

DECEMBER 2011 ISSUE
“The Modern Physician Letter™”
*Conservative Musculoskeletal
Management News & Views*

Chronic Pain Syndrome And Vitamin D

Humans evolved outdoors, in the sunshine. Exposure to the sun's ultraviolet radiation produces a hormone known as "vitamin D". Vitamin D is critical for human health. The nucleus of all of our cells have vitamin D receptors. There is evidence that vitamin D influences the expression of about 10% of human genes.

With very rare exceptions, humans cannot achieve optimal levels of vitamin D through diet alone. Although some foods are fortified with vitamin D, consumption of large amounts of such foods will not achieve optimal levels. To achieve and maintain optimal levels of vitamin D, we must either use vitamin D supplements or use the sun.

The sun showers onto earth a large range of radiation, including ultraviolet radiation (UV). UV radiation has three wavelengths, as follows:

Ultraviolet A (UVA): 320-400 nm

UVA has the longest wavelength and therefore it penetrates deepest into the skin. The most superficial layer of skin cells is the squamous cells. Deeper to the squamous cells are the basal cells. Below the basal cells are the melanocytes. Because UVA penetrates deepest into the skin, it is the primary UV influence on the melanocytes. Melanocytes produce the dark colored skin pigment melanin. This means that it is UVA that is primarily responsible for skin tanning. Sadly, damage to these same melanocytes increases the risk of the deadly skin cancer melanoma. UVA radiation is also primarily responsible for skin wrinkles.

Ultraviolet B (UVB): 280-319 nm

UVB should be subcategorized: 280-289 nm and 290-319 nm

- 280-289 nm UVB radiation is absorbed by the atmosphere and therefore does not influence human physiology, neither positively nor negatively.
- 290-319 UV radiation is most important. This range of UVB is primarily responsible for burning of the skin with excess sun exposure. Because of its

shorter wavelength (as compared to UVA), it is less likely to affect the deeper melanocytes, and therefore is less associated with deadly melanoma. Older sunscreens (UVB blockers only) and contemporary non-broad-spectrum sunscreens (UVB and UVA blockers) only blocked the skin burning UVB radiation, allowing the user to spend more time in the sun without burning. Ironically, this increased the sunscreen user's exposure to the dangerous wrinkle and melanoma producing UVA radiation.

To add to the irony, it is UVB radiation in the 290-319 nm wavelength that starts the production of vitamin D, as detailed below.

Consequently, older sunscreens (UVB blockers only) reduced skin burning, reduce the skin production of vitamin D, increase skin wrinkles, and increase deadly melanomas.

Ultraviolet C (UVC): 200-280 nm

UVC has the shortest wavelength and therefore it does not penetrate well. In fact, it is unable to penetrate the earth's atmosphere, where it is 100% absorbed.

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James Dowd, MD, is an Associate Professor of Medicine at Michigan State University. He is also the founder and director of both the Arthritis Institute of Michigan and the Michigan Arthritis Research Center. He is board certified in internal medicine, adult rheumatology and pediatric rheumatology.

In 2008, Dr. Dowd published a book titled [The Vitamin D Cure: Five Steps to Heal Your Pain and Improve Your Mood](#).

Dr. Dowd states that the optimal level of vitamin D is between 50-70 ng/ml.

PAIN

In his book, Dr. Dowd states:

"Research tells us that a lack of vitamin D makes us ache. Symptoms that point to vitamin D deficiency are muscle spasms, bone pain, and joint pain."

"Doctors often mistake vitamin D deficiencies for fibromyalgia, rheumatoid arthritis, and lupus."

"Because I'm a rheumatologist, people come to me because they want solutions for the pain they're experiencing in their joints, tendons, ligaments, muscles, and bones. They typically have at least one disease

involving muscles, ligaments, joints, and bones, but all of the aches and pains they have are actually connected to their vitamin D levels and what they eat.”

Dr. Dowd explains how joint cartilage integrity is dependent upon the quality of the bone the cartilage sits upon, stating:

“The bone that lies under the joint cartilage keeps the cartilage stable, functioning, and durable.” “You will speed up the rate of your cartilage breaking down when anything destabilizes the bone below the cartilage, such as poor bone development or increased bone turnover caused by vitamin D deficiency.”

