Progesterone in milk- investigations on practicability as a functional trait in dairy cows

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Landesforschungsanstalt für Landwirtschaft und Fischerei

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Getting a cow fertile is a main problem…

Frequency of diseases in local dairy farms

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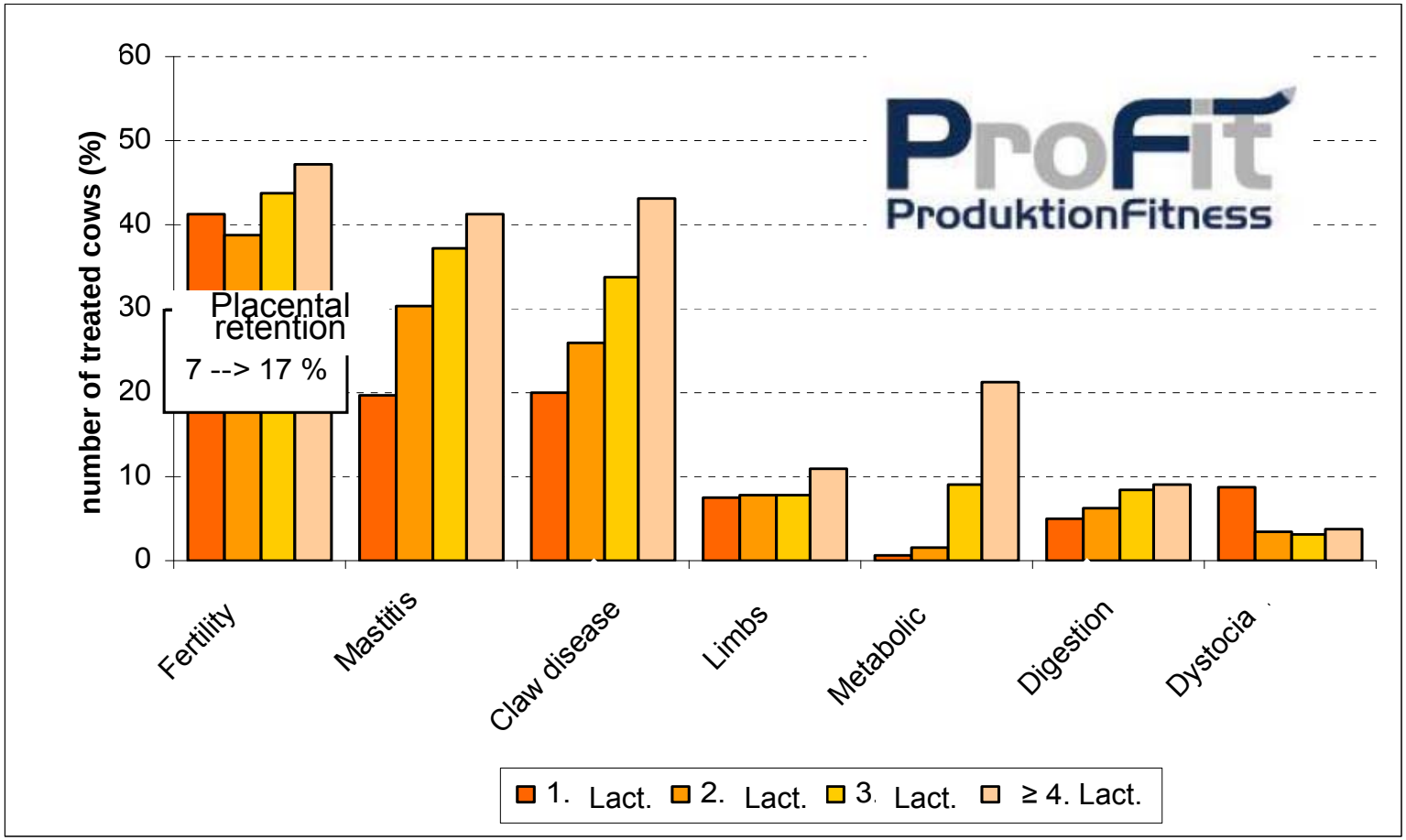

