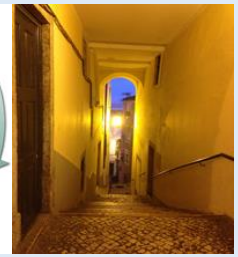
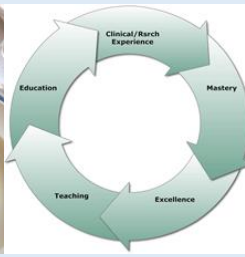
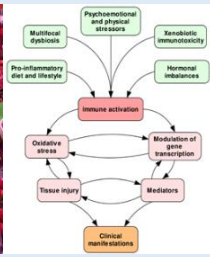


# INTERNATIONAL JOURNAL OF HUMAN NUTRITION AND FUNCTIONAL MEDICINE

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**Critique • Post-Publication Review • Journal Editing • Research Methodology • Medical Education**

# Educational Errors in "Effect of Vitamin D and Omega-3 Fatty Acid Supplementation on Kidney Function in Patients with Type 2 Diabetes" published in JAMA 2019

Alex Vasquez DO ND DC FACN

## Context

Major medical journals publish bogus pro-drug and anti-nutrition research in order to 1) groom medical audiences for pharmaceutical purchases, 2) defend and please their pharmaceutical advertisers (who commonly purchase article reprints for millions of dollars/\$, euros/€, pounds/£<sup>1</sup>), 3) maintain the financial and sociopolitical dominance of the medical profession, 4) deter the general public from seeking and using nonmedical treatments, and 5) misinform politicians and policymakers so that laws, public funds, policies, and research monies will be directed in favor of the medical profession, including medical schools (that produce consecutive generations of pharmaceutically indoctrinated and nutritionally illiterate clones) and drug researchers who use public funds to create privatized drugs that escalate profit of the pharmaceutical industry. While such has always been the inherent bias of the medical publishing industry, some of us noted a new wave of remarkable exacerbations of this bias including overt deceptions and ethical departures published in the biomedical research starting in 2018.<sup>2,3</sup> The cyclical-reciprocal feeding of misinformation from medical journals and drug companies to medical students, physicians, policymakers, the media (e.g., television, magazines, and newspapers—all of which receive millions of \$/€/£ in drug company advertising) creates the pro-pharma “echo chamber” which—when *repetition* becomes *consensus* becomes *practice* becomes *sales* becomes *profit for purchasing politicians*—becomes the pro-pharma “power vortex” with each aspect reinforcing the other, ultimately leading to medical profiteering,

political dominance, censorship of information, blockade of criticism, and restriction of free speech.

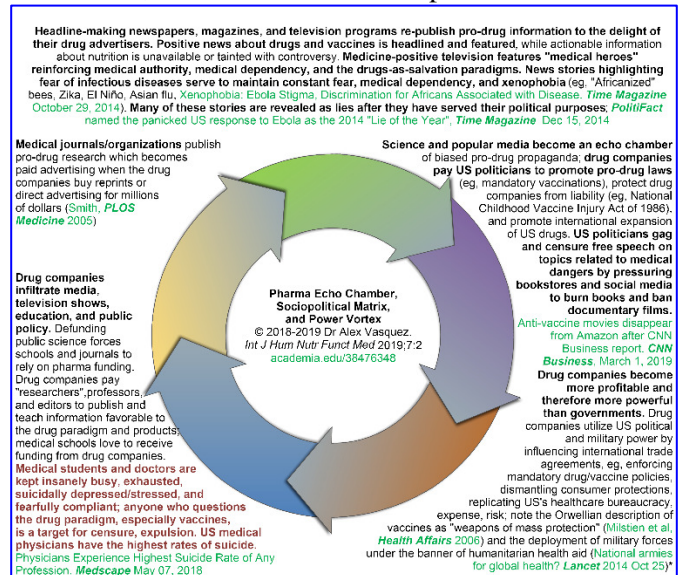


Illustration from: Pharma Echo Chamber, Sociopolitical Matrix, and Power Vortex. *International Journal of Human Nutrition and Functional Medicine* 2019 <https://www.academia.edu/38476348> See also<sup>2,3</sup>

