Click Here

Urine organic acid test

Organic acid testing (OAT) has become very popular amongst functional medicine doctors and dietitians. This urine-based test provides a wealth of information about the functioning of various bodily systems and can be used to identify possible nutrient deficiencies, gut dysbiosis, and more. Keep reading to learn more about the science behind organic acid testing, who might benefit from it, and how to get tested. Want to save this article? Click here to get a PDF copy delivered to your inbox. What Is an Organic Acid? In humans, organic acids are byproducts or intermediates of chemical reactions that occur within the body (1). The quantity (and sometimes the type) of organic acids produced are unique to each individual and can be influenced by a variety of factors. Some factors that can influence organic acid production within the body include (2, 3): Diet Environmental toxins Gut microbes Genetics Kidney and liver function Medications Nutrient status Oxidative stress In order for the body to run effectively, it needs proper amounts of vitamins and minerals to act as cofactors for enzymatic reactions. Without enough of these nutritional cofactors (or if someone has genetic mutations that affect how well their enzymes work), these chemical pathways are unable to proceed at their normal pace. As a result, organic acids begin to build up and are excreted in the urine: Our urinary organic acid profiles can give us clues as to what's happening in our bodies, and this is the basis of organic acid testing. What Does a Urine Organic Acids Test Evaluate? Organic acid testing (OAT) is often compared to performing an emissions test on a car. For cars, the exhaust fumes that come out of the tailpipe are a byproduct of fuel combustion, and the composition can tell us how efficiently the engine burns fuel. In the same way, organic acids in our urine are byproducts of our metabolism and can give us information about how efficiently our body systems are performing. Reasons for Abnormal OAT Results When the body isn't functioning optimally, organic acids in the urine can become elevated or depleted, depending on what is occurring. The main reasons for abnormal urinary organic acid results include: Inborn errors of metabolism B-vitamin deficiencies Gut dysbiosis Impaired fatty acid metabolism Ketosis or poor carbohydrate metabolism Neurotransmitter metabolism Mitochondrial dysfunction Oxidative stress Poor detoxification Inflammation We'll review each of these scenarios in detail below. Reason #1: Inborn Errors of Metabolism Inborn errors of metabolism are genetic disorders that disrupt biochemical pathways in the body (1). These disorders are rare, but their effects can be devastating (4). Often, there is a defect in a gene that codes for a certain enzyme, causing the body to either produce malfunctioning enzymes or none of the enzymes at all. These missing or malfunctioning enzymes prevent important biochemical reactions from occurring and cause metabolites (including organic acids) to accumulate (1). For example, one of the better known inborn errors of metabolism is phenylketonuria (PKU). In PKU, there is a defect in the gene for phenylalanine hydroxylase (PAH), which is responsible for converting the amino acid phenylalanine to tyrosine (5). When PAH isn't working properly, the body tries to metabolize phenylalanine through an alternative pathway, and organic acids like phenyllactate and phenylacetate are produced as a result (6, 7). These organic acids can be measured in the urine via routine screening tests. Other inborn errors of metabolism can also be detected by urinary organic acids, including: Alkaptonuria: homogentisic acid (8, 9) Canavan disease: N-acetylaspartic acid (10, 11) Malonyl-CoA decarboxylase deficiency: malonic acid (12, 13) Maple syrup urine disease (MSUD): 3-Methyl-2-oxovaleric acid (14) In the United States, all newborns are screened for these diseases, so they're usually diagnosed quickly (15). However, about 50% of these disorders are not detected until later in childhood, and some aren't diagnosed until adulthood (16). Organic acid testing is still mostly used for the diagnosis of these disorders, but the science has progressed, and now we can use OAT to evaluate overall metabolic health as well. Reason #2: B-Vitamin Deficiencies Organic acid testing can also be used to detect deficiency (or insufficiency) of certain B vitamins. For example, elevated levels of the organic acid methylmalonic