Hemopyrroluria

by Dietrich Klinghardt, MD, PhD, Scott Forsgren, FDN-P, HHP | Jul 1, 2017

Hemopyrrollactamuria[1]: A Major Piece of the Puzzle in Overcoming Chronic Lyme Disease

Scott Forsgren, FDN-P and Dietrich Klinghardt, MD, PhD

Dietrich Klinghardt, MD, PhD, is a practicing physician in Woodinville, Washington with a focus on the treatment of chronic neurological conditions such as Lyme disease, autism, and CFIDS. In the years that he has treated patients with chronic infections, he has observed that, for many, recovery is often elusive. Patients may plateau or find that their recovery is stalled. In other cases, patients may not succeed in their attempts to rid the body of a particular toxic or infectious burden, such as in patients with long-standing or therapy-resistant, late-stage Lyme disease.

In looking for possible explanations as to why some patients struggle more than others to regain their health, co-author Klinghardt has found a high correlation between patients with chronic Lyme disease and those with kryptopyrroluria (KPU), or more precisely hemopyrrollactamuria (HPU). The condition is alternatively known as the “mauve factor” or “malvaria.”

Dietrich Klinghardt, MD, PhD

HPU may be an inherited condition, but it can also be induced by psychological trauma or chronic infections. Epigenetic influences such as intrauterine, birth, childhood, or transgenerational trauma may trigger HPU; other triggers may include a car accident, divorce or emotional trauma, and physical or sexual abuse. Chronic

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infections, such as Lyme disease, may themselves serve as a trigger for the condition.
The HPU complex is a biochemical marker and neurotoxic substance frequently identified in the urine of patients with autism, learning disabilities, alcoholism, substance abuse, schizophrenia, ADHD, Down syndrome, depression, bipolar disorders, and even criminal behavior. Some estimate the incidence of HPU to be 40-70% in schizophrenia, 50% in autism, 30% in ADHD, and 40-80% in alcoholism and substance abuse.

Based on testing with Klinisch Ecologisches Allergie Centrum (KEAC Parkstad; http://www.hputest.nl) in The Netherlands, Klinghardt has found the incidence of HPU in Lyme disease to be 80% or higher; in patients with heavy metal toxicity (lead, mercury, aluminum, cadmium, and others) over 75%; and in children with autism over 80%. These are very significant percentages of the patient population with chronic illness that may benefit from a treatment program that addresses HPU. Healthy controls do not test positive for HPU.

History

In 1958, a psychiatric research program in Saskatchewan, Canada, led by Abram Hoffer, MD, PhD, the father of orthomolecular psychiatry, was looking for the possible biochemical origin of schizophrenia and a lab marker that would make it easier to identify affected individuals. One study involved evaluating the urine for certain chemical fractions and evaluating those of schizophrenic patients and those of normal controls. The effort yielded “the mauve factor,” a specific substance that reliably

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allowed the examiners to identify the schizophrenic patients, as it was not found in the normal controls.
Early on, the substance was known as “the mauve factor” due to the mauve color that was observed on the stained paper. It was then termed “kryptopyrrole”, later identified as hydroxyhemopyrrolin-2-one (HPL). The researchers first called the disease associated with this condition “malvaria,” but it was renamed by Dr. Carl Pfeiffer, MD, PhD to “pyrolle-uria” which was, for no obvious reason, consistently spelled “pyrroluria” in later publications. Today, the condition is generally referred to as “pyroluria.” In the 1970s, Dr. Pfeiffer created an assay for the condition and was able to show clinical improvement in positive patients with high doses of zinc and vitamin B6 (between 400 mg and 3,000 mg B6).

Associated Conditions

A partial list of conditions where HPU may be a factor include ADHD, alcoholism, autism, bipolar disorders, criminal behavior, depression, Down syndrome, epilepsy, heavy metal toxicity, learning disabilities, lyme disease, multiple sclerosis, Parkinson’s disease, schizophrenia, and, substance abuse. Some of the items listed are those in which Klinghardt has observed a connection to HPU in his patient population.

Symptoms

The HPU condition results in a significant loss of zinc, vitamin B6, biotin, manganese, arachidonic acid, and other nutrients from the body via the kidneys. There are many symptoms of HPU, which may result from deficiencies of these nutrients. Those

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are tell-tale signs of the condition. Klinghardt finds that depression is often a leading symptom of the condition. Symptoms may include the following:

Abdominal tenderness	**Abnormal fat distribution**	**Acne, allergy**
Amenorrhea, irregular periods	Anxiety / Nervousness	Attention Deficit / ADHD
Autism	B6-responsive anemia	Cold hands or feet
Constipation	Course eyebrows Depression	Crime and delinquency
Delayed puberty, impotenc e	Explosive or episodic anger	Emotional liability
Eosinophilia	Knee and joint pain	Familial
Hypoglycemia, glucose intolerance	Nail spots (Leukodynia)	Light, sound, odor intolerance
Mood swings	Paranoia / Hallucinations	Obesity
Pale skin, poor tanning	Poor breakfast appetite	Perceptual disorganization
Pessimism	Stress intolerance	Poor Dream Recall
Poor short-term memory	Tremor, shaking, spasms	Stretch marks (striae)
Substance abuse		Withdrawal

