

## Integrative and Functional Medical Nutrition Therapy

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*Editors*

# **Integrative and Functional Medical Nutrition Therapy**

Principles and Practices

*Editors*

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ISBN 978-3-030-30729-5      ISBN 978-3-030-30730-1 (eBook)  
<https://doi.org/10.1007/978-3-030-30730-1>

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This Humana imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

I wish to dedicate this book to the enlightened mentors in the field of integrative and functional medicine with whom I have had the honour to interact: Doctors Jeff Bland, Jeanne Drisko, Sam Queen, Roger Newton, Sidney MacDonald-Baker, Douglas Hunt and Robert P Heaney. Through their gifts of knowledge, they have provided the foundation for the powerful impact nutrition is experiencing in influencing human health. This textbook is a tribute to their genius.

–Diana Noland

This textbook is dedicated to all the integrative practitioners who taught me how to care for patients as people, those practitioners who are living and those who have slipped away and especially my students who taught me to keep up and stay on my toes. But most of all, what is important for practitioners who are finding their way, “Listen with your heart”.

–Jeanne A. Drisko

This book is dedicated to my family, friends and close colleagues who’ve provided unconditional love and support throughout this and all my work; it is for my teachers, professors and students who’ve been my patient and unwavering mentors. Finally, this is for my patients and clients who have taught me more than I imagined possible about what it means to be a healthcare provider.

–Leigh Wagner

## Foreword

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The incidence of almost every chronic disease has increased relentlessly in every age group for the past 50 years. Diabetes which was once rare (<0.7% of the population) is now projected to affect 35% of the people in their lifetime. For the first time in American history, life expectancy has gone down several years in a row. Healthcare costs (or, more accurately, disease treatment costs) are now 20% of the GDP, increasing inevitably and bankrupting the country. Why is the healthcare system—which obviously has several areas of great success—failing dramatically everywhere else?

Because the common causes of disease are not being addressed.

Conventional medicine has been incredibly effective in many areas, such as injuries, overwhelming infections, congenital malformations and some cancers. However, this model does not work for everyday health and disease prevention. Unfortunately, the burden of chronic disease has become so widespread and severe that most medical treatment is now primarily for symptom control and prevention of even worse sequelae. Very little of medicine as actually practiced today addresses the real reasons why people are suffering such a huge and progressively increasing disease burden.

What are those unaddressed causes? To quote an inspirational functional medicine expert Sid Baker, MD: “Most of medicine is quite simple, get into people what they uniquely need and get out what they uniquely do not need”. In other words, nutrition and detoxification—*according to patient’s unique biochemical needs*.

Nutritional deficiencies are rampant in the population and are getting worse. Not only is the general public choosing food with lower nutrient density but also hybridization and synthetic fertilizers have decreased the trace nutrient content of the food. Almost the entire population is deficient in at least one nutrient and over half has multiple nutritional deficiencies according to conventional standards. But even worse, the environment has become increasingly contaminated by toxic metals and chemicals that displace nutrients, poison enzymes, damage DNA, disrupt cellular communications, increase inflammation and dramatically increase oxidative stress in all systems of the body.

With the genomics revolution, we now know that there is a huge variation between nutritional needs and toxin susceptibility. For example, some people’s single nucleotide polymorphisms (SNPs) result in the lower functioning of their vitamin D receptor sites and need ten times the recommended daily allowance (RDA) of vitamin D to maintain their bones. Another example is the huge 1000-fold variation in the activity of liver Phase I detoxifying enzyme CYP2D6. This enzyme detoxifies 25% of prescription drugs and a number of environmental toxins. Those with a poorly functioning version of this detoxification enzyme are not only much more likely to have an adverse drug reaction to the standard dose of a prescription but also more likely to suffer a number of diseases, such as Parkinson’s disease, if they are exposed to neurotoxins. With over 2 million SNPs, there are a huge number of examples of SNP variants requiring specialized attention.

