

Galen and Modern Healing

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Περίληψη: Ο Γαληνός είναι ο μοναδικός θεραπευτής της δυτικής ιατρικής που γνώρισε τόση απήχηση. Αν και οι βάσεις των ιατρικών απόψεών του και των θεραπειών του μεταμορφώθηκαν σε ένα πιο επιστημονικό και μηχανιστικό ύφος βασισμένο στην ανατομία, τη φυσιολογία, τις λοιμώξεις και τις μοριακές αλληλεπιδράσεις, ωστόσο συνέχισαν να διατηρούν την κυριαρχία τους μέχρι σήμερα. Θα διερευνήσουμε τη ζωή και την ιατρική του Γαληνού και στη συνέχεια θα δείξουμε πώς οι ιδέες αυτού του ανθρώπου ήταν συνεπείς και ότι μπορούν ακόμα να συμβάλουν σημαντικά στην ανακούφιση του ανθρώπινου πόνου.

Summary: Based on his voluminous writings and the number of centuries that medical healers adopted his healing canon, Galen Aelius Galenus (Claudius Galenus, or more simply Galen as he became known across time and geography) was probably the single most influential medical healer in Western medicine of all time. Although the bases of his medical views and treatments were transformed by those derived from a more scientific and mechanistic foundation based on anatomy, physiology, infection and molecular interactions, they continued to hold sway until recent times. That they did speaks to the complexity of the healing arts, which should encompass both the curing of diseases as well as the relief of human suffering. Both are still significant challenges to modern medicine. We will explore Galen's life and medicine, and then show how the ideas of this man are consistent with and can still illuminate evolving paradigms for explaining and treating disease, illness and relieving human suffering.

Λέξεις κλειδιά: Γαληνός, αρχαία ιατρική, σύγχρονη ιατρική, δυτική ιατρική, εναλλακτική ιατρική

Key words: Galen, ancient medicine, modern medicine, Western Medicine, Alternative Medicine

Introduction

Based on his voluminous writings and the number of centuries that medical healers adopted his healing canon, Galen Aelius Galenus (Claudius Galenus, or more simply Galen as he

became known across time and geography) was probably the single most influential medical healer in Western medicine of all time. Although the bases of his medical views and treatments was transformed by those derived from a more scientific and mechanistic foundation based on

anatomy, physiology, infection and molecular interactions, they continued to hold sway until recent times. That they did speaks to the complexity of the healing arts, which should encompass both the curing of diseases as well as the relief of human suffering. Both are still significant challenges to modern medicine. We will explore Galen's life and medicine, and then show how the ideas of this man are consistent with and can still illuminate evolving paradigms for explaining and treating disease, illness and relieving human suffering.

Galen's life: A life fully in accordance with 2nd century AD ideals

Galen was born in 129 AD in Pergamum, seat of the famous Asclepeion, which at that time enjoyed its greatest prosperity that the author of the Revelation of John called it contemptuously 'the throne of Satan'¹ and the philosopher Artemidorus in his *Oneirocritica* made an attempt to explain its success throughout the 2nd century AD by saying that the gods offer visiting patients treatments through dreams that are consistent with medical practice and logic.²

The Asclepeion of Pergamum, which was founded in 350 BC, had the following inscription on display: 'come as a good man and leave as an even better one'.³ The geographer Pausanias, in his *Graecae Descriptio*, explained how the god Asclepius was born in Epidaurus, how from

Epidaurus his worship spread throughout the Mediterranean and how a private individual named Archias carried the god's worship to Pergamum.⁴ The first sanctuary of Asclepius was built in Epidaurus at the end of the 6th century BC. In 430-426 BC, Athens suffered twice from famine and as a result it was decided in 420/19 to introduce the worship of the god Asclepius in the city. The dramatist Sophocles, along with other upper-class individuals, led the movement of introducing and establishing the god. In Rome in 293 BC after three consecutive years of famine, the senatorial and supreme priests consulted the Sybilline books and concluded that famine would cease only if they called Asclepius from Epidaurus. It seems that the introduction of the god's cult was a state matter in Rome, as opposed to Athens, where it was more a private initiative. More than four hundred sanctuaries throughout Greece were dedicated to Asclepius and some remained active until the 6th century AD. The worship of Asclepius in Pergamum and Epidaurus seems however to have faded around 400 AD.⁵ According to ancient Greek mythology, Asclepius was such a skilled physician that he even resurrected with great ease the dead if he wished, until one day Hades felt overshadowed by Asclepius' great abilities and complained to Zeus, who eventually killed Asclepius by striking him with a lightning bolt.⁶ Christian fathers, such as Clement of Alexandria in *Protrepticus*, Tertullian in *Ad Nationes*, and Arnobius in *Adversus Nationes*, liked to spread the rumor that the crime of Asclepius, which led him to his death, was not his ability to bring the dead back to life, but his

¹ Revelation of John 2.13.

² Artemidorus, *Oneirocritica* 4.22f. See also Aristophanes, *Plutus* 649-732, which describes the practice of incubation and ridicules a priest who used to steal, when no one was looking, the edible dedications of the faithful. The Cynic Diagoras according to Cicero, in his *De natura deorum* 3.89, explained that the joyous note of the votive inscriptions posted to the Asclepeion was only feasible because the rest of the visitors were dead.

³ CIL 8/1 n. 2584.

⁴ Pausanias, *Graecae descriptio* 2.26.1-2.28.1.

⁵ See Louise Wells, *The Greek language of healing from Homer to New Testament times*, Berlin, 1998, p. 83-101 and M. Melfi, *I santuari di Asclepio in Grecia I*, Rome, 2007.

⁶ Homer, *Iliad* 2.729-733.

insistence on expecting huge rewards in return for his services.⁷

Galen reported in his own work that when he was seventeen years old and a student of philosophy, the god Asclepius appeared in his father's dreams and bid him to have his son study medicine alongside philosophy.⁸ The family willingly complied, and Galen visited Smyrna, Corinth and Alexandria in order to study with the finest physicians of the time. At the end of his studies, Galen returned to Pergamum at the age of twenty-eight, where he was assigned Supreme Priest at the Asclepeion, a mostly prestigious position in charge of the medical care of the city's gladiators. Galen boasted that thanks to his own highly successful medical decisions, only two injured gladiators eventually lost their lives when his predecessor lost ten gladiators, which was a substantial financial blow for the city. Galen wrote in his work many autobiographical details with undeniably some smugness, which was quite common in intellectual circles in antiquity.⁹

