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The Use of a New Sensor (Behaviour Tag) for Improving Heat Detection, Health and Welfare Monitoring in Different Rearing Conditions

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The Modern Dairy Farm

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- Herd size increase
- Individual cow milk production increase

⇒New challenges – reproduction, health and cow welfare

- New technology generating new information

Behaviour Tag – Pedometer Plus™

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- Measures:
  - o Activity (steps/hour)
  - o Rest Time (minute)
  - o Rest Bout (#)
- Animal/Group/Herd routine → indicates deviation
- Integrating in full management system / stand alone system

Using Behaviour Data

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1. Reproduction – oestrus detection in limited conditions
2. Health – early detection of health problems
3. Welfare and Comfort – monitoring and assessment

Reproduction – Oestrus Detection

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- Oestrus behaviour (intensity and duration) reduced
- Limited conditions depressed oestrus behaviour:
  - Heat stress – reluctance to move
  - Tie stall – limited activity, no socializing interactions
  - First stage of lactation – metabolic stress

Improving Oestrus detection – Tie Stall

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- Early 80th - activity standing and lying time – oestrus detection in tie stall
- Cows in oestrus do not lie down for 6-17 hr, "quiet oestrus" detect by lying time (Brehme et al. 2008)

Rest Behaviour – Improving Oestrus detection

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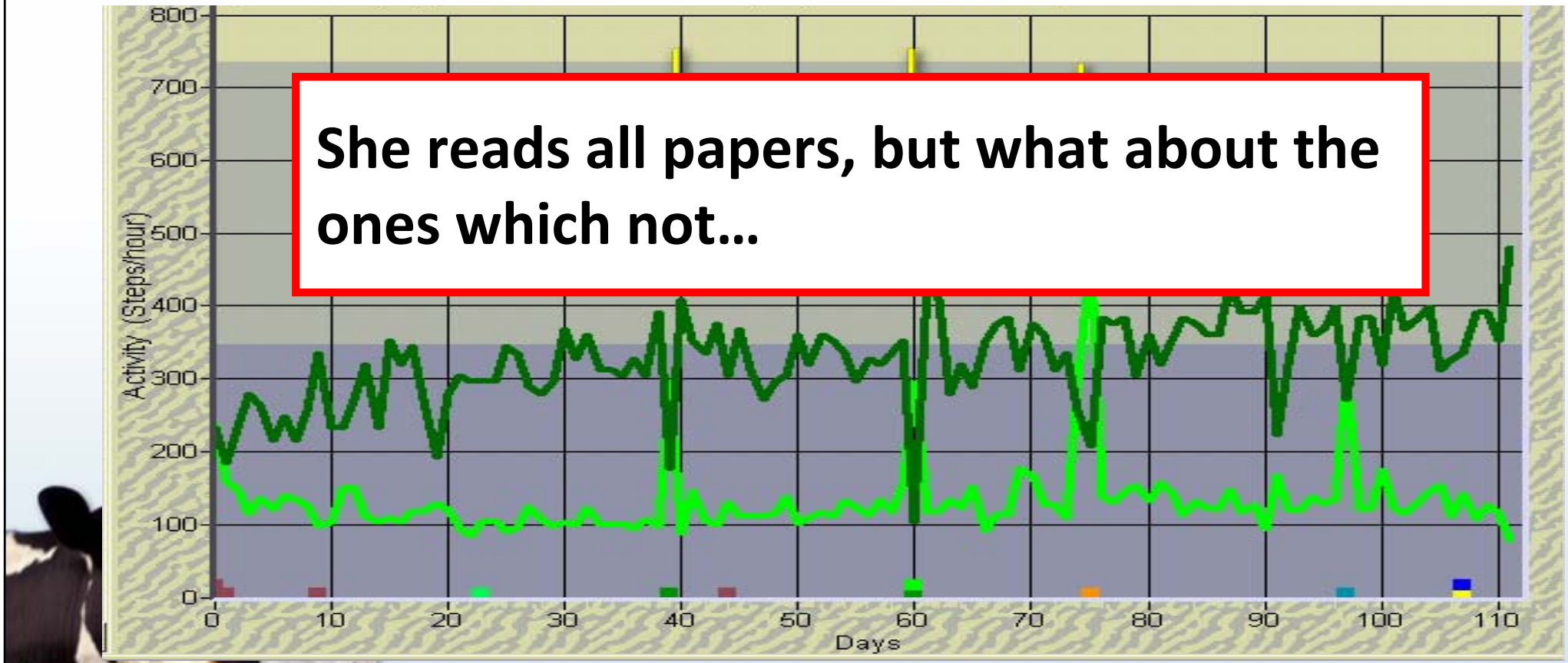
Normal Oestrus Behaviour



Rest Behaviour – Improving Oestrus detection

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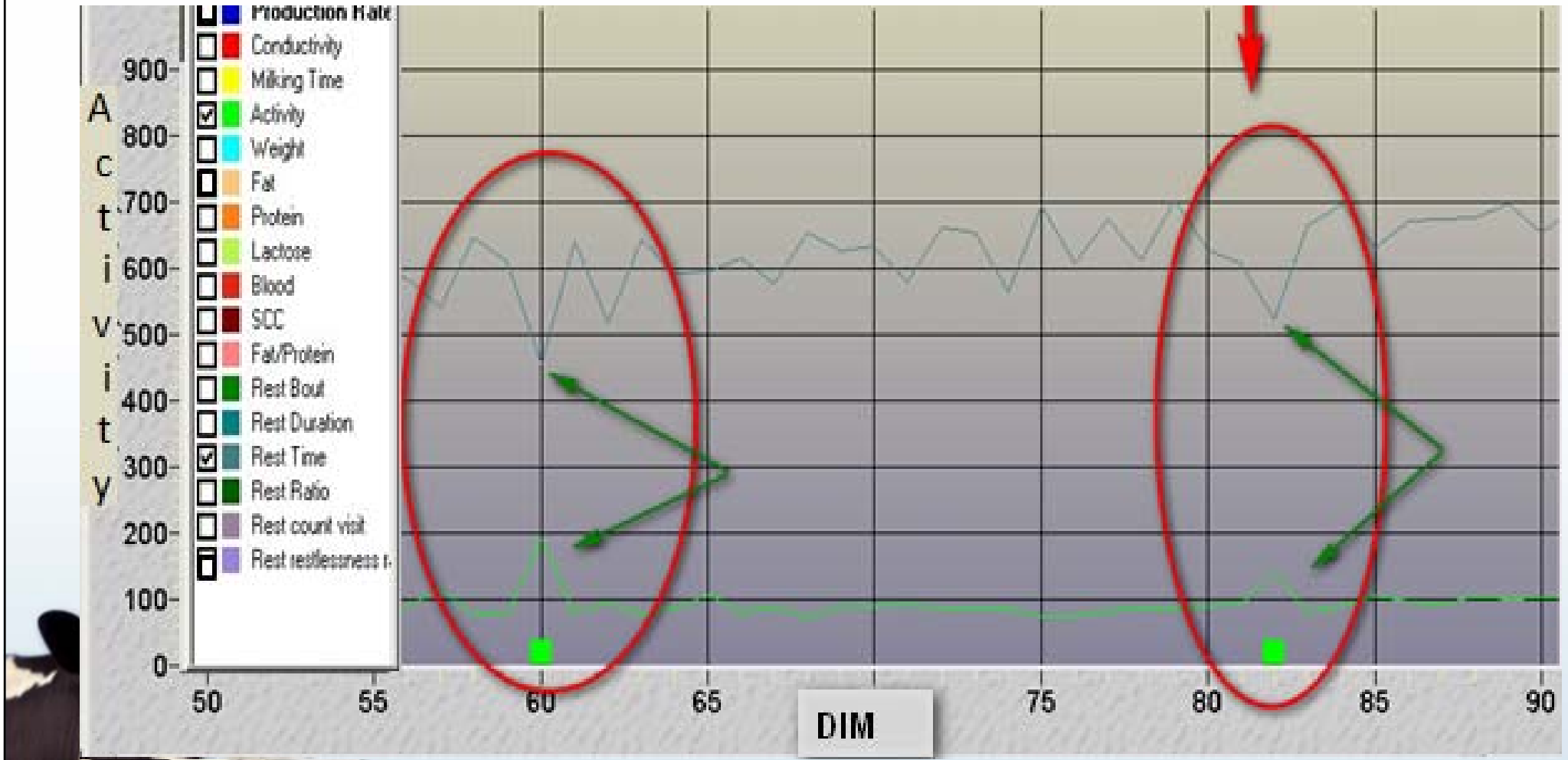
"Silent Oestrus"



