

THE EFFECT OF ZINC SUPPLEMENTATION ON SERUM ALBUMIN AND FOLIC ACID CONCENTRATIONS IN A GROUP OF HYPOALBUMINAEMIC AND HYPOZINCAEMIC AGED PERSONS

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Certain groups within Western society may be at risk from suboptimal zinc and protein nutrition¹. We have identified a group of institutionalised aged persons in whom there are combined apparent deficiencies of zinc and protein, as evidenced by hypozincaemia (<11.0 µmol/l) and hypoalbuminaemia (<35.0 g/l); and, in some, low serum folates as well (<3.0 ng/ml)².

Plasma zinc and serum albumin are significantly related in the elderly³. Sixty to 70 per cent of circulating zinc is loosely bound to albumin and 30 to 40 per cent is bound to an α₂-macroglobulin⁴. However, protein synthesis⁵, and folic acid absorption⁶, are each dependent on zinc metalloenzymes, so that both could be impaired with zinc deficiency.

The effects of oral zinc supplementation on serum albumin and folic acid concentrations have been assessed. Fourteen hypoalbuminaemic and hypozincaemic aged persons were studied over a ten-week period. Five of the 14 had low serum folates. There was no evidence of renal or liver disease to account for hypoalbuminaemia.

A zinc supplement of 50 mg zinc (220 mg zinc sulphate) was given once daily after breakfast for six weeks. The food intake did not change during this period. Blood samples were taken in the morning after an overnight fast. Zinc was analysed by atomic absorption spectrophotometry (Varian Technicon Model AAB) by modification of the method of Meret & Henkin⁷. Serum albumin was assayed with a Centrifichem analyser (Roche 330) using the bromocresol green method⁸. Serum folic acid was measured by radioassay technique.

Twenty-one days of zinc supplementation caused a significant increase in serum albumin concentration from the baseline level of 33.5 g/l to a peak of 36.3 g/l at 21 days (Table 1).

Table 1. Effect of 50 mg zinc as zinc sulphate daily on plasma zinc, serum albumin and serum folic acid concentrations in institutionalised elderly persons (n=14). Significance of difference from baseline is indicated ns P>0.05

	Baseline	Zinc supplementation			Post suppl. 21d
		7d	21d	42d	
Plasma zinc, µmol/l	10.7±0.4	11.1±0.5 ^{ns}	12.9±0.7*	12.3±0.5*	11.6±0.4 ^{ns}
Serum albumin, g/l	33.5±0.5	34.4±0.4 ^{ns}	36.3±0.6*	35.2±0.5*	32.6±0.5 ^{ns}
Serum folic acid, ng/ml	4.3±0.6	5.2±0.7 ^{ns}	4.6±0.7 ^{ns}	4.5±0.6 ^{ns}	5.0±0.8 ^{ns}

*P<0.001.

After cessation of zinc supplementation serum albumin concentration returned to near baseline levels. There was no significant change in serum folate concentration throughout the study period.

Correction of zinc deficiency, therefore, allowed a rise in serum albumin which suggests that zinc supplementation may be worthwhile in this community. There are also implications for other hypoalbuminaemic groups, such as renal patients, who are sometimes found to be hypoalbuminaemic and hypozincaemic.

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References

- 1 Sandstead, H.H. (1973): Zinc nutrition in the United States. *Am. J. Clin. Nutr.* **26**, 1251-1260.
- 2 Flint, D.M., Wahlqvist, M.L., Prinsley, D.M., Parish, A.E., Fazio, V., Peters, K. & Richards, B. (1979): Nutritional assessment of community and institutionalised elderly. *Food Nutr. Notes Rev.* **36**, 173-176.
- 3 Flint, D.M., Wahlqvist, M.L., Prinsley, D.M., Parish, A.E., Richards, B. & Dryden, P. Plasma zinc and serum albumin concentrations in the elderly (submitted for publication).

- 4 Parisi, A.F. & Vallee, B.L. (1970): Isolation of a zinc α_2 -macroglobulin from human serum. *Biochem.* 9, 2421-2426.
- 5 Hsu, J.M. (1979): Current knowledge on zinc, copper and chromium in ageing. *Wld Rev. Nutr. Diet.* 33, 42-69.
- 6 Anon (1979): Zinc and intestinal absorption of folates. *Nutr. Rev.* 37, 221-222.
- 7 Meret, S. & Henkin, R.E. (1971): Simultaneous direct estimation by atomic absorption spectrophotometry of copper and zinc in serum, urine and cerebrospinal fluid. *Clin. Chem.* 17, 369-373.
- 8 Roche-Sirius (1977): Determination of albumin in serum and plasma. Union Carbide's Centrifichem ©System, Operation Manual.

