Using feed intake behavior and feed bunk attendance to detect dairy cow health issue at an early stage

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Individual feed intake measurements

- It is labor intensive
- In free stalls animal it is necessary to use special devices (e.g. calan gates).

Our demand was for a system

- To be used in free stalls with access to the entire feeding bunker
- Able to record feed intake, bunker attendance, time of visits
- easy to use

Automatic feeding recorder

- 14 feeding gates divided into 2 pens
- Each feeding gate:
  - Antenna to identify cow access (De-Laval transponder)
  - Manger with a volume of about 1 cubic meter holding about 80 kg of TMR
  - Mangers are placed on loading cells
- When cow enter a gate:
  - Antenna identify cow ID
  - System records starting time and starting feed weight
- When cow leave the gate
  - System records ending time and ending feed weight

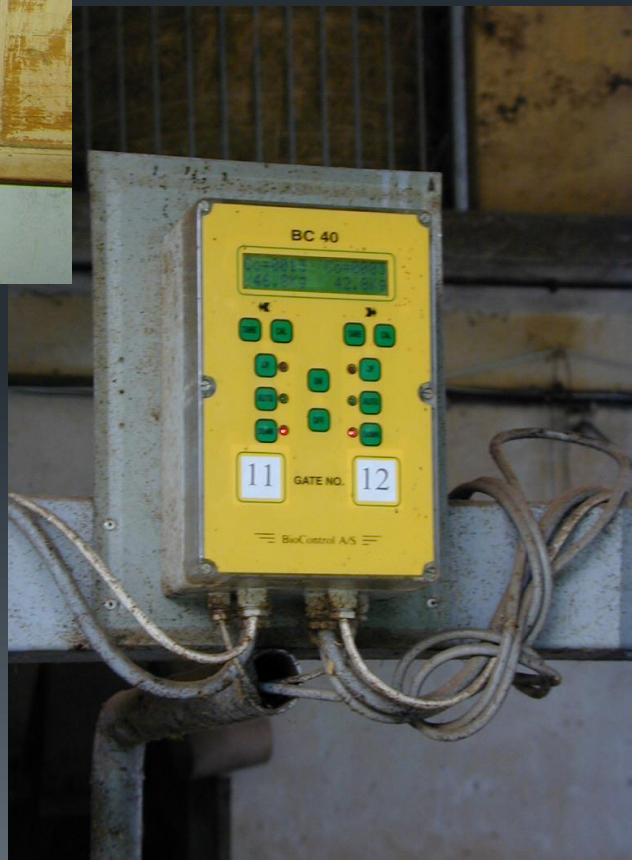
14 feeding gates divided into 2 pens

Biocontrol A/s, Norway

Biocontrol A/s, Norway

Automatic feeding recorder

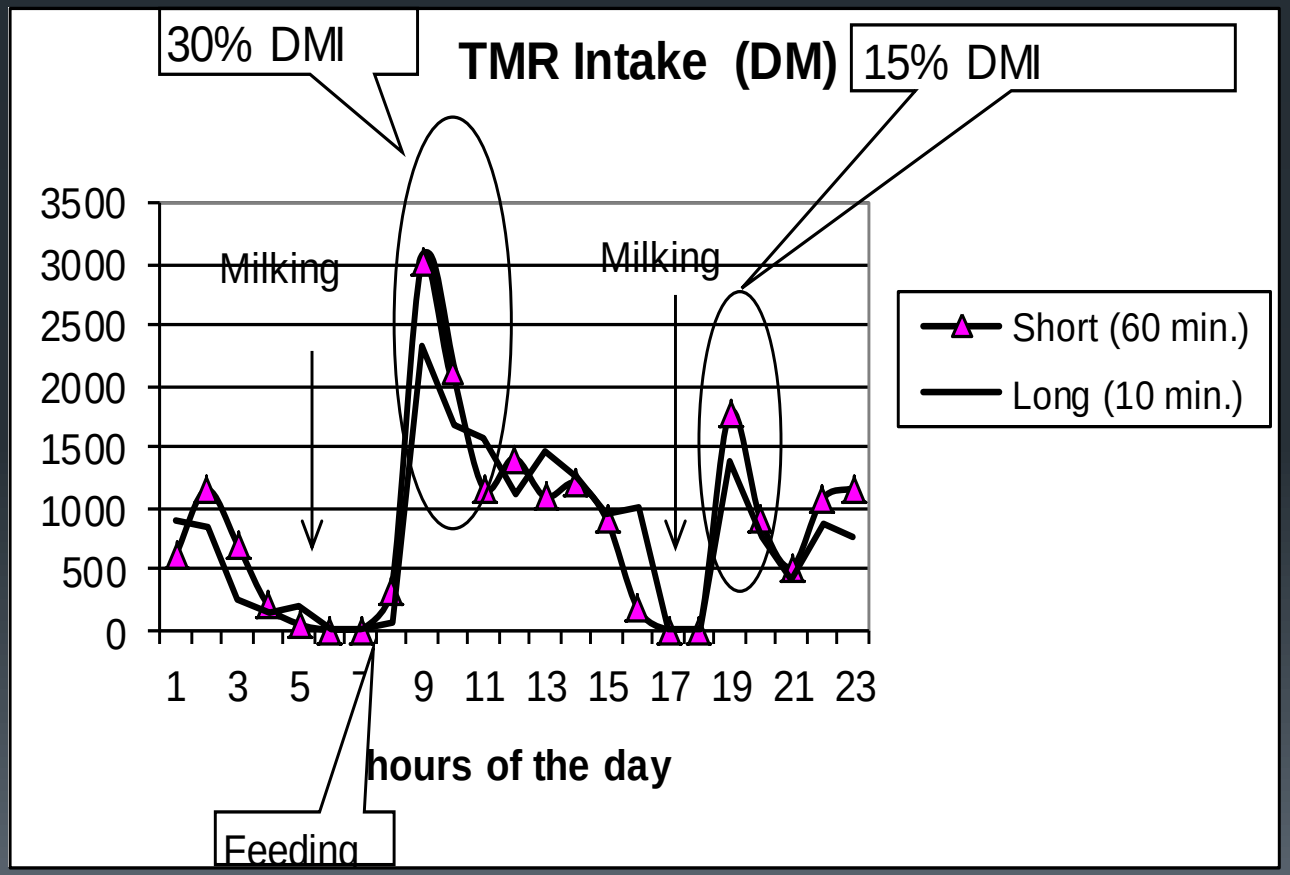
- One controller box every two mangers
  - Tare of loading cells
  - Cleaning and loading mangers
  - Collecting single logs
- One central PC
  - Collects logs every 5 minutes from all of the controller boxes
  - Calculate individual intake feeding data (amount, time, rate)



Biocontrol A/s, Norway

Measuring individual intake

- It is definately necessary in any feeding trials



(Trial: mixing time)

