

Metabolite Profiles in Blood and Milk for Dairy Cows with Different Dry Period Length, parity and lactation stage

Biomarkers for Health and Metabolism in Dairy Cows

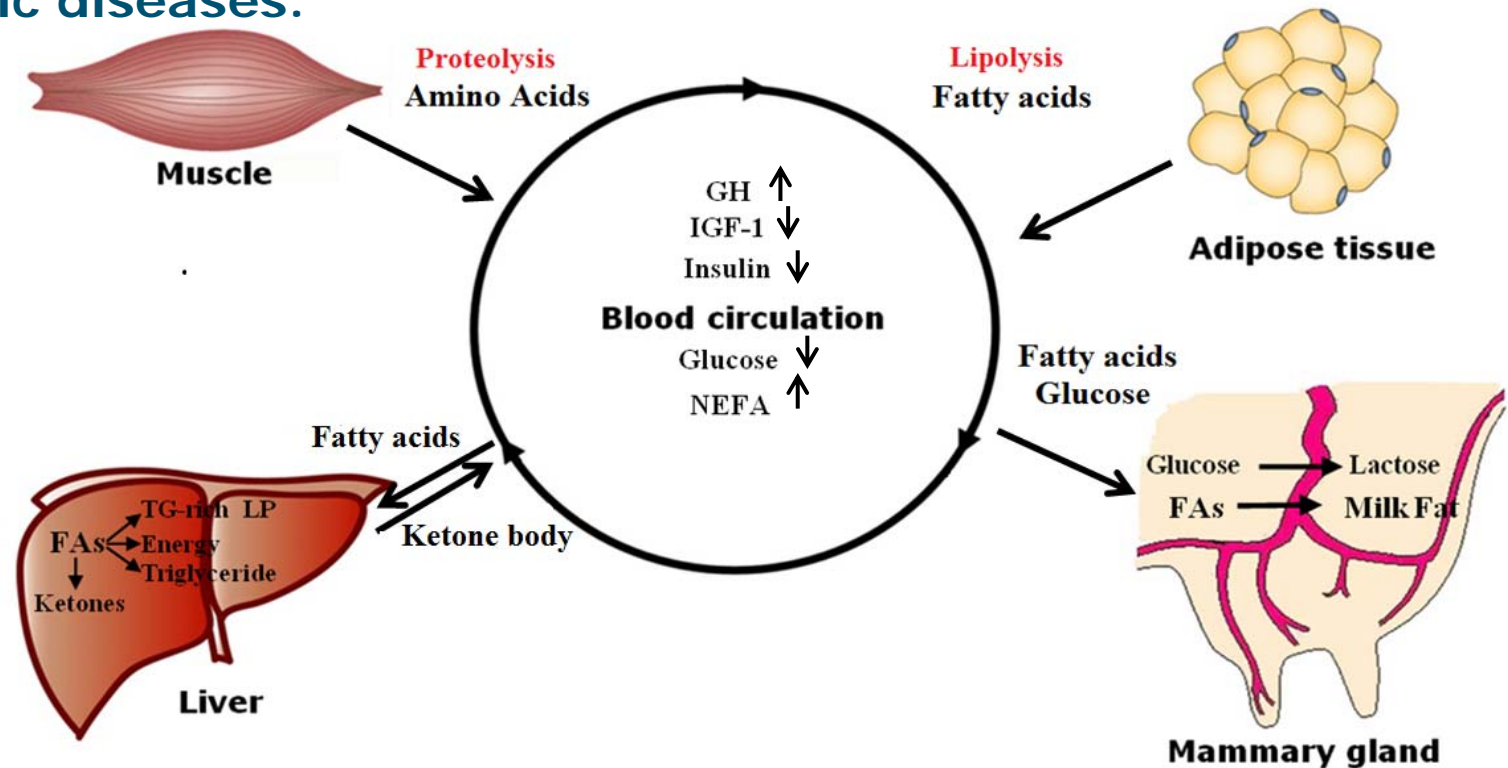
Xu W., Van Knegsel A.T.M., De Koning D.B., Van Hoeij R., Kemp B. and Vervoort J.J.M.

