

Intestinal Dysbiosis – The Link Between Digestion and Poor Health



What is Dysbiosis?

Dysbiosis is defined as a state of imbalance of the intestinal flora (bacteria and other micro-organisms), which may lead to excessive bacterial fermentation in the gut and 'autointoxication' from endotoxins (toxins produced by undesirable bacteria within the body). Dys = difficult + biosis = a way of living.

Your Digestive System is its Own Unique World

Humans coexist in a unique relationship with a complex array of bacterial flora that inhabit the gastrointestinal tract. The number of types of these organisms is in the range of 300 to 500! The interesting fact about this relationship of bacteria and the human body is that neither the body nor the bacteria themselves are harmed in any way. This is known as a *symbiotic relationship*. (Greek sumbisis, companionship, from sumbioun, to live together, from sumbios, living together: sun-, syn- + bios, life;)

The presence of the bacteria play an important role in creating what could be called the intestinal "immune system", and the very development of this system is what protects you against other bacteria which should not be present in the intestines.

How Does it Happen?

In the 1980s an increasing number of reports began to be published about injury to intestinal cells by intestinal bacterial toxins. Bacterial growth appears to destroy enzymes¹ (such as the disaccharidases which are needed to digest sugars) on the intestinal cell surface, thus preventing carbohydrate digestion and absorption, and making carbohydrates available for bacterial fermentation. Excess mucus may then be triggered as the intestine attempts to flush out the microbial toxins and acidic by-products, and the partially digested, unabsorbed carbohydrates. The result may be chronic diarrhea, mucus colitis, irritable bowel syndrome and the many other ill-defined names given to disorders which trouble millions of people.

Based on available research and clinical data, there are four general causes of intestinal dysbiosis: putrefaction, fermentation, deficiency and sensitization.

¹ Enzymes - Enzymes are complex proteins that act aid in starting almost every biochemical process that takes place in the body. Their activity depends on the presence of adequate vitamins and minerals. Many enzymes incorporate a single molecule of a trace mineral -- such as copper, iron or zinc -- without which the enzyme cannot function. In the 1930's, when enzymes first came to the attention of biochemists, some 80 were identified; today over 5,000 have been discovered.

1) Putrefaction

Putrefaction dysbiosis results from *diets high in fat and animal flesh and low in insoluble fiber*². This type of diet produces an increased concentration of Bacteroides species and a decreased concentration of Bifidobacteria species. in the stool. (For a full list of bacteria and yeast that can affect the human body, visit the BecomeHealthyNow.com web site at: http://www.becomehealthynow.com/glossary/pathogenic_organisms.htm). It increases bile flow and induces bacterial urease³ activity. Putrefaction dysbiosis is corrected by decreasing dietary fat and flesh, increasing fiber consumption and feeding Bifidobacteria and Lactobacillus preparations.

2) Fermentation

This is a condition of carbohydrate intolerance induced by overgrowth of bacteria in the stomach, small intestine and beginning of the large intestine. Bacterial overgrowth is promoted by:

- a lack of hydrochloric acid (hypochlorhydria)
- stasis due to abnormal motility, physical/surgical abnormalities
- immune deficiency
- malnutrition

Gastric bacterial overgrowth increases the risk of systemic infection.

Carbohydrate intolerance may be the only symptom of bacterial overgrowth, making it indistinguishable from intestinal candidiasis (having an overgrowth of Candida); in either case dietary sugars can be fermented to produce endogenous⁴ ethanol. Chronic exposure of the small bowel to ethanol may itself impair intestinal permeability⁵. British physicians working with the gut-fermentation syndrome have tentatively concluded, based on treatment results, that the majority of cases are due to yeast overgrowth and about 20% are bacterial in origin. The symptoms include abdominal distension, carbohydrate intolerance, fatigue and impaired mental function.

3) Deficiency

Exposure to antibiotics or a diet depleted of soluble fiber may create an absolute deficiency of normal fecal flora, including Bifidobacteria, Lactobacillus and E. coli. Direct evidence of this condition is seen on stool culture when concentrations of Lactobacillus or E. coli are reduced. This condition has been described in patients with irritable bowel syndrome and food intolerance. Deficiency and putrefaction dysbiosis are complementary conditions which often occur at the same time and call for the same treatment regime.

² Insoluble fibers absorb and retain water, accelerate the transit time of gastrointestinal contents and thus help to prevent constipation. Water-insoluble fibers include: lignin (found in vegetables), cellulose (found in wheat), and hemicellulose (found in cereals and vegetables). Cellulose and hemicellulose are substrates for microbial fermentation, which not only provides energy, but may also be important in converting toxic or carcinogenic compounds into non-toxic forms. These fibers also increase stool bulk, which helps with muscle tone in the colon and makes it less susceptible to the bulging out-pouches seen in diverticular disease. Lignin binds bile acids, which are important in the absorption of cholesterol from food and thus helps in lowering blood cholesterol levels.

³ Urease - An enzyme that catalyzes the hydrolysis of urea to carbon dioxide and ammonia; used as an antitumor enzyme; it is present in intestinal bacterial and accounts for most of the ammonia generated from urea in mammals

⁴ Endogenous - Originating or produced within the organism or one of its parts

⁵ Permeability - The property of being permeable - permitting the passage of substances (e.g., liquids, gases, heat), as through a membrane or other structure.

4) Sensitization

Aggravation of abnormal immune responses to components of the normal intestinal microflora may contribute to the development of inflammatory bowel disease, spinal arthritis, other connective tissue disease and skin disorders such as psoriasis or acne. The responsible bacterial components include toxins which can cross-react with human tissues.

Additional Causes of Dysbiosis

Dysbiosis is promoted by the consumption of antibiotics, which destroy “friendly” (useful) bacteria such as lactobacilli and bifidobacteria much more readily than undesirable putrefactive varieties such as E coli and Clostridium. A reduced ability to produce gastric acid (hydrochloric acid) may also lead to an overgrowth of bacteria in the small intestine. Such an overgrowth may promote nutrient malabsorption, particularly that of vitamin B12.

One particularly common form of dysbiosis is known as candidiasis, where the intestinal tract becomes colonized by the yeast *Candida Albicans*.

Natural medicine practitioners treat dysbiosis and conditions promoted by autointoxication, by using herbal antimicrobials, gut healing products, and probiotics together with an appropriate dietary program.

A healthy person lives in harmony with his or her intestinal flora. The person provides a home and food to over 400 species of bacteria.¹⁷ The bacteria, which in a healthy person will be predominantly "friendly" types, do a myriad of health-promoting things for the person, including detoxification, the production of vitamins, and protecting us from unfriendly organisms. This state is called “symbiosis.”

Sometimes this state of happy balance does not exist because of the presence of frankly pathogenic organisms, the overgrowth of unfriendly organisms that are often not considered pathogenic, or the absence of friendly bacteria. Then, dys-symbiosis, or dysbiosis exists. Dysbiosis can be caused by protozoan parasites (*Entamoeba histolytica*, *Entamoeba coli*, other *Entamoeba*, *Dientamoeba fragilis*, *Endolimax nana*, *Giardia lamblia*, *Blastocystis hominis*, *Chilomastix mesnili*, and others) (For a full list of parasites that can affect the human body, visit the BecomeHealthyNow.com web site at: http://www.becomehealthynow.com/glossary/parasitic_organisms.htm); yeast (*Candida albicans*, other *Candida* species, *Torulopsis glabrata*, and others); or bacteria (*Salmonella*, *Shigella*, *Campylobacter jejuni*, *Yersinia enterocolitica*, *Klebsiella pneumoniae*, *Citrobacter freundii*, *Citrobacter diversus*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, some strains of *Escherichia coli*, *Staphylococcus aureus*, some strains of *Bacteriodes*, *Clostridium difficile*, and others). Some of these organisms are not considered "pathogenic" by conventional medicine. However, weak pathogens, or a predominance of "unfriendly" organisms can cause severe illness in a chronically ill, weakened, or malnourished patient.¹⁸ The eradication of these organisms can make a dramatic difference in the patient's health.

A very common cause of bacterial or fungal dysbiosis is often the repeated or long term use of antibiotics. Antibiotics kill both the bacteria you want them to kill and the "friendly" bacteria in the intestine and the vagina. This leaves these areas open to be colonized by yeast, unfriendly bacteria, and parasites.

Parasitic infestations are on the increase because of changes in our lifestyles that have occurred over the last few decades. International travel is now commonplace. If you are not a traveler, the world and its parasites will come to you, brought by imported produce and immigrants from countries where sanitation is sub-standard. Eating out in restaurants frequently and the close contact of day care centers contribute to the spread of parasites.

