

Neurologic & Mental Health

Contextualizing toxic metal exposure in patients with cognitive, behavioral, sensory, and mood concerns.



Many patients with memory problems, mood changes, or behavior concerns don't get a clear answer from routine testing. Toxic metals like lead, mercury, and arsenic can affect how the brain works—disrupting focus, mood, and nerve signaling.^[1,2,3,9] Heavy metals testing measures whether exposure to these metals may be playing a role, giving clinicians one more piece of the puzzle when symptoms are hard to explain.^[2,6,9]



When Might Providers Consider Heavy Metals Testing

Cognitive or executive function complaints — Poor concentration, slowed processing, or brain fog.^[1,2,3]

Neurodevelopmental or behavioral concerns in children — Attention dysregulation, impulsivity, learning difficulty, or behavioral dysregulation.^[1,2,4]

Sensory processing or sensorimotor differences — Sound/light sensitivity, poor coordination, or balance difficulty—particularly in neurodevelopmental presentations where prenatal or early-life exposure is possible.^[2,7,9]

Mood and self-regulation symptoms — Irritability, emotional lability, low mood, anxiety, or stress intolerance.^[6]

Autonomic or stress-response instability — Orthostatic complaints, palpitations, exercise intolerance, headaches, or episodic dizziness clustering with cognitive-mood-sensory symptoms.^[8,9,10]

What Heavy Metals Testing Measures

Analyte Class	Analytes (select examples)	Neurologic Relevance
Lead (Pb)	Older paint and plumbing, contaminated soil, imported ceramics, some herbal supplements ^[1,2]	Most extensively studied metal in pediatric neurotoxicology; associated with reduced IQ, attention deficits, and behavioral dysregulation even at low levels ^[1,2,4]
Mercury (Hg)	Large fish (tuna, swordfish), dental amalgam, occupational exposure, some skin-lightening products ^[3,8]	Has been associated with cognitive complaints, mood instability, and altered heart rate variability; affects synaptic and autonomic signaling pathways ^[3,8,9]
Arsenic (As)	Groundwater, rice and rice-based foods, pressure-treated wood, some seafood ^[3]	Linked to cognitive and neurodevelopmental effects in children; mechanistic evidence for oxidative stress and mitochondrial disruption ^[2,3,9]
Cadmium (Cd)	Cigarette smoke, contaminated produce and grains, occupational dust inhalation ^[6]	Has been associated with depressive symptom patterns and anxiety in observational studies; may interact with dopaminergic and oxidative pathways ^[3,6,10]
Manganese (Mn)	Welding fumes, contaminated well water, some infant formulas, dietary excess ^[3]	Excess manganese exposure has been associated with neurobehavioral effects and dopaminergic disruption; relevant to both pediatric and occupational contexts ^[3,9,10]

Clinical Applications & Evidence Context

Condition	Clinical Encapsulation
ADHD / Attention & Executive Dysfunction	Lead exposure has the most established association with attention dysregulation and executive function impairment in children, supported by systematic reviews. ^[1,2,4]
Autism Spectrum Disorder (ASD)	Emerging literature supports an association between certain toxic metals and ASD-related patterns. ^[5]
Depression & Anxiety Disorders	Cadmium and lead exposures have been associated with depressive symptom patterns in observational studies; with notable confounding from smoking and socioeconomic factors. ^[6]
Cognitive Decline / Alzheimer's Disease	Metal neurotoxicity mechanisms—including amyloid processing disruption, tau-related signaling, and chronic neuroinflammation—support mechanistic plausibility for cognitive decline associations. ^[9,10,11]
Parkinson's & Neurodegenerative Syndromes	Chronic metal exposure is biologically plausible in models of oxidative injury, mitochondrial dysfunction, and glial dysregulation; selective epidemiologic signals exist. ^[9,10,11]
Sensory Processing & Neurodevelopment	Low-level prenatal lead exposure has been associated with altered auditory brainstem and visual maturation measures; broader heavy metal exposure is associated with adverse sensory and motor neurodevelopmental outcomes. ^[2,7,9]
Autonomic & Stress-Response Instability	Mercury exposure has been linked to changes in heart rate variability and resting heart rate in adolescents, suggesting neurotoxic and vascular interactions relevant to autonomic symptom clusters. ^[8,9]
Neuroimmune / Neuroinflammatory Overlap	Several measured metals are implicated in astrocyte activation, cytokine signaling, blood-brain barrier effects, and epigenetic regulation of neurotoxic responses—supporting mechanistic plausibility when neurologic symptoms co-occur with systemic inflammatory patterns. ^[9,10,11]

