

# Alzheimer's Disease: Minerals and Essential Fatty Acids

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## Introduction

Dementia is a brain disorder. According to the Alzheimer's Disease Fact Sheet ([www.alzheimers.org](http://www.alzheimers.org)) nearly half of all people age 85 and older may have the disease. This paper will discuss the role played by aluminum and diet, concentrating on how to eliminate aluminum by natural means.

The author commenced analyzing hair for essential and toxic minerals in 1975. Since then, he has analyzed many thousands of samples.<sup>1-5</sup> His most recent study indicated that 2,000 clients were deficient in one or more of the eight important essential minerals; 13.4 % had one or more of the toxic minerals in excess. Aluminum constituted a dominant 9.4 % (Tables 1 and 2, p. 174).

When clients showed an excess of one or more toxic minerals, they usually reported serious health problems. They were advised to make necessary changes in their lifestyle, especially related to diet. A regime was designed to correct essential mineral deficiencies and reduce the harmful toxic mineral(s). A follow-up analysis in about a year to measure the success of the program was recommended. When the regime was carefully followed, the success rate was invariably high.<sup>6</sup> The importance of essential fats is also discussed in connection with the health of the brain.

## Methods

When requested, a hair analysis kit was provided. It contained a small envelope to hold the sample, plus an illustrated paper balance card describing how to obtain the correct amount of hair (~1 g). The title page included name, address and important personal information. Pages 2 and 3 included 38 common health conditions and

27 questions such as one's diet and lifestyle. The last page listed the amounts and frequency of supplements taken plus medications. The laboratory (Anamol) measured 18 essential and 5 toxic minerals.

## Overview

The following information was obtained from the neurology channel of Medtrak (<http://www.neurologychannel.com/alzheimers/>). "Alzheimer's disease (AD) is an irreversible, progressive disorder in which brain cells (neurons) deteriorate, resulting in the loss of cognitive functions, primarily memory, judgment and reasoning, movement coordination and pattern recognition. In advanced stages of the disease, all memory and mental functioning may be lost.

*Plaques and Tangles:* The two most significant physical findings in the cells of brains of people affected by Alzheimer's disease are neuritic plaques and neurofibrillary tangles. Another significant factor in AD is the greatly reduced presence of acetylcholine in the cerebral cortex, necessary for cognitive function. Some plaques are found in the brains of elderly people, however they appear in excessive numbers in the brains of AD patients. A protein called beta amyloid occupied the center of these plaques. Surrounding the protein are fragments of deteriorating neurons, especially those that produce acetylcholine, essential for memory and learning.

Neurofibrillary tangles are twisted remnants of a protein called "tau" which is found inside the brain cells and necessary for maintaining proper cell structure and cell activity.

*Anatomy:* The cerebral cortex is an extremely convoluted and complicated structure associated with the "higher" functions of mind-thought, reasoning, sensation, and

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Table 1. Percent of 1,000 Clients deficient in 12 essential minerals, listed in order of deficiency

Mineral	Deficient (%)
Chromium	56
Magnesium (Mg)	49
Zinc (Zn)	47
Calcium (Ca)	46
Manganese (Mn)	40
Selenium (Se)	40
Potassium (K)	37
Iron (Fe)	25
Copper (Cu)	25
Molybdenum (Mo)	15
Phosphorus (P)	9
Sodium (Na)	5

Table 2. Percent of 2,000 clients with toxic minerals, listed in order of toxicity.

Mineral	Excess (%)
Aluminum (Al)	9.4
Lead (Pb)	3.0
Cadmium (Cd)	0.8
Arsenic (As)	0.1
Mercury (Hg)	0.1

motion. Each hemisphere controls certain types of activity.

The frontal lobe, located behind the forehead, is involved with controlling responses to input from the rest of the central nervous system (brain and spinal cord). It is responsible for voluntary movement, emotion, planning and execution of behaviour, intellect, memory, speech, and writing.

The parietal lobe, located above the ear, receives and interprets sensations of pain pressure, temperature, touch, size, shape, and body part awareness.

The temporal lobe, located behind the

ear, is involved in understanding sounds and spoken words, as well as emotion and memory. The occipital lobe, located at the back of the head, is involved in understanding visual images and the meaning of the written word.