Measuring individual intake

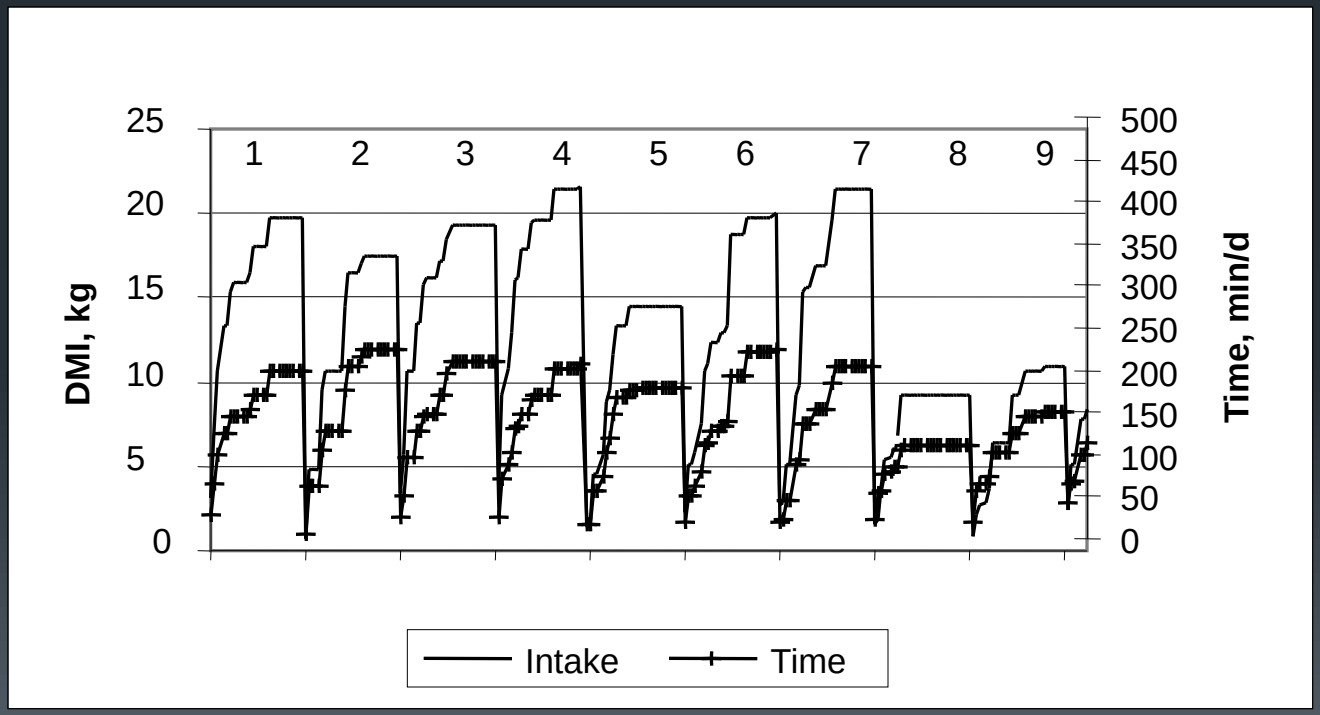
- Beside Research is there any economical value of measuring individual intake under *ad-libitum* TMR feeding systems??

Individual actions

- Individual intake data could be very useful when individual feeding action can be implemented:
  - Robot milking with concentrates supplementation during milking
  - Partial TMR = TMR + autofeeders (nice, but very expensive)
  - Liquid feed in the water (Energy drinks!!!) with limited access

Feeding TMR to milking cows

- When feeding by group(s), there is a little value from individual intake data, but may be, it can be used to early detect problems cows



Identify sick cows at an early stage

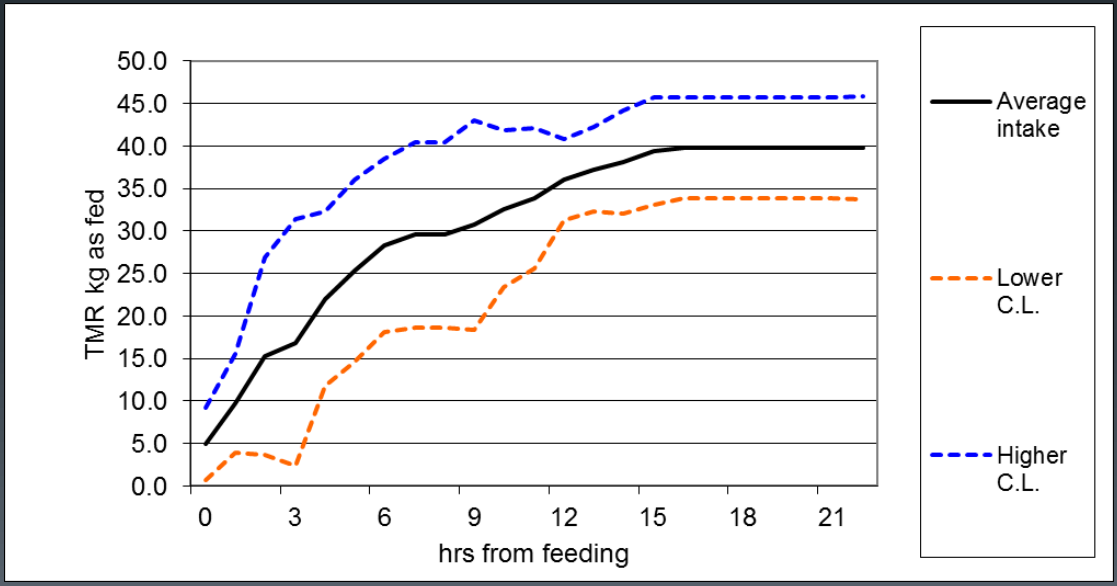
- Define normal cow feeding behaviour for
  - Feed intake (kg as fed)
  - Feed bunk attendance (min)