Impact of Nutrient Loss

Elevated levels of HPL found in urine are the result of an abnormality in heme synthesis. Hemoglobin is the substance that holds iron in the red blood cells. Heme is also the principal building block of many enzymes involved in detoxification (cytochromes), enzymes involved in healthy methylation (MSR and CBS), and NOS – a significant enzyme in the urea/BH4-cycle. HPL is a byproduct of dysfunctional heme synthesis and can be identified in the urine. HPL binds to zinc, vitamin B6, biotin, manganese, arachidonic acid (omega-6), and other important compounds that, as a result, are excreted via the urine. This leads to a significant depletion of these nutrients throughout the body and to the synthesis of non-functioning or poorly functioning enzymes. Turning to the importance of zinc, vitamin B6, biotin, manganese, and arachidonic

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acid in the body, it becomes clear how widespread the problems may be that are created by this condition.
Zinc deficiency may result in emotional disorders, food allergies, insulin resistance, delayed puberty, rough skin, delayed wound healing, growth retardation, hypogonadism, hypochlorhydria, mental lethargy, short stature, diarrhea, stretch marks or striae (which may be misinterpreted as *Bartonella* in some patients with Lyme disease), white spots on the fingernails, reduction in collagen, macular degeneration, dandruff, skin lesions such as acne, hyperactivity, loss of appetite, reduced fertility and libido, transverse lines on the fingernails, defective mineralization of the bones leading to osteoporosis, and many others.
Zinc is a powerful antioxidant, and lower levels lead to an increase in oxidative stress. Lower levels are correlated with lowered glutathione, an important part of the detoxification system. Zinc is required to support proper immune function. “White blood cells without zinc are like an army without bullets,” says Klinghardt.

Patient with Leukodynia before HPU treatment

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Vitamin B6 deficiency is thought to be a rare occurrence. However, in those with HPU, this is not the case. B6-deficiency may lead to nervousness, insomnia, irritability, seizures, muscle weakness, poor absorption of nutrients, decrease of key enzymes and cofactors involved in amino acid metabolism, impairment in the synthesis of neurotransmitters, impairment in the synthesis of hemoglobin, seborrheic dermatological eruptions, confusion, and neuropathy. Like zinc, B6 is an antioxidant and correlates to levels of glutathione.

Biotin deficiency may be evidenced by rashes, dry skin, seborrheic dermatitis, brittle nails, fine or brittle hair, and hair loss. More importantly, however, it may be associated with depression, lethargy, hearing loss, fungal infections, muscle pain, and abnormal skin sensations such as tingling. Biotin is an important co-factor in the production of energy in the mitochondria. Biotin is essential for a healthy brain and nervous system. Biotin deficiency is associated with many aspects of the aging process.

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Manganese deficiency may be associated with joint pain, inflammation, and arthritis. Deficiency may result in a change in hair pigment or a slowing of hair growth.

Patient with Leukodynia after HPU treatment

It is essential for normal growth, glucose utilization, lipid metabolism, and production of thyroid hormone. It may be associated with diseases such as diabetes, dyslipidemia, Parkinson's disease, osteoporosis, and epilepsy.Arachidonic acid (from omega-6) deficiency may lead to the impairment of white blood cell function, primarily the leukocytes, which may lead to one being more vulnerable to infection. It may lead to neuropathy, neural and vascular complications in preterm babies, skin eruptions, behavior changes, sterility in males, arthritic conditions, dry eyes, growth retardation, dry skin and hair, slow wound healing, hair loss, kidney dysfunction, heart beat abnormalities, and miscarriages.

Same patient after 3 months on HPU treatment

When one considers the magnitude of potential health problems that may be present when a single condition leads to a deficiency in zinc, vitamin B6, biotin, manganese, arachidonic acid, and other

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nutrients simultaneously, the negative implications on health are almost endless.

HPU and Lyme Disease

Three possible origins of HPU are discussed in the literature: genetics, trauma, and chronic infections. The connection between HPU and many of the illnesses previously discussed has been known for quite some time. However, prior to Klinghardt's early work in treating Lyme disease, never before had a connection been observed or published between HPU and Lyme disease. This discovery has been a key for Klinghardt to return his patients to an improved state of health and wellness, and the changes he has observed have been profound.

Klinghardt has found that four of five patients with chronic or persistent Lyme disease test highly positive for this condition (when tested with KEAC HPU-test®). That suggests that 80% or more of patients with symptoms of chronic Lyme disease may benefit from a treatment protocol that addresses HPU.

Klinghardt finds that it is rare for a patient to have chronic symptomatic Lyme disease as an adult without the patient having developed HPU. He postulates that the biotoxins from microbes block one or more of the eight enzymes of heme synthesis. This leads to a significant loss of key minerals in the white blood cells, which effectively disarms cellular immunity.