acid (MMA) in the urine are a well-validated indicator of vitamin B12 deficiency (17). If you're deficient in vitamin B12, methylmalonyl CoA cannot be converted to succinyl CoA. MMA then builds up in the blood and is eventually excreted in the urine, where it can be detected by an organic acid test. Organic acids that can indicate possible vitamin B deficiencies when out of range include: General B-vitamins: Alpha-ketoisovalerate, alpha-ketoisocaproate, alpha-keto-beta-methylvalerate (18) Biotin: Beta-hydroxyisovalerate (19) Folate: Formiminoglutamate (20, 21) Vitamin B12: Methylmalonate (17, 22) Vitamin B6: Xanthurenate (23, 24) However, many of these markers have other factors that can increase or decrease their levels, so proper test prep and interpretation is important. Additionally, MMA and formiminoglutamate levels can provide insight into how well methylation pathways are functioning within the body since B12 and folate are important methyl donors. Reason #3: Gut Dysbiosis Organic acids are produced by bacteria in the gut as they metabolize various components of the foods we eat. A portion of these acids is absorbed and excreted into the urine, providing insight into diet and gut health. Types of dysbiosis (and their associated urinary organic acids typically measured) include: General bacterial overgrowth: benzoate, hippurate, indican, phenylacetate, phenylpropionate, p-cresol, p-hydroxybenzoate, p-hydroxyphenylacetate, and tricarballylate (25, 26, 27, 28, 29, 30, 31) Lactic acid bacterial overgrowth: D-lactate (32, 33) Clostridial overgrowth: 3,4-dihydroxyphenylpropionate (34) Yeast overgrowth: D-arabinitol (35) Elevated levels of the "general bacterial overgrowth" organic acids are not diagnostic of any particular overgrowth but can help guide further testing decisions. Additionally, since these markers are influenced by diet, it is important to follow test prep instructions carefully and work with an experienced practitioner for interpretation. More human research is needed to better understand the links between gut microbiota, diet, urinary organic acids, and various medical conditions. Reason #4: Impaired Fatty Acid Metabolism If the body is struggling to burn fat for fuel via beta-oxidation, levels of some organic acids in the urine will rise as the mitochondria use alternative metabolic pathways. The most commonly measured organic acids related to impaired fat metabolism are: Adipate (36) Ethylmalonate (37) Suberate (38) Possible nutrition-related reasons for poor fatty acid metabolism include carnitine and/or riboflavin deficiency or increased need for these nutrients due to genetic variants. Inborn errors of metabolism are another common cause (39, 40, 41). Reason #5: Ketosis or Poor Carbohydrate Metabolism When you fast or consume a very low-carbohydrate diet, the body naturally produces ketones to be used for energy instead. These ketones can be detected in the urine with organic acid testing: Acetoacetic acid (42) 3-hydroxybutyric acid (43) Even when not in ketosis, high levels of other urinary organic acids can identify possible issues with carbohydrate metabolism. These include: Pyruvic acid (44) Lactic acid (45) Elevated levels can be due to genetic mutations or deficiencies in required nutrients like thiamin, lipoic acid, CoQ10, pantothenic acid, riboflavin, or niacin (46, 47, 48, 49, 50, 51). Reason #6: Neurotransmitter Metabolism In order to communicate between neurons, the nervous system produces chemical messengers called neurotransmitters. When these neurotransmitters are metabolized, organic acids are produced as a byproduct. Functional markers of neurotransmitter metabolism that can be measured in the urine include: Norepinephrine/epinephrine: vanilmandelate (VMA) (52, 53) Dopamine: homovanillate (HVA) (54, 55) Serotonin: 5-hydroxyindoleacetate (5-HIAA) (56, 57) Again, these results are just a starting point for further investigation. They are not diagnostic of neurotransmitter levels in the brain or spinal cord. Urinary levels of these organic acids can be impacted by things like genetic snps, nutrient deficiencies, diet, exposure to environmental toxins, stress, sleep, neuroendocrine tumors, supplements, and adrenal function (58, 59, 60, 61, 62, 63, 64) A skilled practitioner can look at the bigger picture to find patterns that point to possible root causes. Reason #7: Mitochondrial Dysfunction Mitochondrial dysfunction (when mitochondria do not produce energy at their optimal rate) can be caused by genetic