- Based on cumulative data, starting at feeding time
  - Cumulative hourly feed intake and feed bunk attendance

Identification of abnormal feeding behaviour

Cumulative feed intake and feed bunk attendance

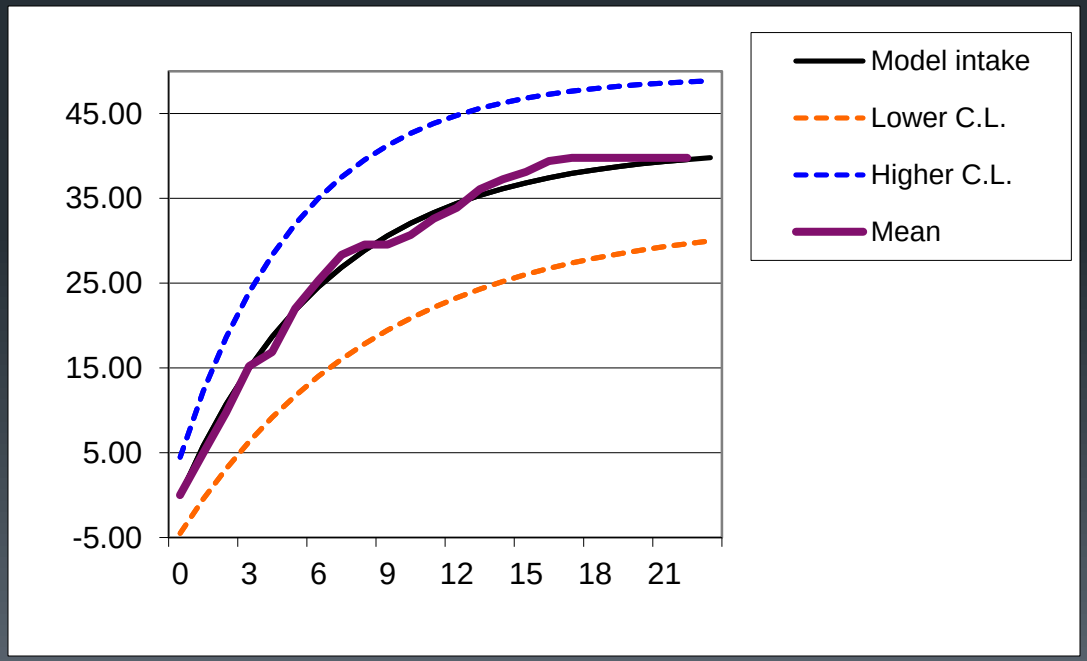
- Simple model
  - Average and SD across 6 normal days
  - 95% confidential limits



