

Farmer summary: Effect of cobalt and vitamin B12 on dairy cow metabolism and performance during the transition period

Work was completed as part of the Mineral and trace-element requirements of dairy cows work package (FS3) in the Cattle health, welfare and nutrition Research Partnership

Report prepared for AHDB Dairy by Prof. Liam Sinclair¹, Mr Dammika Achchilage¹, Ms Amey Brassington², Ms Sarah-Jayne Williams¹, Dr Wing Yee Kwong² and Prof Kevin Sinclair².

¹Harper Adams University, Newport, Shropshire TF10 8NB

²Nottingham University, Sutton Bonington Campus, Leicestershire LE12 5RD

January 2016

Farmer summary

Cobalt (Co) is an important mineral for the synthesis of vitamin B₁₂ in the ruminant animal, while vitamin B₁₂ itself is important in its role in energy metabolism in the liver. Animals that are deficient in B₁₂ may be prone to ketosis and fatty liver during periods of negative energy. Yet despite the role of Co and vitamin B₁₂ in energy metabolism, there is relatively little work on the dietary concentrations of these micronutrients for the transition dairy cow, when effective energy metabolism is critical. Legislation now limits the amount of Co that can be added to ruminant diets to 0.3mg/kg DM, even though vitamin B₁₂ production responds to levels up to 1.0mg/kg DM. It is, therefore, important to assess what impact this new limit will have on dairy cow performance, especially during the critical transition period.

Forty-four multiparous cows (9,699kg previous lactation yield) and twelve first lactation cows (PTA of 17.9 for fat and protein) were assigned to one of four dietary treatments from 57 days pre-partum. The diets offered were:

- Con: No supplementary Co or vitamin B₁₂
- DC: Dietary Co supplemented at 0.2mg/kg DM, no added vitamin B₁₂
- DB: Vitamin B₁₂ supplemented at 0.68mg/kg DM, no added Co
- IB: Weekly intramuscular injection of vitamin B₁₂ (0.71mg/day pre-partum and 1.42mg/day post-partum), no added Co

During the dry period, cows were cubicle housed and offered the treatments through head locking gates. Post-partum, feeding was via TMR and facilitated using electronic troughs fitted with individual cow identification technology. Milk yield was recorded during twice-daily milking with sampling weekly for fat and protein. Animal weight, BCS, blood samples and liver samples were collected at regular intervals until the conclusion of the experiment, 56 days post-partum. The data collected was then used to determine the effects of diet on milk production and energy metabolism.

Dry matter intake (21.7kg/day), milk yield (39.6kg/day) and milk constituents (4.0% fat and 3.3% protein) were not affected by additional Co or B₁₂. Similarly, concentrations of glucose (3.48mmol/l), non-esterified fatty acids (0.42mmol/l) and beta-hydroxy butyric acid (0.51mmol/l) in the blood were unaffected by treatment. The blood metabolic profile and concentration of fats in the liver suggest that the energy supplied from the basal diet was sufficient to meet the requirements of the cows in this study. Under these circumstances, the concentration of Co in the basal diet (0.21mg/kg DM) was sufficient to maintain animal health and productivity.

To conclude, the concentrations of Co in common ruminant feeds and the associated production of B₁₂ are sufficient to meet the metabolic and productive requirements of 'high-yielding' dairy cows. Recent restrictions on the inclusion of Co in the diet are unlikely to have an impact on intake, performance or health, and there is little justification for the use of dietary vitamin B₁₂.

While the Agriculture and Horticulture Development Board seeks to ensure that the information contained within this document is accurate at the time of printing, no warranty is given in respect thereof and, to the maximum extent permitted by law, the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

© Agriculture and Horticulture Development Board 2016. No part of this publication may be reproduced in any material form (including by photocopy or storage in any medium by electronic means) or any copy or adaptation stored, published or distributed (by physical, electronic or other means) without the prior permission in writing of the Agriculture and Horticulture Development Board, other than by reproduction in an unmodified form for the sole purpose of use as an information resource when the Agriculture and Horticulture Development Board is clearly acknowledged as the source, or in accordance with the provisions of the Copyright, Designs and Patents Act 1988. All rights reserved.

All trademarks, logos and brand names contained in this publication are the trademarks of their respective holders. No rights are granted without the prior written permission of the relevant owners.

AHDB Dairy
Agriculture and Horticulture Development Board
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL
T: 024 7647 8702
E: dairy.info@ahdb.org.uk
W: dairy.ahdb.org.uk

AHDB Dairy is a division of the Agriculture and Horticulture Development Board (AHDB).