Rest Behaviour – Improving Oestrus detection

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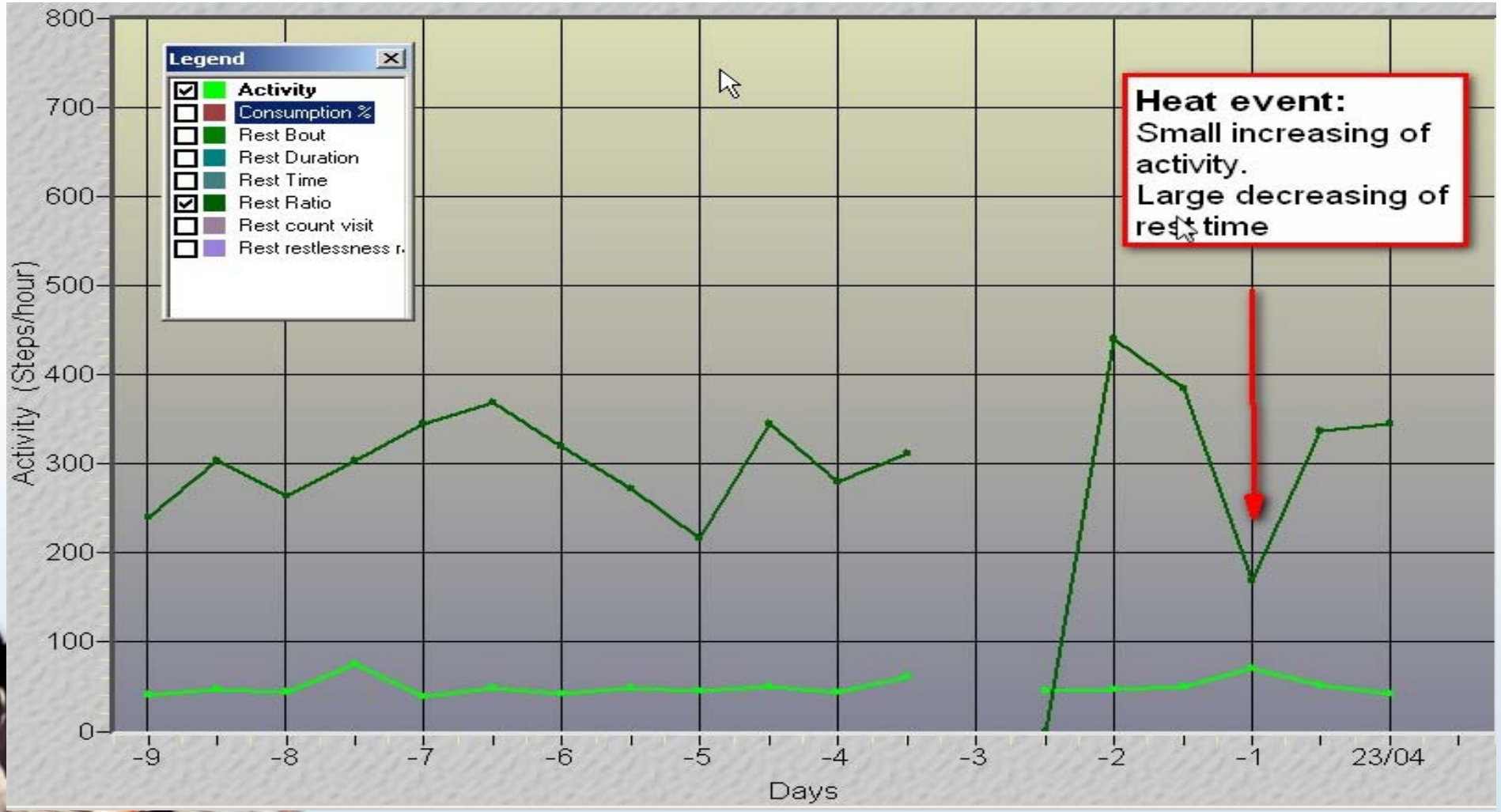
"Silent Oestrus" in Tie stall



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Health – Early Detect of Disorders

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- Adequate rest time importance for cow health
- Identification of lying and standing bouts may assist in early detection of health problems (Tolkamp et al., 2010)
- Few works studied the use of lying behaviour for detecting health problems
- Early intervention improves efficiency of veterinary treatments and management changes (Gonzales et al. 2008)

Health –
Early Detect of Disorders

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- Integrating lying behaviour data could lead for reducing time and specifying of health disorders detection