In 162 Galen left Pergamum for Rome, having such an excellent reputation as a medical practitioner, that patients from distant regions (such as Spain, Galatia and Thrace) trusted their health to him and followed his medical advice without ever meeting him. Three years later he

left Rome and temporarily went to his hometown not only because he was experiencing some difficulties with fellow colleagues, but also because of an epidemic that plagued the city. When he returned to Rome, in 169, he became the official physician of Emperor Marcus Aurelius. In his free time in Rome, he regularly held public anatomical displays open to all, and those attending (mostly medical students and others with an interest in medicine) were allowed to interrupt him and challenge him at any time, and every single time. Each time, Galen proved his worth without much effort, as he himself stated.¹⁰

In 169 Galen avoided accompanying the emperor to a military campaign in Germany, claiming that god Asclepius had in fact explicitly ordered him do so.¹¹ It seems that he sincerely believed that he was close to Asclepius, which was hardly a rare conviction in the 2nd century AD. Consider the case of his contemporary Aelius Aristides, who remained in the Asclepeion of Pergamum for two years (from 145-147), convinced that he was close to God as one of his favorites.¹² Galen asserted that on one occasion, Asclepius saved his life by relieving him of a dangerous and annoying abscess.¹³ On another occasion Asclepius sent him a dream which he obeyed, and without hesitation cut off a vein in order to retrieve his health. He also admitted in his works that he strongly believed in the special relationship people can acquire with the divine through dreams, omens and symbols.¹⁴ Such a

⁷ Clement of Alexandria, *Protrepticus* 2.30.1-2, Tertullian, *Ad nationes* 2.14.12, and Arnobius, *Adversus nationes* 4.24.

⁸ Galen, *De ordine librorum suorum ad Eugenianum* 19, 59 in Kühn. Galen kept the belief throughout his life that a physician ought at the same time to be a philosopher. See his treatises *De optimo medico conoscendo* and *De ordine librorum suorum* 19, 37 in Kühn.

⁹ Sometimes Galen expressed his self-satisfaction with a touch of irony and an acute sense of humor, like for example in his *De naturalibus facultatibus* C, 2,180 in Kühn, where he makes the remark that it is pointless for some to grasp his advanced work exactly as it is when narrating a story on a donkey.

¹⁰ Galen, *De ordine librorum suorum* 19, 21 and 22 in Kühn.

¹¹ Galen, *De ordine librorum suorum* 19, 18-19 in Kühn.

¹² A. Petsalis-Diomedes, *Truly Beyond Wonders: Aelius Aristides and the Cult of Asclepius*, Oxford, 2010. Galen left Pergamum for studies in 146 AD; it is probable that he did not get to meet Aelius Aristides.

¹³ Galen, *De ordine librorum suorum* 19, 19 in Kühn.

¹⁴ Galen, *De naturalibus facultatibus* A', 2, 29 in Kühn.

belief was not strange in antiquity and was also independent of one's social and educational background. Many inscriptions have survived that carry this conviction. According to an inscription of the same period, Ambrosia used to disbelieve and laugh at the cures of god Asclepius although she herself was a sufferer from a severe eye illness until one day she slept in his temple and in a dream the god appeared to her and asked her for a dedication of a silver pig, Ambrosia obliged and indeed the god appeared in her dream and opened her eyes and dropped a drug inside which allowed Ambrosia to return home healthy and grateful.¹⁵ Furthermore Galen admitted that a multitude of patients he knew personally had been actually cured by dreams sent by Asclepius and Serapis in Epidaurus, in Kos and in Pergamum.¹⁶ Galen remained in Rome until the beginning of the 3rd century and was in charge of the health of the young prince Commodus.¹⁷ The 10th century Byzantine encyclopedia of Souda places Galen's death in Pergamum in the year 200, and Arabic writers (like Abu al-Faraj of the 13th century) place it in Sicily in the interval between 216-217.¹⁸

Galenic Principles and the Graeco-Roman Medical Schools

Galen greatly admired Hippocrates¹⁹ and Aristotle,²⁰ and in accordance with their

teachings,²¹ he claimed that nature does nothing that is unnecessary and useless²² and nothing in vain.²³ He believed that the harmony of the flesh is the result of the equilibrium of its four liquids (blood, phlegm, yellow and black bile), and its four properties (hot, cold, dry and wet), which carry the four elements (air, earth, water and fire) from which human bodies (and all material bodies) are composed. Any deviation from the correct ratio results in an illness. Galen firmly believed that it is not enough to identify an illness, but that the patient's age, diet, strength and physical condition, as well as the climate²⁴ and the geographical area where the illness occurs, should be taken into consideration before the doctor selects the most appropriate, fastest and most effective treatment.²⁵

At the time of Galen, five main schools of medicine were to be found in the Mediterranean. The Dogmatic School professed to faithfully follow the doctrines of Hippocrates,²⁶ who taught that illnesses were caused by the imbalance of fluids in the body and at the same time considered age, gender, disposition, temperament, lifestyle, and the environment as crucial factors that determine the health, the appearance and the development of illnesses. He also taught that epidemics are caused through air. And he treated the body as a whole convinced that all

¹⁵ *Inscriptiones Graecae* IV².1. 121-2.

¹⁶ Despina Iosif, *Epilepsy in Antiquity*, Greek National Association Against Epilepsy, Athens, 2013, p. 10, (in Greek).

¹⁷ Galen, *De ordine librorum suorum* 19, 19, in Kühn.

¹⁸ Despina Iosif, *Epilepsy in Antiquity*, p. 10.

¹⁹ Seneca, in *Epistula* 95.21, calls Hippocrates the father of medicine. In Pseudo-Shoranus, *Vita Hippocratis* 8, and in Pseudo-Hippocrates, *Epistula* 5, Hippocrates appeared to refuse with patriotism the gifts of the Persian king Artaxerxes and the proposal which came along with the gifts i.e. to provide his medical services in the Persian

court, for he allegedly considered Artaxerxes a most dangerous enemy of Greece.

²⁰ See David J. Furley, *From Aristotle to Augustine*, London and New York, 1999, p. 346. Note also that Aristotle had anatomical knowledge, contrary to Plato.

²¹ Both Hippocrates and Aristotle have been profoundly influenced by Empedocles and the Pythagoreans.

²² Galen, *De semine* B' 4, 643, in Kühn.

²³ Galen, *De semine* A' 4, 529, in Kühn.

²⁴ Galen, *Ars medica* 1, 341-2, in Kühn and *De plenitudine* 7, 580, in Kühn.

²⁵ Galen, *De plenitudine* 7, 580 και 582, in Kühn.