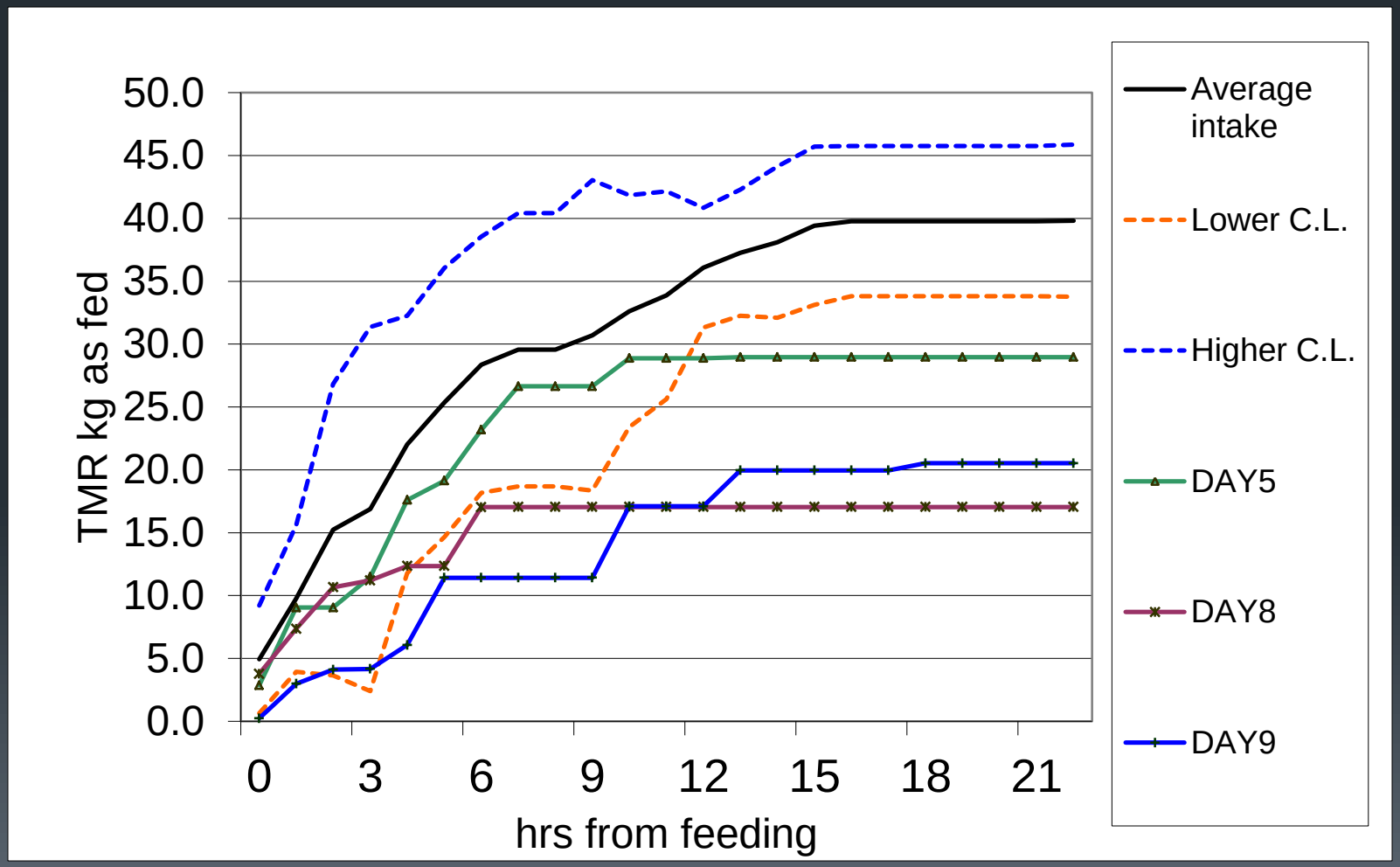
Identification of abnormal feeding behaviour

