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Review Article

Ancient and Alternative Healing Tools for Microbe Management

Janice M Dietert[1] and Rodney R Dietert[2*]

[1]*Performance Plus Consulting, Hereford, AZ 85615, USA*

[2]*Department of Microbiology and Immunology, Cornell University, USA*

***Corresponding author:** Rodney R Dietert, Professor Emeritus of Immunotoxicology, Cornell University, Mailing, USA.

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Abstract

What is considered ancient and traditional medicine in many regions of the world has been largely relegated to secondary status as complementary wellness tools in pharma-dominated western countries. This includes huge, historical medical practices such as Traditional Chinese Medicine and Ayurveda. But a shift is already happening as pharma-dominated, western, allopathic medicine has failed to produce promised chronic disease cures, reduced disease comorbidities with aging, safer drugs, longer healthspans, and significantly-reduced polypharmacy. Additionally, many existing classes of pharmaceuticals have been shown to be toxic for specific human commensal microbes and to facilitate microbial dysbiosis and associated diseases. As a result, there is increasing interest in alternative, more holistic, health strategies. This narrative review provides specific examples of ancient and alternative healing modalities that have been reported to function, at least in part, through shifts in the microbiome and/or specific engagement of microbes. As a result, there are opportunities to manage microbes via these health and wellness modalities while minimizing the risk of collateral damage to the microbiome.

Keywords: Microbiome, Meditation, Acupuncture, Shamanic healing, Qigong, Tai Chi, Massage, Reiki, Herbal remedies, Ayurveda

Abbreviations: CT: Chiropractic therapy; OVA: Ovalbumin; AAI: allergic airway inflammation; DMT: N,N-dimethyltryptamine; LMJ: Liuzijue Training; QCWZD: Qingchang Wenzhong Decoction; N/A: not applicable; AT: Aerobic training; AM: abdominal massage; PD: Parkinson's Disease

Introduction

Microorganisms are the predominant life form on earth and can be found in virtually every location on, above, and/or below the earth's surface. In the process of building complex biological networks [1,2], microorganisms form a superstructure of communication that has been termed "The Internet of Microbes" [3]. This microbial internet functions across media, within and between holobionts and ultimately reaches across the planet. Additionally, our knowledge of microbial functions and capabilities continues to grow each year.

Recent research into bacterial capabilities has led to the emerging realization that bacteria are cognitive, conscious, information field-dominating, quantum-operating beings [4-6]. They possess sentient, problem-solving capabilities [7-10], multi-generational memory [11], shapeshifting capabilities [12], are superb information, energy, and light gathers, processors and distributors [7,13], and represent state-of-the-art models for investigating quantum-based living (e.g., entanglement, light-energy duality, field interactions via novel antennae) [14-16], and phase transitions [17]. Because humans and other holobionts are majority microbial by several measures, these microbial capabilities have implications for holobiont capacities including our own.

Table 1 presents a visual comparison of recent findings on the properties, features, and capabilities of bacteria as well as the remarkably diverse routes of communication used by bacteria. We first introduced this subject in Dietert and Dietert [18]. The side-by-

side illustrations of the properties and communication capabilities of bacteria within the Internet of Microbes are important for any consideration of healing tools, for tools for microbe management as well as safety for the microbiome (Table 1).

Table 1: A Summary of Bacterial Properties, Capabilities, and Communication Mechanisms (See also references for this information: [4-6, 11-13, 19-37]).

Examples of Properties of Bacteria [Reference(s)]	Examples of Routes of Bacterial Communication[Reference(s)]
Cognitive Beings [4-6]	Light Harvesting (e.g., via antennae) [25, 26]
Sentient Cells [19]	Electrical Signals [27,28]
Possess Multigenerational Memory [11,20]	Electrochemical Signals [29,30]
Can Simultaneously Hold Multiple States (Quantum Superpositions) [13]	Use of Magnetic Fields [31]
Exist as Wired and Wireless Informational Fields [5]	Vibration Interactions [32]
Become Quantum Entangled with the Hologenome [5]	Chemical/Hormonal Signaling (including Inter-Kingdom Communication) [33]
Are Shapeshifters [12]	Use of Sound Waves [34]
Grow Using Fractal Geometry [21]	Use of Olfaction (of Volatile Compounds) [35]
Can Sense, Move and Respond to a Massive Array of Physical and Chemical Forces [22, 23]	Nanowires (a form of wired communication) – [37]
Exist as Communication & Decision-Making Networked Communities [24]	
Can Sense and Communicate at a Distance [24]	

These features are also:

1. A basis for conscious living in the human holobiont and
2. A foundation for healing strategies via the microbiome.

With this in mind, it is not surprising that healing modalities of a variety of types that focus inward and/or better connect our bodies to nature have an impact on human and other holobiont microbiomes. Given the importance of the human microbiome to human development, health, metabolism, and physiological function [38-43], it is important to explore all healing modalities for the potential to promote a healthy microbiome. It is particularly important given the problematic track record of prevalent pharma-based western medicine when it comes to disease prevention and cures [40,44-46].