²⁶ ζύρροια μία, ζύμπνοια μία, ζυμπαθέα πάντα, in Hippocrates, *De alimento* 23.

parts and organs of the body are vitally connected and constantly cooperating with each other and urged his colleagues to try to first understand the different parts of the body in order to understand the whole. The Dogmatic School professed that the symptoms of an illness are the result of a hidden cause that brings it about, and only the knowledge of the hidden allows a physician to properly understand how to cure a patient. Symptoms that manifest themselves are indicative of the underlying condition causing the illness, and the hidden state indicates the treatment that ought to be followed. Founders of the Dogmatic School were Thessalus and Polybus (late 5th or early 4th century BC). The most well-known physicians who belonged to this school are Diocles (4th century BC), the student of Aristotle, who according to tradition wrote the first ever textbook on anatomy, and who gave special importance to hygiene, nutrition, and lifestyle in order to preserve health and prevent illness, and Praxagoras (3rd century BC), who is considered the first to systematically study the pulse and its importance in medical practice.

The Empiric School, which was not interested in philosophical theories or in anatomical experiments, rejected the theoretical background of an illness and the idea of hidden causes, and found that treating an illness is a matter of experience and common sense. The founder of the empiric school is Philinus of Cos (about 260 BC), who was a student of Herophilus. Its most important representative is Heracleides (2nd century BC), who wrote comments to Hippocrates, which have regrettably not survived.²⁷

In response to these two schools, a Methodic School was established, which stated that all illnesses are the result of the contraction or expansion of the pores and therefore the medical history of each patient is totally indifferent. For a correct diagnosis it was only required to carefully observe the course of the illness. The most prominent representatives of the methodic school were Asclepiades in the 1st century BC (who some consider also as founder of the school) and Soranus in the 2nd century AD.

The Pneumatic School, influenced by Stoicism, claimed that the spirit, which plays a leading role in the functions of the human organism, is inherent in matter, in the human organism, in the environment and in drugs. The founder of the pneumatic school was Athenaeus from Cilicia (1st century AD), from whom we learn mostly from Galen.

Finally the Elective School, which cannot perhaps be considered as a single school as it did not follow a particular system or method. What characterized it was that it adopted, in terms of theoretical bases and therapeutic approaches, elements from different faculties that it considered more acceptable or more useful. Founder of the school was Archigenes (end of the 1st or beginning of the 2nd century AD). Galen belonged to this school.

Galen was a strong supporter of the view that anatomy and dissection is an integral branch of medical science²⁸ as it helps clarify many issues and it makes plain the function of the human body, especially when dissection is performed on living animals.²⁹ Galen had at least two opportunities to perform anatomical experiments on humans, once on an unidentified corpse discovered in a river, and the other time

²⁷ Celsus in 30 AD in *De medicina* 38 attributed the following revealing saying to the empiric school: 'What matters is not what causes illnesses but what cures them'.

²⁸ Galen, *De semine A* 4, 526 and 538, in Kühn.

²⁹ Galen, *De foetuum formatione* 4, 664, in Kühn.

on a corpse dismembered by birds or a robber.³⁰ Marcus Aurelius had allowed physicians working in Rome to perform anatomical experiments on killed enemy warriors. We have no way of knowing if Galen seized this opportunity,³¹ but it makes sense that he would have. The first Greek anatomists, according to tradition, were Herophilus and Erasistratus who were active in the early 3rd cent. BC in Alexandria. The pagan philosopher Celsus, in his *De Medicina*, and the Christian theologian Tertullian, in his *De Anima*, report at the end of the 2nd century AD that Herophilus and Erasistratus used to perform vivisections, mostly on incarcerated criminals.³² Regardless of the methods ancient anatomists used, it is evident that anatomy had an incredibly prominent role in medical circles at the time. Galen was aware that Erasistratus had performed anatomical experiments on the human brain in order to understand its functions, exactly like Hippocrates earlier had performed on the brains of goats, but unfortunately, not enough research has been done to allow us to understand to what extent Galen continued the anatomical work of his predecessors.³³

The Galenic impact through the 16th century

Galen was recognized by his contemporaries as an important figure and had great impact on the future development of medicine. It is interesting how many prominent Christian fathers almost forgave Galen for being a pagan. In 210 AD, Eusebius wrote how a group of Christians in

Rome headed by Theodotus took so seriously Galen's exhortations to people to lead their lives with impeccable morality that they eventually separated from the official Church and ended up being considered heretics.³⁴ Origen in 240 AD described Galen as an anatomist who could superbly explain the work of divine providence.³⁵ In Galen's or Pseudo-Galen's *De Affectuum Renibus* (19, 679 in Kühn), Galen appears to self-define himself as a Christian. Apparently some Christians believed that this false reputation could appear perfectly credible because Galen had declared, in another of his works, in *De Foetus Formatione*, that he was ignorant of the conditions of the creation (696), of the creator of the universe (696), of the essence of the soul (700), and of the principle that allows the embryo to sustain its life (700), and humbly admitted that the existence of life must presuppose a wise and powerful creator (695).

Galen's reputation has surpassed the geographical and temporal boundaries of the Roman Empire, and his works have been translated into a plethora of foreign languages (for example in Syriac in the 5th century and in Arabic in the 8th century). During the Golden Age of Islam, the Arabs, such as the Persian Avicenna (c. 980-1037), author of *The Book of Healing* and *The Canon of Medicine*, were deeply influenced by Galen, highly valued Galenic treatises and transmitted their appreciation to Western scholars. Galen must have influenced more than any other physician in antiquity the evolution of Western medicine, at least until the Renaissance. His books were translated into Latin and prevailed as classical writings in Europe's finest medical schools. In the 16th century, Galenic works that had been lost

³⁰ Galen, *De anatomicis administrationibus* 1.2.

³¹ Galen, *De anatomicis administrationibus* 3.5.

³² Tertullian, *De Anima* 10.4 και Cornelius Celsus, *De medicina* proemium 23-24. Cornelius Celsus approved of anatomy being performed only on dead humans and not on living, see his *De medicina* proemium 74-75.

³³ Despina Iosif, *Epilepsy in Antiquity*, p. 13.

³⁴ Eusebius, *Historia ecclesiastica* 5.28.13-14.

³⁵ Origen, *Philokalia* passage 2.2.

for centuries were discovered and the Galenic theories returned to the forefront. It should also be noted that anatomy revived in the 16th century while it had been abandoned for centuries. The first signs of the revival of the anatomy are to be found in Italy early in the 14th century, where the bodies of saints were laid down and exhaustively examined to prove their different, almost divine, essence.³⁶ Jacques Dubois (also known as Jacobus Sylvius), Professor of Medicine at the University of Amsterdam, the inventor of injection, and a successful anatomist, was a fervent follower of Galen. When in the middle of the 16th century he identified some anatomical errors made by Galen, he concluded that the human organism must have changed over the centuries simply because it could not have been conceivable that Galen might have made a mistake. At the same time, Paracelsus, Professor at the Medical School of University of Basel and a botanist, burned down the writings of Galen, deeply outraged that generations of doctors were allegedly deceived by him.

