

Once recorded metabolic adaptation does not allow to predict longevity in dairy cows

J.J. Gross¹, L. Grossen-Rösti¹, F. Schmitz-Hsu², R.M. Bruckmaier¹

- 1) Veterinary Physiology, Vetsuisse Faculty University of Bern, Switzerland
- 2) Swissgenetics, Zollikofen, Switzerland

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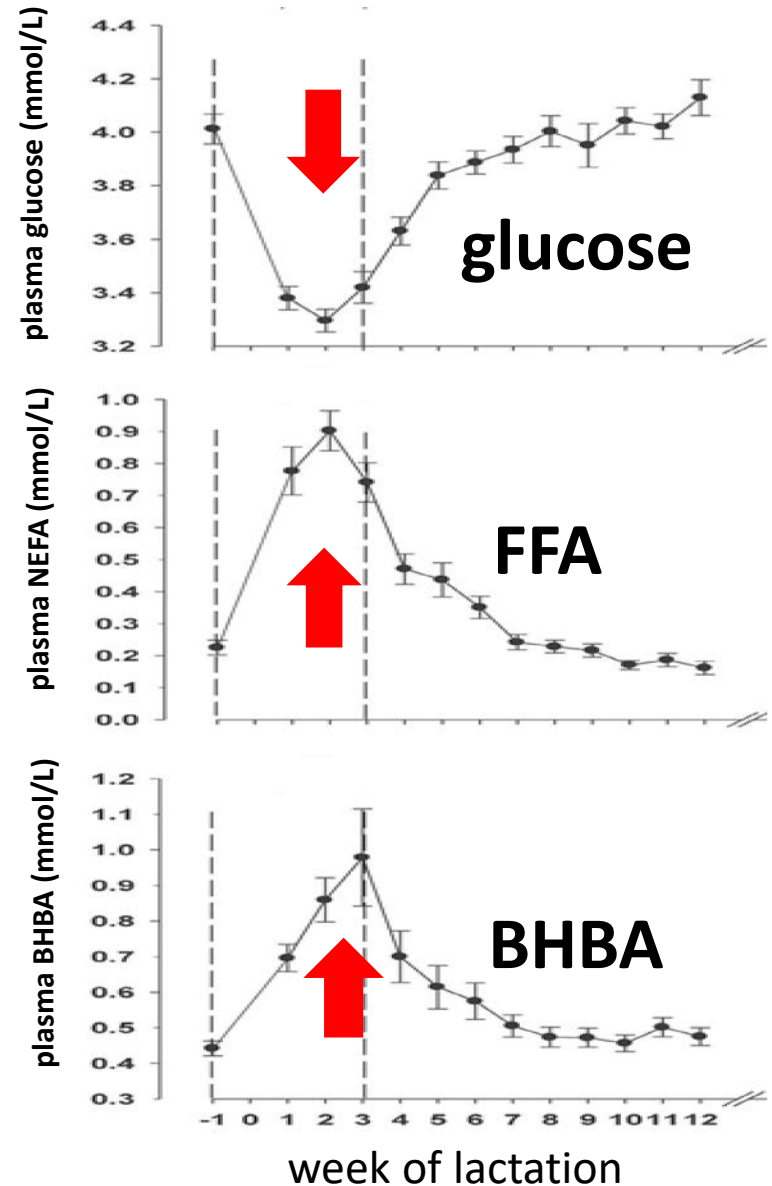
Background

- In dairy cows body reserves are mobilized in early lactation, often leading to metabolic disorders

(Kessel et al., 2008; Gross et al., 2011)