Rudolphi, 2012

Culling rate because of infertilllity in Germany

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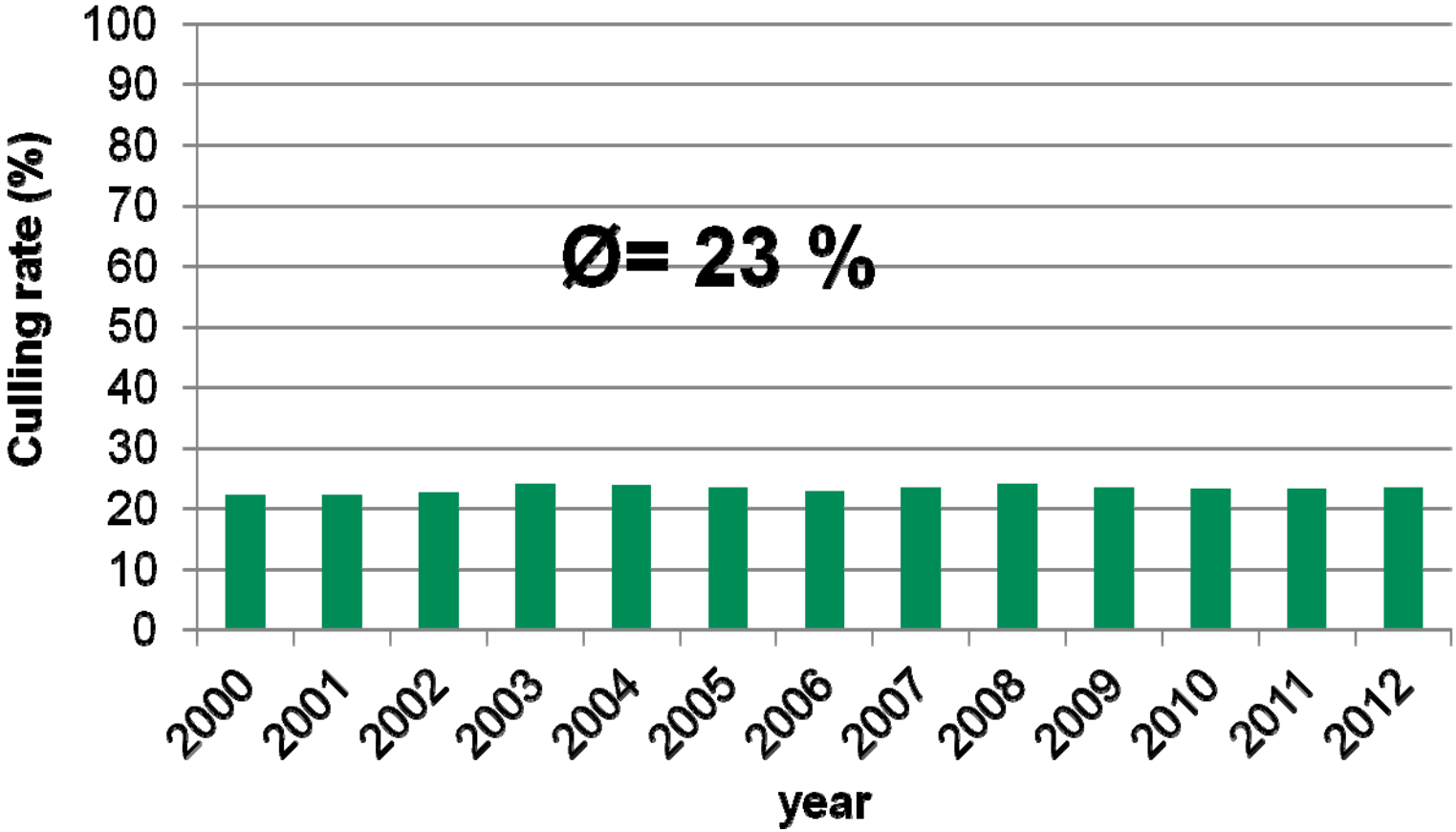

ADR, 2013

That‘s why…

- reproduction management needs a useful tool to identfy
  - cyclic cows or cows with cyclic disorders
  - cows in heat
  - pregnant cows
- noninvasive methods are advantageous because of reducing stress

⇒ such a tool is determination of progesterone in milk

⇒ reproductive status can be predicted from milk progesterone values *(Friggens and Chagunda, 2005)*

- further benefit of this method is the simplicity of sample collection
- devices for analysing progesterone „on-farm“

Material and method

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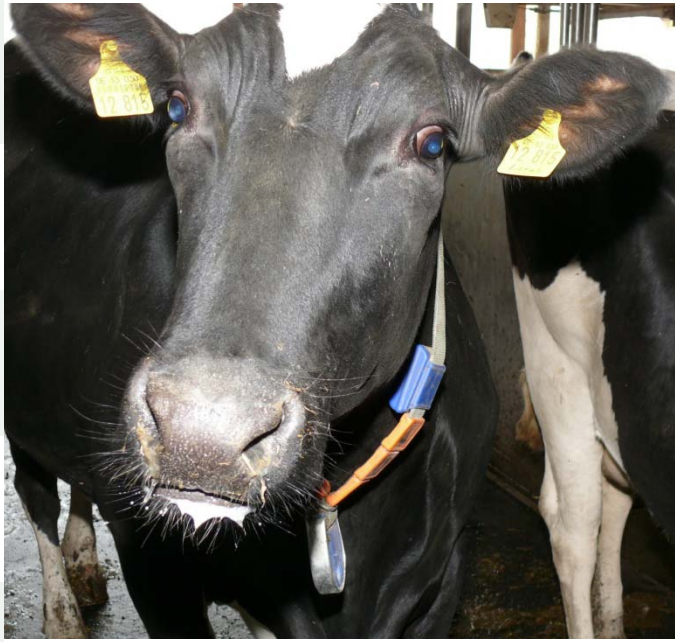
number of cows	**513 German Holsteins**
milk yield per cow and year	10,622 kg
fat / protein	4.1 % / 3.4 %
period	Nov. 2009 – Dec. 2011
sampling	1x weekly premilking samples
subject group	1st to 3rd parity 3rd until 14th week post partum
Number of analysed samples	7,662 „on-farm“ (eProCheck) 7,650 RIA



