

Therapeutic Role of Food as Medicine in Naturopathy: A Comprehensive Review

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Abstract: Background: Food has been used widely in parts of the world as a healing modality in naturopathic practice for more than a century. A core naturopathic principle is explained by the fact that our food choices influence our health and capacity to recover from diseases or conditions. Recent scientific research in nutrition, plant-based bioactive compounds, and the human physiology department has provided increasing evidence to support the therapeutic value of food in maintaining good health and reducing the risk of diseases.

Objective: The aim of this review is to synthesize the current evidence on the therapeutic use of foods in naturopathic practice, including the mechanisms of the action of the key dietary bioactive compounds, their role in chronic disease management, and their integration within contemporary integrative medicine frameworks.

Methods: A narrative literature review was conducted using the peer-reviewed articles from the PubMed, Scopus, and CINAHL databases (2000-2024). Studies that explore the dietary interventions in the field of naturopathic medicine, phytochemical mechanisms, gut microbiome modulation, and chronic disease outcomes were included in this study.

Results: There's evidence that the anti-inflammatory foods, fermented foods, adaptogenic herbs, and diets that are high in phytonutrients can be therapeutically effective for many chronic conditions like type 2 diabetes, cardiovascular disease, inflammatory bowel disease, autoimmune disorders, and neuropsychiatric conditions. Major mechanisms that are included are the modulation of the gut-brain-immune axis, epigenetic regulation, reduction of oxidative stress, and optimization of the microbiome.

Conclusion: The approach of the title food-as-medicine is scientifically-based, patient-centered, and cost-effective. Its inclusion in mainstream health care as part of integrative medicine holds great promise for the prevention and management of various chronic diseases. Nutrigenomic principles will be the next frontier of personalized nutrition.

Keywords: naturopathy; food as medicine; phytochemicals; gut microbiome; integrative medicine; chronic disease; anti-inflammatory diet; nutrigenomics.

1. INTRODUCTION

The notion that the diet is a fundamental factor in health is as old as medicine. Hippocrates, the father of Western medicine, prescribed food as the primary therapeutic method, a philosophy that naturopathic medicine has maintained and developed for two millennia. However, a paradigm shift is occurring in the contemporary healthcare system with the enhancement of the global burden of the non-communicable diseases (NCDs) and growing disenchantment with the various pharmacological approaches alone, food-based interventions are experiencing an extraordinary scientific and clinical renaissance.

Naturopathy is a health care system that uses a variety of natural treatment modalities to stimulate the body's inherent healing powers to heal on its own. Nutritional medicine is considered to be the therapeutic core of naturopathy. Naturopathic philosophy is based on the six principles: *Vis Medicatrix Naturae* (use the healing power of nature), *Tolle Causam* (identify and treat the cause), *Primum Non Nocere* (first, do no harm), *Docere* (the doctor as teacher), *Tolle Totum* (treat the whole person), and *Prevenir* (prevention is the best cure). Food is a multidimensional biochemical intervention that conveniently satisfies all of these principles at once.

Many of the dietary principles advocated by naturopathy have been strongly supported by recent advances in nutritional science. Large-scale studies such as the PREDIMED trial, the Nurses' Health Study, and the EPIC cohort have consistently shown that the diets that are rich in whole, minimally processed foods are associated with reduced risk of developing chronic diseases (1,2). Meanwhile, the emergence of new disciplines such as nutrigenomics, microbiome research, and systems biology has enabled scientists to better understand the molecular level at which food affects an individual's health. The results of these studies suggest that the components of the diet can affect mainly the activity of genes, controlling immune responses, and contributing to maintaining the metabolic balance within the body itself.

This review discusses the therapeutic role of food in naturopathic medicine and its importance in health promotion and in disease management. It describes the major groups of the bioactive food components, their known mechanisms of action, and the evidence-based practical use in the management of common chronic diseases. Additionally, this review covers the emerging concepts, such as the gut-brain-immune axis and personalized nutrition, that are broadening our understanding of how food can be used as a therapeutic tool and shaping the future of the food-as-medicine approach in modern healthcare.

2. PHILOSOPHICAL AND HISTORICAL FOUNDATIONS

Ancient Origins

The therapeutic use of food goes back before the days of recorded medical history. In ancient Egypt, physicians often prescribed certain kinds of foods to cure diseases of the internal organs. In Traditional Chinese Medicine (TCM), foods were classified by their energetic properties—warming, cooling, tonifying, or purging—and foods were prescribed based on constitutional imbalances. Ayurvedic medicine also divides foods by their effect on the three doshas based on the tridosha principle (Vata, Pitta, Kapha), recognizing that the perfect nourishment was always unique to the individual.

