

Reducing Pain and Inflammation Naturally

Part I: New Insights into Fatty Acid Biochemistry and the Influence of Diet

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PAIN AND INFLAMMATION ARE NEUROCHEMICAL MANIFESTATIONS of physiologic imbalances which originate biochemically, structurally, and/or neurologically. Beyond the obvious relevance to the treatment of conditions associated with pain and inflammation, the implications of the data presented will provide therapeutic insight for doctors treating a wide range of complex chronic illnesses. Given the strength and momentum of this research, combined with the public's increasing interest in alternatives to dangerous, expensive, and often ineffective pharmaceutical treatments, the time has come for the chiropractic profession to assume a more empowered leadership position in the provision of healthcare and the prevention and treatment of most chronic health problems.

INTRODUCTION:

Since its inception, the chiropractic profession has recognized and affirmed the importance and benefits of whole-patient healthcare.^{1,2} In contrast to the medical model of disease, which generally seeks to use synthetic drugs to target isolated biochemical pathways, the holistic model of health and disease appreciates that a multifaceted approach including physical (structural, biomechanical, anatomical), biochemical (nutritional, hormonal, neurochemical), and psychoemotional assessments and interventions is commonly safer, more effective, and less expensive in the long-term for the restoration and preservation of optimal health.³ Extensive documentation in support of these concepts and their clinical applications has recently been compiled by the current author in a 486-page manuscript.⁴

While the benefits, safety, and cost-effectiveness of physical medicine and spinal manipulation have been well established in journal articles and commissioned reports,^{5,6} it is only within the past few years that we have seen a literal explosion of high-quality research supporting the concept that skillful phytonutritional interventions can have a powerful and beneficial influence on patient outcomes for a wide range of health concerns. Thus, as the only nationally-licensed healthcare providers with training in nutrition, chiropractic physicians should claim their proper position of leadership in the management of chronic health disorders.

The research increasingly points to inflammation as a common determinant of many diseases, including cancer, cardiovascular disease, neurologic conditions, diabetes, arthritis, and the so-called autoimmune diseases such as rheumatoid arthritis, lupus, and multiple sclerosis. Additionally, new research is also documenting the powerful influence of nutrition on optimal cell membrane dynamics, neurotransmitter/hormone receptor function, and modification of gene expression. The most powerful, cost-effective, and fundamental means for effectively addressing all of

these processes—1) inflammation, 2) cell membrane dynamics, 3) neurotransmitter/hormone receptor function, and 4) gene expression—is with skillful nutritional intervention: dietary improvement and phytonutritional supplementation. In particular, modulation of fatty acid metabolism by supplementation with nutritional oils is the most efficient means to achieve all four of the above-mentioned goals.

FOOD AND INFLAMMATION:

The adage “One man’s food is another man’s poison” finds particular relevance when we are dealing with patients experiencing pain and inflammation. Although dietary recommendations must always be customized for each individual patient, we can confidently make certain general recommendations to help these patients overcome their health problems and to feel and function better. Conceptually, we can organize our ideas about foods into the following categories: 1) foods to avoid, 2) foods to consume, 3) customized recommendations with regard to allergies, sensitivities, and intolerances.

Foods to Avoid: Many doctors and patients are unaware of the pro-inflammatory nature of many commonly eaten foods.⁷ As long as patients continue to consume pro-inflammatory chemicals in their foods on a daily basis, then they will continue to fight an uphill battle against pain and inflammation. Generally speaking, eating is itself a pro-inflammatory event, with sugars and fats inducing more inflammation than protein-containing foods.⁸ Therefore, simple sugars and high-fat foods should be avoided. Two fatty acids in particular, linoleic acid (LA) and arachidonic acid (ARA) from the n-6 family should be reduced or eliminated from the diet to the extent possible. LA increases inflammation by several mechanisms, one of which is activation of NF-kappaB.⁹ (Phytonutritional modulation of NF-kappaB¹⁰ will be reviewed in upcoming articles in this series.) Therefore, rich sources of LA should be avoided as much as possible. LA is abundant in most nut, seed, and

vegetable oils such as canola oil (21%), safflower oil (76%), sunflower oil (71%), corn oil (57%), soybean oil (54%), and cottonseed oil (54%). Similarly, ARA is the direct precursor to the isoprostanes—chemicals that are formed from the non-enzymatic oxidation of ARA and which exacerbate pain and inflammation. ARA is the precursor for and increases the production of inflammatory and noxious chemicals, particularly the prostaglandins and leukotrienes. Additionally, laboratory research has found that ARA also promotes activation of NF-kappaB and can cause a 400% increase in superoxide production in Kupffer cells.⁹ The most obvious method for *reducing production of chemicals derived from ARA* is to *reduce dietary intake of ARA*; this means avoiding the richest sources of ARA such as whole milk, beef, liver, pork, lamb, and to a lesser extent turkey and chicken. Additionally, many of these problematic foods, especially beef, liver, pork, and lamb, are also major sources of dietary iron, which promotes joint inflammation independently from its contribution to iron overload and hemochromatotic arthropathy. Indeed, as I have discussed in this journal¹¹ and elsewhere¹², all patients with polyarthropathy should be tested for iron overload. In summary, patients with inflammatory conditions should avoid foods that are high in fat, simple carbohydrates, linoleic acid, arachidonic acid, and iron. Artificial and processed foods should also be avoided since they are commonly rich in *trans*-fatty acids and are depleted of antioxidants.

Foods to Consume: Fruits and vegetables are rich sources of health-promoting nutrients such as vitamins, minerals, fiber, fatty acids such as squalene, and—perhaps most important—a wide range of phytochemicals including limonoids, carotenoids, terpinoids, isothiocyanates, flavonoids, proanthocyanidins and other polyphenols. Dietary antioxidants have important anti-inflammatory benefits that extend beyond their abilities to quench free radicals. Additionally, components of whole foods, such as the sterols and sterolins found in vegetables, have significant immune-modulating effects and have shown benefit in alleviating the inflammation of rheumatoid arthritis. Fruits and vegetables contain over 5,000 different phytochemicals that act additively and synergistically to maximize antioxidant protection and to protect health.¹³ Vegetarian, vegan, and plant-based whole-foods diets are naturally low in fat, linoleic acid, arachidonic acid, iron, and *trans*-fatty acids. Extra virgin olive oil contains oleic acid, squalene, and phenolic compounds which work synergistically to reduce inflammation, pain, and cardiovascular disease. Whey, soy, and cold-water fatty fish provide health benefits in addition to the provision of high-quality protein. Green tea shows anti-inflammatory, antioxidant, and anti-cancer actions. Diets with a strong foundation of whole fruits and vegetables help patients increase their intake of antioxidant and

anti-inflammatory vitamins, minerals, fiber, and phytonutrients while helping to reduce intake of pro-inflammatory iron and fatty acids. Lastly, a significant portion of the health benefits and anti-inflammatory effects of increased consumption of fruits and vegetables is due to favorable alterations in gastrointestinal microflora¹⁴ rather than the direct nutritive values of foods.

Customized Recommendations and Food Allergies:

We are all aware that, in certain patients, specific foods and combinations of foods may exacerbate joint pain and inflammation.^{15,16} Therefore the diet must be customized for each patient with regard to food allergies, food sensitivities, and food intolerances. Not only must problematic foods be avoided, but patients' gastrointestinal and immune status must be evaluated and improved.⁴ Although many doctors are aware of the elimination-and-challenge technique, most doctors do not direct sufficient attention to improving gastrointestinal status and immune function so that the immune system is no longer hyper-responsive to benign food constituents.⁴

AN INTRODUCTION TO FATTY ACID METABOLISM

We can think of the major biologically active fatty acids as originating from three major categories or “families” based on their molecular configuration and thus their physiologic properties. We can then ascribe general properties to these families and the individual members within each group. The most clinically important fatty acids are “unsaturated”, meaning they have one or more carbon-to-carbon double bonds rather than carbon-to-carbon single bonds, the latter being “saturated” with the full number of hydrogen molecules. Double bonds strongly influence the biochemical and clinical effects of fatty acids, making these fatty acids more reactive and biologically active than their saturated counterparts, as well as more prone to oxidation, rancidification, and hydrogenation.

Within each family, fatty acids progress from predecessors to progeny by a series of enzymatic steps catalyzed by desaturase and elongase enzymes. The desaturase enzymes are very slow in their conversions compared to the elongase enzymes, and the clinical relevance of this difference will become apparent as this article and series of articles progresses. We also note that fatty acids never change from one family to another: e.g., an omega-3 fatty acid will always remain in the omega-3 family and will never become a member of the omega-6 or omega-9 family. This is because the defining characteristic on a molecular level is never altered: omega-3 fatty acids have their first carbon-to-carbon double bond starting at the third carbon from the methyl group; omega-6 fatty acids have their first carbon-to-carbon double bond starting at the sixth carbon from the

methyl group; omega-9 fatty acids have their first carbon-to-carbon double bond starting at the ninth carbon from the methyl group. For the sake of efficiency and accordance with nomenclature conventions, we will hereafter abbreviate “omega” as “n” for the n-3, n-6, and n-9 fatty acids, respectively.