In those where HPU was triggered by infection with Lyme organisms, Klinghardt has observed that the HPU is often an unstable form of the condition where there are times of higher levels of pyrroles being excreted and times where this is not observed. If a person has episodes of depression, these episodes

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generally correlate to times when pyrroles are being released in higher levels in the urine.

One young adult female struggling with Lyme for several years had severe multiple chemical sensitivities (MCS) that were not improved by any previous treatment. After starting the HPU protocol, she noticed improvements in her MCS for the first time since she became ill. Other patients with intractable chronic infections have experienced significant improvements in immune function and a resulting lowering of total microbial burden.

Klinghardt has observed numerous patients that have struggled to rid the body of parasitic infestations. In these patients, regardless of the interventions used, the patient continues to expel these parasites on an ongoing basis. Therapy-resistant infections are a hallmark sign of HPU. Klinghardt has found that once the HPU protocol is put in place, there is often swift resolution of long-standing infections and infestations. This includes patients who have failed years of antibiotic therapy for chronic or late-stage Lyme disease.

Sandeep Gupta, MD, from Australia has stated that parasites and pyroluria almost always go together. He has observed that almost every chronically unwell individual seems to have both; one opens the door to the other. Chronically low levels of zinc allow parasites to invade the mucosal layer of the gut. Parasites may then move to the liver and gallbladder. They interfere with mood, energy levels, and sleep. Addressing the parasites while restoring zinc and B6 often makes a tremendous difference in his patients.

Chronic Lyme disease patients often suffer from severe jawbone infections that may require cavitation surgery, which often tends to fail in this population. When the clients are pre-treated for HPU, the outcome of the surgical procedure is generally much better. In

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some mild cases, ozone treatment of the jaw may be sufficient to turn things around.

Klinghardt has followed the interest in HLA-DR genetic typing in regard to biotoxin illnesses such as Lyme disease and mold. Prior to HPU, patients with certain haplotypes were considered more difficult to treat as the body could not properly and effectively respond to and remove biotoxins from Lyme disease, molds, or in the worst cases, both. In his experience, once the HPU issue is addressed, these HLA types become far less of a concern in most patients and no longer hold them back on their road to regaining health.

Once bodily systems are back online and functioning properly, a few months after introducing the HPU protocol, patients become less vulnerable to Lyme disease, to mold, and even to heavy metals. Their bodies are now much better equipped to deal with these conditions when they have appropriate levels of zinc, vitamin B6, biotin, manganese, and arachidonic acid to support optimal functioning of numerous bodily processes.

HPU and Methylation

In Klinghardt's work, if a patient has HPU, treating the HPU condition first is a foundational intervention before pursuing more specific methylation support. Specific enzyme blockages are discussed earlier in this article.

In people with cancer and active EBV infection, EBV triggers a hypermethylation inside the cancer cells that may accelerate cancer cell growth. If methylation support is introduced based on genetic SNPs or other lab testing but the patient has an untreated, active EBV infection (such as is common in chronic fatigue syndrome, Lyme disease, and other related conditions) or an EBV-

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related cancer such as throat, stomach, breast, prostate, or Hodgkin lymphoma, supporting methylation may lead the patient to an increased risk of cancer or accelerated rate of cancer growth. This potential makes treating HPU first even more important as balancing the zinc and B6-dependent enzymes indirectly without the addition of methyl groups is generally a safer way to restore healthy methylation on all fronts as opposed to directly supporting methylation with methyl donors.

When people begin to explore methylation, HPU should always be evaluated and addressed first. Several enzymes in or adjacent to the methylation cycle use the heme molecule which utilize zinc and vitamin B6 as primary building blocks. By supporting HPU, the methylation cycle works more smoothly, both in its ability to methylate and demethylate, and at a lower risk to the patient.

HPU and Heavy Metal Toxicity

When HPU is present and zinc and vitamin B6 are depleted, the detoxification pathways are overwhelmed and ineffective as the heme molecule is an integral part of many detoxification enzymes. Both zinc and vitamin B6 deficiencies, which are important cofactors in the methylation cycle, reduce levels of glutathione in the body. Glutathione is important for the detoxification of heavy metals and other toxins.

Replacing missing zinc and vitamin B6 increases glutathione. This, in turn, increases the rate of detoxification of heavy metals and other body burdening toxins. Once HPU treatment is introduced with zinc and B6, reducing the metal burden no longer requires heroic measures.

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However, it is also the case that incorporating the HPU protocol will liberate additional heavy metals within the body. This aspect of the HPU protocol is discussed later in this article and is important for the practitioner to understand before beginning to treat patients for the condition as additional detoxification support is generally needed. This protocol is intended to be done only with the guidance of a knowledgeable practitioner.

HPU and Porphyrin Disorders

There is a group of disorders related to pyroluria called porphyrias. HPU is one of a group of conditions known as porphyrin diseases. In 100% of porphyrin diseases, the HPL compound is found in the urine.