The hippocampus plays a crucial role in learning and in processing various forms of information as long-term memory. When it is damaged it produces global retrograde amnesia, that is, the inability to retain new information.

*Incidence and Prevalence:* About 2 million people in the United States suffer from AD.

Approximately 10% of all people over the age of 65 and as many of 50% of those over the age of 85 are diagnosed with this condition.”

### Literature Review

The toxic effects of aluminum were observed when hemodialysis patients (chronic renal failure) were treated with aluminum containing phosphate binders. The results were that many kidney patients developed dialysis dementia.<sup>7</sup>

While the cause of Alzheimer's disease (AD) remains unknown, there is mounting evidence that implicates aluminum as a toxic environmental factor of considerable importance. Four independent lines of evidence—laboratory studies of the effects of intracerebral aluminum on the cognitive and memory performance of animals, biochemical studies, epidemiologic studies, and the slowing of the progress of the disease with the use of an agent that removes aluminum from the body—now support the concept that aluminum is one of the pathogenic factors in AD. The evidence warrants serious consideration of reducing human exposure to aluminum. McLachlan et al. hypothesized that a public health effort to restrict human ingestion of aluminum would reduce the incidence of this common chronic illness of the elderly.<sup>8</sup>

Aluminum and silicon were found to be co-localized in the central region of senile plaque cores in studies with energy dispersive X-ray analysis. The distribution of these elements was similar in cores isolated from the cerebral cortex of patients with *senile dementia* of the Alzheimer type and in cores studied *in situ* from tissue sections from the cerebral cortex of pre-senile and senile patients with Alzheimer's disease and elderly, mentally normal patients. High-resolution solid-state nuclear magnetic resonance techniques showed aluminum and silicon to be present as aluminosilicates. This contrasts with the distribution of other inorganic constituents. It suggests that they may be involved

in the initiation or early stages of senile plaque formation.<sup>9</sup>

In a survey of 88 county districts within England and Wales, the rates of Alzheimer's disease in people under the age of 70 years were determined. Aluminum concentrations in water over the past ten years were obtained. The risk of Alzheimer's disease was 1.5 times higher in districts where the mean aluminum concentration exceeded 0.11 mg/L than in districts where the concentrations were less than 0.01 mg/L.<sup>10</sup> A similar study was done in Ontario, Canada, by Neri and Hewitt. They concluded that when drinking water contained more than 0.2mg/L, aluminum there was a risk factor for Alzheimer's disease of 1.46.<sup>11</sup>

Aluminum is the third most prevalent element in the earth's crust. It was once believed that aluminum was a harmless mineral. Much research, especially in the last century, indicates that this is far from true, though it has been used in many beneficial ways. It is a safe, non-toxic metal under most circumstances. However, soluble aluminum compounds are powerful brain poisons, causing many adverse health conditions. When given orally to animals, they develop AD-like symptoms including the inability to think logically. Humans may absorb aluminum when food is cooked in aluminum cookware, (especially when it is acid in nature). Other sources are some toothpastes, most underarm deodorants, vaginal douches, most baking powder, table salt, buffered aspirin, bleached flour, some processed cheese, pancakes and cake mixes, some pickled vegetables and fruit, non-dairy creamers, anti-diarrheals, dental amalgams and cigarette filters.<sup>12</sup>

It is known that serum aluminum concentrations increase with age. It may accumulate slowly over our lifetime or we may absorb it more easily as we age. There is evidence that people with AD have serum levels of aluminum that are often significantly higher than those of people with other types of dementia, as well as healthy people of similar ages.<sup>13</sup>

Further evidence that aluminum fosters the development of AD comes from a scientific (placebo-controlled) trial of desferroxamine, a drug that removes aluminum from the body by binding with it. The drug failed to stop the disease progression, but it did significantly reduce the rate of decline.<sup>14</sup>

### Mineral Antagonisms

An outstanding paper, with 250 citations, was published by medical researcher Harold Foster, an overview of AD with emphasis on its prevention and treatment. He shows how certain minerals such as calcium, magnesium, zinc, silica and fluoride are antagonistic to aluminum. When these essential minerals are in the normal range, excess aluminum is lowered.<sup>15</sup> Dr. G. Tamari, director of Anamol Laboratories at Concord, Ontario, Canada, has studied and reported on similar antagonistic effects of

certain minerals on the absorption of aluminum (Figure 1, below). His lab has analyzed many thousands of human hair samples (including those for this author) and reported on his observations.<sup>16</sup> It was discovered that suboptimal levels of dietary zinc increased aluminum accumulation in the rat brain. Zinc had a more powerful effect than copper, iron or magnesium.<sup>17</sup>

