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1 **Thiamine deficiency in the western diet and dementia risk**

2 Richard Hoffman

3 Department of Biological and Environmental Sciences, School of Life and  
4 Medical Sciences, University of Hertfordshire, Hatfield, Herts, AL10 9AB, UK

5 Tel. +44 1707 284526

6 Fax: +44 1707 285046

7 E- mail: r.hoffman@herts.ac.uk

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13 In their recent systematic review, ter Borg and colleagues estimated that 50% of  
14 older ( $\geq 65$  years) men and 39% of older women are failing to reach the estimated  
15 average requirement (EAR) for thiamine <sup>(1)</sup>. This is noteworthy since thiamine  
16 plays a unique role in brain physiology as an essential cofactor for glucose  
17 metabolism; it is especially important for normal cognitive function in the elderly  
18 <sup>(2)</sup>; and thiamine insufficiency is linked with an increased risk of Alzheimer's  
19 disease <sup>(3)</sup>.

20 Nevertheless, as noted by ter Borg et al, concerns over thiamine deficiencies are  
21 generally discounted in western countries. This is partly because white flour  
22 products and breakfast cereals are commonly fortified with thiamine, and this  
23 vitamin also occurs naturally in a wide range of foods: good sources include  
24 whole grains, trout, pork, peas and beans. However, some sectors of the elderly  
25 population may be making dietary choices that compromise their thiamine intake  
26 and increase their vulnerability to thiamine insufficiency. For example, an  
27 increasing number of elderly people in western countries are being diagnosed as  
28 gluten intolerant <sup>(4)</sup>. When they replace wheat-based products with gluten-free  
29 products they are at increased risk of thiamine deficiency since gluten-free  
30 products - unlike wheat-based products - are not usually fortified with this  
31 vitamin <sup>(5)</sup>. A second cause for concern relates to the rise in the consumption of  
32 ready meals and convenience foods by the elderly <sup>(6)</sup>. Sulphites destroy thiamine,  
33 and yet in the UK they are a common preservative in convenience meat products  
34 such as pork sausages, in canned pulses and in many ready meals and convenience  
35 foods containing potatoes. For example, consumption of fresh pork is declining in  
36 the UK diet <sup>(7)</sup>. And whereas a grilled pork chop is an excellent source of thiamine  
37 (0.78 mg/100g), grilled sausages contain only trace amounts <sup>(8)</sup>. Losses of  
38 thiamine during the production of ready meals are also likely since this vitamin is  
39 very heat-sensitive and leaches into cooking water <sup>(9)</sup>. The extent to which this  
40 occurs during ready meal production is not known.

41 Despite the wide range of factors affecting thiamine levels in foods, the National  
42 Diet and Nutrition Survey (NDNS) in the UK has reported very low levels of  
43 deficiency in the over 65 year olds <sup>(10)</sup>. Thiamine levels were determined by

44 measuring activation of the thiamine-dependent enzyme transketolase by thiamine  
45 pyrophosphate - the erythrocyte transketolase activation coefficient (ETKAC).  
46 However, this assay has not been fully validated for measuring thiamine status in  
47 the elderly, it is subject to limitations, and hence it has been recommended that the  
48 ETKAC should be used in conjunction with other measurements <sup>(11)</sup>. Direct  
49 measurement of thiamine levels to complement the ETKAC would also help  
50 address inconsistencies between NDNS data and the study by ter Borg et al. Since  
51 new eating trends mean that some sectors of the elderly population are increasing  
52 their likelihood of thiamine insufficiency, consideration could be given to not  
53 using sulphites in sausages (as is already the case in some countries) and to  
54 fortifying gluten-free products with thiamine. It is likely that many micronutrient  
55 deficiencies contribute to Alzheimer's disease and other forms of dementia <sup>(12)</sup>,  
56 and thiamine certainly deserves more attention to ensure that it is not one of these  
57 contributors.

58

#### 59 *Conflict of Interest*

60 None

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64

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