



Possibilities of implementing measures from Automatic Milking Systems in routine evaluations of Udder Conformation and Milking Speed

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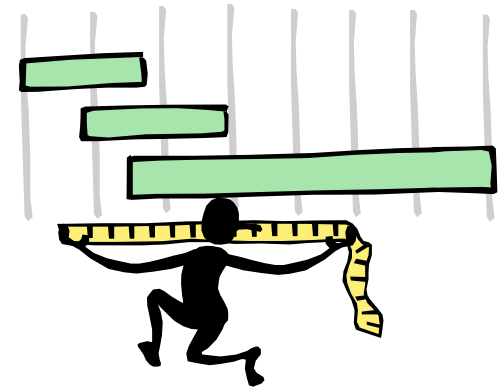
Outline

- **Background and data collection**
- **Udder conformation**
 - **Teat co-ordinates**
- **Time usage**
 - **Fat and protein flow**



Advantages of data from milking robots

- Repeated measurements of a variety of traits
- Objective measurements
- Measured on all cows in milk
- Measured over more lactations
- Data is available – why not use them?

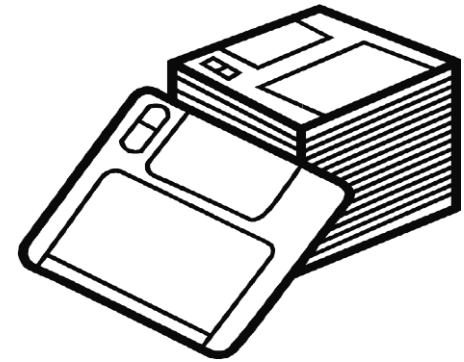


Data collection from AMS herds

- **Collected by technicians in connection with milk recording**
- **Data are subsequently transferred to the national cattle database**
- **At present only data from Lely's milking robots**
- **Danish Cattle Federation collaborates with Lely in transferring data in real time – long-term strategy**

How to handle repeated measurements

- **Great many observations**
- **Average of the variable in question over a period of time**
- **Presumably more sophisticated methods to utilize the information to the full**

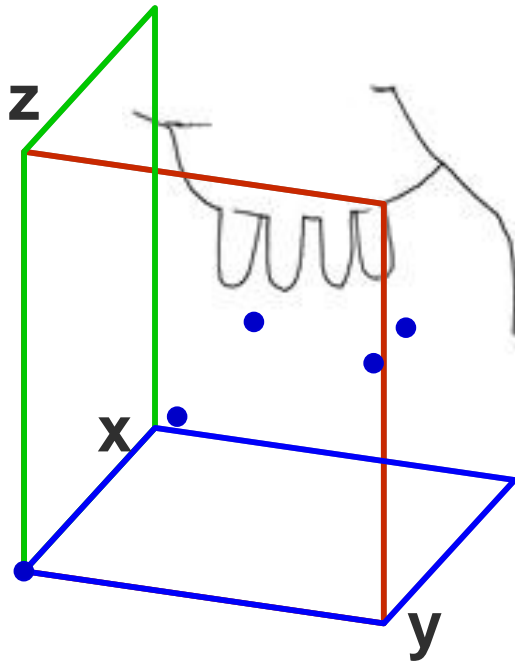


Udder conformation

- 130 000 Danish cows are classified per year
 - The majority of the cows are 1st parity cows
- Wish for EBVs based on later parities
- Possibility to apply information on teat co-ordinates in the genetic evaluation?



Teat co-ordinates



- Front teat placement
- Rear teat placement
- Distance, front - rear
- Udder balance
- Udder depth

Data set and choice of model

- The udder conformation study is based on Holstein 1st parity data
 - 2 591 cows with AMS data
 - AMS data from February '11 to May '12
 - Avg. of obs. 30-60 DIM
 - 102 816 classified cows
 - Year > 2006
 - 1490 cows having both

Model – udder conformation

- Bi-variate linear animal model

$$\text{AMS} = \text{HY} + \text{AGE} + \text{MO} + a + e$$

$$\text{Assessment} = \text{HYS} + \text{AGE} + \text{MO} + \text{CLA} + \text{CA} + a + e$$

- Where

HY = herd*year, HYS = herd*6 month, AGE = age at calving, MO = calving month , CLA = classifier*2 month, CA = distance calving-assessment, a = additive genetic effect, and e = residual

Heritabilities and genetic correlations

Trait	h^2 (S.E.) - AMS	h^2 (S.E.) - CLA	r_g (S.E.)
Front teat placement	0.46 (0.06)	0.31 (0.01)	0.92 (0.04)
Rear teat placement	0.38 (0.05)	0.32 (0.01)	0.94 (0.04)
Distance, front - rear	0.46 (0.09)	-	-
Udder balance	0.44 (0.07)	0.22 (0.01)	0.90 (0.04)
Udder depth	0.65 (0.06)	0.42 (0.01)	0.94 (0.02)

