targeting the short-term average of the milk traits…

…we compared two methods

On-line milk analyser

Frequent measurement

…limited by cow-specific bias

Single-day herd test

Precise measurement

…limited by day-to-day variation

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On-line Milk Analysers

Saber SCC

- SCC

Saber Milk

- Volume
- Fat
- Protein
- Lactose

Saber Lab

- Volume
- Fat
- Protein
- Lactose
- SCC

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Trial Design

24-a-side swing-over herringbone

14 x Saber Lab (58%)

10 x Saber Milk & SCC (42%)

NZ herd of 208 cows

Twice-a-day milking

Herd tests at 20 consecutive milking sessions (10 days)

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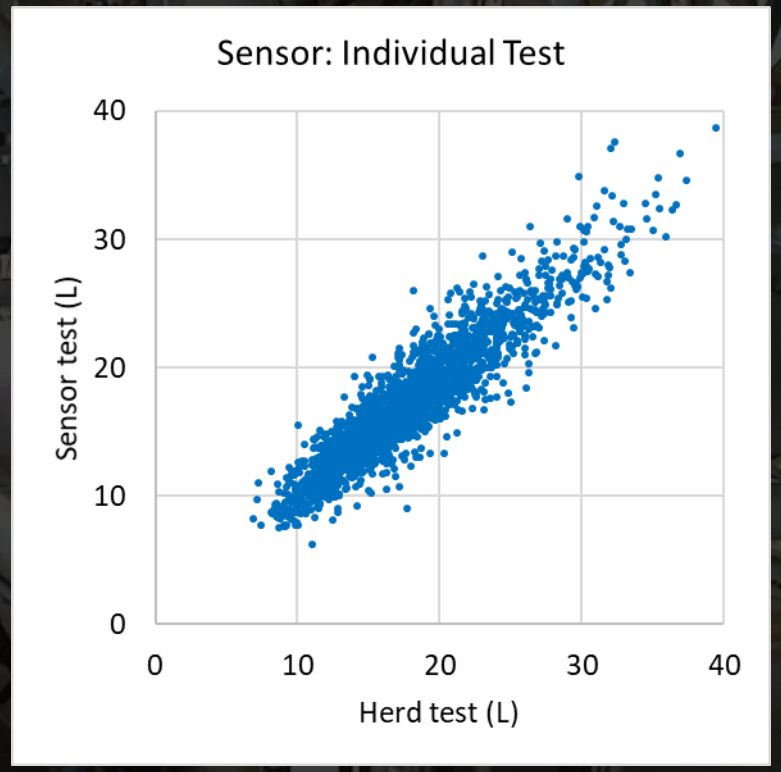
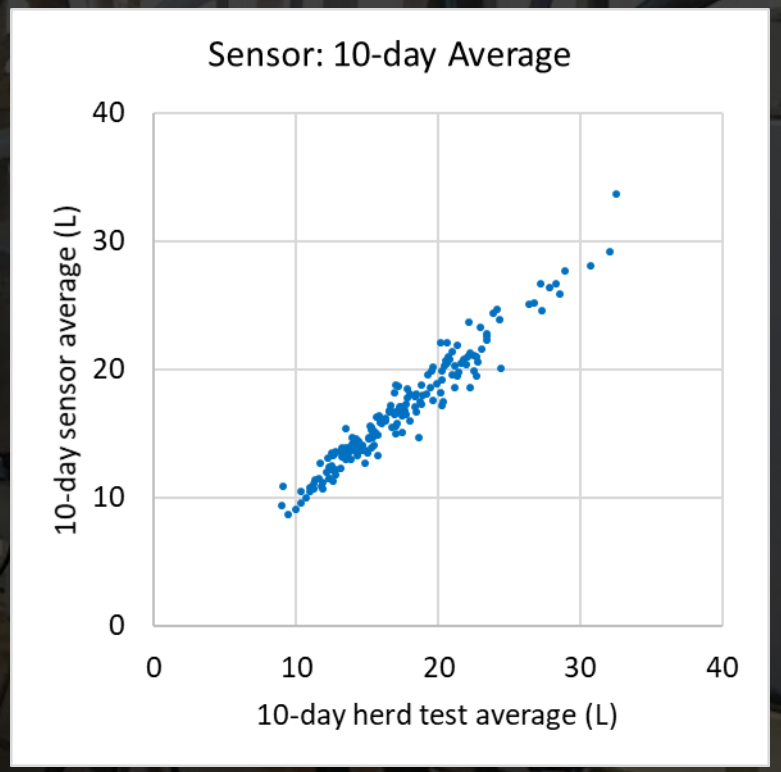
Volume

