

ACUPUNCTURE: A SCIENCE-BASED ASSESSMENT

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Introduction

Despite a lack of well-designed clinical studies supporting its efficacy, public interest in acupuncture has grown significantly during the past 40 years. Proponents of acupuncture repeatedly make the unjustified claim that acupuncture is an efficacious and cost effective complement to conventional medicine. These claims rely on a body of dubious and discredited research data.

During the past ten years, however, researchers have begun to take a more rigorous look at acupuncture, designing studies that are properly randomized and adequately controlled for placebo effect. Though research is ongoing, an increasingly robust body of literature has accumulated showing that acupuncture has no intrinsic clinical value. The Cochrane Collaboration, perhaps the world's most respected evaluator of medical literature, recently undertook a systematic review of acupuncture research. In 2008 the results of the Cochrane analysis were included in a summary of recent acupuncture research by Edzard Ernst in *The American Journal of Medicine*:

After discarding reviews that are based on only 3 or fewer primary studies, only 2 evidence-based indications emerge: nausea/vomiting and headache. Even this evidence has to be interpreted with caution; recent trials using [...] placebos suggest that acupuncture has no specific effects in either of these conditions. (Ernst, 2008, 1027)

At the same time that empirical evidence has mounted against it, however, acupuncture has become increasingly embedded within the American healthcare system. In recent decades, positive news coverage—typically based on anecdotal stories and simplistic reporting of the medical research—has represented acupuncture as a gentle and natural alternative to what is seen as the harsh sterility of conventional medicine. Increased acceptance of acupuncture as a

legitimate therapy is part of a cultural movement towards complementary and alternative medicine (CAM). The National Center for Complementary and Alternative Medicine (NCCAM) defines CAM on its Web site as a set of therapeutic practices “not generally considered to be part of conventional medicine.” A 2007 NCCAM study suggests that nearly 40% of the American public had used some form of CAM during a 12 month span. (Barnes, Bloom, & Nahin 1)

The public’s perceived interest in alternative medicine has led to a flourishing new alternative medicine industry—a nexus of governmental, academic and medical provider institutions that promote alternative cures. NCCAM, a NIH-administered research center founded in the 1990s, now coordinates high profile research on alternative medicine. The legacy of NCCAM on the alternative medicine movement has been complex. The standards of acupuncture research had been traditionally notoriously poor (Ernst, 2008, 1027) and recent research funded by NCCAM appears to bring some measure of rigor to acupuncture research. This has led to a dramatic deflation of the claims of acupuncture proponents. At the same time, the erosion of evidence supporting acupuncture has not stopped NCCAM from funding integrative medical clinics that include acupuncture. The legitimizing effect of NCCAM has fateful repercussions for our healthcare system and violates our longstanding tradition of science-based medicine—a tradition responsible for staggering improvements of health and longevity for billions of people worldwide the past century.

The Center for Inquiry is deeply concerned that the newfound prominence of unproven and unscientific therapies like acupuncture diminishes the primacy of science in our health policy discourse and degrades our healthcare system. We believe the uncritical adoption of acupuncture will ultimately add incalculable costs to our already overburdened healthcare system and will lower standards of medical training and treatment. More fundamentally, the expansion

of alternative medical institutions—increasingly funded by the federal government—lends dangerous and undue authority to pseudoscience, degrading respect for science in the public realm.

“Astrology with needles”—history and theory

Traditional acupuncture involves the insertion of needles at hundreds of specified locations, known as meridians, throughout the body. In traditional acupuncture practice, the insertion of needles at these locations is intended to adjust the flow of *qi* (usually translated into English as “energy.”) Like the ancient Greek concept of *pneuma*, *qi* is a sustaining life force that can neither be seen nor measured. (Kavoussi, Ben, Focus on Alternative and Complementary Therapies) The goal of acupuncture is not to heal specific pathologies but to restore systemic balance to the patient’s reserve of *qi*. (Ernst and Sing 43-46) In order to recalibrate the body’s system of *qi*, needles are inserted at the correct meridians in order to block the appropriate channels. Because more than one channel of *qi* may be out of alignment, multiple insertion sites may be necessary. Diagnosis in acupuncture incorporates not just a review of the patient’s complaints but also a close inspection of skin color, pulse and coating of the tongue. From clues gathered during this inspection, the practitioner makes a determination as to whether the patient is “hot” or “cold,” “damp” or “dry”—the relative hotness and dryness of the patient helping determine which *qi* channels require adjustment. (Ibid. 43-46) Acupuncture is part of an integrated system of traditional Chinese medicine that also includes herbal medication.