disorders, inadequate nutrition, inflammation, environmental toxins, medications, viral infections, and DNA damage (65, 66, 67, 68). In severe cases, mitochondrial deficiency disorders cause significant symptoms, such as poor muscle tone, weakness, impaired growth, enlarged heart or brain, and liver failure. More recently, scientists have learned that less severe mitochondrial dysfunction plays a role in many chronic conditions, including cancer, diabetes, epilepsy, and neurodegenerative diseases like Parkinson's, Alzheimer's, and Huntington's disease (69, 70, 71, 72, 73). Organic acid testing is one of the best ways to test for mitochondrial dysfunction, since it measures most of the intermediates in the citric acid cycle (65, 74, 75, 76). Urinary organic acids typically tested that involve the mitochondria include: Alpha-ketoglutarate (77) Cis-aconitate (78) Citrate (79) Fumarate (80) Hydroxymethylglutarate (HMG) (81) Isocitrate (82) Malate (83) Succinate (84) When these organic acids are out of balance, this clues the clinician to search for factors that may be impairing mitochondrial function. Nutritional factors include deficiency in coenzyme Q10, carnitine, riboflavin, thiamin, niacin, vitamin B12, iron, magnesium, or manganese, all of which are required for cellular respiration (energy production) in the mitochondria (85, 86, 87, 88). Reason #8: Oxidative Stress Oxidative stress occurs when there is an imbalance between free radicals and antioxidants within the body (89). Free radicals are unstable atoms that steal electrons from other molecules, leading to cellular damage (90). High levels of free radicals and oxidative stress contribute to chronic diseases like cancer and heart disease (91). Thankfully, our bodies can use antioxidants to destroy free radicals and counteract oxidative stress (92, 93). Antioxidant levels that are indirectly measured via urinary organic acid testing (along with their corresponding organic acids) include: Glutathione: pyroglutamic acid and 2-hydroxybutyric acid (94, 95, 96) CoQ10: 3-hydroxy-3-methylglutaric acid (97, 98, 99) It is also possible to indirectly measure DNA damage caused by high levels of oxidative stress via the following urinary marker: DNA damage: 8-OH-dg (100) Reason #9: Poor Detoxification Some substances that our bodies absorb within the gut are shuttled to our liver, where they are transformed into water-soluble molecules that can be excreted in the sweat, urine, or bile. By measuring the levels of organic acids created during these processes, we can get insights into how well the liver and kidney's detoxification processes are working. Urinary organic acids related to detoxification and/or liver and kidney function that are commonly measured on OATs include (101): Amino acid conjugation: benzoate, hippuric acid (102) Liver enzyme function: Glucarate (103, 104, 105, 106) Liver antioxidant synthesis: alpha-hydroxybutyrate (107) Kidney recovery of amino acids: pyroglutamate (108, 109, 110) Overall detox and antioxidant function: sulfate (111) Ammonia clearance: Orotate (112) Xylene exposure: 2-methylhippurate (113, 114) Depending on which organic acid levels are out of range, nutrition and lifestyle interventions may be recommended, including: Reducing exposure to environmental toxins Correcting nutrient deficiencies that may impair these pathways (glycine, glutamine, taurine, cysteine, methionine, pantothenic acid, riboflavin, niacin, vitamin B6, folate, vitamin B12) (115, 116, 117, 118, 119, 120). Adding foods or supplements to the diet that enhance the body's natural detoxification abilities (magnesium, NAC, zinc, selenium, copper, manganese, antioxidants, thiols, etc.) (121, 122, 123, 124, 125, 126) A practitioner well-versed in functional nutrition can best assist in these recommendations. Reason #10: Inflammation Chronic inflammation can push the metabolism of tryptophan down the kynurenine pathway, increasing levels of certain organic acids in the nervous system and urine, including (127): Kynurenate (128) Quinolinate (129) Picolinate (130) These organic acids can bind to NMDA receptors within the nervous system and increase (quinolinate and picolinate) or decrease (kynurenate) their excitatory activity. More research is needed to understand the health implications of elevated levels of these organic acids, but it can indicate a possible issue with inflammation. Who Might Benefit from Organic Acid Testing? Organic acid testing may be useful for people whose symptoms haven't