Estimation of fat and protein yields in dairy cattle from one milk sample per day in herds milked twice a day

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Back ground

- Electronic Tru-Test milk meters – one milk sample per milking per test day
- By introducing Tru-Test milk meters in Denmark the cost for the milk recording sceme increased (more samples because a.m. and p.m. samples are not blended)
- Herd size increases in Denmark (average 125 cows) and farmers are looking for ways to reduce labour costs
- Possibilities of reducing the number of milk samples was requested

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Objektive of the project

- Develop a model to calculate daily yield for fat and protein on basis of one milk sample per test day
- Estimate loss of accuracy of one sample per day compared to two samples per day

Material

- Holstein cows, 540 herds from June 2003 to July 2004
- 63,077 cows
- 472,180 milkings
- Milk samples by each milking
- 38,682 Holstein cows used

Average results

Time	Milk	Fat%	Protein%
Morning, a.m.	14.84	3.95	3.40
Evening, p.m.	12.16	4.45	3.44
Difference	2.68	-0.50	-0.04

Linear Model

Fat/protein with two test samples =

Mean

+ b_2 × Milk yield with a test sample

+ b_3 × Milk yield without sample

+ b_4 × Fat yield with a test sample

+ b_5 × Protein yield with a test sample

+ b_6 × Interval between milking

+ Rest

Model explanation (R^2)

Milk sample	Fat	Protein
A.m. kg	0.94	0.99
%	0.93	0.98
P.m. kg	0.94	0.99
%	0.91	0.98

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Robustness of the model

$$\text{Accurary} = \frac{Var_{(act)}}{Var_{(act)} + Var_{(dif)}}$$

Schaeffer et. al (2000)

Act = Actual yield (fat or protein) calculated on basis of two milk samples

Dif = Actual yield – estimated yield (fat or protein) based on one milk sample

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Accuracy of the model

		Accuracy	
Sample time	Parity	Kg fat	Kg protein
A.m.	1	0.93	0.99
	2	0.94	0.99
	3	0.94	0.99
P.m.	1	0.94	0.99
	2	0.95	0.99
	3	0.95	0.99

Estimation of 305 days yield

Method	Time for sample
AM	All morning samples
PM	All evening samples
AM PM	Every second sample morning sample and every second sample evening sample

Accuracy of 305 days yield

	Parity	AM	PM	AM PM
Fat	1	0.96	0.94	0.98
	2	0.95	0.93	0.97
	3	0.95	0.93	0.97
Protein	1	0.998	0.998	0.998
	2	0.998	0.998	0.999
	3	0.999	0.999	0.999

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Conclusion

High correlation between estimated fat and protein yield and true yield

305 days yield for protein can be calculated with high accuracy. Little lower accuray for fat

True-Test milk meters are now used in Denmark. One sample (morning or evening) is analyzed

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