

ESSAY REVIEW

Unfathomed Dangers from Aluminum— Alzheimer’s? Autism? Multiple Sclerosis?

Imagine You Are an Aluminum Atom: Discussions with Mr. Aluminum by Christopher Exley. Skyhorse, 2020. 151 pp., \$22.99. ISBN 978-1510762534. Kindle, 14.99.

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That aluminum is fatally toxic is beyond doubt, demonstrated by mass human poisoning at Camelford in Cornwall in Britain in 1988 (Chapter 18) and by occasional fish kills (p. 49). Aluminum may also be a contributing factor in a number of human diseases, in particular those involving brain and nerves (p. 124)—autism, Alzheimer’s disease (AD) (Chapter 14), Parkinson’s disease, multiple sclerosis. Aluminum salts used in kidney dialysis may be responsible for dialysis-related encephalopathy (pp. 38, 79).

Aluminum adjuvants in vaccine can cause macrophagic myofasciitis (MMF: inflammation and associated microscopic muscle necrosis at the injection site) as well as such whole-body ailments as chronic fatigue syndrome and marked cognitive deficits (Rigolet et al. 2014); one middle-aged individual injected with five aluminum-adjuvanted vaccines within 4 weeks became work-disabled (pp. 72–73).

Studying the possible dangers associated with aluminum adjuvants in vaccines is complicated by the fact that aluminum acts as an antigen as well as an adjuvant—the immune system generates antibodies

against aluminum itself, so that later exposures to aluminum might produce an antibody cascade capable of damaging any of the tissues in which aluminum had accumulated (pp. 73–76).

Christopher Exley has studied aluminum in relation to human health for some 35 years. This book summarizes his work and cites the pertinent primary publications (some 200) in appropriate peer-reviewed journals. The book also offers quite convincing evidence of the determined efforts by a variety of vested interests to disparage and suppress Exley's work and findings.

In my opinion, the published work summarized in this book makes a plausible case based on empirical evidence that aluminum may be a contributing causative factor in neurological and nerve diseases. Further, Exley suggests fully detailed mechanisms that are quite plausible for how that comes about. Beyond that, he points to a fundamental *a priori* reason why aluminum, among all the other elements and metals, might be so uniquely dangerous. It is the third most abundant element in the Earth's crust (after oxygen and silicon), yet there are no known biological uses of aluminum. By contrast, several other metals and non-metals are essential components of some biological systems, for example, iron in hemoglobin in blood (pp. 5–6, 11). Those two facts make it far from implausible that absorption of aluminum could be biologically harmful, by competing with or replacing other metals, or perhaps just because of its chemically oxidative properties.

But if all that is so, how has the Earth's biosphere flourished for billions of years without succumbing to the toxicity of the super-abundant aluminum?

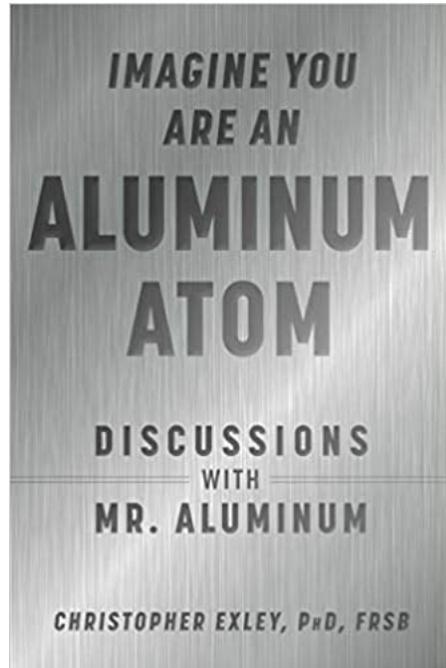
Because naturally occurring aluminum is stored safely in ores not accessible to the animal kingdom. Only since 1889, with the invention of a process for extracting aluminum from its ores (p. 9)—the beginning of what Exley calls "The Aluminum Age"—have innumerable compounds of aluminum been manufactured and used in ways that expose human bodies to aluminum in a variety of chemical forms as well as to the metal itself. Because exposure of the biosphere to aluminum began so recently on the geological and evolutionary timescales, natural selection has not evolved biological mechanisms for protecting living systems against aluminum (p. 6 ff.).

Much of the evidence for the dangers from aluminum is inevitably

somewhat circumstantial, since experimentation on human subjects is not possible and there are no suitable animal models. There are also significant technical problems (chapter 5). Even establishing how much aluminum is present in human bodies rests on assumptions about how the element is distributed through various organs and how it enters the body. It remains unknown whether aluminum in urine is a reliable measure of the body burden, or whether the amounts of aluminum in hair or in the blood or in skin tissue represent sound

estimates of the body burden. A further complication is that exposure to aluminum can only be estimated, involving a range of assumptions, because it comes from such diverse sources as food, cosmetics, and drugs. One particularly dangerous potential source is the aluminum adjuvant present in a number of vaccines; and investigating that last aspect is hindered not only by the technical difficulties but also because that possibility is anathema to the pharmaceutical industry as well as to the aluminum industry.