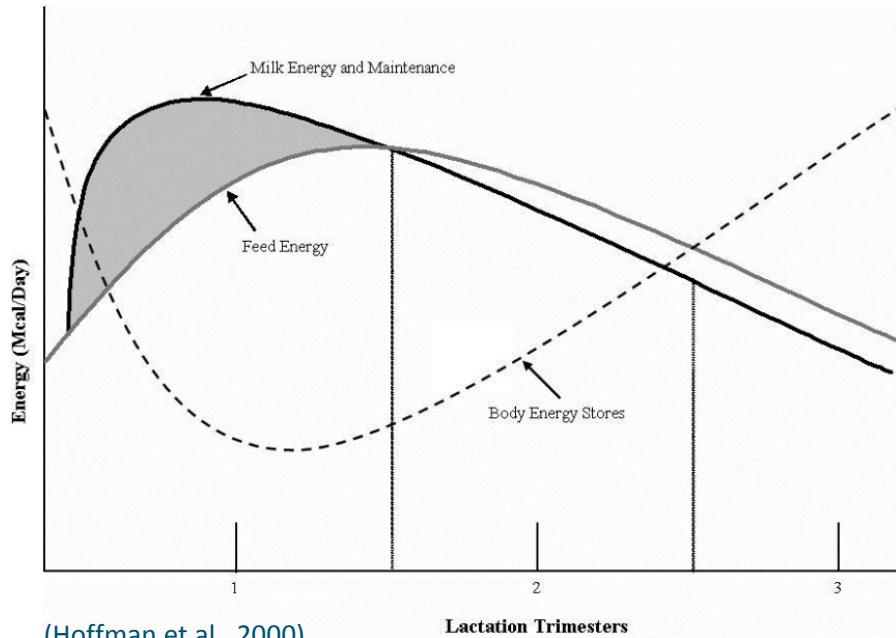
Ghent, Belgium 22-09-2016



Background:

1. Negative energy balance (NEB) after calving;
2. Body mobilization for nutrient requirement;
3. Physiological changes;
4. Metabolic diseases.





Conventional dry period (DP)

1. Dry Matters intake decreased;
2. Higher energy requirement For milk production.

Energy need < Energy intake

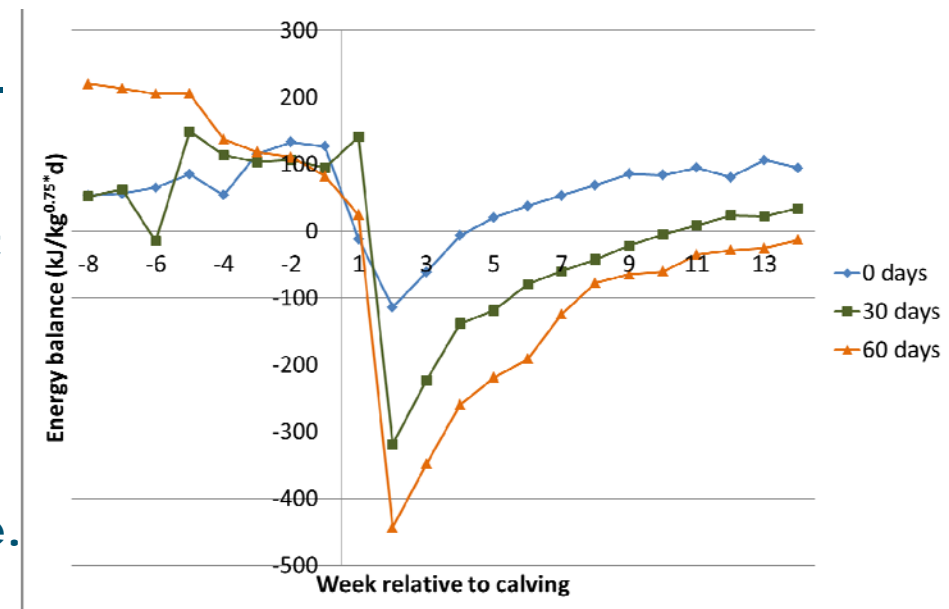
Negative Energy Balance !

