Proceedings of the Nutrition Society (2017), **76 (OCE3)**, E72 doi:10.1017/S0029665117001458

Irish Section Meeting, 21–23 June 2017, What governs what we eat?

Effect of a 12 week low carbohydrate ketogenic diet versus a high carbohydrate diet on blood count indicators of iron status in male endurance athletes

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Low carbohydrate ketogenic diets (LCKD) where carbohydrate intake is <50 g/d have become popular is many populations, including endurance athletes[1]. The complete effect of this diet on nutrient absorption and its potential to influence health has not been fully uncovered[2]. A 14 day ketogenic diet in females demonstrated no effect on RBC, Hb or Hct levels in healthy females[3], but longer duration research in an athletic population is lacking. The aim of the current research is to examine the effect of a LCKD versus a high carbohydrate diet, on blood count indicators of iron status in endurance athletes.

Following ethical approval 19 participants selected into a high carbohydrate (HC) (65 % kcal CHO, 20 % kcal fat, 14 % kcal protein) or LCKD (>75 % kcal fat, 10–15 % kcal protein and <50 g/d CHO) group for 12 weeks. Participants also completed an endurance training protocol during the trial. Whole blood samples were analysed using the haematology analyser before and after selection into each dietary group. RM ANOVA was used to assess changes in indicators of iron status in participants over time. Paired t-tests assessed changed within group over time.

	HC diet ($n = 10$)				LCKD diet ($n = 9$)				RM ANOVA		
	Pre		Post		Pre		Post		*P* Value		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Time	Group	Time*Group
RBC (10^{-6}µl)	4·59	0·33	4·30	0·63	4·67	0·42	4·44	0·61	0·038*	0·620	0·783
Hb (g/dl)	14·15	1·25	13·36	1·87	14·29	0·99	12·95	1·62[a]	0·013*	0·816	0·487
Hct (%)	0·41	0·03	0·38	0·05[a]	0·41	0·03	0·39	0·05	0·015*	0·846	0·744
MCV (fL)	90·47	4·52	89·35	4·78	89·19	3·14	88·31	2·40	0·082	0·430	0·825
MCH (pg/cell)	30·81	1·78	31·14	2·00	30·88	1·75	29·27	1·63[a]	0·113	0·239	0·021*
MCHC (g/dl)	33·66	1·95	34·85	1·52	34·59	0·87	33·14	1·33[a]	0·801	0·417	0·017*
RDW (%)	12·65	0·70	12·52	0·69	12·89	0·44	13·83	2·34	0·253	0·116	0·137

RBC – red blood cell; Hb – haemoglobin; Hct – haematocrit; MCV – mean corpuscular volume; MCH – mean corpuscular haemoglobin; MCHC – mean corpuscular haemoglobin concentration; red cell distribution width.
* Significant difference at $P < 0·05$; [a] Significant difference within group over time at $P < 0·05$.

RBC, Hb, and Hct significantly decreased over time. Within group Hct decreased between weeks 1 and 12 in the HC participants and Hb, MCH and MCHC decreased within the LCKD participants.

Endurance training has been associated with increased plasma volume with exercise induced inflammation also implicated as a possible cause for iron deficiency in athletes[4]. It is possible the endurance training added during this trial had a similar effect on iron status within these participants. However it does not explain the difference in Hb, MCH and MCHC between HC and LCKD participants. Due to the effect iron status has on oxygen transport to muscle, further research is warranted to investigate the effect of a ketogenic diet on iron status in endurance athletes.

1. Volek JS, Noakes T & Phinney SD (2015) *Eur J Sp Sci* **15**, 13–20.
2. Paoli A, Rubini A, Volek JS *et al.* (2013) *Eur J Clin Nutr* **67**, 789–796.
3. Nazarewicz RR, Ziolkowski W, Vaccaro PS *et al.* (2007) *Rejuvenation Res* **10**, 435–439.
4. Hinton PS (2014) *Appl Physiol Nutr Metab* **39**, 1012–1018.