Rest Behaviour – Improving Health problems detection

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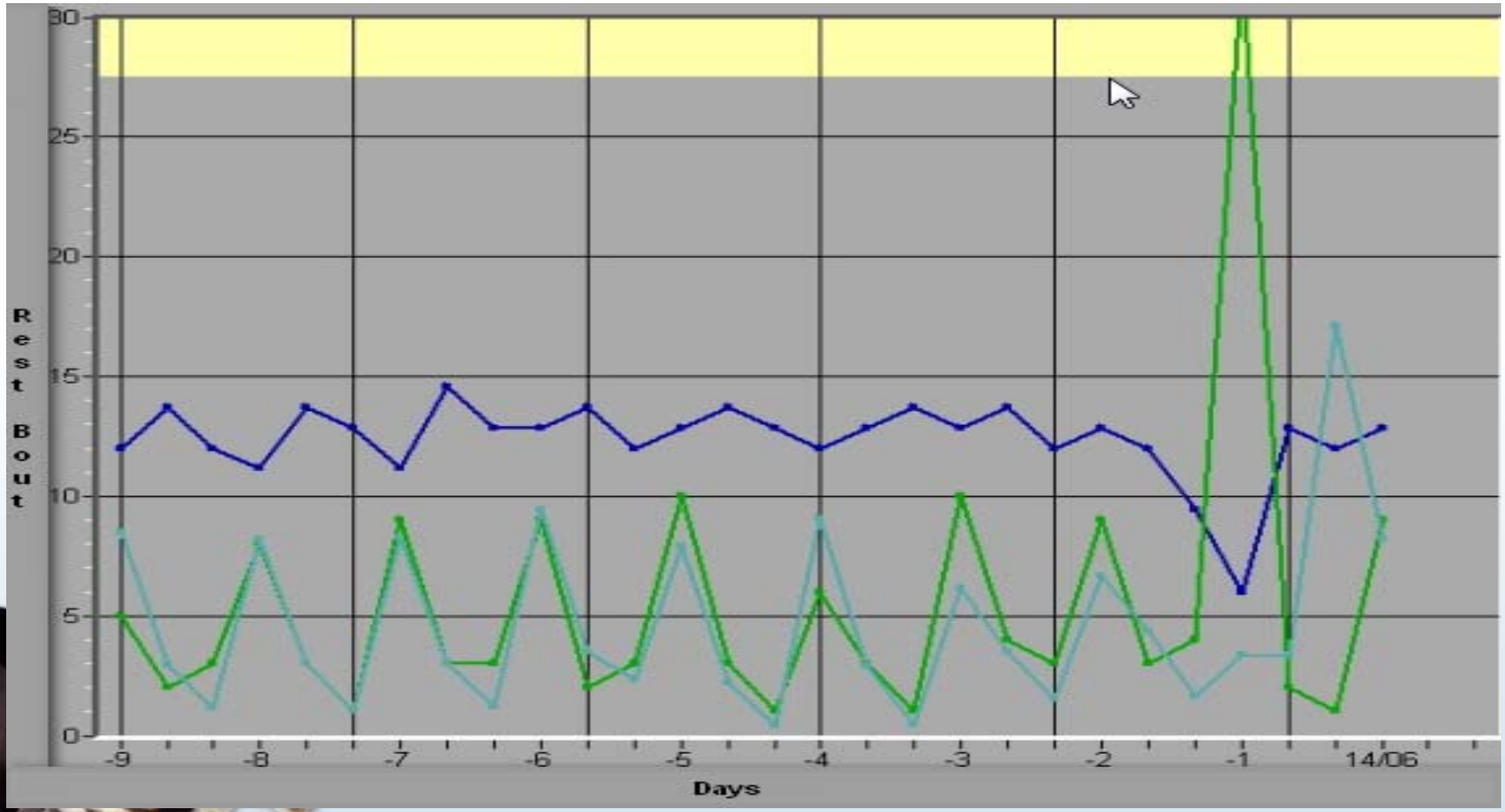
Abdominal pain - change of lying bout behaviour



Rest Behaviour – Improving Health problems detection

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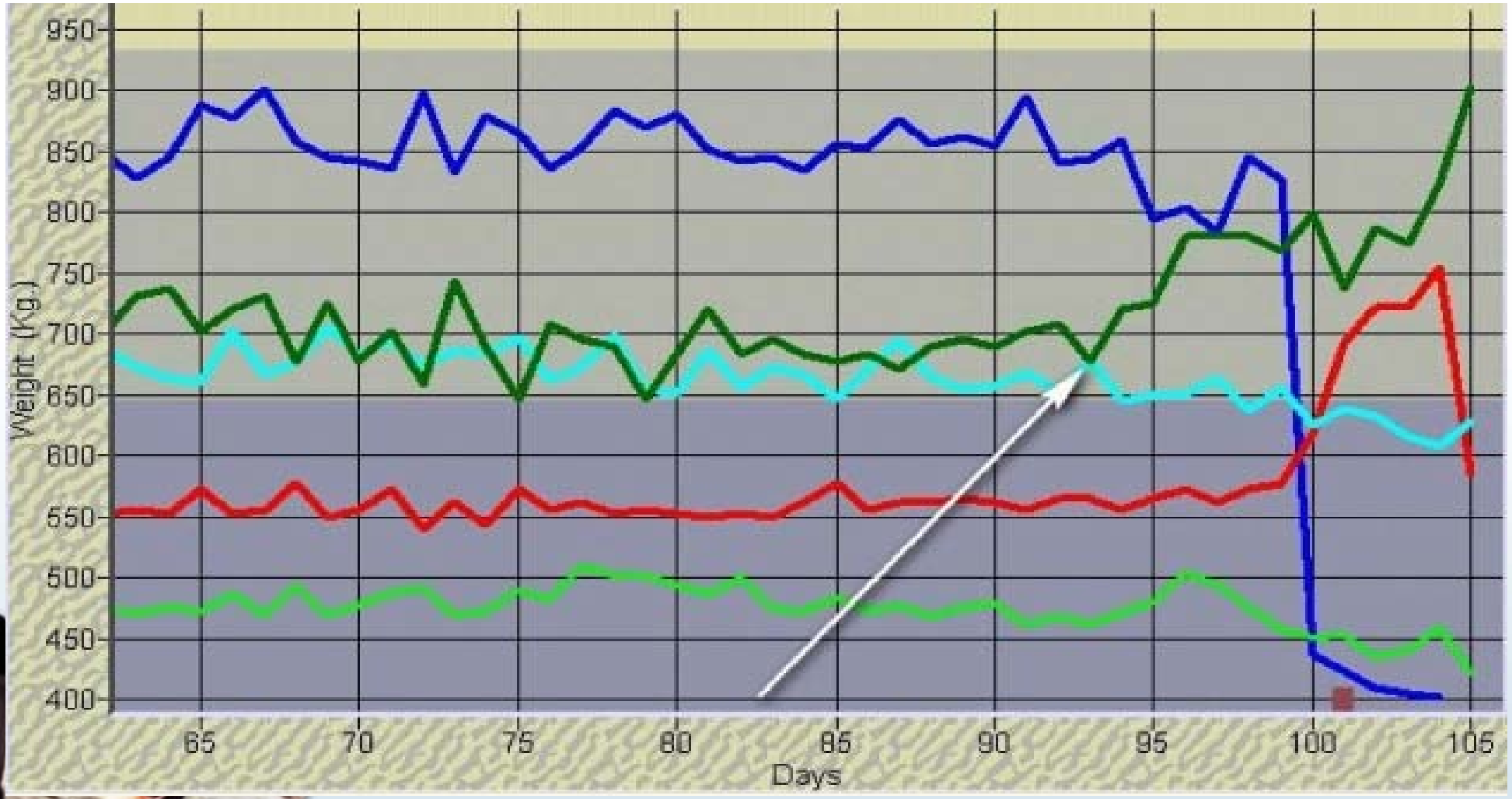
Mastitis - early change of lying time