Why no or a short dry period?

1. Improved energy balance in early lactation (due to less milk);

2. Improved metabolic status and potential for improved fertility.

Alternative for cows in the future.



(Van Kneegsel et al., 2014)

Customised Dry Period Length (DPL)

-Started from 2014

-130 dairy cows were selected

Sample collecting:

1. Milk and Blood

2. Metabolome and proteome.

General objectives of project:

1. Effect of different DPL, Parity, Lactation stage, body score, diets and energy balance on metabolome and proteome.

2. Relation between the blood and milk of dairy cows for the metabolome and proteome.

3. Biomarkers for Health and Metabolism status of cows.

Different DPL, Parity and Lactation stage

Objectives:

1. Energy balance and milk yield of dairy cows.
2. Metabolite in blood and milk of dairy cows in different DPL, parity and lactation stage.

Experimental Design, Method, and Statistics:

31 Holstein Friesian dairy cows

Blood and milk samples

Samples were collected weekly

Nuclear magnetic resonance

Mixed model in SAS

Table 1. Experimental Design.

Cows Number	Dry period length	
	0 Day	30 Days
Parity 2	8	7
Parity 3	8	8

Results:

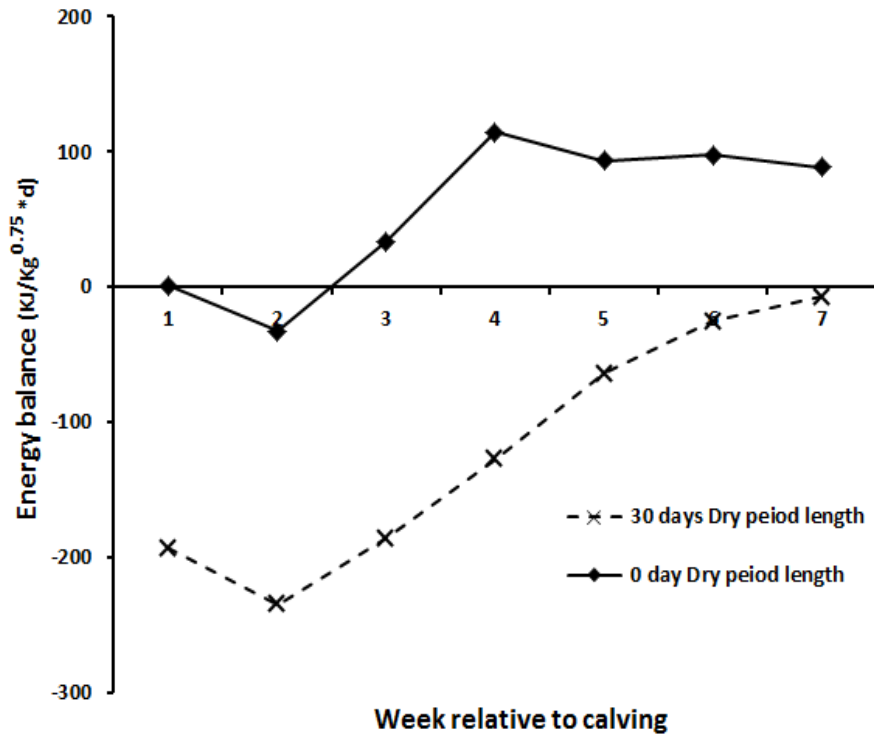


Figure 2, The energy balance of dairy cows in early lactation.