Galen was the most prolific medical writer in antiquity. He has not only produced medical treatises but also philosophical and linguistic essays. Extremely valuable are the extensive comments he made on the Hippocratic corpus. At least eighty-three Galenic writings that are recognized as genuine have been preserved up to this day.³⁷ This corpus is really impressive if we

³⁶ Helen King, *Greek and Roman Medicine*, London, 2009, 2001¹, p. 55.

³⁷ One may find quite a few discrepancies in the Galenic corpus. Galen appeared for example to proclaim his strong belief in the importance of diagnoses that come as a result of personal and careful examination of the patient by the physician, which is in contradiction with the information that he kept patients in distant areas and he was taking care of them from a distance (as mentioned earlier in this paper). These discrepancies are either due to not very careful copiers or comments inserted deliberately to works of Galen, or simply reflect a change in Galen's position

consider that it has been estimated that at best only about a third of his entire writings have been preserved. Some of Galen's works were lost during his lifetime in a fire that hit Rome in 192 AD.³⁸ Galen composed his *De Indolentia*, explaining how he remained totally calm and untouched by the great loss, true to the philosophical ideals of the time that recommended apathy when confronted with a disaster.

Galen and the Future of Medicine

Our understanding of health, disease and its treatment have been transformed in the 1800 years since Galen's death. How would he view the present practice of Western medicine? As a

over the time. Galen admitted that he was aware that some disloyal slaves of his had in fact stolen and published a few of his unfinished works without asking for and obtaining his approval, (Galen, *De ordine librorum suorum* 19, 41 in Kühn). At the same time, he was aware that some of his works circulated were distorted, (Galen, *Dyspnoea* C 7, 892, in Kühn) and that interventions in texts were an extremely common practice in antiquity (Galen, *Dyspnoea* C 7, 892, in Kühn). In the light of these remarks, it seems to me rather strange when Galen admitted that he was willing to accept interventions in texts as long as they were respectful, and they preserved the intention of the author, and intended not to distort but only clarify the message, (Galen, *Dyspnoea* C 7, 894, in Kühn). Furthermore, Galen revealed that some of his works were not intended to be published at all, but were his own notes or that of students or colleagues of his, and eventually circulated in his own name without him knowing and that he was informed of their circulation only at a later stage (Galen, *De ordine librorum suorum* 19, 10 and 33-34, in Kühn and *De ordine librorum suorum ad Eugenianum* 19, 49-50 in Kühn). In addition, some of his works did not fully satisfy him and he reworked them at a later stage and published them again annotated or altered, (Galen, *De ordine librorum suorum* 19, 12, in Kühn). Finally, during his lifetime pseudepigraphal works attributed to him were in circulation, as were works originally his in which some of his colleagues and students had made minor changes and additions and promoted them unashamedly as their own, (Galen, *De ordine librorum suorum* 19, 17 in Kühn).

³⁸ Galen, *De ordine librorum suorum* 19, 19, in Kühn.

member of the elective faculty approach to healing, which holds as useful a variety of approaches from other schools, Galen would likely approve of many modern medical treatments. He would certainly endorse a mechanistic, anatomical, physiological and pharmacological bases for medicine. Yet these essential underpinnings of medicine offer incomplete and inadequate ways to maintain health and relieve human suffering. The overreliance on surgical and pharmacological treatments, which drives up health care costs and minimizes environmental, psychosocial and cultural contributions to the balance between health and illness, have led to a rise in complementary and alternative medical practices. Galen would probably support alternative approaches as well, as these provide opportunities for a more holistic view of health preservation and disease treatment.

To better improve health and alleviate suffering, the goals of medical healers from Galen to today, we need to understand why people seek alternative health care as they live the strengths and weaknesses of the mechanical and pharmacological models for disease treatment. Perhaps more fundamentally, we need to better understand the very words we use to describe our medical state (disease, illness and suffering), what it means to heal, and who can be a healer. Finally, by exploring different explanatory and treatment paradigms of healing, we can move forward to a medicine of the future that embraces the parts of both Galenic and modern treatments that improve the human condition.

Alternative and Complementary Medicine

Over the last decades, alternative and complementary medical practices have become more widely accepted by Western medical doctors and even health insurance companies in the United States. Given its widespread use, The National Institute of Health in the United States established The National Center for Complementary and Integrative Health (NCCIH) to “coordinate scientific research on complementary and integrative health approaches”.³⁹ National surveys conducted by the NCCIH show that in 2017, about 14% of people in the USA practice yoga as well as meditation and about 10% receive chiropractic manipulations.⁴⁰ In a broader study conducted in 2012, they found that approximately⁴¹:

- 33% of U.S. adults used complementary health approaches;
- 18% of adults used natural products, defined as dietary supplements other than vitamins and minerals, often to promote wellness rather than for a specific medical problem;
- 50% of respondents experienced pain preceding their participation in the survey.

The rise of alternative medicine is not without its critics who suggest that parts of it have not been rigorously validated by scientific studies (random clinical trials, cohort or case control studies) and that some of its practices can

³⁹ The National Center for Complementary and Integrative Health (NCCIH). <https://nccih.nih.gov/about/ataglance> (accessed 18/11/2018).

⁴⁰ National Health Interview Survey 2017 <https://nccih.nih.gov/research/statistics/NHIS/2017> (accessed 18/11/2018).

⁴¹ National Health Interview Survey 2012 <https://nccih.nih.gov/research/statistics/NHIS/2012/key-findings> (accessed 18/11/2018).

produce harm. In addition, these practices have been criticized on grounds that use of certain alternative practiced are not ethical since their use might deprive patients of proven efficacious practices. A recent study showed that patients who rejected modern medical treatment for curable cancer had a significantly higher mortality.⁴² Some of these objections have been minimized when alternative practices are used in conjunction with modern practices which effectively describes what is often called complementary medicine. Others would suggest that any therapeutic effects from these practices would arise from the placebo effect. Kaptchuk argues that alternative medicine “offer patients a participatory experience of empowerment, authenticity, and enlarged self-identity when illness threatens their sense of intactness and connection to the world”.⁴³

Strengths and Weakness in Modern Western Medicine

It is important to examine the reasons for the rise of complementary and alternative practices considering both the strengths and weaknesses of modern medicine. The Commonwealth Fund, an organization that promotes “a high-performing health care system that achieves better access, improved quality, and greater efficiency, particularly for society’s most vulnerable, including low-income people, the

uninsured, and people of color”⁴⁴, routinely compares health care systems in developed countries. Their 2017 report shows that the USA ranks last in health care system performance compared to 10 other developed countries in Europe as well as Canada and Australia.⁴⁵ This occurs even though the USA spends a far greater percent of its GDP (about 16%) compared to all the other countries (average of about 10%) on health care. The USA ranked last in access, equity, and health outcomes. Areas where the USA excelled were on measures that involve the doctor–patient relationship, wellness counseling, chronic disease management, and end-of-life discussions.