Material and method

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		RIA	ELISA (ePro-Check)
specifity	(%)	100	100
sensitivity	(pg)	8	
intra-assay coefficients of variation	(%)	8.0	4.5 – 9.5
inter-assay coefficients of variation	(%)	9.6	9.7 – 15.6

„On-farm“ analysing method

Comparision of progesterone analysing methods

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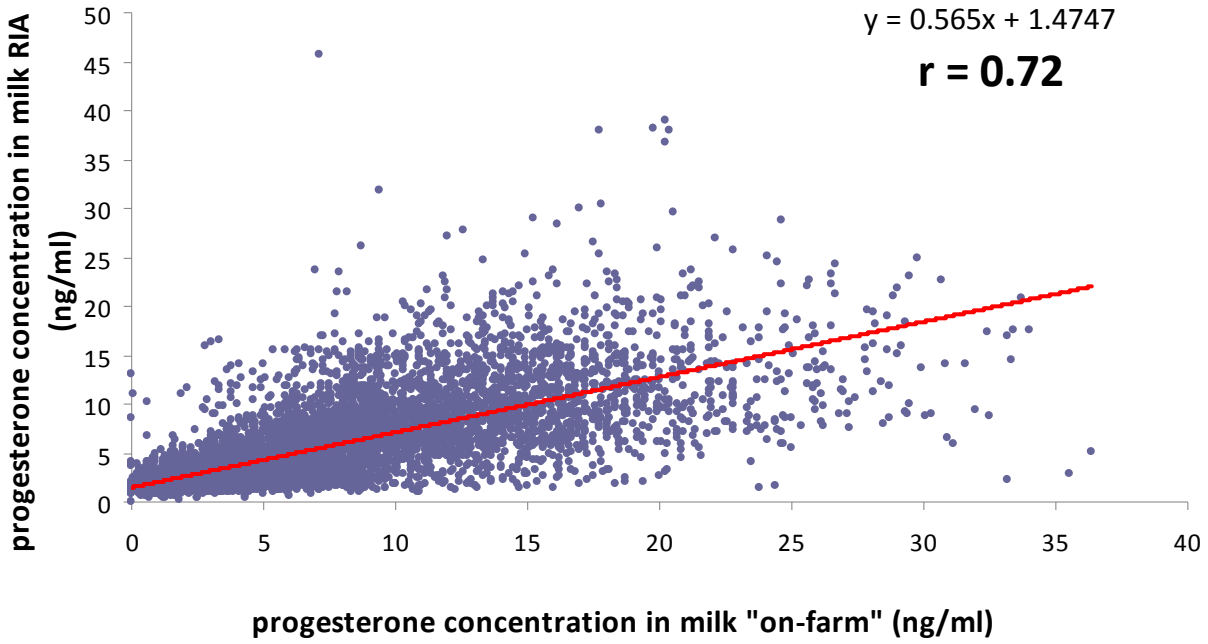
	Number of samples (n)	Mean (ng/ml)	Standard-deviation	Minimum (ng/ml)	Maximum (ng/ml)
on-farm ELISA	7,662	6.9	5.9	0	36.4
RIA	7,650	5.4	4.6	0	45.7
difference |on-farm ELISA-RIA|	7,640	1.5	4.1	0	38.6



Commencement of luteal activity (CLA)