In this narrative review, we provide examples of ancient and alternative healing approaches that have been shown to affect the microbiomes of humans and/or other holobionts. Such information is not surprising when one considers the very nature of bacteria. This review builds upon and extends the information we recently presented in papers concerning both the embodied microbiome and the Internet of Microbes [18,47]. Among the alternative healing approaches that are discussed in the present review, we have set aside the consideration of sound, light, electrical, and magnetic approaches to microbe management, healing, and wellness [48-51]. These four healing approaches have a substantial literature that will be included in a subsequent review.

Examples of Ancient Healing Modalities and Microbial Rebiosis

One of the realizations today is that ancient human civilization had health and wellness practices that not only could improve human health but also produce microbiota rebioisis as part of patient/client outcomes. Evidence is showing us that many ancient healing modalities are microbiome inclusive in stark contrast to pharma-based medicine that has been institutionalized in many Western countries [18,45]. Table 2 illustrates examples of some alternative and many ancient wellness practices and reported effects on the microbiota. The studies included both human trials and lab animal model findings. While associated shifting in microbiota (e.g. the gut microbiota.) does not prove causation of biomarker changes and resulting health benefits, it is clear that these approaches are capable of mediating changes in immune and other systems biology-regulating microbiota. Table 2 [18,52-73] covers the healing modality landscape beyond those based on sound and light frequencies. These represent a major focus of this review and will be considered later.

Table 2: Examples of Ancient and Alternative Healing Modalities and Microbial Alterations.

Healing/Wellness Modality (species)	Review/Experimental and/or Clinical Study	Effects on Microbes	Other Effects
Abdominal Massage (human) [52]	Randomized study of 60 recruited (54 completed) Type 2 diabetes patients in China for effects of a control, generalized, and abdominal/visceral massage three times per week for eight weeks duration.	Four genera within the gut microbiome were found to be significantly altered following abdominal massage when compared to the control group. *Bifidobacteria* and Lactobacilli were increased by the treatment while *Enterococcus* and *Enterobacter* bacteria were decreased.	The abdominal massage group had significantly improved levels of glycated hemoglobin, and total cholesterol compared with the control group.

Acupuncture (human) [53]	An analysis of 18 studies that included microbiome analysis within an acupuncture research study.	17 of 18 microbiome inclusive studies reported significant changes in microbiome diversity and/or specific composition.	Many of the studies found gut barrier morphological and/or functional improvement and/or a rebalancing in immune function.
Artificial Reality Virtual Reality (chicken) [54]	A blinded study of young adult White Leghorn hens examined the short-term (5-day duration) effects of virtual reality on biological/immunologic al parameters as well as gut microbiome composition.	The short-term VR exposure produced shifts in the abundance of several genera of gut microbiota; (e.g., *Megamonas, Ruminococcus* and *Slackia* were reduced in VR hens vs. controls, while *Mucispirillum schaedleri* was increased).	Compared with controls, VR-exposed hens had increased plasma cortisol levels and related increased host resistance parameters. They also reported a VR-associated increase in the dopamine-derivative, salsolinol.
Ayurveda (human) [55]	This review article describes the seamless integration of gut microbiome research and knowledge with key Ayurvedic approaches to human health. It describes the emphasis on the right foods (e.g. prebiotic and probiotics) within Ayurveda as well as considerations such a seasonality.	N/A	N/A
Ayurveda (human) [56]	This review illustrates in detail the apparent linkages between Prakriti types with gut microbiome composition and the gut metabolome. It is a step toward personalized medicine for the gut microbiome within Ayurveda.	N/A	N/A
Ayurvedic Herbs (human) [57]	A study involving 10 nootropic herbs and Parkinson's disease patients examined the personalized responses of the patients' gut microbiota to each herb in vitro.	The investigation showed that several nervine herbs (including Ashwagandha, Bhringaraj, Guduchi, Jatamansi, Kapikacchu and Shankhapushpi) increased the diversity of communities among microbiota from all three subjects. Changes helped to correct the dysbiosis normally seen with PD. Additionally, some of the responses were highly personalized.	The researchers concluded that many of the qualities of the responses to the herbs should benefit PD patients.
Ayurvedic Herbs (human) [58]	A review of active ingredients from 31 Ayurvedic herbs	N/A	N/A
Chiropractic Therapy (CT) (rat) [59]	Male Sprague -Dawley rats were examined for the effect of CT on ovalbumin (OVA)-induced allergic airway inflammation (AAI), immune parameters and gut microbiota. Ovalbumin sensitization was used to induce AAI. The chiropractic treatment group received adjustments once a day for three weeks.	Rats that received chiropractic treatment had elevated *Roseburia*, and *Ruminococcus*_1 and decreased *Lactobacillus* compared with the AAI group. At the species level, chiropractic treatment rats had a lower abundance of both *Lactobacillus_vaginalis* and *Lactobacillus_gasseri* compared with the AAI rats.	CT across the pre-sensitization and OVA challenge period resulted in attenuated airway inflammation (inflammatory cell infiltration), reduced Th2-inflammatory cytokine production.
Dowsing (environmental) [60]	A review article on the concept of using types of bacterial dowsing rods to direct environmental exploration. This combines the literature found in Tables 1 and 2.	N/A	N/A
Essential Oils (human) [61]	This review article emphasizes the benefit of essential oils in oral health based primarily on their selective antimicrobial, antibacterial, antiviral, antifungal, anti-inflammatory properties and capacity to restore oral microbiome balance.	N/A	N/A
Herbal Remedies [various) [62]	A review of the effectiveness of herbal remedies in wound healing	For many of the herbs considered in this study, a primary effect was the establishment of commensal microbe balance in the wound.	Modulation of the local immune system in the wound was important for effective healing.