Porphyrin testing is readily available and is a reliable tool. Klinghardt prefers to send a urine sample to Laboratorie Philippe Auguste (http://labbio.net) in France for testing. Other options are also available in the US, such as through Genova Diagnostics, Doctor's Data, and Great Plains Laboratory.

In the US, pyroluria and porphyria are viewed as separate conditions. However, in collaboration with the Dutch lab KEAC, it has been established that everyone with elevated porphyrins has pyroluria. When pyroluria is addressed, the porphyrins go down. In porphyrin testing, uroporphyrin is an indicator for aluminum, coproporphyrin for lead, and precoproporphyrin for mercury. Klinghardt has not seen a case with elevated porphyrins that did not have HPU, and when the HPU was corrected, aluminum, lead, and mercury are excreted from the body, and the porphyrins go down.

This is, in part, due to the fact that when the body has been deficient in zinc for a long period of time, it may retain heavy metals

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much more readily. When zinc is missing from the body, it is replaced in our bones with lead. If zinc is supplemented, lead is expelled. Secondly, the enzymes needed to detoxify these metals are heme-dependent enzymes, and these metals accumulate when heme synthesis is abnormal.

Klinghardt notes that discussions on the topic of porphyria are much more widely accepted than those on pyroluria. In his experience, he finds that almost all of his patients have elevated porphyrins, and that pyroluria is the deeper core issue.

HPU and Histamine

When a HPU patient is having a good day, low histamine levels are observed; on a bad day, higher histamine levels are observed. It is the relative elevation of histamine in response to foods, inhalants, allergens, emotional stressors, and electrosmog that is problematic and causes the allergic phenomena, not the absolute histamine level. When histamine levels rise from a low level to a moderate level, the reactions are often severe.

When exploring histamine levels in a HPU patient at a time when they are experiencing hives or asthma, the histamine levels are elevated, but not to levels that would create a problem for others. The relative rise in histamine, however, in HPU patients is experienced in a far more significant way.

Klinghardt has worked with biochemists in Germany that are beginning to link HPU with mastocytosis or mast cell activation syndrome (MCAS). They have observed that HPU treatment repairs the heme molecule, which notably stabilizes the mast cells and lowers the response to these relative rises in histamine.

HPU and Multiple Sclerosis

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Klinghardt has treated many patients with multiple sclerosis. The MS patients that he has tested have been highly positive for HPU. Over time, he has concluded that HPU is a frequent cofactor in MS. He has found that patients with MS respond favorably to HPU treatment.
In patients with HPU, absolute histamine levels are almost always low. The treatment for MS patients with HPU may include histamine in addition to the HPU protocol outlined in this article. Treatment with histamine may be either with oral or transdermal products. Prokarin is a transdermal patch which delivers histamine and has been used by some practitioners in the treatment of MS.

Evaluation and Testing

Klinghardt recommends that people start with the HPU Questionnaire (http://www.hputest.nl/evraag.htm). Once the questionnaire is completed, a score is calculated to provide a probability that a person may have HPU. If the score is 10-14, Klinghardt will often recommend proceeding with treatment without the need for confirmatory testing as the treatment itself is generally well-tolerated. If the score is 0-9, he may suggest testing for the condition using additional lab work.
Pyrroles are impacted by light, temperature, oxygen, and time; and they readily break down. Once they begin to break down, the likelihood of detection is significantly lowered. Ideally, testing would be performed within eight hours after the collection, though this is not practical and rarely possible.
Within the United States, two of the available labs for testing include the following:

- **DHA Laboratory**

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(https://www.pyroluriatesting.com) uses a frozen one-time collection at a cost of $80. They recommend the collection be the second urination of the day. They suggest avoiding all supplements, vitamins, and minerals for 12-24 hours prior to the specimen collection. The lab is testing for hydroxyhemopyrrolin-2-one (HPL).

- **Health Diagnostics and Research Institute** (http://www.hdri-usa.com) charges $140 for a 24-hour collection and $90 for a random collection. HDRI suggests stopping zinc and B6 as well as antidepressant medications for 48 hours prior to the collection. They suggest not smoking or consuming caffeine for 24 hours prior. While there is no additional cost for testing the hydroxyhemopyrrolin-2-one (HPL) compound, this must be specifically ordered on the requisition form as it is not part of their HPU assay by default. If you do not specify HPL as an add-on, you will get kryptopyrrole (2,4 dimethyl-3-ethyl pyrrole) only.