The Western tradition Hippocrates (460–370 BCE) described the healing effects of certain foods, including the use of vinegar and honey in respiratory diseases, and advocated dietary change as the primary treatment for most of the diseases. Galen later systematized these principles, which persisted in medieval Islamic medicine, especially in the writings of Ibn Sina (Avicenna), whose Canon of Medicine contained long sections on the medicinal properties of foods and spices.

Naturopathic Medicine and the Food-as-Medicine Paradigm

Modern naturopathic medicine was formalized in the late 19th century in Germany and North America, combining these ancient traditions with emerging scientific nutrition. Benedict Lust, known as the father of American naturopathy, said that the basic therapies were whole foods, fasting, and the elimination of dietary toxins. The Bircher-Benner clinic in Zurich, founded in 1897, was the first to apply clinical nutrition therapy based on raw food and attracted international attention among people and scientific interest.

Naturopathic physicians are trained extensively in the field of nutritional medicine in accredited programs today, and dietary counseling is the most common naturopathic intervention. This increase in the incorporation of the naturopathic principles into conventional practice, that is evident in the rise of an integrative medicine, a model that integrates evidence-based conventional and complementary therapies, at the world's leading academic medical centers.

3. THERAPEUTIC FOOD CATEGORIES AND MECHANISMS OF ACTION

Anti-inflammatory Foods

It is widely accepted that the pathophysiological basis of most non-communicable diseases (NCDs), such as cardiovascular disease, type 2 diabetes, obesity, neurodegenerative diseases, and cancer, is always characterized by a chronic low-grade inflammation (3). Naturopathic dietary strategies, therefore, focus on foods with documented anti-inflammatory activity.

Curcumin is one of the major bioactive components of turmeric (*Curcuma longa*), and it inhibits the nuclear factor-kappa B (NF- κ B) signaling, which suppresses the pro-inflammatory cytokines such as TNF- α and IL-6, and modulates cyclooxygenase-2 (COX-2) activity. Clinical trials have shown efficacy for rheumatoid arthritis, inflammatory bowel disease, and metabolic syndrome (4). Ginger (*Zingiber officinale*) gingerols and shogaols also inhibit prostaglandin synthesis and have comparable potency for non-steroidal anti-inflammatory drugs (NSAIDs) in some settings.

Omega-3 polyunsaturated fatty acids (PUFAs), especially eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) from the fatty fish, flaxseed, and walnuts, are converted into the specialized pro-resolving mediators (SPMs)—resolvins, protectins, and maresins—that actively resolve the inflammatory processes rather than simply suppressing them (5). This distinction has greater clinical importance, since many chronic inflammatory diseases are characterized by a failure of resolution rather than an overexuberance of initiation.

Gut-Healing and Probiotic Foods

The gastrointestinal tract, which contains approximately about 38 trillion microbial organisms that together comprise the gut microbiome, is increasingly recognized as a key regulator of systemic health (6). Naturopathic medicine has traditionally and widely placed importance on gut health through dietary intervention, and recent microbiome research has provided a strong mechanistic support for this approach.

Fermented foods, such as yogurt, kefir, kimchi, sauerkraut, miso, and kombucha, all provide viable probiotic organisms that regulate the microbiome composition and diversity. In a landmark randomized controlled trial, Wastyk et al. (2021) determined that a diet rich in fermented food items has significantly enhanced the microbiome diversity and reduced the inflammatory markers, including 4 types of immune proteins, over a period of ten weeks(7). Prebiotic foods such as oats, garlic, onions, Jerusalem artichokes, and chicory root contain non-digestible oligosaccharides that preferentially promote the growth of the beneficial microorganisms, particularly the *Bifidobacterium* and *Lactobacillus* species.

Bone broth, a traditional naturopathic remedy, that supplies the collagen-derived amino acids such as glycine, proline, and hydroxyproline, along with glutamine, the main fuel for enterocytes that supports the intestinal barrier integrity. Increased intestinal permeability, colloquially referred to as ‘leaky gut’, has been implicated in various conditions ranging from autoimmune disorders to psychiatric illness, and dietary strategies to restore barrier function represent an active area of clinical research (8).