Dr. Dowd notes that there is a 2-3 fold faster rate of osteoarthritis progression in those with the lowest 20% of vitamin D levels compared to those with the highest levels.

Dr. Dowd notes that adequate vitamin D supplementation can eliminate chronic back pain symptoms in nearly all patients, stating:

“Those who took vitamin D supplements saw dramatic resolution of pain, muscle fatigue and muscle cramps.”

MAGNESIUM

Dr. Dowd emphasizes that there is an important relationship between vitamin D and magnesium, stating:

- 1) Magnesium is critical for one’s body to produce the active form of vitamin D.
- 2) The receptor that vitamin D uses in the nuclear membrane is poorly expressed when one is magnesium deficient.
- 3) Magnesium is required for vitamin D to function properly.

Dr. Dowd further explains that magnesium is low when the body becomes acidic. He notes that the two main causes of an acidic body are the consumption of grains and dairy products, so he discourages both. He states that the most abundant and absorbable source for magnesium is the consumption of green leafy vegetables.



The world’s leading authority on vitamin D is Michael F. Holick, PhD, MD. Dr. Holick is a professor at Boston University Medical Center and the director of the university’s General Clinical Research Unit, Bone Health Clinic, and the Heliotherapy, Light, and Skin Research Laboratory. A search of the National Library of Medicine

using the PubMed search engine identified 345 articles using the key words "holick mf AND vitamin d".

Dr. Holick is the discoverer of the active form of vitamin D (1,25, dihydroxy vitamin D). In his 2010 book titled The Vitamin D Solution; A 3-Step Strategy to Cure Our Most Common Health Problems, Dr. Holick details these steps to the formation of the active form of vitamin D:

STEP #1

Our skin cells contain a molecule called
7-dehydrocholesterol = provitamin D3
which absorbs ultraviolet light B (UVB, wavelength 290-319 nm)

STEP #2

The absorption of UVB by provitamin D3
produces
pre-vitamin D3
within the skin cells

STEP #3

Our body heat
converts
pre-vitamin D3
into
vitamin D3
within the skin cell
(this is the same molecule as supplemental vitamin D3)

STEP #4

Vitamin D3
exits the skin cell into the blood stream
and
travels to the liver
where
25-hydroxy vitamin D (calcitriol) is produced

STEP #5

25-hydroxy vitamin D
leaves the liver
into the blood stream
to the kidney

STEP #6

The kidney makes the active form of vitamin D
1, 25 dihydroxy vitamin D
(this is the active form of vitamin D that was discovered by Dr. Holick)

STEP #7

This active form of vitamin D (1, 25 dihydroxy vitamin D)
circulates throughout the body
binding to receptors in the nucleus of the cell
influencing gene expression

Dr. Holick discusses the following FACTS pertaining to vitamin D:

- 1) Humans evolved in a manner as to be dependent upon sunshine for life and health.
- 2) There has been a 22% reduction of vitamin D levels in the US population in the last 10 years.
- 3) In the United States vitamin D insufficiency occurs in:
 - 70% of Whites
 - 90% of Hispanics
 - 97% of Blacks
- 4) The activated form of vitamin D that is found in your blood is produced in the kidneys. However, some other tissues also make the activated form of vitamin D. These include the prostate, breast, lungs, colon and brain. The activated vitamin D formed in these tissues does not enter the blood stream, but remains in those specific tissues.
- 5) "You could easily consume 5,000 IU of vitamin D a day, probably forever," without overdosing.
- 6) The assay for 25-vitamin D is the most ordered assay in the United States. This is the form of vitamin D that exists after the liver but before the kidney.
- 7) It is more difficult to synthesize the active form of vitamin D as one ages. A 70-year old person is 75% less efficient in synthesizing vitamin D as compared to a 20-year old person.
- 8) Neither calcium levels nor activated vitamin D levels (1, 25 dihydroxy vitamin D) levels are indicative of one being vitamin D deficient or not. The only acceptable measure for vitamin D deficiency is 25-vitamin D (made in the liver). Dr. Holick states:

"Do not accept any other marker no matter what your doctor tells you."