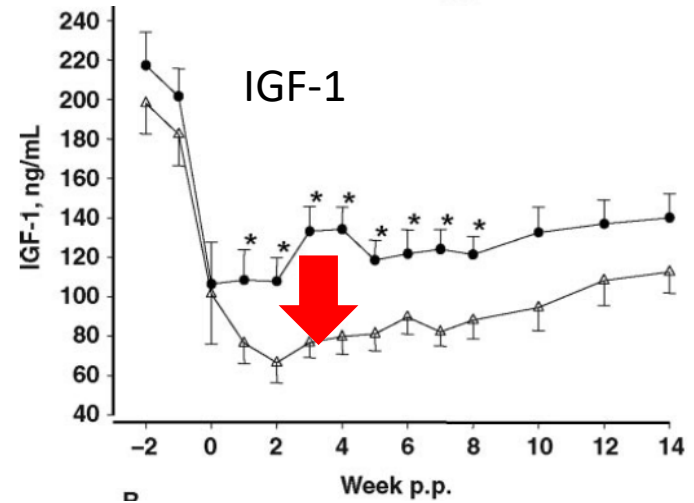
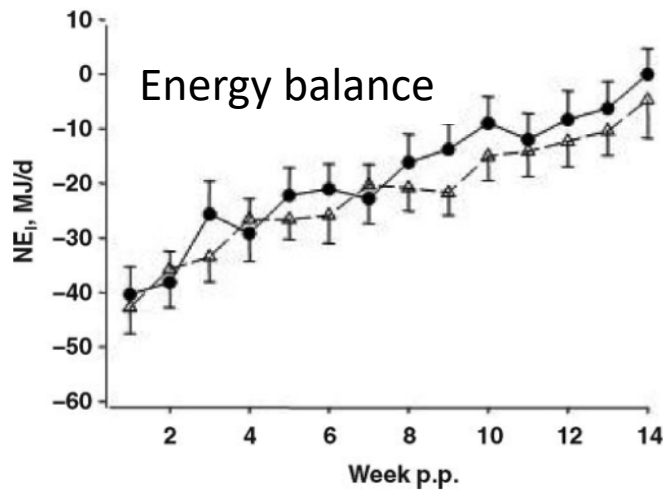
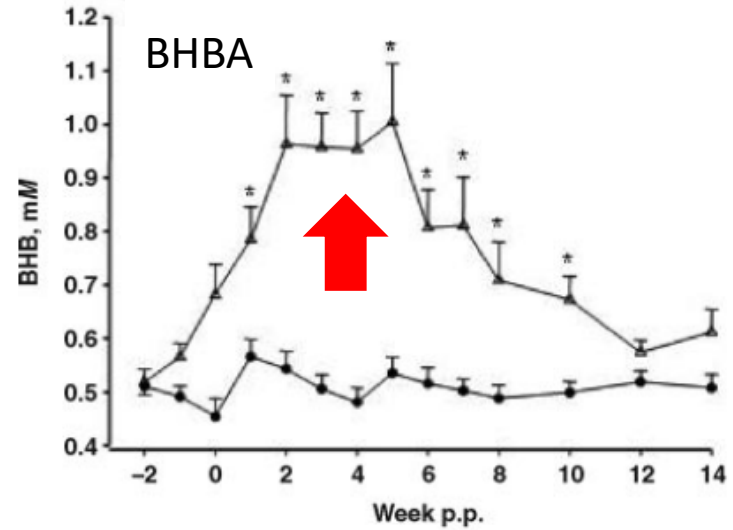
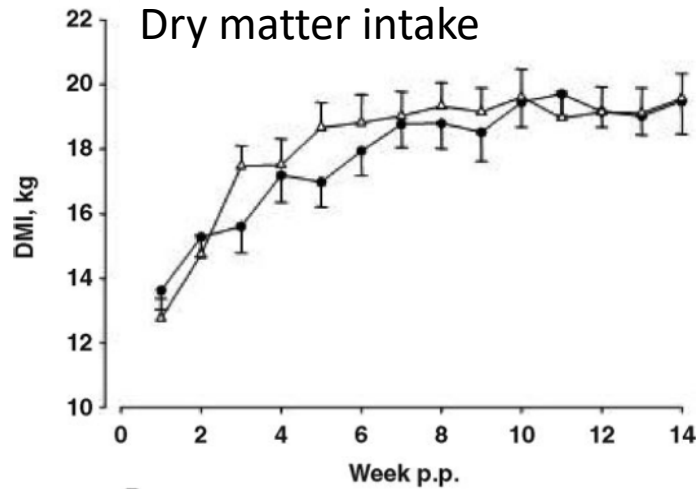
- Excessive mobilization of adipose tissue:
 - ⇒ high FFA and ketone bodies
 - ⇒ compromised immune system
 - ⇒ reduced gluconeogenesis and feed intake

(Laeger et al., 2010; Zarrin et al., 2013; 2014)



Background

Similar performance – different metabolic adaptation



Background

Culling takes commonly place because of production diseases, based on metabolic disorders and related disturbances of the immune system (Ahlman et al., 2011; Pinedo et al., 2014)

Goal

Is the success of metabolic adaptation recorded in one lactation related to lifetime performance and longevity?

