Aluminum and Dietary Factors in Alzheimer's Disease

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The Alzheimer's Research Institute* has, as a public service, undertaken a dietary epidemiological study of aluminum and protective nutrients in their relation to Alzheimer's disease (AD), which is ongoing. The preliminary results presented here tend to support the growing body of evidence that has accumulated regarding the role of aluminum in Alzheimer's disease[1 2 3 4 5] and the nutritional interventions which are useful.[6 7]

This element has been known as a neurotoxic substance for nearly a century and the scientific literature on its toxic effects has now grown to a critical mass.[8 9 10] We are *not* saying that aluminum *causes* Alzheimer's disease. But it is the only element noted to accumulate in the tangle-bearing neurons characteristic of the disease. Aluminum is also found in elevated amounts in four regions of the brain.[11]

While this does not prove that aluminum cause the plaques, it does add weight to the concept that aluminum is not a late but an early event in plaque formation. The by now famous British study of aluminum in drinking water by Martyn, et al,[1] is further evidence that "chronic low exposure can lead to deposition inside neurons in the brain" (as reported in *Chemistry and Industry*, June 6, 1988, p. 346).

The Martyn study has been criticized for a number of "methodological problems", but we agree with the conclusion that "the relative risk of having Alzheimer's was related to the concentration of aluminum in the water" (as reported *in Chemistry*

* The Alzheimer's Research Institute is a California not-for-profit corporation unencumbered by governmental, political, or corporate ties. Through private support novel biomedical research is conducted. Inquiries may be directed to ARI, Box 2056, San Rafael, California 94912-2056.

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and Industry, June 6, 1988, p. 346).

We also know that "some, if not all, cases of Alzheimer's disease are linked to a mutation in the proximal portion of the long arm of chromosome 21 ..." As D. R. McLachlan and co-workers at the University of Toron to Faculty of Medicine further postulate, "one consequence of the mutation is loss of the natural barriers and intracellular ligands for aluminum. As a result, aluminum gains access to several brain sites including the nuclear compartment in certain neurons of the central nervous system." (Personal communication, in press.)

In a recent communication, Dr. W. J. Lukiw of the University of Toronto (Canada), Centre for Research in Neurodegenerative Diseases, informs us that in *in vitro* simulation of Alzheimer's disease confirms that aluminum negatively influences genetic function. He further states "our paper entitled 'Linker Histone -DNA Complexes...', published in *Federation of European Biochemical Societies* (FEBS) 253(1,2): 59-62, 1989 also substantiates the claim that aluminum basically 'gums up' chromatin at very basic levels of genomic organization." As he and Drs. Kruck and McLachlan stated in their 1987 paper all the evidence would "suggest an aluminum induced impairment in the readout of the genetic information".

In response to those who remain skeptical regarding the evidence which supports the role of aluminum in Alzheimer's disease, I refer to the article recently published in *The Lancet*, January 14, 1989, pages 59-62, by C. N. Martyn and colleagues. This is the strongest of the *five* epidemiological studies which have previously been published on the role of aluminum in drinking water in Alzheimer's disease.

The second major link is biochemical where strong evidence has been discovered, particularly by D. R. McLachlan and

colleagues at the University of Toronto, Department of Medicine, Division of Neurology.

Further, there is also increasing evidence that aluminum in *antacids* may pose an even greater risk, owing to the degree of bioavailability of aluminum in these products.[7] Dr. Laura Fleming and associates discuss this concern, concluding in part "... there should be an even stronger correlation between Alzheimer's disease and the long-term use of antacids containing aluminum".

With regard to the efficacy of choline I would recommend that interested skeptics review the landmark article by A. Little, et al, in the *Journal of Neurology, Neurosurgery, and Psychiatry,* 1985: volume 48, pages 736-742. Entitled, "A double-blind, placebo controlled trial of high dose lecithin in Alzheimer's disease" this study indicated that with high *quality* choline in *dosages higher* than those tried previously, a significant number of patients enjoyed a restoration of memory and other cognitive functions which warrants the use of this nutrient.

It is appropriate and important to mention the source of support for this research study. *Appropriate* because scientific progress is increasingly threatened by institutionalized, highly regimented thinking. Thinking controlled by grants more of a political than of an objective "rational" nature. *Important* owing to the relatively obscure yet medically profound implications of the gradient shift in thinking evolving as a result of emerging trace metal research in Alzheimer's disease (AD).

