

Interrelationships between live weight, body measurements, BCS and energy balance of dairy cows

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1. Introduction

- milk production \uparrow – live weight \uparrow
- higher milk production for efficiency
- consideration of live weight
- prediction by body measurements
- proportions change
 - consideration of breed, parity, stage of lactation

2. Objectives

Examination of relationships between body measurements, BCS, energy balance and live weight during lactation

- influence of breed, parity and stage of lactation

Prediction of live weight

Does influence of body measurements on live weight change during lactation?

3. Materials and Methods (I)

- Experimental design and Data collection
 - AREC Raumberg-Gumpenstein 2012 - 2013
 - 11 experimental periods
 - 63 cows each
 - Fleckvieh (Simmental), Holstein Friesian, Brown Swiss crossbreeds
 - meeting requirements, forage-based (hay and silage), concentrate

 - milk production, feed intake, feed stuff, live weight
 - body measurements, BCS
 - nutrient intake, nutrient requirements and balances

(VDLUFA 1976, EDMONSON et al. 1989, VAN SOEST et al. 1991, DLG 1997, UTZ 1998, GfE 2001, GfE 2008, GfE 2009)

3. Materials and Methods (II)

- Statistical analyses

- 614 records, 16 % dry period
- SAS 9.2, proc mixed
- fixed effects: breed (1 - 5), parity (1 - ≥4), time (-10, -8, -6, -4, -2, 1 - 12), breed × time
- random effects: cow (breed), residual
- prediction of live weight: breed × time not significant

Table 1: Description of selected parameters in lactation

Parameter	Unit	Lactation			
		Mean	± SD	min	max
Total feed intake	kg DM/d	17.9	3.57	8.5	27.0
Concentrate level	% of DM	28	17.0	1	60
NE _L	MJ NE _L	6.5	0.37	5.5	7.1
Energy-corrected milk	kg/d	24,0	7.20	2.1	51.2
Energy balance	MJ NE _L /d	-0.5	22.0	-103.3	68.4
Live weight	kg	649	80	474	887
BCS	Points	3.0	0.41	1.6	4.3
Heart girth	cm	203	8.5	178	230

4. Results and Discussion (I)

- Prediction of Live weight – Breed, Parity
- FV100 (730 kg) to HF100 (613 kg)
 - FV 646 - 720 kg, HF 589 - 688 kg
 - 53 kg 1st to ≥5th lactation, degressive

(GRUBER et al. 1995, HAIGER and KNAUS 2010)
(ENEVOLDSEN and KRISTENSEN 1997)

$$\text{Live weight (kg)} = -780 + \text{Breed} + \text{Parity} + \text{Time} + b_{LW,BG} \times \text{Belly girth (cm)} + b_{LW,HG} \times \text{Heart girth (cm)} + b_{LW,CD} \times \text{Chest depth (cm)}$$

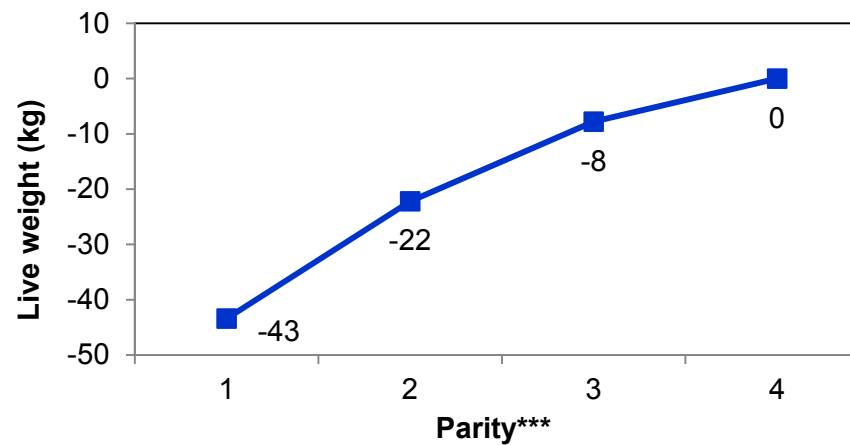
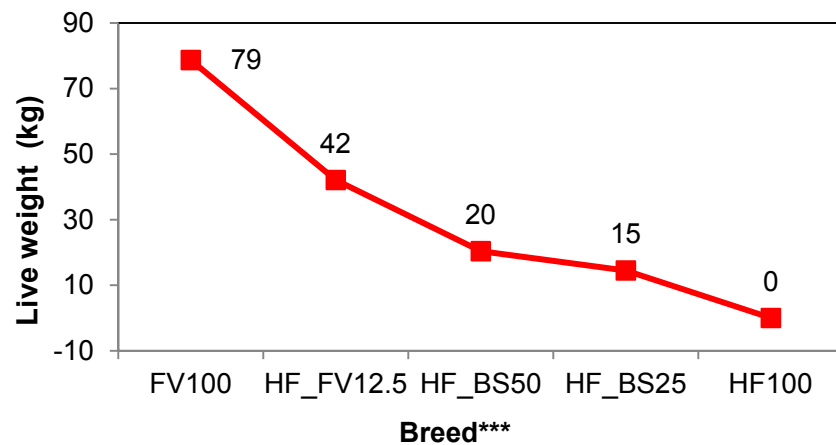