Rest Behaviour – Improving Health problems detection

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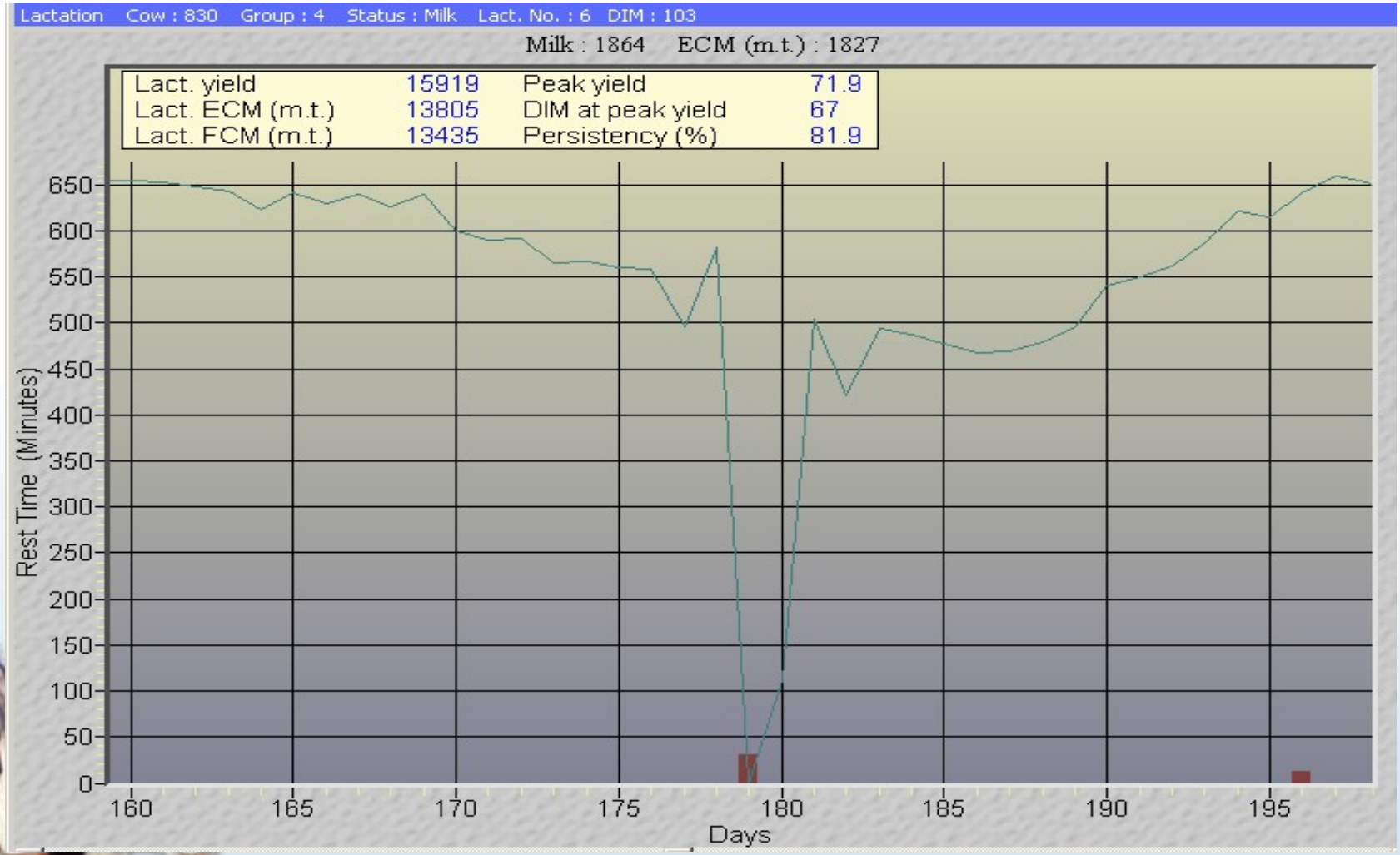
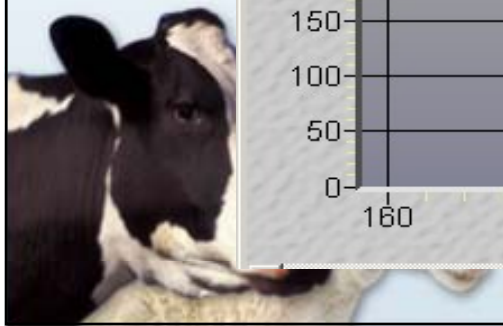
Diarrhoea – sharply decrease of lying time





Using Behaviour Data

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Welfare & Comfort - Assessment

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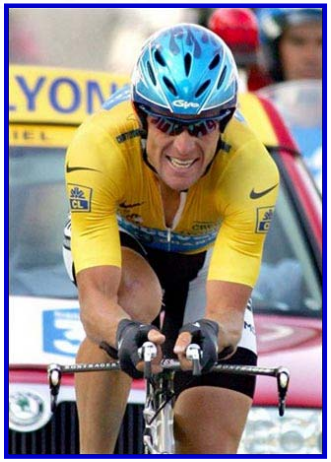
- Increasing importance – social, politics, ethics, research and **management**
- **Advantages of Adequate Rest Time:**
  - Increasing blood flow to udder and uterine
  - Decrease incidence of hoof problems and lameness
  - Increase efficiency of rumination and feed consumption
  - Increase milk production – for every additional 1 hr rest 1 kg milk/day (Grant, 2005)

"Dairy cows are highly motivate to lie for 12 -13 h/day" (Jensen et al. 2005)



Welfare & Comfort - Assessment

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- Model for welfare assessment
  1. Environmental parameters – indirect
  2. **Animals' reaction parameters – direct**
- Level of welfare ≠ absence of difficulties