How Heavy Metals Testing Supports Clinical Reasoning

Adds exposure context

When the standard workup is incomplete, inconclusive, or does not account for environmental contributors ^[2,3,9]

Supports hypothesis generation

About toxic metal burden as a biologically plausible contributor to cognitive, mood, sensory, or autonomic symptom patterns ^[3,6,9]

Identifies metals

Linked to neuro-development, attention, mood, cognition, and neurologic function in the peer-reviewed literature ^[1,2,4,9,10]

Guides clinical reasoning

Especially when symptoms cluster across domains, fluctuate over time, or occur in the context of a plausible exposure history ^[2,3,9,11]

How to Order

To order the Heavy Metals Testing, contact your Mosaic Diagnostics representative or visit [www.mosaicdx.com]. Specimen collection kits and requisition forms are available through your account portal. For clinical support or interpretation questions, contact our clinical education team.

This document is intended for licensed healthcare professionals and is for informational and educational purposes only. The test results are not intended to diagnose, treat, cure, or prevent disease. All clinical interpretation should be done by a qualified healthcare professional in the context of the individual patient. Statements regarding associations between health symptoms and conditions do not constitute diagnostic claims.

References

1. Heidari S, et al. The effect of lead exposure on IQ test scores in children under 12 years: a systematic review and meta-analysis of case-control studies. *Syst Rev*. 2022;11(1):106.
2. Heng YY, et al. Heavy metals and neurodevelopment of children in low and middle-income countries: a systematic review. *PLoS One*. 2022;17(3):e0265536.
3. Karri V, Schuhmacher M, Kumar V. Heavy metals (Pb, Cd, As and MeHg) as risk factors for cognitive dysfunction: a general review of metal mixture mechanism in brain. *Environ Toxicol Pharmacol*. 2016;48:203-213.
4. Farmani R, et al. Exploring the link between toxic metal exposure and ADHD: a systematic review of Pb and Hg. *J Neurodev Disord*. 2024;16(1):44.
5. Ding M, et al. Association between heavy metals exposure (cadmium, lead, arsenic, mercury) and child autistic disorder: a systematic review and meta-analysis. *Front Pediatr*. 2023;11:1169733.
6. Cybulska AM, et al. Are cadmium and lead levels linked to the development of anxiety and depression? A systematic review of observational studies. *Ecotoxicol Environ Saf*. 2021;216:112211.
7. Silver MK, et al. Low-level prenatal lead exposure and infant sensory function. *Environ Health*. 2016;15(1):65.
8. Gribble MO, et al. Mercury exposure and heart rate variability: a systematic review. *Curr Environ Health Rep*. 2015;2(3):304-314.
9. Carmona A, Roudeau S, Ortega R. Molecular mechanisms of environmental metal neurotoxicity: a focus on the interactions of metals with synapse structure and function. *Toxics*. 2021;9(9):198.
10. Li B, et al. Astrocytes in heavy metal neurotoxicity and neurodegeneration. *Brain Res*. 2021;1752:147234.
11. Yu G, et al. Neurotoxic effects of heavy metal pollutants in the environment: focusing on epigenetic mechanisms. *Environ Pollut*. 2024;345:123563.