Adaptogenic and Immunomodulatory Foods

Adaptogens are substances that increase the nonspecific resistance to stress, while normalizing various physiological functions. Many culinary foods are classically associated with the adaptogenic herbs such as *Withania somnifera* (ashwagandha), *Rhodiola rosea*, and *Panax ginseng*, which have adaptogenic properties through the modulation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathoadrenal responses.

Medicinal mushrooms such as *Ganoderma lucidum* (reishi), *Lentinula edodes* (shiitake), and *Grifola frondosa* (maitake) contain beta-glucans and triterpenoids, which have been shown to possess immunomodulatory, anti-tumor, and adaptogenic effects or properties. Beta-glucans that can activate the innate immune cells (macrophages, dendritic cells, and natural killer (NK) cells) through the Dectin-1 and complement receptor 3 (CR3) receptors (9). Garlic (*Allium sativum*) contains allicin and alliin, which enhance innate and adaptive immunity and show strong antimicrobial and cardiovascular protective activities.

Detoxifying and Hepatoprotective Foods

Naturopathic medicine always emphasizes the importance of supporting the endogenous detoxification pathways, especially hepatic phase I and phase II biotransformation. Cruciferous vegetables (*Brassica* species) such as broccoli, cauliflower, Brussels sprouts, kale, and cabbage are especially valued for their higher concentrations of glucosinolates, which are enzymatically converted to the isothiocyanates, including sulforaphane and indole-3-carbinol, upon cellular disruption.

Sulforaphane activates the Nrf2 (nuclear factor erythroid 2-related factor 2) and induces phase II detoxification enzymes, upregulating glutathione S-transferases, NAD(P)H quinone oxidoreductase, and UDP-glucuronosyltransferases, enzymes that conjugate and eliminate environmental toxins, carcinogens, and reactive metabolites (10). Epidemiological evidence has consistently shown that eating cruciferous vegetables is inversely associated with the risk of cancers, notably colorectal, lung, prostate, and breast cancers.

Beets (*Beta vulgaris*) support the hepatic lipid metabolism and increase the bile flow through betaine (trimethylglycine) and betalain pigments. Chlorella is a freshwater microalgae used in clinical naturopathy for heavy metal chelation with cilantro (*Coriandrum sativum*). There is limited strong clinical evidence for this and this requires further investigation.

Evidence-Based Applications in Chronic Disease Management

Table 1 summarizes evidence-based naturopathic dietary interventions in the context of prevalent chronic diseases with identification of the key bioactive compounds responsible for the therapeutic effects.

Table 1. Naturopathic Dietary Interventions in Chronic Disease Management.

Condition	Naturopathic Dietary Intervention	Key Bioactive Compounds
Type 2 Diabetes Mellitus	Low glycemic index diet, bitter melon, fenugreek, cinnamon	Polyphenols, vicine, trigonelline, cinnamaldehyde
Cardiovascular Disease	Mediterranean diet, omega-3 fatty acids, garlic, flaxseed	EPA/DHA, allicin, lignans, oleocanthal
Inflammatory Bowel Disease	Elimination diet, probiotic-rich foods, bone broth	Glutamine, collagen, <i>Lactobacillus</i> spp., short-chain fatty acids
Cancer (Supportive Care)	Cruciferous vegetables, antioxidant-rich diet, caloric restriction	Sulforaphane, indole-3-carbinol, lycopene, resveratrol
Autoimmune Disorders	Anti-inflammatory diet, gluten-free protocol, omega-3 enrichment	Curcumin, quercetin, EPA/DHA, polyphenols
Depression & Anxiety	Gut-brain axis support, tryptophan-rich foods, magnesium	Serotonin precursors, magnesium, B vitamins, omega-3s
Thyroid Disorders	Selenium-rich foods, iodine balance, goitrogen management	Selenium, iodine, zinc, tyrosine
Metabolic Syndrome	Whole food plant-based diet, intermittent fasting	Dietary fiber, polyphenols, short-chain fatty acids

Note: EPA = Eicosapentaenoic acid; DHA = Docosahexaenoic acid

Type 2 Diabetes Mellitus

Dietary intervention is the cornerstone of the naturopathic treatment of type 2 diabetes mellitus (T2DM). Dietary patterns with the low glycemic index (GI) have been shown to decrease the postprandial glucose excursions, improve insulin sensitivity, and decrease HbA1c levels. A meta-analysis of 27 randomised controlled trials reported a 0.5% reduction in HbA1c with a low GI diet relative to control diets, a magnitude similar to that of the first-line pharmacotherapy (11).

