



Effect of Dietary Energy Level Pre- and Post-calving on Production and Blood Metabolites of Dairy Cows During Early Lactation

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Introduction

- **High yielding dairy cow experiences excessive and prolonged negative energy balance**
- **Predisposed to severe body reserve mobilisation and Increased blood NEFA (Top et al., 1995)**
- **May detrimental to liver function and subsequently impair production and fertility (Newbold, 2006)**

Introduction (II)

- **Body reserve mobilisation during the dry period reduced body tissue mobilisation at the start of lactation (Grum *et al.*, 1996)**
- **Reduced intake during the dry period increased blood NEFA's pre partum but lowered liver lipid contents post partum (Douglas *et al.*, 1998)**
- **Increased plasma NEFA concentrations during the dry period prime the liver to better deal with increased NEFA concentrations post partum (Friggens *et al.*, 2004)**

Objectives

- 1. Examine the effect of a high and low energy intake, pre- and post-calving, on cow performance and blood parameters**
- 2. Explore feeding strategies to reduce excessive body reserve mobilisation**

Experimental Design

- **2x2 factorial design**

Pre-calving

- **High energy intake (36% conc., *ad lib.*)**
- **Low energy intake (17% conc., restricted)**

Post-calving

- **High energy diet (70% conc.)**
- **Low energy diet (30% conc.)**

- **Animals on diets for first 250 d of lactation**

Experimental Design (II)

Animals

- **80 Holstein Friesian cows [40 primiparous and 40 multiparous (mean parity 3.2)]**

Measurements

- **Body condition score, live weight, milk yield, and dry matter intake (weekly)**
- **Blood samples - analysed for NEFA and glucose (weekly)**
- **Energy balance calculated weekly (Thomas, 2004)**



RESULTS

Effect of Pre-calving Energy Intake on Parameters from day -21 to Calving

	<i>Ad lib.</i>	Restricted	SED	Diet
ME Intake (MJ/d)	95.2	68.0	3.32	***
Body Condition at Calving	2.74	2.49	0.06	***
Daily Energy Balance (MJ/d)	-19.8	-40.8	4.49	***
Plasma NEFA (meq/l)	0.38	0.41	0.05	NS

Treatment Effects on Intake and Milk Production Parameters (day 1 to 100 post-calving)

Pre-calving treatment	Ad lib.		Restricted		SED	Pre	Post	Int.
Post-calving treatment	High	Low	High	low				
Dry Matter Intake (kg/d)	17.6	14.7	18.5	14.4	0.41	NS	***	*
Milk Yield (kg/d)	32.7	28.1	32.2	28.3	1.33	NS	***	NS
Milk F + P yield (kg/d)	2.27	2.06	2.20	2.09	0.07	NS	**	NS
Total Milk Energy (MJ/d)	98.8	88.9	95.4	90.1	4.49	NS	*	NS

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Treatment Effects on Energy Parameters (day 1 to 100 post-calving)

Pre-calving treatment	Ad lib.		Restricted		SED	Pre	Post	Int.
Post-calving treatment	High	Low	High	low				
ME Intake (MJ/d)	219	173	232	169	6.5	NS	***	*
ME Requirement (MJ/d)	225	205	217	207	8.3	NS	*	NS
Daily Energy Balance (MJ/d)	-4.9	-32.1	12.3	-39.5	5.37	NS	***	**
Cumulative energy balance (MJ)	-819	-2316	101	-2369	386	*	***	NS