That powerfully influential vested interests have attempted to hinder Exley's work is demonstrably, sadly, dismayingly true. That will of course seem quite normal to any other researchers who take minority stances on any scientific matter at all (Bauer, 2012). Thus Exley was attacked viciously (pp. 2–3; p. 132 ff.) by the legions of individuals and groups who label as “anti-vaxxer denialist” anyone who suggests that any vaccine might occasionally have damaging “side” effects—even though his article about aluminum in autistic brains had only a single by-the-way mention of a possible relationship: “Paediatric vaccines that include an aluminum adjuvant are an indirect measure



of infant exposure to aluminum and their burgeoning use has been directly correlated with increasing prevalence of ASD.”

The saddest illustration of the campaigns against Exley’s research is the manner in which his own university tried to prevent support of his research by outside donors (p. 142 ff.), after changes in the university administration coincided with funding to the university from the Gates Foundation and from a British pharmaceutical company.

The strongest evidence for Exley’s claims about harms from aluminum comes from brain tissues from deceased individuals who had suffered from AD or autism: Those brains contain unusually high amounts of aluminum (pp. 81–83, 84, 100); by contrast, normal brain tissues did not contain appreciable amounts of aluminum. There is corresponding circumstantial *negative* evidence as well: Control brain tissues from individual donors who did *not* die with a diagnosis of AD, Parkinson’s, multiple sclerosis, or autism have only low amounts of aluminum (p. 94). Furthermore, the first reported case of familial AD came within two decades of the beginning of the Aluminum Age (p. 101); and at least one case report is of early onset AD in an individual occupationally exposed to aluminum (p. 28).

There are indications that genetic predisposition to Down’s syndrome and familial AD (p. 100) may also predispose to absorption and accumulation of aluminum; perhaps those diseases would not manifest even in those genetic circumstances in the absence of aluminum (p. 27)?

Aluminum does seem to accumulate in the body over time even absent of neurological diseases (p. 25). Acidic soils facilitate uptake of aluminum by plants whose products enter the human diet via tea, coffee, soy products (p. 36). Aluminum salts are very cheap, and they are used in food processing to improve texture and color. Aluminum also gets into food via cans and other packaging material, and too much is present in many infant formulas (pp. 65–66).

There are no evidence-based guidelines, let alone regulations, as to aluminum in food. The European Food Standards Agency regards 1 mg of aluminum per kg of body weight per week as safely tolerable, but Exley regards this as *intolerable*, pointing out that it is based on only a few studies in animals (pp. 30–31). In Bavaria, pretzels were once toxically contaminated by aluminum owing to the use of sodium

hydroxide in conjunction with aluminum baking trays.

Human skins are exposed to appreciable amounts of aluminum compounds in antiperspirants, sunscreens, and other cosmetics (pp. 14, 39). Smoking tobacco leads to ingestion of aluminum (p. 42). Aluminum-based antacids have actually been suggested to be risk factors for AD (p. 37).

But perhaps the most clearly and directly dangerous aluminum compounds are the adjuvants in some vaccines (p. 68); aluminum adjuvants have the advantages of being cheap, sufficiently but not too toxic, and unregulated (p. 85). As the vaccine is created, the amount of aluminum is continually increased until the vaccine yields the desired antibody response. That adjuvants can cause harm is suggested by Merck's Gardasil anti-HPV vaccine which produces 24,000 instances of injury for every 1 million injections (p. 85). But the dangers of aluminum adjuvants are not revealed in safety trials because the controls include adjuvant rather than being genuinely inactive placebos (pp. 69, 85).

Thus Exley gives the clear impression that he regards aluminum as a modern Satan: an omnipresent evil. "The chances of being overloaded with aluminum are actually quite high" (p. 89). The book ranks aluminum as a significant risk factor (p. 90) for anemia, asthma, autoimmune conditions, breast cancer (Chapter 15), chronic fatigue syndrome, epilepsy, Gulf War Illness, multiple sclerosis (Chapter 16), Parkinson's disease, problems with fertility and reproduction, vascular disease. "If I could remove all aluminum from my body, I would expect an overall increase in vitality" (p. 91); "We now know that Alzheimer's disease can be prevented [by eliminating aluminum]" (p. 103).

All this seems excessive, but elsewhere in the book Exley makes clear that he is offering his own convictions, acknowledging that the objective evidence is not yet conclusive; he insists only that the case is strong enough to warrant further research.