Physicians in the USA are under increasing economic pressure to see more people during the day. Although studies show that the average physician-patient visit has risen from 18 to 20 minutes from 1993-2010,⁴⁶ many would this amount of time inadequate for dialog and relationship building between patient and physician. There is significant economic incentive for physicians to see more people in a day as their pay is often linked to number of procedures ordered and number of patients seen, although more recent reforms link pay to quality of outcomes for populations.⁴⁷ This movement also occurs in psychiatry were fifteen-minute

⁴² Skyler B. Johnson; Henry S. Park; Cary P. Gross; James B. Yu, ‘Complementary Medicine, ‘Refusal of Conventional Cancer Therapy, and Survival Among Patients With Curable Cancers’, *JAMA Oncol* 4(10), 2018, p. 1375-1381.

⁴³ Ted J. Kaptchuk and David M. Eisenberg, ‘The Persuasive Appeal of Alternative Medicine’, *Ann Intern Med* 129, 1998, p. 1061-1065.

⁴⁴ The Commonwealth. <https://www.commonwealthfund.org> (accessed 18/11/2018).

⁴⁵ Eric C. Schneider, Dana O. Sarnak, David Squires, Arnav Shah, and Michelle M. DotyMirror, *Mirror 2017: International Comparison Reflects Flaws and Opportunities for Better U.S. Health Care*. <https://interactives.org> (accessed 18/11/2018).

⁴⁶ Meredith K. Shaw; Scott A. Davis; Alan B. Fleischer, Jr; and Steven R. Feldman, ‘The Duration of Office Visits in the United States, 1993 to 2010’, *The American Journal of Managed Care* 20(10), 2014, p.820-826.

⁴⁷ Rita E. Numerof and David B. Nash. For truly affordable health care, we need to pay for outcomes, not services. *StatNews*. March 29, 2017. <https://www.statnews.com> (accessed 19/11/2018)

patient visit, often centered on managing psychiatric medications, are the norm.⁴⁸

Modern medicine is also highly dominated by laboratory tests for diagnosis and medications for therapy. Unneeded tests drive up health care costs, with patients often supportive of tests without thought of financial cost and their benefit.⁴⁹ Patients are not necessarily against a medication culture. Taking pills to treat conditions is in most ways simpler than making significant life or work style changes. Most people also take multiple vitamin supplements even though medical and scientific studies don't support their efficacy and in addition show potential harm from their use.⁵⁰ Modern dietetic studies often appear to offer conflicting advice about what constitutes a healthy diet. Americans still consume large quantities of meat even though definitive studies suggest a diet low in meat and high in vegetables, grains and olive oil (Mediterranean Diet) promotes health.⁵¹

In summary, there is a complex relationship between the patient and the health care system in the United States. Patients both like and dislike a system that relies on laboratory diagnosis and pharmaceutical treatment as they embrace alternative therapies alone or in complementation with modern practices. As such, it is probably no different than what

occurred throughout history when traditional medicines would coexist with state-sanctioned care, and in which patients would choose health care consistent with what they learned in family settings and financial resources available to them and to the state. A modern example occurred in China. When Mao Tse Tong came to power, he wished to rid China of old influences and that included Traditional Chinese Medicine. Later, recognizing the financial resources required for that conversion, and the need to unite his people under a shared culture with unique historical, political, and legal foundations,⁵² he changed his description of Traditional Chinese Medicine from "collected garbage" to a "treasure house".⁵³

Ancient and Modern Healing

People, ancient and modern, differ little in genetic makeup and the characteristics that emerge from their genes. The amazing advances in technology, philosophy, literature, proto-science and culture that were developed, and which emerged from the ancient Western world clearly demonstrate that human intellect, cognitive abilities, and the underlying psychosocial desires of people varied little over time. Advances since that time have been based on accumulated knowledge and competition, with the advances occurring in a nonlinear fashion over time. Hence human desires for healing by society-sanctioned healers and the bases for many types of healing have changed little over time. To understand and define healing over time, terminology becomes important. From what

⁴⁸ David Rettew. Psychiatry's Med Check: Is 15 Minutes Enough? The history and perils of condensed, fractioned, mental health care. *Psychology Today*. Nov 10, 2015. (accessed 18/11/2018).

⁴⁹ Marshall Allen. Unnecessary Tests and Treatment Explain Why Health Care Costs So Much. *Scientific American*, November 29, 2017; www.scientificamerican.com (accessed 18/11/2018).

⁵⁰ Multivitamin/mineral Supplements: Fact Sheet for Health Professionals. National Institute of Health, Office of Dietary Supplement. <https://ods.od.nih.gov> (accessed 12/1/18)

⁵¹ Donato F. Romagnolo, PhD, MSc and Ornella I. Selmin, 'Mediterranean Diet and Prevention of Chronic Diseases', *Nutr Today*, 52, 2017, p. 208–222.

⁵² Matthew H. Liang, Philip S. Eichling, Lawrence J. Fine, and George J. Annas, 'Chinese Health Care: Determinants of the System', *American Journal of Public Health* 63, 1973, p. 102-110.

⁵³ Paul U. Unschuld, *Medicine in China: A History of Ideas*, University of California Press, 1985, p. 252.

are patients being healed? To understand that, it is best to understand our modern concepts of illness as differentiated from disease.

Illness and Disease

People often use these words interchangeably, but modern science allows a more nuanced understanding. Let's first consider the word disease, which denotes something more serious than illness and relates to perturbations in normal biological process, form and function. A disease can be defined as an alteration or change from a normal equilibrium condition of biomolecules. The changes cause alterations in cell structure and function,⁵⁴ leading to changes in organ, organ systems, and body form, activity and function.⁵⁵

An example might clarify this description and its relation to illness. Type 1 diabetes is a disease caused by destruction of beta islet cells in the pancreas, leading to low or no insulin secretion into the blood. Insulin normally binds to a protein on the surface of cells (muscle cells for example), facilitating glucose (a sugar) import into them for energy use. The disease starts with an autoimmune destruction of the islet cells, probably after a viral infection that elicits an immune response to a viral protein and a similarly structured human protein. The primary medical treatment is molecular in nature, the timed injections of exogenous insulin to replace missing insulin. Dietary changes to promote predictable and steady levels of carbohydrates are also required.