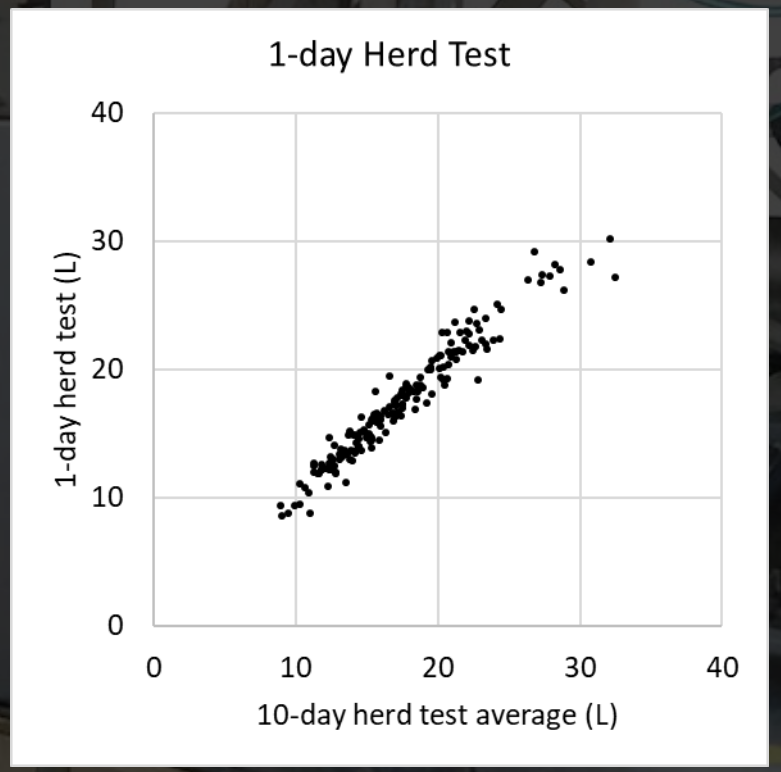


SDRE 10.6%



SDRE 6.0%

Spearman 0.969



SDRE 6.1%

Spearman 0.976

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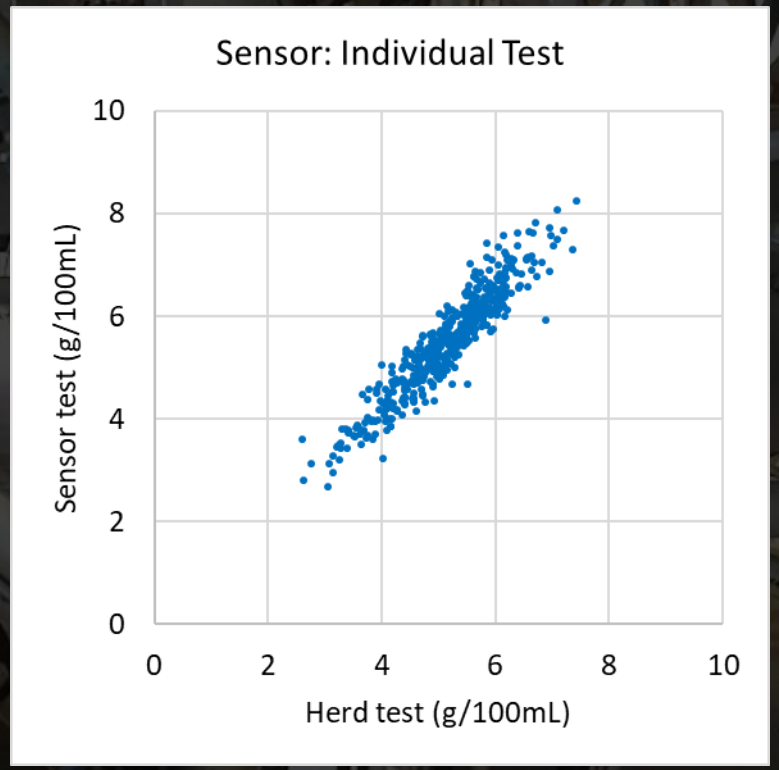
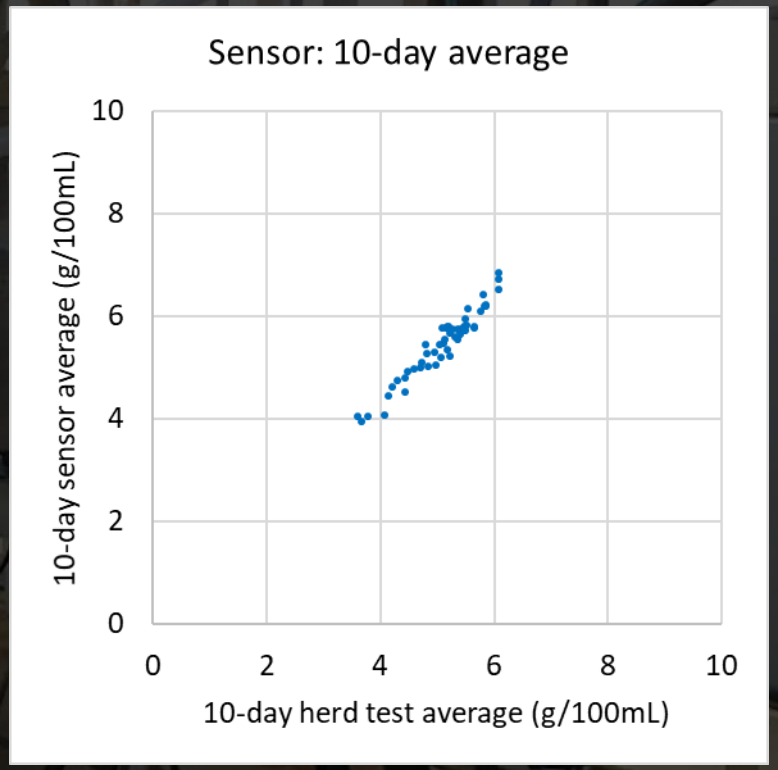
Fat