Liuzijue Training (LZJ) (an integrated breathing, meditation, and physical exercise TCM practice) (human) [63]	Randomized, controlled, single-blind experimental trial conducted for 12 weeks among hypertension patients comparing the effects of LZJ vs. aerobic training (AT) vs. controls. The LZG group had 21 patients, the AT group 15 patients and the control 20 patients. The exercise protocol of approximately 50 minutes duration was conducted three times a week for 12 weeks for the LZG and AT groups.	Blood pressure responders (specific responders) had a significantly reduced ratio of *Firmicutes* /*Bacteroidetes* that paralleled the ratio of healthy controls. *Bacteroidetes* was specifically increased in abundance following the LZJ protocol.	There was a significant reduction in blood pressure (57 % among blood pressure responders) following LZJ treatment. Blood pressure responders also had a significant improvement in inflammatory markers. Blood pressure responders were more prevalent in the LZJ group vs. the standard aerobic training group (25%) and the former LZJ training was found to be more suitable for patients than AT.
Medicinal Plants (humans and experimental animals) [64]	This review is among the most extensive published on the effects of medicinal plants on the gut microbiome with an emphasis on neurological outcomes. Both in vivo and in vitro studies are examined across the spectrum of human and experimental animal research.	N/A	N/A
Meditation (human) [65]	A review covering the effects of mind/body practices including meditation on improving gut microbial dysbiosis of asthmatics.	N/A	N/A
Meditation (human) [18]	A review of 5 studies regarding the effects of meditation on human gut microbiota	N/A	N/A
Osteopathic Manipulation Treatment (human) [66]	A pilot study was conducted with Parkinson's Disease (PD) patients with associated constipation complications. Manipulation treatments were weekly for four weeks with gut microbiome and Bristol score analyses collected at baseline and each time interval. Six patients completed the pilot study.	Significant changes occurred in the gut microbiome composition with specific changes in microbiome reflecting a normalization away from the dysbiotic profile that occurs in PD with constipation patients. Treatment-associated normalization of specific gut Actinobacteria was one of the hallmarks for improved bowel function.	A Movement Disorders Society-Unified PD rating scale and Bristol stool scale and questionnaires were used to evaluate symptom severity and quality of life. There were significant reductions in constipation symptoms for these patients.
Qigong (human) [67]	A meta analysis was conducted of studies using Qigong as well as Tai Chi from Traditional Chinese Medicine (TCM)	Evidence was obtained that both TCM practices produced increases in *Bifidobacterium* and *Lactobacillus*	The meta analysis was not designed to evaluate specific clinical improvement.
Qingchang Wenzhong Decoction (QCWZD) (mouse) [68]	Experimental examination of the mechanisms through which QCWZD heals colitis in mice. Six- to eight-week-old female C57BL/6 mice was used with one week of drug induced colitis treatment followed by one week of QCWZD administration.	Herbal induced rebalancing of the dysbiotic gut microbiome was shown to be a major factor in healing.	Restoration of intestinal barrier function was important in the healing process.
Plant Derived Quorum Sensing Inhibitors (chicken) [69]	Experimental study examining the effects of combinations of Quercetin, Vanillin and Umbelliferon mixtures fed to Arbor Acres broiler chickens for 35 days. Cecal microbiome contents, inflammation levels, and production levels were measured.	When compared with the basal diet control group, all supplemented groups had a significantly increased cecal *Bacillota: Bacteroidota* Ratio.	Blood parameters suggested that the supplementation reduced the levels of inflammation. Increased feed conversion with reduced mortality was also seen in several of the supplemented groups.
Reiki (In vitro cultures) [70]	This research study examined the effects of Reiki on heat shocked bacterial cultures of *Escherichia coli* K12. Status of the Reiki practitioner was also considered in the study as was a prior healing context variable. Bacterial counts were made one hour post Reiki treatments as an indicator of recovery from heat shock damage.	The study demonstrated that the administration of Reiki energy could alter microbial status and rescue previously injured bacteria.	There was added benefit seen when practitioners used reiki on human subjects and then did the work on the bacterial cultures.