## Critique en breve

On November 8 of 2019, JAMA—*Journal of the American Medical Association* published “Effect of Vitamin D and Omega-3 Fatty Acid Supplementation on Kidney Function in Patients With Type 2 Diabetes” (doi:10.1001/jama.2019.17380); this is yet another pathetic “nutrition study” which was so poorly designed and misrepresentative of the practice of clinical nutrition that it was sure to provide the desired “negative” results



for *JAMA*'s medical audience and the resulting headlining news distributed to millions of professionals, policymakers, and patients. As a matter of course, the story was rapidly echoed by pro-pharma *Medscape* in the expected uniformed and adolescent commentary.<sup>4</sup> My initial critiques of this publication are as follows

1. **Authors and Editors failed integrate previous data:** In order for science to advance and avoid repeating the same errors and wasting misappropriated effort (i.e., repeatedly *recreating the wheel in the age of air and space travel*), research authors and journal editors have the responsibility to competently maintain awareness of the current *state of the art* so that research and publications reflect advancement in the field. Clearly in the case of this publication, neither the authors nor the editors represented the current state of the art in nutritional management the conditions discussed herein.<sup>5</sup> The numerous nutritional interventions previously shown to provide positive benefit for this condition were ignored in this publication to support what appears to have been the predetermined conclusion and goal.
2. **Nobody really thinks this would work:** This investigation was mostly a wild goose chase, a strawman fallacy. No naturopathic or nutrition student would intervene in such a complex condition as diabetes with pending renal insufficiency by *solely* using *underdosed* fish oil and *underdosed* vitamin D; as such this intervention represents clinical incompetence more so than the competent clinical practice of Nutrition and any of its related variants (e.g., Functional Medicine, Naturopathic Medicine, Functional Inflammalogy, etc).
3. **The investigators used inadequate doses of both nutrients in order to ensure failure of the intervention:** The authors used <50% of the proper dose of vitamin D for healthy patients<sup>6,7</sup>, let alone a proper dose for diabetic patients which is more commonly in the range of 10,000 IU per day.<sup>8,9</sup> The authors used 44% of the proper dose of EPA+DHA; obviously, under-dosing the treatments is expected to lead to lackluster results and *much ado about nothing*.
4. **The investigators intentionally hid the identity so that readers would not know what really happened:** The authors failed to provide the identity of the "placebo" so that doctors and policymakers would not know that used olive oil as the placebo in

order to undercut the perception of any clinical benefit; olive oil is one of the most potent antiinflammatory and cardioprotective oils known to biomedical science. Using olive oil as a "placebo" is inappropriate in an intervention testing the efficacy of a cardioprotective and renoprotective intervention.

5. **This study does not represent the modern practice of Clinical Nutrition:** Half-baked ideas presented as reasonable intervention are still half-baked ideas; this study is inappropriate in its design, implementation, and reporting. This study does nothing to inform the practice of Medicine, and—in fact by misrepresenting a flawed study as a legitimate study—this publication simply misleads healthcare professionals, policymakers, and the general public.
6. **As expected, this low-quality research was repeated throughout the pro-pharma echo chamber:** The commentary published by *Medscape* concluded, "This was a high quality trial that tells us that we don't need to focus our energies here [on using vitamin D and fish oil]. Only a novice or ignoramus would consider this "a high quality [sic] trial", and describing it as such does more than mislead the reader about this particular topic but also by extension about the very nature of clinical research, ethics, and investigational study design.

## Conclusion

This publication "Effect of Vitamin D and Omega-3 Fatty Acid Supplementation on Kidney Function in Patients with Type 2 Diabetes" published in *JAMA* 2019 is a disservice to physicians, policymakers, and patients and should be retracted from the biomedical record. This investigation intentionally underdosed both interventions, withheld the identity of the placebo, and attempted to apply these interventions in an inappropriate manner that was unlikely to benefit patients and was nearly ensured to produce negative results which would then be inappropriately generalized in news and other media outlets; as such this publication is a *red herring—a piece of information which is or is intended to be misleading or distracting*.<sup>10</sup> Journal editors and trial authors should consult with legitimate nutrition experts prior to the design and publication of research outside their field of knowledge. ☒

