KNOWLEDGE CENTRE FOR AGRICULTURE
Cattle

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

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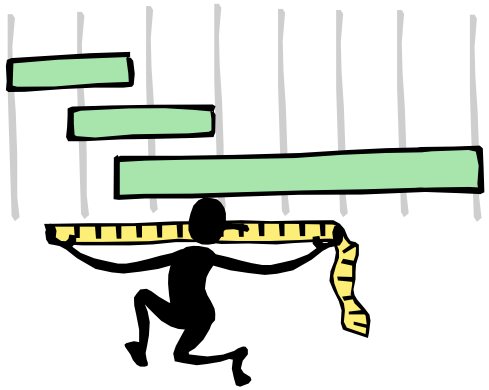
Outline

- 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?

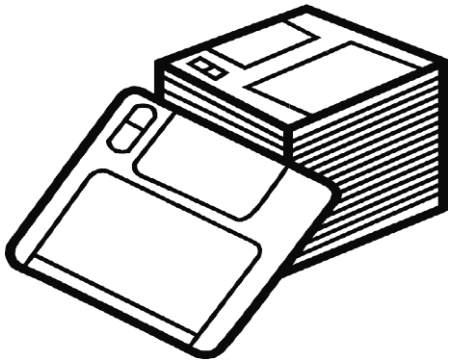


Data collection from AMS herds

- 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

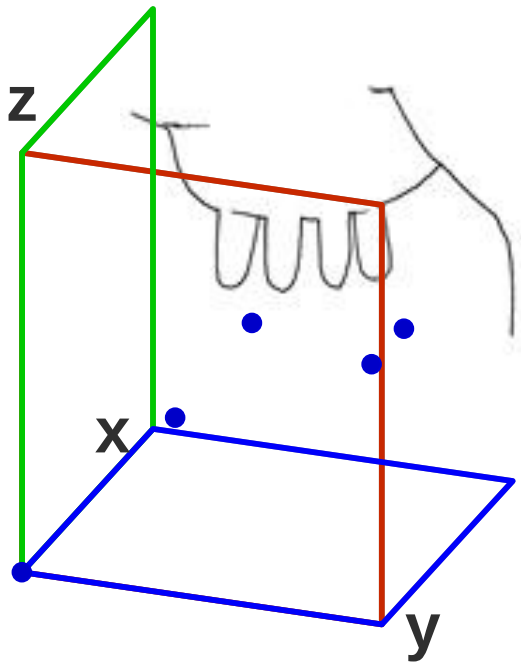
- Great many observations
- Average of the variable in question over a period of time
- Presumably more sophisticated methods to utilize the information to the full



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**

$$AMS = HY + AGE + MO + a + e$$

$$Assessment = HYS + AGE + MO + CLA + CA + a + e$$

- **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

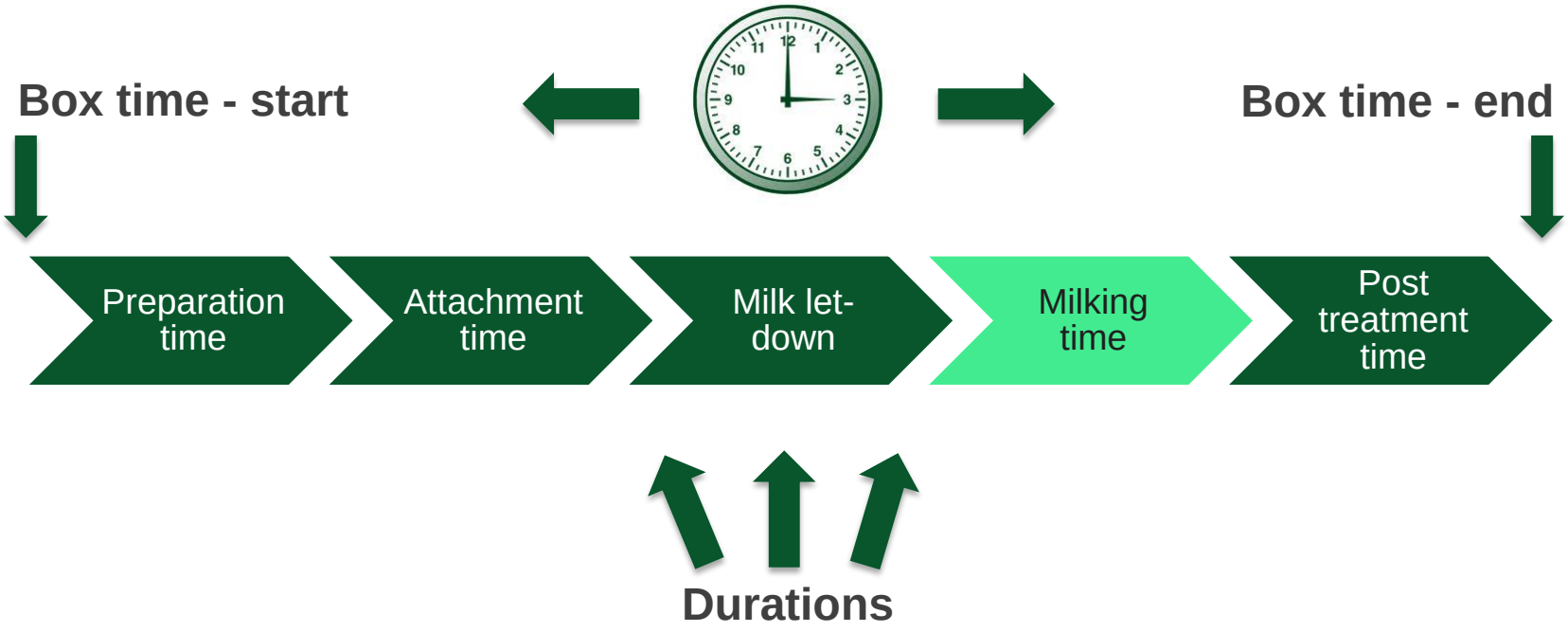
Partial conclusion – Udder conformation

- 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
  - Milkmeters (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


Box time - start
Box time - end
Preparation time
Attachment time
Milk let-down
Milking time
Post treatment time
Durations

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**

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

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

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

- **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