been explained through other blood work, stool tests, or urinary hormone tests. It helps provide a bigger picture of mitochondrial function, nutrient deficiencies, neurotransmitter metabolism, antioxidant status, detoxification abilities, and gut health, which trained and experienced clinicians can use to dig deeper. It can also be used to identify subclinical (non-symptomatic) metabolic imbalances in order to PREVENT chronic illness from developing. However, there are some limitations to consider when deciding whether OAT is right for you: 1. Individual organic acids can be falsely elevated by diet, medications, or other factors, so proper test prep and working with an experienced practitioner is vital. 2. While OAT can evaluate the status of some vitamins, it does not provide a complete assessment of micronutrient status. Minerals and fat-soluble vitamin status cannot be measured via organic acids. 3. OAT is not able to detect intestinal parasites that might be contributing to your symptoms. 4. OAT is relatively expensive and often isn't covered by insurance, so it's not a reasonable option for everyone. Overall, organic acid testing can be a good starting point for complicated cases. It is rarely used in isolation, and additional testing is usually ordered after looking at the results. How Is an Organic Acid Test Performed? Performing an organic acid test is relatively easy. Your healthcare practitioner can order it for you, but it is not always covered by insurance. To collect your sample, you are required to urinate into a collection cup first thing in the morning, before you've had anything to eat or drink. Depending on which OAs are being measured, the instructions might require you to avoid certain foods and supplements for a couple of days leading up to the test as well. The sample is then frozen and shipped to the laboratory, where organic acids are measured from the urine sample using liquid or gas chromatography-mass spectrometry (131). Chromatography separates all of the different components found in the urine sample, while mass spectrometry is a tool used to identify and quantify each component by looking at its chemical makeup (132). After the lab receives your sample, it typically takes about 2 weeks to get your results. Your practitioner will receive a report that lists the levels of individual organic acids as either being high, low, or within the normal range. While it might be tempting to focus on individual OAs that show abnormal results, the overall pattern of abnormalities is more important (133). In some ways, interpreting OAT results is a lot like working on a puzzle – you can't fully understand what you're seeing until you've put all the pieces together. Where to Get an Organic Acid Test While many labs offer a variety of organic acid tests, two companies are most popular: 1. Great Plains Laboratory: The Organic Acids Test The Organic Acids Test from Great Plains Laboratory evaluates over 70 different organic acids. They also offer a Microbial Organic Acids Test (MOAT) that can be used as a follow-up to the OAT for patients who have been treated for dysbiosis. 2. Genova Diagnostics: Organix Genova Diagnostics has a test called the Organix Basic Profile that includes more than 30 different OAs. The Organix Comprehensive Profile offers a more detailed evaluation, with over 40 OAs. The main difference between the two is that the Basic Profile does not include any of the OAs that serve as markers for bacteria and fungi. However, they also offer Organix Dysbiosis, which is a separate test for just for microbial OAs (similar to MOAT from Great Plains). If someone is only interested in looking at organic acids related to metabolism, the Metabolic Analysis Profile may be a good option. Further Education on Organic Acid Testing For healthcare practitioners interested in learning more about organic acid testing, Great Plains Laboratory regularly holds in-person trainings around the world. You can find a schedule of their upcoming training here. They also have a variety of free webinars available on their website. Final Thoughts Organic acids are byproducts of metabolism that provide insights on how different bodily systems are performing. Through organic acid testing, we can detect possible nutrient deficiencies, gut dysbiosis, and other imbalances in metabolism. Anyone who suffers from a chronic health condition or who simply wants to gain insight into their overall metabolic health is likely to benefit from OAT. Because