Shamanic Microscopy (human and ecological) [71]	A review describing the tradition among Amerindians of their Shamans both viewing and interacting with microbes including pathogens	This is part of the process through which both human infections and ecological dysbiosis can be addressed via traditional Shamanic practices.	Direct contact with microbes as beings is viewed as an essential part of the Shamanic practice and overall healing process.
Shamanic Psychedelics (human) [72]	A review article including information on Ayahuasca and the active ingredient DMT (N,N-dimethyltryptamine) and its interactions with the gut microbiome.	N/A	N/A
Tai Chi (human) [73]	Randomized control study of 30 college basketball players (15/per group). The test group practices included a 24-style simplified Tai Chi practice with music 7-8 times a week for 5 months.	Alpha diversity of gut microbiota was significantly increased in the test vs. the control group. Additionally, the test group had a significantly greater abundance of *Ruminococcaceae, Lachnospiraceae, Rikenellaceae,* and *Paraprevotellaceae* and reduced abundance of *Oxalobacteraceae*, and *Lactobacillaceae* vs. the control group.	Trigycerides, high-density lipoprotein cholesterol, and blood pressure levels decreased significantly with Tai Chi intervention compared with the control group.

Abdominal Massage, General Massage, and Metabolic Syndrome

Massage therapy has a long history of application dating back thousands of years [74,75] and can take several different forms [76]. It has been part of the Ayurvedic system where it is viewed as a complete therapy [77], while in the west it has been generally considered as a complementary therapy [78]. Among the mechanotherapy benefits of massage as described by *Van Pelt, et al*. [79] are the modulation of skeletal muscle satellite cell proliferation, useful changes in immune response, ribosome turnover, and protein turnover, which in turn, benefits the recovery process from eccentric exercise and disuse atrophy. For the purposes of this narrative review, abdominal massage (also known in Chinese medicine as visceral massage) is a focal point for discussion. This form of massage has been a research focus when it comes to the evaluation of potential effects on the microbiome. The linkage of abdominal massage to changes in the gut microbiome has been investigated in both animal models and humans. *Huang, et al*. [80].

Abdominal massage (AM) has been shown to be particularly useful for addressing metabolic syndrome/type 2 diabetes [81]. This is particularly critical since the cadre of metabolic syndrome conditions spread inflammation to other tissues and organs resulting in an increased risk of multimorbidity with aging. The example was shown recently of obesity having an elevated risk for 43 different comorbid diseases and conditions [40].

Evidence suggests that metabolic signaling is altered through this AM therapy. For example, it ameliorates fat accumulation in diabetes model mice (Obese strain mice) fed a high fat diet. Evidence suggests that metabolic signaling (the PPARγ signaling pathway) is enhanced as part of the protection against fat accumulation [81]. *Xie, et al*. [52] examined the effects of abdominal massage in type 2 diabetes patients including both parameters for the disease as well as changes in the gut microbiome (see Table 2). They reported beneficial shifts in disease parameters as well as shifts in the gut microbiome following AM therapy.