Maldigestion can also promote dysbiosis. Dr. Martin Lee says, “Colonic flora is a reflection of what it is fed.”¹⁹ If food is completely and rapidly digested and absorbed in the small intestine, it is not available to nourish unfriendly bacteria or yeast in either the small or large intestine. Almost all that is left to reach the large intestine is fiber, which is a favorite food for friendly bacteria such as *Lactobacillus* and *Bifidobacterium* and promotes their growth.

Diet can also contribute to dysbiosis. A diet high in flesh protein and low in plant foods promotes the growth of Bacteroides species, but a lacto-vegetarian diet, based on milk products and plant foods, promotes the growth of Lactobacillus and Bifidobacterium.²⁰ Elaine Gottshall's book Breaking the Vicious Cycle prescribes the "specific carbohydrate diet" for patients with inflammatory bowel disease.²¹ This diet eliminates all grains, sugar, lactose, other disaccharides, and some starches that such patients may be unable to digest and absorb. This leads to a shift in bowel flora towards normal and improvement in symptoms.

The ideal diet for patients with candidiasis is the subject of considerable debate. Several years ago, high-protein, low-carbohydrate diets, on which the grams of carbohydrate may have even been counted, were used. Then Dr. William Crook began using diets higher in complex carbohydrates for his patients. Simple carbohydrates, such as fruits, were still restricted initially.²² When Dr. Crook spoke to a group of health professionals in 1995, the question of the best diet for candidiasis was raised. Dr. Crook said that, in his many years of experience, the only absolute he had determined to be essential for the diet was that sugar had to be avoided. He said that all the NystatinTM or DiflucanTM (two medications used in the treatment of Candida), in the world will not eradicate Candida if a patient continues to eat sugar. Recent German studies suggest that very low carbohydrate diets may be counterproductive because they cause the Candida to become invasive and penetrate deeper into the tissues in search of food.²³

Dysbiosis caused by bacteria or yeast can be diagnosed using a stool test called a comprehensive digestive stool analysis (CDSA). The microbiology part of this test differs from a standard "stool culture," which usually only reports the presence or absence of aerobic (oxygen-loving) bacteria considered "pathogenic" by conventional medicine, such as Salmonella and Shigella. A CDSA tests for the presence and amount or absence of all aerobic organisms and the friendly facultatively anaerobic organisms Lactobacillus and Bifidobacterium. The organisms a CDSA reports include yeast of all kinds, all normal and abnormal aerobic bacteria, Bacteroides, Lactobacillus, and Bifidobacterium. A CDSA also gives your doctor chemical information that reflects the health of your digestive system. This information includes the presence and amount or absence of undigested protein and plant fibers, fats, fatty acids, occult blood, and other metabolic markers. This information may be suggestive of conditions that are affecting your health in general. Tests for dysbiosis, such as a CDSA or a parasitology test, as discussed below, may be the most important tests you do and should not be omitted for any patient with severe food allergies or digestive problems. We offer this test from Great Smokies Diagnostic Laboratory and if you have not already done this test, you can call us to arrange for a test kit to be sent to your home. No doctor's visit is necessary to do the test and the results are available seven days after the lab receives your stool specimen. More information regarding this test, as well as a sample report can be viewed at this link:

<http://www.becomehealthynow.com/article/products/abdigestive/1162/>

In-depth parasitology testing can also be done to determine if parasites are causing dysbiosis. Such in-depth testing can also be done by Great Smokies Diagnostic Laboratory. The parasitology testing you should have done differs from the standard "ova and parasites" test done at most hospital laboratories in several ways. This testing will report organisms that would not be reported on a standard test because they are not considered "pathogenic" by many in conventional medicine, such as Blastocystis hominis. Also, since specialized laboratories have more experience in looking for parasites, they are more likely to find any that are there. However, even when the test is done by an experienced laboratory, Dr. Leo Galland says that parasitology testing should be "taken with a grain of salt."²⁴ stool samples, by their very nature, contain a lot of debris mixed with a very few parasites, eggs, or cysts. It is not always easy to distinguish a white blood cell that is being broken down or other material from something significant. For this reason the test may be reported as negative when the patient DOES have parasites, even if it is done by a competent technician at an excellent laboratory. The more samples submitted, the more likely a parasite will be picked up. We commonly suggest that you submit "purged stool specimens" (done with a mild laxative), or a rectal swab as these increase the chance of detecting parasites because they are dislodged from the intestinal wall. A patient may have several negative tests and still have parasites.

Intestinal dysbiosis can be treated with a variety of prescription and botanical medicines to rid your body of unfriendly organisms. Your CDSA results include sensitivity testing which indicates which medicines are effective against your particular unfriendly bacteria and yeast. Treatment of dysbiosis caused by bacteria and/or yeast will also usually include supplementation with friendly probiotic organisms such as Lactobacillus and Bifidobacterium. Dr. Leo Galland does not recommend taking probiotics while under treatment for parasitic infestations because bacteria are “food” for protozoal parasites: save your probiotics to take after the course of anti-parasitic treatment is completed.²⁵

A few supplements you may be taking can be counterproductive to the treatment of dysbiosis and are mentioned here so you can avoid them. Iron supplements feed unfriendly bacteria and protozoan parasites.²⁶ Fructooligosaccharides (FOS) also feed some unfriendly bacteria, especially Klebsiella pneumoniae, hemolytic E. coli, Bacteroides species, and Staphylococcus aureus.²⁷ As mentioned above, protozoal parasites “eat” bacteria, so your doctor may advise you to avoid probiotics during the course of anti-parasitic treatment. Cysteine, glycine, and glutathione, while important antioxidants, can stimulate the growth of yeast in some patients with candidiasis.²⁸ If you are taking botanical remedies for dysbiosis, your doctor may tell you to temporarily avoid all antioxidants because botanical medicines kill parasites and bacteria by oxidizing them, and thus, antioxidants reduce the effectiveness of these remedies.²⁹

What can Dysbiosis Lead To?

Because dysbiosis is not a disease in itself, it can lead to a multitude of syndromes which then later lead to frank disease. Improving your digestive tract function is vital if you are to ever be truly healthy.

Anxiety and Dysbiosis

There are some indications that dysbiosis (poor intestinal flora) can contribute to anxiety.

1. Low dose Salmonella toxins have been shown to induce anxiety in humans.
2. Hypoglycemia is a common consequence of dysbiosis. When blood sugar dips too low, there is a release of adrenaline to bring the blood sugar back up. This can trigger a panic attack in susceptible individuals.
3. Imbalanced hormones are associated with Dysbiosis. Often thyroid and progesterone are low and estrogen is relatively high. This hormone balance tends to increase epinephrine (adrenaline). Elevated epinephrine can cause anxiety. Low thyroid, low progesterone and high estrogen also contribute to hypoglycemia.

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Arthritis and Intestinal Flora

There is a strong relationship between what grows in the intestines and arthritis. There is even a “candida” arthritis, where they find fungus in the joints. (Candida arthritis is treated by administering systemic antifungals and by injecting antifungals into the joints.)

A common finding in arthritis is bacterial overgrowth of the small intestine. It doesn't necessarily cause arthritis, but it may contribute to it. Poor intestinal bacteria can increase inflammatory cytokines like IL-1, TNF, and IL-6, which are involved in rheumatoid arthritis. When there is bacterial overgrowth of the small intestine, osteoporosis is often present too. This bacterial overgrowth is also a common finding in irritable bowel, the yeast syndrome, chronic fatigue and fibromyalgia.

When mice are fed a diet high in lectins, it strips the intestinal mucous coating in the small intestine, and encourages the overgrowth of abnormal bacteria and protozoa. Lectins are also implicated in the development of rheumatoid arthritis.

Broda Barnes, MD, found that almost all of his arthritis patients were in need of thyroid. Some of his patients also did better when they were given a small amount of cortisol, four times per day.

Products Used in Treating Dysbiosis

Some of the same products that help people with their arthritis can help people heal their gut. We have many products available to help you achieve a state of improved digestion and some of these include the following. To view the product information, you will need your user name and password. We can assist you in determining which products are best for you.

Cholacol® II

<http://www.becomehealthynow.com/article/suppscolon/386/>

Cholacol II also contains purified beef bile salts, but it's primarily a detoxification product for the colon. Each tablet contains 540 milligrams of montmorillonite clay, which absorbs toxins from the colon, the toxins being the result of the incomplete digestion of food. The person whose food is putrefying in his colon due to incomplete digestion will have foul-smelling stool and lower bowel gas several hours after eating, as well as diarrhea.

