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Added dietary cobalt and vitamin B_{12} in the periparturient period in dairy cows

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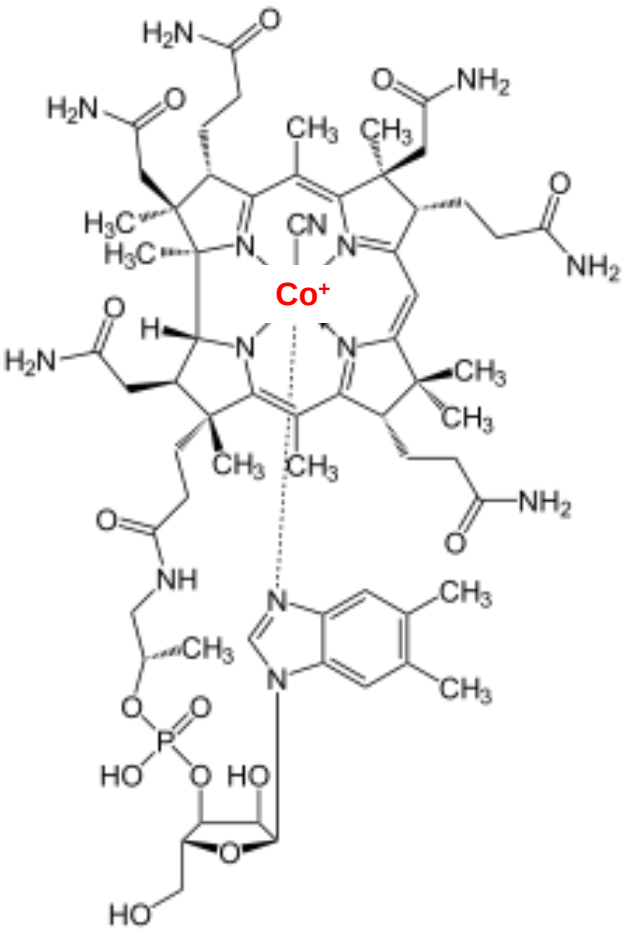
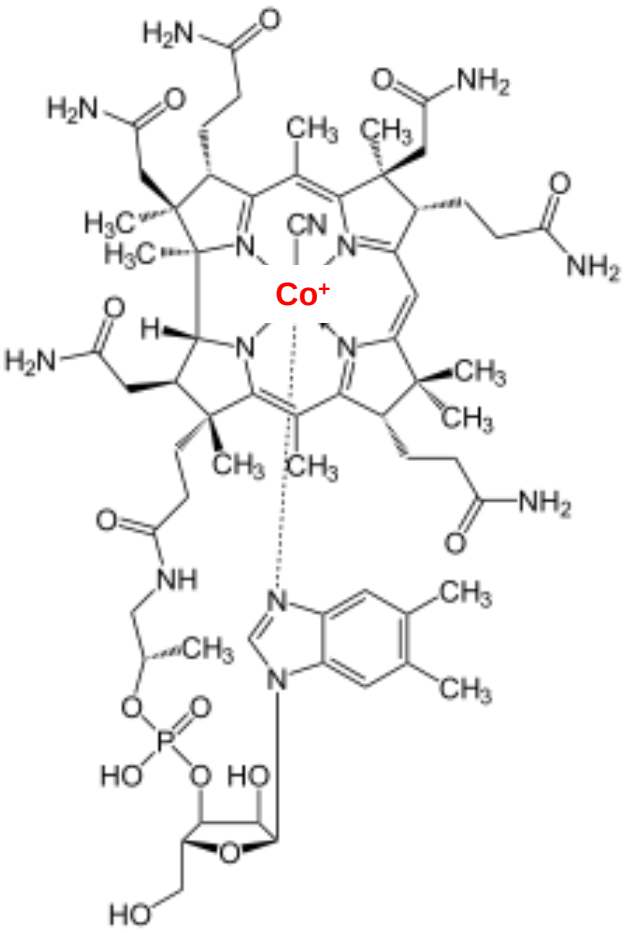
Background

- Cobalt required by rumen microbes to synthesise vitamin B_{12}
- Vit B_{12} has the most complex structure of all vitamins
- Coenzymic forms of Vit B_{12} involved in several enzyme systems:
- Methyltransferase: synthesis of methionine from homocysteine
- Glucose synthesis from propionate: methylmalonyl Co-A to succinyl CoA



Background

- Cobalt deficiency symptoms include:
  - inappetance
  - ketosis
  - fatty liver syndrome
  - reduced performance



Changes in EU inclusion rates:

- Recommended levels = 0.11 mg/kg DM
- Maximum added levels = 0.34 mg/kg DM
- Maximum total diet = 1.1 mg/kg DM
- Lead to concern that insufficient Co being fed
- Vit B_{12} supplements being used