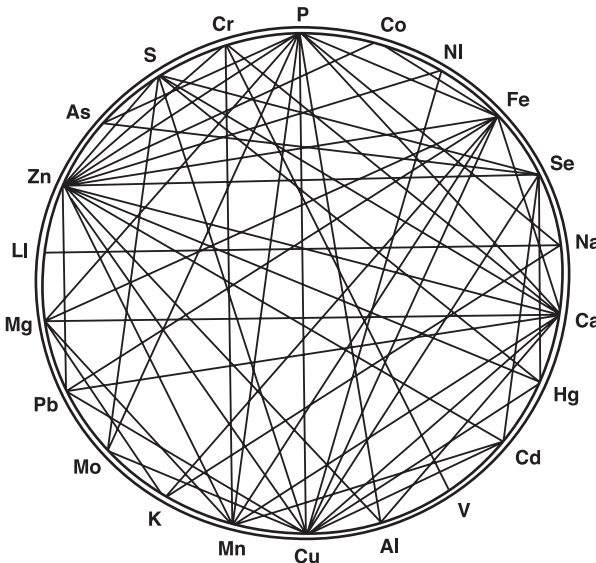
The author commenced doing hair analyses in 1975 and continued until 2001. Results from several thousand samples showed that when the levels of toxic metals such as aluminum were high, the clients were invariably low in one or more essential minerals, such as calcium and magnesium. Once they were brought up to normal by dietary changes and/or supplements, the minerals in toxic range also became normal. Obviously this information could be helpful in the prevention and treatment of AD.<sup>6</sup>

After 1988 the author proceeded to

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Figure 1. Diagrammatic representation of the interaction of minerals and trace elements.

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store a great amount of data in the computer to back up his theories. The paper<sup>4</sup> was based on hair analyses results as well as information gained from completed questionnaires of 1,000 clients during the period 1990 to 1995. His latest paper<sup>6</sup> gives the results of 2000 clients from 1995 to 1999 (Tables 1 & 2). The four most deficient minerals were: chromium (56 %), magnesium (49%), zinc (47%) and calcium (46 %). Figure 1, (p.176) shows that aluminum is antagonistic to both zinc and calcium. An Egyptian and Iranian study of dwarf males indicated that their diets were high in the zinc-binding phytates from unleavened bread and the habit of clay eating (geophagia) in certain rural areas. They were not only small in relation to their age, but lacked sexual development. Hair analysis results revealed very low levels of zinc; when supplemented with this mineral, normal growth and development followed in a few months.<sup>18</sup> A similar antagonistic effect to that of aluminum and zinc exists with aluminum and calcium. Aluminum is capable of displacing physiological divalent ions such as calcium from negative binding sites. This ion exchange is probably the first event in the toxic accumulation of aluminum in the neurodegeneration processes of dementia senilis, Alzheimer's syndrome.<sup>19</sup> Commonly used aluminum-containing antacids induce calcium loss by increased

urinary excretion of calcium, thus resulting in a negative calcium balance.<sup>20</sup>

In earlier times it was believed that the brain operated in relative isolation from the rest of the body. It is now well recognized that it is inextricably connected to every part of the body's nervous system. If it is lacking in nutrients, it will impact negatively on the mind and emotions. In an earlier paper the author listed the most prevalent health conditions. Depression headed the list at 31 % (Table 3, below). This reinforces the fact that mental problems are endemic.<sup>6</sup>

#### Diet and the Prevention of Alzheimer's Disease

It is significant that only a little over one-quarter of the author's latest 2,000 clients were on an adequate diet. This might explain why almost half were on medication. (Table 4, p. 178). The appallingly poor and nutritionally inadequate food choices made by many people in Canada and the United States are shown in Table 5. These items bring transitory pleasure but at a high cost healthwise.<sup>21</sup> (Table 4 and 5 p.178) During the refining of grains and flour, the nutrient-rich germ and bran portions are removed, resulting in a significant loss of vitamins and minerals. When whole wheat is refined to white flour the following percentages of selected vitamins and minerals are lost: vitamin B<sub>6</sub> (72 %), folic acid

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Table 3. Most prevalent health condition associated with high aluminum levels (%).