SERUM FERRITIN AND BLOOD HAEMOGLOBIN CONCENTRATION AMONG GASTROSCOPIED OUT-PATIENTS

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Bleeding, loss of iron and low blood haemoglobin concentration are practical clinical problems. Serum ferritin concentration (SFER) reflects the status of body iron stores^{1,2}. However, there are no data about the relationships between SFER and Hb amongst patients with upper abdominal symptoms.

SFER were measured immunoradiometrically, and Hb by Coulter-Counter S analyser in all electively gastroscopied outpatients during one month. 13 males and 12 females had esophagitis or gastritis (E/G), nine males and seven females had gastric or duodenal ulcer (U); eight males and nine females had other diagnoses, or the findings from gastroscopy were normal.

Four patients had a previous cholecystectomy and five a subtotal gastrectomy; one patient had a highly selective vagotomy and one had a history of gastric ulcer perforation. The mean body weight (wt) of the females was ideal but that of the males with E/G was more than and of the males with U less than the ideal wt ($P < 0.001$). Detailed clinical and anthropometrical data have been previously reported³.

In normal women SFER $< 50 \mu\text{g/l}$ shows the absence of iron stores. In the present study SFER was $< 50 \mu\text{g/l}$ for 14 males and 13 females and between 50 to 350 $\mu\text{g/l}$ for 18 males and 13 females. The distribution of the patients in these two SFER groups was independent of sex ($\chi^2 = 0.336$), although SFER in the respective groups were lower ($P < 0.001$) for females (18 ± 3.3 and 117 ± 6.9) than for males (34 ± 3.5 and 180 ± 8.7).

Among 14 males and 13 females with SFER $< 50 \mu\text{g/l}$, eight males and seven females had normal Hb. The distribution of the patients in these groups was independent of Hb and sex ($\chi^2 = 0.333$). Only two of the 18 male and none of the 13 female patients with SFER between 50 - 350 $\mu\text{g/l}$ had Hb below normal. The mean Hb of the males with normal Hb and SFER $< 50 \mu\text{g/l}$ ($n = 8$) did not differ ($P > 0.05$) from those of the males ($n = 16$) with SFER 50 - 350 $\mu\text{g/l}$ (146 ± 2.6 vs 147 ± 2.8), whereas the corresponding mean Hb of females ($n = 7$) with SFER $< 50 \mu\text{g/l}$ was lower ($P < 0.001$) than the mean Hb among those ($n = 13$) with higher SFER (128 ± 2.7 vs 136 ± 2.5).

The mean Hb of the patients with SFER $< 50 \mu\text{g/l}$ (males 136 ± 3.4) or between 50 - 350 $\mu\text{g/l}$ was normal (males 145 ± 3.1 , females 136 ± 2.5), with the exception of the females with low SFER (119 ± 4.0). However, the patients with SFER $< 50 \mu\text{g/l}$ (14 males, 13 females) had a lower mean Hb ($P < 0.001$) than those with SFER between 50 - 350 $\mu\text{g/l}$ (19 males, 13 females).

Among males with U there was no difference ($P > 0.05$) between the mean Hb among those ($n = 4$) with SFER $< 50 \mu\text{g/l}$ and those ($n = 5$) with SFER between 50 - 350 $\mu\text{g/l}$ (145 ± 2.8 vs 142 ± 2.9), whereas among males with E/G those ($n = 5$) with SFER $< 50 \mu\text{g/l}$ had a lower ($P < 0.001$) mean Hb than those ($n = 8$) with SFER between 50 - 350 $\mu\text{g/l}$ (131 ± 3.2 vs 147 ± 3.4). The mean SFER did not differ ($P > 0.05$) among the males with μ (35 ± 3.5) and with E/G (33 ± 3.8) among those with SFER $< 50 \mu\text{g/l}$, whereas the males with U had a higher ($P < 0.001$) mean SFER (192 ± 8.5) than the males with E/G (159 ± 8.0) among those with

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