

ORGANIC ACID TESTS



In our continued effort to innovate and improve, we've now added six organic acid tests (OATs) to our DUTCH Complete™ and DUTCH Plus™ panels.

Three neurotransmitter metabolites will offer insights into symptoms such as mood disorders and fatigue, and will be combined with markers for vitamin B12, vitamin B6 and glutathione deficiency.

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.



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.

5-HYDROXYINDOLEACETATE (5HIAA) | PRIMARY METABOLITE OF **SEROTONIN**

Many people use the DUTCH Test™ to understand symptoms such as fatigue and depression. While low hormone values can cause these symptoms, serotonin deficiency can also contribute significantly. High cortisol or estrogen can influence tryptophan metabolism to move away from the serotonin pathway, so 5HIAA levels may be particularly relevant to DUTCH testing. Low serotonin can also lead to low melatonin, which is a metabolite of serotonin and included in DUTCH testing.

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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.

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.