Cumulative feed intake and feed bunk attendance

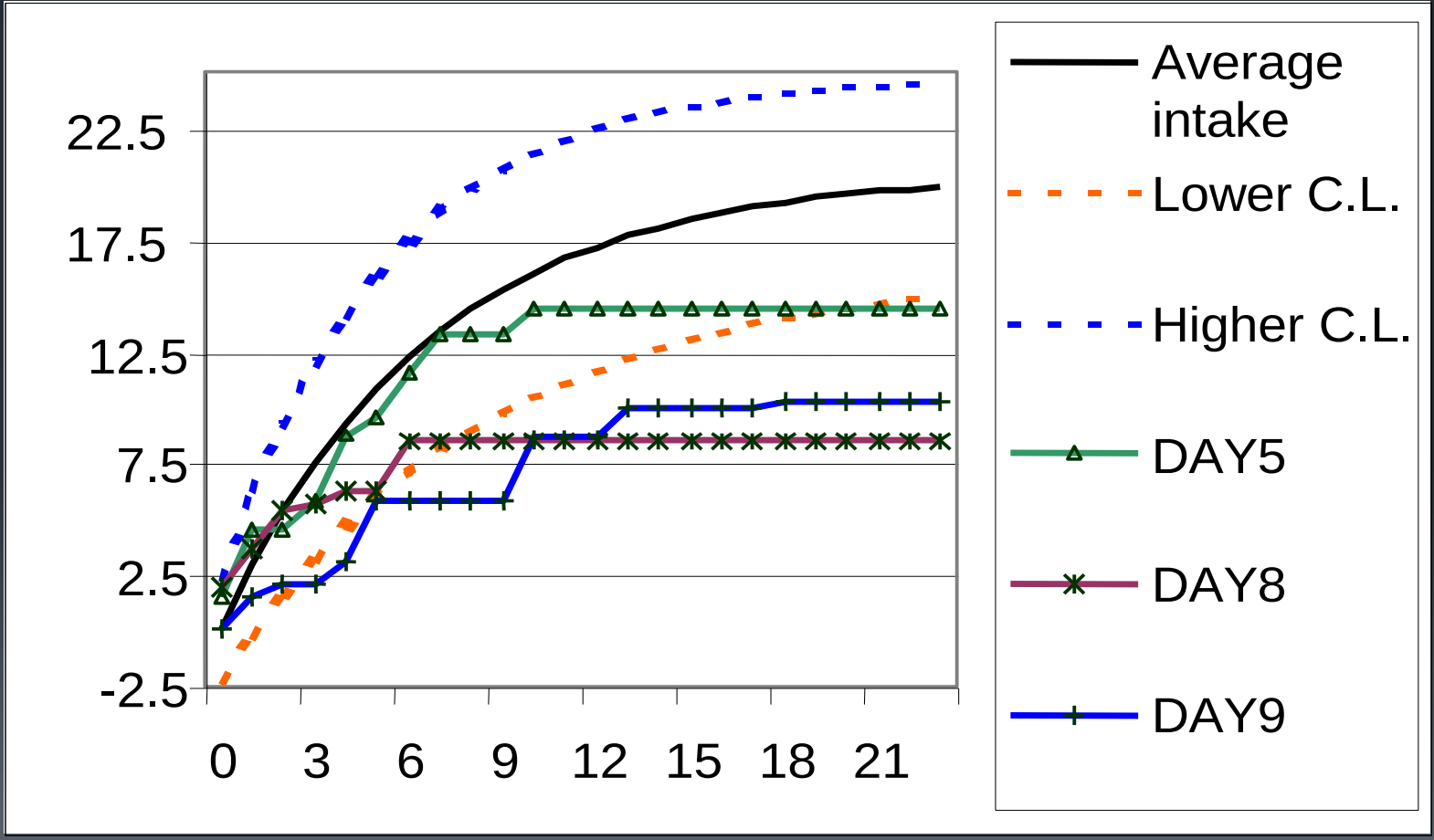
- Exponential model
  - Cumulative data of 6 days fitted with an exponential asymptotic function
  - $Y=b*(1-e^{-k*t})$
  - 95% confidential limits
  - Model RSQ=0.86