In Europe, Klinghardt uses the Dutch Lab KEAC (http://hputest.nl) for HPU testing. The lab is guided by biochemist Dr. John Kamsteeg, a world leader in HPU. The results of HPU testing with this lab align closely with the percentages of patients with chronic Lyme and other conditions that Klinghardt identifies with the HPU condition.
In Australia, HPU testing is available through SAFE Analytical Laboratories (http://safelabs.com.au) and Applied Analytical Laboratories Pty Ltd (http://www.apanlabs.com).
Each lab has their own very specific instructions for performing the test. This includes information such as shielding the specimen from

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light as well as how to handle and ship the specimen. It is important that the recommendations be closely followed to optimize the sensitivity of the test result.
To further maximize the sensitivity of testing, it may be best for the patient to be under stress at the time the test is being performed as HPL excretion is known to increase during times of stress.
In some circumstances, however, patients may still test negative even when the condition is suspected. In those cases, it may be best to repeat the test. In many cases, the result will be positive on the second or third test. In some patients, an empiric trial of the HPU protocol may be indicated despite repeated negative HPU tests, and this often leads the patient to higher ground.
WBC (not RBC) intracellular zinc may be a useful tool for exploring the potential for zinc deficiency where it matters most – in the white blood cells.
Other laboratory indicators that may be suggestive of HPU include the following:

- WBC < 5000/mcL (due to low levels of zinc)
- High LDL / Low HDL
- Low normal alkaline phosphatase (<60U/L)
- Low omega-6 fatty acids in red cell membrane test
- Low taurine in amino acid profile
- High MCV
- Low glutathione
- Low ATP
- WBC and RBC zinc and manganese levels may be normal while biopsies from bone and CNS are completely deficient.
- Bone biopsies are a reliable predictor of HPU. Severe deficiencies of zinc, manganese, lithium, calcium, magnesium, and molybdenum are often found.

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Alkaline phosphatase (ALP) is a zinc and magnesium dependent enzyme. When someone is consuming adequate magnesium and is still presenting with low ALP, zinc deficiency is a likely consideration, and this may represent another indication for HPU. When ALP is below 55, zinc deficiency can be suspected; when below 40, it is likely.
A consequence of HPU is low glutathione and low ATP. In the realm of chronic illnesses, low reduced glutathione and low ATP are common and should alone trigger the suspicion that HPU may be a factor.

Treatment

HPU is a severe but reversible deficiency of zinc, vitamin B6 (or P5P), biotin, manganese, arachidonic acid, and other co-factors. It is important to recognize, however, that treatment with zinc and vitamin B6 does not result in fewer pyrroles being excreted in the urine. HPU orthomolecular treatment does not fix the underlying condition; it substitutes what is being lost as a result of the condition such that the person is no longer deficient in key nutrients needed by the body to move towards health.
The general HPU substitution treatment that Klinghardt uses in his practice is as follows (dosages for 160 lb. adult and should be adjusted based on weight; may be customized for specific patient needs):
With breakfast:

- **Zinc**
  25-30 mg (as picolinate, gluconate, sulfate, or zinc l-carnosine). Nausea after zinc supplementation may be a sign of hypochlorhydria or low stomach acid; this often resolves after a few months on treatment.

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- **Vitamin B6**
  50-100 mg (split between pyridoxine HCl and P5P, with P5P being the predominant form)
- **Biotin**
  3-5 mg for brain, skin, hair, and nails
- **Magnesium**
  100 mg (glycinate, bisglycinate, or malate) – or titrate to bowel tolerance.
- Arachidonic acid from

  Omega-6 oils
  (Ghee such as Mt. Capra Goat Milk Ghee, Evening Primrose Oil, Hemp Seed Oil, Black Currant Oil, Borage Oil, Pumpkin Seed Oil; 4-6 capsules of Evening Primrose Oil per day is commonly used.)

  With dinner:

- **Zinc**
  25-30 mg
- **Vitamin B6**
  50-100 mg
- **Biotin**
  3-5 mg
- **Magnesium**
  100 mg
- **Omega-6 Oils**

This is the core treatment Klinghardt utilizes for HPU.

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Additional Support

- **Vitamin A**
  1,500-3,000 IU per day to improve the absorption of zinc in the gut
- **Niacin**
  40-50 mg per day for psychiatric symptoms. (Abram Hoffer used up to 3000 mg per day.)
- **Taurine**
  100 mg twice per day (up to 2,000 mg at bedtime) for brain-related symptoms such as seizures, brain fog, and memory loss. Supports elimination of neurotoxins, improves bile quality, increases glutathione, and normalizes brain rhythms.
- **Lithium**
  5-10 mg per day (Orotate or Aspartate); lithium is lost in the urine in some patients with HPU.
- **Manganese**
  2-5 mg per day (Patients with joint problems may require additional manganese above the dosages recommended here; see additional considerations later in this article on manganese for patients with Lyme disease.)
- **Chromium**
  250-500 mcg per day
- **Molybdenum**
  100-500 mcg per day
- **Boron**
  1-3 mg per day
- **Trace Minerals**

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– As more is learned about HPU, additional elements are found to be lower in those with the condition. Thus, supplementing trace minerals may be a supportive strategy. BioPure MicroMinerals, Quinton Isotonic, or similar mineral products may be helpful.

As compared to the first version of this article which was published in 2009, Klinghardt has found that many of his patients do quite well with lower dosages of some of these key nutrients than were originally utilized.