N-3 fatty acids: The n-3 family of fatty acids begins with alpha-linolenic acid, commonly referred to as one of the two “essential fatty acids” because it cannot be produced within the human body and must therefore be provided by the diet. Manifestations of n-3 fatty acid deficiencies are generally subtle when contrasted to those of the n-6 family and include behavioral and visual impairment, endocrinologic alterations, and a tendency toward the development and progression of several chronic degenerative diseases.¹⁷

Abundant in flax oil (~57%), alpha-linolenic acid (ALA) is converted to stearidonic acid by delta-6-desaturase. Stearidonic acid (SDA) is elongated to n-3 eicosatetraenoic acid, which is then converted to eicosapentaenoic acid (EPA) by delta-5-desaturase. EPA is elongated to n-3 docosapentaenoic acid (n-3 DPA), which is then converted to docosahexaenoic acid (DHA) by delta-4-desaturase. These substrates and conversions are illustrated in Figure 1 (modified with permission from Integrative Orthopedics⁴).

N-6 fatty acids: The n-6 family of fatty acids begins

with linoleic acid (LA), also referred to as an “essential fatty acid” because it cannot be synthesized *de novo* within the human body. LA is abundant in most nut, seed, and vegetable oils such as canola oil (21%), safflower oil (76%), sunflower oil (71%), corn oil (57%), soybean oil (54%), and cottonseed oil (54%).¹⁸ LA is converted by delta-6-desaturase to gamma-linolenic acid (GLA), which is quickly elongated to dihomo-gamma-linolenic acid (DGLA). DGLA is slowly converted by delta-5-desaturase to arachidonic acid (ARA), which is elongated to adrenic acid, which is finally converted to n-6 docosapentaenoic acid by delta-4-desaturase. These substrates and conversions are illustrated in Figure 2 (modified with permission

Figure 1. Metabolism of n-3 fatty acids

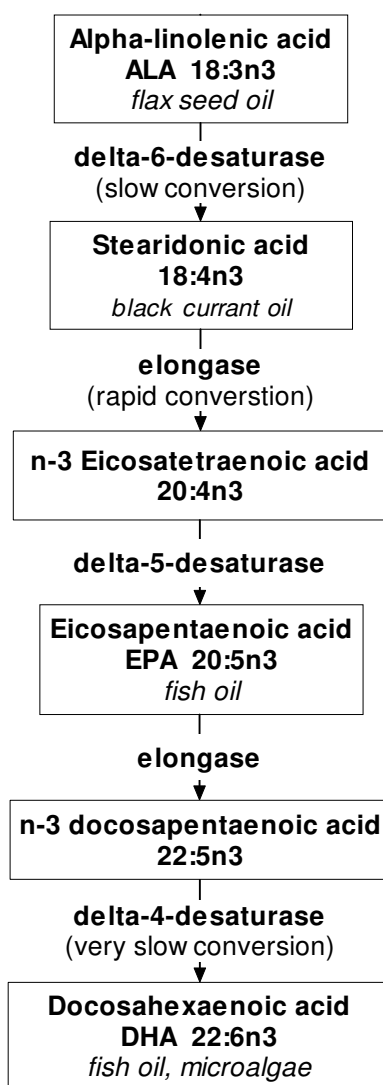
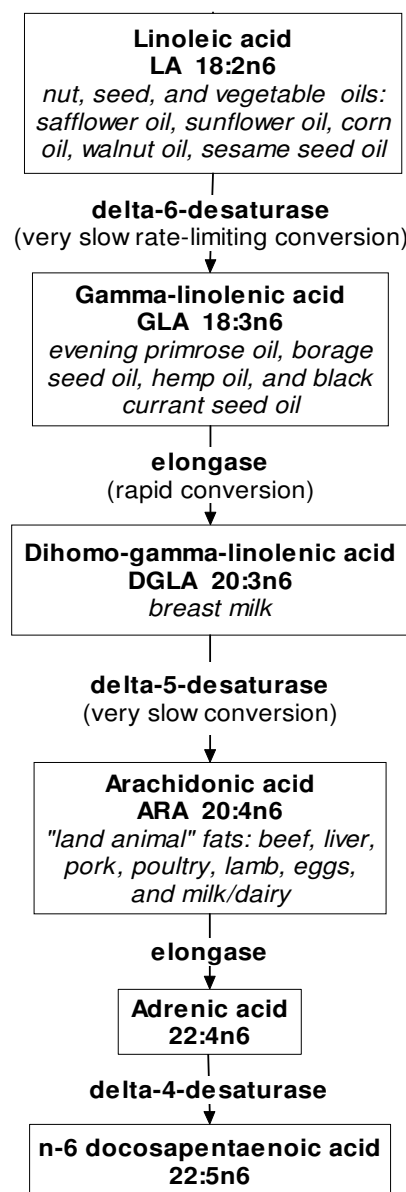


Figure 2. Metabolism of n-6 fatty acids



from *Integrative Orthopedics*⁴).

Note that the term “eicosatetraenoic acid” can apply to both 20:4n6 (arachidonic acid) of the omega-6 fatty acid family¹⁹ and to 20:4n3 of the omega-3 fatty acid family.²⁰ Therefore, to avoid the confusion that would result from the use of the term “eicosatetraenoic acid” by itself, “n-6 eicosatetraenoic acid” should be used when referring to 20:4n6 (arachidonic acid) and “n-3 eicosatetraenoic acid” should be used when referring to 20:4n3. Similarly, 22:5n3 of the omega-3 fatty acid family^{21,22} and 22:5n6 of the omega-6 fatty acid family^{23,24,25} are both referred to as “docosapentaenoic acid.” Therefore using the term “docosapentaenoic acid” will be ambiguous unless the appropriate n-3 or n-6 designation is stated. “N-3 docosapentaenoic acid” should be used to refer to 22:5n3 and “n-6 docosapentaenoic acid” should be used for 22:5n6.

N-9 fatty acids: The primary n-9 fatty acid in the human diet is oleic acid, the predominant monounsaturated fatty acid in olive oil. While oleic acid is certainly biologically active and therefore clinically important, due to the complexity of olive oil as the primary source of oleic acid, we are not yet able to clearly determine from epidemiological studies how much of the benefit of olive oil consumption is due to the oleic acid compared to the benefits derived from the powerful antioxidant and anti-inflammatory actions of the phenolics, the relatively high content of squalene, or other confounding variables in diet and lifestyle.^{26,27}

ENZYMATIC CONVERSION: CHEMICAL FLOWCHARTS VERSUS THE REALITY OF CLINICAL EFFECTIVENESS

If conversion of one fatty acid to the next proceeded as efficiently as depicted in biochemical flow charts, then n-3 ALA and n-6 LA could be supplemented to provide all of the downstream fatty acids and their metabolites, presumably in the proper ratios. However, clearly this is not the case due to intrinsic as well as genotypic (inherited) and phenotypic (manifested) defects in enzyme effectiveness. Clinicians need to understand the individual characteristics of these enzymes in order to successfully employ therapies which modulate fatty acid metabolism. Since the conversions catalyzed by elongase are quite efficient and are almost never discussed as cause for concern in the medical and nutritional literature, we will focus on the desaturase enzymes, which are noted to have significant variances in phenotypic expression and which can be adversely affected by common vitamin and mineral deficiencies.

Delta-6-desaturase: The first step in the n-3 and n-6 pathways is the action of delta-6-desaturase (D6D) in converting ALA to SDA and LA to GLA, respectively. Enzymatic conversions by D6D are rate-limiting due to 1)

its strong need for several vitamin and mineral co-factors, 2) its genotypic impairment, such as in patients with eczema,²⁸ 3) its phenotypic impairment in patients with diabetes,²⁹ and its impairment by trans-fatty acids,³⁰ stress neurotransmitters,³¹ and other environmental and nutritional influences.⁴ The slow conversions by D6D explain why, as Horrobin noted, “...it is impossible to produce any significant elevation of DGLA levels in humans by increasing linoleic acid intake.”³² Similarly, conversion of ALA to the downstream and clinically desirable fatty acids EPA and DHA is unreliable, with most studies showing only a modest increase in EPA and no increase in DHA following supplementation with ALA. Cofactors required for efficient action of D6D include iron, zinc, magnesium, pyridoxine, riboflavin, and niacin; when these vitamins and minerals are deficient, D6D function will be impaired and defects in fatty acid metabolism will result.³³

Delta-5-desaturase: Delta-5-desaturase (D5D) slowly converts n-3 eicosatetraenoic acid to EPA, and in the n-6 pathway, DGLA to ARA. Supplementation with GLA has been shown to result in a slight to modest increase in ARA that may or may not be clinically significant. Impairment of D5D is seen in patients with the blinding eye disease retinitis pigmentosa, resulting in marked reduction in retinal DHA levels.³⁴

Delta-4-desaturase: Delta-4-desaturase (D4D), like the other desaturase enzymes, is also very slow-acting. While impaired conversion of adrenic acid to n-6 docosapentaenoic acid appears to be of little or no consequence, reduced bioavailability of DHA due to its slow conversion from n-3 docosapentaenoic acid has tremendous implications in the etiology of schizophrenia, a disease associated with impaired D4D activity.³⁵

By understanding the biochemical efficiency of these enzymes, doctors are better able to understand how to implement clinical strategies for modulating fatty acid balance in their patients. In the n-3 family, supplementation with ALA increases (in order of decreasing efficiency) ALA, SDA, and EPA but does not consistently elevate DHA. Therefore, although consumption of flax oil has many important benefits and may be used to modestly increase EPA levels, it cannot be relied upon to increase DHA levels.³⁶ Supplementation with SDA increases EPA levels, but DHA is not significantly increased due to the slow conversion by D4D.³⁷ Supplementation with EPA proportionately increases EPA but does not consistently increase DHA.³⁸ DHA supplementation is the most effective and reliable means for increasing DHA levels.³⁹

In the n-6 family, supplementation with LA does not lead to clinically significant increases in GLA or DGLA.³² Supplementation with GLA greatly increases DGLA and

leads to a modest increase in ARA.⁴⁰ Diets high in ARA lead to increased tissue levels of ARA. Consumption of EPA lowers levels of GLA/DGLA²⁹ and oleic acid⁴¹; likewise, consumption of GLA lowers levels of EPA.⁴⁰

Overall, the implications are that when a particular fatty acid is desired for its physiologic effect and clinical benefits, it should be supplied directly from the diet or supplements.