Pattern of TMR Intake, kg as fed: simple hourly mean±SD over 6d



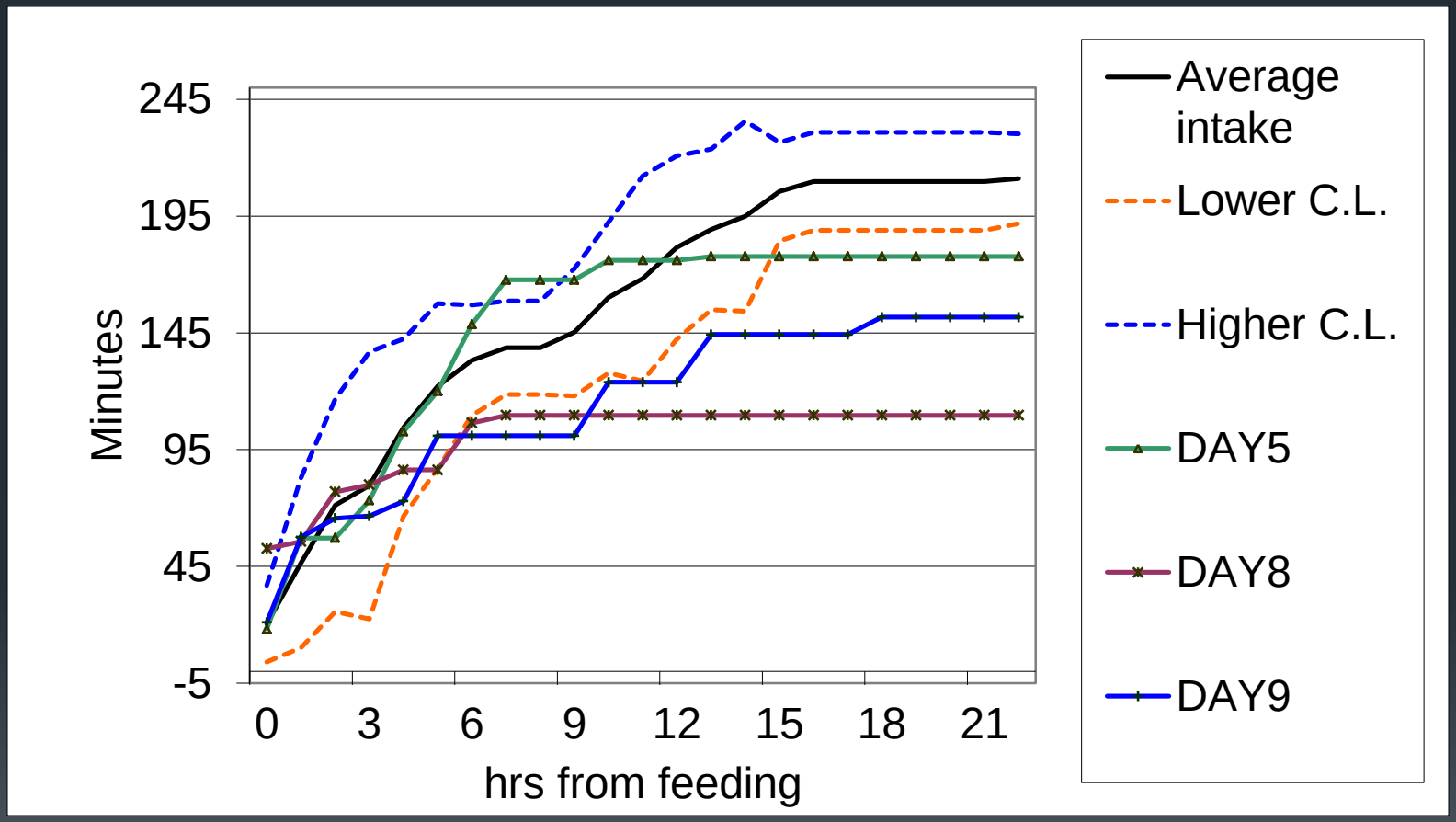
Pattern of TMR Intake, kg as fed: Exp Model $Y=b*(1-e^{-k*t})$