Lact-Enz®

<http://www.becomehealthynow.com/article/suppscolon/415/>

Lact-Enz combines bowel flora and pancreatic enzymes, useful in candida (yeast) overgrowth, the intestinal consequences of antibiotic therapy, and problems resulting from sensitivity to dairy products or from a diet that relies on dairy products.

Lactic Acid Yeast

<http://www.becomehealthynow.com/article/suppscolon/417/>

Lactic Acid Yeast converts the carbohydrates in food to lactic acid, thereby maintaining proper bowel pH. The lactic acid yeast organism in Lactic Acid Yeast wafers does the same thing that lactic acid bacillus does with one difference. Lactic acid bacillus only changes milk sugar to lactic acid, whereas Lactic Acid Yeast organism changes any carbohydrate to lactic acid. This difference makes the Lactic Acid Yeast organism a better bowel

flora for most people, especially people who limit or avoid milk and dairy products. I don't think anyone else uses the Lactic Acid Yeast organism; other companies use lactic acid bacillus.

Okra Pepsin E3

<http://www.becomehealthynow.com/article/suppscolon/436/>

Okra Pepsin E3 Contains Okra, Vitamin E3, and Allantoin To Provide Bowel- Cleansing Action And Tissue-Healing Properties

Spanish Black Radish

<http://www.becomehealthynow.com/article/suppscolon/473/>

Black Radish is effective in intestinal toxemia, especially for detoxifying the bowels when the patient doesn't have diarrhea. It may be used with Zymex, Livaplex, and Chlorophyll perles for a great general detoxification program. The product was developed by Dr. Henry in Detroit to help with bowel cancer.

Fen-Cho ®

<http://www.becomehealthynow.com/article/suppsdigestive/397/>

This is a combination of Di-Sodium Phosphate, fenugreek seed and bile salts in a capsule. The "Cho" stands for Cholacol, our bile salt product. Fenugreek seed improves the flow of material through the gastrointestinal tract, so it has a mild laxative effect. We've also added Collinsonia, Fen-Cho works as a laxative in several ways.

Gastrex ®

<http://www.becomehealthynow.com/article/suppsdigestive/403/>

Gastrex is formulated to support digestion and stimulate the healing and cleansing, principally, of the upper gastrointestinal tract. Gastrex accomplishes this task via the primary ingredients of okra powder, bentonite, anise powder, and the chlorophyll found in tillandsia; in addition to porcine stomach and duodenum tissue extracts.

Zymex® Capsules

<http://www.becomehealthynow.com/article/suppsdigestive/491/>

Zymex is actually made from a culture that we grow. We take red beets, beet leaves and wheat germ, make a bed out of the mixture, sterilize it and seed it with a certain culture. Then we put the culture under ideal moisture and temperature conditions and let it grow. After about three nights and two days, a beautiful gray mold has grown. It looks just like velvet. We dry the mold in a sigmoid dryer and make wafers out of it -- that is Zymex.

Zymex® II

<http://www.becomehealthynow.com/article/suppsdigestive/490/>

Zymex II contains important digestive enzymes and other valuable phytonutrients to support healthy gastrointestinal function

Zymex® Wafers

<http://www.becomehealthynow.com/article/suppsdigestive/489/>

The human digestive system is responsible for taking nutrients from the different foods we eat and drink and breaking them down into substances suitable for absorption that takes place in the intestines. The intestinal

environment requires a certain pH balance throughout (as does our entire body), in order to maintain appropriate beneficial species of intestinal flora, that are needed to perform a number of important functions.

Dysbiosis can Contribute to Many Physical Conditions

Asthma and Intestinal Flora

70% or more of the immune system is in the intestines. The same immune components that are important in asthma also play a big role in intestinal inflammation and food allergies. So logically, one could look for a connection between asthma and what is happening in the gut. There are connections.

1. If you merely take the DNA from good intestinal flora and inject it under the skin, it will relieve asthma.
2. LPS from gram-negative intestinal bacteria can make the airways hypersensitive.
3. Low blood sugar can make asthma worse. Toxins from yeast and the wrong intestinal flora will contribute to low blood sugar. In fact, one of the major complaints of people with “the yeast syndrome” is hypoglycemia.
4. Magnesium is often very helpful in relieving asthma. Magnesium improves the integrity of platelet and mast cells. With more magnesium present, less serotonin will be released from these cells. This is very important because free serotonin outside of the cells will cause bronchial constriction. Low magnesium may be a problem when there is intestinal inflammation because the inflammation interferes with the absorption of minerals.
5. B6 is often recommended to help with asthma. Yeast toxins can interfere with the creation of coenzyme B6, and they can cause a functional deficiency of B6. Yet, be careful. B6 and many of the B vitamins may encourage yeast growth. It may be best to take them on an empty stomach. Also, the active or coenzyme form of these vitamins are sometimes needed. This is not the form found in most supplements.

If you want to get asthma under control, healing the gut should be a major consideration.

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Attention Deficit and Dysbiosis

If you are familiar with the books of William Crook, MD, then you are aware that “the yeast syndrome” has a strong connection to attention deficit. However, it isn’t only intestinal yeast or Candida that contribute to attention deficit. Intestinal bacteria are sometimes an even bigger factor.

Various substances produced by bacteria and yeast will affect your ability to think. For instance, some intestinal bacteria produce a lot of ammonia. Too much ammonia will increase the turnover of serotonin in the brain. Ammonia interferes with mitochondrial energy production. Ammonia will also increase GABA, an inhibitory

neurotransmitter in the central nervous system, and this will change the way other neurotransmitters are used. Another example of a substance that will affect cognition is DHPPA. Clostridia bacteria produce DHPPA, a molecular mimic of norepinephrine and dopamine. Thus toxins from intestinal bacteria can affect your ability to think.

The bacteria and yeast in the gut will alter the immune system. The immune system can affect sleep, memory, learning and hormonal regulation. Eg. A toxin from bacteria in the gut called lipopolysaccharide (LPS) will increase an immune cytokine called IL-1. IL-1 is of particular concern in attention deficit because it can have a profound effect on memory and learning.

LPS can also cause central hypothyroidism. This type of hypothyroidism is not picked up by the usual blood tests. Hypothyroidism alters the way the brain uses neurohormones like serotonin, norephenephine and epinephrine. Sometimes, merely correcting hypothyroidism with a thyroid hormone supplement will eliminate attention deficit. (With central hypothyroidism, it is particularly important to consider the use of natural thyroid and T3 thyroid hormone as opposed to the standard treatment of just T4 thyroid.)

Yet, please don't start thyroid supplements while a child is still on Ritalin. The combined effect could be dangerous. Thyroid hormones increase the sensitivity of the body to adrenaline. When you first start taking thyroid hormones (especially ones that contain T3), there can be an initial period where this adrenaline sensitivity is very prominent. That is why Ritalin could be a problem. Ritalin augments the body's sensitivity to noradrenaline. The combination could be additive and lead to things like a very rapid heart beat.

Fuad Lechin, MD, PhD has found two types of neurochemical disorders in attention deficit hyperactivity. One presents excessive free serotonin in the plasma, while the other shows excessive dopaminergic activity plus norepinephrine overactivity.

Free serotonin:

Free serotonin in the plasma can be caused by allergies, low magnesium, toxins from the gut, or free unsaturated fatty acids. (Stress, including low blood sugar, will release oils in their free fatty acid form.) To prevent the release of serotonin into the plasma, it may be wise to limit dietary polyunsaturated oils. Eg. Reduce intake of corn, safflower, soy, cottonseed, canola, peanut and even flax oil. (Some of the biggest sources of these oils are margarines, restaurant French fries, and pizza crusts.) If you want to reduce free serotonin, then adequate magnesium is important too. Magnesium stabilizes platelets and mast cells. This reduces their release of serotonin into the plasma. Eliminating allergies would also reduce the amount of serotonin found in the plasma. Glycine counters some of the effects of free serotonin. Glycine improves memory and learning, and is therefore another supplement worth considering. However, glycine can also make some bacteria and yeast healthy. You need to watch out for this if you decide to try a glycine supplement.

Excessive dopaminergic activity plus norepinephrine overactivity:

The Feingold diet will improve the liver's ability to remove norepinephrine and dopamine. The Feingold diet reduces the strain on the liver's sulfation pathway, which is used to remove norepinephrine and dopamine. This pathway is often weak in attention deficit. However, to truly heal, one needs to get to get closer to the source of the problem. There are reasons that this sulfation pathway can be weak. One possible culprit is mercury

poisoning. Another is intestinal inflammation. Intestinal inflammation and mercury poisoning reduce the sulfates in the body. Candida/yeast also contribute to the sulfation pathway problem by loading the body with phenolics. Yeast create phenolics that need to be removed by the liver, often by this same sulfation pathway. Also, consider low thyroid function as a possible contributor to this condition. In hypothyroidism, there tends to be an excess of serotonin, epinephrine and norepinephrine. Thyroid also helps the liver work better.