This is why *Integrative and Functional Medicine Nutrition Therapy: Principles and Practices* is such an important textbook. Every clinician who wants to care for their patients in a curative way must recognize and understand the clinical presentations of *functional* nutritional deficiencies and toxin overload. Relying on blood (or other tissue) levels of nutrients or environmental toxins is an ineffective diagnostic strategy for many reasons. For example, measuring blood levels of B-vitamins is very misleading. Using the conventional range standards, only a small percentage of the public is deficient. But measuring levels of toxic metabolites, such as homocysteine and methylmalonic acid, which build up when a person has a functional deficiency of B-vitamins, elevated levels indicate increased risk of tissue damage. This means increased risk for heart disease, Alzheimer’s disease, osteoporosis and other chronic degenerative diseases.

We see the same pattern with environmental toxins. For example, the “safe” levels of most toxins are established according to population norms. But the “normal” population suffers a huge disease burden! And as mentioned above, using absolute levels of toxin misses the huge variation in detoxification function found in the general population. Some people can smoke their entire life without apparent problems while a non-smoking spouse

gets lung cancer. There are numerous examples of common chronic diseases being primarily caused by the combination of nutritional deficiencies and toxin load in the context of biochemical susceptibility. Drugs do not reverse deficient nutrients or help increase toxin excretion. In fact, almost all drugs are yet another load on the already overloaded detoxification systems.

The only effective clinical strategy is that which thoughtfully *integrates* multiple diverse interventions that not only address the actual causes of disease but also utilizes safe therapies that optimize each person's unique physiological function.

This is the premise and promise of IFMNT.

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# Preface

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Over the past 50–60 years, the world has seen an unparalleled and unprecedented growth in non-communicable (chronic) disease. Chronic disease has replaced acute infectious disease and trauma as the dominant influence on healthcare delivery. Our current healthcare model is no longer sustainable, i.e. the captain of the ship making a brilliant diagnosis and delivering the silver bullet cure or surgically repairing the problem. No silver bullet exists that satisfactorily addresses the chronic, complex disorders that currently clog our healthcare systems. The health of our nation and world has changed rapidly while healthcare delivery has remained stagnant. But change, it must!

This urgently needed change does not appear to be coming from within large healthcare systems. However, healthcare consumers, especially those with chronic and life-threatening disorders, are demanding a different delivery of care. As one patient with chronic disease relayed, her primary care physician told her that she had so many problems he wouldn't be in practice long enough to solve them all. This is a message devoid of hope and care. In this setting, “care” is a misnomer as it has been stripped from healthcare by the abbreviated allotted visit times, and with practitioners no longer allowed to interact with those entrusted to their charge and prevented from knowing their patients as people.

The unifying theme of this textbook is the understanding of the nutritional status of patients. Without a strong nutritional foundation, healing of chronic disease is impossible. Unlike conventional medical care that narrowly defines nutrition, dismisses its importance and marginalizes its delivery, we propose that nutrition become a fundamental part of healthcare providers' broad scope. Without this foundation, our ability to successfully deliver care is limited. You will find within these pages authors with all types of backgrounds who have found success using integrative and functional medicine nutrition therapies when faced with chronic health conditions.

We wrote this textbook to help practitioners, health system leaders and policy makers to understand that there is a different and novel approach to address complex chronic disorders. Human physiology has not changed. What has changed are those factors acting on human physiology in the form of poor nutrition, environmental toxicant

exposures, fractured human interactions, infrequent physical movement, stress, poor sleep and other lifestyle problems.

As editors with a collective 65 years of practice in integrative and functional medicine nutrition therapies, we have witnessed (and practiced) a new healthcare delivery system that incorporates important advances of conventional medical care that, combined with the original roots of healthcare, returns the patient back to the centre of the process. Partnering with patients fosters better understanding of the chronic disorders that plague them. We have witnessed how teams of practitioners with diverse healthcare backgrounds work together to find solutions to our looming healthcare crisis.

Although our backgrounds are in integrative and functional medicine, the model we present transcends and defies all labels and simply should be called “good medicine”. In this textbook, we provide principles to illuminate understanding of how healthcare can be delivered to get to the root of chronic disorders. After the principles are laid out, the practice of “good healthcare” is described in detail. The reader will see that there is again hope for finding satisfaction in healthcare careers when burnout rates are soaring.

