Proceedings of the Nutrition Society (2015), **74 (OCE1)**, E82 doi:10.1017/S002966511500097X

Summer Meeting, 14–17 July 2014, Carbohydrates in health: friends or foes

Effect of production system, supermarket and purchase date on the vitamin D content of eggs

J. Guo[1], K. E. Kliem[1], J. A. Lovegrove[2] and D. I. Givens[1]

[1]*Food Production and Quality Division, Faculty of Life Sciences, The University of Reading, Reading, RG6 6AR, UK and* [2]*Hugh Sinclair Unit of Human Nutrition and Institute for Cardiovascular and Metabolic Research (ICMR), Faculty of Life Sciences, The University of Reading, Reading, RG6 6AP, UK*

There is mounting evidence to show that vitamin D deficiency may increase the risk of many common and serious diseases, including osteoporosis, cardiovascular disease, some cancers and type 1 diabetes[1]. Hypovitaminosis D is prevalent in the UK general population. Due to lifestyle changes most people do not endogenously synthesise sufficient vitamin D from sunlight exposure[2]. Therefore, vitamin D intakes from dietary sources have become very important. Egg yolk is known to be a useful source of vitamin D yet very few studies have investigated the effect of production method on vitamin D content of UK hens' eggs. The purpose of this study was to explore the effects of production system, supermarket and time of the year on the concentration of vitamin D_3 and 25(OH)D_3 in UK hens' eggs at retail.

Eggs ($n = 259$) from free range, organic (also allows outdoor access) and caged (as identified on the label) production systems were purchased from three supermarkets (Asda, Tesco and Budgens) each month from July to November in 2012. The concentrations of vitamin D_3 ($n = 130$) and 25(OH)D_3 ($n = 129$) were analysed by HPLC/Tandem MS. Statistical analysis was undertaken using general linear model of ANOVA in Minitab 16·0 and the least square means for concentration of vitamin D_3 and 25(OH)D_3 in egg yolks according to production system (PS) and effect of supermarket (SM) and month (M) are shown in the table.

	PS				P for			
Vitamin D form (μg/kg)	Caged	Free range	Organic	SE	PS	SM	M	PS x SM
vitamin D_3	40·2^b	57·2^a	57·2^a	3·10	<0·001	0·009	NS	<0·001
25(OH)D_3	13·0^b	13·8^b	16·1^a	0·59	0·001	NS	<0·001	0·033

^{a,b}different superscripts indicate significantly different means ($P < 0·05$); NS, not significant ($P > 0·05$).

Overall, concentrations of vitamin D_3 were similar to those of FSA[3] but lower than a more recent study[4]. The significantly higher vitamin D_3 concentrations in free range and organic eggs is presumably related to increased vitamin D synthesis by birds that have access to sunlight although why the effect on 25(OH)D_3 was only seen for organic eggs is unclear. The significant interaction effect of system and supermarket for both forms of vitamin D reflects inconsistencies in the ranking of vitamin D by production systems between supermarkets, perhaps indicating some incorrect labelling. The effect of month of purchase on 25(OH)D_3 reflected significantly higher values in July and September than in August (data not shown). Whether this is related to more sunshine hours is not known and there was no such effect on vitamin D_3.

In conclusion, these results confirm that eggs from outdoor production systems are likely to have higher vitamin D concentrations but this may not be a consistent effect in all supermarkets. Future work could expand the sampling number and research time through the whole year and match feeding schemes for the birds. Furthermore, genotype of birds that go outdoors may also be a factor.

Acknowledgments: We are grateful to DSM (Switzerland) for partially funding this study.

1. Holick MF & Chen TC (2008) *Am J Clin Nutr* **87**, 1080S–1086S.
2. Hyppönen E & Power C (2007) *Am J Clin Nutr* **85**, 860–868.
3. FSA (2002) *McCance and Widdowson's The Composition of Foods, 6th Summary Edition*. RSC: Cambridge.
4. Benelam B, Roe M, Pinchen H *et al.* (2012) *Nutr Bull* **37**, 344–349.