⁵⁴ Franklin G. Miller, Luana Colloca, and Ted J. Kaptchuk, 'The placebo effect: illness and interpersonal healing', *Perspect Biol Med*, 52(4), 2009, p. 518. doi:10.1353/pbm.0.0115.

⁵⁵ Cecil G. Helman, 'Disease versus illness in general practice', *Journal of the Royal College of General Practitioners* 31, 1981, p. 548-552.

Now imagine a population of people that have these molecular and cellular alterations. Would each experience the disease in the same way? The answer is no, as each person brings a unique constellation of genetic, environmental, social, cultural, religious and experiential factors into the lived experience of the disease. Some people may be more biologically tolerant of decreases in serum glucose levels, while others might be more committed to adherence to suggested pharmaceutical and life-style treatments. Hence people might suffer to varying degrees with the same disease. Illness then becomes the lived experience of a disease. Some people with a disease might experience few symptoms while other extreme ones. Some would suffer greatly, others little.

In a parallel fashion, imagine a disease that might have been postulated years ago but which is no longer diagnosed and concomitantly no longer considered a disease. As an example, consider chlorosis,⁵⁶ a disease of women characterized by lethargy, gastric disturbances and poor appetite. In the 16th and 17th centuries, it was a condition linked to unmarried woman and not having sexual relationships. This diagnosis clearly is socially defined. When it was diagnosed, some would have presumably suffered significantly while others not. Human suffering, a characteristic of life, can occur in the absence of a demonstrable disease. For such cases, psychosocial and cultural factors would largely be causative of suffering and hence of the illness.

Other diseases, although ultimately associated with biological anomalies, might arise

⁵⁶ Keith Wailoo, *Chlorosis Remembered: Disease and the Moral Management of American Woman in Drawing Blood: Drawing Blood: Technology and Disease Identity in Twentieth-Century America*, Johns Hopkins University Press, revised ed. edition 1999, p. 17-25.

primarily from psychosocial, cultural, and lifestyle factors that lead to the biochemical and cellular anomalies associated with an emergent disease. Type II diabetes, characterized by insulin resistance (insulin is present but does not elicit the appropriate cellular response) is often considered a disease of modern civilization. Biochemically, it is associated with altered fat metabolism, obesity, and a constellation of other metabolic abnormalities known as metabolic syndrome. Adopting a “nonwestern” diet, increasing physical activity and exercise, sitting less and lowering stress are collectively therapeutic, suggesting that chronic illness and associated suffering can originate from non-biochemical factors.⁵⁷

Types of Healing

What does it mean to heal? Kaptchuk et al have suggested three types of healing, natural, medical and interpersonal.⁵⁸

Natural Healing: Humans can live to ages over 100. This would not be possible unless biological mechanisms exist to protect us from disease and repair harm that occurs. The immune and clotting systems are central to our protection and longevity as we live in a world filled with lethal pathogens and we routinely injure our bodies. Yet we heal from these independent of medical treatment until our restorative system can no longer cope. Imagine an injury associated with pain and temporary decrease in bodily function. We would most likely visit a healer (or attempt healing on our own) at the peak of

suffering (for instance maximal pain or fever). If we visit a healer at that point, we would interpret subsequent healing as derived from specific medical treatment. Yet the symptoms and suffering would in most cases resolve after their peaks. Healing then would have occurred in the absence of medical care due to natural biological mechanisms. This type of healing could occur even if a person were unconscious.

Medical Healing: This involves intervention by trained professionals that helps reestablishes the non-disease state. These interventions include surgery and specific medicines such as chemotherapy to kill cancer cells, antibiotics to kill bacteria, and antivirals to prevent viral replication. This would also include adjunctive therapies such as physical and occupational therapy, to reduce pain and restore activity and function. Alternative therapies with the same goals for certain diseases would include acupuncture, chiropractic, and herbal therapies. Specific medicines used by modern physicians (artemisinin to treat malaria, for example) have been actually derived from traditional herbal therapies.⁵⁹ These surgical and pharmaceutical treatments would be efficacious in unconscious patients.

Interpersonal Healing: This uniquely different type of healing requires the establishment of a relationship between a healer and a patient and as such would not work in an unconscious patient. If such therapies require a relationship, that it would follow that any type of therapy could produce healing if the treatment was amenable to nonsurgical and nonacute-infectious disease. All psychotherapies would evoke this kind of healing.

⁵⁷ Nita G Forouhi, Anoop Misra, Viswanathan Mohan, Roy Taylor & William Yancy, ‘Dietary and nutritional approaches for prevention and management of type 2 diabetes’, *British Medical Journal* 2018, 361 doi: <https://doi.org/10.1136/bmj.k2234>.

⁵⁸ Ibid

⁵⁹ Youyou Tu, Artemisinin-A Gift from Traditional Chinese Medicine to the World (Nobel Lecture). *Angewandte Chemie International Edition*, 55, 10210-10226 (2016)

Frank and Frank have reviewed common characteristics of therapies that involve interpersonal healing, from shamanic healing to modern day psychotherapy and found similarities.⁶⁰ Specifically, they found four common characteristics of modern psychotherapy required for healing:

1. An emotionally connecting relationship with the healer. This was the most important of all. Patients must think that the therapist is well trained and cares about them;
2. Sanctioned places of healing. This would increase patient's expectation of healing and offer higher perceived credentials to the therapist;
3. A rational conceptual healing scheme or myth accepted by patients. Patients need to believe that foundation of the therapist's healing ideas are based on valid and sound ideas (scientific, religious, etc.) often associated with highly regarded individuals;
4. A procedure or ritual that is accepted by patients.

These characteristics are also essential in any system of learning as well, which is also enhanced by strong relationships between teacher and learner. In effect, healing from psychotherapy derives from new intellectual and emotional learning by the patient, derived from a relationship between the healer and patient.

Since interpersonal healing is a component of all medical treatments, then the four characteristics above would also pertain to modern and ancient medicine as well. Placebo healing has its basis in interpersonal healing.

⁶⁰ J.D. Frank & J. D. Frank, *Persuasion and Healing: A Comparative Study of Psychotherapy*, Johns Hopkins University Press, 3rd edition, 1993.

This type of healing is not likely to be effective without other interventions in acute infectious disease, in traumatic injury or serious cellular, organ, and organismal anomalies.