Unfortunately, despite that disclaimer, the book's mode of presentation makes it easy to accuse Exley of "protesting too much" in seeing dangers from aluminum everywhere. Skeptical readers may find too much speculation based on too little hard evidence; for example, "there are sufficient indications across scientific literature to suggest that its [aluminum's] effects [on human reproduction] are more widespread than currently acknowledged" (p. 61), raising the question

whether human exposure to aluminum could be a contributing factor in the lower sperm count in men in the developed world (p. 62). Or, that “burgeoning childhood allergy” may be “linked to increasing everyday exposure to aluminum” (p. 70) since infants are exposed to aluminum through infant formulas, baby powder, and antacids. The colorings in children’s sweets often contain aluminum compounds; perhaps it is the aluminum in the sweets rather than the sugar that may play a role in “abnormal behavior such as Attention Deficit Hyperactivity Disorder (ADHD)” (p. 71).

The documented information provided by this book should be of interest to everyone, but Exley does not make the best case for himself—far from an uncommon problem with researchers who take a path not trodden by others and whose work is perpetually hindered by powerful vested interests. The book’s publisher could and should have improved the presentation greatly through competent copyediting. The book’s ridiculous title hardly entices an average reader: *Aluminum as Cause of Alzheimer’s?* (say) would surely have attracted more media attention and book sales. The absence of an index is inexcusable. The lack of a glossary is frustrating: that aluminum in hair could be measured “using either TH GFAAS or ICP MS” (p. 20) is not very illuminating if one has no idea what TH GFAAS or ICP MS are.

A good copyeditor would also have reduced the number of repetitive complaints about a “hostile and nonscientific background of ill-found criticism” (p. 77), or naming fairly prominent individuals as aluminum ambassadors “who have accepted the 40 pieces of silver that are always on offer” (p. 97), or similar grouches (pp. 86, 98, 110, 125, and more). Not that these words and sentiments are unjustified; they are quite justified. Exley is quite typical of researchers who push minority views and cannot get proper satisfaction in the face of official misdeeds, not only rank suppression but failing to disclose conflicts of interest on the part of Journal editors (p. 129) who also simply ignore substantive critiques of articles they published (p. 141). However, these repetitive complaints just preach to the choir, hardly a strategy for encouraging initially unbiased readers to look carefully at the body of rather solid evidence for the central substantive claims in the book.

A competent copyeditor would also have eliminated or had

clarified a few points where the text is unclear or even seems wrong: If “dwarf thistles are identical species to . . . tall thistles,” how can the “former have a different genetic makeup”? (p. 112). Again, to claim that “world class computational chemistry” has “proven both the existence and pro-oxidant activity” of aluminum dioxide (p. 114) even though “it remains to be identified directly in any biological milieu” surely places too much confidence on empirically untested theory. “Is it only a coincidence that those countries in the world using the most sunscreen have the highest incidence of melanoma?” (p. 16)—perhaps not; but that would not necessarily indict the aluminum in sunscreen, the cause might well be the unusually high exposure to sun rays that brings high use of sunscreen.

The most striking claim in this book is that aluminum can be eliminated from the body by drinking silicon-rich mineral water (Chapter 9), and that AD (and perhaps autism and other aluminum-caused ailments) can be cured in this way (p. 103). This belief originated as anecdotal evidence published by Exley and his mentor in 1989: The toxicity of aluminum to fish appeared to be eliminated in silicon-rich acid waters (Birchall et al. 1989). Additional circumstantial evidence comes from a small trial in which drinking silicon-rich mineral water facilitated urinary elimination of aluminum in individuals diagnosed with AD; most remarkably, significant improvement of cognitive abilities in people with AD was reported in 20% (3 of the 15 participants) after they drank, for 12 weeks, 1.5 liters per day of silicon-rich mineral water (p. 55). The book also claims “positive reports” of benefits of silicon-rich mineral water “in relation to Alzheimer’s disease, multiple sclerosis, autism, epilepsy, and vaccine injury” (pp. 58–59).

This reader’s skepticism was aroused, however, by the book’s caution that “there are no effective alternatives to natural silicon-rich mineral waters” and that silicon and silica supplements sold in health stores have not been shown to facilitate removal of aluminum from the body (pp. 57–58). But silicic acid is just an ordinary chemical substance. This book describes its origin as from leaching of the Earth’s silicon-rich crust by rain (p. 52). I cannot understand why silicic acid could not then be synthesized from silicon materials by leaching with acidic water, thereby avoiding the difficulties Exley describes in obtaining mineral waters for his research (pp. 54–55) and his apparent current

reliance on the surely expensive importing of proprietary mineral water from Malaysia. I could not readily believe that synthesis of silicic acid for research by Exley requires “sophisticated laboratory equipment” and that it is difficult to make it “biologically safe” (p. 58): How biologically safe is natural, silicon-rich mineral water commercially bottled in Malaysia?

This book’s claims about AD, autism, and other ailments in possible connection to aluminum should be considered by everyone. Further research is desperately needed.

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