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Autism and Intestinal Flora

80% to 90% of the children with autism have abnormal levels of bacteria or fungal metabolites in their urine. (Great Plains Laboratory results.) However, it isn't just the toxins from bacteria and yeast that interfere with cognition. The changes in the immune system caused by abnormal intestinal flora also interfere with memory and learning. Some of these same immune changes can cause central hypothyroidism, which is often found in autism.

People suspect that mercury poisoning is a big contributor to many cases of autism. Among other things, mercury poisoning changes the body chemistry so that a person is likely to have dysbiosis. Mercury also increases how fast the measles virus mutates. It is harder for the immune system to keep up with a virus if it keeps mutating into a different form. This makes it difficult to eliminate the virus. The measles virus is often found in the intestines of the autistic.

Brain Fog and Dysbiosis

Brain fog is a very common complaint among those suffering from the yeast syndrome. Several things associated with dysbiosis (poor intestinal flora) can make it more difficult to think.

1. Hypoglycemia. This is commonly associated with dysbiosis. Arabinol and tartaric acid from yeast can contribute to hypoglycemia.

2. **Immune System Alteration.** The intestinal flora interacts with your immune system. A component of the immune system called IL-1 can interfere with memory and learning.
3. **Hypothyroidism or Hyperthyroidism.** Low thyroid levels reduce your energy and make it difficult to think. High thyroid levels may activate the prefrontal cortex and interfere with attention.
4. **Low Cellular Energy.** Fungal toxins like cyclopiazonic acid interfere with cellular energy production. Less cellular energy makes it more difficult to think.
5. **Ammonia.** Certain intestinal bacteria can produce a lot of ammonia. Excess ammonia interferes with mitochondrial energy production in the cells. The brain needs energy to function properly. The ammonia will also increase GABA, an inhibitory neurotransmitter.

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Carpal Tunnel and Intestinal Flora

Carpal Tunnel is much more prevalent in those who have candida overgrowth in their intestines. Let's take a look at what people have found helpful in the treatment of carpal tunnel. There is biotin, B6, MSM, thyroid hormone and serrapeptase. How does this relate to intestinal candida or yeast overgrowth?

1. Biotin may be deficient, because you are missing the good flora that create it. The bioavailability of the biotin can also be compromised by accumulation of pentosines that are increased by a yeast alcohol called arabinol.
2. B6 needs to be converted into its active form before the body can use it. The yeast toxin called acetylaldehyde interferes with the conversion of B6 into its active form.
3. MSM is a form of sulfur. Intestinal inflammation caused by yeast and harmful bacteria will cause the body to lose the sulfates lining the intestines.
4. More thyroid hormone is often needed when there is poor intestinal flora. This is due to a change in the immune system and due to the strain on the liver caused by toxins produced in the intestines. It is the liver that converts most of your thyroid into its active form.
5. Serrapeptase breaks down fibrin formation and may improve circulation. Why would there be fibrin formation when there is poor flora in the intestine? It can be caused by an immune reaction to LPS from the

shell of gram-negative bacteria in the intestines. Also, excessive dietary polyunsaturated oils will set a person up for fibrin formation and poor gut flora.

Yes, you can and should correct any deficiencies contributing to your carpal tunnel. However, if you also have intestinal symptoms, then you will definitely want to learn how to change the flora in your intestines.

Frequent Colds or Flu

Chronic infections are a sign that the immune system is in trouble. Since 70% or more of the immune system is located in the intestines, it makes sense to take a look at this. What lives in your intestines affect your immunity. In particular, yeast and viruses in your intestines can suppress your cell-mediated immunity. This makes you much more susceptible to the next flu that you encounter. In fact, the bacteria, yeast, and viruses in your intestines can train your immune system to be healthy or sick. That is why it is so very important to get an child's intestinal flora healthy as soon as possible.

Frequent colds and flu can also be due to low thyroid function. Low thyroid function can be induced by dysbiosis.

Constipation or Diarrhea and Dysbiosis

There are several ways that poor intestinal flora can lead to constipation or diarrhea.

1. Certain bacteria create methane gas. Methane gas can shut down the contractions in the intestines and lead to constipation.
2. Bacteria, parasites and yeast can contribute to diarrhea by causing intestinal inflammation.
3. Poor intestinal flora can contribute to hypothyroidism. Hypothyroidism is classically associated with constipation. However, this does not preclude the possibility of a person being hypothyroid and experiencing diarrhea.
4. Poor flora can lower the body's nutritional and energy status. It can reduce the liver's ability to detoxify hormones and neurohormones. It can alter the immune system. All of this will have an indirect effect on intestinal motility.

Crohn's, Colitis and Intestinal Flora

High potency "good bacteria" can keep Crohn's and colitis in remission. (Studies were done with VSL probiotics.) There is little doubt in the mind of the medical community that intestinal bacteria are a big factor in Crohn's and Colitis. There is also some speculation that antibodies to yeast may play a role in the pathogenesis of these diseases.

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Depression and Dysbiosis

Dysbiosis (poor intestinal flora) can contribute to depression by altering the immune system. Let's examine this relationship a bit closer. Cytokines are produced by our immune system. In depression, there is an increase in inflammatory cytokines called IL-1, IL-6, and TNF. These same cytokines can be increased by exposure to the LPS in the cell wall of gram-negative intestinal bacteria. By increasing these cytokines, intestinal bacteria have been shown to induce depression, anxiety and cognition impairment.

Antidepressants modify the brain's response to cytokines. In fact, this might be one of the ways that these drugs work to relieve depression. The same inflammatory cytokines that are associated with depression can activate the hypothalamic-pituitary-axis (HPA). An activated HPA is also associated with depression. These same inflammatory cytokines can also cause central hypothyroidism. There is some indication that central hypothyroidism is present in depression. However, this type of central hypothyroidism is not easily found by the usual tests. If central hypothyroidism exists, it is important to treat it. Without treatment, there is less chance that anti-depressants will work.

Central hypothyroidism means that there is not enough thyroid hormones circulating in the body because the brain is not regulating them properly. Doctors often employ a TSH test to screen for thyroid problems. TSH is a chemical produced in the brain that tells your thyroid gland to produce thyroid hormones. If TSH is high, it usually means that your thyroid is having trouble meeting the demands of the body and that you need a supplement of thyroid hormones. However, TSH is suppressed in central hypothyroidism. The brain isn't making enough of it in response to the body's need for thyroid. Therefore TSH won't register high even though the body needs more thyroid hormone.

Unfortunately, many institutions rely solely on this TSH test to screen patients for thyroid abnormalities. The TSH test will not detect central hypothyroidism. To detect central hypothyroidism, a TRH test is usually employed. However, a doctor cannot even rely on the TRH test. In depression, the suppression of TSH seems to occur at night, not during the day when a TRH test is usually administered. Therefore many cases of hypothyroidism in depression can be missed.

A doctor cannot even totally rely on the thyroid hormone levels in the blood to tell him if hypothyroidism is present. There is a slow clearance of thyroid hormones from the blood when hypothyroidism exists. This throws off these tests.

A form of thyroid hormone called T3 seems to be very important in the treatment of depression. Be careful to find a doctor willing to gradually try introducing the T3 form of thyroid into your treatment protocol. Unfortunately, most doctors have been taught to just use T4 thyroid when treating hypothyroidism. An alternative doctor is more likely to employ T3 thyroid. (Natural thyroids like Armour contain T4 and T3 thyroid.)

There is another relationship between your immune system, the gut and depression. A healthy intestine will produce an enzyme called DPP IV. (The intestines and kidney are where most of this enzyme is created. Certain intestinal bacteria can create this enzyme too.) This enzyme is important for the digestion of food, and it is important for the immune system. It appears to have a major role in depression, as evidenced by the following observations.

1. The activity of this enzyme is low in the blood serum of people with depression.

2. Treatment with either interferon-alpha or IL-2 will reduce DPP IV activity in the blood. This reduction in DPP IV activity directly correlates with an increase in depressive symptoms.

3. The DPP IV enzyme is important for methylation in the body. Methylation appears to be important in the treatment of depression. (eg. SAMe)

4. The DPP IV enzyme degrades (helps to get rid of) IL-1, IL-6, and TNF. These inflammatory cytokines are often elevated in depression.

DPP IV is contained in several digestive aids on the market. However, as of yet, there are no studies where DPP IV has been used to treat depression. Used by itself, DPP IV may or may not be a good idea in the treatment of depression. The ideal solution is to heal the gut and let the body create its own DPP IV and other digestive peptidases.