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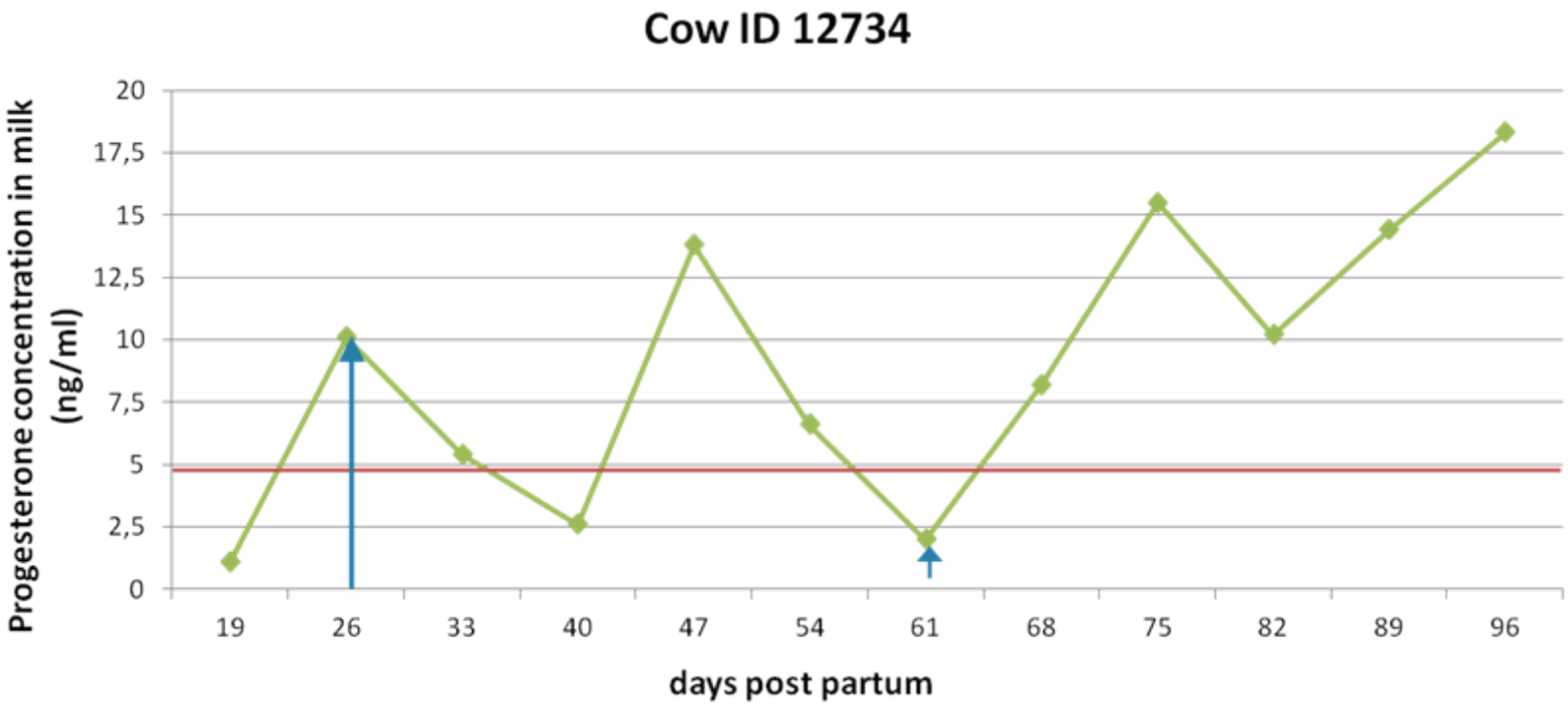
Threshold value for CLA:

=> first week post partum where P4- concentration exceeded 5 ng/ml



Distribution of commencement of luteal activity after calving

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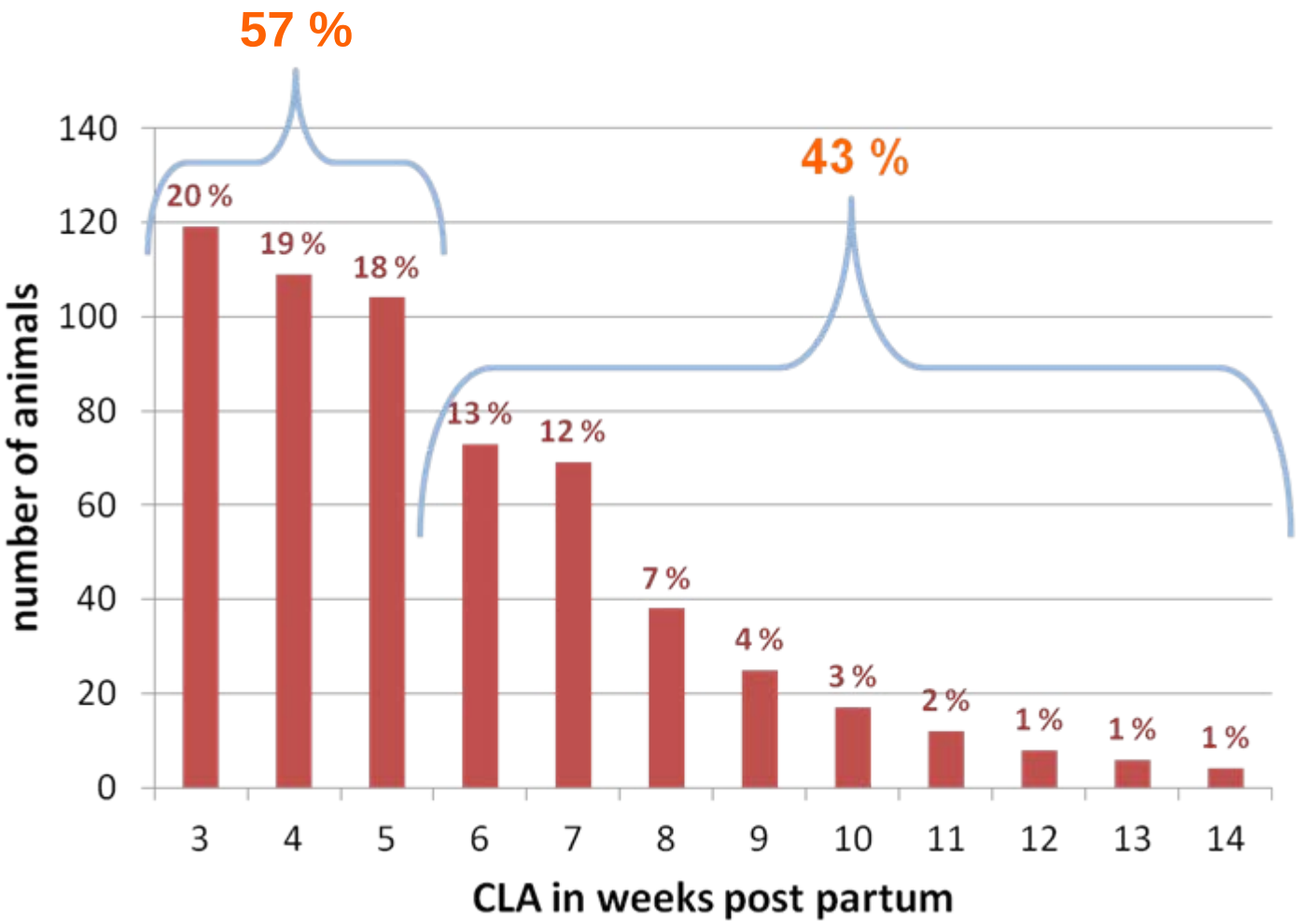

Is there a relationship between milk yield, protein content or body condition and commencement of luteal activity?

- milk yield was measured daily by milkmeter, summarised to 100-d milk yield
- protein content was determined on basis of first milk recording
- to describe body condition, change in back fat thickness (Δ BFT) from 1st to 2nd milk recording was used
- Statistical analysis: SAS MIXED procedure

Effect of milk yield on commencement of luteal activity

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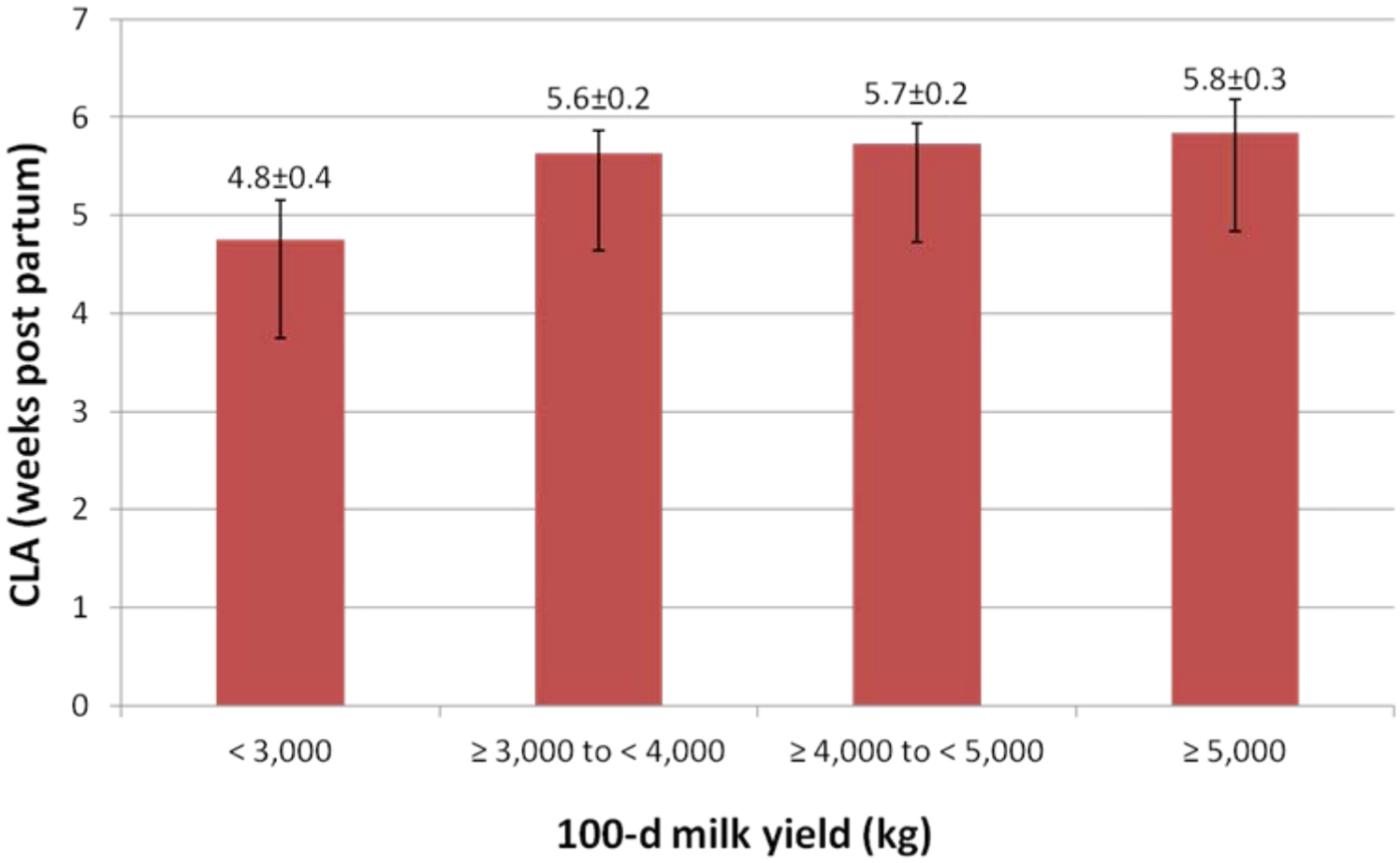

