CYREX® Laboratories

## CLINICAL SPECIFICATIONS

# PHTHALATES

### Chemical Found In:

Long-chain, high molecular weight phthalates such as Diisononyl Phthalates (DINP), Diisodecyl Phthalates (DIDP) and Dipropyl Phenyl, or Di-n-propyl, Phthalates (DnPP) are commonly used to give flexibility in polyvinyl chloride (PVC) plastics. Considerable amounts of phthalates are found in consumer products such as construction materials, electrical wires and cables, automotive parts, clothing, and furniture. Many food and drink containers have phthalates in them and thus, the chemicals may leach into the food or drink product.

### Sources:

https://www.epa.gov/sites/production/files/2015-09/documents/phthalates_actionplan_revised_2012-03-14.pdf

https://web.archive.org/web/20150216193447/http://oehha.ca.gov/prop65/prop65_list/files/P65single012315.pdf

https://www.osha.gov/dts/chemicalsampling/data/CH_235470.html

### Known Cross-Reactions:

### Clinical Significance:

Phthalates or their metabolites, by binding to human tissue, form neoantigens. In individuals exposed to phthalates, immune response against these neoantigens results in the production of antibodies against both phthalates and human tissue. The detection of antibodies to Phthalates bound to human protein in serum indicates a breakdown in immunological tolerance and the induction of chemical intolerance. In the pathogenesis of Alzheimer's disease (AD), Phthalates bind 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-phthalate antibodies can bind to amyloid beta and thereby contribute to amyloidogenesis.[1] Prenatal exposure to phthalates was shown to be associated with poor cognition and social impairment mainly in girls, who are more vulnerable to the neurotoxic effects of phthalates than boys.[2] Phthalates have also been shown to significantly inhibit the activity of acetylcholinesterase, and upregulate myelin basic protein (MBP) and glial fibrillary acidic protein (GFAP) in a zebra fish model.[3] It was observed that prenatal exposure to phthalates caused cognitive dysfunction and an increase in tau protein phosphorylation in rats.[4,5]

Persons with antibodies to Phthalates bound to human protein in serum should avoid exposure to the substance in order to prevent AD and other neurodegenerative disorders.

### Suggested Reading:


1. Vojdani and Vojdani. Immunoreactivity of anti-AβP-42 specific antibody with toxic chemical food antigens. J Alzheimers Dis Parkinsonism, 2018; 8(3):1-11.
2. Braun et al. Impact of early-life bisphenol an exposure on behavior and executive function in children. Pediatrics, 2011; 128:873-882.
3. Xu et al. Effects of di-n-butyl phthalate and diethyl phthalate on acetylcholinesterase activity and neurotoxicity related gene expression in embryonic zebrafish. Bull Environ Contam Toxicol, 2013; 91:635-639.
4. Sun et al. Perinatal exposure to di-(2-ethylhexyl)-phthalate leads to cognitive dysfunction and phosphor-tau level increase in aged rats. Environ Toxicol, 2014; 29:596-603.
5. Vaiserman A. Early-life exposure to endocrine disrupting chemicals and later-life health outcomes: An epigenetic bridge? Aging Dis, 2014; 5:419-429.
6. Calafat et al. Selecting adequate exposure biomarkers of diisononyl and diisodecyl phthalates: data from the 2005–2006 National Health and Nutrition Examination Survey. Environ Health Perspect, 2011; 119:50-55.
7. Koch and Calafat. Human body burdens of chemicals used in plastic manufacture. Phil Trans R Soc B, 2009; 364:2063-2078.
8. Lington et al. Chronic toxicity and carcinogenic evaluation of diisononyl phthalate in rats. Fundam Appl Toxicol, 1997; 36(1):79-89.
9. Ma et al. Cognitive deficits and anxiety induced by diisononyl phthalate in mice and the neuroprotective effects of melatonin. Sci Rep, 2015; 5:14676.
10. Saravanabhavan and Murray. Human biological monitoring of diisononyl phthalate and diisodecyl phthalate: a review. J Environ Pub Health, 2012; 2012:810501.