it only requires the collection of a urine sample, OAT is quick and painless for patients. Interpreting OAT results is very complicated, so it's best to review your results with a health professional who has experience with OAT. Want to save this article? Click here to get a PDF copy delivered to your inbox. This article was a joint-venture, written by both Erica Julson, MS, RDN, CLT (owner/founder) and Amy Richter, MS, RDN, LD, CLT (lead writer). Erica and Amy are experienced registered dietitians who are passionate about creating great nutrition content! The organic acids test includes markers of yeast and bacterial overgrowth. How reliable are these markers? What causes yeast and bacterial overgrowth and what can be done about it? Read on to find out. What is The Organic Acids Test? Organic Acid Test, popularly known as OAT, measures the levels of organic compounds in urine that are produced in the body as a part of many vital biochemical pathways. It's used to check for RARE inborn genetic defects of metabolism, most often in newborns. A defect in a particular pathway can result in either accumulation or lowered levels of its byproducts. Thus, measuring the levels of these markers can help to identify which metabolic process is blocked or compromised. However, OAT has been increasingly available as a pricy, direct-to-consumer test recommended by many alternative practitioners. In this article, we will look into the tests that purportedly signal yeast and bacterial overgrowth. We'll also go over the causes of yeast and bacterial overgrowth and ways to address them. Yeast and Bacteria Change Organic Acid Levels The gut microbiota is a combination of billions of bacteria, fungi, and viruses that naturally live in the gut. It develops with us throughout our lives and is influenced by our genetics, diet, and environment [1, 2]. When the different species in our gut microbiota are no longer working together for mutual benefit, a condition called dysbiosis develops. This is when disease-causing microbes grow in large numbers over our "good" microbes [3]. Dysbiosis can has been associated with gut diseases like irritable bowel syndrome, celiac disease, and inflammatory bowel disease and with other conditions like obesity, metabolic disorder, heart disease, allergies, and asthma [3]. Read more about the gut microbiome and the roles it plays here. Organic Acids Testing: Yeast and Bacteria The Organic Acids Test for yeast and bacteria measures the amount of certain organic acids from the first urine produced in the morning. These acids can be produced by the microorganisms in our gut. The exact number and nature of the organic acids measured will depend on the laboratory performing the test. The amount is reported as the concentration of the substance (as mmol or micrograms) in respect to a reference amount of creatinine (per mol or per milligram) found in the urine. The concentration of creatinine is used as a reference for how much water the person drank, which can tell you if the sample is too diluted. Keep in mind that the reference values given in these tests are often not backed by scientific studies and need to be taken with a grain of salt. The reference values for the organic acids included in these tests are [4, 5, 6]: Acids related to yeast and fungus overgrowth: Arabinose: ≤ 29 mmol/mol creatinine D-Arabinitol: ≤ 73 µg/mg creatinine Carboxycitric: ≤ 29 mmol/mol creatinine Citramalic: ≤ 3.6 mmol/mol creatinine Furan carbonyl glycine: ≤ 1.9 mmol/mol creatinine Furan-2,5-dicarboxylic: ≤ 16 mmol/mol creatinine 5-Hydroxymethyl-2-furoic: ≤ 14 mmol/mol creatinine 3-Oxoglutaric: ≤ 0.33 mmol/mol creatinine Tartaric: ≤ 4.5 mmol/mol creatinine Tricarballylic: ≤ 0.44 mmol/mol creatinine (or ≤ 1.41 µg/mg creatinine) Acids related to bacterial overgrowth: Benzoate: ≤ 9.3 µg/mg creatinine Hippuric: ≤ 613 mmol/mol creatinine (or ≤ 1070 µg/mg creatinine) 4-Hydroxybenzoic: ≤ 1.3 mmol/mol creatinine (or ≤ 1.8 µg/mg creatinine) 2-Hydroxyhippuric: ≤ 1.3 mmol/mol creatinine 4-Hydroxyhippuric: 0.79 – 17 mmol/mol creatinine 2-Hydroxyphenylacetic: 0.06 – 0.66 mmol/mol creatinine (or < 1.4 µg/mg creatinine) Indican: ≤ 90 µg/mg creatinine D-Lactate: ≤ 4.3 µg/mg creatinine Phenylacetate: ≤ 0.18 µg/mg creatinine Phenylpropionate: ≤ 0.06 µg/mg creatinine Acids produced by "good" bacteria: DHPPA: ≤ 0.38 mmol/mol creatinine Acids related to Clostridium overgrowth: 4-Cresol: ≤ 75 mmol/mol creatinine 3,4-Dihydroxyphenylpropionate: ≤ 0.05 µg/mg creatinine HPHPA: ≤ 208 