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Condition	(%)
Depression	31
Allergies	30
Low back pain	24
Arthritis	20
Cardiovascular	18
Digestion	14

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(67%), calcium (60%), magnesium (85%), manganese (86%), copper (68%) and zinc (78%)". It is estimated that about 50% of the average diet of North Americans consists of nutrient depleted sugar and refined grain. It is obvious that a lack of important nutrients required to keep the brain aluminum-free contributes to the high incidence of AD. The popular drink, Coca Cola, is high in orthophosphoric acids. It removes the vitally important calcium needed to keep aluminum at a safe level.<sup>22</sup>

#### Harmful and Essential Fats

The role of fats in human health has undergone a significant change in recent times. The medical establishment has

given fats a negative connotation. Thanks to great pioneers like the late David Horrobin, this attitude is changing for the better as we recognize the vital role fats play in maintaining a healthy body and mind. Figures 2 and 3 (p. 179, 180) show the steps taken by the body to produce the predominantly brain-fats EPA(eicosapentaenoic acid and especially DHA (docosahexaenoic acid). They illustrate how dietary fats and oils affect mental, physical and emotional wellbeing. Trans fatty acids occur when unsaturated oils are heated for long periods, as in deep frying. They also form during hydrogenation processes used in making margarine, shortening and similar prod-

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Table 4. Miscellaneous statistics. (%)

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Information	(%)
Those on a supplement program	70
Those on medication	49
Those on a good diet	28
Average age (years)	49
Female	58
Male	42

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Table 5. Annual consumption of low nutrient foods.

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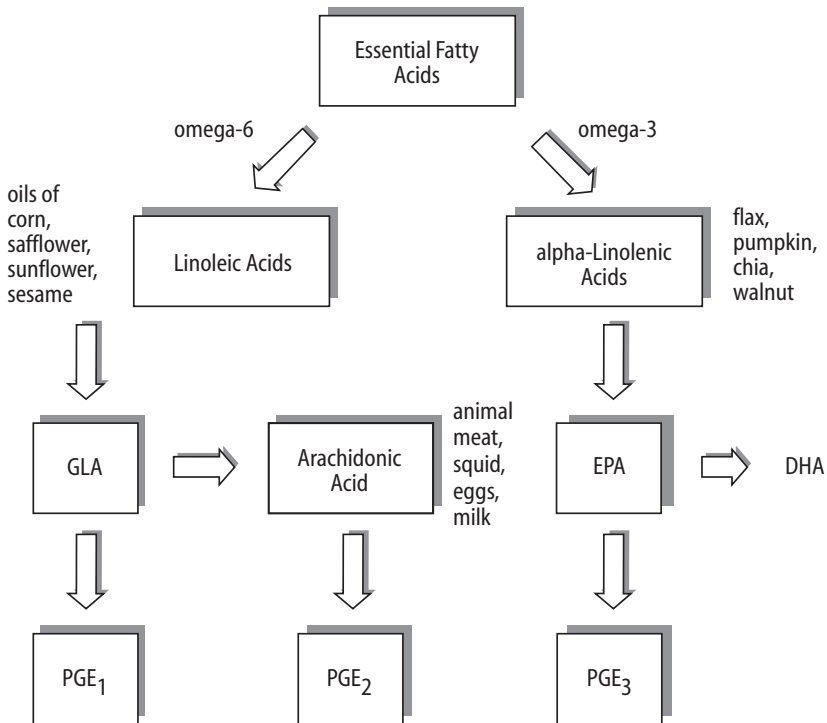
Donuts (number)	756
Cakes and cookies (pounds)	60
Ice cream (gallons)	23
Potato chips (pounds)	7
Candy (pounds)	22
Gum (sticks)	200
Soda pop (servings)	365
fat (pounds)	90
Refined sugar (pounds)	134

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ucts. Deep fried foods contain an abundance of trans fatty acids as do many packaged and highly processed foods. They tend to make cell membranes more rigid and inflexible, and interfere with the normal functional properties of cell membranes. Trans fatty acids are not needed by the brain and have none of the valuable properties of the essential fats

such as DHA. It is now clear that these harmful fats enter the body and become lodged within the cell membranes including in the brain. Westerners tend to over consume saturated fat (primarily from animal sources) and harmful hydrogenated fats. By some estimates the amount of omega 3 (brain) fats has declined by over 80%.