Within, you will find the underlying principles and practices laid out that give you, the reader, an understanding of the science of integrative and functional medicine nutrition therapies with real-world examples. The authors were selected because of their notable experience in integrative and functional medical nutrition therapies. This textbook will augment your journey back to the heart and soul of the practice of good healthcare.

The 10-year journey to writing *Integrative and Functional Medicine Nutrition Therapy: Principles and Practices* was the brainchild of editor Diana Noland. Diana collaborated with colleagues Jeanne Drisko and Leigh Wagner to successfully launch a master-level certificate program in integrative nutrition at the University of Kansas Health System in conjunction with the Department of Dietetics and Nutrition and the University of Kansas Integrative Medicine. We crafted materials to be used in the education of dietetic students but also used the materials in training all practitioners and students under our guidance. Their care for patients has

thrived with this underpinning. The development of this textbook provides a roadmap for care.

The editors and authors of this textbook have written this book in the hope that the knowledge it provides will help to achieve the day when all medical healthcare practices appreciate and include nutrition and lifestyle assessment and intervention for each unique individual.

We are thankful that this journey was guided by Coco and Roger Newton, who shared our vision for Integrative and Functional Medicine Nutrition Therapy: Principles and Practices. We also acknowledge our families who, for the past 3 years, have stood by us, supported our efforts and nurtured us while we wrote and edited, even during nights, weekends and family vacations. Special thanks to our spouses, Steve Noland, Robert Drisko II and Rob Bauer, who gave us insights and advice along this journey.

Many thanks to our faithful and accomplished copy editors, Matt Erickson and Jeffrey Field, who polished every chapter over the 2-year project.

Thanks to Michael D. Sova, our Springer developmental editor, who conducted the conversion from a vision to a reality. He brought together the work of individual authors to a cohesive collection of contributions toward providing the science and the practical aspects of integrative and functional medical nutrition therapy. Michael guided us in the preparation for a finished product and became an integral member of our team.

And finally, we would like to thank our friend, Dr. Joe Pizzorno, for writing the Foreword of the textbook as he joins us to express his common vision of the importance of nutrition therapy in the quest to quell the epidemics of chronic diseases in the twenty-first century.