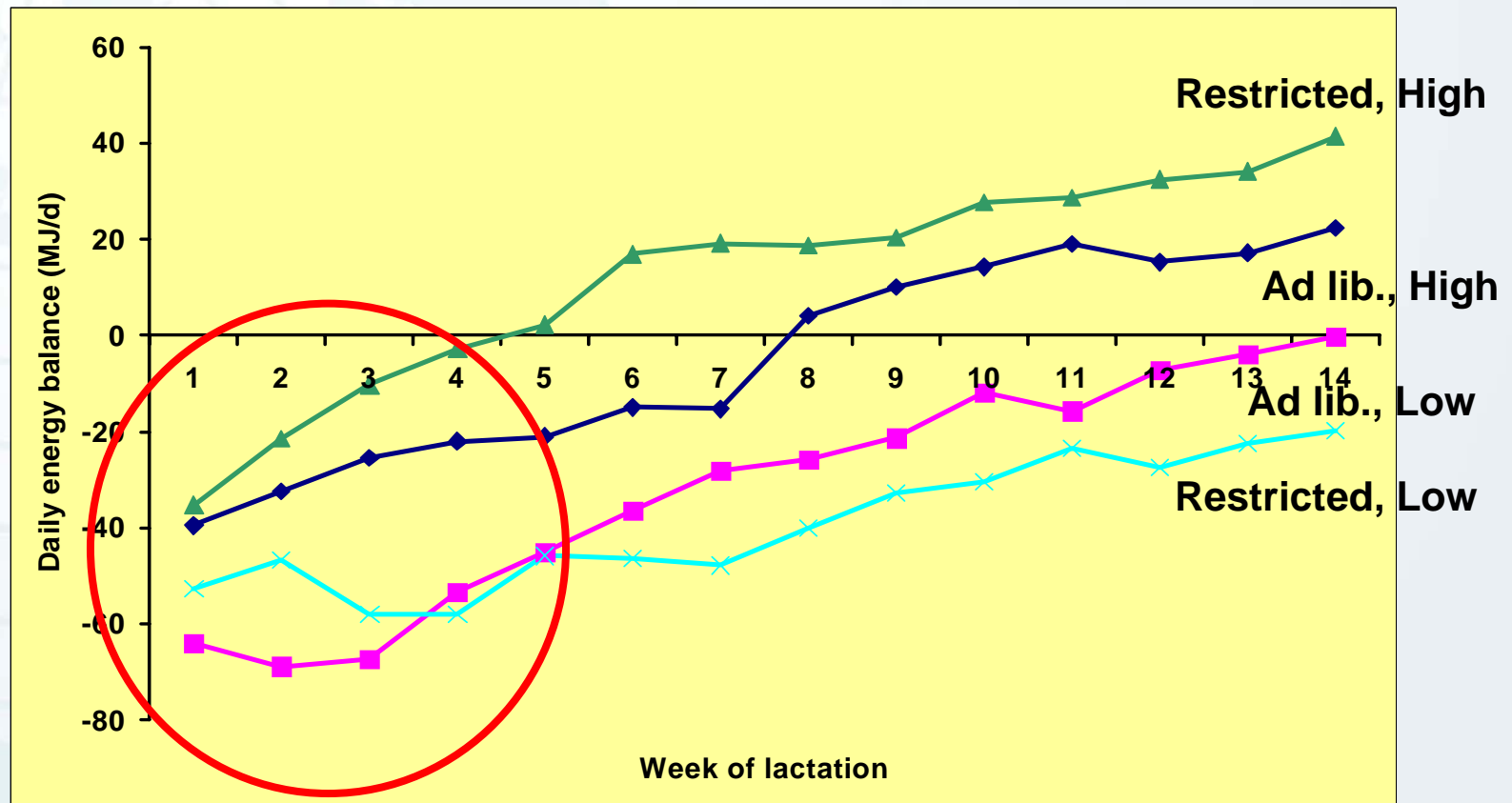
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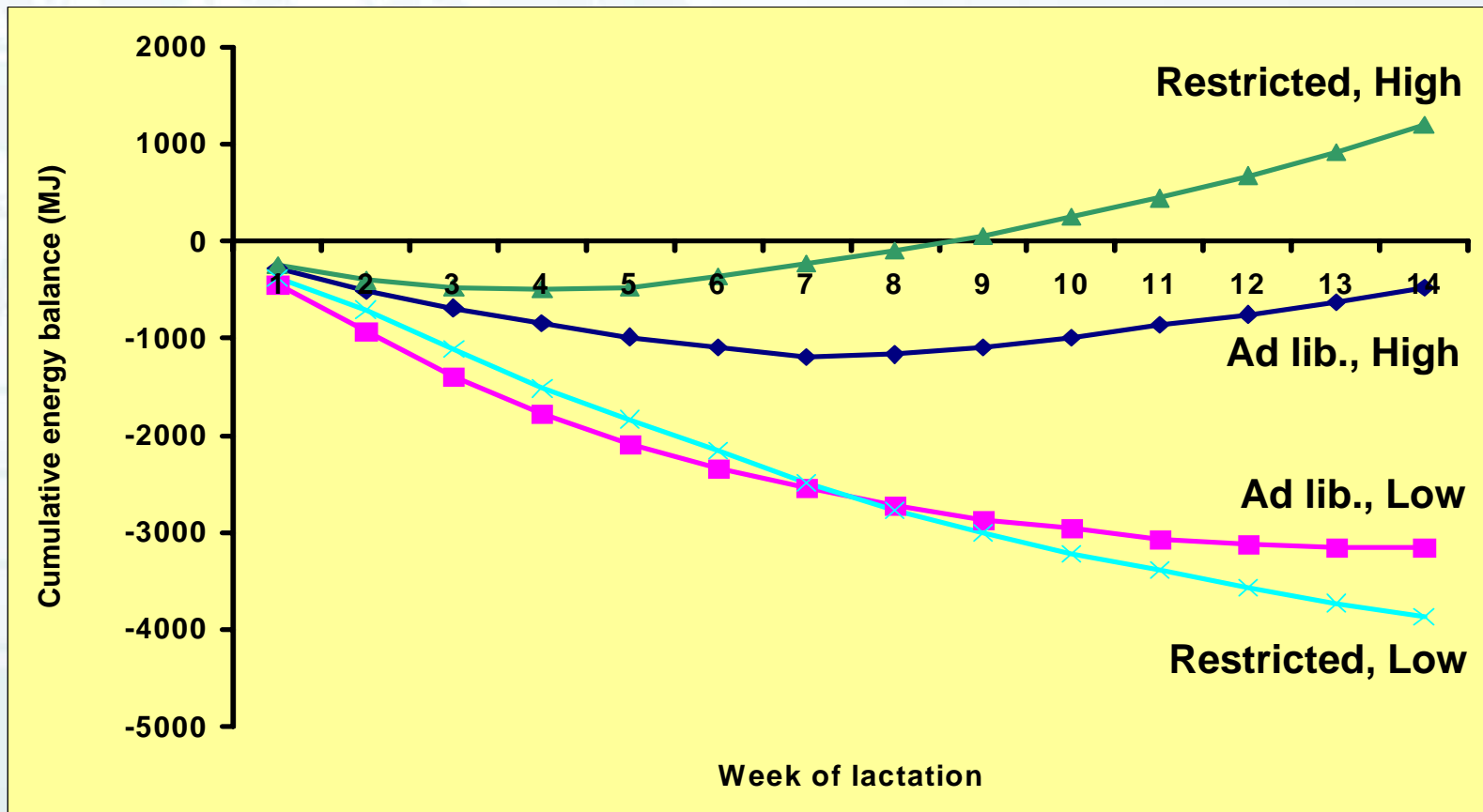
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Treatment Effects on Daily Energy Balance



