

CLINICAL SPECIFICATIONS

ETHYL + METHYL MERCURY

Chemical Found In:

Mercury (Hg) is a heavy chemical element that is emitted into the air by human activities, such as manufacturing or burning coal for fuel, and from natural sources, such as volcanoes. It is deposited, via ecosystem transport, into lakes and oceans, where it bioaccumulates in fish. According to the US EPA, "nearly all methylmercury exposures in the U.S. occur through eating fish and shellfish."¹ In addition, mercury is used in thermometers, barometers, float valves, mercury switches, and other devices where exposure can occur with device breakage. It is also found in dental amalgams, energy-efficient light bulbs, and is used in scientific research applications.

Sources:

<https://www.epa.gov/mercury/how-people-are-exposed-mercury>

<https://www2.usgs.gov/themes/factsheet/146-00/>

Known Cross-Reactions:

Clinical Significance:

Mercury by itself does not initiate an immune response, but mercury bound to human tissue may be recognized by the immune system and result in the production of antibodies against both mercury and human tissue antigens.^{2,3} In the pathogenesis of Alzheimer's disease, mercury binds to human tissue protein, misfolding it into a structure similar to amyloid beta. Antibodies against this structure are produced and circulate in the blood. If the blood-brain barrier is breached, these anti-mercury antibodies can bind to amyloid beta and thereby contribute to amyloidogenesis.³ Mercury ions bind to tubulin, inhibiting guanosine triphosphate (GTP) nucleotide binding capacity and reducing its biological activity, leading to microtubule degeneration.⁴ Mercury has been reported as a risk factor for Alzheimer's disease due to its well-known neurotoxicity.⁵ In vitro and animal studies have shown that mercury causes hyperphosphorylation of tau protein and increased formation of A β P aggregation.^{reviewed in 5} Chronic mercury exposure can induce oxidative stress, which may lead to neuroautoimmunity.^{reviewed in 6} It may also cause the introduction of self-antigens to antigen presenting cells, resulting in the breakdown of T-cell tolerance, which may lead to autoimmunity.^{2,3}

Suggested Reading:

1. <http://www.epa.gov/hg/exposure.htm>
2. Ong et al. Mercury, autoimmunity, and environmental factors on Cheyenne River Sioux tribal lands. *Autoimmune Dis*, 2014; 2014: article ID 325461.
3. Vojdani and Vojdani. Immunoreactivity of anti-A β P-42 specific antibody with toxic chemical food antigens. *J Alzheimers Dis Parkinsonism*, 2018; 8(3):1-11.
4. Haley. The Relationship of the toxic effects of mercury to exacerbation of the medical condition classified as Alzheimer's disease. *Medical Veritas*, 2007; 4:1510-1524.
5. Mutter et al. Does inorganic mercury play a role in Alzheimer's disease? A systematic review and an integrated molecular mechanism. *J Alzheimers Dis*, 2010; 22:357-374.
6. Havarinasab and Hultman. Organic mercury compounds and autoimmunity. *Autoimmun Rev*, 2005; 4:270-275.