

ORGANIC ACID TESTS - PROVIDER INFORMATION SHEET



In an effort to continually innovate and improve, we've added nine organic acid tests (OATs) to our DUTCH Complete™ and DUTCH Plus® panels.

Three neuro-related metabolites offer insight into potential neuroinflammation and symptoms like mood disorders and fatigue. Six nutritional markers indicate deficiencies in biotin, b12, b6, and glutathione as well as evidence of gut dysbiosis.

These new markers make DUTCH testing the most comprehensive overview of patient health available in one test.

NEUROTRANSMITTER METABOLITES

These organic acids are the primary metabolite of dopamine, norepinephrine and serotonin. Patients with an imbalance in these neurotransmitters may experience symptoms that are also common with an imbalance in hormones. Hormones (cortisol and estrogen are examples) included in DUTCH testing also directly alter some of these metabolites, so their inclusion provides an even more comprehensive picture of your patient's hormone health.

NUTRITIONAL ORGANIC ACIDS

These organic acids act as functional markers of nutrient deficiency. When the body has inadequate cellular levels of vitamin B12, vitamin B6 or glutathione, levels of their corresponding organic acid build up and spill into the urine. In some cases, these markers are more effective than measuring the nutrient directly.



NEUROTRANSMITTER METABOLITES

HOMOVANILLATE (HVA)

PRIMARY METABOLITE OF DOPAMINE

If dopamine in circulation is low, HVA is usually low. People with low dopamine often report fatigue, low motivation, depression and addiction issues. These symptoms are similar to those with low hormones. Conversely, if there are low levels of SAM, Magnesium, FAD and NAD, dopamine cannot be converted to HVA. In these cases, HVA may be low even though circulating dopamine levels may be normal or elevated.

VANILMANDELATE (VMA)

PRIMARY METABOLITE OF NOREPINEPHRINE/EPINEPHRINE

Cortisol, DHEA and norepinephrine/epinephrine are all released from the adrenal gland at different layers. A marker of the "other" major adrenal hormone gives providers more insight into adrenal and HPA axis function. If norepinephrine/epinephrine in circulation are low, VMA will usually be low. Epinephrine production (from norepinephrine) is actually a cortisol-dependent reaction and measuring VMA along with adrenal hormones enhances DUTCH adrenal testing even more.

QUINOLINATE

NEUROTOXIN DERIVED FROM TRYPTOPHAN

Quinolate is a neurotoxin derived from tryptophan. Elevated quinolate is seen in brain and nerve tissue damage, especially in disorders such as Alzheimer's disease, Parkinson's disease, Huntington's disease, motor neuron diseases, multiple sclerosis, epilepsy, amyotrophic lateral sclerosis, and major depressive disorder. We can also see elevated quinolate due to low serotonin and need for vitamin B3 (niacin). The causes of elevated quinolate include neuroinflammation, general inflammation, infection, phthalate exposure, and/or oral tryptophan use.

NUTRITIONAL ORGANIC ACIDS

b-HYDROXYISOVALERATE | MARKER FOR BIOTIN

OTHER NAMES | None known.

RESULTS | High b-Hydroxyisovalerate = Low Biotin

SYMPTOMS OF BIOTIN DEFICIENCY

Hair loss, symptoms of other B-vitamin deficiencies.

TREATMENT OPTIONS

Increase supplemental biotin.

ADDITIONAL INFORMATION

b-Hydroxyisovalerate is made when the body is deficient in biotin. This marker has an inverse relationship with biotin, therefore elevated levels represent deficiencies in biotin. Biotin is an important cofactor in mitochondrial function, metabolism of fatty acids, glucose, and protein, as well as ROS production. Factors that influence biotin levels include inadequate dietary intake, long-term and high-dose B5 supplementation, dysbiosis/gut health, antibiotic use, medications, and biotinidase deficiency.

INDICAN | MARKER FOR GUT HEALTH

OTHER NAMES | None known.

RESULTS | Accumulated levels of Indican in the urine may suggest gastrointestinal dysbiosis or malabsorption.