CONCLUSION:

In this brief article, we have introduced and reviewed the foundational terminology and concepts which will facilitate the introduction of more advanced concepts as presented in the upcoming articles in this series. Dietary improvement and custom-tailored prescription of individual fatty acids is consistently providing patients and doctors with greater health and superior clinical results. Alleviation, prevention, and effective treatment of many diseases previously considered to be “untreatable” is now possible with fatty acid supplementation, diet modification, and the use of other vitamins, minerals, and botanical medicines. The skillful use of these interventions by the chiropractic profession, whether as adjunctive treatment to spinal manipulation or as primary therapy, is in accord with our holistic philosophy and promises to advance the prominence of our profession in the healthcare arena. Since the pharmaceutical-surgical paradigm delivers many unnecessary risks and unsatisfactory outcomes in the management of chronic disease⁴²⁻⁴⁹, now is the time for chiropractic physicians to step forward and deliver the safest, most effective and cost-effective therapies ever before seen in American healthcare for the management of chronic health problems.

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BOOK EXCERPTS, CHAPTERS:

- <https://www.amazon.com/Dr-Alex-Vasquez/e/B00AT5764Y>
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- <https://ichnfm.academia.edu/AlexVasquez> (main archive/repository)
- https://www.researchgate.net/profile/Alex_Vasquez2 (archive/repository)
- <https://www.inflammationmastery.com/reprints> (cloud-based PDF folder)
- <https://www.ichnfm.org/public>

VIDEOS: Access to public videos is available per the following:

- Main archive: <https://vimeo.com/drvasquez>
- See also: <https://www.ichnfm.org/public>
- And to a lesser extent: <https://www.youtube.com/channel/UCPR2pgwFw9L2GUnBgupQ5Aw>

WEBSITES:

- Main: <https://www.inflammationmastery.com/>
 - Antiviral: <https://www.inflammationmastery.com/antiviral>
 - Fibromyalgia: <https://www.inflammationmastery.com/fibromyalgia>
 - Migraine: <https://www.inflammationmastery.com/migraine>
 - Complete protocol: <https://www.inflammationmastery.com/book-nutrition-functional-medicine>
- Main: <https://www.ichnfm.org/> This is actually a very rich website with many blogs and videos
 - <https://www.ichnfm.org/antiviral2019> and the long series starting with <https://www.ichnfm.org/antiviral>, <https://www.ichnfm.org/antiviral2>, <https://www.ichnfm.org/antiviral3>, <https://www.ichnfm.org/antiviral4>, and continuing...
 - <https://www.ichnfm.org/braininflammation>

SOCIAL MEDIA UPDATES: Note that updates are made on a regular basis to the following social media pages, with some overlap but also some topic-specific specialization, which is self-explanatory by the titles of these pages:

- Dr Alex Vasquez 's Inflammation Mastery <https://www.facebook.com/InflammationMastery>
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- International Journal of Human Nutrition and Functional Medicine <https://www.facebook.com/IJHNFMM>
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Availability in print and digital formats (examples):