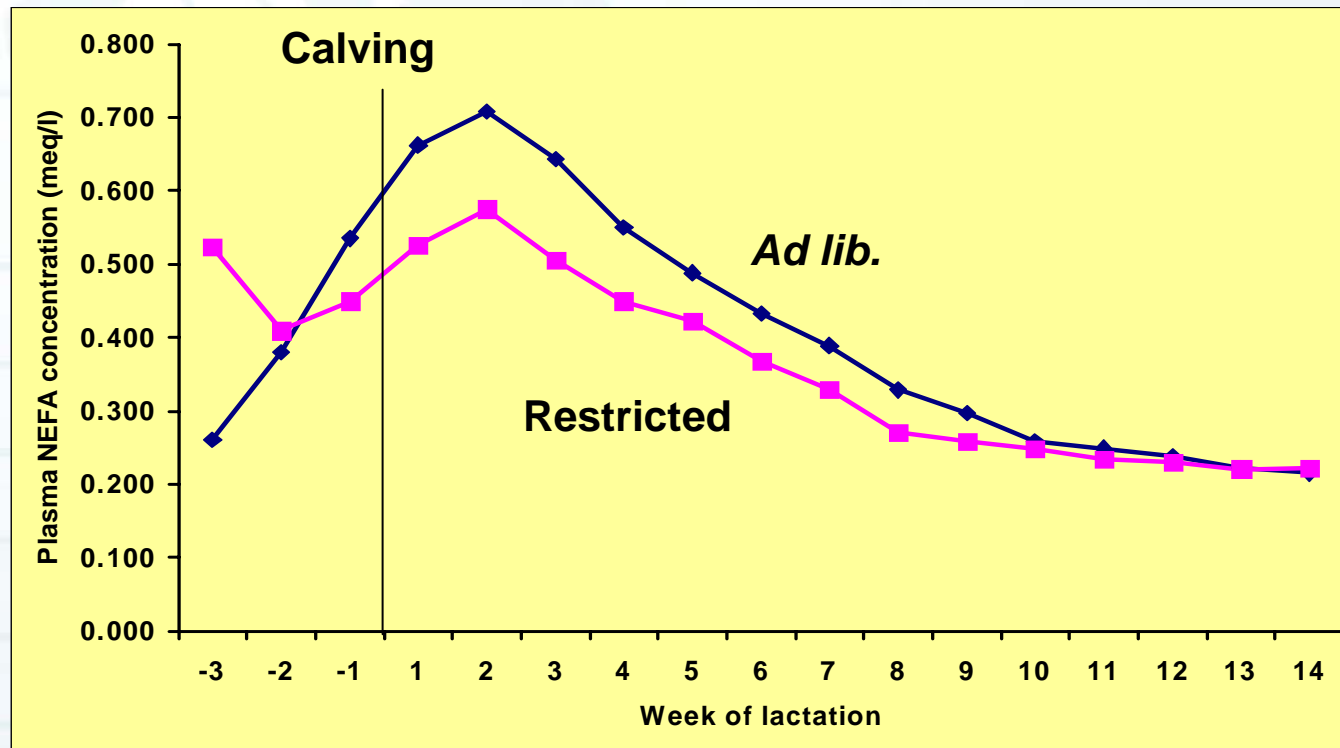
- Significant week of lactation*pre-calving diet*post-calving diet interaction (P<0.001)