Many people receiving acupuncture for the first time are surprised when needles are inserted nowhere near the location of the primary complaint. The treatment for ailments of the head or lungs will typically involve inserting needles into meridians far removed from the head

or lungs. There is substantial evidence that acupuncture's clinical system is based not on biological considerations but on astrological ones—with channel and meridians designed to mimic in miniature the Chinese astrological system—prompting one writer to dismiss acupuncture as “astrology with needles.” (Ben Kavoussi, 2009, Science-based Medicine blog) Citing the *Yellow Emperor's Canon of Medicine*, the formative text of traditional Chinese medicine, Kavoussi shows how explicitly the body is schematized according to astrological principles:

The belief in a ‘cosmological correspondence between the houses of the Chinese zodiac and the chinglo channels’ seems to be based on the doctrine of ‘as above, so below’, which stipulated that everything in the heavens has its counterpart on earth and also in man. The doctrine is explicitly stated in the *Yellow Emperor's Canon of Medicine* as ‘Heaven is covered with constellations, Earth with waterways, and man with channels.’ (Kavoussi, Ben, Focus on Alternative and Complementary Therapies Web site)

Kavoussi's essay persuasively argues that the tendency to see acupuncture and conventional medicine as a fortuitous blending of opposing virtues is based on sheer cultural projection. It posits an idealized Asian culture that excels where Western culture lacks—offering wisdom rather than cleverness, holism rather than reductionism.

A more accurate—and deflating—assessment of acupuncture is that it looks astonishingly similar to forms of medicine that conventional medicine long ago abandoned. Though acupuncture proponents propose this therapy as a counterpoint to conventional medication, its resemblance to medieval European medical theories is striking¹. The traditional Chinese diagnostic system of hotness and dampness would not have seemed unfamiliar to the 17th century

¹ The following account of the history of acupuncture is heavily indebted to Ben Kavoussi in “The untold story of acupuncture,” found at <http://beta.medicinescomplete.com/journals/fact/current/fact1404a05t02.htm>

European physicians who first encountered Chinese medical texts. There would have been nothing revolutionary about the notion of diagnosing patients according to their hotness/coldness and dampness/dryness. The 17th century European concepts of medicine were largely based on the speculations of ancient Greek physicians like Galen. Classical Greek medical theory posited that illness was caused by imbalances of one of four humors in the body: blood, phlegm, black bile, and yellow bile. Each humor carried with it a range of associations—organs of the body, elements, seasons of the year—as well as qualities of hotness and dryness. The classically-trained European physician would have used bloodletting, purging, and herbal remedies to influence hotness/coldness and dampness/dryness to restore the balance of humors. The classical European tradition also included a supernatural life force similar to *qi* called *pneuma*. Even the most notorious practice of archaic European medicine, bloodletting, can be seen as analogous acupuncture. In fact, the Chinese ideogram for acupuncture is based on the symbol for bloodletting. Far from being a revolutionary new concept, acupuncture was more properly seen in Europe as a minor variation of existing—and, as we now know, wholly ineffective—intuitions about illness.

The integration of acupuncture into biomedicine requires special support because the two systems are fundamentally irreconcilable. The integration of acupuncture into medieval European medicine, however, would have been straightforward. During the 17th century the conceptual framework of the European physicians was similarly influenced by spiritual considerations. It was at this historical moment that the blending of traditional western and eastern medicine would have been most propitious. European medicine instead moved towards a biomedical model of disease. Shorn of its cultural trappings, the integration of acupuncture into conventional medicine is entirely anachronistic. It is the equivalent of teaching today's students

of science-based medicine to correct imbalances of phlegm through medieval techniques of bloodletting. Proponents of acupuncture present integrative medicine as a blending of eastern holism with western reductionism. This view requires a willful historical blindness. The actual function of integrative medicine is to mix proven biotechnologies with long discarded folk remedies. Integrative medicine does not blend east with west; it blends modern with medieval.