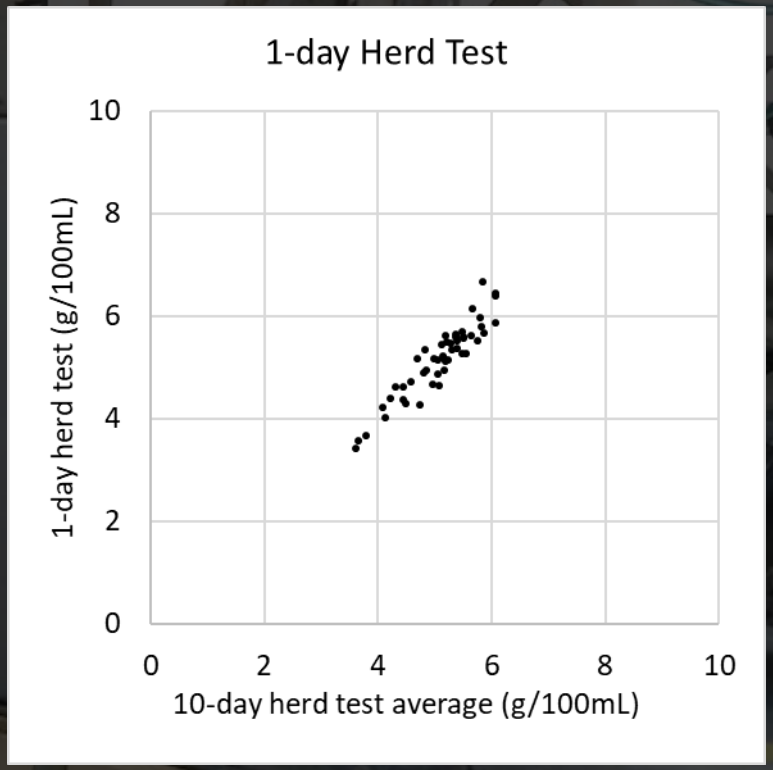


SDE 0.36 g/100mL



SDE 0.18 g/100mL

Spearman 0.957



SDE 0.26 g/100mL

Spearman 0.940

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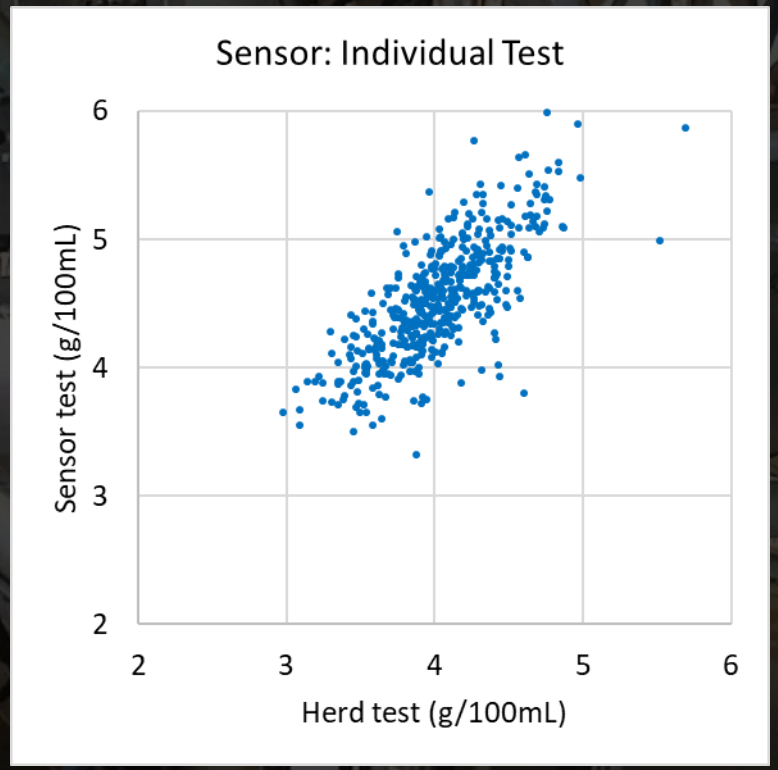
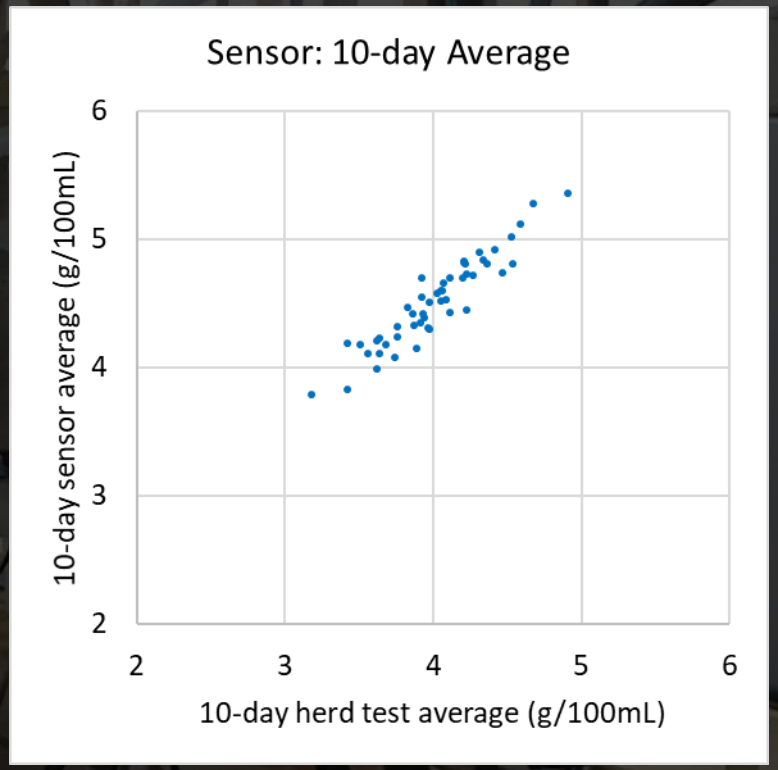
Protein