Treatment Effects on Cumulative Energy Balance



- Significant week of lactation*pre-calving diet*post-calving diet interaction ($P < 0.001$)

Effect of Pre-calving Energy intake on Plasma NEFA Concentration



- Significant pre-calving diet effect in post-calving period ($P < 0.05$)
- Significant week pre calving*pre-calving diet interaction ($P < 0.001$)

Conclusions

- Pre-calving nutrition can be used as a tool to alter body condition score at calving
- Pre-calving nutrition affects lactational responses to post-calving nutritional management
- The post-calving energy trajectory was significantly influenced by pre-calving nutrition
- A restricted pre-calving energy diet resulted in reduced NEFA concentrations post-calving which indicates reduced body reserve mobilisation



Acknowledgements

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Diet and Composition

	Ad lib. precalving		Restricted precalving			High postcalving			Low postcalving			
	Conc.	Grass silage	Conc.	Soya	Grass silage	Conc.	Grass silage	Maize silage	Conc.	Soya	Grass silage	Maize silage
Proportion of diet	360	640	120	50	830	700	150	150	165	135	350	350
DM content (g/kg)	870	226	870	870	226	870	236	258	870	870	236	258
CP (g/kg of DM) 2	220	134	220	540	134	220	136	90	220	540	136	90
ME (MJ/kg of DM) 2	13.1	10.5	13.1	13.4	10.5	13.1	11.4	10.7	13.1	13.4	11.4	10.7
Total ME (MJ/kg of DM) 2	11.4		11			12.5			11.7			
Total CP (g/kg of DM)	165		165			187			187			
ERDP (g/kg of DM) 2	114		111			122			115			
DUP (g/kg of DM) 2	44.7		45			54.3			58.5			
Starch (g/kg of DM)	79		29			190			130			