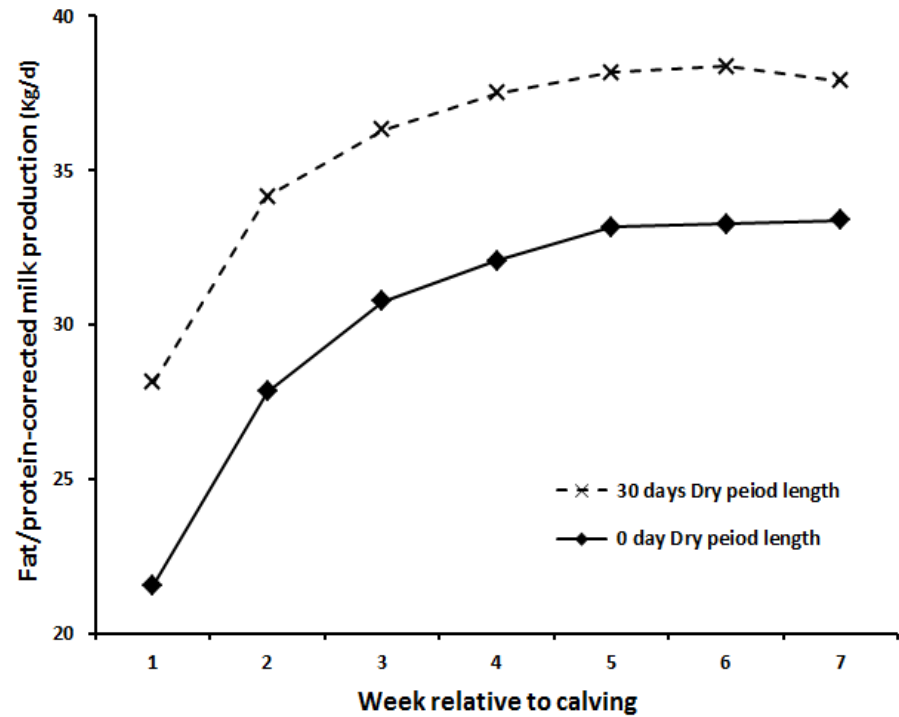
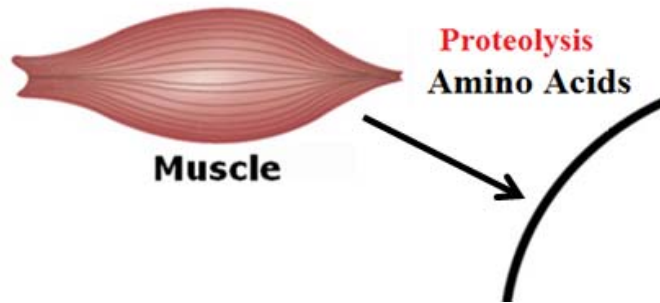
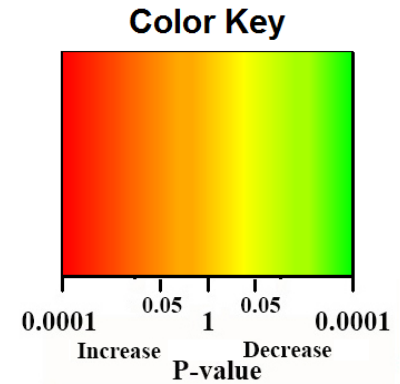


Figure 3. The milk yield of dairy cows in early lactation.

Dairy cows with 0 day dry period length have better energy balance and lower milk yield, compared with cows with 30 days dry period length.

Results:

1. Increased nitrogen catabolism;
2. Heavier body reserve mobilisation.



Muscle is degraded to free amino acids in blood circulation.

More amino acids, intermediates and derivatives of nitrogen metabolism.