Despite numerous appeals, the major foundations refused to fund this epidemiological dietary survey. Moreover, the various state, local and university Alzheimer's research units in California all refused us access to their patients. Luckily though, through the foresight and generosity of Eric and Sal Estorick of London, England, the Alzheimer's Research Institute was able to support this research.

The history of science shows that critical discoveries often hinged on the work of the "private gentleman", those able to pay for their own research, both in time and materials.

"Without what the English call the 'private gentleman', the scientific process could not have begun in Greece, and could not have been renewed in Europe. The universities played a part, but not a leading part, in the philosophical and scientific thought of this period. Endowed learning is apt to be timid and conservative learning, lacking in initiative and resistant to innovation, unless it has the spur of contact with independent minds."

H. G. Wells, *History of the World.* Today, unless the scientist comes to his study with independent funding, the prospects for conducting truly novel, potentially innovative research are practically nil. Commercial and political interests now dominate the grant-making process to an almost totalitarian degree of control. Thus, the scientist who sees evidence that aluminum is implicated in Alzheimer's disease faces the resistance of both of the medico-pharmaceutical complex and the aluminum industry. Yet the truth which is emerging cannot be suppressed forever. With continued research, perhaps the mounting evidence will be acknowledged. With such acknowledgement, steps will eventually be taken to alert people to the dangers of aluminum and the protective benefits of proper nutritional support. This despite the efforts to suppress this knowledge by the Media-industrial complex.

Study Summary (Tables pages 77 and 78) In our study of the relationship between aluminum, other metallic elements, protective nutrients and AD, two hundred, twenty-seven (227) people *without* any symptoms of the disease were interviewed. All were over 60 years of age. A self-programmed retrospective dietary questionnaire was supplied and later reviewed by an epidemiologist with training in human nutrition.

Several interesting patterns appear to be operant in this population.

1. These "brain-healthy" people self-scored a relative "high" or "medium" intake of all 4 nutrients known to protect brain function (choline, vitamin B_{12}, niacin, and folic acid). Iron, which may play a paradoxical role in AD was consumed in "high" or "medium" quantities only by 14% of the study population (see Table 1).

2. Of the people who consumed alcohol between "one or more" and "three or more" times per week (50% of the respondents), the greatest number consumed wine three or more times per week. Interestingly, beer was consumed by perhaps a significantly minute percentage of these seniors without AD. Beer in aluminum cans may be a factor in the AD riddle (see Table 2).

3. Forty-nine percent (49%) of these brain-healthy people had taken a multivitamin preparation for an average of 15 years and 21% took a B-complex supplement for an average of 16 years.

Surprisingly, minerals and other nutrients thought to influence brain-function were *not* taken as supplements by a significant number of the study population (see Table 3).

4. A significant number of people reportedly took antacids and buffered aspirin for many years. Known to contain significant quantities of aluminum, it appears that these preparations may be self-limiting in their contribution to the overall aluminum load; or, the intake of vitamin supplements and other protective factors may block the uptake of aluminum into brain cells (see Table 4).

5. Eighty-five percent (85%) of the respondents used some caffeine-containing beverage on a regular basis. Apparently, caffeine does *not* appear to be implicated in AD (see Table 5).

6. If aluminum is found to be implicated in AD it appears that food offers sufficient protection against aluminum absorption, either as a result of nutrients they contain (such as calcium) or by slowing the absorption of aluminum in another manner (see Table 6).

7. Respondents ascribed certain factors for their good health; namely, diet, diet and exercise, exercise and genetics. As respondents were older, they gave more weight to each of these factors. Surprisingly, 79% felt that their poor health was owing to "no particular reason" (see Table 7).

This study is a good beginning for future research regarding dietary factors and Alzheimer's disease. In our next phase we intend to direct a similar survey towards the care-givers of patients *with* the disease.

Conclusion: Replace Aluminum with Magnesium

The debate for or against the role of aluminum in Alzheimer's disease will continue long after the publication of this and other studies. However, the strongest evidence that aluminum intake and AD are causally related is epidemiological; people who drink water with high concentrations of aluminum are 50 percent more likely to develop Alzheimer's disease than those whose water is aluminum free. At greatest risk, according to this study, were adults younger than age 65.[1] The present study indicates that people over 60 years of age who do *not* exhibit symptoms of Alzheimer's disease tend to ingest foods containing nutrients known to retard the bioavailability (i.e., absorption) of aluminum and to take vitamins known to protect memory and other brain functions.