Figure 2: Effects of breed and parity in model with belly girth, heart girth and chest depth

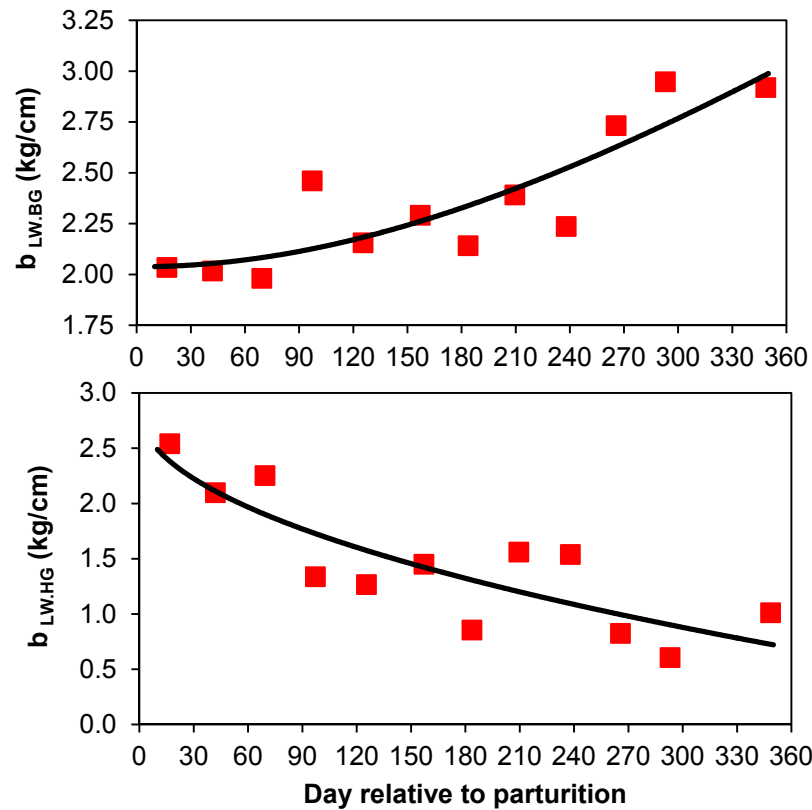
4. Results and Discussion (II)

■ Prediction of Live weight – Stage of lactation

$$\begin{aligned} \text{Live weight (kg)} = & -780 + \text{Breed} + \text{Parity} + \text{Time} + \\ & + b_{\text{LW.BG}} \times \text{Belly girth (cm)} + b_{\text{LW.HG}} \times \text{Heart girth (cm)} + b_{\text{LW.CD}} \times \text{Chest depth (cm)} \end{aligned}$$

- correlations LW, BCS, BG, HG und body width in dry period higher
 - fat reserves ↑ in late lactation (ANDREW et al. 1994)
 - fat cover is measured (OTTO et al. 1991)
- fitting curves to regression coefficients during lactation
 - Do regression coefficients change?

4. Results and Discussion (III)



- influence of body measurements changes during lactation
 - growth, mobilisation, storage of fat (WALL et al. 2005)

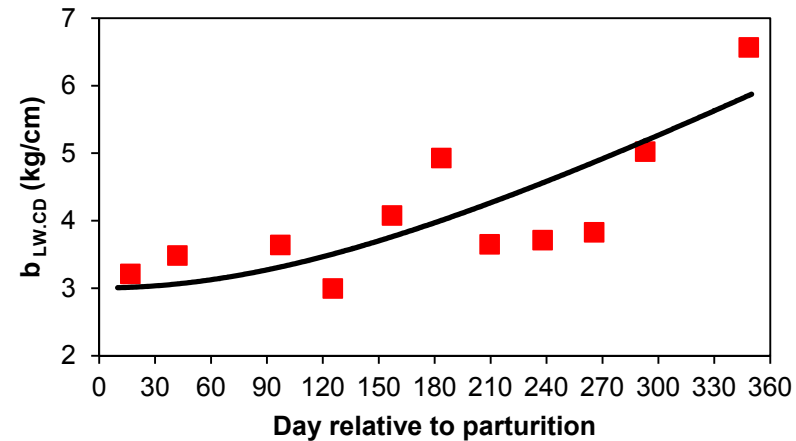


Figure 3: Change of regression coefficients of belly girth, heart girth and chest depth in lactation

5. Conclusions

- live weight – potential of milk production ↑
- degressive, simultaneous growth (body measurements and live weight)
- change of regression coefficients
- change of correlation coefficients (live weight, body measurements and BCS)
- influence of physiological stage

Thank you for listening!



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