Modern medical doctors, viewed as the ultimate modern healers, should also realize the interpersonal nature of their work. Interviews with 40 physicians and ten practitioners of complementary/alternative medicine reveal what all healers should do.⁶¹ Note that they encompass the above characteristics.:

1. Do the little things: introduce yourself, greet everybody, shake hands, smile, make eye contact, give your undivided attention, be human and personable;
2. Take time and listen: be still, quiet, interested and present;
3. Be open: be vulnerable, brave, look for the unspoken;
4. Find something to like, to love: take the risk, stretch yourself and your world, think of your family;
5. Remove barriers: practice humility, pay attention to power and its differentials, create bridges, be safe and make welcoming spaces;
6. Let the patient explain: listen for what and how they understand, for the fear and for the anger, for expectations and for hopes;
7. Share authority: offer guidance, get permission to take the lead, support patients' efforts to heal themselves, be confident;
8. Be committed and trustworthy: do not abandon, invest in trust, be faithful and thankful.

⁶¹ Larry R. Churchill, PhD, and David Schenck, 'Healing Skills for Medical Practice', *Annals of Internal Medicine* 149, 2008, p. 720-724.

These traits were certainly practiced by Galen, otherwise he would not have had the reputation he acquired and sustained.

Paradigms of Healing

Thomas Kuhn, in his seminal work *Structures of Scientific Revolution* defines a paradigm as a common conceptual and consensual framework of ideas, methods and values that define a mature scientific field.⁶² Paradigm shifts, he argues, occur when usually young members of a scientific community question the consensual explanations offered by their community in the presence of an accumulation of anomalies that cannot be explained by the existing paradigm.

When a new paradigm is accepted, older ones are either discarded (phlogiston theory of burning, Aristotelian views of motion) or are viewed as limiting cases (Newton's Theory of Gravity) of a more general theory (Einstein's view of gravity as a curvature of space by massive objects). If these concepts are applied to the history of medicine, several explanatory and treatment paradigms have developed over history. Some generally accepted paradigms well known through medicine are listed in the table below.

Paradigm	Treatment
Religious	exorcisms, prayers, offerings
Four Humors	bloodletting, diet, botanical cures, exercise, diet, surgery
Nutrition	Food, supplements
Infection	Nutrition, herbs, potions, Elixirs, antibiotics, antivirals
Autoimmune	Steroids, anti-inflammatories, Immunosuppressants, transplants

⁶² Thomas Kuhn, *The Structure of Scientific Revolutions*, University of Chicago Press, 4th edition 2012.

Genetic	drugs, gene therapy (replacement, editing)
Psychosocial	poverty, habits, culture
Environmental	pollution, toxins, climate change
Ecological	Probiotics (vs antibiotics);

Compared to the natural sciences, most of these paradigms and associated treatments methods coexist in health care treatments in most of the world. Brief discussion of the role religion and humoral treatments in health follow as the rest are widely recognized if not adopted in modern medical practices.

Religion: Studies have shown that spirituality is associated with health. Konig outlines several reasons.⁶³ Religion helps people cope with stress. It proscribes ways to live socially within groups. Most religions call people to love others as themselves and be compassionate to less fortunate. Judeo-Christian traditions call people to treat their bodies as temples. These psychological, social and behavioral characteristics of personal spirituality would promote mental and physical health.

Humoral Medicine: Although humoral medicine as developed by ancient Greeks and championed by Galen is not practiced to any significant extend, its methods of treatment are not inconsistent with those from the other paradigms. Galen used techniques (other than medical laboratory tests) that most today would still espouse. He used pulse diagnosis, examined body secretions and excretions for imbalances in humors, and would listen carefully to his

⁶³ Harold G. Koenig, 'Religion, Spirituality, and Health: The Research and Clinical Implications', *ISRN Psychiatry*, Volume 2012, Article ID 278730, 33 pages. doi:10.5402/2012/278730

patients' stories and histories for clues that would lead to accurate diagnoses.⁶⁴

The humor blood had special status in Galenic medicine and an excess was associated with disease, so bloodletting was a common treatment. Bloodletting presumably killed more than it might have helped given the likely infections that ensued. Nevertheless, it was used for over 2000 years and was even included in a 1942 medical textbook by Sir William Osler for treatment of acute pneumonia.⁶⁵ If bloodletting did have efficacy in some, which might be a reason for its persistence, it may have been because pathogenic bacteria need the iron carried in the blood by hemoglobin.⁶⁶ Bloodletting would reduce the supply of heme iron and hence have some antibacterial effects.

Galen also discussed the effect of mind on the body and the body on the mind, which presages the more modern holistic view that emotional and physical states affect each other and are non-separable from each other. He believed that the "soul" consisted of both a rational and non-rational part. The nonrational part could be divided into a spirited and one from which desire sprung. Hence it was tripartite. The psyche was distributed in a sense throughout the heart, brain and liver⁶⁷ which are effectively linked by three conduits, nerves, arteries and veins.⁶⁸

⁶⁴ Susan Mattern, 'Perspectives - The art of medicine: Galen and his patients', *The Lancet* 378, 2011, p. 478-479.

⁶⁵ D.P. Thomas, 'The demise of bloodletting', *J R Coll Physicians Edinb* 44, p. 201472-7. <http://dx.doi.org/>

⁶⁶ Tracey A. Rouault, 'Pathogenic Bacteria Prefer Heme', *Science* 305, 2004, p. 1577-1578. doi: 10.1126/science.1102975

⁶⁷ John B. West, 'Galen and the beginnings of Western physiology', *Am J Physiol Lung Cell Mol Physiol* 307, 2014 p. L121-L128.

⁶⁸ Singer, P. N., 'Galen', *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), Edward N. Zalta (ed.) <https://plato.stanford.edu> (accessed 11/29/2018).

For Galen, the brain housed rational thought, added animal spirit to the circulation and controlled perception and voluntary motion. The heart housed the spirited soul, was the source of the vital spirit and controlled involuntary motion such as the pulse and breathing. Emotions such as anger, fear, anxiety arose from the heart. The liver was the source of desire, added natural spirit to the blood, and produced blood and nutrition. Hence physical states and emotions states are linked. Mental states could be caused or at least strongly linked with physical states, as clearly expressed by the four personality/emotional states linked with specific humors. Likewise, he argues that the soul does not leave the brain under various physical states, suggesting their dependence if not equivalence.

Galen believed that some diseases had a mental origin. He spoke much about the role of anger and anxiety in the etiology of disease. High levels of anxiety could lead to an excess of black bile which in turn would turn into melancholia, one of the four temperaments.