In Europe, Depyrrol is one product which provides support for HPU. Additionally, and in the United States, BioPure CORE and CORE-S are available to support those dealing with the condition. Another product in this realm is Mensah Medical's Pyrrole Pak. These products serve as a solid foundation for HPU treatment; though additional co-factors may be needed for a given patient. Some patients may not tolerate both vitamin B6 and P5P as contained in some products and may find it necessary to take each component of the HPU program separately.

In terms of BioPure's CORE and CORE-S, CORE-S is a recent reformulation of the CORE product which has been available for many years. While either may be an appropriate option, CORE-S generally results in less nausea, better absorption, and is often better tolerated by those patients with Lyme disease as it does not contain manganese. While many with pyroluria may benefit from manganese, it may act as a growth factor for untreated Lyme disease, and thus, some may prefer to avoid its use in this patient population. The reformulated CORE-S contains horsetail as people with HPU excrete higher levels of silica in the urine, which leads to higher levels of aluminum toxicity. With either CORE or CORE-S, two capsules twice daily are a common target dose for a 160 lb.

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adult. When first starting to introduce products in support of HPU, it is best to start with lower dosages and to take them towards the end of a meal and to gradually work up to the target dosage. Levels of B6, taurine, or biotin may be additionally and individually titrated upwards depending on the patient's symptoms and needs.
With the introduction of zinc, it is best to monitor copper levels after a few months on the protocol as copper replacement may also be needed. Zinc, vitamin B6, and manganese are copper antagonists. Thus, monitoring levels of copper and supplementing where needed is an important part of the treatment protocol. Copper deficiency can lead to hemorrhoids, varicose veins, fatigue, edema, hair loss, anorexia, skin problems, osteoporosis, cardiovascular disease, aneurisms, and many other undesired conditions. Current nutritional teachings are misinformed on the topic of copper toxicity. The immune system uses copper and iron to fight infections associated with Lyme disease. As a result, oxidized copper is displaced in the connective tissue and may appear as though the patient is copper toxic by some testing methods when in fact copper supplementation may be appropriate. High dose Vitamin C has the effect of reducing oxidized copper to a form that can be reused by the body.

Detoxification and Course of Treatment

As treatment for HPU is implemented, this often can result in toxin mobilization as the body begins to release heavy metals. Symptoms may include muscle aches, bowel problems, or those normally associated with cleansing or detoxification reactions. Additionally, the immune system begins to become more active which can result in a Herxheimer-like reaction as the immune

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system begins to better respond to the backlog of microbes that it was previously unable to adequately address.

One approach for minimizing these reactions is to start slowly with introduction of the HPU nutrients and work up over time. In most cases, there is no reason that the treatment course must be an aggressive one. Nonetheless, this treatment should always be guided by a knowledgeable practitioner. In addition to the HPU treatment discussed earlier, consideration should be given to detoxification support and to protection of the red blood cells as the treatment is initiated.

According to Klinghardt, many of our metabolic enzymes use zinc as part of their molecular makeup. However, in patients with HPU, there is not enough zinc available to satisfy the need. In these cases, lead, mercury, and other 2-valent metals bind to these sites instead in a poor attempt to fulfill the role of zinc.

Once zinc is reintroduced into the body, 2-valent metals such as mercury, cadmium, aluminum, and lead are liberated. The patient may now have dislodged heavy metals circulating throughout the body. These may be competing for the already overtaxed detoxification pathways or may be redistributed to places where they may be more problematic. Lead moves back into the blood which can cause problems including damage to red blood cells. To protect the red blood cells, freeze-dried garlic and Vitamin E are often used.

Incorporation of known toxin binders further supports the detoxification process. Some of the binders that Klinghardt uses in his practice include chlorella, *Ecklonia cava*, zeolite, and chitosan. Silica from horsetail supports binding of aluminum, and thus, the use of a high-silica zeolite such as BioPure ZeoBind is often utilized. It is critical to support the kidneys with specific drainage

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and organ support remedies in order to optimize the removal of heavy metals and to avoid stressing the kidneys.
An interesting observation has been that patients with HPU often get worse when an attempt is made to incorporate detoxification agents or antimicrobial agents prior to having first addressed the HPU condition. Once HPU has been addressed, other treatment options are often much more effective and better tolerated.

Additional Considerations

Many patients with chronic Lyme disease have issues with sulfur intolerance. This leads to a patient being unable to effectively utilize a number of detoxification agents such as alpha-lipoic acid, DMSA, DMPS, and glutathione; as well as supplements such as garlic. This may be related to genetic predisposition, but some of the enzymes involved in sulfur metabolism (CBS and others) are heme and B6 dependent; both of which are depleted in HPU. As patients are treated for HPU, these sulfur tolerance issues may resolve. Klinghardt has found that molybdenum at a dose of 100-500 mcg per day may correct sulfur intolerance in patients with HPU, as molybdenum may also be lost in these patients.
Ammonia is generally high in patients with HPU. As HPU is treated, high levels of ammonia tend to normalize. To bind and excrete ammonia, zeolite may be used.