Material and Methods

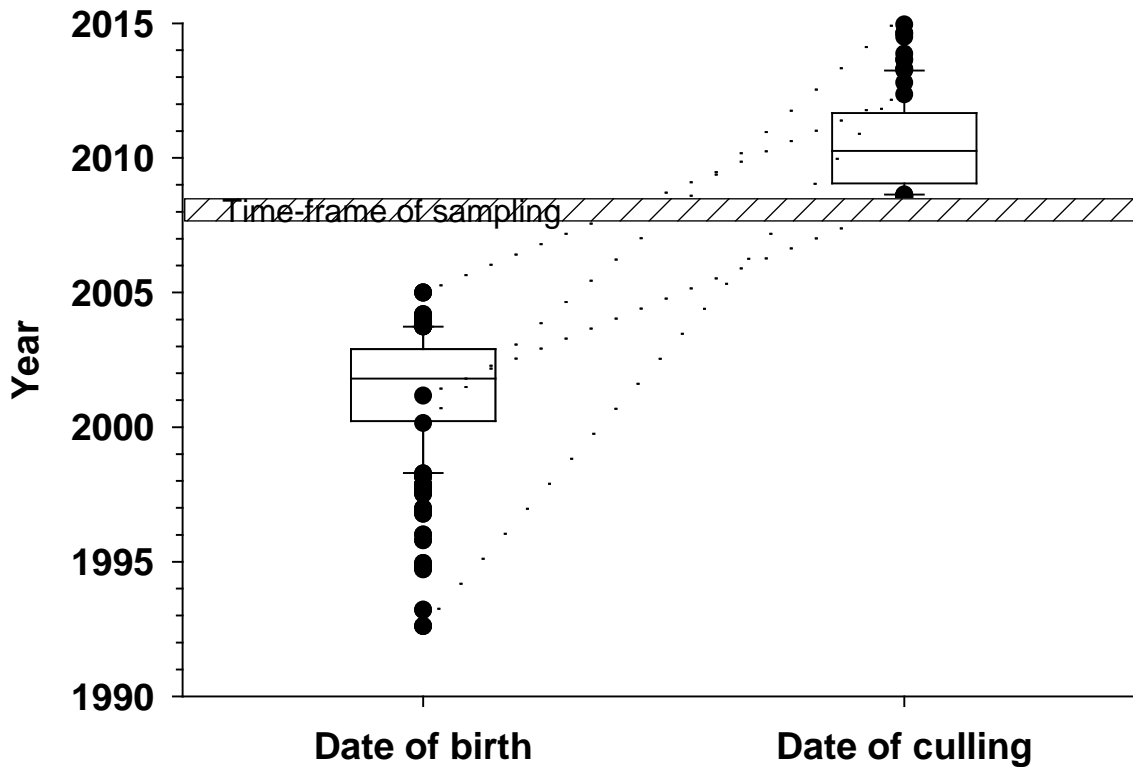
2007/2008

- Field study on metabolic adaptation conducted in Switzerland 232 pluriparous cows from 64 commercial farms
- Breeds: Holstein, Brown Swiss, Swiss Fleckvieh
- Sampling in lactation 3-14; mean: 5 ± 2 parities at sampling
- Blood was sampled in weeks 3 before, 4, and 13 after parturition (analysis of various plasma parameters including glucose, FFA, BHBA, IGF-1).

In 2015:

- New contact with farmers involved in the field study
- Age of animals at culling, performance data
- Calculation of relationships between metabolic load in early lactation (wk 4), life-time performance, and causes for culling.