## Citations:

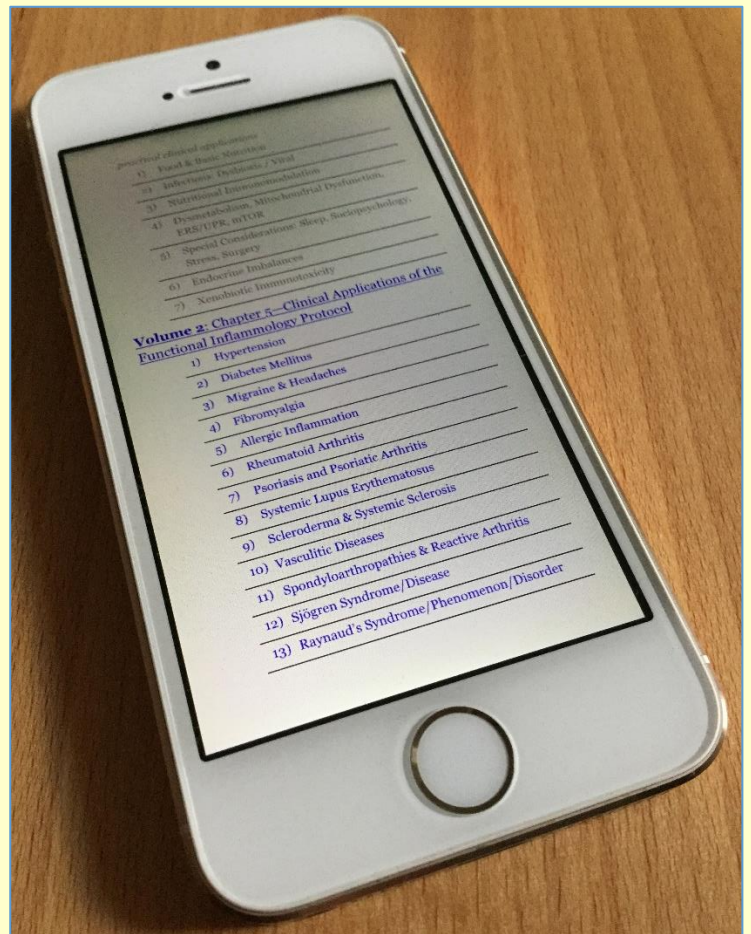
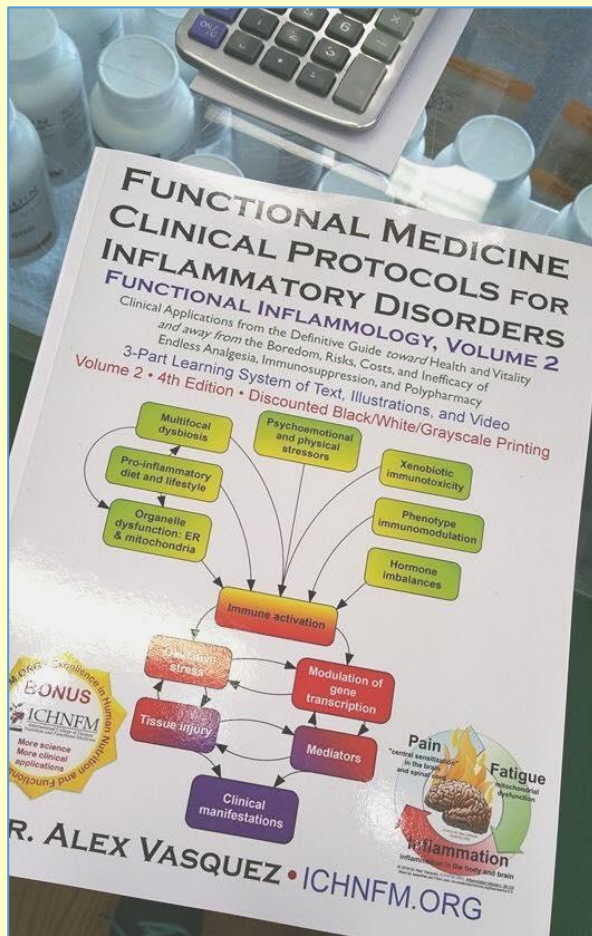
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**About the author and presenter: Alex Kennerly Vasquez DO ND DC (USA), Fellow of the American College of Nutrition (FACN), Overseas Fellow of the Royal Society of Medicine:** An award-winning clinician-scholar and founding Program Director of the world's first fully-accredited university-based graduate program in Human Nutrition and Functional Medicine, Dr Alex Vasquez is recognized internationally for his high intellectual and academic standards and for his expertise spanning and interconnecting many topics in medicine and nutrition. Dr Vasquez holds three doctoral degrees as a graduate of University of Western States (Doctor of Chiropractic, 1996), Bastyr University (Doctor of Naturopathic Medicine, 1999), and University of North Texas Health Science Center, Texas College of Osteopathic Medicine (Doctor of Osteopathic Medicine, 2010). Dr Vasquez has completed hundreds of hours of post-graduate and continuing education in subjects including Obstetrics, Pediatrics, Basic and Advanced Disaster Life Support, Nutrition and Functional Medicine; while in the final year of medical school, Dr Vasquez completed a Pre-Doctoral Research Fellowship in Complementary and Alternative Medicine Research hosted by the US National Institutes of Health (NIH). Dr Vasquez is the author of many textbooks, including Integrative Orthopedics (2004, 2007 2012), Functional Medicine Rheumatology (Third Edition, 2014), Musculoskeletal Pain: Expanded Clinical Strategies (commissioned and published by Institute for Functional Medicine, 2008), Chiropractic and Naturopathic Mastery of Common Clinical Disorders (2009), Integrative Medicine and Functional Medicine for Chronic Hypertension (2011), Brain Inflammation in Migraine and Fibromyalgia (2016), Mitochondrial Nutrition and Endoplasmic Reticulum Stress in Primary Care, 2<sup>nd</sup> Edition (2014), Antiviral Strategies and Immune Nutrition (2014), Mastering mTOR (2015), Autism, Dysbiosis, and the Gut-Brain Axis (2017) and the 1200-page Inflammation Mastery 4<sup>th</sup> Edition (2016) also published as a two-volume set titled Textbook of Clinical Nutrition and Functional Medicine. "DrV" has also written approximately 100 letters and articles for professional magazines and medical journals such as *TheLancet.com*, *British Medical Journal* (BMJ), *Annals of Pharmacotherapy*, *Nutritional Perspectives*, *Journal of Manipulative and Physiological Therapeutics* (JMPT), *Journal of the American Medical Association* (JAMA), *Original Internist*, *Integrative Medicine*, *Holistic Primary Care*, *Alternative Therapies in Health and Medicine*, *Journal of the American Osteopathic Association* (JAOA), *Dynamic Chiropractic*, *Journal of Clinical Endocrinology and Metabolism*, *Current Asthma and Allergy Reports*, *Complementary Therapies in Clinical Practice*, *Nature Reviews Rheumatology*, *Annals of the New York Academy of Sciences*, and *Arthritis & Rheumatism*, the Official Journal of the American College of Rheumatology. Dr Vasquez lectures internationally to healthcare professionals and has a consulting practice and service for doctors and patients. DrV has served as a consultant, product designer, writer and lecturer for Biotics Research Corporation since 2004. Having served on the Review Boards for *Journal of Pain Research*, *Autoimmune Diseases*, *PLOS One*, *Alternative Therapies in Health and Medicine*, *Neuropeptides*, *International Journal of Clinical Medicine*, *Journal of Inflammation Research*, *BMC Complementary and Alternative Medicine* (all PubMed/Medline indexed), *Integrated Blood Pressure Control*, *Journal of Biological Physics and Chemistry*, and *Journal of Naturopathic Medicine* and as the founding Editor of *Naturopathy Digest*, Dr Vasquez is currently the Editor (2013-) of International Journal of Human Nutrition and Functional Medicine and Editor (2018-present) of Journal of Orthomolecular Medicine, published for more than 50 consecutive years by the International Society for Orthomolecular Medicine.