Resolution of HPU

For most with the condition, supplementation will be required for life. However, Klinghardt has seen complete resolution of the condition after having addressed epigenetic influences, trauma, or unresolved conflicts using tools such as mental field therapy, family constellation work, or EMDR. By resolving trauma in the

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ancestry, the epigenetics are influenced in a positive way and the condition resolves. Klinghardt has also observed complete resolution of Lyme-induced HPU when the infection is managed successfully with biological interventions.

Final Thoughts

Once patients are on the HPU protocol and mobilized metals have been addressed, the body begins to respond to backlogged infections and significant improvements in the patient's condition are often observed. Hormonal status often improves. Some patients who have been on thyroid medication for years may even become hyperthyroid as the body begins to function more optimally. Other patients may lose weight. Symptoms directly related to low levels of zinc, vitamin B6, biotin, manganese, and arachidonic acid often resolve.

Just as homes are built by first laying a solid foundation, addressing HPU and the deficiencies in zinc, vitamin B6, biotin, manganese, and arachidonic acid are key pieces of the puzzle in addressing the complexities of chronic Lyme disease and many other conditions.

Evaluation for HPU is one of the first things that Klinghardt pursues in working with patients with chronic illnesses. Implementing the HPU protocol often yields progress that had not previously been possible, and patient recovery is accelerated in a very deep and profound way.

About the Authors

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Scott Forsgren, FDN-P,

is the founder of BetterHealthGuy.com, a health coach, blogger, podcaster, health writer, advocate, support group facilitator, and LymeLight Foundation board member. He recovered his own health after a 20-year journey through Lyme disease and mold illness. Today, Scott is grateful for his current state of health and all that he has learned on this life-changing journey. Dr. Klinghardt served as a powerful mentor, teacher, and guide as Scott worked to understand the disease which had previously taken so much of his life and moved toward a place of health and wellness. Scott continues to utilize a maintenance pyroluria protocol which he started almost a decade ago. To follow Scott's work, visit http://www.betterhealthguy.com. His podcast "BetterHealthGuy Blogcasts" is available on his web site and on YouTube, iTunes, Google Play, and Stitcher.

Dietrich Klinghardt, MD, PhD,

studied medicine and psychology in Freiburg, Germany, completing his PhD on the involvement of the autonomic nervous system in autoimmune disorders. Early in his career, he became interested in the sequelae of chronic toxicity (especially lead, mercury, environmental pollutants, and electromagnetic fields) and its impact on chronic illness. Dr. Klinghardt has contributed significantly to the understanding of metal toxicity and its

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connection with chronic infections, illness, and pain. He has developed Autonomic Response Testing, a comprehensive evaluation system that has helped many practitioners to become accomplished holistic practitioners. He founded Sophia Health Institute (http://www.sophiaha.com) in 2012, and is actively involved in patient care at his clinic outside of Seattle. More information on his educational seminars can be found through the Klinghardt Academy (http://www.klinghardtacademy.com; US) and the Klinghardt Institute (http://www.klinghardtinstitute.com; UK).

Disclaimer

This article is not intended to provide personal treatment recommendations or to facilitate self-treatment. Treatment should be done only under the care and supervision of a licensed medical authority. Attempts to self-treat the condition may result in unintended negative consequences.

Resources

- Depyrrol can be found at http://www.depyrrol.de.
- BioPure Healing Products (CORE, CORE-S) can be found at http://www.BioPureUS.com.
- Mensah Medical Pyrrole Pak can be found at http://www.mensahmedicalstore.com.
- Information on Prokarin is available at http://www.edmsllc.com.
- Oral homeopathic histamine is available from Deseret Biologicals at http://www.desbio.com.

Useful Resources

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- Discerning the Mauve Factor Part 1. Woody R. McGinnis, MD, et al. *Alternative Therapies*. March/April 2008; Vol. 14, No 2.
- Discerning the Mauve Factor Part 2. Woody R. McGinnis, MD, et al. *Alternative Therapies*. May/June 2008; Vol. 14, No 3.
- Mood Instability May Be Pyrrole Disorder, a possible cause of Bipolar, DMDD. Albert Mensah, MD, October 1, 2015 http://www.mensahmedical.com/pyroluria-pyrrole-disorder
- Pyroluria: The Unknown Disorder. Dr. David Jockers, DC. http://drjockers.com/pyroluria-common-unknown-disorder
- Pyroluria, Jeremy E. Kaslow, MD, FACP, FACAAI. http://www.drkaslow.com/html/pyroluria.html
- Pyroluria: Hidden Cause of Schizophrenia, Bipolar, Depression, and Anxiety Symptom. Woody McGinnis, MD. May 2004 http://www.alternativementalhealth.com/articles/pyroluria.htm
- Kryptopyrolles, Donald Lee McCabe, DO. http://www.orthomolecular.org/library/jom/1983/pdf/1983-v12n01-p002.pdf
- Change of Blood Ammonia Level and Efficiency of Nitrogen Utilization in Priangan Lambs Due to Klinoptilolit Addition in Ration. http://www.uaiasi.ro/zootehnie/Pdf/Pdf_Vol_56/Heni_Siti_Mainah.pdf

Callouts

White blood cells without zinc are like an army without bullets.