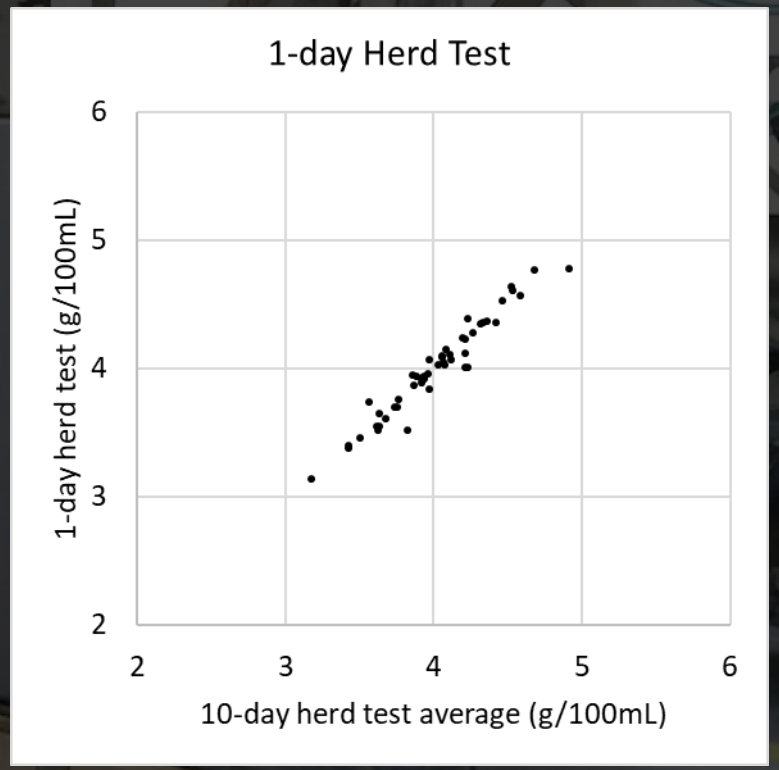


SDE 0.29 g/100mL



SDE 0.12 g/100mL

Spearman 0.934



SDE 0.09 g/100mL

Spearman 0.973