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Fatigue and Dysbiosis

There are many ways that dysbiosis (poor intestinal flora) can contribute to fatigue.

1. Toxins from yeast and bacteria can interfere with energy production by the cell's mitochondria.

2. Epstein-Barr, Herpes, CMV and other viruses are associated with chronic fatigue. These are normally kept in check by your cell-mediated immunity. Intestinal yeast suppress your cell-mediated immunity and thus make it more difficult for your body to keep these viruses in check.
3. Thyroid hormone is required for energy production. Thyroid hormone levels can be suppressed by the body's reaction to the intestinal flora and its toxins.
4. Poor flora can lead to alterations in your immune system that can promote the formation of fibrin. When fibrin coats your capillaries, this can interfere with oxygen getting to your cells.
5. Good flora helps your body digest food and acquire the nutrients that your body needs to function properly.
6. Poor flora interferes with the nutrition needed to produce energy. Eg. Yeast destroy coenzyme Q10 before your body gets a chance to absorb it. Coenzyme Q10 is very important for cellular energy production. Yeast also reduce alpha ketoglutaric acid in the body. This interferes with the Krebs energy cycle.
7. Intestinal inflammation depletes the body of sulfates. The liver needs sulfates to detoxify many harmful substances that interfere with the production of energy in the body.

Fibromyalgia and Dysbiosis

Mark Pimentel, MD, discovered that people with fibromyalgia have a significant amount of bacterial overgrowth in their small intestine. Those with the most overgrowth had the most pain. He then conducted motility studies on fibromyalgia patients and discovered that the housekeeper wave was very weak or missing. The housekeeper wave is a strong contraction that occurs between meals. This contraction cleans the small intestine of debris and bacteria. The small intestine should have very little bacteria in it. The housekeeper wave helps keep it that way.

The housekeeper wave can be missing for several reasons or combinations of reasons. Here are a few.

1. High levels of histamine can stop the housekeeper wave. Excessive histamine can be caused by allergies, by an immune attack against parasites, or by low magnesium levels. (Magnesium supplements are often very helpful in fibromyalgia. Sometimes an anti-histamine helps with sleep.)
2. Poor circulation to the gut can stop the housekeeper wave. The circulation may be impaired by fibrin coating the capillaries. Fibrin formation can be caused by an immune response of the body combined with other factors like estrogen, high histamine or free serotonin. (Stress combined with a diet high in polyunsaturated oils will free serotonin from cells. Therefore, one may wish to limit polyunsaturated oils in the diet. Eg. Don't eat as much corn, safflower, canola, soy, cottonseed, peanut, and flax oils.)
3. Enough thyroid is required for strong housekeeper wave contractions. Thyroid hormone is often low in fibromyalgia. The immune system and/or free serotonin could shut down the brain's regulation of thyroid. Even excess ammonia generated from certain bacteria in the gut could increase serotonin in the brain and affect hormonal regulation. In fact, according to Dr. John Lowe, about 45% of the fibromyalgia patients that he has

examined have central hypothyroidism --- the brain is not regulating thyroid properly. Usually, to correct this problem, the patient must be slowly worked up to taking relatively large doses of T3 thyroid.

4. The mere presence of the bacterial overgrowth can stop the housekeeper wave. So, it is important to lower the overgrowth by other means. A diet like the Specific Carbohydrate Diet may be helpful for some. Or a prescription elemental diet would reduce the overgrowth.

Why is the immune system off in fibromyalgia? It can be thrown off by injury to the neck or brain from an automobile accident. Or it can be thrown off by toxins produced in the gut by the flora there.

One suspected source of the immune dysfunction in fibromyalgia is a viral infection of E. coli. Theophil Hey, MD and colleagues found that 80% of those with fibromyalgia harbor viral infected E. coli. Only 13% of those without fibromyalgia have this. The virus causes the bacteria to burst and send parts of the bacteria's shell into the body. Lipopolysaccharide (LPS) from the E. coli shell increases cytokines IL-1, IL-6, and TNF in the body. These can cause central hypothyroidism and difficulty with memory and learning. LPS can also release serotonin from mast cells. (The growth of E. coli and other bacteria can be retarded by supplements like enteric-coated peppermint and oregano.)

Magnesium is very important in the treatment of fibromyalgia. When magnesium is deficient, it increases the inflammatory cytokines IL-1, IL-6, and TNF. Magnesium deficiency also increases histamine, substance P and lowers glutathione. Magnesium deficiency also causes the cells to take up calcium.

Fibromyalgia patients have often noticed an increased accumulation of tartar on the teeth near the gum lines. This could be an indication that there is increased tartaric acid in the body. In fact, Dr. Shaw has often found increased amounts of tartaric acid in the urine of those with fibromyalgia. The body does not make tartaric acid. However, certain bacteria and yeast can create tartaric acid. The increased tartaric acid could be due to intestinal yeast or bacteria.

Tartaric acid interferes with the creation of malic acid in the body. Guifenisen therapy may help the body remove the tartaric acid. Many people have found that malic acid and Guifenisen are very helpful. However, others have not experienced any benefit from Guifenisen or malic acid. Perhaps the benefit of these interventions depends on whether or not an individual has increased tartaric acid in the body. It would be interesting to run such an experiment and find out.

There are many things to learn about how fibromyalgia arises and how it best can be treated. However, perhaps start by asking your doctor about magnesium, thyroid, anti-histamines and diet. Avoidance of excessive polyunsaturated oils in the diet may be helpful too.

Food Allergies-Sensitivities and Dysbiosis

Food allergies and delayed sensitivities to food are very common when there is dysbiosis. This is caused by increased permeability⁶ of the intestines --- leaky gut. Leaky gut is caused by the breakdown of the intestinal lining by yeast, certain bacteria, viruses and protozoa. Leaky gut allows larger molecules, more toxins and more undigested food particles to cross the gut lining. This leads to many food allergies. (The most common food

⁶ Permeability - The property of being permeable - permitting the passage of substances (e.g., liquids, gases, heat), as through a membrane or other structure.

allergies are to milk, chocolate, peanuts, eggs and wheat.) However, you don't have to be allergic to a food to be sensitive to it. The following are examples of how dysbiosis can make you sensitive to a food even though you aren't allergic to it.

If you have harmful intestinal bacteria, your reaction may be due to the way the bacteria process the food. For instance, you might have an overgrowth of Clostridia in your intestines. (This generally harmful bacteria often overtakes the intestinal environment because it is resistant to most antibiotics.) When Clostridia digests the casein found in milk, it produces the vasoactive amines of histamine, tyramine, agmatine, serotonin, putrescine and cadaverine. These can give you a migraine. Thus a migraine induced by milk may or may not be due to a true allergy to milk. It might be due to harmful bacteria acting on that milk. Similarly, if protein keeps you awake, it may be due to harmful bacteria acting on the protein and producing ammonia. It is the excess ammonia that is keeping you awake.

Here is another example of how dysbiosis can induce a sensitivity. Many people with Candida overgrowth are sensitive to monosodium glutamate, or MSG. (MSG is a "flavor enhancer" added to many food products.) This sensitivity can be due to an inactivation of a B6 dependent enzyme called glutamic oxaloacetic transaminase. Hence, if someone is deficient in B6, they can become sensitive to MSG. People with the yeast syndrome are often very low in the active form of B6. This is because the toxins from yeast create a real and a functional deficiency of the active form of B6. Thus yeast overgrowth can cause a sensitivity to MSG.

Here is another example of how a food sensitivity might arise. Many people have noticed that their autistic children do better without gluten and casein in their diet. (Gluten is in most grains. Casein is in most milk products.) This is not a food allergy reaction. It is probably due to a lack of an enzyme called DPP IV, which is needed to break down gluten and casein. When gluten and casein are eliminated from the diet, more of this DPP IV enzyme is available for other important functions in the body. Among other functions, this DPP IV enzyme breaks down opiates and immune system cytokines. This may be the reason that the elimination of gluten and casein can improve learning and memory in some of the autistic.

Sensitivity to food colorings is another example. It isn't an allergy, but it is a strain on the liver. For example, the Fiengold diet for attention deficit eliminates food colorings and salicylates from the diet. Food colorings are phenolics. Salicylates interfere with the liver's ability to remove phenolics by inhibiting the PST enzyme. The liver's PST enzyme attaches sulfates to phenolics. A weak PST enzyme or a lack of sulfates will interfere with the body's ability to remove phenolics, such as food colorings. Dysbiosis fits into this picture because it reduces the sulfates in the body. Dysbiosis may also induce hypothyroidism, which would interfere with the liver's ability to get rid of phenolics. Hence, dysbiosis may contribute to this sensitivity to food colorings and salicylates as found in some cases of attention deficit and autism.

