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Relationship between plasma zinc and antibacterial innate immune function in the elderly

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Ageing is associated with impaired immunity and an increased susceptibility to infection[(1)]. Micronutrient deficiencies are common amongst older individuals in the UK[(2)], and as nutritional status also impacts on immune status[(3)] it is important to better understand the impact of such deficiencies on immune function in the elderly.

Participants (*n* 85, free-living, 65–85 years old) were recruited from Barnsley, South Yorkshire, UK using a variety of methods including writing to potential participants from general practitioners' lists. Blood was collected and plasma Zn concentrations were analysed using inductively-coupled plasma MS (HP 4500; Agilent, Cheadle, Staffs., UK). Differential leucocyte counts were determined using standard techniques, and phagocytic responses of monocytes to *Escherichia coli* and oxidative burst responses to *E. coli*, fMLP (a synthetic peptide that mimics bacterially-derived peptides) and phorbol myristate acetate (PMA; protein kinase C activator) were evaluated by whole-blood flow cytometry.

Quartile...	1 (*n* 20)		2 (*n* 21)		3 (*n* 19)		4 (*n* 20)	
Zn (μmol/l)...	<10.4		10.4–11.7		11.7–12.6		>12.6	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Differential leucocyte count ($\times 10^9$/l)								
Neutrophils	3.8	3.0–4.3	4.0	2.9–4.7	3.9	3.1–4.7	4.0	3–5
Lymphocytes	1.7	1.6–2.1	2.1	1.7–2.7	2.1	1.7–2.5	2.4	1.8–2.7
Monocytes	0.3	0.3–0.5	0.4	0.4–0.5	0.4	0.3–0.5	0.4	0.3–0.5
Eosinophils	0.2	0.1–0.4	0.2	0.1–0.3	0.2	0.1–0.2	0.2	0.1–0.3
Basophils	0.05	0.03–0.07	0.04	0.03–0.06	0.04	0.03–0.05	0.05	0.03–0.06
Monocyte phagocytosis, fluorescent intensity								
Unstimulated	31	22–39	32	25–40	31	24–63	27	24–33
+ *E. coli*	262	152–364	265	122–421	223	126–388	248	170–326
Monocyte oxidative burst, fluorescent intensity								
Unstimulated	14	13–16	15	14–17	15	13–16	16	14–18
+ fMLP	16	14–17	15	14–17	16	15–17	16	13–18
+ PMA	22	17–37	27	17–37	19	13–25	19	15–28
+ *E. coli*	22	17–25	25	21–35	17	15–27	17*	14–25

IQR, interquartile range. Median value was significantly different from that for quartile 1 (Kruskal-Wallis): $*P = 0.012$.

The median plasma Zn concentration in this cohort of elderly individuals was 11.7 (interquartile range 10.4–12.6) μmol/l and this value compares with 14.3 μmol/l, which has been reported in the National Diet and Nutrition Survey for older people[(2)]. Although lymphocyte numbers were higher in individuals in the upper quartile for plasma Zn concentrations, this difference was not significant. No other relationship between Zn concentration and leucocyte counts were apparent. Furthermore, there was no relationship between plasma Zn and any of the monocyte functional variables, except for a reduced ability to generate an oxidative-burst response to *E. coli* in individuals having the highest plasma Zn concentrations (Table). Dietary data has been collected and will be analysed to give information on dietary intakes of zinc.

Overall, the present study fails to identify a robust relationship between plasma Zn status and measures of innate immune function in the elderly; this finding may reflect the relative homogeneity of plasma Zn in this cohort.

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