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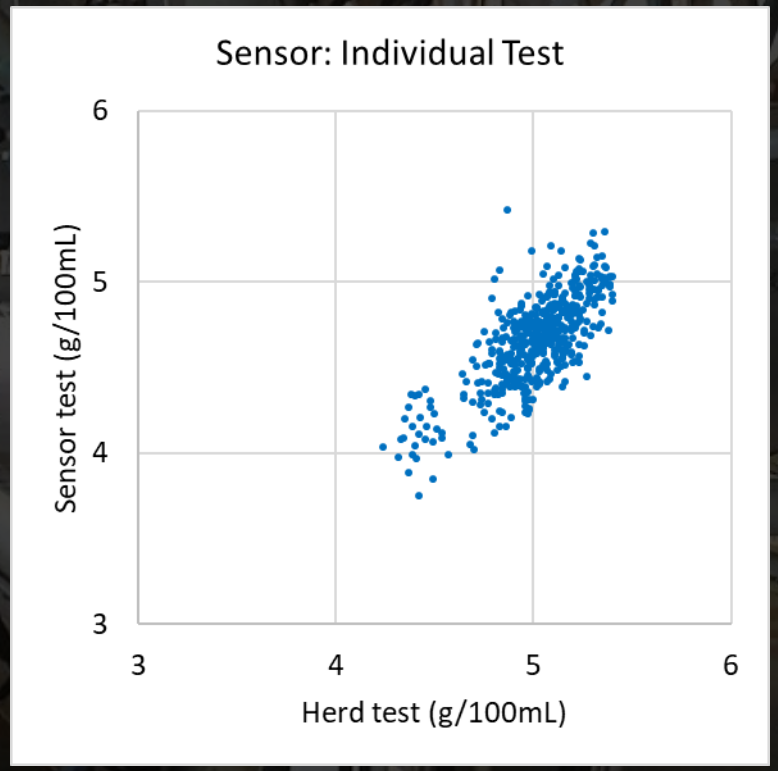
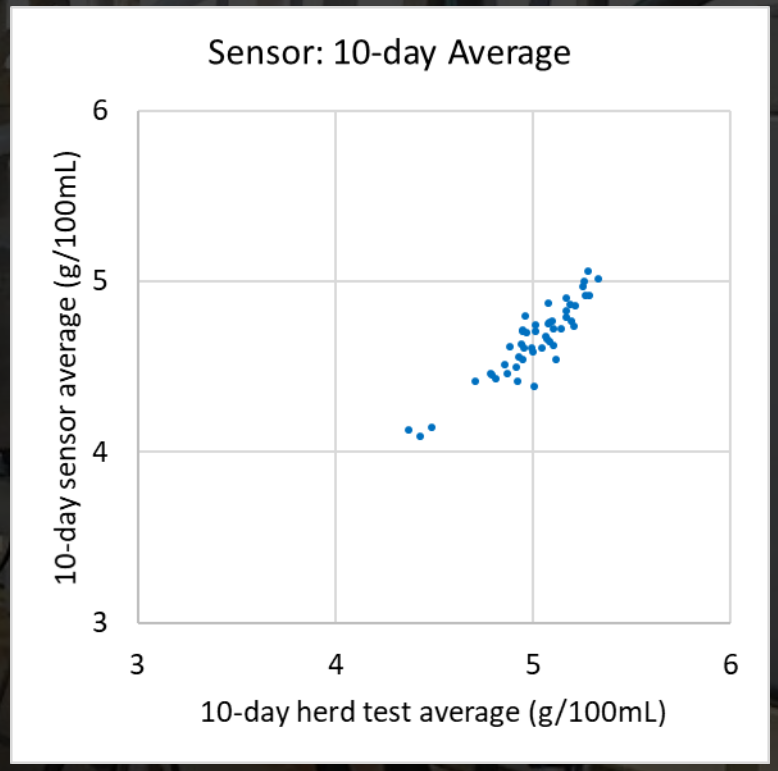
Lactose