Objectives

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To determine the effect of the dietary addition of Co, vit B_{12} or injecting vit B_{12} in late gestation/early lactation on dairy cow performance, intake, blood metabolites and liver fat levels

Materials and Method

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- 56 Holstein-Friesian dairy cows
- 8 weeks pre-calving to 8 weeks post-calving
- Four dietary treatments:
  - **C:** no added cobalt
  - **DC:** + 0.2 mg Co per kg DM
  - **DB:** + 0.68 mg Vit B_{12} per kg DM
  - **IB:** weekly injection of 10 mg Vit B_{12}
- Weighed, condition scored & blood sampled
- Intake and milk yield post calving
- Liver biopsy at -8 and + 4 weeks

Diet composition g/kg DM

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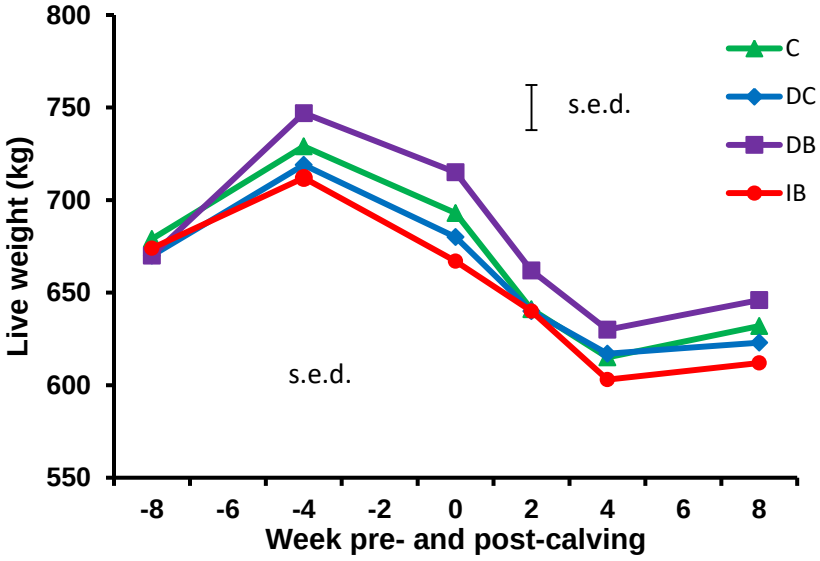
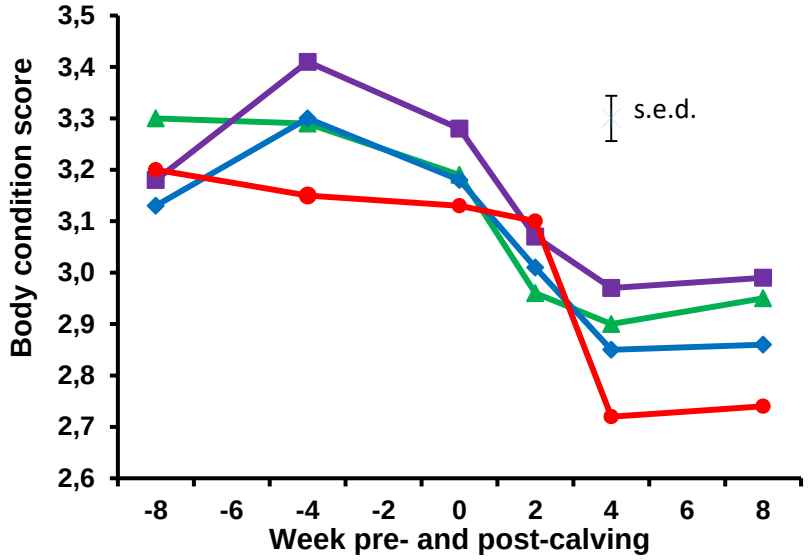
	Dry cow	Lactation
Chopped wheat straw	471	---
Maize silage	218	389
Lucerne silage	87	111
Wheat	109	79
Molassed sugar beet feed	---	79
Soya hulls	---	66
Molasses	3	7
Protected fat	---	16
Rapeseed meal	31	91
Soyabean meal	26	76
Maize gluten meal	19	55
Palm kernel meal	9	25
Urea	10	1
Mins/Vits	13	5

Chemical analysis g/kg DM

	Dry	C	DC	DB	IB
DM, g/kg	474	471	466	468	471
Organic matter	932	941	939	937	941
Crude protein	139	168	169	165	168
Fat, g/kg of DM	16.7	33.5	34.4	31.7	33.5
Co, mg/kg DM	0.21	0.21	0.36	0.22	0.21