  = capacity to overcome difficulties (Bertoni & Calamari, 2006)

Survey of Dairy Cows Rest Behaviour in Israel

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- Israeli commercial high producing dairy farms, using the Pedometer Plus system for ≥1 year

1. Rest behaviour characteristic during 305 days lactation
2. Difference of rest behaviour during different seasons (winter vs. summer)
3. Hypothesis – rest behaviour is a sensitive parameter for welfare assessment (compare with milk production and activity)
4. Explore the potential use of rest data as practical tool for monitoring and improving cow welfare & comfort

The dynamics of daily rest time and daily milk production of Israeli-Holstein cows during the lactation

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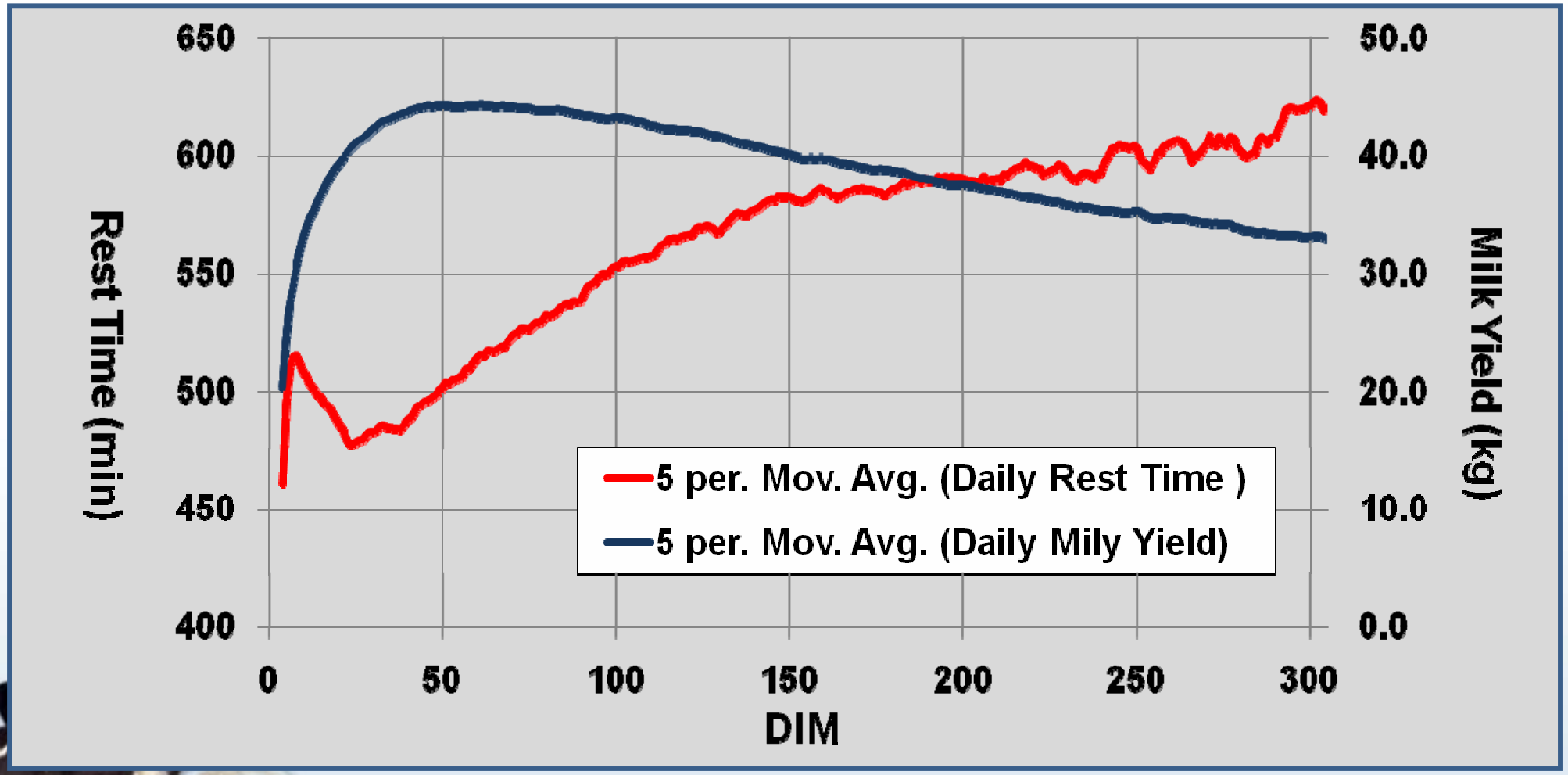

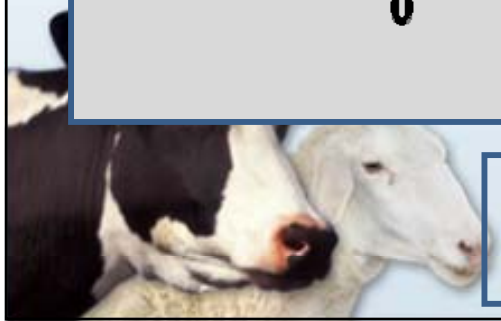

Data obtained from 6 herds (total of 1810 lactating cows) - average production of 11,832 kg milk /lactation, during 2009-10

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Pearson correlations between daily lying time and milk yield during different stages of lactation

DIM	Pearson Correlation*
5-25	-0.846
26-50	0.628
51-100	-0.706
101-200	-0.843
201-305	-0.466

*P<0.001

Data obtained from 5 herds (range: 233-580 milking cows), total of 1,726 cows, average production of 11,851 kg milk /lactation