- High heritabilities
 - AMS > Classifiers assessments

- High genetic correlations

Partial conclusion – Udder conformation

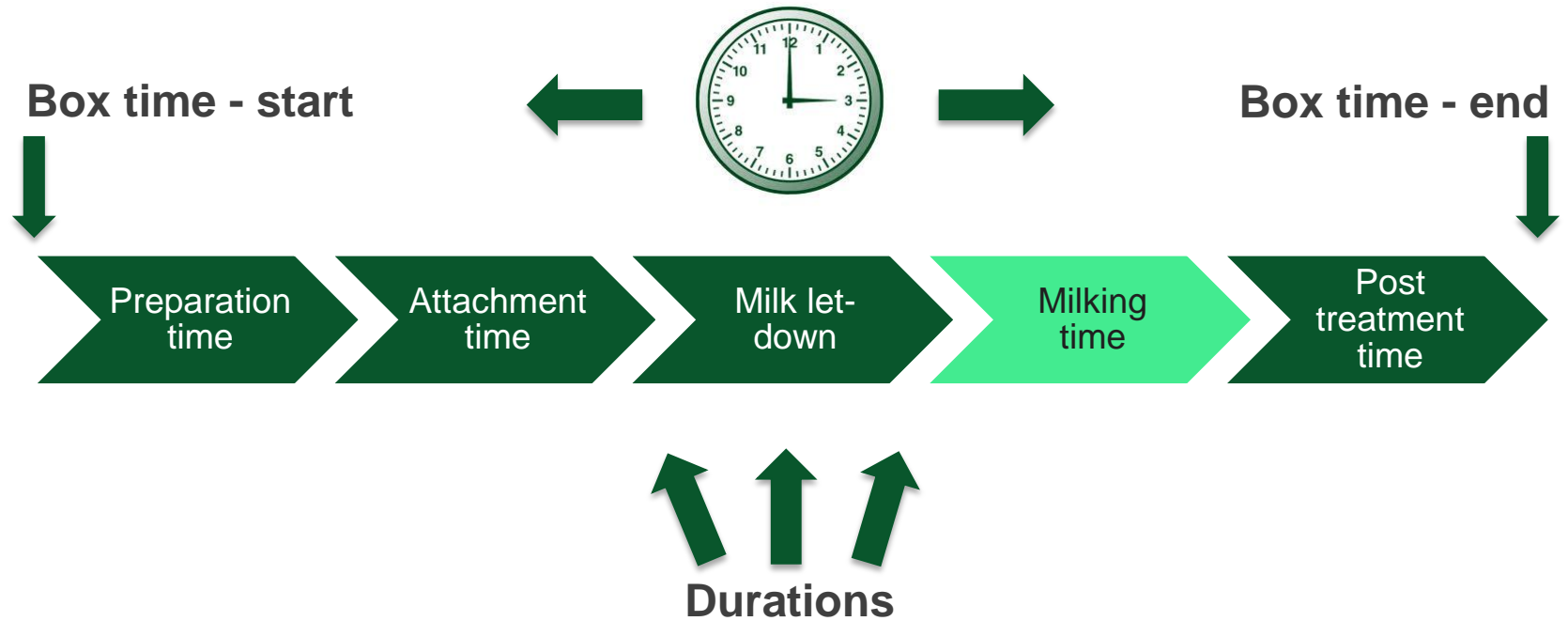
- Teat co-ordinates from robots will be included in the genetic evaluation in the future**
- More reliable indices for later lactations**
- More reliable indices for cows not classified**
- Cheaper registrations**

Fat and protein flow in kg per minute

- Fat and protein flow is already included in joint Nordic routine evaluation for milkability
 - Milkimeters (DK) or assessed by dairy farmers
- Data from milking robots are not yet included in the genetic evaluation
- Possibility to add information on fat and protein flow from milking robots in routine evaluation?



Time usage



Data set and choice of model

- The flow study is based on Holstein 1st parity data
- 4 050 cows with F+P flow from AMS
 - 900 with assessments
- 272 043 cows with F+P flow from milkmeters
 - 47 000 with assessments
- No cows with both types of F+P flow
- AMS data from May '05 to February '11



Calculated F+P flow AMS

- One observation per cow
 - First milk recording 30-240 DIM
- 14 days moving average of milk yield per milking calculated in the robot
- Fat and protein percentages from milk recording
- 14 days moving average of milking time



Model – Fat and protein flow

- Tri-variate linear animal model

$$\text{F+P flow}_{\text{AMS}} = \text{HYS} + \text{AGE} + \text{MO} + \text{CM} + a + e$$

$$\text{F+P flow}_{\text{Milkmeter}} = \text{HYS} + \text{AGE} + \text{MO} + \text{CM} + a + e$$

$$\text{Assessment} = \text{HYS} + \text{AGE} + \text{MO} + \text{CA} + a + e$$

- Where

HYS = herd*6 month, AGE = age at calving, MO = calving month , CM = distance calving-milkrecording, CA = distance calving-assessment, a = additive genetic effect, and e = residual

Genetic parameters for flow

- h^2 for flow from robots and milk recording are high
- h^2 for assessments and flow from milk recording are very close to previous estimates
- High genetic correlations between the traits
- Heritabilities and **genetic correlations** (S.E.)

	h^2	Assessments	Flow, milkmeter
Flow (F+P), AMS	0.63 (0.07)	0.91 (0.05)	0.94 (0.03)
Assessments	0.20 (0.02)	-	0.91 (0.02)
Flow (F+P), milkmeter	0.41 (0.01)	-	-

Partial conclusion - Flow

- **It is possible to use flow from robots in the genetic evaluation**
- **Limited effect on the EBVs of the bulls**
 - **There are already many observations from electronic milkmeters**
- **Cows from AMS herds will be genetically evaluated**

Conclusions

- **According to the preliminary results it is possible to use:**
 - **Teat co-ordinates in the genetic evaluation of udder conformation**
 - **Fat and protein flow from milking robots in the genetic evaluation of milking speed**