Time of birth and culling, and period of blood sampling of the experimental cows



Boxes: 25 to 75 percentiles; whiskers: 5 to 95 percentiles; line in box: median

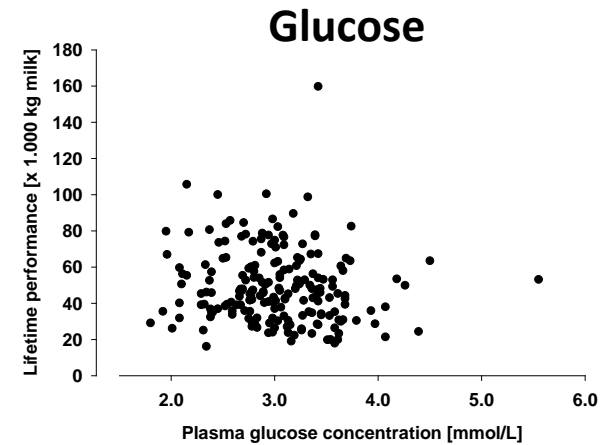
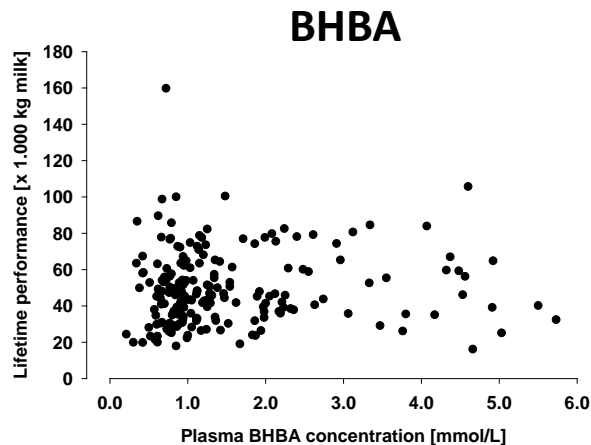
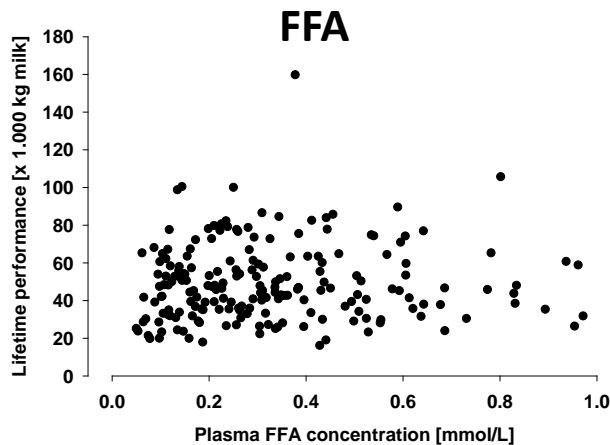
Performance data, and metabolic and endocrine parameters in early lactation (wk 4 post partum)

Variable	Mean	SD	Minimum	Maximum
Age at culling (years)	9.3	2.5	4.7	20.2
No. of lactations at culling	6.6	2.2	3	17
Total DIM	2028	730	671	5676
Lifetime milk production (kg)	49301	20238	16182	159839
Milk yield per d of life (kg/d)	14.2	2.9	5.1	23.5
Milk yield per DIM (kg/d)	24.1	3.1	13.9	36.3
FFA (mmol/L)	0.33	0.21	0.05	0.97
BHBA (mmol/L)	1.51	1.13	0.21	5.73
Cholesterol (mmol/L)	3.66	0.72	1.59	6.33
Triglycerides (mmol/L)	0.15	0.04	0.05	0.30
Glucose (mmol/L)	3.02	0.53	1.80	5.55
Insulin (μU/mL)	10.2	7.3	1.0	40.3
IGF-1 (ng/mL)	69.1	27.3	14.5	160.8

Distribution of culling age and performance

Culling at parity no.	Culling % of 232 cows	Lifetime performance kg	Performance/day of life kg	Performance/DIM kg
3-4	18	27188	12.7	23.8
5-6	42	39716	13.1	23.7
7-8	27	56261	14.6	24.2
9-17	13	76854	16.5	24.7

Plasma metabolites in wk 4 vs. lifetime performance



No significant correlations!

Low, but significant correlations ($p < 0.01$)
IGF-1 vs. lifetime performance: $r = -0.2$
FFA vs. performance/DIM: $r = 0.2$

Summary and Conclusions

- None of the cows studied had a particularly short lifetime in the study (for experimental reasons).
- Despite this fact a wide range of plasma concentrations of key metabolic factors occurred, partially indicating an enormous metabolic load.
- Longevity has a positive impact on lifetime performance of COWS.
- Contrary to wide spread assumptions, a higher metabolic load in early lactation did not necessarily result in an earlier culling of dairy cows, although they might be more prone to metabolic disorders.

Longevity - coping with all circumstances



Thank you for listening!