Effect of protein content on commencement of luteal activity

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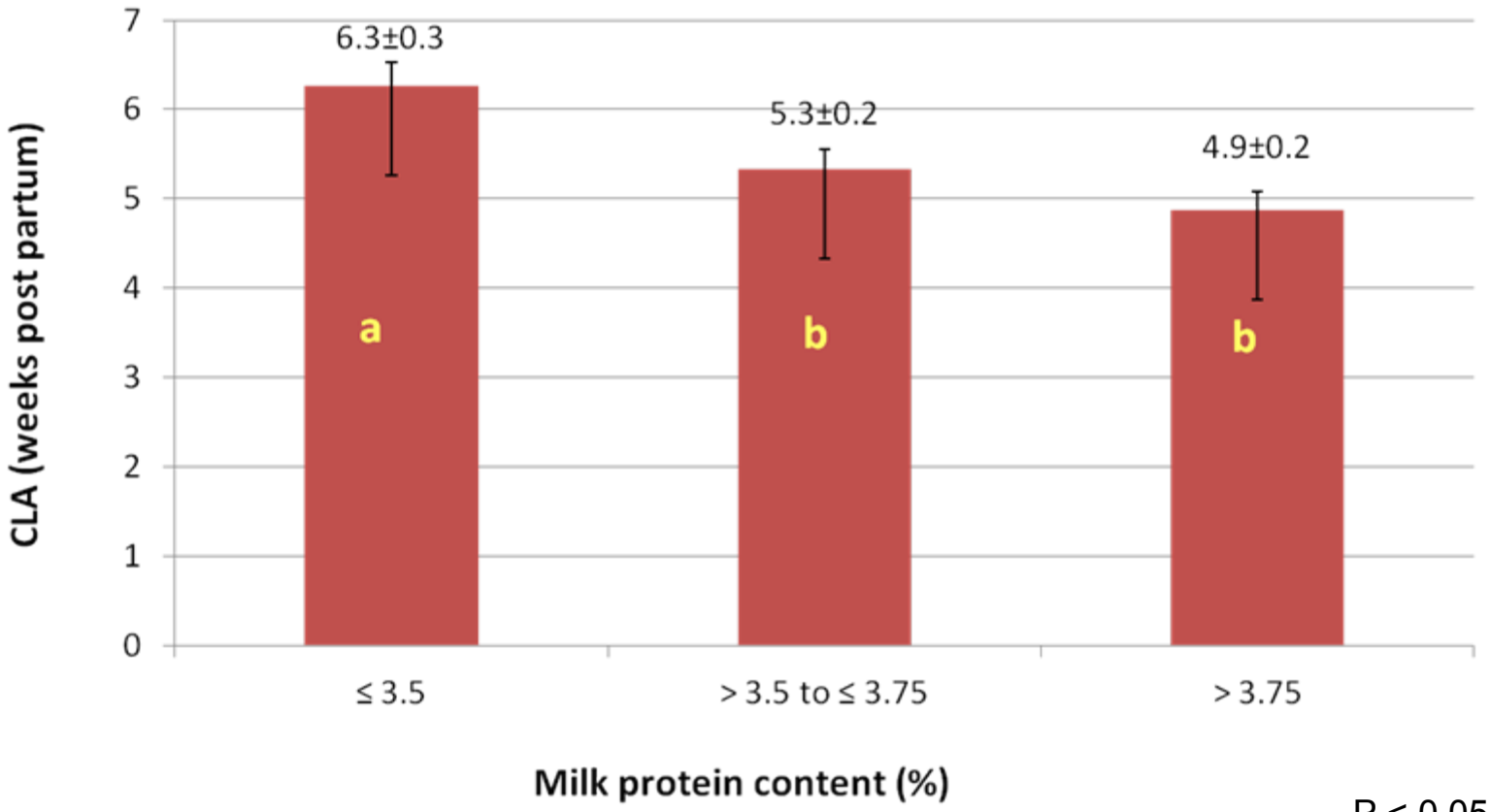