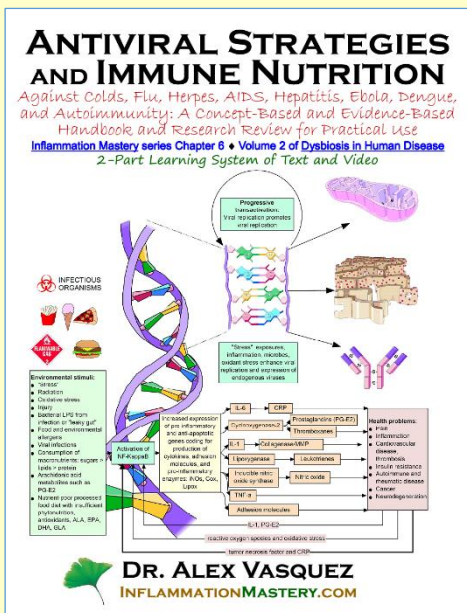
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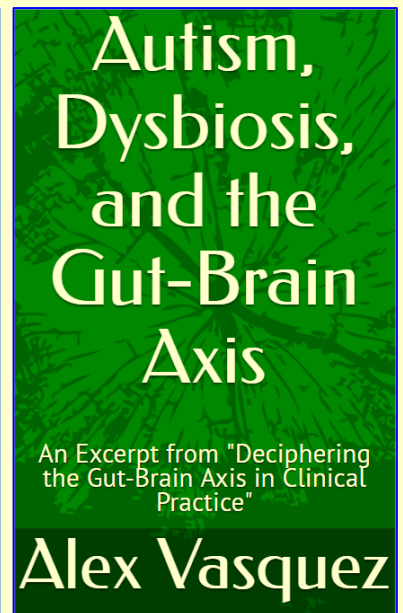
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"The purpose of life is to live it, to taste experience to the utmost, to reach out eagerly and without fear for newer and richer experience."

