

Short reports

Alzheimer's disease and the relationship between silicon and aluminium in water supplies in northern England

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A recent case-control study failed to show any statistically significant relationship between presenile dementia of the Alzheimer type (PDAT) and exposure to aluminium in drinking water, tea, or medicines.¹ However, Birchall has argued, on geochemical grounds, that in soft water areas silicic acid (dissolved silicon) will be low and the water may contain aluminium because of acidity or the addition of aluminium salts to flocculate organic matter in peaty waters. On the other hand, in hard water areas where silicic acid is high, the water will be low in aluminium.² Moreover, silicon determines the bioavailability of all sources of dietary aluminium.^{3,4} In this study, therefore, the concentration of both dissolved silicon and aluminium in current water supplies was examined to determine whether an inverse relationship exists between dissolved silicon and aluminium.

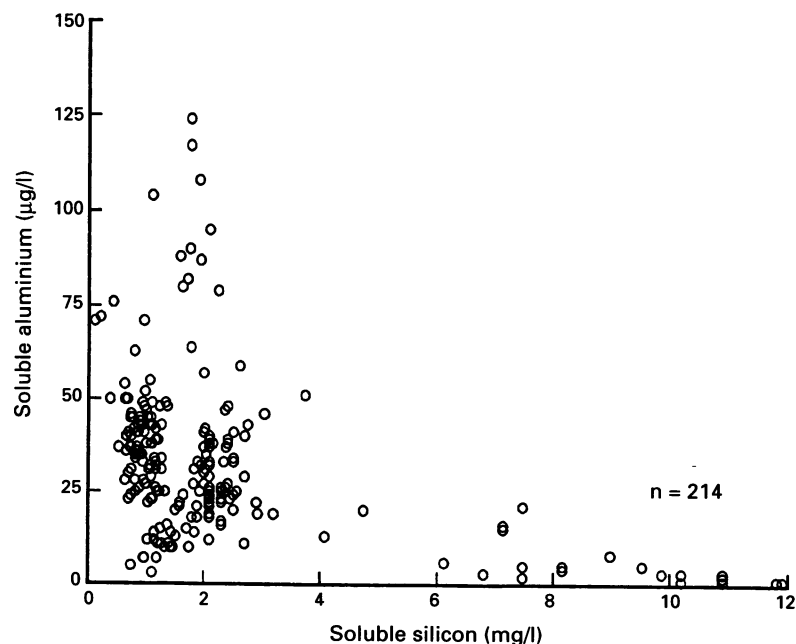
Methods: Water samples were collected between the 23 June and 15 July, 1993, based on the list of addresses of 109 cases and 109 controls in a previous study of PDAT through-

out the northern health region.¹ These addresses were the location at which the case of PDAT had lived longest during the 10 years before the onset of symptoms of dementia (and the equivalent in the control). All cold water samples were collected in silicon free containers by a single investigator (GT), blind to knowledge of whether a case or control had lived there, after the tap had been run for 30 seconds. The water samples were randomised and both aluminium and silicon were measured using a modification of a previous method by graphite furnace atomic absorption spectrometry using an AS40 autosampler, HGA500 furnace 3030 spectrophotometer, and pyro coated L'vov tubes.⁵

Results: Water samples were obtained for 214 of the 218 (98.2%) addresses of cases and controls. The inverse relationship between dissolved aluminium and dissolved silicon is shown in the figure. Spearman's rank order correlation coefficient between soluble silicon and soluble aluminium was -0.43 ($p < 0.001$).

No historical data on silicon in water were available to apply to our cases of PDAT and matched controls. We therefore compared the case-control pairs for which we had data ($n = 105$) for current levels of silicon at their address, based on these water samples. Using the Wilcoxon matched pairs signed-ranks test, soluble silicon values in the cases were not significantly different than in the controls ($p = 0.65$). Similarly, the dissolved aluminium values in current water samples, based on the addresses of cases and controls, were not significantly different ($p = 0.60$, Wilcoxon matched pairs signed-ranks test). The odds ratio in the case-control pairs, for the threshold value of 3 mg/l ($100 \mu\text{mol/l}$) of soluble silicon or above, was calculated as 0.8 (95% confidence interval 0.34, 1.83), which was not significant at the 5% level.

Discussion: The study of water samples showed an inverse relationship between soluble silicon and soluble aluminium, thus supporting the hypothesis proposed by Birchall.² Birchall also suggested that a threshold level of



100 $\mu\text{mol/l}$ (about 3 mg/l) of soluble silicon is necessary to protect against the absorption of aluminium, that is all forms of aluminium in the diet.⁴ Unfortunately, we did not have historical data on silicon levels in water before the onset of dementia. We therefore applied the current silicon levels to our case-control pairs and found a non-significant OR of 0.8 based on the postulated protective level of 3 mg/l of dissolved silicon in water. The weight that can be placed on this result is debatable given that the proposed protective factor was measured after the disease onset, albeit based on the address before the onset of dementia. However, silicon levels in the same water source are relatively stable with time, although the source of water for a particular area may have been changed. Additionally, relatively few of the samples had a silicon concentration of 3 mg/l or above in order to test the threshold hypothesis of silicon in water.

Silicon determines the bioavailability of all

dietary exposures to aluminium. It is availability rather than simple exposure which is important if aluminium is causally involved in AD; we therefore suggest that the possible preventive role of silicon in PDAT requires further investigation. For example, the incidence rates of AD in areas in which the concentration of silicon is high (3 mg/l or above in water) could be compared with those in areas of low silicon values.

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Asthma history and sociodemographic characteristics in elderly French people

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Asthma is a disabling chronic disease, especially in elderly people in whom prevention of the loss of autonomy becomes very important.¹ Recent data have also suggested that mortality related to asthma has increased over the past 10 years in both Britain and France, particularly in the elderly.² There are, however, few epidemiological data on asthma in this group.

This was a cross sectional study. Based on a cohort of subjects aged 65 and over (Paquid cohort), we aimed to investigate the prevalence and sociodemographic characteristics of self reported asthma in this population.

Methods: Paquid is a cohort of 3777 dwellers, representative of the population aged 65 and over in two administrative areas of south western France (Gironde and Dordogne). Baseline data were collected in 1988-89. The Paquid questionnaire included sociodemographic characteristics: age (in years), sex, main lifetime occupation (housewives, farm workers, blue collar workers, and white collar workers), smoking status (current, former, and never smokers), and many variables on health status, disability, cognitive performance, and medication. Details of the Paquid methodology have been published elsewhere.³

Data for this study were taken from the third year of the follow up. A total of 2406 subjects (63.7% of the initial sample) were involved. Asthma identification was based on two questions: (1) "Have you ever had asthma?" and (2) "Did you have at least one asthma attack in the last 12 months?" Subjects were categorised according to their smoking history.

The prevalence of asthma was evaluated in relation to sex, smoking status, and lifetime occupation. An association between former work and asthma was determined by logistic regression analysis. The dependent variable was asthma history (coded 1 *versus* 0). Explanatory variables were age (in years), sex (women *versus* men), smoking history (current smokers, and former smokers *versus* never smokers), and former work (housewives, farm workers, and blue collar workers *versus* white collar workers).

Results: Of 2406 subjects, 2355 (97.5%) responded to the questions on asthma symptoms (979 men and 1376 women). A total of 144 subjects (6.11%) reported asthma and 58 (40.2%) of them at least one attack in the last 12 months. The mean (SD) age was lower in subjects with a history of asthma compared

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