- <https://www.ichnfm.org/im4>
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- <https://books.apple.com/us/author/alex-vasquez/id1139497284>
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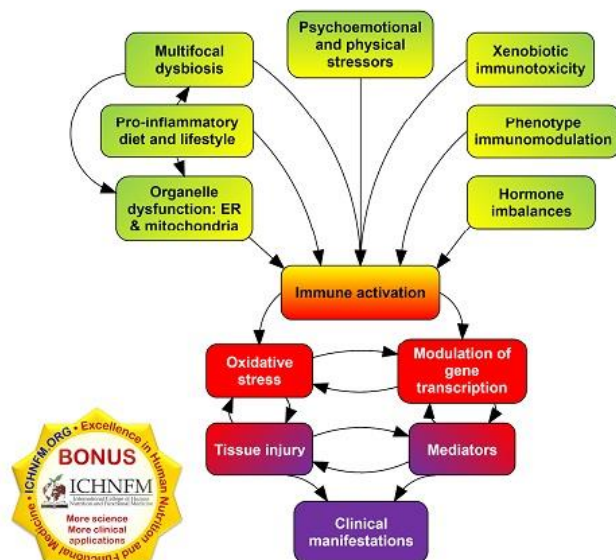
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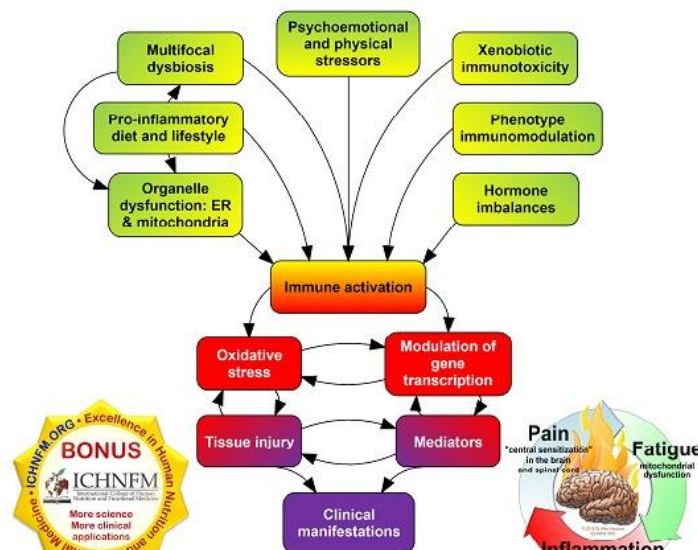
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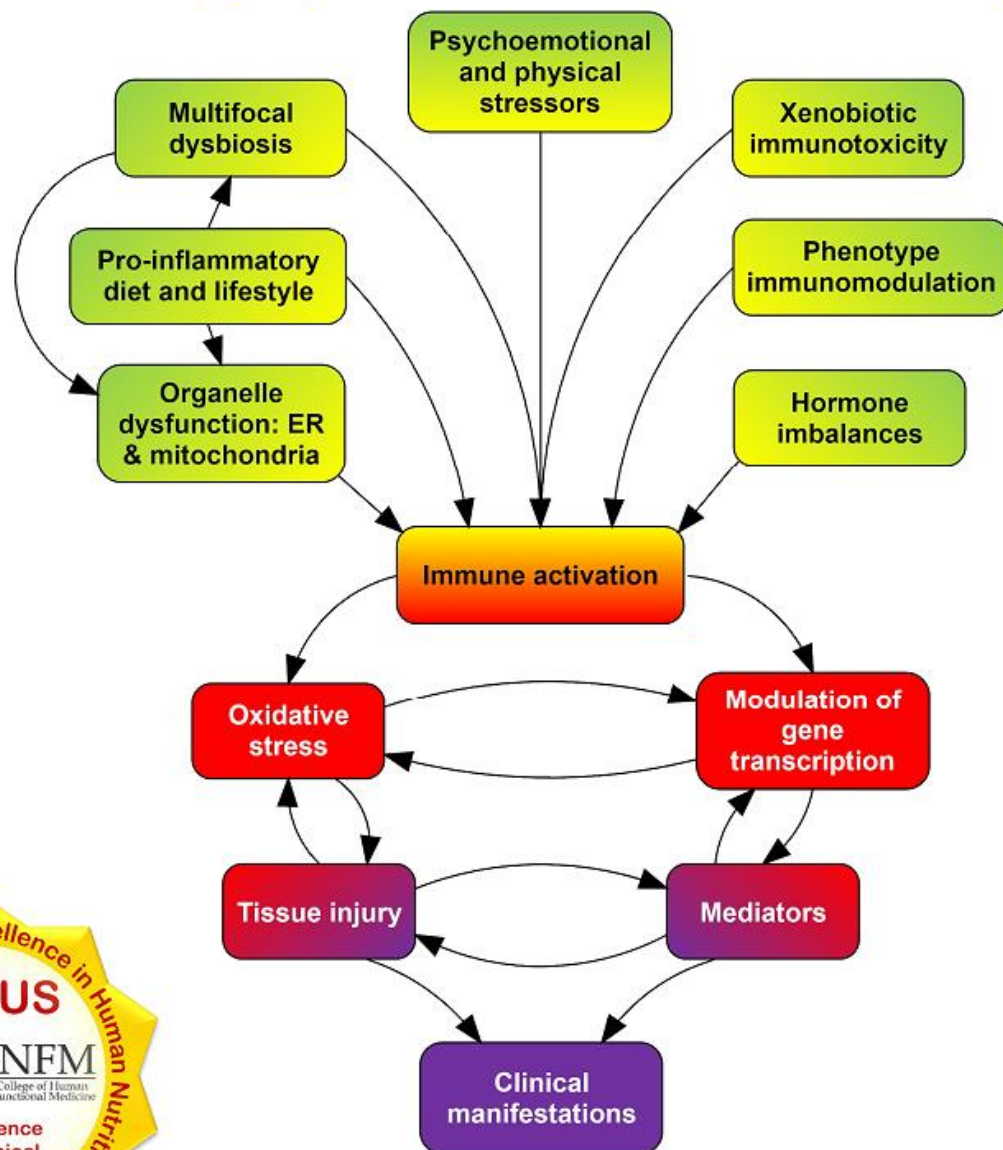
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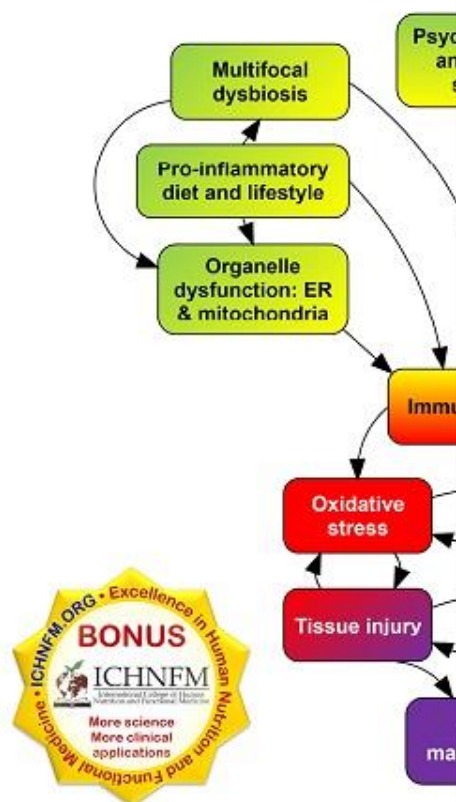
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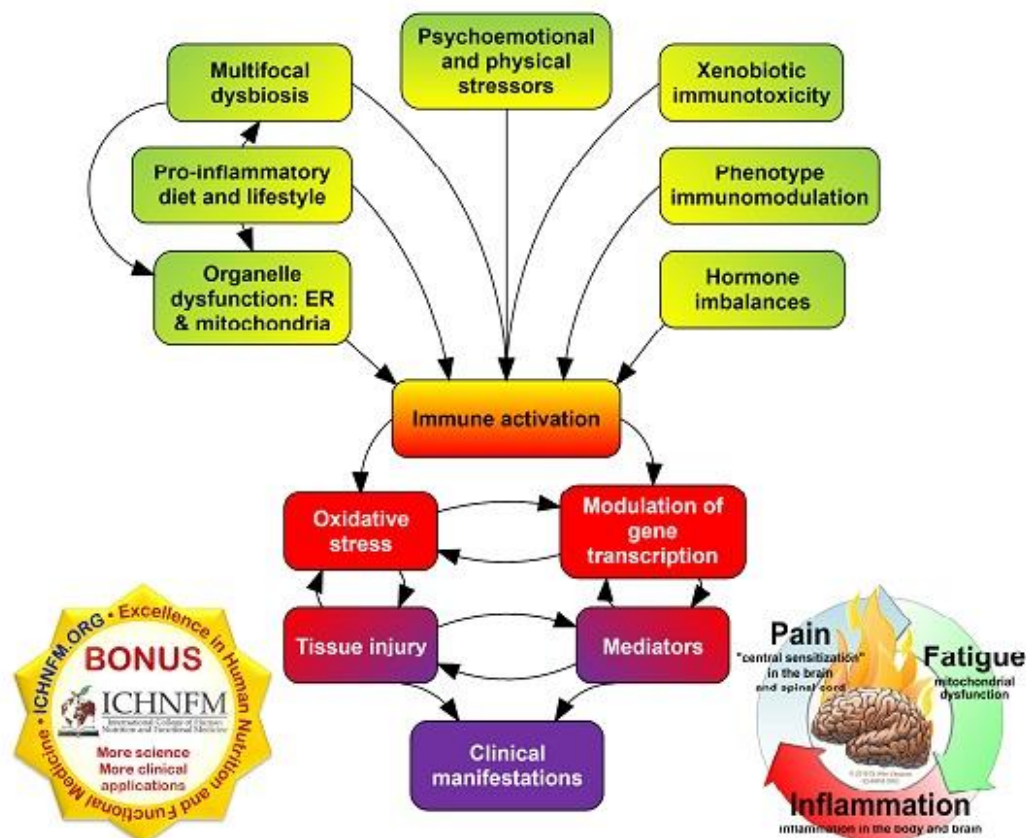
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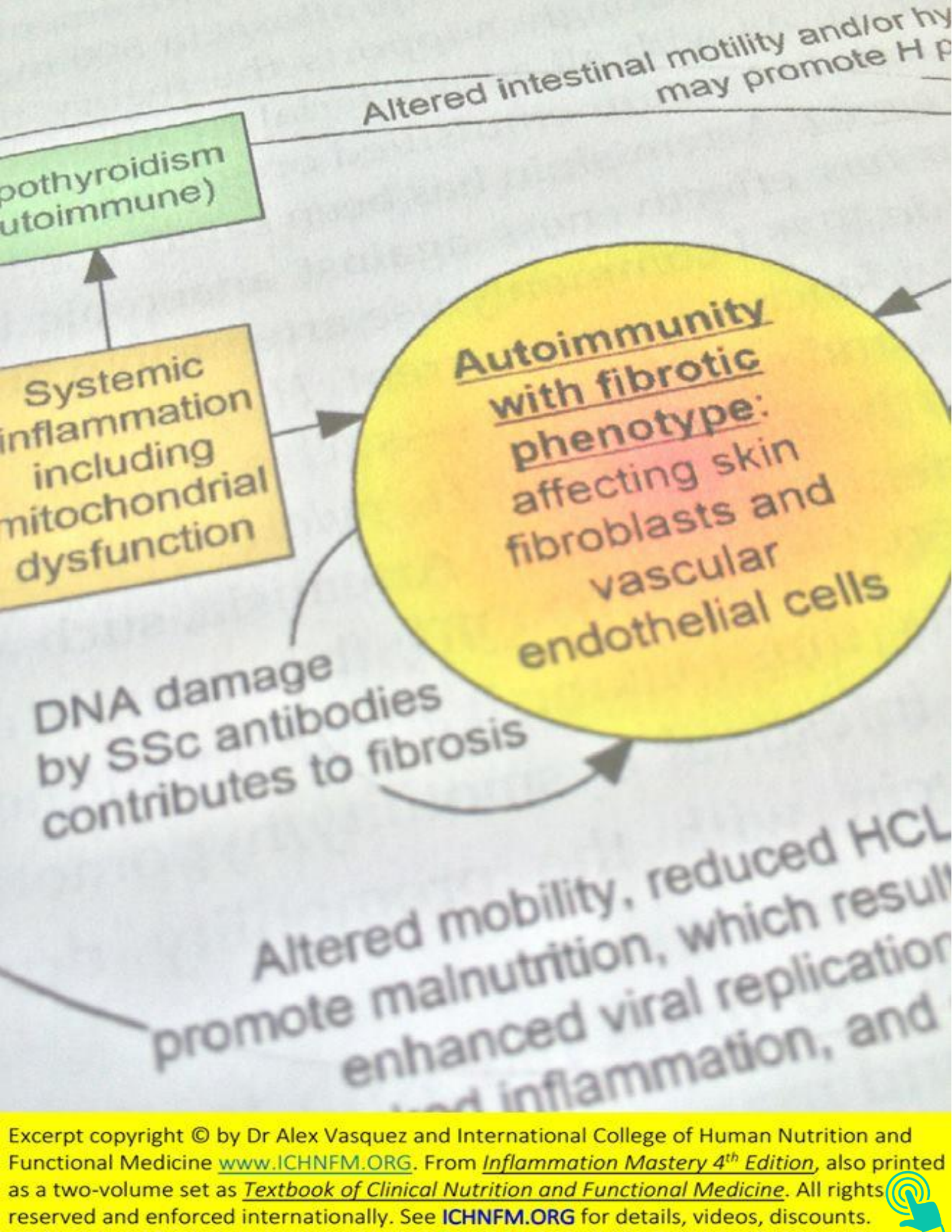
ALEX VASQUEZ D.C. N.D. D.O. F.A.C.N.