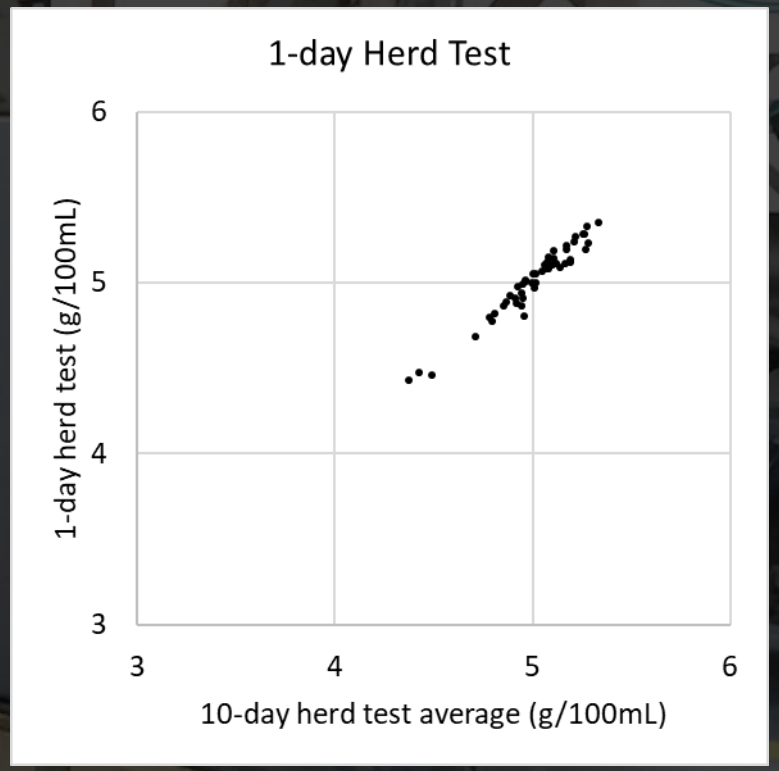


SDE 0.18 g/100mL



SDE 0.09 g/100mL

Spearman 0.935



SDE 0.05 g/100mL

Spearman 0.957

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