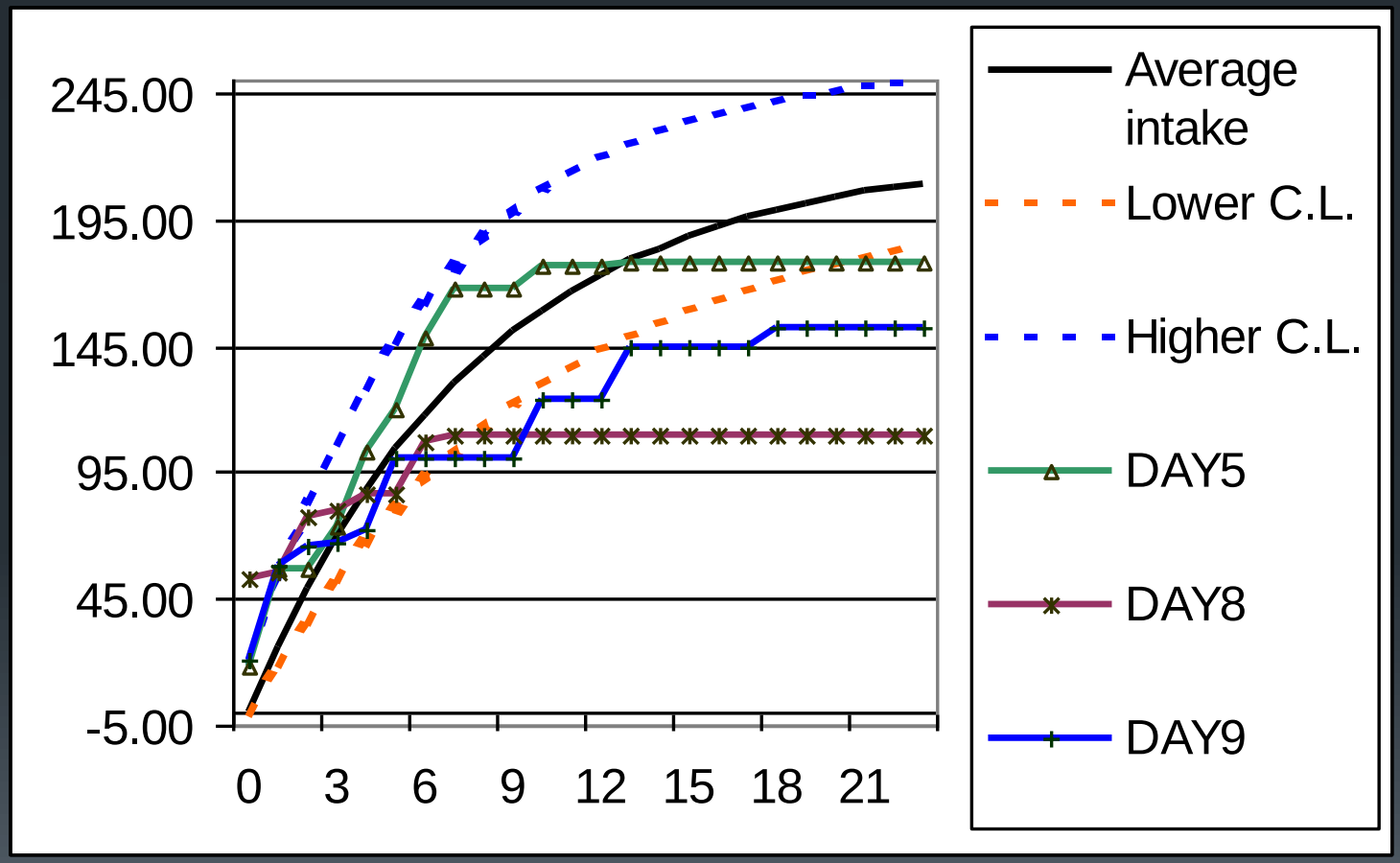
Pattern of TMR Intake, kg as fed: alarms after feeding, hours

	Models	
Day	mean±SD	$Y=b*(1-e^{-k*t})$
5	12	21
8	5	8
9	4	3

Pattern of Bunker attendance, min: simple hourly mean±SD over 6d



Pattern of Bunker attendance, min: Exp Model $Y=b*(1-e^{-k*t})$



Alarms after feeding, hours

	mean±SD		$Y=b*(1-e^{-k*t})$	
	Intake	Time	Intake	Time
5	12	15	21	21
8	5	6	8	8
9	4	6	3	7

K.I.S.S. principle?

- Simple model based on Mean and SD works!!!!
- Modelling works too and more sophisticated behavioral model may work even better
- In a farm environment, recording bunker attendance would be cheaper to implement and easier to run than intake measurements

Paolo's fantasy farm (milk price >0.4€/l)

- Transition cows:
  - DMI measuring system;
  - PMR with daily correction of concentrate allowance using autofeeders to maintain energy balance

- Fresh (0-45 DIM):
  - DMI measuring system;
  - TMR (PMR?)

- Rest of lactating cows:
  - TMR
  - Bunker attendance measurements used to estimate DMI
  - Rate of intake is fairly constant in each cows (CV=4.8%)

DairyCare

Hvala

Merci

obrigado

Tak

Thank you!

Спасибо

Grazie

Gracias

Danke