- Doctor of Osteopathic Medicine, graduate of University of North Texas Health Science Center, Texas College of Osteopathic Medicine (2010)
- Doctor of Naturopathic Medicine, graduate of Bastyr University (1999)
- Doctor of Chiropractic, graduate of University of Western States (1996)
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- Former Overseas Fellow of the Royal Society of Medicine
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- Private practice of integrative and functional medicine in Seattle, Washington (2000-2001), Houston, Texas (2001-2006), Portland, Oregon (2011-2013), consulting practice (present)
- Consultant Researcher and Lecturer (2004-present), Biotics Research Corporation
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 - Founder and Former Program Director of the world's first accredited university-affiliated graduate-level program in Functional Medicine
 - Adjunct Professor, Integrative and Functional Nutrition in Immune Health, Doctor of Clinical Nutrition program at Maryland University of Integrative Health
 - Former Adjunct Professor (2009-2013) of Laboratory Medicine, Master of Science in Advanced Clinical Practice
 - Former Faculty (2004-2005, 2010-2013) and Forum Consultant (2003-2007), The Institute for Functional Medicine
 - Former Adjunct Professor (2011-2013) of Pharmacology, Evidence-Based Nutrition, Immune and Inflammatory Imbalances, Principles of Functional Medicine, Psychology of Wellness
 - Former Adjunct Professor of Orthopedics (2000), Radiographic Interpretation (2000), and Rheumatology (2001), Naturopathic Medicine Program, Bastyr University
- Author of more than 100 articles and letters published in *JAMA—Journal of the American Medical Association*, *BMJ—British Medical Journal*, TheLancet.com, *JAOA—Journal of the American Osteopathic Association*, *Annals of Pharmacotherapy*, *Journal of Clinical Endocrinology and Metabolism*, *Alternative Therapies in Health and Medicine*, *Nutritional Perspectives*, *Journal of Manipulative and Physiological Therapeutics*, *Integrative Medicine*, *Current Allergy and Asthma Reports*, *Nutritional Wellness*, *Evidence-based Complementary and Alternative Medicine*, and *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*

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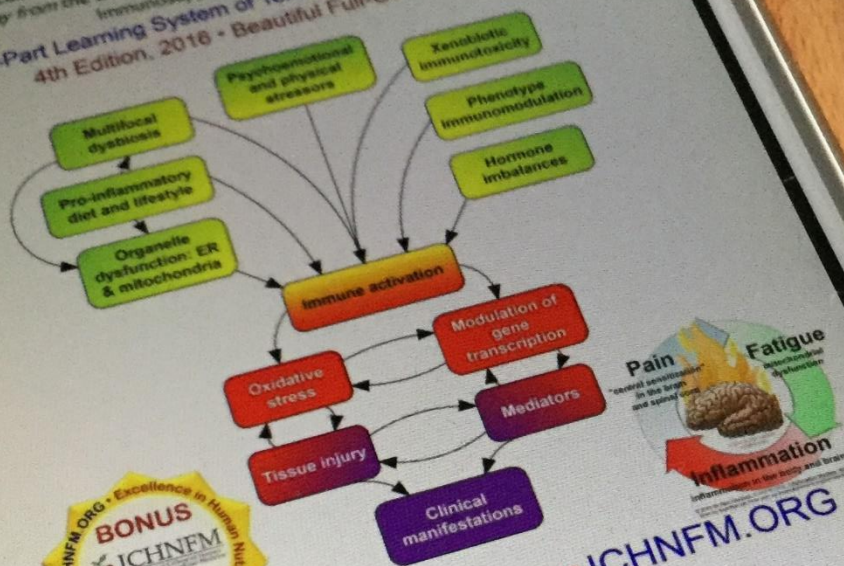


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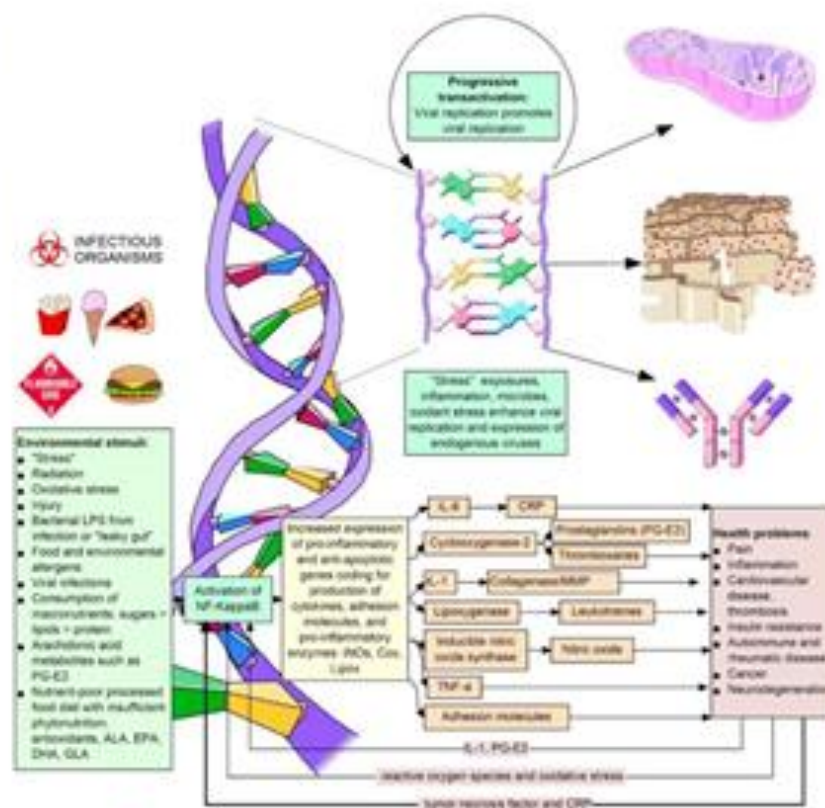


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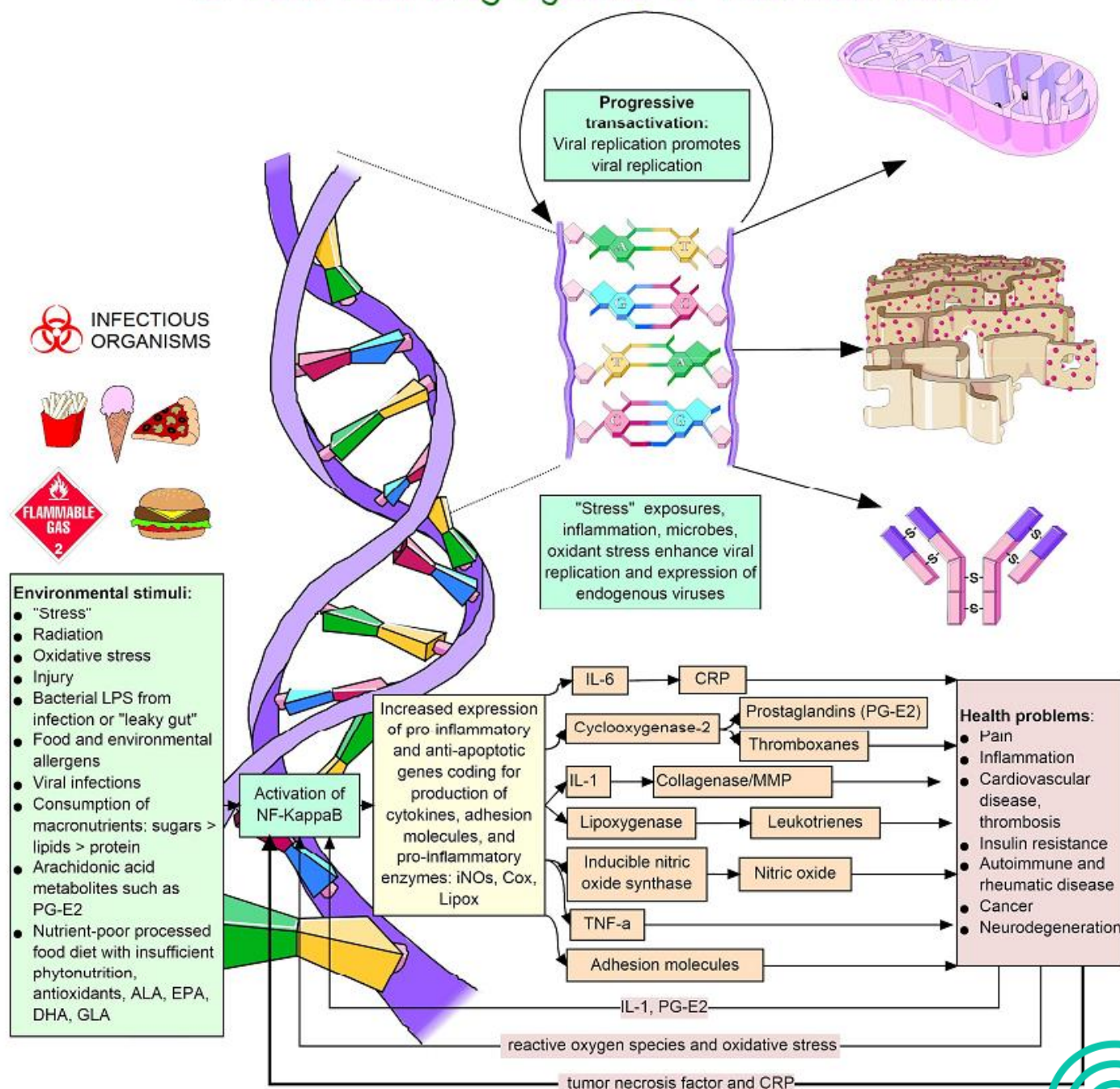


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THE PATH AHEAD

Concerns About The Integrity of The Scientific Research Process—Focus On Recent Negative Publications Regarding Nutrition, Multivitamins, Fish Oil And Cardiovascular Disease



Alex Vasquez, DC, ND, DO; Joseph Pizzorno, ND, Editor in Chief

Abstract

The next step in reestablishing credibility seems to us honesty and recognizing we all share a common goal of the health and wellness of the human community and the planet. Everyone agrees that the current healthcare system, despite its many incredible successes, is also

showing its limitations and is no longer sustainable. We believe the solution starts with us the researchers and editors. A good first step might be formally recognizing the errors and showing how we can and *intend* to get better.