$P < 0.05$

fixed effects: milk yield, protein content, parity, calving ease, endometritis, year-season

Effect of body condition on commencement of luteal activity

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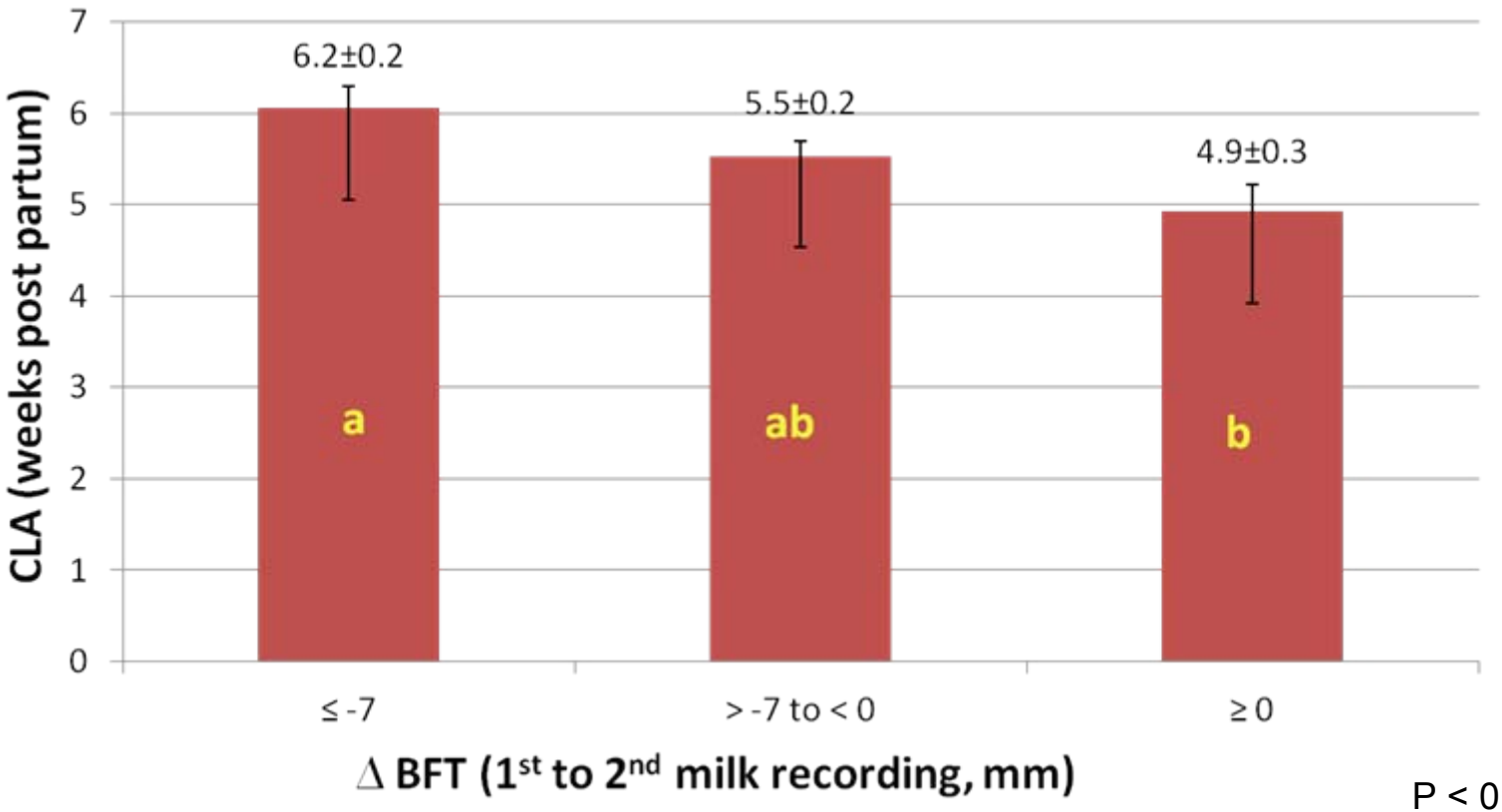