Acupuncture

Acupuncture, stimulation of body locations through needling, has a long history as a healing procedure probably originating in China and dating back a few hundred years BCE [82]. *White and Ernst* [82] describe its progression of use across the centuries as it moved geographically across Asia then to Europe. There has also been a progression of thinking concerning the mechanisms through which acupuncture works to bring healing. These include what are known as the facia theory, the theory of Qi moving though channels and or meridians, and a more recent neurological and immunological theories including combined systems biology models (e.g., neuroimmune) [83-86]. Acupuncture has proved helpful for a wide variety of diseases and conditions including the following based on a recent evidence map: neurological conditions (e.g., symptom improvement and improved sleep quality) including stroke (e.g., improved motor function), gastrointestinal disorders (e.g., symptom improvement), obstetrics, gynecology (reduced severity of menstrual symptoms), and women's health (e.g., improved postpartum lactation), connective tissue disease (e.g., fibromyalgia) (e.g., reduced musculoskeletal pain), pregnancy (e.g., increased pregnancy rate), and mental health (e.g., reduced depression and opioid cravings) [87].

Recently, *Jiang, et al*. [53] provided a comprehensive analysis of published research on acupuncture and gut microbiota alterations in humans and rodent animal models. Nineteen studies were included in this review. Of these, thirteen studies employed electroacupuncture, five used manual acupuncture and one was simply designated as acupuncture. By species, twelve studies used mice, four examined rats, and three had human subjects. Gut microbiota status was examined in 18 of the 19 studies with 17 of the 18 microbiome-inclusive studies reporting one or more significant changes in microbiome diversity and/or composition. Across the studies, different animal models (e.g., species/strains) were used, human populations varied (age, sex distribution of the study population, etc.) and the targeted disease conditions also varied. As a result, no consistent pattern of microbiome modification was revealed in this

sampling. But it is clear that acupuncture treatments can significantly modify the gut microbiome and gut microbiome modulation is known to affect not simply metabolism but also a wide range of different systems biology outcomes.

Across the 19 studies, a second major outcome was evident concerning elements of the microimmunosome [88] (e.g., gut barrier, underlying immune status) beyond simply the gut microbiota. As *Jinag, et al*. [53] discuss, at least some studies resulted in barrier morphological and/or functional improvement (e.g., tight junctions) and changes in the underlying immune system were also reported. Taken together this literature suggests that acupuncture treatments are highly likely to modulate the gut microimmunosome among one or more targets, and that restored balance of the gut microbiome and/or improved barrier function and rebalanced immune function (e.g., better regulation of inflammation) can result in useful health outcomes.

Ayurveda

Ayurveda is a comprehensive system of medicine that is thought to represent one of the oldest traditional medicine practices [89] on earth. It dates back at least to the 2nd century BCE when traditional Hindi philosophical schools in India included it in their materials [90]. However, the origins may be much earlier [89]. As described by *Jaisalwa and Williams* [90], Ayurveda is contained within ancient texts, the Vedas (where specific healing plants are described), and is thought to have divine origins from *Brahma* [58]. *Mukerjee, et al*. [58] describe the development of a complete Ayurveda medical system during the "Samhita" period of 1,000 BCE.

At its core Ayurveda comprises the five basic elements of the universe Vayu (Air), Jala (Water), Aakash (Space or ether), Prithvi, (Earth) and Teja (Fire) called the Pancha Mahabhoota, which form the three basic humors of the human body known collectively as the Tridosha [89]. Taken together, the Tridosha are considered as determining the Prakriti (or individual type) [56]. These three humors control physiological functions of the body across principal and subdivisions of doshas [90]. Each body tissue is considered both separately and in a holistic concert [90]. *Jnana, et al*. [56] reviewed the relationship between three dosha determination of individual type or Prakriti, the gut microbiome composition, and the metabolome (Table 2).

This system of basic elements and doshas is considered to impact physical health, mental balance, spiritual well-being, social welfare, and environmental considerations through an emphasis on seasonal change, diet, and emphasis on lifestyle habits [58]. In their review, *Mukerjee, et al*. [58] illustrate the evolution of Ayurvedic medicine into 18 distinct disciplines. The challenge of melding the comprehensive system of Ayurvedic medicine and western allopathic medicine was discussed by *Chopra* and *Doiphode* [91]. A sampling of Ayurvedic research is included in Table 2. These include both clinical trials and research analysis of Ayurvedic plants and herbs relative to the microbiome. For example, *Mukerjee, et al*. [58] reviewed more than 30 Ayurvedic herbs as per the active ingredients and evidence of healing actions (Table 2). Notably, and not surprisingly, some of these active ingredients exhibit effects on microbes (e.g., Asiaticoside from *Clitoria ternatea L*.).

