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Correction to some statements about aluminum in Sulaiman et al.

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I am addressing the following statements in Sulaiman R, Wang M, Ren X. 2020. Exposure to aluminum, cadmium, and mercury and autism spectrum disorder in children: A systematic review and meta-analysis. *Chem. Res. Toxicol.* Published ASAP, September 29, 2020.

- “Environmental levels of Al vary depending on location and weather, with industrial cities recording air concentrations up to 3 mg/m³.” The cited reference ¹ states: “In general, background levels of aluminum in the atmosphere are low, typically ranging from about 0.005 to 0.18 µg/m³. Much higher levels are routinely observed in urban and industrial locations. A mean aluminum concentration of 474.6 ng/m³ (range 38.4–2,619.6 ng/m³) was reported in particulate matter collected in air from downtown Rio de Janeiro, Brazil.” 2,619.6 ng/m³ would round up to 3 µg/m³, not mg/m³.
- “The FDA has no limits on the amount of Al in foods or medicines”.
 - There is a limit to the amount of aluminum in biologics, such as vaccines. The amount of aluminum in the recommended individual dose of a biological product shall not exceed: (1) 0.85 milligrams if determined by assay; (2) 1.14 milligrams if determined by calculation on the basis of the amount of aluminum compound added; or (3) 1.25 milligrams determined by assay. 21CFR610.15
<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=610.15>
 - There are limits to aluminum in large and small volume parenterals used in total parenteral nutrition. The aluminum content of large volume parenteral (LVP) drug products used in total parenteral nutrition (TPN) therapy must not exceed 25 micrograms per liter. ... the maximum level of aluminum present at expiry must be stated on the immediate container label of all small volume parenteral (SVP) drug products and pharmacy bulk packages (PBPs) used in the preparation of TPN solutions. 21CFR201.323
<https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=201.323>
- “The body burden of Al is difficult to measure because most of it is stored in bone and the brain”. Normal human tissue aluminum levels are 1.0, 1.2, 2.2, 2.6, 3.3, 4.1, and 43 mg/kg in heart, muscle, brain gray matter, spleen, bone, liver, and lung ². Based on organ weights, ~ 54% of aluminum is in the skeleton and 1% in the central nervous system ³.
- “Al in blood binds to albumin”. Approximately 90% of aluminum in plasma is bound to transferrin. Most of the remainder is bound to citrate ^{4,5}.

References:

¹ ATSDR (Agency for Toxic Substances and Disease Registry). (2008) Toxicological profile for aluminum. US Department of Health and Human Services, Public Health Service, Agency of Toxic Substances and Disease Registry, 357 pages.
<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=191&tid=34>

² Alfrey AC. 1983. Aluminum. *Advances in Clinical Chemistry* 23: 69-91.

- ³ Priest ND. 2004. The biological behaviour and bioavailability of aluminium in man, with special reference to studies employing aluminium-26 as a tracer: review and study update. *Journal of Environmental Monitoring* 6: 375-403.
- ⁴ Martin RB, Savory J, Brown S, Bertholf RL, Wills MR. 1987. Transferrin binding of Al³⁺ and Fe³⁺. *Clinical Chemistry* 33: 405-407.
- ⁵ Yokel RA, McNamara PJ. 2001. Aluminum toxicokinetics: An updated mini-review. *Pharmacology and Toxicology* 88: 159-167.