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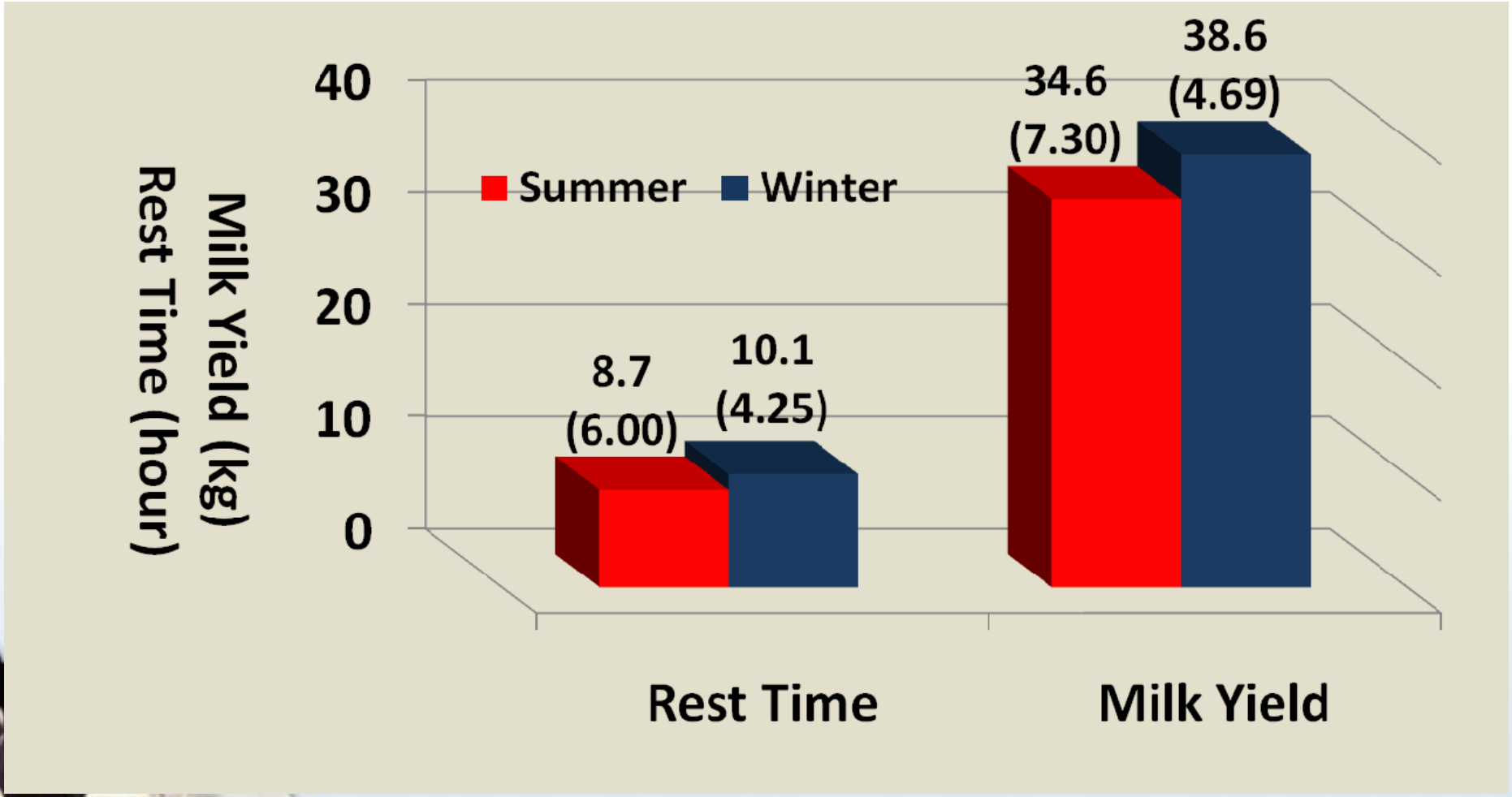
Rest time and milk yield in 7 Israeli dairy cow herds during winter* and summer (CV values)



*Winter=January-March, 2009 ; Summer= July-September, 2009

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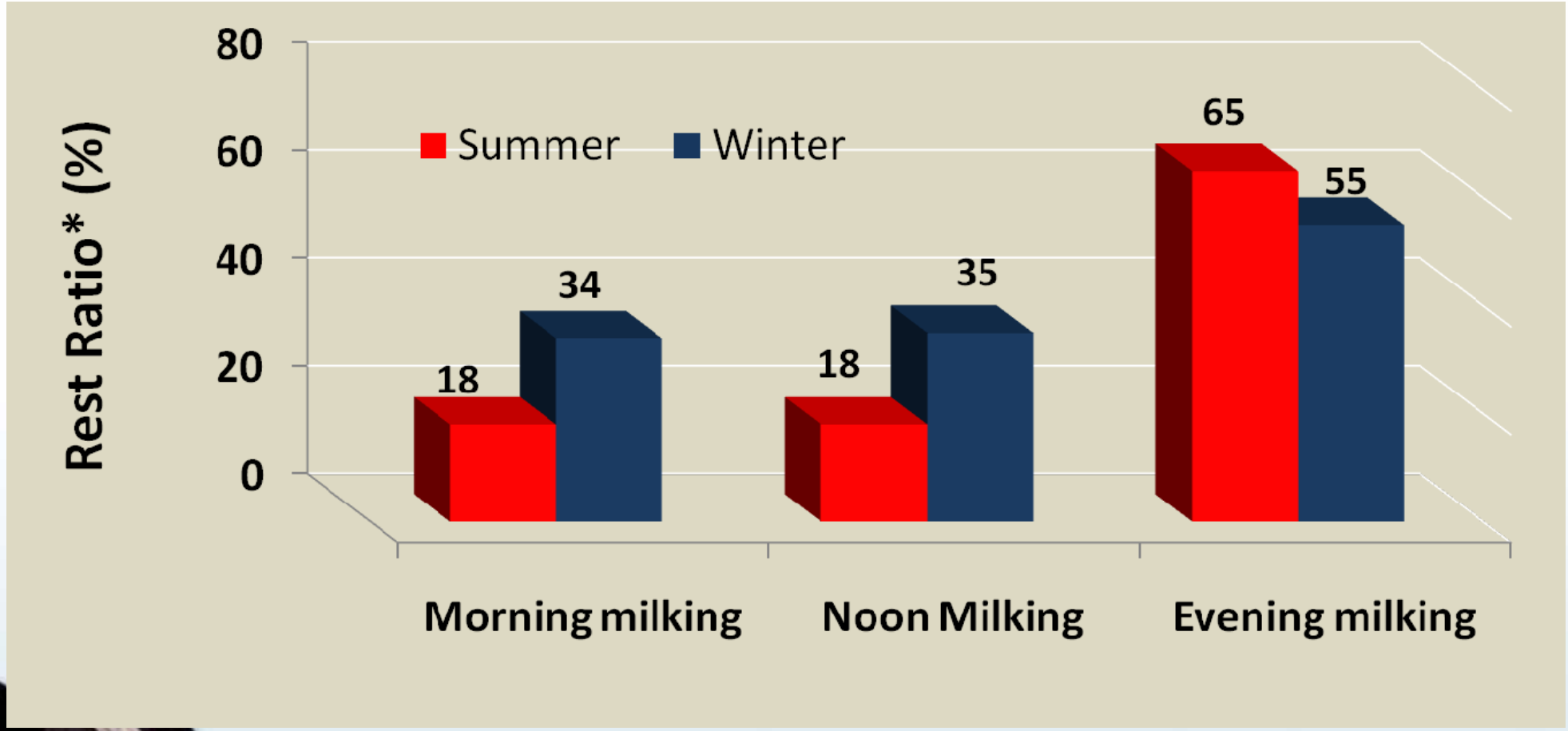
Diurnal rest behaviour pattern during winter (27/2-8/3/2010) and summer (31/7-9/8/2009)