Klinghardt has found the incidence of HPU in Lyme disease to be 80% or higher.

Fixing metals does not involve heroic measures; it involves fixing HPU.

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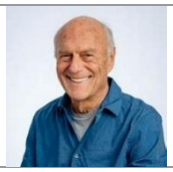
Authors



Dietrich Klinghardt, MD, PhD

Dietrich Klinghardt, MD, is the founder and medical director of Sophia Health Institute in Woodinville, Washington, as well as the founder of the Klinghardt Academy (USA), Klinghardt Institute (UK) and the American Academy of Neural Therapy. He is the medical director of the Institute of Neurobiology and Founder and Chairman of the Institute for Neurobiology in Germany and Switzerland. The Klinghardt Academy teaches about biological treatments and Autonomic Response Testing (ART) assessment techniques.

Dr. Klinghardt has been treating a wide variety of chronic and degenerative health conditions for more than 40 years and is internationally known for his successful treatment of chronic pain and illness. He combines non-surgical orthopedic medicine with immunology, endocrinology, toxicology, neural therapy, hypnotherapy, and energy psychology, and has a unique approach to diagnosing and treating diseases and disorders on both the physical and mental-emotional levels.

Dr. Klinghardt studied medicine (1969–1975) and psychology (1975–1979) in Freiburg, Germany, and completed his doctorate on the involvement of the autonomic nervous system in autoimmune disorders. His research and work have been documented in several publications. Early in his career, he became interested in the sequel-ae, or involvement of

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toxins (especially lead, mercury, environmental pollutants, and electromagnetic fields), in illness.

While working in India as a junior physician, Dr. Klinghardt learned about Eastern concepts of disease etiology and combined these with his Western training to better help his patients. This laid the foundation for his five-level system of integrative medicine, for which he is well known.

After immigrating to the United States, Dr. Klinghardt spent three years working as a full-time emergency physician before becoming the medical director of the Santa Fe Pain Centre. Increasingly aware of the limitations of conventional medicine for chronic conditions, he also trained in Ericksonian hypnotherapy and began to incorporate body-oriented psychotherapeutic and counseling approaches into his work, along with neural therapy, mesotherapy injection techniques and applied psycho-neurobiology (psycho-kinesiology and mental field therapy).

Since the 1970s, Dr. Klinghardt has contributed significantly to the work of understanding heavy metal toxicity and its connection to chronic infections, illness, and pain. He is considered an authority on this subject and has been instrumental in advancing various fields within biological medicine, including non-invasive pain management, injection techniques for pain and orthopedic dysfunction, anti-aging medicine, toxicology, pediatrics (particularly neurodevelopmental disorders), energy psychology and biological dentistry. He has also developed Autonomic Response Testing (ART), a comprehensive diagnostic system that has helped many practitioners to be-come accomplished holistic physicians.

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Dr. Klinghardt has lectured at the universities of Illinois, Utah, Freiburg and Adelaide, as well as at Capital University in Washington, D.C., among others, and at Swiss medical schools in Geneva and Zurich. From 1996–2005, he was an associate professor in the Department of Applied Neurobiology at Capital University.

Dr. Klinghardt is regularly invited to teach workshops at the prestigious Medicine Week in Baden-Baden, Germany. Among his books is the groundbreaking Psychokinesiology: A New Approach in Psychosomatic Medicine, which is a comprehensive book about musclefeedback-guided psychotherapy.

To learn more about Dr. Klinghardt's work, see KlinghardtInstitute.com. To schedule a consult at his clinic, contact Sophia Health Institute in Woodinville, Washington: SophiaHi.com.

Scott Forsgren, FDN-P, HHP

Scott Forsgren, FDN-P is a health coach, blogger, podcaster, health writer, and advocate. He is the editor and founder of BetterHealthGuy.com, where he shares his 26-year journey through the world of Lyme disease, mold illness, and the myriad of factors that chronic illness often entails.

His podcast "BetterHealthGuy Blogcast" interviews many of the leaders in the field and is available on his web site, BetterHealthGuy.com, and on YouTube, Apple Podcasts, Google Podcasts, Stitcher, and Spotify. He has been

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interviewed on numerous podcasts and has lectured on his recovery from chronic illness at conferences and on several online summits. He has written for the Townsend Letter and other publications.

He is the co-founder of The Forum for Integrative Medicine which hosts an annual conference bringing together some of the top integrative practitioners to share practical tools for treating complex, chronic illness.

He serves on the Board of Directors of LymeLight Foundation which provides treatment grants to children and young adults recovering from Lyme disease.

Today, Scott is grateful for his current state of health and all that he has learned on this life-changing journey.

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