P < 0.05

fixed effects: Δ BFT, parity, endometritis, calving ease, year-season

Effect of calving ease and endometritis on commencement of luteal activity

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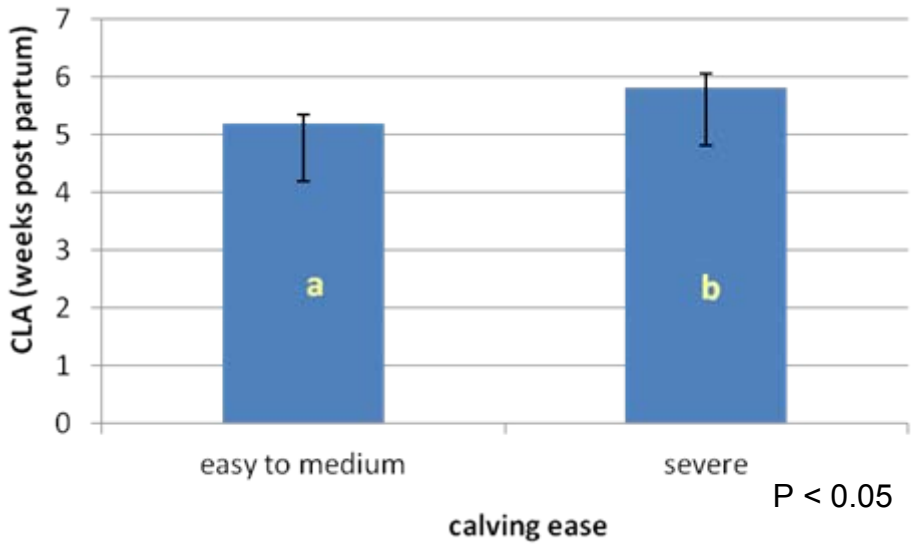
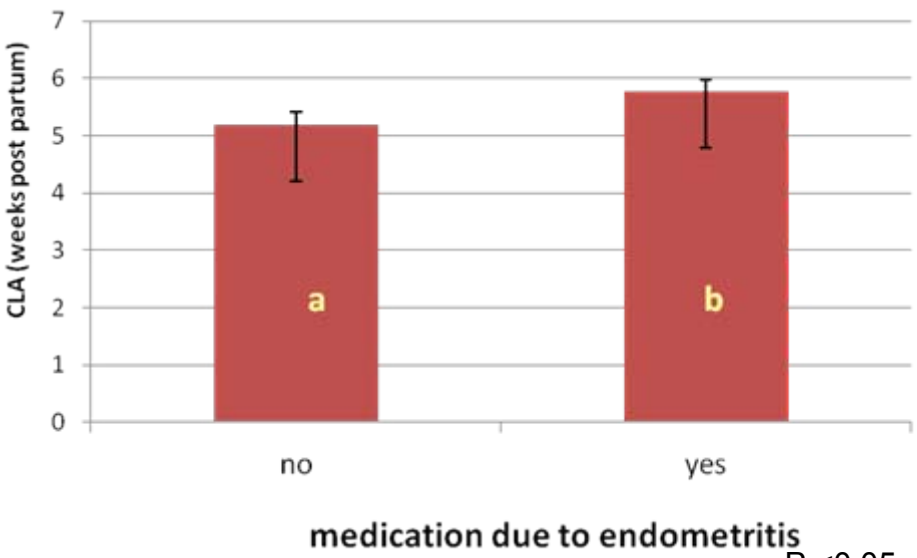


P < 0.05

- **easy to medium=** not observed, without or little assistance
- **severe=** mechanical calving aids, assistance with more than one person or veterinarian, caesarian section, fetotomy



P <0.05

Take home message

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- milk progesterone concentrations „on-farm” correlated significantly with measurements done by the RIA-method (r=0.72)
- with regard to laboratory conditions for RIA and on-farm conditions for ELISA (eProCheck) the difference in means of 1.5 ng/ml can be accepted
- => useful tool for reproduction management
- effect of milk yield on commencement of luteal activity could not be confirmed
- significant impact of milk protein content and change in body condition p.p. on start of oestrus cycle after calving
- Management: cows with high protein content at first milk recording and a severe lost in body condition should have a longer voluntary waiting period


Thank you for your attention!
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