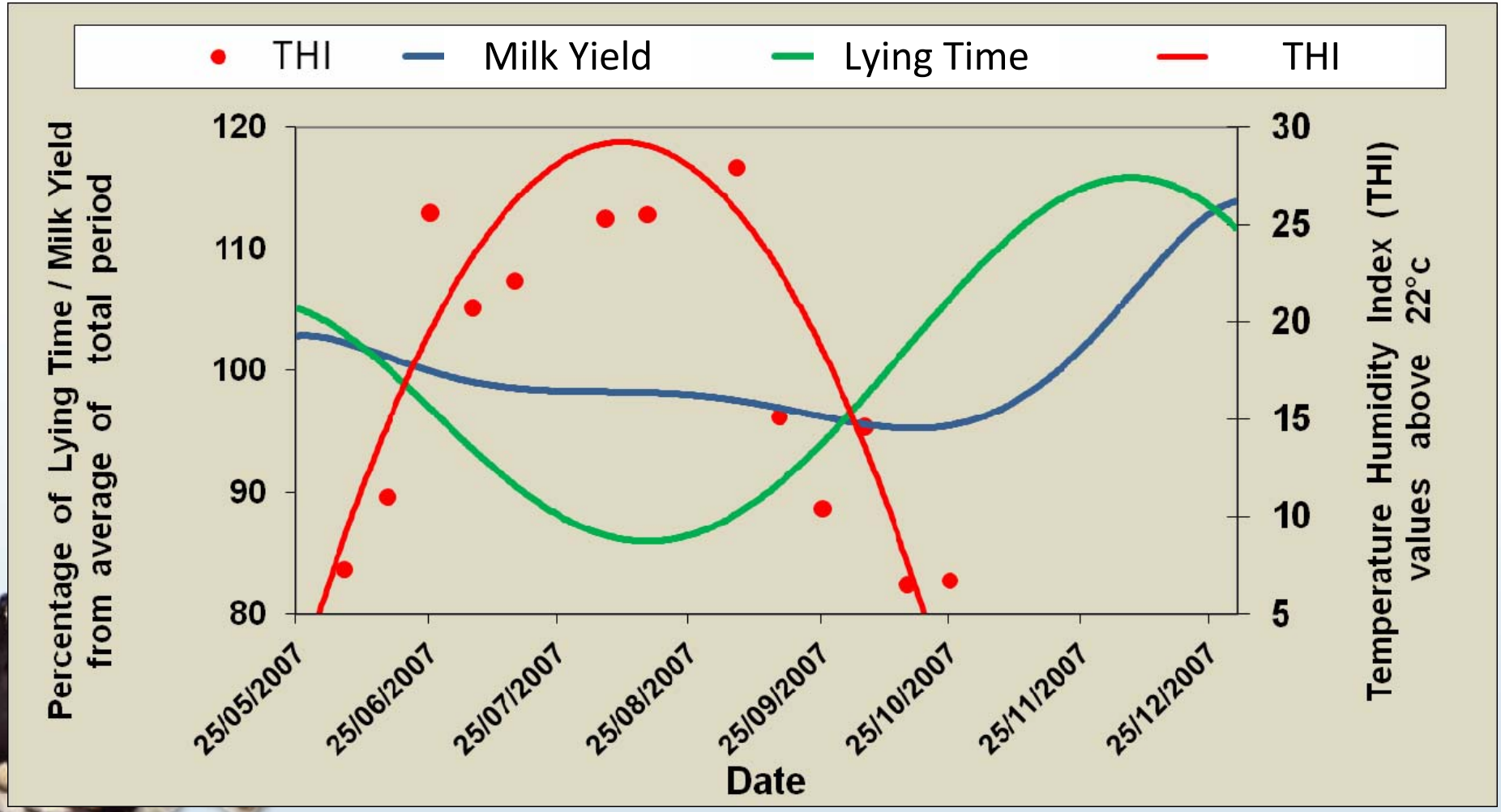


*Percentage of lying time from total time between milking

Data obtained from 242 milking cows in commercial farm (south of Israel)

Does Rest Behaviour is a Sensitive Parameter for Welfare Assessment ?

Lying time and Milk production in commercial herd during different heat stress conditions (May-December 2007)