Dr. Holick discusses the following MYTHS pertaining to vitamin D:

- 1) It is a myth that one can wash vitamin D off from the skin shortly after being in the sun. Dr. Holick says this is not true because vitamin D3 is actually produced inside the skin cell itself, and therefore cannot be washed off.
- 2) Vitamin D2 does not work or is inferior to vitamin D3. Dr. Holick says it is now proven and understood that vitamin D2 works just as well as vitamin D3.
- 3) One can obtain adequate activated vitamin D from eating a good diet. Dr. Holick disagrees with this. He is adamant that one can only achieve adequate levels of vitamin D by being exposed to sufficient sunshine or by supplementation. He further notes that one cannot obtain optimal levels of vitamin D by consuming vitamin D fortified foods or by taking a multiple vitamin supplement, as the levels of vitamin D are too low.

PAIN

In 2007, Dr. Sota Omoigui states:

“The origin of all pain is inflammation and the inflammatory response.”

“Irrespective of the type of pain, whether it is acute or chronic pain, peripheral or central pain, nociceptive or neuropathic pain, the underlying origin is inflammation and the inflammatory response.”

“Activation of pain receptors, transmission and modulation of pain signals, neuroplasticity and central sensitization are all one continuum of inflammation and the inflammatory response.”

“Irrespective of the characteristic of the pain, whether it is sharp, dull, aching, burning, stabbing, numbing or tingling, all pain arises from inflammation and the inflammatory response.”

Dr. Holick details how vitamin D has substantial anti-inflammatory properties.

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Dr. Holick notes that osteomalacia is a known widespread chronic pain syndrome that is caused by vitamin D deficiency. Dr. Holick states:

“Osteomalacia is characterized by vague but often intense bone and muscle aches and is frequently misdiagnosed as fibromyalgia, chronic fatigue syndrome, or arthritis.”

Dr. Holick estimates that 40 – 60% of those diagnosed with fibromyalgia or chronic fatigue syndrome are actually suffering from osteomalacia subsequent to a massive vitamin D deficiency.

Dr. Holick notes that when a patient has a deficiency of vitamin D, there also exists a deficiency of calcium mineralization in the bones. Poorly mineralized bones consist of a "Jell-O-like" collagen matrix that expands with pressure, abnormally stretching the highly innervated periosteal coverings. The result is a throbbing, aching bone pain. Dr. Holick states:

"When people are sitting with aches in their hips or lying in bed with throbbing aches in their bones, it can be very hard for physicians to immediately think of vitamin D deficiency. But often that's exactly what's causing the problem."

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Dr. Holick notes that 93% of those suffering from nonspecific muscular and skeletal aches and pains are shown to be vitamin D deficient.

RECENT SUPPORTIVE STUDIES

In 2009, Gerry Schwalfenberg, MD from the Department of Family Medicine, University of Alberta, Canada, published an article in the ***Journal of the American Board of Family Medicine***, titled:

Improvement of Chronic Back Pain or Failed Back Surgery with Vitamin D Repletion: A Case Series

In this study, Dr. Schwalfenberg describes 6 cases of improvement/resolution of chronic back pain or failed back surgery after vitamin D repletion in a Canadian family practice. He notes that vitamin D insufficiency is common; repletion of vitamin D to normal levels in patients who have chronic low back pain or have had failed back surgery may improve quality of life or, in some cases, result in complete resolution of symptoms. In this report, there were 4 patients who had chronic back pain for more than a year and 2 patients who suffered for more than 3 years from failed back surgery.

In this study, Dr. Schwalfenberg makes the following key points:

"Back pain is the most common neurological complaint in North America, second only to headache."

"Low back pain (LBP) and proximal myopathy are common symptoms of vitamin D deficiency and osteomalacia."

“Vitamin D is required for the differentiation, proliferation, and maturation of cartilage cells and for the production of proteoglycan synthesis in articular chondrocytes.”

“Patients who have chronic, nonspecific LBP or have had failed back surgery may have an underlying vitamin D insufficiency/deficiency.”

“All patients had tried various pain treatments, including physiotherapy, visiting a chiropractor, acupuncture, or visit to a pain management clinic, all without much benefit.”

“Repletion of inadequate vitamin D levels demonstrated significant improvement or complete resolution of chronic LBP symptoms in these patients.”

Physicians should have a high index of suspicion for low vitamin D levels in patients with LBP.

“The patients in this study who responded best used between 4000 and 5000 IU of vitamin D3/day.”

“This case series supports information that has recently become apparent in the literature about vitamin D deficiency and its influence on back pain, muscle pain, and failed back surgery. Doses in the range of 4000 to 5000 IU of vitamin D3/day may be needed for an adequate response.”