Hives, Eczema and Dysbiosis

Hives are caused by mast cells dumping histamine into the skin's blood vessels. This may be in response to allergies or chemicals. Poor gut flora tend to increase the number of allergies and chemical sensitivities that people have. Indeed, there seems to be many people with the "yeast syndrome" who experience hives.

Poor absorption of minerals can also be part of the problem. In particular, low magnesium will make you more susceptible to hives. Magnesium stabilizes mast cells. Thus more magnesium may reduce the amount of histamine that is released and may help prevent hives.

Sometimes, eczema is a manifestation of an overworked liver --- a liver that cannot keep up with eliminating all the toxins with which it is presented. Poor intestinal flora may contribute to this situation, and is associated with eczema.

If you have problems with eczema, this is a possible indication that you have hypothyroidism (not enough thyroid hormone). Hypothyroidism is common when there is dysbiosis. However, hypothyroidism is not always detected by the usual blood tests. The Broda Barnes basal metabolism test will help your doctor determine if you need thyroid. You can do this simple test before your appointment. If your basal temperature is low, see an alternative doctor and discuss this with him/her.

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Hypoglycemia and Dysbiosis

There are quite a few mechanisms by which dysbiosis or poor intestinal flora contribute to hypoglycemia.

1. Biotin is important for the maintenance of good blood sugar levels. Biotin is created by good flora. In contrast, poor flora can induce a functional deficiency of biotin. However, before rushing out to get a biotin supplement, some precautions should be taken. Large supplements of biotin without inositol can lead to liver damage. Biotin can increase yeast growth, so it is best to consider this vitamin only after the yeast growth is somewhat under control.
2. Ethanol/alcohol, which is produced by certain yeast, will inhibit the liver's formation of glucose (sugar) from fats and protein. In particular, an alcohol called arabinol appears to be a problem in many cases of yeast overgrowth and hypoglycemia.
3. The body's normal production of glucose (a sugar) is impaired by the tartaric acid. Tartaric acid is produced by certain strains of yeast and bacteria. An overproduction of tartaric acid is often found in fibromyalgia.
4. Poor flora can lead to low thyroid function. Poor thyroid function contributes to hypoglycemia by reducing cellular respiration and by reducing the liver's ability to detoxify estrogen.
5. Estrogen causes hypoxia (lack of oxygen). This causes hypoglycemia.
6. Progesterone protects the body from hypoglycemia. It is more likely to be in short supply if the thyroid function is low.
7. Low levels of glutamine and branch chain amino acids can contribute to hypoglycemia. These amino acids are used to create glucose (a sugar) in the body. These amino acids may be low because of the dysbiosis. (Intestinal yeast overgrowth can cause low glutamine. Some bacteria produce a lot of ammonia and this lowers branch chain amino acids.)

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Poor Sleep - Insomnia and Dysbiosis

Eliminating dysbiosis (poor intestinal flora) may gradually help a person get better sleep. There are several things associated with dysbiosis that will affect sleep. Excess ammonia, excess histamine, food allergies, low magnesium, and immune system changes are all associated with dysbiosis and they may contribute to the sleep problem.

One of the reasons for poor sleep is excess ammonia. Some intestinal bacteria produce a lot of ammonia. Ammonia causes an increase in serotonin turnover. This increased turnover of serotonin is thought to cause sleep disturbances. Changing the intestinal flora by using things like bifidus and lactulose can reduce the ammonia in the body.

Yeast don't make a lot of ammonia, so their contribution to the sleep problem is probably less dramatic. However, getting rid of yeast may help. Yeast make a toxin called acetaldehyde. This depletes alpha ketoglutaric acid. Alpha ketoglutaric acid helps the body remove ammonia. Yeast also deplete taurine and coenzyme B6. These are also important for good sleep.

IgG allergy reactions to food can cause sleep disturbances. Dysbiosis is often associated with food allergies. Therefore, in this manner, dysbiosis may be indirectly interfering with sleep. Certain cytokines and antibodies to cytokines can also disturb sleep. These cytokines can be increased by the body's reaction to intestinal flora. This is yet another way that the intestinal flora may alter sleep patterns.

Sometimes an antihistamine taken at night helps people fall asleep. To reduce histamine formation, more magnesium may be helpful. Also, correcting a thyroid problem can help too. In hypothyroidism, it is common for there to be an excess of histamine. Dysbiosis may be part of the problem here, because it may induce hypothyroidism and reduce magnesium levels.

Intestinal Yeast - Candida

1. Yeast secrete an enzyme that digests the lining of the intestines.
2. Yeast shifts the immune system from Th1 to Th2. This sets the stage for allergies and viral infections.

3. Yeast enzymes break down IgA. IgA is the most predominant type of antibody that is found covering the gut mucosa. IgA keeps toxins and bacteria from binding to the cells that line the intestines. Without enough IgA, the intestines become inflamed, and the lymphoid tissue in the gut swells.
4. The byproducts of certain yeasts or fungus are able to alter the bacterial content of the intestines. (The fact that fungal metabolites can do this should come as little surprise. Many of our antibiotics are made from molds.)
5. Candida secretes an enzyme that reduces the body's ability to kill Staphylococcus aureus, a common pathogen in human intestines.
6. Yeast creates toxins like tartaric acid, acetylaldehyde and arabinol that interfere with the body's ability to produce energy.
7. Drs. Truss, Galland and Ionescu have all measured reduced levels of amino acids, imbalances of fatty acids and deficiencies of various vitamin and minerals in their yeast syndrome patients. In particular, yeast reduce the body's coenzyme Q10, coenzyme B6, alpha ketoglutaric acid, taurine, and asparagine. Some types of yeast promote the formation of pentosines. These create a functional deficiency of B6, lipoic acid and folic acid.

The most dramatic proof of harmful yeast toxins comes from the Great Plains Laboratory. Tartaric acid from yeast causes muscle weakness. Dr. Shaw discovered very high levels of tartaric acid in the urine of two autistic brothers. Both had such severe muscle weakness that neither could stand up. When treated with an antifungal called Nystatin, the tartaric acid measurements declined, and the children improved. When the Nystatin was discontinued, the tartaric acid levels rose, and the children got worse. Often, Dr. Shaw also finds tartaric acid in the urine of those with fibromyalgia, a condition characterized by muscle pain, poor sleep and tender points.

Yeast can be present in the intestines even if they don't show up in a stool culture. Dr. Leo Galland has shown that the yeast can be damaged and not grow in a culture, even though the yeast were present in a stool sample.

The most harmful place for yeast seems to be in the small intestine. This was shown in a study of children with failure to thrive. Biopsies of the upper small intestine were taken and were examined with an electron microscope. The yeast were embedded in the intestinal lining in their invasive fungal or mycelial form. Some of these children had no yeast showing up in their stool. Yet the yeast in this first part of their intestinal tract was interfering with their nutrition.

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Interstitial Cystitis and Dysbiosis

If you have bladder pain, but no urinary infection, then you might have interstitial cystitis. Interstitial cystitis is also known as Chronic Pelvic Pain Syndrome, CPPS. There is no infection, yet there is a very sensitive, inflamed lining of the bladder. Often there is abdominal pain. This condition occurs more frequently in women than men. (The “yeast syndrome” and irritable bowel also occurs much more frequently in women.) Many times men feel pain in the prostate, but the pain is actually emanating from the bladder.

Many people have noticed that their interstitial cystitis starts to clear up when they improve their intestinal flora. It could be the change in the immune system, or nutritional status, or it could be a reduction in the amount of toxic material dumped into the urine. The reason is not known. Interstitial cystitis appears to be a local manifestation of a whole body problem. Women with interstitial cystitis were found to have a greater number of other symptoms than controls. They were more likely to have headaches, dizziness, chest pain, aches in joints, heart pounding, backache, abdominal cramps, nausea, or other pelvic discomfort. Even though there is no urinary bacterial infection, antibiotics have often cleared up the pain and frequent voiding in women. (This might be due to a mycoplasma infection.) All of this suggests that there may be an infection elsewhere in the body that is contributing to the interstitial cystitis.

If you have bladder pain, as an added precaution, ask your doctor to rule out a urinary fungal infection. Most doctors only run a routine test for urinary bacterial infections. The urine must be cultured on a different medium to detect a urinary fungal infection.

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Causes of Leaky Gut

Leaky gut is a common term for increased intestinal permeability⁷. Larger molecules cross the gut barrier and increase the toxic load on the body. It also sets up the body for acquisition of food allergies/sensitivities. Toxins produced by poor intestinal flora can cause leaky gut. Polyunsaturated oils, pesticides, and heavy metals also help set up leaky gut.