Evidence-based medicine—by definition—requires objective, reliable and accurate research and reviews from which to make the best decisions in patient care and public policy. The causes of inaccurate information, ranging from presumably innocent mistakes all the way to apparently intentional fraud, affect all scientific and biomedical disciplines.¹ While these accidental and intentional errors can derail our understanding of diseases and impact tens of thousands of affected patients, such inaccuracies in the field of nutrition are worldwide.² While a specific disease human population nutrition research particularly concerning nutrition research healthcare professions nutrition. Clinical vast majority of medical training programs are obviously in gastroenterology⁷ training in clinical proclaims itself as including the entire and serious problem arises when unskilled and invalid research is published by authors (including nonphysician journalists¹¹) in major journals which mischaracterizes the validity of nutrition interventions (e.g., essentially always concluding that nutritional interventions are inefficacious

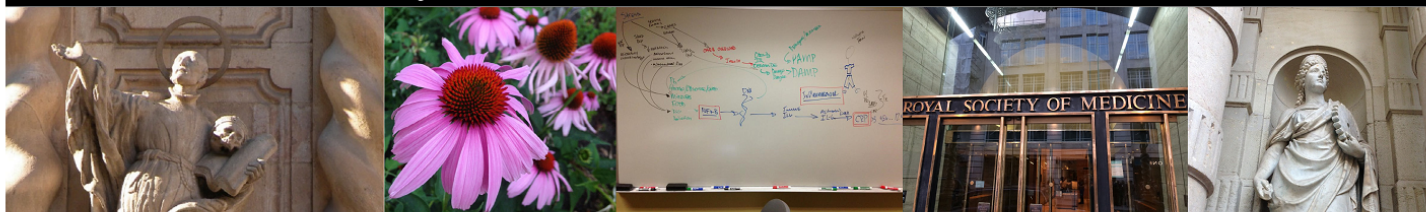
or potentially hazardous) and then such research is used politically and in the media to disparage, restrict and regulate practitioners and nutrition supplement industry¹² to the detriment of human health.

Several factors disrupting the integrity of nutrition research are commonly found in studies published by “elite” universities in “top-tier” journals, which are then republished and distributed as “headlining news” in newspapers, magazines, and television via which they ent policy and ons of people. examples of ulations, lists sed solutions. pendent upon stigative and ts of clinical rovements are ignorance in

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- **VIDEO:** BRIEF Critique of “Effects of n–3 Fatty Acid Supplements in Diabetes Mellitus: ASCEND Study” <https://vimeo.com/287650812>
- **VIDEO:** Bad Science in Medical Nutrition: Politics of Fish Oil <https://vimeo.com/314997927>

tion review recent publications related to nutrition. Perceived shortcomings are documented with both citations here and links to more detailed and authoritative reviews and video presentations. In some instances, speculations regarding the cause and consequences of identified errors are provided.



Perspective, Opinion, Editorial • Education • Academia • Wage Theft • Corruption

Ending the Exploitation of Experts Begins with Educating Them about Employment, Curbing Enthusiasm to Preserve Enthusiasm

Alex Vasquez DC ND DO FACN

My own paths toward and perspectives on Education

My passion for teaching and education began "formally" when I was about 9 years of age, sitting on the floor of Ms Hall's 4th grade classroom; from that vantage as I sat somewhat near my best friend Robert, I saw the destructive power of bad teaching and discrimination, and from that day I started analyzing teachers, teaching methods, educational and social structures, and ways to convey knowledge and inspire students. Additionally inspired by my teacher of English and Literature in my final years at Riverside Military Academy, I began college with the plan of eventually teaching "something—most likely English and Literature" because I appreciated and valued teaching, proper grammatical structure, and nuanced use of language; I later developed and interconnected my interests in teaching, writing, language, physiology, medicine, and nutrition to complete three doctorate degrees in the health sciences and publish more than 120 articles, letters, rebuttals, monographs, and books on a wide range of topics, with those publications ranging from dense 1-page Letters and Responses to published research up to single-author textbooks of more than 1,180 pages. I have taught at various colleges and universities at the undergraduate, graduate/Masters, and Doctorate levels and have lectured internationally for post-graduate medical education. I see teaching not simply as effective transfer of information, but also as a means to interconnect and inspire generations of people, notably in a reciprocal manner. At its best, teaching and learning are activities that reflect and support love for life itself.

Oh, the stories I could tell you Academia, "nonprofits", and "Education"

I would be happiest to tell you that Administrators are vanguards of support for fellow Professors, and their commitment is to truth and reality, setting ablaze the passions of those they teach, lead, and supervise in flower fields like a professor.

singing a rhythmical rendition of "*The Hills are Alive...with the...Passions of Education and Intellectual Integrity*." But a Pollyanna representation of my observations would be a misrepresentation of the realities I have seen and experienced. I have seen university presidents lie to their students, expel experts for the sake of maintaining their own petty powers and preferences, and I have seen entire academic administrations lie (misrepresent) in unison to their boards of trustees and their accreditation commissions. I have seen stand-alone academic programs make millions of dollars in profit, while its administrators refuse to pay a living wage to doctorate-level infrastructure and while allowing themselves 6-week European vacations during major institutional initiatives. I have seen administrators lie to accreditors and allow students to cheat their way through graduate programs (by bypassing faulty examination software in online programs), and I have seen accreditors turn a blind eye to obvious university corruption, made worse when the accreditation commission is infiltrated by university administrators—thus did "accreditation" come to lose its value. I have seen "nonprofit educational institutions" underpay their faculty, plagiarize from their faculty, resell the work of other professionals without notice or compensation, and then pay their upper administrators in excess of US\$160,000 for less than part-time work—thus did "nonprofit organization" come to lose its value. I have seen schools blackmail excellent professors and leaders in education with gag orders, legal threats, and financial bribery (range US\$25,000 up to \$250,000) to buy their silence about institutional corruption. I have corresponded

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Tutorial & Editorial • Scientific Writing • Journal Editing • Professional Experience • Video

How to Improve Scientific Writing and Journal Editing: A Short Narrative-Video Guide, Part I

Alex Vasquez DO ND DC FACN

Introduction

“Hello everyone, Dr. Alex Vasquez here, and today I’m going to start a different series of videos, and this time the conversation is going to focus around journal editing and writing. I’m calling this “*Editing and Writing Tips #1*”, and I’m going to start with a few of my own perspectives and experiences, then I’ll talk about a few basics, and a few influential ideas. In later videos, I will talk about some more specific examples, and then perhaps at some point we will have a review and conclusion.

Early Experiences and Influences

Very briefly I’ll talk about some of my own experiences, and the reason for my doing this is to share with you and segue into some examples that I think are very important. Basic though they might be, a lot of our success in various fields of life actually comes from respecting and appreciating and utilizing those basic concepts.

Let us start here with some of my initial experiences. I started becoming aware of language and the fact that I had some facility for it, first, when I was about 12 years old. I remember writing a poem in class, and again this is somewhat peripheral to the main topic of today, but I do remember that early on, in that kind of my entryway, I think, in that our assignment was to write a poem, and I remember writing this poem in class, on and on, and—compared with some of the other students—I just realized that writing for me was not a struggle.

Then again, when I was in a military school, I remember in our

being asked questions, and I remember just how the answers to understanding grammar and language just came very easy to me, and I do remember feeling like I had some facility for the structure of language.

Another influential experience I had when I was about 11 years old, totally unrelated to language, is that we took, in the late 1970s or early ‘80s, a Computer Science class in our elementary school, and I remember that class also specifically having some influence on me, in terms of structuring logic. We basically had to write our own computer programs and this was back when computers were very new. Obviously today everybody has computers; back in the late ‘70s, computers were a novelty. I consider myself lucky to have taken this Computer Science class; it was obviously extremely basic, but we did have to write some code and what I remember from that is just the sequential manner in which communication has to take place in order to be successful. In this case, we were writing programs for computers and doing basic

“Writing comes from the entirety of one’s experience.”