Some antidiabetic foods include bitter melon (*Momordica charantia*), which has active compounds charantin, polypeptide-p, and vicine with insulin-like action and upregulates glucose transporters; fenugreek (*Trigonella foenum-graecum*), which has soluble fiber and trigonelline that delay glucose absorption and improve insulin secretion; and cinnamon (*Cinnamomum verum*), which has polyphenolic polymers that enhance the insulin receptor sensitivity and the GLUT4 translocation.

Cardiovascular Disease

The Mediterranean diet is the most studied pattern of diet for cardiovascular protection and is empirically consistent with the principles of naturopathy. The landmark PREDIMED study (n=7,447) showed that a 30% reduction in major cardiovascular events in high-risk individuals randomized to a Mediterranean diet supplemented with either extra-virgin olive oil or mixed nuts versus a low-fat control diet (Estruch et al., 2013). Oleocanthal, a phenolic compound unique to extra-virgin olive oil, inhibits both COX-1 and COX-2, as ibuprofen does.

Garlic supplementation has been associated with an average reduction of the systolic blood pressure of 8-9 mmHg and diastolic blood pressure of 6-7 mmHg in the hypertensive patients, effects that are mediated by allicin-mediated hydrogen sulfide production and the upregulation of endothelial nitric oxide synthase (12). Omega-3 fatty acids, sources from the fatty fish and the flaxseed, lower the triglycerides, improve endothelial function, reduce platelet aggregation, and have antiarrhythmic properties by multiple complementary mechanisms.

Neuropsychiatric Conditions and the Gut-Brain Axis

The emerging field of nutritional psychiatry provides promising evidence that diet influences mental health outcomes. Dietary patterns and the microbiome composition exert a tremendous influence on the gut-brain axis, the bidirectional communication network between the enteric nervous system, vagus nerve, hypothalamic-pituitary-adrenal axis, and immune system (13).

Prospective cohort studies indicate that adherence to Mediterranean and other similar whole-food dietary patterns is bounded to 25-35% reduced odds of depression (14). The SMILES randomized controlled trial (15) showed that the dietary intervention significantly reduced the depressive symptoms in a clinically depressed population, with the 32% of people in the dietary therapy group often achieving remission, versus 8% of the social support control group.

Tryptophan-rich foods (turkey, eggs, pumpkin seeds, fermented foods) help in the serotonin biosynthesis via the kynurenine pathway. Dark leafy greens, legumes, nuts, and seeds are rich in magnesium, which is a natural NMDA receptor antagonist with antidepressant properties. Omega-3 FAs promote the neuronal membrane fluidity, synaptic transmission, and resolution of neuroinflammation.

The Gut-Brain-Immune Axis: A Central Naturopathic Framework

The gut-brain-immune axis is arguably the most important conceptual advance in modern naturopathic nutrition, providing mechanistic support for the observation that dietary choices influence not only gastrointestinal but also systemic and neurological health. The tripartite axis works through some interconnected pathways that includes:

The enteric nervous system (ENS) is composed of some 500 million neurons located in the wall of the gastrointestinal tract. The ENS is the source of over 90% of the body's serotonin and 50% of its dopamine. In this way, the dietary substrates (tryptophan, tyrosine, phenylalanine) for the neurotransmitter synthesis and cofactors (B vitamins, zinc, magnesium) are of significant neurological importance.

Short-chain fatty acids (SCFAs), including butyrate, propionate, and acetate, are the main energy source of the colonocytes, which regulate intestinal permeability, modulate immune cell differentiation, and cross the blood-brain barrier, impacting neuroinflammation and cognition. Butyrate, particularly, has shown neuroprotective, anti-inflammatory, and epigenetic regulatory properties by inhibiting the histone deacetylases (HDACs).

The vagus nerve is the principal parasympathetic conduit connecting the gut and brain, and it carries the information derived from the microbiome directly to the central nervous system. Controlled trials have demonstrated that probiotic interventions reduce the stress responses, the cortisol levels, and anxiety symptoms (16), and vagal mediation is confirmed by the abolishment of these effects by vagotomy in the animal models.