mmol/mol creatinine 4-Hydroxyphenylacetic: ≤ 19 mmol/mol creatinine (or ≤ 34 µg/mg creatinine) 3-Indoleacetic: ≤ 11 mmol/mol creatinine (or 0.60 – 10.50 µg/mg creatinine) Yeast and Fungal Markers There is a certain amount of scientific support backing the use of these markers [7, 8, 9]. However, in general, much larger and well-designed studies are needed to confirm that these markers are indeed suited to test for yeast and fungal overgrowth in the general population. Bacterial Markers There are studies that connect these markers to bacterial overgrowth in humans. However, when interpreting these markers, it's important to keep in mind that factors and conditions other than bacterial overgrowth/dysbiosis can increase them. For example: Benzoic acid can increase with elevated benzoate intake, elevated benzoate production by gut bacteria, a urinary infection, or liver or kidney issues with the benzoate-hippurate conversion [10, 11, 12, 13]. Hippuric acid tests are used to check for occupational exposure to toxins such as toluene [14, 15] 4-hydroxybenzoic acid increases after consuming almonds, strawberries, green tea, and gingko or oregano extract [16, 17, 18, 19, 20, 21, 22]. 4-hydroxybenzoic acid levels also increase after ingestion of parabens — these are additives used as preservatives in foods, cosmetics, and pharmaceuticals [23]. Indican can increase on diets high in protein and low in fiber [24, 25]. Vegetarians generally have lower indican levels [25]. Indican levels also increase in malabsorptive disorders, such as celiac disease and hypochlorhydria (low stomach acid) [26, 27, 28]. Phenylacetic acid can increase with the ingestion of certain foods and drugs, exercise, gut dysbiosis, chronic alcoholism, and in a metabolic disorder called phenylketonuria [29, 30, 31, 32, 33, 34]. Phenylproprionate can increase in phenylketonuria [35] 3,4-Dihydroxyphenylpropionate or DHPPA is listed by one company as beneficial, by the other as signaling bacterial overgrowth. DHPP is produced in the breakdown of caffeic acid by gut bacteria [36, 37, 38, 39, 40]. It's production slightly increases after ingestion of caffeic acid sources, such as coffee, mate, and many types of spices, fruits, and vegetables [37]. 4-hydroxyphenylacetic acid can increase in a genetic disorder called tyrosinemia. In addition, people on vegetarian and Mediterranean diets tend to have higher levels [41, 42, 43, 44, 45, 46]. Because of all these confounders, it's important to discuss any abnormalities with your doctor, who will interpret the results based on your medical history, signs, symptoms, and more reliable test results. Causes of Yeast and Bacterial Overgrowth 1) Antibiotics The use of antibiotics is a common cause of changes in the microbiota. The effect will depend on the dosage, length of treatment, and the type of antibiotic [47]. Changes in the microbiota can allow fungi or bacteria normally present in the gut to grow out of control, which then often cause issues such as diarrhea. This is the case for different species of bacteria, such as Clostridium difficile, and of the yeast Candida albicans [48]. In some cases, the imbalance can also allow microorganisms that cause diseases to reproduce and cause an infection [48]. That's why you should only take antibiotics as prescribed by your doctor. 2) Stress Our body responds to stress by releasing hormones. Our microbiota responds to these hormones by releasing active compounds into the blood [48]. Some studies suggest that high levels of stress can diminish the amount of the beneficial bacteria, Lactobacillus and Bifidobacterium, in our gut. It may also lower the natural protection of the gut, making it an easy target for infection-causing microorganisms like E. coli or Y. enterocolitica [47, 49]. While the mechanisms here are certainly plausible, larger studies are needed to confirm the link between stress and microbial imbalance. 3) Diet High-protein Diets When we eat an excessive amount of protein, some of it is not completely digested. The protein that has not been broken down by the enzymes in the stomach can reach the gut. Studies suggest that microbes can use the protein to produce metabolites that our body's usually don't produce. This is especially true of animal protein [50, 47]. High Carbohydrate and Sugar Diets A large amount of refined sugar in the diet causes fermentation to occur in the gut. Studies also suggest that sugar in excess can change the production of bile acids and their use by our gut bacteria, altering the gut environment and the microbiota balance [51]. Sulfates Sulfate is found in food preservatives, dried fruits, dehydrated vegetables, packaged fruit juices, and most alcoholic beverages. The protein in cow's milk, cheese, eggs, and meat also contain large amounts of sulfur that can be converted into sulfate in the body. Some research suggests that large amounts of sulfate may change the gut environment, thus helping the growth of microorganisms that cause disease [52]. 