Dr Alex Vasquez

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Editorial

Misrepresentations of Clinical Nutrition in Mainstream Medical Media: Growing Importance of Legitimate Expertise in Independent Peer-Reviewed Publications - Part 1

2018 As a Milestone in the Post-Truth Era

Among the various topics that have either interested or fascinated me throughout my youth and well into my adult years, Nutrition has certainly reigned supreme. My personal routine has been to read as much as reasonably and practically possible on the topic, while not doing so to the exclusion of other topics in biomedicine, psychosociology and philosophy. Thus, with roughly 30 years of experience in reading books and primary research in the field of Nutrition, I could not help but notice the radical departures that occurred in 2018 from the previous norms to which I had grown accustomed.

Of course, 2018 was not the first year during which “bad research” was published in mainstream medical journals and then replicated throughout the echo chamber of mass media; one could observe this periodically occurring throughout the past 50 years, starting not at least with the demonization of dietary cholesterol and the glorification of processed foods, especially refined grains and so-called vegetable oils. But in 2018 what many of us observed was not simply poorly performed research but, in some instances, radical departures from any attempt to provide descriptions that could be considered “reasonable” by previous standard.¹ Especially related to the topic of nutrition, mainstream medical journals and the media which parrots their conclusions have begun to make overt misrepresentations of Nutrition with regard for science, logic, biomedical history and

One has to be aware of a few key ironies that characterize mainstream medical discussions of nutrition: that 1) medical physicians receive essentially no training in clinical nutrition in their graduate school education and in their post-graduate residency training², 2) medical physicians and organizations publish “research” and commentaries (both of which commonly conclude that nutritional interventions are inefficacious or unsafe) despite their lack of formal education on the topic, and

stream medical voices consistently call for “regulating the nutrition supplement industry” despite their lack of training on the topic and because of negative conclusions based on their own poorly conducted research and self-serving conclusions. As such, not only are the map-makers blind, but they mislead their blind followers, and then both groups promote themselves as expert cartographers and guides when advising the public on an area that none of them have studied or understood. We should have no surprise whatsoever when the “medical community” publishes poorly conducted and self-serving “research” on the topic of nutrition, to reach their desired conclusion that nutrition is unsafe and inefficacious, and that the profitable market needs to be managed of course by the selfsame “medical community” that is never received a decent 15 minutes on the topic of therapeutic nutrition. Pervasive and persistent ignorance on the topic of nutrition among medical physicians must be understood as intentional and strategic, because otherwise this problem would have been solved 30 years ago when it was first discussed during what was called at the time the “golden age of nutrition.”³ The easiest way to manipulate people and to keep them in a perpetual state of confusion, ineffectiveness, and dependency is to keep them ignorant on important topics; our educational sys-

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- **VIDEO:** BRIEF Critique of “Effects of n–3 Fatty Acid Supplements in Diabetes Mellitus: ASCEND Study” <https://vimeo.com/287650812>
- **VIDEO:** Bad Science in Medical Nutrition: Politics of Fish Oil <https://vimeo.com/314997927>

Mitochondrial Medicine Arrives to Prime Time in Clinical Care: Nutritional Biochemistry and Mitochondrial Hyperpermeability (“Leaky Mitochondria”) Meet Disease Pathogenesis and Clinical Interventions

Alex Vasquez, DC, ND, DO, FACN

Alex Vasquez, DC, ND, DO, FACN, is director of programs at the International College of Human Nutrition and Functional Medicine in Barcelona, Spain and online at ICHNFM.org. (*Altern Ther Health Med.* 2014;20(suppl 1):26-30.)

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MITOCHONDRIAL MEDICINE ARRIVES TO GENERAL PRACTICE AND ROUTINE PATIENT CARE

Mitochondrial disorders were once relegated to “orphan” status as topics for small paragraphs in pathology textbooks and the hospital-based practices of subspecialists. With the increasing appreciation of the high frequency and ease of treatment of mitochondrial dysfunction, this common cause and consequence of many conditions seen in both primary and specialty care deserves the attention of all practicing clinicians.

We all know that mitochondria are the intracellular organelles responsible for the production of the currency of cellular energy in the form of the molecule adenosine triphosphate (ATP). In this time, contemporary clinicians

considered on a routine basis in clinical practice. *Mitochondrial medicine* is no longer an orphan topic, nor is it a superfluous consideration relegated to boutique practices. Mitochondrial medicine is ready for prime time—now—both in the general practice of primary care as well as in specialty and subspecialty medicine. What I describe here as the “new” mitochondrial medicine is the application of assessments and treatments to routine clinical practice primarily for the treatment of secondary/acquired forms of mitochondrial impairment that contribute to common conditions such as fatigue, depression, fibromyalgia, diabetes mellitus, hypertension, neuropsychiatric and neurodegenerative conditions, and other inflammatory and dysmetabolic conditions such as allergy and autoimmunity.

BEYOND BIOCHEMISTRY

Structure and function are of course intimately related and must be appreciated before clinical implications can be understood and interventions thereafter applied with practical precision. The 4 main structures and spaces of the mitochondria are (1) intramitochondrial matrix—the innermost/interior aspect of the mitochondria containing various proteins, enzymes of the Krebs cycle, and mitochondrial DNA; (2) inner membrane—the largely impermeable lipid-rich compartmentalized membrane that separates the matrix from the intermembrane space; (3) intermembrane space—the space between the inner and outer membranes; and (4) outer membrane—the outermost layer of the mitochondria, which is highly permeable and contains passive transport systems for select molecules that need to enter and exit the mitochondria. Clinicians need to appreciate that mitochondrial membrane integrity is of the highest importance; just as we have come to appreciate the

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stated during the recent International Conference on Human Nutrition and Functional Medicine¹ in Portland, Oregon, in September 2013, we have collectively arrived at a time when mitochondrial therapeutics and the contribution of mitochondrial dysfunction to clinical diseases must be

Editorial

Orthomolecular Medicine, Catalytic Creativity, and the Psychosocial Ecosystem

Transitioning From One Year to the Next

Various cultures since time immemorial have marked and celebrated the winter solstice with celebrations, meals with friends and family, and time away from work; transitioning from one calendar year to the next has given people pause and a moment to reflect on the events that happened in the past year and what might be anticipated in the next. Reflection with anticipation along with the realization that the future is somewhat malleable inclines people to imagine how the future might be shaped by the exertion of some modicum of creativity and effort. Any realistic conception of how we might improve the near future must segue from our recent past; we must have an awareness of what is going on around us as we look toward the future to visualize ourselves living within it and also acting upon it. What is going on in the world and how might I act upon that trend and flow in order to improve both its transition and its destination? What should each of us do on a personal level to (in the words of Mahatma Gandhi) be, embody, and materialize the change(s) that we want to see in the world?

Salutation and Introduction From the Journal's New Editor

Over the past few years I have reflected on several occasions how much I enjoy editing, and so I was correspondingly surprised and pleased when I was offered the opportunity to be the next Editor for the *Journal of Orthomolecular Medicine*. I began studying nutrition and orthomolecular concepts in my teen years and moved to school in the early 1990s. "Your Nerves" book that I read as a teenager was followed immediately by the book of Jonathan V Wright of whom would later be my professor at the University. By the mid-1990s I had read the book of Jeffrey Bland PhD had introduced me to integrative medicine, which I studied for personal and professional reasons. By the mid-1990s I had contained several hundred articles on nutrition and health with another large section on philosophy and psychology. In 1994, I joined the Review Staff of the *Journal*

of Naturopathic Medicine, and I started publishing nutrition articles, perhaps most of which might be seen as practice in preparation of an important letter published in 1996 by the American College of Rheumatology in their journal *Arthritis and Rheumatism*. Since those early years and during the course of three doctorate degrees and teaching thousands of students/attendees internationally, I have reviewed for⁴ and published in⁵ a wide range of refereed journals in addition to publishing commissioned books, chapters, and independent publications and videos. Being an author and reviewer for many different publications—along with my experiences teaching internationally, treating patients in various settings, designing and directing academic programs, and producing educational videos—has given me a wide range of experiences and insights that I hope to bring to the benefit of the *Journal of Orthomolecular Medicine*.

We Must Work Together if We Are Going to Succeed

I have to start this conversation with a few hopes, assumptions, and beliefs, namely that you (the reader) and I (the author and new Editor) have a few things in common. On a professional level, by virtue of the fact that you are reading this essay, I will assume that you are interested or actively engaged in healthcare, medicine, nutrition, research and/or public health. I might also imagine that some smaller percentage of our new and established readers are perhaps less inclined toward the mechanisms and more drawn to the *Journal of Orthomolecular Medicine* for its potential humanistic applications; we can reasonably assume that (and competent healthcare providers (adequate nutrition) are basic to submit a counterargument for all of my assertions, they are and more to the point, my assertions are regardless of personal position—we share some common ground including the following:

and deliver the best health solution, then we each want the best possible solution. Efficiency of time or money is not the top priority when we are seeking solutions

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Mini-Review • Continuing Education • Microbiome • Dysbiosis • Infectious Disease

Translating Microbiome (Microbiota) and Dysbiosis Research into Clinical Practice: The 20-Year Development of a Structured Approach that Gives Actionable Form to Intellectual Concepts

Alex Vasquez DC ND DO FACN

Experience and Perspectives

Many years ago when I published my first books^{1,2} and articles³ detailing "dysbiosis", the word could hardly be found in the Medline index, the topic was controversial at best and ethereal at worst, the term "microbiome" (first published in French in 1949 and in English in 1988) was virtually unknown, and I spent most of the time and space in my lectures and articles substantiating and defending the condition's existence. These days, everyone is talking about microbiome, dysbiosis, "leaky gut" (thanks largely to Leo Galland MD), and my 1996 article on "Silent Infections and Gastrointestinal Dysbiosis" has been downloaded at least 4,000 times and is one of the top 1% most popular articles on dysbiosis. In 2010, I found "dysbiosis" more than 1,200 times. The concept has become popular, but to do with it in *International Journal of Human Nutrition and Functional Medicine*, the complete microbiota project, the number of scientific papers linking the microbes that live in our gut to diseases ranging from diabetes and colitis to anxiety and depression has grown exponentially. Yet, these tantalizing connections have yielded few benefits from a therapeutics standpoint.⁴ To the extent that this information is being integrated into clinical practice at all, the current level of


"Dysbiosis" is an important concept, but doctors cannot treat concepts.