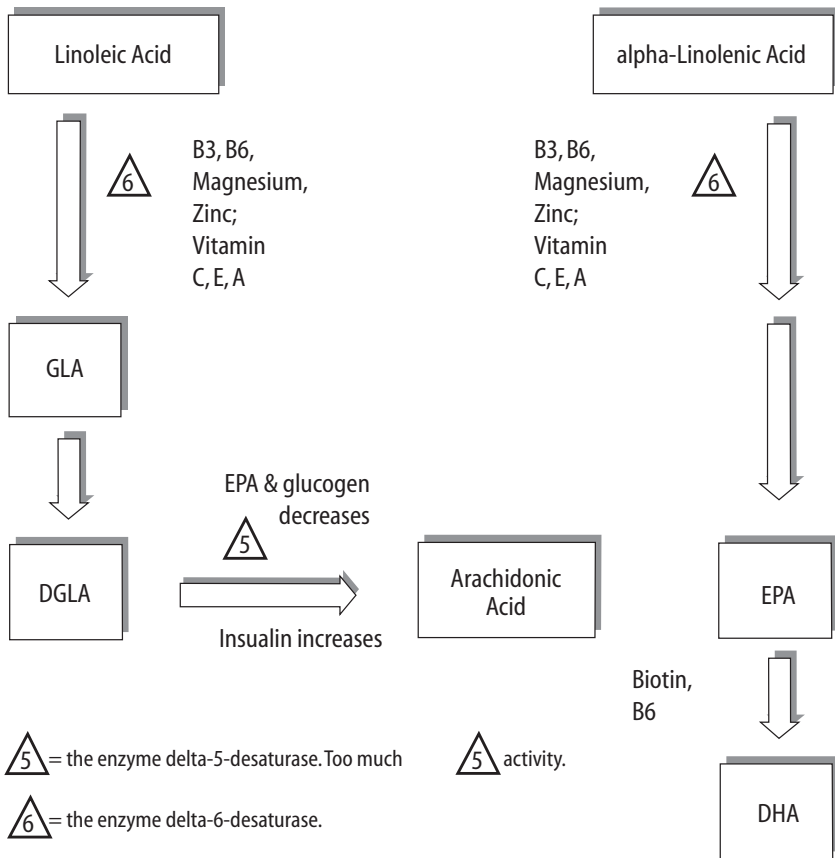
Figure 2. How the brain messengers are formed from fatty acids



Dietary fatty acids are converted into compounds called prostaglandins, leukotrienes, thromboxane, and prostacyclin, which have a tremendous effect on the brain's blood flow. They also affect the brain's immune system and the neurotransmitter system. (Prostaglandins PGE1, 2, 3).

From Smart Fats: *How Dietary Fats and Oils Affect Mental, Physical and Emotional Intelligence* by Michael A. Schmidt, Published by Frog, Ltd., copyright © 1997 by Michael A. Schmidt, (revised and retitled in 2001 as *Brain-Building Nutrition: The Healing Power of Fats & Oils*). Reprinted by permission of author.

Figure 3. Making the enzymes of fatty acid conversion work.



Dietary fatty acids are converted by enzymes into their long-chain products that are ultimately used in forming the brain's structure. The enzymes can be assisted or blocked by many factors.

From *Smart Fats: How Dietary Fats and Oils Affect Mental, Physical and Emotional Intelligence* by Michael A. Schmidt, Published by Frog, Ltd., copyright © 1997 by Michael A. Schmidt, (revised and retitled in 2001 as *Brain-Building Nutrition: The Healing Power of Fats & Oils*). Reprinted by permission of author.

### Recommended Fats

For optimum brain health an adequate supply and ratio of omega 6 and omega 3 fatty acids is required. It is estimated that in earlier times it was approximately 1:1. Unfortunately the ratio is now as high as 30 parts of omega-6 for every one part of omega-3 fatty acids.

Some reasons for this alarming change are:

1. Increased consumption of omega-3 deficient, warm weather oils such as corn, sunflower and sesame.
2. Hydrogenation of oils in commercial processing.
3. Decreased fish consumption.