Live weight and body condition





Intake and milk performance

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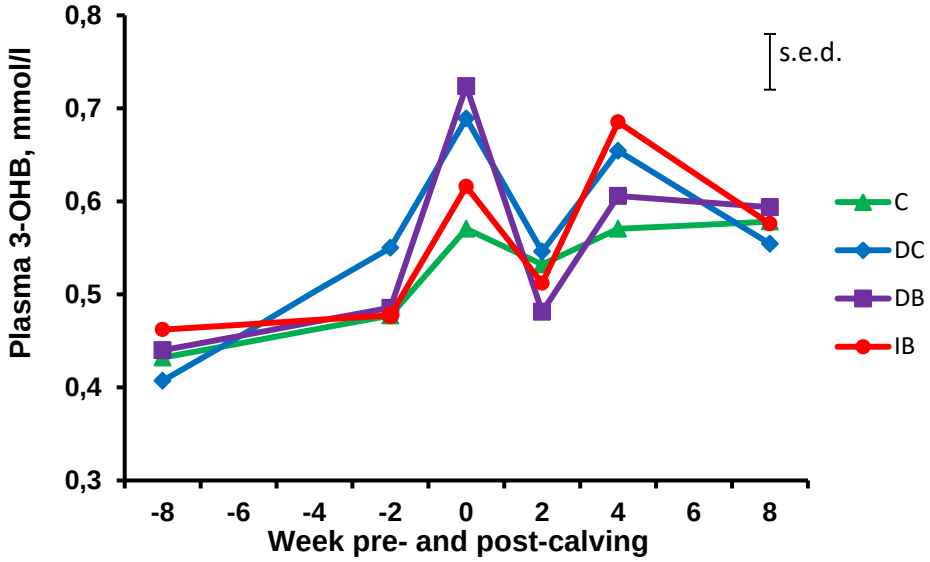
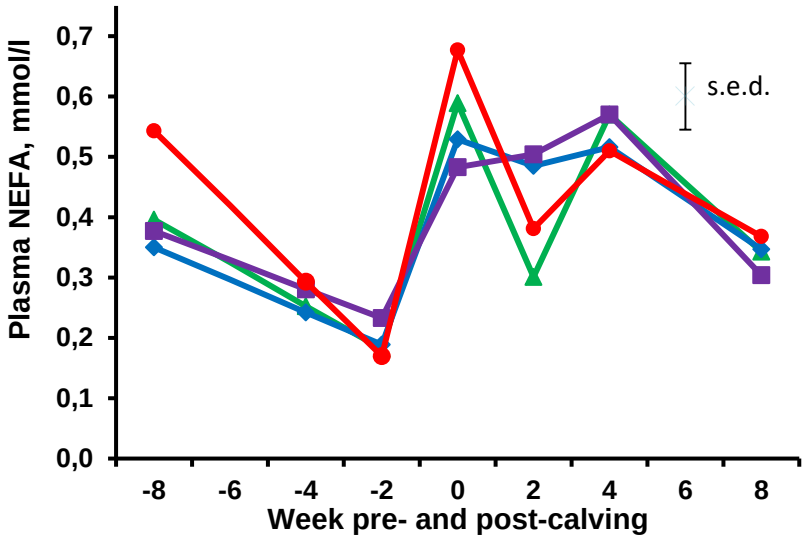
	C	DC	DB	IB	s.e.d	P-value
DM intake, kg/d	21.5	21.3	21.7	21.8	0.78	0.918
Milk yield, kg/d	38.3	39.5	40.8	39.6	1.58	0.480
Milk fat, g/kg	40.6	40.8	40.6	39.6	1.92	0.922
Milk protein, g/kg	32.9	33.2	33.3	33.1	0.67	0.936
Milk fat, kg/d	1.54	1.59	1.63	1.55	0.921	0.715
Milk protein, kg/d	1.24	1.28	1.34	1.30	0.046	0.235
SCC, Log_{10}/mL	1.74	1.59	1.67	1.83	0.152	0.452

Plasma 3-OHB and NEFA





Liver triacylglycerol mg/g fresh weight

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	C	DC	DB	IB	s.e.d.	P-value
Pre-partum	7.1	6.9	7.0	9.2	2.08	0.664
Post-partum	30.7	26.9	33.7	33.8	13.00	0.946

Conclusions

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Compared to unsupplemented control diet there was little effect of feeding additional dietary Co or vit B_{12}, or injecting with vitamin B_{12} on:

- live weight pre- or post-calving,
- post-calving dry matter intake, milk yield or composition
- plasma metabolites that indicate clinical or subclinical ketosis
- liver fat levels

The recent limitations on the use of Co in the diet of dairy cows is therefore unlikely to have any significant impact on cow performance or health

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