SYMPTOMS OF EXCESS INDICAN

A positive indican result may signal gut problems. Results can also be explained by the diet or medical history of a particular patient. Evaluating urinary indican results is nuanced. Low levels of indican do not necessarily correspond with a small degree of dysbiosis. The same is true of high indican levels.

TREATMENT OPTIONS

Evaluate gut health further (stool testing/food intolerances, SIBO, etc.)

ADDITIONAL INFORMATION

Indican is a byproduct of tryptophan putrefaction by microbes in the gut. Production of Indican occurs when tryptophan creates indoles in the colon. When there is concern of dysbiosis, there can also be concern for poor metabolism of sex hormones (including estrogen) along with chronic low-grade inflammation that can impact cortisol production and metabolism. This test is not diagnostic but generally warrants further testing to rule out gut dysbiosis.



NUTRITIONAL ORGANIC ACIDS (CONTINUED)

KYNURENATE | *MARKER FOR VITAMIN B6*

OTHER NAMES | Kynurenic Acid or KYNA

RESULTS | High Kynurenate = Low Vitamin B6

SYMPTOMS OF VITAMIN B6 DEFICIENCY

Fatigue, shortness of breath, irritability, anxiety and depression, low energy and fatigue

TREATMENT OPTIONS

Food high in B6 include turkey breast, grass-fed beef, pinto beans, avocado, pistachios, chicken, sesame and sunflower seeds. Supplementation may be advised.

ADDITIONAL INFORMATION

KYNA is a product of the metabolism of Tryptophan if there is a deficiency of Vitamin B6 BUT, chronic stress, reactive oxygen species (ROS) and possibility LPS from gram negative gut bacteria/leaky gut causing inflammation can increase KYNA as well. KYNA is useful in the body – anti-inflammatory, neuroprotective, some anti-ulcerative properties and antagonizes hypermobility of the intestines.

METHYLMALONATE | *MARKER FOR VITAMIN B12*

OTHER NAMES | Methylmalonic Acid or MMA

RESULTS | High MMA = Low Vitamin B12

SYMPTOMS OF VITAMIN B12 DEFICIENCY

Fatigue, brain fog, memory problems, muscle weakness, unsteady gait, numbness, tingling, depression, migraines/headaches and low blood pressure.

TREATMENT OPTIONS

Common foods high in B12 include beef liver, sardines, lamb, wild salmon, grass-fed beef, nutritional yeast and eggs. Supplementation may be advised.

ADDITIONAL INFORMATION

This marker is considered superior to measuring serum B12 levels directly. A 2012 publication by Miller showed that 20% of those tested had a genetic defect in the protein that transports B12 to cells. These patients may have a functional B12 deficiency, even if serum levels of B12 are normal.

XANTHURENATE | *MARKER FOR VITAMIN B6*

OTHER NAMES | Xanthurenic Acid

RESULTS | High Xanthurenate = Low Vitamin B6

SYMPTOMS OF VITAMIN B6 DEFICIENCY

Changes in mood, such as irritability, anxiety and depression, confusion, muscle pains, low energy, or fatigue.

TREATMENT OPTIONS

Food high in B6 include turkey breast, grass-fed beef, pinto beans, avocado, pistachios, chicken, sesame and sunflower seeds. Supplementation may be advised.

ADDITIONAL INFORMATION

If levels of estrogen or cortisol are high, it may exacerbate xanthurenate elevations and increase the need for B6. Xanthurenate complexes with insulin and decreases insulin sensitivity. Xanthurenate can also bind to iron and create a complex that increases DNA oxidative damage resulting in higher 8-OHdG levels. If both markers are elevated, there is likely an antioxidant insufficiency.

PYROGLUTAMATE | *MARKER FOR GLUTATHIONE*

OTHER NAMES | Pyroglutamic Acid

RESULTS | When levels of pyroglutamate are high or low, there may be insufficient glutathione.

SYMPTOMS OF GLUTATHIONE DEFICIENCY

Glutathione is one of the most potent antioxidants in the human body. It is especially important in getting rid of toxins and can protect against cancer, aging, heart problems and brain diseases.

TREATMENT OPTIONS

High-quality lean protein, fresh fruits and vegetables, spices, increase alpha-lipoic acid, increase selenium, or add a multivitamin with glutathione-supporting vitamins.