Chiropractic Healing

Zhu, et al. [59] examined the influence of chiropractic therapy in immune rats on both the status of gut microbiota as well as allergic airway inflammation. As shown in Table 2, this study found there was significant benefit of repeated chiropractic therapy both for shifts in the gut microbiome and for reduction of Th2-driven allergic inflammation. This result suggests that more studies of chiropractic therapies and their impact on the microbiome are in order.

Dowsing

Dowsing is shrouded in a certain amount of mystery. Researchers do not agree as to its antiquity. Some say it only began in the 17th century. Others point back to cave paintings that are 8,000 years old that show what appears to be a man holding a divining rod. What is certain is that the practice of dowsing has continued into the 21st century. Both authors of this review have ancestors who were dowsers; in one case this was even recorded on a census. While centuries-old tension exists between "modern technologies" and dowsing, history also shows examples where ancient knowledge has been successfully blended with new technologies and new scientific revelations. One such case was the example of an English woman who was a well-known, accurate water dowser. During WWII, she was pressed into service by the Ministry of Defense to discover the whereabouts of German U-boats using just a map and a pendulum [92, p. 308].

One scientific paradigm that may now be leading to an explanation behind the phenomenon of dowsing is quantum physics. For one, it explains how consciousness or the observer effect might play a major role in dowsing [93 p .ix]. According to *Charles Massey*, Ph.D., successful dowsing relies on concentrated focus [92 p. 309]. Microbes are also making a surge as players in the quantum field (see Table 1). As knowledge increases about the microbial nature of the human body and Earth's ecosystems as well as the potent field of energies within and beyond the human body [18], dowsing emerges as a reflection of quantum as well as scalar physics.

In Chapter 4 of Dowsing: The Ultimate Guide to the 21st century, *Brown* [94] discusses the reality that the human body is mainly microbes, energy, and space. When the bacterial functions of Table 1 are considered, it is not surprising if bacterial-gathered information and energy is a conduit through which information concerning specific targets (e.g., water, minerals, oil, pollution levels, other energies) can be gathered via the Internet of Microbes. *Raymon Grace* [95] is one of the present-day master-dowsers who has found that the questions asked and answers received are virtually unlimited as are the ways in which dowsing can be applied. He is equally good at dowsing for a lost dog as he is at cleansing water in Canada from where he sits in Viginia. The potential role of microbes in the information flow is distinctly plausible and has been supported by *Kotlar* [60] as shown in Table 2. In fact, this researcher discusses bacterial divining rods for oil. Because microbes inhabit virtually every ecological niche of earth and can easily operate at a distance,

information exchange between our holobiont consciousness and sensing targets beyond our physical body is much like tapping into a microbial search engine linked to the Internet of Microbes [3,18,47].

Liuzijue Training

Liuzijue (meaning six healing sounds) originates from traditional Chinese medicine and combines aspects of breathing techniques from Qigong with movement, breath, and focused techniques from mindfulness meditation. It has grown in use partly because of its ease of learning [96]. Primary application of health and wellness have focused on the treatment of hypertension and the success of Liuzijue training to reduce blood pressure [55] as well as improve lung function with pulmonary diseases [97,98]. Table 2 shows a study by *Wu, et al*. [63] where a 12-week LT protocol produced not only positive benefits on blood pressure in hypertension patients but also resulted in a shift in gut microbiome composition.

Medicinal Plant Based Remedies

Research into the effects of plant based medicinals including essential oils on the microbiome is a significant area of growth. Numerous studies have emerged during the past decade including one of the more comprehensive reviews as included in Table 2 [64]. A sampling of other studies is also found in Table 1 to illustrate the importance of this area of microbe management. Additionally, many plants used in the shamanic practices of indigenous peoples have recently been found to shift the microbiome. In fact, the whole of shamanic practices appears to be intimately linked to human and environmental microbes.

Meditation

The practice of and training in meditation is important in health and wellness. Numerous examples exist where the introduction of meditation regimes has resulted in:

1) significant reduction in disease-associated symptoms,

2) reduction in pharmaceutical needs,

3) improved function, and/or

4) increased resiliency. Meditation training has been applied to a wide variety of health conditions with positive benefits (via evidence maps) demonstrated to include stress reduction, improved sleep, fatigue reduction, reduced depression and anxiety disorders, reduced oxidative stress, reduced hypertension, reduced pain, and improved brain function [99].