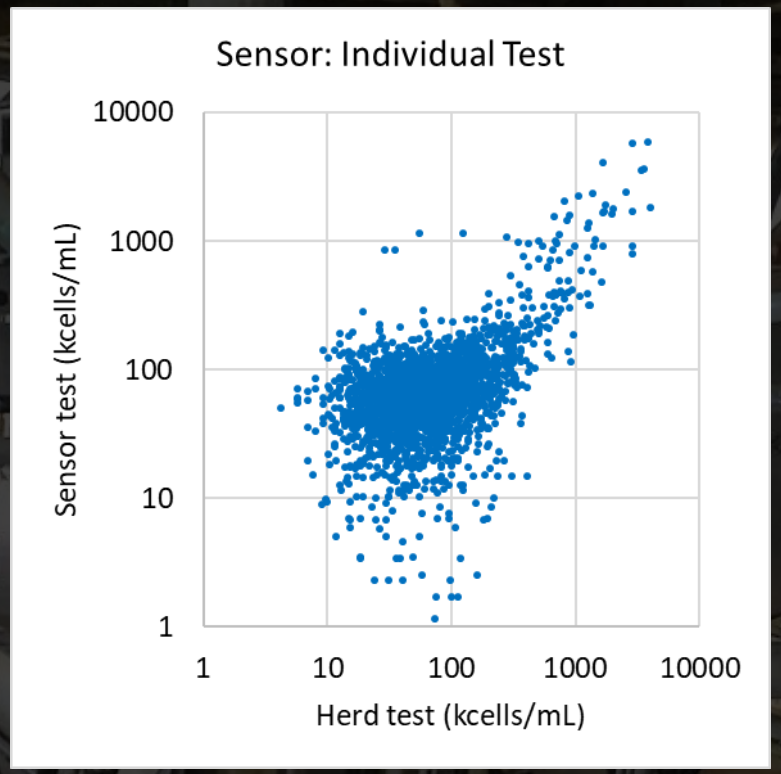
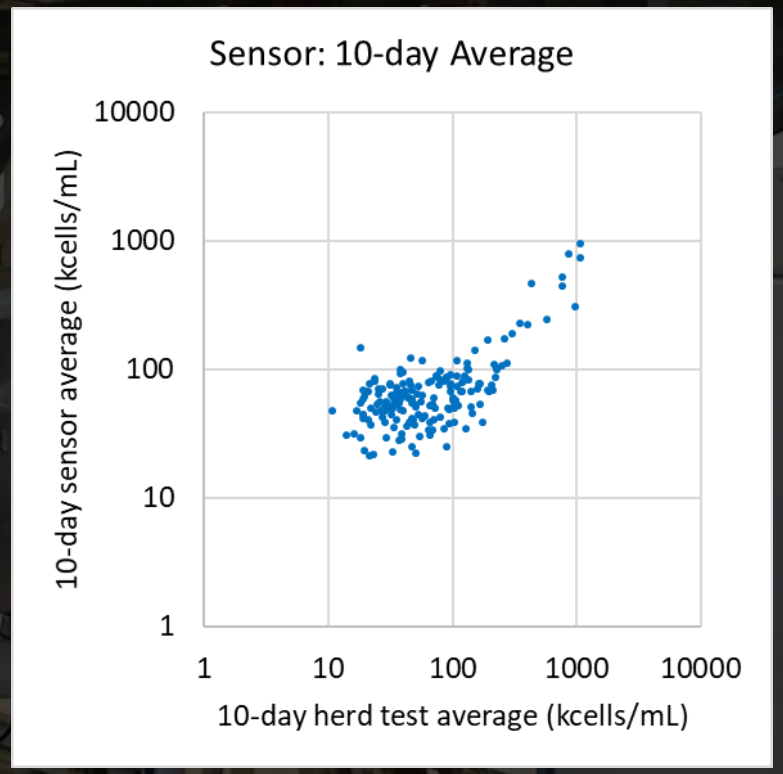
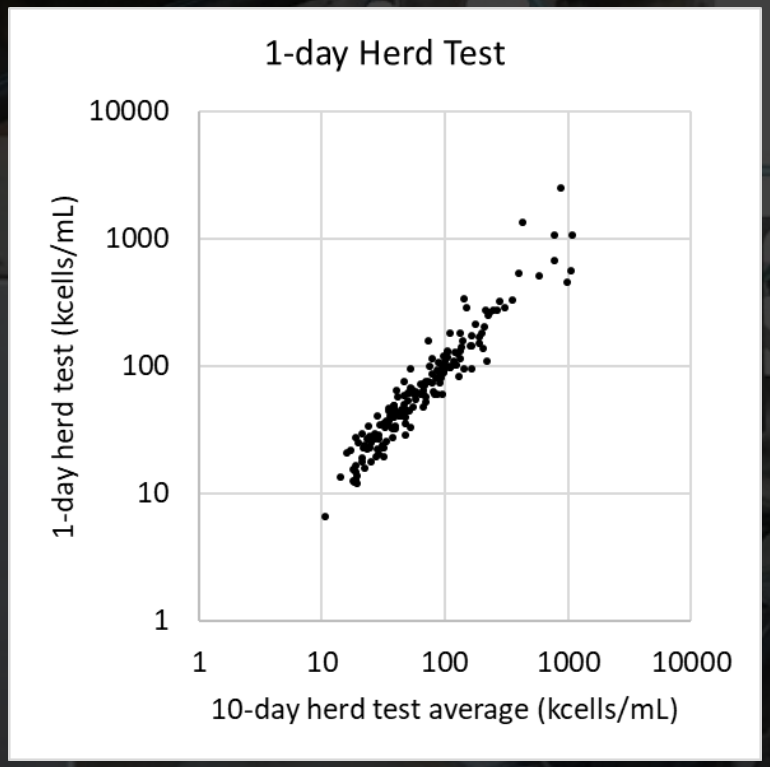
SCC