Clostridia is a very common intestinal bacteria that is resistant to many antibiotics. It may take over the intestinal environment after a person has been on antibiotics. This bacteria loosens the tight junctions in the intestinal lining. This contributes to leaky gut. Toxins from influenza and vesicular stomatitis viruses also loosen the tight junctions in the intestinal lining. The common parasites called Giardia and Blastocystis hominis also loosen these junctions. Enzymes from yeast digest the lining of the intestine.

⁷ Permeability - The property of being permeable - permitting the passage of substances (e.g., liquids, gases, heat), as through a membrane or other structure.

Besides toxins generated in the gut by pathogens, there are poisons from outside the body that contribute to leaky gut. Some organophosphate pesticides increase the conversion of tryptophan into IAG (Indolyl Acryloyl Glycine). IAG can increase gut permeability. Mercury causes the kidneys to dump sulfates. Sulfates are needed to create a tight barrier in the gut. Pesticides, fungicides, herbicides, cadmium, lead, mercury, and fluoride interfere with your immune system. These substances also inactivate the DPP IV enzyme in the intestines. This enzyme is important for your immune system. DPP IV also helps you digest the type of protein found in gelatin, and this protein helps your body repair leaky gut.

Leaky gut can be caused by excess calcium entering the cells that line the gut. Anything that interferes with metabolism or increases oxidative stress will cause cells to take up more calcium. A prime example of this type of poison is excessive polyunsaturated oils in the diet. They suppress the immune system, interfere with metabolism and contribute to oxidative stress. In this manner, polyunsaturated oils increase intestinal permeability. They can cause leaky gut.

If you put rats on a diet without any polyunsaturated essential fatty acids (EFA oils), then these rats react very differently to gut toxins. When exposed to toxins created by gut bacteria, these rats experience less intestinal permeability, less hypoglycemia, and much fewer deaths. These rats survive the onslaught with less liver, stomach, and small intestinal damage than rats given EFA oils. In other experiments, rats deficient in EFA oils were exposed to various other toxins. They had less lung, kidney, pancreas, and colon damage than rats given EFA oils.

Everyone puts the blame on antibiotics for the increased incidence of leaky gut and the yeast syndrome in our society. However, look at the greater number of chemicals to which we are exposed, and look at all the additional polyunsaturated oils in our diet. These are also feeding this epidemic.

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Migraines and Dysbiosis

In order to understand how intestinal flora can cause a migraine, you have to first understand a little of the mechanics of migraines. A migraine starts with a clumping of platelets, and a release of serotonin from the platelets. This raises the free serotonin in the plasma. This free serotonin causes the constriction of blood vessels. During a migraine, there is also a release of a polyunsaturated omega-6 fatty acid called linoleic acid. This essential fatty acid in its free form will increase the loss of serotonin from platelets and thus increase the blood vessel constriction. This initial phase is followed by the painful rebound phase where the release of serotonin diminishes, and the blood vessels expand. This expansion is believed to be the source of the pain.

Those of us with dysbiosis (poor intestinal flora) are particularly vulnerable to migraines. Often we have food allergies, hypoglycemia, low magnesium, low taurine, low sulfates and low coenzyme B6. Sometimes our bowel flora creates substances that either dilate or constrict blood vessels, depending on what we have eaten. Going into a bit more detail, our intestinal flora affect our susceptibility to migraines because:

1. Allergies cause platelets to clump together. This releases serotonin and can initiate a migraine. Many people have found relief from migraines by eliminating food allergies.
2. Low taurine makes one more susceptible. Taurine helps keep platelets from clumping together. At 400 mg per day, taurine reduced platelet aggregation by 30%, and at 1600 mg per day, taurine reduced platelet aggregation by 70%. Unfortunately, the body dumps taurine when there is intestinal yeast/candida overgrowth. (If you have yeast overgrowth, be careful with taurine supplementation. It may increase yeast growth. Small amounts under the tongue might be tolerated better. Taurine should be taken at mealtime because taurine increases stomach acid secretion.)
3. Hypoglycemia makes one more susceptible to migraines. (That is one reason why migraines are more common in the morning. The blood sugar is low after the night's fast.) When blood sugar drops, the body releases free fatty acids into the blood. If these free fatty acids are mainly unsaturated, then it will cause a migraine. This happens because unsaturated free fatty acids cause a serotonin release. Unfortunately, those of us with dysbiosis often have a problem with hypoglycemia. At least we can diminish the probability that hypoglycemia will start a migraine by changing the fats in our diet. It may be helpful to avoid excessive use of unsaturated oils like corn, safflower, soy, cottonseed, peanut, canola and flax oils. Fish oil is unsaturated and excessive consumption of this would be a problem for the same reason. However, a small amount of fish oil in the diet will help prevent migraines because fish oil helps keep platelets from clumping together.
4. Stress will also release oils into our blood stream in their free fatty acid form. Perhaps we can't avoid stress in our life, but we can keep it from initiating a migraine by changing the type of fatty acids that are released into the blood. Avoiding polyunsaturated oils and substituting olive or coconut oil may help.

5. More magnesium is often helpful in the treatment of migraines. Magnesium inhibits platelet aggregation and stabilizes platelets and mast cells. This keeps them from dumping their serotonin and initiating a migraine. People with dysbiosis are more likely to be low on magnesium. Magnesium is not absorbed well when the intestines are irritated. Also, people with dysbiosis are often low in thyroid. Low thyroid will cause the loss of magnesium. (Additional salt in the diet may be helpful because it helps to prevent urinary magnesium loss.)

6. Intestinal bacteria can create substances that can initiate a migraine. For example, Clostridia is a generally harmful bacteria that is more likely to take over the bowel environment after administration of antibiotics. When Clostridia is grown in a medium containing casein (a milk protein), then the Clostridia produces the vasoactive amines of histamine, tyramine, agmatine, serotonin, putrescine and cadaverine. Since vasoactive amines expand or constrict blood vessels, these could initiate a migraine.

7. One means by which the liver removes these vasoactive amines is by attaching a sulfate molecule to them. Many people with migraines have a weak sulfation pathway in their liver and thus have a more difficult time removing these vasoactive amines. Dysbiosis enters into the picture by weakening this sulfation pathway. Sulfates are lost when the intestines are inflamed. If sulfates are low, the liver's sulfation pathway is impaired.

Hence, there are many things that suggest our intestinal flora is a major factor in migraines.

Mitral Valve Prolapse and Dysbiosis

People with the yeast syndrome, fibromyalgia or multiple chemical sensitivity are more likely than others to have a heart condition called mitral valve prolapse. In fact, Leo Galland found that almost half of those being treated for chronic Candida albicans infections also had mitral valve prolapse. Depleted taurine, coenzyme Q10 and low magnesium are associated with both mitral valve prolapse and candida overgrowth. This suggests that yeast may play a major part in the development of this condition. With mitral valve prolapse, the body appears to have a problem with controlling the release of noradrenaline and adrenaline.

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PMS and Dysbiosis

If PMS occurs during the later two weeks of the cycle, there is usually too much estrogen compared to progesterone during this part of the cycle. In this case, people often suggest zinc, B6 and natural progesterone to relieve symptoms. If PMS occurs during the first two weeks of the cycle, it is dubbed "reverse PMS" and will sometimes respond to a small amount of estrogen.

What does this have to do with intestinal yeast? There are quite a few connections. Coenzyme B6 is reduced by the presence of the yeast toxin acetylaldehyde. A functional deficiency of B6 can be caused by exposure to arabinol, which is made by some yeast. Yeast make estradiol, the strongest of the human estrogens. Not only does this throw off the hormonal balance, but estrogen wastes B6, folic acid, B12 and zinc. Estrogen causes the retention of copper. Estrogen suppresses the thyroid. Thyroid helps the ovaries make more progesterone. So even less progesterone is made. It is obvious that intestinal yeast can contribute to the hormonal and nutritional causes of PMS.

Intestinal bacteria make a difference too. Very few bacteria should be in the small intestine. When there is an overgrowth of bacteria there, it deconjugates too much of the estrogen dumped there by the liver. The deconjugated estrogen is absorbed back into the body and must be processed by the liver again. This compromises the liver's ability to balance hormones in the body.

Natural progesterone is often recommended to alleviate symptoms of PMS. Does this exacerbate the intestinal yeast problem? Everyone agrees that supplements of estrogen makes the yeast syndrome worse. (Estrogen decreases the secretory antibodies that reach the yeast to help kill it.) What about progesterone? There was a study where they removed the ovaries of mice. The mice that were given estrogen developed yeast infections. The mice that were given natural progesterone did not. So it seems like natural progesterone should not be a problem. Yet, some women find that natural progesterone makes their yeast symptoms worse. Why?