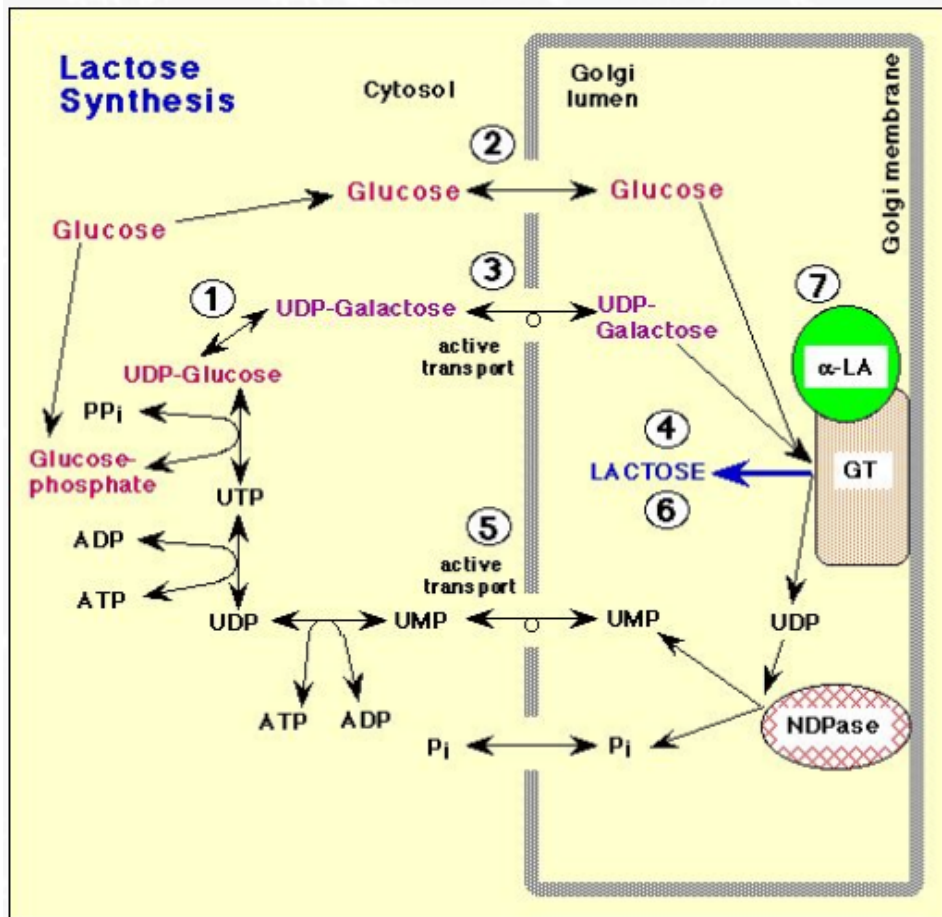
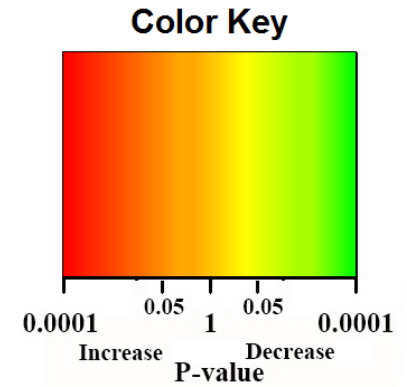
0.0810	0.0141	0.0102	Histidine
0.1842	0.0394	0.0542	Phenyl alanine
0.0996	0.1213	0.0356	Formic acid
0.0116	0.0349	0.0233	Carnitine
0.0265	0.0554	0.1758	Hippurate
0.0062	0.0835	0.3742	Citric acid
0.2487	0.0608	0.0057	Ornithine
0.0042	0.9951	0.0145	Glycine
Treatment DPL 0 vs. 30	Parity 2nd vs. 3rd	Lactation stage week 2 vs. 7	

Heat maps for metabolite profiles in blood.

Results:

Lactose synthesis in mammary gland.

More apoptosis in mammary gland cell.



0.9007	0.0001	Hippurate
0.1380	0.0001	Galactose-1-phosphate
0.8838	0.0008	Fumaric acid
0.0009	0.0001	N-acetyl sugar
0.0001	0.0001	UDP-derivative
0.0022	0.0001	Sugar-1-phosphate
0.0003	0.0001	N-acetyl-sugar-1-phosphate
Parity 2nd vs. 3rd	Lactation stage week 2 vs. 7	

Heat maps for metabolite profiles in blood.

We are still working for further studies,

More intermediates from

- **Amino acids metabolism**
- **Lipid metabolism**
- **Carbohydrate metabolism**
- **Purine metabolism**
- **and etc..**

Thanks for your attention!

Question & Discussion?