4. Loss of cereal germ by modern milling practices
5. A 2,500% increase in trans fatty acid intake interferes with fatty acid synthesis. Foods high in trans fatty acids include: French fries, cookies, candy, potato and tortilla chips, cake, mayonnaise, shortening, deep fried foods, corn chips, doughnuts, margarine and most salad dressing.<sup>23</sup>
6. A 250 % increase in sugar intake which interferes with the enzymes of fatty acid synthesis.

### The Importance of DHA

Recently, the public has learned that DHA is the critical long-chain fatty acid so prominent in the brain. It is concentrated in parts of the brain that require a high degree of electrical activity. There are important enzymes necessary for the production of DHA. The following interferes with these enzymes and the ultimate production of DHA in the brain: high dietary or blood cholesterol, high dietary saturated fat, high trans fatty acid intake, stress, alcohol consumption, diabetes, sugar, aging, medication such as aspirin, indomethacin, and ibuprofen, elevated blood glucose or insulin, obesity, smoking and severe fasting.<sup>23</sup>

### The Importance of Phospholipids

Phospholipids are substances that form the "bricks and mortar" of nerve cell membranes. Phospho means they contain the mineral phosphorus. Lipids that they contain fat molecules. The phospholipids of the brain contains DHA and AA ( arachidonic acid ). They are important in protecting nerve membranes from toxic injury and free radical damage. Two common phospholipids are phosphatidylcholine (PC or lecithin) and phosphatidylserine (PS). These are now being used to treat patients for memory-enhancement, depression, attention deficit disorder, schizophrenia, Alzheimer's disease and Down syndrome.<sup>23</sup>

### Guides to Low Fat Intake

1. Keep total fat intake around 20-30 %.
2. Reduce saturated fat
3. Keep unsaturated fat intake at approximately 40 % of total fat.
4. Keep the omega-6 to omega-3 ratio between 1:1 and 3:1.
5. Diet should include nutrients especially Mg, Zn, B<sub>6</sub>, B<sub>3</sub> and vitamin C.
6. Never use unsaturated omega-3 fatty acids, except olive oil, for cooking.

### Recommended Fats and Oil Supplements

The author did a study some years ago on the rancidity of different unsaturated oils. It was discovered that bottled oils such as cod liver, had a degree of rancidity. It was found that this did not occur in any capsulated product. It was concluded that when oil is stored in a capsule, it prevents the entrance of oxygen required for rancidity. Following are recommended fat and oil supplements:

1. ALA (alpha-linolenic-acid ) from flax seed oil : 1-3 teaspoons daily.
2. ALA from flax seed meal: 2-4 teaspoons daily.
3. DHA from fish oil: 200 mg daily.
4. GLA from borage or evening primrose oil.
5. Vitamin E: 50-400 IU. daily.<sup>23</sup>

### Conclusion

Plant scientists began analyzing soil, water and plant tissue more than a hundred years ago. Yet most nutritionists and the medical establishment are still skeptical about such an accurate procedure as hair analysis and the critical importance of minerals in human health. Fortunately, this attitude is changing.

Food preserving has been practiced since ancient times by smoking, salting, fermenting and sun drying. Processing began in France around 1800 when food-canning was invented. The introduction of the steel roller in 1860 was the beginning of white-flour products. It was more afford-

able and became widely popular in the Western world. Refined sugar became available about the same time. Today sugar consumption in North America is nearly 20 times higher than in the early 1800s. Acid rain has greatly increased the mobility of aluminum and its levels in soil water and drinking water. Oil refining commenced in the 20th century. The percentage of processed unnatural fats in the form of margarine, vegetable shortening and other refined oils increased by 400%. The rampant increase in obesity, diabetes, cardiovascular disease, AD and other degenerative conditions reflects the damaging effects of a diet based on nutritionally deficient refined foods. In his article, "Can Aluminum Cause Alzheimer's Disease," Mervyn Werbach makes the following statement:

"Although the aluminum/Alzheimer's link remains unproven, I believe that waiting for definitive proof before taking a few easy and protective measures is foolhardy—and more scientists are starting to agree. Perhaps one person in 10 age 65 or older suffers from dementia, by age 80 that figure rises to one in five. This is too common an illness to ignore preventive measures until we can know for certain why it develops." The author fully agrees with Dr. Werbach.

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