The Metabolic Assessment Profile (#101)

**Indican**

*Convenient screen for protein digestion and dysbiosis*

Urinary indican is an effective screening tool for assessment of protein digestion, dysbiosis, small intestine bacterial overgrowth (SIBO), and malabsorption states. Also known as indoxyl sulfate, indican is produced when there is putrefaction of tryptophan from dietary protein by dysbiotic (imbalanced) bacteria in the gastrointestinal tract.

If the indican level is ‘1’ or higher, either dietary protein is not being adequately digested and/or an overgrowth of harmful bacteria exists in the intestine, where it is feeding off the protein before it can be digested. ‘High’ or ‘Very High’ indican levels may indicate hydrochloric acid (HCL) and/or protease enzymes insufficiency as well as hypermotility of the upper bowel, parasitic and bacterial infections (notably Helicobacter pylori), and food reactions.

Common symptoms of elevated indican include: Gas, diarrhea, constipation, bad breath, bloating, weight gain, allergies, asthma, arthritis, headaches, skin conditions, nervous system problems, and colon toxicity.

**Protein Digestion and Putrefaction**

The level of indican is an index of the efficiency of protein digestion. Compromised amino acid or protein digestion can be caused by insufficient gastric hydrochloric acid, insufficient digestive enzymes, adverse food reactions, parasitic infection, fungal infection, an overgrowth of bacteria that metabolize specific proteins, hypermotility of the small intestine, or other gastrointestinal dysfunction.

Putrefaction is especially important because it can produce dozens of types of carcinogens. These substances can enter the liver through the general circulation. Undigested protein also increases systemic toxicity, burdening the detoxification capacity of the liver. Poor protein digestion can lead to other problems, such as intestinal microbial overgrowth, which in turn can lead to unfavorable pH changes and impaired absorption.

**The Indican Lab Test**

The BioHealth method is not a rapid test but a superior quantitative determination of indican (indoxyl sulfate) using colorimetric methods on an ELISA plate reader, producing values which are correlated to five concentrations of indican. The possible results are:

1. ‘0’ – Normal
2. ‘1’ – Low Positive
3. ‘2’ – Medium Positive
4. ‘3’ – High Positive
5. ‘4’ – Very High Positive

Elevated indican readings prompt further lab testing as well as lifestyle modifications and nutritional supplementation. Digestive enzymes and natural liver support, along with diet modification (such as reduced meat intake) are common therapeutic approaches.

**Bile Acids**

*Urinary assessment of liver health*

At the center of detoxification within the digestive system complex is the liver, and damage to liver cells will compromise health. A healthy diet is central to a healthy lifestyle, but a sick and under-functioning digestive system, including poor liver function, will unfortunately compromise a quality diet and maintain a stimulus for chronic stress. Therefore, performing bile acid testing is important in any functional medicine practice.

Large amounts of bile are secreted into the intestines on an ongoing basis, but only small amounts are expelled from the body. The main
reason for this is that the vast majority of bile that is distributed in the duodenum (the first section of the small intestine) is then reabsorbed from the last part of the small intestine, called the ileum. The blood supply from this region of the small intestine is taken back through the liver where liver cells (hepatocytes) reabsorb the bile to resupply the bile acid pool.

If damage has occurred to the liver cells by infection, inflammation, or other factors, much of this bile acid is leached into the general circulation. The bile acids can then be detected through urine testing as excess bile acid filters through the kidneys. Therefore, assays on bile acid in urine can be used clinically as a sensitive indicator of liver dysfunction.

Common symptoms of elevated bile acids include: Unstable blood sugar levels, inability to lose weight, sluggish metabolism, elevated LDL, reduced HDL, elevated triglycerides, indigestion, intolerance to alcohol and fats, recurrent headaches, depression, irritability, putrid body odor, and hormonal imbalance.

### The Bile Acids Lab Test

Sophisticated ELISA testing on urine using fluorimetric wavelengths is a means to measure total bile acids in biological samples. In the assay, 3α-hydroxysteroid dehydrogenase reacts with all twelve bile acids, converting NAD to NADH, which reduces a probe to a highly fluorescent product.

Elevated bile acid readings prompt further lab testing as well as lifestyle modifications and nutritional supplementation. Common nutrients for assisting with liver repair and reduction of toxic load include: milk thistle seed extract, l-methionine, taurine, reduced l-glutathione, n-acetyl-l-cysteine, and bioflavonoids.

Long-standing intestinal disease (such as IBD), malabsorption, persistent diarrhea, and starvation can all lower bile acid readings.

The reference range for BioHealth's urinary bile acids is 11.0 - 34.0 umol/g measured in units of creatinine concentration.

### Lipid Peroxides

#### Oxidative stress evaluation on urine

Lipid peroxidation is a well-established mechanism of cellular injury and is used as an indicator of oxidative stress, also known as “free radical damage.”

The elevation of lipid peroxides serves as an early warning of the potential long-term effects of oxidative stress. The outcome of long-term oxidative stress is chronic degenerative disease, an example being the peroxidation of low-density lipoproteins contributing to atherosclerosis.

Oxidative stress can result from exposure to toxins or pathogens, inappropriate lifestyle - such as over-exercising or smoking - or byproducts of normal metabolism.

The degree of lipid peroxide elevation can be used as a guideline for lifestyle modification and further testing. It can also help to determine antioxidant supplementation for helping to boost resistance to free radical damage. A slight elevation would require a less aggressive approach using minimal/maintenance levels of antioxidants. Moderate to extreme elevations would necessitate a more aggressive antioxidant regime, particularly in the short term, until follow-up testing indicates a return to normal levels.

Though not necessarily present in most patients, symptoms of elevated lipid peroxides include: Fatigue, memory loss, brain fog, muscle and/or joint pain, wrinkles, impaired eyesight, headaches, and susceptibility to infections.

Elevated lipid peroxide readings prompt further lab testing as well as lifestyle modifications and nutritional supplementation. Antioxidant intake, in the form of foods and nutritional supplements, is often indicated, with the most common nutrients being: Coenzyme Q10, alpha lipoic acid, vitamin E, B12, grapeseed extract, and vitamin D.

### The Lipid Peroxides Assay

Lipid peroxides, derived from polyunsaturated fatty acids, are unstable and decompose to form a complex series of compounds, which include reactive carbonyl compounds, such as malondialdehyde (MDA). MDA can be quantified through a controlled reaction with thiobarbituric acid, generating thiobarbituric acid reactive substances (TBARS). The TBARS assay is a well-recognized, established method for quantifying these lipid peroxides, especially on urine in which there are few significant interfering substances. Steps are employed in the assay procedure to further reduce interference, rendering it a reliable measure of lipid peroxidation.

The reference range for BioHealth's lipid peroxides assay is <4.0 umol/g measured in units of creatinine concentration.