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In 2009, (Straube) a study was published in the journal ***Pain***, titled:

Vitamin D and Chronic Pain

The authors reviewed 22 studies that indicated a strong association between vitamin D deficiency and chronic pain.

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In 2010, JoAnn Manson, MD from the Division of Preventive Medicine, Brigham and Women's Hospital, Harvard Medical School, published an article in the journal ***Metabolism***, titled:

Pain: sex differences and implications for treatment

In this study, Dr. Manson found that women have a higher prevalence than men of several clinical pain conditions and of inflammation-mediated disorders. Given the important role of inflammation in mediating pain, nutritional factors that modulate the

inflammatory response offer a promising and exciting new avenue for the prevention and treatment of chronic pain disorders. Of particular interest is the potential role of moderate- to high-dose vitamin D and omega-3 fatty acid supplements, both of which have powerful anti-inflammatory effects. These nutritional interventions, which influence cytokine, leukotriene, and prostaglandin pathways, may be of particular benefit to women due to their higher prevalence of inflammatory chronic pain disorders.

In this study, Dr. Manson makes the following key points:

Inflammation increases the incidence of pain. Both vitamin D and omega-3 fatty acids “have powerful anti-inflammatory effects.”

“Women tend to have a heightened inflammatory response compared with men. This enhanced inflammatory response may contribute to the substantially higher risk of painful inflammatory autoimmune conditions in women compared with men, including rheumatoid arthritis, lupus and other collagen vascular disorders, and osteoarthritis.”

Two very promising nutritional interventions for pain management are moderate- to high-dose vitamin D and the marine omega-3 fatty acids (eicosapentaenoic acid + docosahexaenoic acid).

Vitamin D and omega-3 fatty acids “reduce levels of circulating pro-inflammatory cytokines, decrease chronic joint pain, and may reduce the risk of autoimmune diseases.”

“Vitamin D, in addition to its role in calcium homeostasis, has powerful effects on the immune system, inhibiting proinflammatory cytokines such as interleukin-6 and tumor necrosis factor- α and reducing C-reactive protein.”

Vitamin D deficiency increases chronic widespread pain and/or fibromyalgia, especially in women.

A high level of vitamin D reduces knee and hip osteoarthritis and pain.

Given the important role of inflammation and cytokines in mediating and modulating pain, there is a “promising role of moderate- to high-dose vitamin D and omega-3 fatty acid supplementation in preventing and treating inflammation and chronic pain disorders. These nutritional interventions may be of particular benefit to women due to their higher prevalence of inflammatory chronic pain disorders.”

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In October 2010, (Heidari) a study was published in the journal ***International Journal of Rheumatic Disease***, titled:

Association between nonspecific skeletal pain and vitamin D deficiency

The authors detail the evidence on how deficiency of vitamin D is reported in patients in many types of musculoskeletal pain. Their study evaluated 276 chronic skeletal pain sufferers and 202 control subjects to add to the evidence that vitamin D deficiency is associated with chronic nonspecific skeletal pain.

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In November 2010 (Bhatti) a study published in the journal ***Journal of the Pakistan Medical Association***, titled:

Vitamin D Deficiency in Fibromyalgia

The authors assessed 40 female patients diagnosed with fibromyalgia from Karachi, Pakistan. They found that 100% of these woman had suboptimal levels of vitamin D. Specifically, they found that 80% had vitamin deficiency (averaging about 15 ng/ml) and 20% had vitamin D insufficiency (below 30 ng/ml). The authors concluded that vitamin D deficiency is frequently seen in patients with fibromyalgia and nonspecific musculoskeletal pain syndromes.

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In April 2011, (Arnson) an editorial appeared in the journal ***Israeli Medical Association Journal***, titled:

Is Vitamin D a New Therapeutic Agent in Auto-inflammatory and Pain Syndromes?

The authors note that "hypovitaminosis D is a worldwide epidemic, due to insufficient intake and inadequate sunlight exposure," estimating that worldwide 40-90% of older persons are vitamin insufficient. They recommend that all chronic pain persons be assessed for vitamin D levels.