Even if new evidence casts doubt on this relation, what is wrong with recommending low aluminum intake? It is a neurotoxic metal of *no* known use in the human body and is implicated in several disease states. There is no need to continue using aluminum in antacids, analgesics and other medications. Magnesium, already used by several manufacturers, is an equally fine carrying agent, it has all the added benefit of contributing to cardiovascular health. Prior to the 20th century, aluminum was not used in any foods or pharmaceuticals; it is no longer necessary to debate whether aluminum is the "cause or consequence" of AD. That this metal *is* found in elevated concentrations in regions of the brain of Alzheimer's patients is reason enough to curtail its intake from *all* sources, including cookware.

We certainly do not have to lose our minds while the debate continues. Whatever the next chapter on aluminum and AD may prove to be, such an environmental toxin is always preferably avoided. Given the effect of Alzheimer's on much of the aging population and the great costs, human and medical, aluminum reduction is one of our most sensible health investments. Its replacement by magnesium in antacids and other medications will assure a continued source of comfort for those reliant on them.

Table 1
Nutrients From Foods

	3 or more times/week %	1 or more times/ week %	Total %
Choline	**12**	**16**	**28**
Vitamin B_{12}	**19**	**30**	**49**
Niacin	**18**	**28**	**46**
Folic Acid	**21**	**25**	**46**
Iron	**7**	**7**	**14**

Table 2
Alcoholic Beverages

	3 or more times/week %	1 or more times/week %	Total %
Beer	**0**	**1**	**1**
Wine	**15**	**11**	**26**
Hard Liquor	**7**	**6**	**13**
More than one type of alcohol	**6**	**4**	**10**
Total	**28**	**22**	**50**

Table 3
Supplemental Vitamin Intake

	Average Years Taken	Percentage Who Take
Vitamins		
Multi-vitamins	**17**	**49**
Vitamin A	**11**	**2**
Vitamin B	**16**	**21**
Vitamin C	**15**	**42**
Vitamin E	**10**	**10**
Minerals		
Calcium	**10**	**5**
Cod Liver Oil	**20**	**5**
Iron	**18**	**1**
Lecithin	**13**	**1**
Multi-minerals	**2**	**1**
Niacin	**14**	**1**
Zinc	**10**	**9**

Table 4
Medications Containing Aluminum

	Average Years Taken	Percentage Who Take
Antacids	**8**	**29**
Buffered Aspirin	**11**	**27**
Antidiarrheals	**9**	**3**
Ulcer Medicine	**5**	**7**

Table 5
Caffeinated Beverages

	3 or more times/week %	1 or more times/week %	Total %
Tea, coffee, cocoa, canned cola	**64**	**15**	**79**

Table 6
Foods Containing. Aluminum

	3 or more times/week %	1 or more times/week %	Total %
Cake, flour, dough	**3**	**3**	**13**
Cheese	**32**	**34**	**66**
Total	**35**	**47**	**82**

Addendum

As this article went to press I was informed of a study to be published by Dr. McLachlan's group at the University of Toronto School of Medicine. Based on a five year trial of deferoxamine as an aluminum chelating agent, a significant number of Alzheimer's disease patients were shown to improve. This study should further solidify the aluminum/Alzheimer's disease links.

Table 7 Self-Described Good Health Factors

	AGE			
	60-69	**70-79**	**80-92**	**Total**
Diet	**9**	**14**	**26**	**49**
Exercise	**2**	**5**	**5**	**12**
Diet & Exercise	**4**	**10**	**13**	**27**
Vitamins	**0**	**1**	**2**	**3**
Genetics	**2**	**3**	**5**	**10**
Genetics, Diet & Exercise	**0**	**3**	**3**	**6**
Rest & Diet	**0**	**1**	**0**	**1**
Rest, Diet & Exercise	**0**	**2**	**0**	**2**
No Reason	**12**	**20**	**47**	**79**
Other Than Above*				**12**
Total Subjects				**207**

* Other reasons for good health included common sense, cleanliness, sense of humour, moderation, enjoying life, keeping active, home cooking (31), not smoking or drinking alcohol, no-TV, travel, faith, and long marriages.

Poor Health

14 — No Reasons 4 — "Other" (smoking, stress, loneliness, diet)	
Total Subjects	18
Respondents that did not answer these questions	2
Total	227

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