Natural progesterone causes the displacement of estrogen. As progesterone goes into cells, estrogen comes out, usually in the sulfated form. Thus, when you first take natural progesterone, more estrogen will be dumped into the bloodstream. Often supplements of progesterone will make yeast symptoms worse at first, but after a few months, the problem disappears. If it doesn't disappear, or gets worse, look to your sulfate levels, your thyroid function and your liver status. It is very important to have enough sulfates in the body in order to use hormones properly. (Those with dysbiosis are often depleted of sulfates.) Of course, work on clearing up a very likely source of the whole problem, your gut flora!

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Prostatitis and Dysbiosis

Prostatitis is an inflamed prostate. Most of the time, the inflammation is not due to an infection. Most of the time, there is pain. However, sometimes there is a misdiagnosis, and the pain is actually a referral pain due to an irritated bladder. (See interstitial cystitis.)

Excess estrogen probably contributes to prostatitis. To reduce the effects of estrogens, some people recommend taking phytoestrogens. In small quantities, these can block the effects of the stronger estrogens. However, phytoestrogens are dangerous. If you take too much of these, you will experience increased estrogenic effects. In fact, prostatitis can be induced in rats by giving them soy phytoestrogens.

Excess estrogen also contributes to benign prostatic hyperplasia and prostate cancer. Look up the work being done by John Lee, MD, with men who have prostate cancer. Eliminating all sources of estrogen and using

natural progesterone has brought 10 cases of prostate cancer into remission. The protocol includes avoidance of pesticides, plastics and lacquers because these have estrogen-like substances in them.

An often ignored source of estrogen is from intestinal yeast. Yeast make estradiol, the strongest of the human estrogens. However, yeast isn't the only intestinal problem that contributes to excess estrogen. *Dysbiosis interferes with the body's ability to eliminate estrogen.* Bacterial overgrowth in the small intestine will increase the recycling of estrogen. The liver dumps estrogen into the intestines in a conjugated form, which does not get absorbed from the intestines. Bacteria deconjugate the estrogen, making it available for reabsorption. *Thus, when there is a bacterial overgrowth in the small intestine, the liver will have to dump the same estrogen into the intestines over and over again.* Another way that dysbiosis interferes with the elimination of estrogen is by reducing the body's supply of sulfates. The inflammation caused by dysbiosis leads to increased loss of sulfates. This interferes with the body's ability to eliminate estrogens in their sulfate form. There is yet another way that dysbiosis interferes with the elimination of estrogen. Dysbiosis can cause hypothyroidism. Hypothyroidism reduces the liver's ability to get rid of estrogen.

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Sinus - Ear Infections and Dysbiosis

Sinus and ear infections are more frequent when a person has dysbiosis. This is partly due to the increased incidence of food allergies associated with dysbiosis (poor intestinal flora). Food allergies, especially to milk, seem to be a factor in frequent sinus and ear infections.

If there is a fungal or viral infection in the intestines, this suppresses the cell-mediated immunity. This makes it more likely that a person will suffer a fungal infection of the sinuses or ears. Sinus infections that last for several months or longer are usually associated with fungus rather than a bacterial infection.

Suggested Nutritional Protocol for Dysbiosis

The following nutritional protocol can be used in the management of dysbiosis. Please note that this program should be recommended by your on-line doctor and should only be done with supervision. The program consists of two basic steps:

- Step One: Prepare and Weed (Days 1-3)
- Step Two: Food (Days 4-15)

Day	Protocol	Dietary Guidelines
Day 1 – Prepare & Weed	Prescribed medicines and supplements are to be taken as normal if the patient is currently on a protocol; if not on a current nutritional protocol start immediately with this step.	• Fasting – no food and plenty of water; if you cannot fast, eat light, fresh meals of vegetables and salads only • No consumption of yeast, sugar or starches is essential. This includes fruits. Vegetable juices and broths are acceptable • No alcohol or caffeine • If cravings for carbohydrates are interfering with patient compliance, add Gymnema tables (3 per day) into the protocol for the blood sugar regulation
Days 2 & 3 – Weed – Eradicate Dysbiotic Organisms using Garlic & Goldenseal	• Garlic 1-2 fresh crushed cloves of garlic twice daily or 2 high quality, enterically-coated garlic tablets (Mediherb® Garlic 5000mg) • If fresh garlic is used, it should be taken with a copious quantity of water. This has the effect of flushing the fresh garlic quickly into the small intestine where we want it to work on the bacteria contributing to dysbiosis • Mediherb® Golden Seal 500mg - 4 tablets per day	• Fasting is ideal; if you cannot fast, eat very light, fresh meals of vegetables and salads. • No consumption of yeast, sugar or starches is essential. This includes fruits and fruit juices. Vegetable juices and broths are acceptable • No alcohol or coffee
Days 4 to 15	• Slippery elm powder (obtain at a high quality health food store that routinely carries herbs): 1-2 heaped teaspoons of slippery elm powder with copious (240 ml) water, to allow it to swell in the gastrointestinal tract • Mediherb® Vitanox (a herbal antioxidant containing green tea, grape seed extract, turmeric, and rosemary; 2 tablets at night before bed or on an empty stomach, at least 2 hours away from food)	• Gradually introduce clean, fresh foods • Daily consumption of green tea

Additional Notes for the Dysbiosis Protocol

- If you feel that you have problems craving carbohydrates, the addition of Gymnema tables (2-3 per day) or even better, Gymnema liquid extract will reduce the cravings. You can call to order this product.

- Garlic was used in World War I as an anti-infective agent for various infectious intestinal diseases, including cases of cholera and dysentery. It also had a protective antibacterial effect: soldiers whose diet included garlic suffered less frequently from dysentery than those who did not eat garlic. In vitro and in vivo studies indicate that garlic has both antibacterial and antifungal activity, giving it broad spectrum antimicrobial activity in gastrointestinal disorders. Broad spectrum antimicrobials are best used for weeding as they do not create imbalance in the microflora.
- Goldenseal, like garlic, is a broad spectrum antimicrobial.
- Other broad-spectrum antimicrobial herbs can be included in phase one. For example, pau d'arco is an herb which possesses a broad spectrum of antimicrobial activity, especially against protozoa and fungi, and appears to have a capacity to kill micro-organisms, rather than merely inhibit their growth. It consists of the inner bark of several species of *Tabebuia*. Pau d'arco contains naphthoquinones, and while much research has focused on the chemical lapachol, this particular compound is not the major naphthoquinone found in the inner bark. The compound of β -lapachone is more important in the context of the use of the inner bark.

Notes regarding slippery elm powder (Used in Step 2)

The growth of endogenous beneficial bowel flora can be encouraged by administering prebiotics. Prebiotics are food for probiotics (beneficial bowel flora), and include herbs and foods containing mucilages, polysaccharides and fructooligosaccharides (FOS). FOS, otherwise referred to as fructans, are complex carbohydrates found in several common foods and a number of medicinal herbs. Foods containing FOS include Jerusalem artichokes, globe artichoke, onions, bananas, asparagus, leeks, garlic, wheat and barley. FOS taste sweet, however unlike sugar and starch, they add no calories to the diet because they are not digested or absorbed in humans. Inclusion of these in the diet can enhance gastrointestinal health by providing an energy source for bowel flora and thereby improve nutrient absorption and assist in reducing inflammation. FOS enhances mineral absorption and counteracts the deleterious effects of phytic acids.

The most common mucilage-containing herb historically used for gastrointestinal disorders is slippery elm (*Ulmus rubra*). Slippery elm contains mucilage (a polysaccharide), starch and minerals. Mucilaginous herbs will also encourage the growth of beneficial bowel flora and are more simple, clinically effective and inexpensive when compared to probiotic supplementation.

Notes regarding the product Vitanox® (Used in Step 2)

Gastrointestinal antiseptics are used to restore normal bowel flora. This includes green tea and grape seed extract. Vitanox used in step two of the protocol improves dysbiosis management, dramatically reduces flatulence and abdominal bloating, and provides powerful antioxidant activity. Green tea and grape seed contain tannins which are defined as vegetable substances capable of tanning animal hides to produce leather. The advantage of tannins is that they are poorly absorbed in the gastrointestinal tract. Hence, through their capacity to bind proteins, they can inhibit the growth of micro-organisms, especially in the colon. One of the most notable effects of tannins in the gut is their dramatic effect on diarrhea. Because of their affinity for free protein, they will concentrate in damaged areas.

FOOTNOTES

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