Decrease of rest time following by decrease of milk yield during heat stress

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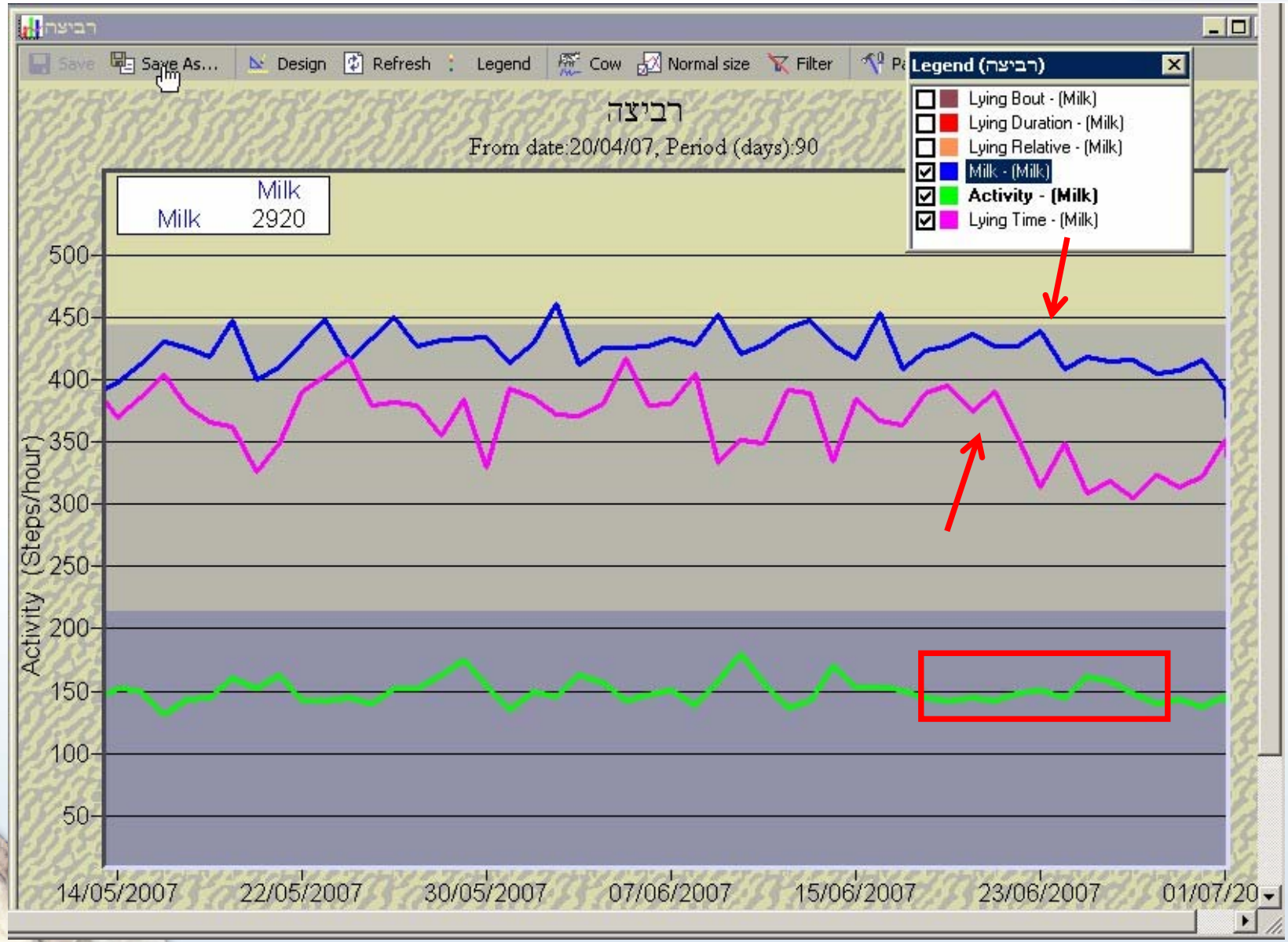
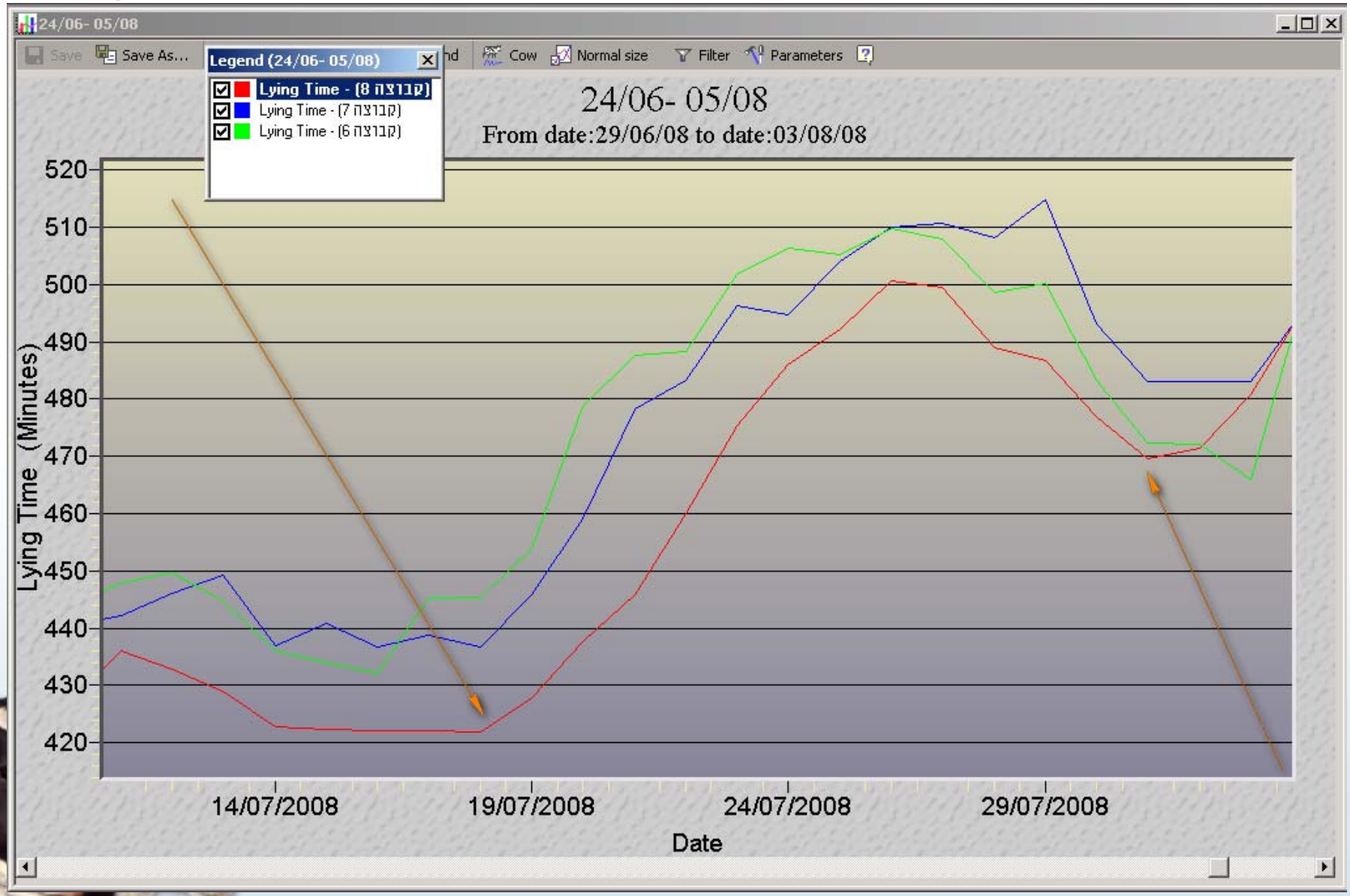


Data obtained from ~70 milking cows in commercial farm (north of Israel)

Extensive increase in daily rest time of cows in three free stall barns due to improving of the bedding



Conclusions of Survey

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- The lying time and the correlation between lying time and MY are changing along the lactation
- Difference in daily lying patterns during summer and winter
- Israeli dairy cows do not reach the optimal daily 12h lying time – is that the optimal?
- Lying behavior is more sensitive indication of cow welfare disturbance than milk production and activity

Studies using the Pedometer Plus system

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- Cows in high density pens lie less time than cow in control pen (Adin et al. 2009)
- Decrease of lying time and increase of activity when cows were moved from pens (Guash and Bach, 2009)
- Forced cooling cows for one hour twice daily during the summer do not impaired quantitatively with normal cow behaviour (Maltz, personal communication)

Summary

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- Lying behaviour of cows provide valuable information which have high potential for:
  - o Improving oestrus detection in unfavourable conditions
  - o Enable early and specific detection of health problem and diseases
  - o Monitoring cows welfare & comfort as an indicator of the facilities and management procedures in the herd
  - o Creating objective criteria and standards for welfare assessment based on automatic recording data

Further studies will have to be performed both in research and commercial farms

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Thank you