Recently, several studies have monitored the capacity of meditative practices to alter microbiota in conjunction with beneficial health outcomes. Many of these studies were described by *Das, et al*. [65] and by us [18] (Table 2). Those practices encouraging an inward focus were particularly effective in producing shifts in microbes associated with improved wellness and reduced disease burden. While different forms of meditation have been described as beneficial for alterations in microbiota, mindfulness meditation is among the most extensively examined to date.

Qigong

Qigong is an approximately 3,000-year-old traditional Chinese physical and energetic practice that has been associated with both longevity and reduced prevalence of certain diseases and conditions [100]. The practice includes various physical movements that are gentle and, therefore, can be practiced by a significant portion of middle-aged and older populations [101]. There is a controlled breathing aspect to Qigong, and practitioners have been shown to exhibit a high tidal volume [102]. Among the reported health benefits of practicing Qigong are reduced systolic blood pressure [103], reduced depression [104], stress prevention [105], and improved physical function in Parkinsons' Disease [106]. As reported in in a recent meta-analysis study in Table 2, Qigong has specific effects on the human gut microbiome [67].

Reiki

Reiki is an ancient method of channeling healing energy that was rediscovered by the Japanese Buddhist priest, Mikao Usui. He further developed this discovery into the healing system now known as Usui Reiki Ryoho [107 p.5]. "Ki" in Reiki refers to life-force energy that flows throughout the human body [107 p. 21]. The word taken as a whole actually means the universal life-force energy, a vast energy that both connects us to all that is, while existing within each person and living thing [108 pp.1-2]. The life-force energy that inhabits each person and living thing vibrates at a high rate and fast frequency. This has made it difficult to detect scientifically until more advanced technology was developed [107 p.21]. Reiki energy operates at an even higher level. In fact, it is at such a high vibration and fast frequency that it moves easily though all parts of the human energy field [107 p. 21].

In order to study the Reiki energy, it was important to identify its main characteristics. *James Bachman* and others have proposed that it is electromagnetic. Given that the heart and brain both generate measurable electromagnetic fields (biofields), the proposal identified an avenue to target when trying to test for Reiki energy [109 p.2]. The possibility exists that as an electromagnetic frequency, Reiki may alter the vibrational frequencies of the heart and brain, thereby altering the electrical currents that produce the human biofields [109 p.2]. Interestingly, as seen in Table 1, microbes, in particular bacteria, communicate via electrical, electrochemical and magnetic fields. Using their specialized antennae, bacteria as well as other types of microbes constantly sample the 'noise' around them until they identify a useful signal, which they then tap into and use. We hypothesize that this may be one method by which Reiki is able to heal as the microbes in the receiver's body detect Reiki's electromagnetic field, register the information therein then act upon that information to alter themselves and their environment.

While that action is very difficult to observe in a laboratory, as shown in Table 2, a study in the lab was able to demonstrate the positive effects on heat shocked bacterial cultures in vitro after receiving Reiki energy [70]. Given that these were in vitro bacteria outside of a human body, there was no possibility that a placebo effect via the power of suggestion could be induced. It is also interesting that the effectiveness of the Reiki treatment on the bacterial

cultures was enhanced when the Reiki practitioners had given Reiki treatments to a human just before moving to the cultures. Clearly, more research on the effects of Reiki on human and other microbiomes is warranted. Reiki has been applied in clinical settings for quite some time, both as emotional support when facing serious medical diagnoses as well as physical aid in hospital operating arenas [108 pp.xxvi-xxvii]. The differences in experience are not only felt by the patient receiving Reiki but by the hospital staff in the operating room as well. Measurable differences in outcomes and quality of life for the patient have also been observed. Reiki has become a significant complementary therapy particularly within the nursing and palliative health care communities [110-112]. Additionally, it is also extensively utilized as part of hospital procedure preparation and/or the treatment of various diseases and conditions [113-115].

Our opinion is that Reiki is a valuable tool for affecting better medical outcomes, and that as technological advances create tools with finer capabilities to register the high vibration and fast frequency of this energy, the widespread benefits of Reiki should become even more apparent.

Shamanic Healing: The Connection Between Shamanism and Microbes

According to *Michael Harner*, PhD, shamanism is the most widespread healing modality worldwide [116 p.40]. The practice of shamanism encompasses ancient hunter-gatherer and early farming communities persisting to the present day even within urban centers [117,118]. While they acted as a messenger of Spirit, healers and magicians providing entertainment for the community and its members [117], shamans curated ancient techniques and technologies that are remarkably similar the world over [116 p xvii].