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In September 2011, Tague and colleagues from the University of Kansas Medical Center published a study in the ***Journal of Neuroscience***, titled:

Vitamin D deficiency Promotes Skeletal Muscle Hypersensitivity and Sensory Hyperinnervation

The authors note that "musculoskeletal pain affects nearly half of all adults and most of them are vitamin D deficient." They also know that nociceptors express

vitamin D receptors, and that a lack of vitamin D can cause nociceptive hyperinnervation of skeletal muscles, contributing to muscular hypersensitivity and pain.

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In 2011, the editorial of the ***Scandinavian Journal of Primary Health Care*** (Kragstrup) is titled:

Vitamin D Supplementation for Patients with Chronic Pain

In this editorial Dr. Kragstrup reviews the epidemiological studies that link low levels of vitamin D to chronic pain. He advocates both testing for and supplementing of vitamin D in chronic pain sufferers.

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Also in 2010, Joseph Pizzorno, ND, the Editor in Chief of the journal ***Integrative Medicine***, published an editorial in his journal titled:

What We Have Learned About Vitamin D Dosing?

In this article, Dr. Pizzorno makes the following key points:

- 1) “Over the past several years, the surprising prevalence of vitamin D deficiency has become broadly recognized.”
- 2) Vitamin D deficiency is linked to:
 - Osteoporosis
 - Cardiovascular disease
 - Cancer
 - Autoimmune diseases
 - Multiple sclerosis
 - Pain
 - Loss of cognitive function
 - Decreased strength
 - Increased rate of all-cause mortality
- 3) “Deficiency of vitamin D is now recognized as a pandemic, with more than half of the world’s population at risk.”
- 4) Approximately 50% of the healthy North American population and more than 80% of those with chronic diseases are vitamin D deficient.
- 5) 80% of healthy Caucasian infants are vitamin D deficient. [And the rate of vitamin D deficiency tends to be greater in African American and Hispanic children].

- 6) Those with vitamin D deficiency experience 39% higher annual healthcare costs than those with normal levels of vitamin D.
- 7) The minimum blood levels of vitamin D [25(OH)D3] is 32 ng/ml; the optimal level is 50-70 ng/ml.
- 8) Prolonged intake of 10,000 IU of supplemental vitamin D3 "is likely to pose no risk of adverse effects in almost all individuals."
- 9) The recommended loading dose of supplemental vitamin D3 should be about 20,000 IU/day for 3 – 6 months with a maintenance dose of 5,000 IU/day. Those taking this amount of supplemental vitamin D3 should periodically have their serum 25(OH)D3 levels measured.

SUMMARY POINTS FROM DAN MURPHY:

- All chronic pain patients should have their 25 hydroxy vitamin D levels checked.
- If a patient's 25 hydroxy vitamin D levels are below 50 ng/ml, and especially if they are below 30 ng/ml, the patient needs more UVB sun exposure without sunscreen, or they need to supplement with 5,000 IU of vitamin D3 per day until optimal levels are achieved.

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The Modern Physician Letter™ is a monthly publication by myself, Dan Murphy, DC. I am a 1978 graduate of Western States Chiropractic College in Portland, OR. I have been in practice for 33 years and have had about 70 associate doctors.

I have had about 15,000 new patients. About 10,000 of them are whiplash injured patients.

I have taught about 1,500 post graduate continuing education seminars. About 1000 of them have been on whiplash and spinal trauma. Included in these is a year-long (10 modules, 120 hour) certification class in spinal trauma through the International Chiropractic Association. I did this program for 21 years and it graduated about 2000 chiropractors.

I am Board Certified in Chiropractic Orthopedics (Diplomate of the American Board of Chiropractic Orthopedics, DABCO), since 1985.

I have been part-time faculty at Life Chiropractic College West for 29 years, and my official ranking is that of Professor.

I am past vice president of the International Chiropractors Association, 2003-2009 and was chiropractor of the year for the International Chiropractors Association 2009.

The purpose of The Modern Physician Letter™ is to keep you updated as to relevant academic concepts pertaining to musculo- skeletal management. The hope is that the information is useful in terms of enhanced understanding, as well as helping the primary care physician work with each other and deal with insurance claim adjusters.

The doctor sending you this Letter is well versed and trained in these concepts, and can be a valuable asset in musculoskeletal cases in terms of both academics and treatment. Additionally, these expert chiropractors have access to a monthly phone consultation with me to discuss any pertinent issues that they may be facing on a particular case.

Dan Murphy, DC, DABCO

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