A new paradigm of healing

From the above discussion, it should be evident that effective medical healers throughout time must have adopted a holistic approach to an individual to promote health and treat both disease and the lived effect of disease, illness. In that sense, modern medicine has much in common with Galenic medicine in that they both understand the linked effects of environmental, psychosocial, spiritual and nutritional factors on disease prevention and healing. Patients wish to be treated with respect as an individual and with a holistic view of them in a complex web of

interactions and environment in which they live their lives.

In the last decade, we have learned that the human body, is comprised of about 37 trillion cells which must work in harmony.⁶⁹ The neuron (cells in the human brain) are estimated to make 100 trillion connections among the brain cells.⁷⁰ Compare this with the estimated 2 trillion galaxies in our universe⁷¹ and it becomes clear that each human body is a universe in itself. The DNA (genome) within those cells encodes about 22,000 genes, small sections of our genome that are decoded to form the proteins (proteome) required for life. In the last decade, we have learned that there are about the same number of much smaller bacterial and fungal cells on the surface of our skin and inside our bodies (mouth, gastrointestinal system, etc.) as there are human cells.⁷² These cells (the microbiome) contain DNA that collectively encode over 100-times the number of human genes. Studies over the last decade have shown that changes in our gut biome can affect our chances of acquiring cardio-

vascular disease, obesity, autoimmune disease and can affect brain function.

A simple example illustrates microbiome effect on cardiovascular health. A small molecule in blood, TriMethylAmine N-Oxide (TMAO), has been linked to increased risk of cardiovascular disease.⁷³ The molecule is made in the gut by bacteria, which convert a molecule found in high concentration in red meat, carnitine, to TMAO. TMAO then enters the circulation and affects cardiovascular health.⁷⁴ If patients are given antibiotics that kill gut bacteria that make TMAO, the levels of blood TMAO decrease. Vegetarians have low levels of TMAO. If given meat, over time, their blood levels of TMAO increase.

Conversely, many gut bacteria make small molecules which keep the body's own gut immune system, which prevents harmful bacteria from causing disease, from harming the body itself and causing autoimmune disease.⁷⁵ Patients with inflammatory bowel disease, which can lead to cancer, appear to have an imbalance in the species of bacteria their gut, which promotes

⁶⁹ Eva Bianconi, Allison Piovesan, Federica Facchin, Alina Beraudi, Raffaella Casadei, Flavia Frabetti, Lorenza Vitale, Maria Chiara Pelleri, Simone Tassani, Francesco Piva, Soledad Perez-Amodio, Pierluigi Strippoli & Silvia Canaider, 'An estimation of the number of cells in the human body', *Annals of Human Biology* 40, 2013, p. 463-471.

⁷⁰ Carl Zimmer, '100 Trillion Connections: New Efforts Probe and Map the Brain's Detailed Architecture', *Scientific American*, January 2011, p. 59-63.

⁷¹ Ray Villard, Mathias Jäger and Christopher Conselice. Hubble Reveals Observable Universe Contains 10 Times More Galaxies Than Previously Thought. http://hubblesite.org/news_release/news/2016-39 (accessed 11/30/18)

⁷² Ron Sender, Shai Fuchs and Ron Milo. Revised Estimates for the Number of Human and Bacteria Cells in the Body. *PLOS Biology* | DOI:10.1371/journal.pbio.1002533 August 19, 2016. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4991899/pdf/pbio.1002533.pdf> (accessed 12/1/18)

⁷³ Randrianarisoa, E., Lehn-Stefan, A., Wang, X., Hoene, M., Peter, A., Heinzmann, S. S., Zhao, X., Königsrainer, I., Königsrainer, A., Balletshofer, B., Machann, J., Schick, F., Fritsche, A., Häring, H. U., Xu, G., Lehmann, R., Stefan, N. (2016), 'Relationship of Serum Trimethylamine N-Oxide (TMAO) Levels with early Atherosclerosis in Humans', *Scientific reports* 6, 26745. doi:10.1038/srep26745.

⁷⁴ Robert A Koeth, Zeneng Wang, Bruce S Levison, Jennifer A Buffa, Elin Org, Brendan T Sheehy, Earl B Britt, Xiaoming Fu, Yuping Wu, Lin Li, Jonathan D Smith, Joseph A DiDonato, Jun Chen, Hongzhe Li, Gary D Wu, James D Lewis, Manya Warrier, J Mark Brown, Ronald M Krauss, W H Wilson Tang, Frederic D Bushman, Aldons J Lusis & Stanley L Hazen, 'Intestinal microbiota metabolism of L-carnitine, a nutrient in red meat, promotes atherosclerosis', *Nature Medicine* 19, 2013, p. 576-585.

⁷⁵ Dachao Liang¹, Ross Ka-Kit Leung, Wenda Guan and William W. Au, 'Involvement of gut microbiome in human health and disease: brief overview, knowledge gaps and research opportunities', *Gut Pathog* 10, 2018, p. 3.

those disease. For these disease, antibiotic treatments for infectious disease may unintentionally alter the balance of health and disease promoting microbes in our body, leading to future diseases. Medicine is moving forward to promote a microbiome optimal for health. Probiotics (foods to promote that) will become increasingly important to health maintenance and disease treatment and prevention. Hippocrates said, “Let food be thy medicine and medicine be thy food”.⁷⁶ He was right.

Summary

Modern medical treatment must move to a brand-new kind of holistic view of health, disease and illness in which the totality of an individual is treated within the totality of the environment in which they live. This must happen not only to improve the quality of health care but also to make medicine more sustainable. We have to recognize that humans are really a complex ecosystem that we share internally and externally with a plethora of micro- and macro-organisms. We are individually complex ecosystems living in complex ecosystems. To promote human health, as well as the health of our planet, we are called upon to learn about the interactions of life and the environment within us, on us, and outside of us. We must become stewards of all life and realize our part in the complex, interconnected web of life. This new paradigm is consistent with Galen’s notions of balance, moderation, and use of proper nutrition and food.

This call sounds very scientific, but it must be accompanied by healers who understand the

vast interconnections, both microbial, biochemical and psychosocial that determine the balance between health and disease. The requires the practice of medicine as both a science as well as art. Galen did just that with the science he had available to him.

A quote from Mattern summarizes Galen and his art of medicine:

“Galen’s writings reveal him as a conscientious practitioner, a shrewd diagnostician, and a tireless interrogator of his patients... If everyone who undertook to teach and write something”, as he writes, “would first demonstrate these things with deeds, overall few false things would be said”. Western medicine has long dismissed Galen’s physiological theories as quaint; but he remains a worthy founding figure for the clinical practice of medicine”⁷⁷

⁷⁶ Richard Smith, ‘Let food be thy medicine...’, *British Medical Journal* 328, 2004, p. 7433.

⁷⁷ Ibid