4) Lowered Immune System Response In the gut, a very close interaction between our immune system and microorganisms takes place. Researchers found that our microbiota helps develop our adaptive immune response (the type that produces antibodies), and they balance each other. When the immune response is weakened (we become immunosuppressed), the balance is broken, allowing for the uncontrolled growth of some species [53, 54]. 5) Certain Medication Drugs that alter the balance of the gut microbiota due to their effects, either directly or indirectly, are: Antacids: Some medications that diminish the amount of acid in the stomach (proton pump inhibitors) such as omeprazole, lansoprazole, or pantoprazole, may cause SIBO (small intestine bacterial overgrowth) [55]. Antipsychotics: A study suggests that the use of atypical antipsychotics like risperidone, changes the gut microbiota in women but not men [56]. Metformin: diabetes medication, like metformin, that lower blood glucose levels can change the microbiota, possibly by affecting the bile acids available [57]. Opioids: The use of opioids can cause constipation and modify the gut environment [58]. Statins: certain drugs that help lower cholesterol levels can either cause constipation or act as laxatives [59, 60]. Ways to Decrease Bacterial and Yeast Overgrowth 1) Antibiotics Antibiotics That Kill Clostridium Bacteria Overgrowth of certain bacteria, such as Clostridium difficile, can have serious consequences. Standard therapy for controlling C. difficile includes antibiotics like metronidazole, vancomycin, or fidaxomicin [61]. Rifaximin Improves Traveler's Diarrhea Rifaximin is a broad-spectrum antibiotic that kills both gram-positive and gram-negative bacteria with very little effects on the microbiota [62]. 2) Probiotics and Prebiotics Probiotics are living microorganisms that have a beneficial effect on our health. The most common are species of the Lactobacillus and Bifidobacterium families. Their effect on restoring the microbiota depends on the cause of the imbalance [63, 64]. Prebiotics are fiber that cannot be digested but stimulate the growth of specific bacteria in the gut. Oligofructose, a type of fiber, helped prevent diarrhea caused by C. difficile in a study with 142 patients with a previous infection [65]. Remember,always speak to your doctor before taking any supplements, including prebiotics and probiotics, because they may interfere with your health condition or your treatment/medications! 3) Fecal Microbiota Transplantation In cases where the microbiota has been severely affected, gut bacteria from a healthy donor can be transplanted into the patient's gut, where they replace the unstable microbiota. Studies suggest that this may be effective to stop infections by C. difficile [66]. 4) Regular Exercise Although excessive exercise can generate physical stress and may damage the microbiota, regular exercise helps keep a varied and stable microbiota. Studies have found that small but significant changes in the microbiota happen when a person begins working out [67, 68]. Limitations and Caveats The reference concentrations for the different substances of the Organic Acids Test were taken as the mean values for a set of males or females 13 years or older. Values might vary within that age group, as well as for different geographical zones or ethnical groups. The reference ranges have not been verified in independent clinical studies. In other words, we don't know if they are reliable. If something does come back flagged, discuss the relevance of the result with a medically trained health professional. Your doctor will interpret your results, taking into account your signs, symptoms, medical history, and other test results. They will order further, more reliable tests if needed. Further Reading To find out which parts of the OAT test can be useful, and which are nonsense, we delve into the science and look into each of the marker types in isolation: (3 votes, average: 4.67 out of 5)Loading...