Nutrigenomics and Personalized Naturopathic Nutrition

The scientific frontier of the food-as-medicine paradigm is nutrigenomics, the study of the interactions between food components and the genome. Dietary bioactives are the epigenetic modulators that affect the DNA methylation, histone modification, and microRNA expression without changing the genetic sequence. These epigenetic changes are passed down between the generations, meaning that what you eat can have health effects on future generations.

Genetic polymorphisms are an important determinant of the individual response to particular foods and nutrients. The MTHFR C677T variant decreases the efficiency of folate metabolism and, therefore, requires a higher intake of dietary folate. FADS1/FADS2 polymorphisms influence the rate of omega-3 conversion. APOE4 genotype modifies the cardiovascular response to saturated fat consumption. CYP1A2 variants determine the rate of caffeine metabolism and the associated cardiovascular risk. These and hundreds of other gene-diet interactions underscore the naturopathic tenet that optimal nutrition is inherently individualized.

The emerging field of precision nutrition utilizes the multi-omic data, including genomic, epigenomic, metabolomic, and microbiome profiling, to provide personalized dietary advice at an unparalleled level of specificity. The landmark study by

the Weizmann Institute showed that the glycemic responses to the same foods were strikingly different between the individuals, and were best predicted by a microbiome composition rather than the diet composition alone (17).

Integration with Conventional Medicine

The most convincing evidence for the food-as-medicine currently exists in the field of integrative medicine, which is a model that combines evidence-based conventional and complementary approaches with a patient-centered philosophy. Academic medical centers such as the Cleveland Clinic, Mayo Clinic, and MD Anderson Cancer Center have established many integrative medicine programs that incorporate the naturopathic nutritional principles into the standard care protocols.

The American College of Lifestyle Medicine and the Global Consortium for Integrative Medicine have advocated for dietary counseling as a first-line intervention in chronic disease management, a position increasingly supported by the health economics research demonstrating that dietary interventions offer superior cost-effectiveness ratios compared to pharmacotherapy for conditions including T2DM, cardiovascular disease, and obesity.

But multiple challenges impede the wider integration. These include the variability in individual responses to dietary interventions, the complexity of the food matrices compared with isolated pharmaceutical compounds, methodological challenges in dietary research, such as adherence measurement and dietary assessment validity, and the limited incorporation of nutritional medicine into the conventional medical education curricula (18).

Limitations and Future Directions

The evidence base for the food-as-medicine is very large and growing, but the important limitations must be recognized. Most mechanistic evidence comes from in vitro and animal studies. Clinical trial data, although promising, are often limited by small sample sizes, short durations, heterogeneous populations, and poor blinding. Observational studies are epidemiologically powerful, but they lack the ability to establish causality and are prone to confounding by unmeasured diet and lifestyle variables.

The reductionist approach of isolating the single bioactive compounds from whole food matrices may not be able to capture the synergistic interactions that are characteristic of the therapeutic effects of the whole foods. New research on food systems suggests that food synergism, the combined effect of the multiple compounds in a food or meal beyond the sum of the individual components, is a major determinant of the therapeutic efficacy.

Important future research priorities include adequately powered large-scale randomized controlled trials of whole-food dietary interventions, development of standardized outcome measures for nutritional research, mechanistic investigations of food synergism, longitudinal studies of nutrigenomic and epigenetic effects, and evaluation of culturally tailored dietary interventions across diverse populations.

4. CONCLUSION

Food as a therapy in naturopathic medicine is a scientifically sound, philosophically consistent, and clinically relevant approach to the prevention and treatment of chronic disease. Food as a primary therapeutic agent is now supported by a compelling evidence base reflecting the convergence of traditional naturopathic wisdom with the contemporary molecular nutrition, microbiome science, and nutrigenomics.

Anti-inflammatory dietary patterns, gut microbiome optimization, phytonutrient-dense foods, and adaptogenic culinary botanicals work together to target the underlying physiologic drivers of chronic disease through several complementary mechanisms. The gut-brain-immune axis offers a unifying framework for the systemic and neurological effects of dietary choices. Nutrigenomics heralds an era of precision nutrition, in which dietary recommendations can be tailored to an individual's genetic, epigenetic, and microbiome profiles.

The unsustainable burden of chronic non-communicable diseases is straining global healthcare systems all over the world. Food-as-medicine is an integral component of mainstream medical practice that provides a transformative, patient-empowered and economically sustainable therapeutic paradigm. Naturopathic medicine has hundreds of years of clinical experience and increasing scientific validation, and is uniquely positioned to lead the charge for this integration.

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