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## Abbreviations

<b>5-HIAA</b>	5-Hydroxyindoleacetic acid	<b>DHF</b>	Dihydrofolate
<b>5-MTHF</b>	5-Methylenetetrahydrofolate	<b>DHFR</b>	Dihydrofolate reductase
<b>5-OH-TRP</b>	5-Hydroxytryptophan	<b>DHGL/DGLA</b>	Dihomo-gamma-linolenic acid
		<b>DMG</b>	Dimethylglycine
<b>A1AT</b>	Alpha-1 antitrypsin	<b>DMT2</b>	Diabetes mellitus type 2
<b>AA</b>	Arachidonic acid	<b>DXA/DEXA</b>	Dual-energy X-ray absorptiometry
<b>AADC</b>	Aromatic L-amino acid decarboxylase		
<b>ABPM</b>	Allergic bronchopulmonary mycosis	<b>ECW</b>	Extracellular water
<b>ACD</b>	Anemia of chronic disease	<b>ED</b>	Erectile dysfunction
<b>ACE</b>	American Council on Exercise	<b>EEI</b>	Equilibrium Energy Intake
<b>ACSM</b>	American College of Sports Medicine	<b>EFA</b>	Essential Fatty Acids
<b>AERD</b>	Aspirin-exacerbated respiratory disease	<b>eNCPT</b>	Electronic Nutrition Care Process Terminology
<b>ALA</b>	Alpha-lipoic acid	<b>eNOS</b>	Endothelial nitric oxide synthase
<b>ALA</b>	$\alpha$ -linolenic acid	<b>EPA</b>	Eicosapentaenoic acid
<b>ALS</b>	Amyotrophic lateral sclerosis	<b>ET</b>	Exercise training
<b>AMDR</b>	Approximate Macronutrient Distribution Ranges		
<b>ARDS</b>	Acute/Adult Respiratory Distress Syndrome	<b>FAD</b>	Flavin Adenine Dinucleotide
<b>ATP</b>	Adenosine triphosphate	<b>FDA</b>	US Food and Drug Administration
		<b>FeNO</b>	Exhaled fractional nitric oxide
<b>BCM</b>	Body cell mass	<b>FEV</b>	Forced expiratory volume
<b>BCMO1</b>	$\beta$ -carotene 15,15'-monooxygenase	<b>FIGLU</b>	Formiminoglutamate
<b>BCNH</b>	Bastyr Center for Natural Health	<b>FIP</b>	Familial interstitial pneumonia
<b>BH4</b>	Tetrahydrobiopterin	<b>FPF</b>	Familial pulmonary fibrosis
<b>BHMT</b>	Betaine homocysteine methyltransferase	<b>FUT2</b>	Fucosyltransferase 2
<b>BIA</b>	Bioelectrical impedance analysis		
<b>BIS</b>	Bioimpedance spectroscopy	<b>GBS</b>	Guillain Barre syndrome
<b>BMI</b>	Body mass index (body weight (kg)/height (m) <sup>2</sup> )	<b>GERD</b>	Gastroesophageal reflux disease
<b>BMR</b>	Basal metabolic rate	<b>GFN</b>	Geometric Framework for Nutrition
<b>BRCA1</b>	Breast cancer type 1 susceptibility protein	<b>GGT</b>	<i>Gamma-glutamyl transpeptidase</i>
<b>BRCA2</b>	Breast cancer type 2 susceptibility protein	<b>GLA</b>	Gamma-linolenic acid
		<b>GMP</b>	Guanosine monophosphate
<b>C</b>	Capacitance	<b>GPx</b>	<i>Glutathione peroxidase</i>
<b>CBS</b>	Cystathione beta synthase	<b>GSH</b>	Reduced glutathione
<b>CF</b>	Cystic fibrosis	<b>GSSG</b>	Oxidized glutathione
<b>CGL</b>	Cystathionine gamma-lyase	<b>GTP</b>	Guanosine triphosphate
<b>cGMP</b>	Cyclic guanosine monophosphate		
<b>CH3</b>	Methyl group	<b>HAP</b>	Hospital-acquired pneumonia
<b>CHD</b>	Coronary heart disease	<b>HDL</b>	High-density lipoprotein
<b>CLA</b>	Conjugated linoleic acid	<b>henceforth NPE</b>	Non-protein energy
<b>CLIA</b>	Clinical Laboratory Improvement Amendments	<b>HFE</b>	Hemochromatosis gene
<b>COMT</b>	Catechol-O-Methyltransferase	<b>HGBA<sub>1C</sub></b>	Hemoglobin A <sub>1c</sub>
<b>COOH</b>	Carboxyl group	<b>HIIT</b>	High-intensity interval training
<b>COPD</b>	Chronic obstructive pulmonary disease	<b>HTN</b>	Hypertension
<b>CT</b>	Computed tomography	<b>HVA</b>	Homovanillate
<b>CTH</b>	Cystathionine gamma-lyase		
<b>CVD</b>	Cardiovascular disease	<b>ICW</b>	Intracellular water
		<b>IFMNT</b>	Integrative and Functional Medical Nutrition Therapy
<b>DASH</b>	Dietary Approaches to Stop Hypertension	<b>IFN</b>	Integrative and functional nutrition
<b>DHA</b>	Docosahexaenoic acid	<b>ILD</b>	Interstitial lung disease

