Proceedings of the Nutrition Society (2013), **72 (OCE4)**, E210 doi:10.1017/S0029665113002358

Summer Meeting, 15–18 July 2013, Nutrition and healthy ageing

The relationship between zinc intake and indices of cognitive function: A systematic review and meta-analyses

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Brain growth and development are critically dependent on several micronutrients[(1)]. Zinc is one of these micronutrients and is found in high levels in the brain particularly the hippocampus, the area of the brain considered to be involved in learning and memory[(2)]. During early development, cellular activity may be particularly sensitive to zinc deficiency which may compromise cognitive development and attention[(3,4)]; however, the evidence from human studies is equivocal[(5)].

As part of a series of systematic reviews of zinc intake, status and health outcome relationships, undertaken by the EURRECA[(6)] consortium, a systematic review of published literature examining the relationship between dietary zinc intake and indices of cognitive function in adult and elderly populations, and children aged 1 to 18 years, was undertaken according to a pre-defined search protocol[(7)]. The databases searched included MEDLINE, EMBASE (both on Ovid) and the Cochrane Library CENTRAL from inception to March 2013. Following the EURRECA protocol of screening and sorting, 2173 studies were assessed for eligibility criteria. Data was extracted from 19 studies across all population groups that met the inclusion and exclusion criteria (12 randomised controlled trials (RCTs), and 7 observational studies). Meta-analysis of data extracted from 7 RCTs conducted in children was undertaken using Review Manager (5.2). A random effects model was used to investigate the impact of zinc intake on indices of cognitive function including intelligence (7 data sets from 862 children), executive function (7 data sets from a 942 children), and motor development (4 data sets from 622 children).

The analysis yielded a pooled standard mean difference for the impact of zinc supplementation on intelligence of 0.06 (95% CI −0.10, 0.22) $p = 0.47$; executive function, 0.13 (95% CI, −0.02, 029) $p = 0.10$ and motor development, −0.05 (95% CI −0.36, 0.26) $p = 0.75$. These results revealed that there was no significant overall effect of zinc supplementation on these cognitive function outcomes assessed in children.

Due to the heterogeneity of the cognitive function test methodology, only a small number of studies could be included in the meta-analysis. To date, the evidence regarding the effect of zinc intake on cognitive function remains inconclusive. However, taking all the studies per population as a whole there is some evidence for a positive association between zinc and cognitive function and there is a need for further high quality RCTs to investigate this relationship.

This research was undertaken as an activity of the European Micronutrient Recommendations Aligned (EURRECA) Network of Excellence (www.eurreca.org), funded by the European Commission Contract Number FP6 036196–2 (FOOD). The original conception of the systematic review was undertaken by the EURRECA Network and coordinated by partners based at Wageningen University (WU), the Netherlands and the University of East Anglia (UEA), United Kingdom. Also supported by Funds for Women Graduates (FfWG) (http://ffwg.org.uk/).

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