We have to define, describe, and deconstruct the microbes, molecules, and mechanisms into their components, then rebuild a conceptual scaffold and intellectual structure that becomes a useful tool that, with study and experience, can be used in a clinical setting to effective benefit.

practical application is a bit indelicate and cumbersome beyond the most commonly repeated advice of advocating probiotics, avoiding antibiotics, perhaps delving into using botanical antimicrobials and laboratory testing. Breath testing (an inexpensive test for only one culture of gastrointestinal popular to the clinical clues. Laboratory testing particular used methods to extract they only to suffering and


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International College of Human Nutrition and Functional Medicine

ICHNFM has many videos on the topics of dysbiosis, persistent infections, and dysbiotic clinical conditions such as fibromyalgia at www.Vimeo.com/ICHNFM



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CME

CONTINUING MEDICAL EDUCATION

THE CLINICAL IMPORTANCE OF VITAMIN D (CHOLECALCIFEROL): A PARADIGM SHIFT WITH IMPLICATIONS FOR ALL HEALTHCARE PROVIDERS

Alex Vasquez, DC, ND, Gilbert Manso, MD, John Cannell, MD

Alex Vasquez, DC, ND is a licensed naturopathic physician in Washington and Oregon, and licensed chiropractic doctor in Texas, where he maintains a private practice and is a member of the Research Team at Biotics Research Corporation. He is a former Adjunct Professor of Orthopedics and Rheumatology for the Naturopathic Medicine Program at Bastyr University. **Gilbert Manso, MD**, is a medical doctor practicing integrative medicine in Houston, Texas. In prac-

tice for more than 35 years, he is Board Certified in Family Practice and is Associate Professor of Family Medicine at University of Texas Medical School in Houston. **John Cannell, MD**, is a medical physician practicing in Atascadero, California, and is president of the Vitamin D Council (Cholecalciferol-Council.com), a non-profit, tax-exempt organization working to promote awareness of the manifold adverse effects of vitamin D deficiency.

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OBJECTIVES

Upon completion of this article, participants should be able to do the following:

1. Appreciate and identify the manifold clinical presentations and consequences of vitamin D deficiency.
2. Identify patient groups at risk for vitamin D deficiency and hypersensitivity.
3. Know how to implement proper doses and with appropriate monitoring.

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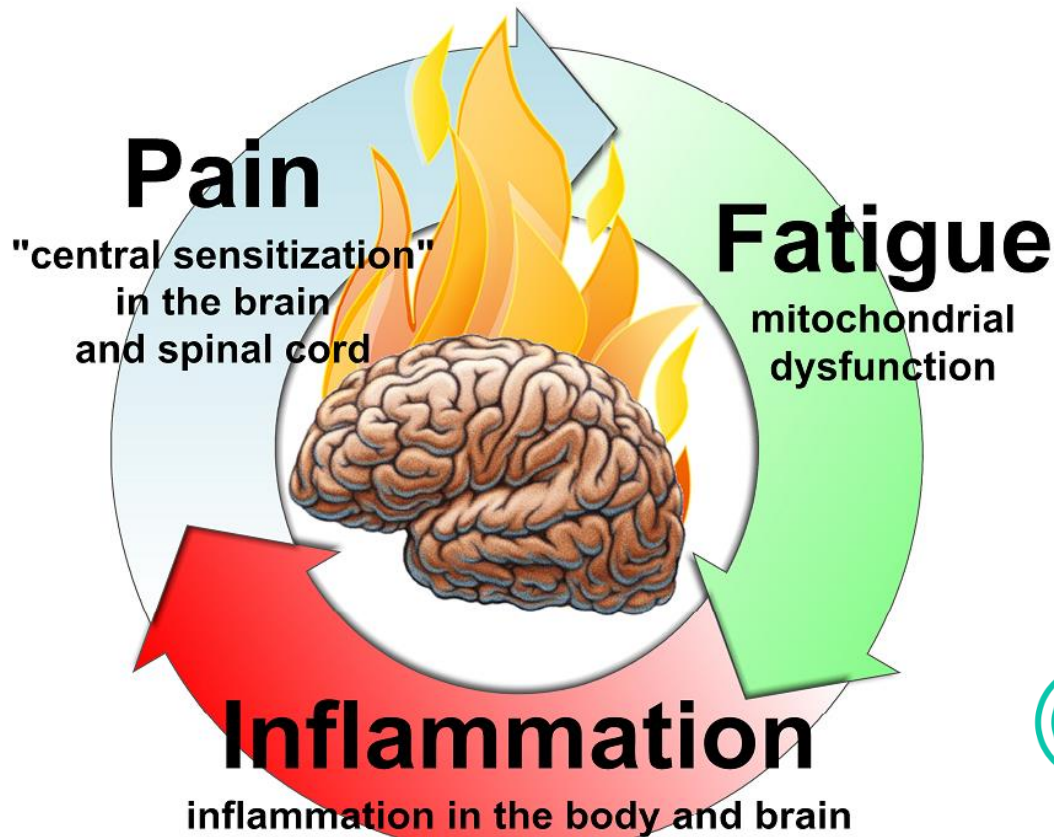
While we are all familiar with the important role of vitamin D in calcium absorption and bone metabolism, many doctors and patients are not aware of the recent research on vitamin D and the widening range of therapeutic applications available for cholecalciferol, which can be classified as both a vitamin and a pro-hormone. Additionally, we also now realize that the Food and Nutrition Board's previously defined Upper Limit (UL) for safe intake at 2,000 IU/day was set far too low and that the physiologic requirement for vitamin D in adults may be as high as 5,000 IU/day, which is less than half of the >10,000 IU that can be produced endogenously with full-body sun exposure.^{1,2} With the discovery of vitamin D receptors in tis-

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BRAIN INFLAMMATION IN CHRONIC PAIN, MIGRAINE AND FIBROMYALGIA

THE PARADIGM-SHIFTING GUIDE FOR DOCTORS AND
PATIENTS DEALING WITH CHRONIC PAIN



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- From *Inflammation Mastery, chapter 5*, the two sections specific to migraine and fibromyalgia were also published separately as *Pain Revolution* (full-color printing; <https://www.amazon.com/dp/B01AR3NX0S>) and *Brain Inflammation in Chronic Pain, Migraine and Fibromyalgia: The Paradigm-Shifting Guide for Doctors and Patients Dealing with Chronic Pain* (black-and-white printing; <https://www.amazon.com/dp/B01EQ9KMH6/>); both versions are also available in digital ebook format for phone, computer, iPad via the free Kindle software

Biological plausibility of the gut–brain axis in autism

Alex Vasquez 

Organic abnormalities with neuroinflammation, purine metabolism, neurotransmitter abnormalities, are noted in autism, and many of these abnormalities are metabolites, and heightened serum levels

Keywords: gut–brain axis; autism; me

In their recent review, Sherwin and colleagues, among many other issues, the review of the gut microbiome–brain axis with a section subtitled “Microbiota-based interventions for the treatment of autism: hype or reality?” *et al.*¹ largely discuss preclinical studies and the 2017 open-label study by Karpman *et al.*² used a sequence of oral vancomycin, rifaximin, and polyethylene glycol laxative, and fecal microbiota transplantation (FMT) with human fecal microbiota transplants. The authors claim clinical benefit in subjects with au-

Readers will likely benefit from additional relevant clinical studies, including the publication by Sandler *et al.*³ showing the effect of oral vancomycin, as well as the clinical studies showing positive impact of various antibiotics (metronidazole, ketoconazole, ampicillin) in patients with autism.^{4,5} These studies have been shown to have gut dysbiosis as well as *Clostridia* species,⁶ the group of bacteria noted for their production of neurotoxic substances. International studies have consistently demonstrated that patients with autism have heightened production of 3-(3-hydroxypropionic acid (HPHPA), a phenylalanine metabolite of *Clostridia* in the gastrointestinal tract.^{7,8} HPHPA reportedly is involved with the conversion of dopamine to

Autism, Dysbiosis, and the Gut-Brain Axis



An Excerpt from "Deciphering the Gut-Brain Axis in Clinical Practice"

Alex Vasquez

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