Eleanor Roosevelt (1884 - 1962)





## 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.<sup>1</sup> 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.<sup>2</sup> 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 gastroenterology<sup>7</sup> training in clinical proclaims itself as including the entire territory of clinical nutrition.<sup>10</sup> A major and serious problem arises when unskilled and invalid research is published by authors (including nonphysician journalists<sup>11</sup>) 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 industry<sup>12</sup> 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 influence public policy and decisions of people. Examples of publications, lists of solutions. dependent upon investigative and results of clinical improvements 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>

review recent examples of questionable or inaccurate 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.



## 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 cases, radical departures from any attempt to present descriptions that could be considered “reasonable” by previous standard.<sup>1</sup> Especially related to the topic of nutrition, mainstream medical journals and the media which parrots their conclusions have begun to present 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 education in clinical nutrition in their graduate school or in their post-graduate residency training<sup>2</sup>, 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 then 3) main-

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.”<sup>3</sup> The easiest way to manipulate people and to keep them in a perpetual state of confusion, ineffectiveness, and dependency is to

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- **VIDEO:** Bad Science in Medical Nutrition: Politics of Fish Oil <https://vimeo.com/314997927>

when pondering the probable future of intellectual integrity and the products of education.





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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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- **See original video here:** <https://vimeo.com/318326979>



# 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); by this time, contemporary clinicians should be developing an awareness of the other roles that mitochondria play in (patho)physiology and clinical practice. Beyond being simple organelles that make ATP, mitochondria

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 convoluted/invaginated membrane that envelopes and defines the matrix and which is the structural home of many enzymes, transport systems, and important structures such as cardiolipin and the electron

play clinical inflammatory disease such disorders stated during Nutrition at September mitochondria

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## 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 more diligently as I entered graduate school in the early 1990s. I read the "book that I read" *Your Nerves* (1975) by this was followed immediately by the book *Structures of Jonathan V Wright* of whom would later be a professor at the University of California, San Diego. By the mid-1990s, Jeffrey Bland PhD had introduced me to orthomolecular medicine, which I practiced for personal<sup>3</sup> reasons. By this time my own personal library contained several hundred books, mostly dedicated to 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 for<sup>4</sup> and published in<sup>5</sup> 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 insights and social contributions; we can reasonably assume that competent healthcare (and nutrition) are basic human rights. I will admit a counterargument to my assertions, they are more to the point, my assertions are regardless of personal position, we share some common ground. The following:

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• We each want to receive and deliver the best healthcare possible: If we have a problem, 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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# 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

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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 that are predisposed to vitamin D hypersensitivity
3. Know how to implement proper doses and with

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.<sup>1,2</sup> With the discovery of vitamin D receptors in tissues other than the gut and bone—especially the brain, breast, prostate, and lymphocytes—and the recent research suggesting

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