CYREX Laboratories

CLINICAL SPECIFICATIONS

ALUMINUMS

Chemical Found In:

Aluminum or aluminium is a chemical element with symbol Al and atomic number 13. A ductile metal in the boron group, it is a silvery-white, soft and nonmagnetic. Aluminum is the third most abundant element after oxygen and silicon and the most abundant metal in the Earth's crust.

Sources:

https://www.atsdr.cdc.gov/phs/phs.asp?id=1076&tid=34; https://www.osha.gov/SLTC/metalsheavy/

Known Cross-Reactions:

Clinical Significance:

Metals such as aluminum are known to cause toxicity to the brain and other organs and have been linked to numerous neurodegenerative disorders, including Alzheimer's disease (AD). A recent study,[1] found colocalization of aluminum and iron in the nuclei of nerve cells in brains from patients with AD, with the highest levels found in the nucleoli of nerve cells. In vitro studies have shown that aluminum together with other metals is involved in the formation of amyloid beta (Aβ) protein aggregation, which leads to amyloid fibrils and the formation of amyloid-like plaque structure.[2] Aluminum can change the structure of human proteins, causing them to misfold into a structure similar to amyloid peptide; consequently, the antibodies made against $A\beta_{42}$ and the antibodies made against aluminum bound to human tissue bind to each other and contribute to aggregation.[2] The detection of antibodies to aluminum bound to human protein in serum indicates a breakdown in immunological tolerance and induction of chemical intolerance. Aluminum or its metabolites can bind to human tissue proteins and form neo-antigens. These new antigens are comprised of the haptenic chemical plus the tissue antigen. The formation of neo-antigens initiates an immune response which may result in antibody production against the chemical and the human tissue. Continued exposure to the chemical and the subsequent production of antibodies against various tissue antigens may result in increased risk for cognitive decline when the blood-brain barrier is breached.

Persons with antibodies to aluminum bound to human protein in serum should avoid exposure to the substance.

Suggested Reading:

1. Yumoto et al. Colocalization of aluminum and iron in nuclei of nerve cells in brains of patients with Alzheimer's disease. J Alzheimer Dis, 2018; 65:1267-1281.
2. Vojdani and Vojdani. Immunoreactivity of anti-AβP-42 specific antibody with toxic chemical food antigens. J Alzheimers Dis Parkinsonism, 2018; 8(3):1-11.
3. Chen et al. Manufactured aluminum oxide nanoparticles decrease expression of tight junction proteins in brain vasculature. J Neuroimmune Pharmacol, 2008; 3(4):286-295.
4. Exley. Aluminum should now be considered a primary etiological factor in Alzheimer's disease. J Alzheimer's Dis Rep, 2017; 1:23-25.
5. Exley. Human exposure to aluminium. Environ Sci Processes Impacts, 2013; 15:1807.
6. Gherardi et al. Macrophagic myofasciitis lesions assess long-term persistence of vaccine-derived aluminium hydroxide in muscle. Brain, 2001; 124:1821-1831.
7. Kawahara and Kato-Negishi. Link between aluminum and the pathogenesis of Alzheimer's disease: the integration of the aluminum amyloid cascade hypotheses. Int J Alzheimers Dis, 2011; 2011:27693.
8. Krewski et al. Human health risk assessment for aluminium, aluminium oxide, and aluminium hydroxide. J Toxicol Environ Health B Crit Rev, 2007; 10(Suppl 1):1-269.
9. Perricone et al. Autoimmune/inflammatory syndrome induced by adjuvants (ASIA) 2013: unveiling the pathogenic, clinical and diagnostic aspects. J Autoimmunity, 2013; 47:1-16.
10. Tomljenovic and Shaw. Mechanisms of aluminum adjuvant toxicity and autoimmunity in pediatric populations. Lupus, 2012; 21:223-230.
11. Watad et al. Autoimmune/Inflammatory syndrome induced by adjuvants and thyroid autoimmunity. Front Endocrinol, 2017; 7:150.
12. Zhao et al. Aluminum-induced amyloidogenesis and impairment in the clearance of amyloid peptides from the central nervous system in Alzheimer's disease. Front Neurol, 2014; 5:167.