<200 kcells/mL	SDE 66 kcells/mL	SDE 42 kcells/mL Spearman 0.309	SDE 26 kcells/mL Spearman 0.948
≥200 kcells/mL	SDRE 52%	SDRE 21% Spearman 0.825	SDRE 68% Spearman 0.796

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Day-to-day Variation Drives Herd Test Precision

	Single-day Herd Test (SDE or SDRE)	Day-to-day Variation (SD or CV)
Volume (L)	6.1%	7.0%
Fat (g/100mL)	0.26	0.31
Protein (g/100mL)	0.09	0.10
Lactose (g/100mL)	0.05	0.07
SCC (<200 kcells/mL)	26	21
SCC (≥200 kcells/mL)	68%	61%

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Conclusions

Experimental results consistent with theoretical research

For estimating the cow average

Single herd test precision was numerically similar to day-to-day variation	On-line sensor was better than herd test for parameters with high day-to-day variation	On-line sensor was worse than herd test for parameters with low day-to-day variation

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Conclusions

How good is the on-line analyser?

Volume ✓ (as good as a herd test)

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Conclusions

How good is the on-line analyser?

Volume	✓	(as good as a herd test)
Fat	✓	(better than a herd test)

Conclusions

How good is the on-line analyser?

Volume	✓	(as good as a herd test)
Fat	✓	(better than a herd test)
Protein	✓	(practically as good as a herd test)

Conclusions

How good is the on-line analyser?

Volume	✓	(as good as a herd test)
Fat	✓	(better than a herd test)
Protein	✓	(practically as good as a herd test)
Lactose	✓	(practically as good as a herd test)

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Conclusions

How good is the on-line analyser?

Volume	✓	(as good as a herd test)
Fat	✓	(better than a herd test)
Protein	✓	(practically as good as a herd test)
Lactose	✓	(practically as good as a herd test)
SCC	✓	(better than a herd test at high SCC)

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Conclusions

How good is the on-line analyser?

Volume	✓	(as good as a herd test)
Fat	✓	(better than a herd test)
Protein	✓	(practically as good as a herd test)
Lactose	✓	(practically as good as a herd test)
SCC	✓	(better than a herd test at high SCC)
Timeliness	✓	(recent data always available)

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