Shamanism is purported to have ancient origins and an untouched, 12,000-year-old Natufian grave consisting of remains from internment rituals, specific grave goods and the construction of the grave itself all point to the oldest, established shamanic burial found [117,118]. Given the antiquity of shamanism and now the variety of practices in modern shamanism, scientific study of its efficacy has been difficult to perform. However, one ancient culture whose practices have survived into the 21st century and have been studied in the Amerindians of South America. The observations concerning the way their shamans work shine a new light on what 'spirits' may be, interactions with them and how healing may actually occur via shamanism.

According to *Cesar E. Giraldo*, PhD, Amerindian shamans describe the beings they deal with "in ways that correspond to contemporary understandings of microbes" [119 p .ix]. In Amerindian cultures, shamans have developed methods and technologies that allow them to even perceive the microbial world without the aid of microscopes [119 p.ix]. Often to achieve this skill, they employ Ayahuasca, a brew of several different herbs at least one of which possesses DMT (N,N-dimethyltryptamine) while a second prevents DMT from being broken down quickly in the body. Interestingly, DMT has known effects on the human microbiome.

Amerindians conferred personhood on the 'beings' they consulted. Unsurprisingly, these 'beings' were found in the same circumstances as microbes that caused the very diseases the shamans sought to heal [109 p. 2]. The 'beings' and the microbes even shared nearly identical characteristics, one example being the microbe that causes syphilis [119 p.140].

As part of their training and initiations, apprentice shamans would ingest certain microbes in a particular order and learn the rigorous dietary and fasting regimes necessary to keep the colony of these microbes at levels below the threshold that would create illness [119 p.67]. It was through these colonies that the shamans recognized the source of the illnesses in their patients by seeking the microbe they felt resonated with the 'being' in their patient. In theory the method of communication between host and microbe could have been through bidirectional communication via the Vagus nerve gut-to-brain pathway [119 p.74].

To summarize, via this one particular, specialized, curated method of shamanic healing involving the ingestion of and intimate knowledge of specific microbes and the knowledge of how to maintain the balance of their own microbiome in order to remain healthy, Amerindian shamans are then able to recognize the specific microbe that is in a state of overgrowth in their patient. They can then apply the dietary mechanisms of fasting, slow dietary rebiosing and herbs to bring their patient back into a state of microbial balance.

Tai Chi

Tai Chi is an ancient Chinese practice that integrates meditation, exercise, and martial arts. While each element of the Tai Chi practice has been shown to have potential beneficial gut microbiota altering capabilities, direct investigation of Tai Chi and microbiome status is limited to date. *Wang, et al*. [120] provided a recent narrative review of Tai Chi concerning a variety of potential health and functional benefits. Gut microbiota were discussed in this review article including the 2017 review on Tai Chi and gut microbiota by *Hamasaki* [121]. *Hamasaki* [121] emphasized that Tai Chi can improve immune function and reduce inflammation of the gut. These are two intertwining outcomes that are connected to the status of the microimmunosome [88]. *Hamasaki* [121] further suggested that Tai Chi may also affect gut microbiota through vagal modulation and the hypothalamic-pituitary-adrenal axis, which has been a route for gut microbiota-brain/neurological effects [121]. Importantly, Hamasaki [121] suggested protocols of directly exploring Tai Chi and specific gut microbiota and alterations/rebiosis. Another example of a human research study through which Tai Chi practice modulated the gut microbiome can be found in *Zhang, et al*. [122] and a further example is provided in Table 2 [73].

Conclusions

While many of the healing tools considered in this review have existed for decades, centuries or millennia, examination of the connection between the healing modalities and the microbiome is a relatively new avenue of study. Such mechanistic and personalized healing information has gained in significance due to the recent

decline of the pharmacracy. A half century or more of increasing chronic disease prevalence (with few cures) resulting from prescription drug-driven western medicine [45,46] has meant that "alternative" healing modalities are increasingly moving to the forefront. The present narrative review provides examples of ancient and alternative healing modalities where impact on the microbiome has been examined. In some cases, the changes in microbiome status appear to have a direct mechanistic impact on improvement in disease symptoms and/or physiological biomarkers of disease.

The major conclusions are that:

1. A substantial array of alternative healing modalities examined produce significant effects on the microbiome and

2. These modalities appear to offer much needed holobiont-oriented alternatives to prescription drug-driven therapies many of which are toxic for critical human commensal bacteria [123,124].

Author Contributions

JMD is a practitioner of multiple healing modalities covered in this paper and drafted parts of Tables 1 and 2 plus Sections 7, 12, and 13. She also edited the entire manuscript. RRD contributed the majority of the microbiome-related research and content. Both authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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