<b>IP3</b>	Inositol triphosphate	<b>P</b>	Protein
<b>IPF</b>	Idiopathic pulmonary fibrosis	<b>P5P</b>	Pyridoxal-5-phosphate
<b>IR</b>	Insulin resistance	<b>PA</b>	Phase angle
<b>IRDS</b>	Infant Respiratory Distress Syndrome	<b>PAH</b>	Phenylalanine hydroxylase
<b>ISMET</b>	Integrated standing, movement, and exercise training	<b>PAH</b>	Pulmonary arterial hypertension
		<b>PDE5</b>	Phosphodiesterase type 5
		<b>PDXK</b>	Pyridoxal kinase
<b>LA</b>	Linoleic acid	<b>PES statement</b>	Problem-etiology-signs and symptoms
<b>LC</b>	Lung cancer	<b>PG</b>	Prostaglandins
<b>LDL</b>	Low-density lipoprotein	<b>PGE</b>	Prostaglandin E <sub>2</sub>
<b>LT</b>	Leukotrienes	<b>PGG</b>	Prostaglandin G <sub>2</sub>
<b>LTB</b>	Leukotriene B <sub>4</sub> (LTB <sub>4</sub> )	<b>PGH</b>	Prostaglandin H <sub>2</sub>
<b>LTD</b>	Leukotriene D <sub>4</sub> (LTD <sub>4</sub> )	<b>PLH</b>	Protein leverage hypothesis
<b>LTE</b>	Leukotriene E <sub>4</sub> (LTE <sub>4</sub> )	<b>PN</b>	Parenteral nutrition
		<b>PNMT</b>	Phenylethanolamine N-methyltransferase
<b>MAO-A</b>	Monoamine Oxidase A	<b>PUFA</b>	Polyunsaturated fatty acids
<b>MAO-B</b>	Monoamine oxidase-B		
<b>MCT</b>	Medium-chain triglycerides	<b>RA</b>	Rheumatoid arthritis
<b>MetSyn</b>	Metabolic syndrome	<b>RBC</b>	Red blood cell
<b>MMA</b>	Methylmalonic acid	<b>RMT</b>	Right-angled mixture triangle
<b>MNT</b>	Medical nutrition therapy		
<b>MRI</b>	Magnetic resonance imaging	<b>SAH</b>	S-Adenosylhomocysteine
<b>MSQ</b>	Medical symptoms questionnaire	<b>SAM</b>	S-Adenosylmethionine
<b>MTHFR</b>	Methylenetetrahydrofolate reductase	<b>SCFA</b>	Short-chain fatty acids
		<b>SCLC</b>	Small-cell lung cancer
<b>MTR</b>	Methionine synthase	<b>SIT</b>	Sprint intensity training
<b>MTRR</b>	Methionine synthase reductase	<b>SMA</b>	α-smooth muscle actin
<b>MUFA</b>	Monounsaturated fatty acids	<b>SMART goal</b>	Specific, measurable, accountable, reachable/realistic, and timely
<b>NAC</b>	N-acetyl cysteine	<b>SNP</b>	Single-nucleotide polymorphism
<b>NADPH, NADP+, iNOS</b>	Inducible nitric oxide synthase	<b>SOD</b>	Superoxide dismutase
<b>NAFLD</b>	Nonalcoholic fatty liver disease	<b>sTFR</b>	Soluble transferrin receptor
<b>NASH</b>	Nonalcoholic steatohepatitis	<b>SUOX</b>	Sulfite oxidase
<b>NCP</b>	Nutrition Care Process		
<b>NIBLETS</b>	Nutrition, inflammation, biochemical individuality, lifestyle, energy and metabolism, toxic load, and stress	<b>TBW</b>	Total body water
		<b>TETR</b>	Therapeutic ET for Rehabilitation
<b>NIH</b>	National Institute of Health	<b>TG</b>	Triglycerides
<b>nNOS</b>	Nitric oxide synthase 1	<b>TH</b>	Tyrosine hydroxylase
<b>NO</b>	Nitric oxide	<b>THF</b>	Tetrahydrofolate
<b>NOS</b>	Nitric oxide synthase	<b>TIBC</b>	Total iron binding capacity
<b>NOS1</b>	Nitric oxide synthase 1	<b>TPH</b>	Tryptophan hydroxylase
<b>NOS2</b>	Nitric oxide synthase 2	<b>TX</b>	Thromboxanes
<b>NOS3</b>	Nitric oxide synthase 3	<b>TXA</b>	Thromboxane A
<b>NPE</b>	Nutrition physical exam		
<b>NSAID</b>	Nonsteroidal anti-inflammatory drugs	<b>VAP</b>	Ventilator-associated pneumonia
<b>NSCLC</b>	Non-small-cell lung cancer		
		<b>W<sub>3</sub></b>	Omega-3
		<b>W<sub>6</sub></b>	Omega-6
		<b>WHR</b>	Waist-to-hip ratio