Even in China, acupuncture's status has traditionally been marked by ambiguity. Though it is often presented as utterly central to Chinese culture, for much of Chinese history acupuncture was discouraged by the ruling class. Within China, acupuncture has generally been dismissed as a folk medicine, largely practiced by and for the rural poor. Perhaps because of its practice as folk medicine, the teaching of acupuncture in Chinese medical schools was actually discouraged—and in 1822 the teaching of acupuncture at China's leading medical school was banned outright by the imperial authorities. (Ibid.) Acupuncture was kept alive in the rural parts of China where trained doctors were rare. The practice of acupuncture eventually fell into centuries-long abeyance, remembered largely as a quaint and largely forgotten folk practice. In the 1930s, acupuncture experienced a minor revival in China when a pediatrician named Cheng Dan'an surmised that acupuncture may have some neurological basis. This represented one of the first efforts to ground acupuncture in a rational biomedical explanation, though acupuncture soon quietly retreated into the background again.

The resurrection of acupuncture in China happened only recently, in 1949. Facing a shortage of qualified physicians in the first few years of the new communist state, General Mao Zedong embraced acupuncture and other forms of traditional medicine as a stopgap method of providing healthcare to the rural poor. Even this embrace of acupuncture was marked by diffidence. Mao had little faith in the "barefoot doctors" and planned for these folk doctors to be

replaced by scientifically trained physicians as soon as possible. (Ernst and Sing 46-47) In fact, between 1900 and 1997 life expectancy in China more than doubled from 30 years to 71 years. (People's Daily Website) This staggering increase in longevity did not happen because of a retrenchment into traditional therapies like acupuncture. The true medical revolution in China resulted from a clear-eyed embrace of western biomedicine. According to Chinese demographer Zhao Baohua, the 240% increase in life expectancy in China, "can be attributed to the advancement of science and technology, especially in medical science." (Ibid.) Proponents of acupuncture want to turn back the clock, integrating ineffective folk remedies into a system of conventional medicine that has been miraculously effective—especially in China.

Contemporary interest in acupuncture stems from a story written by reporter James Reston. Reston, a reporter for the *New York Times*, had accompanied Secretary of State Henry Kissinger in 1971 to China in preparation of President Nixon's historic visit there. (Ernst and Sing 47) Shortly after arriving, however, Reston experienced an acute case of appendicitis and was taken to a Chinese hospital. Two days after his procedure, he complained of postoperative pain, which was treated with acupuncture. In the article he wrote following his trip, "Now about my operation in Peking," Reston explained how needles were inserted into his right elbow and just below both knees. (Ibid 47-8) Reston reported that the pain receded and his body quickly healed, attributing this outcome to his treatments of acupuncture. Reston's article ushered a wave of interest in Chinese medicine, with physicians from around the world suddenly traveling to China to investigate this 3000 year old therapy. Reston's claims, of course, were purely anecdotal. In the article, Reston admits that he was being treated with painkillers in addition to acupuncture. Indeed, his miraculous healing almost certainly had less to do with acupuncture and more to do with the body's own tendency to heal itself. Even with no treatment at all, most

postoperative patients recovering from routine surgery will experience diminished pain in reasonably short time.

Reston's article was published during a cultural moment when increasing numbers of citizens were expressing a more critical view of science and technology. The 1960s countercultural critique of modern technology was beginning to work its way into the culture at large, spurring an interest in ecology, pacifism and natural foods. As millions turned their backs on modern science and technology, the costs of such modern medicine came into question. (Unshuld 1995) The rediscovery of acupuncture fulfilled a latent desire for a medicine that is more gentle, spiritual and "natural." Conventional medicine, which had for generations represented the progress of industrial civilization, was now seen by some as outmoded and spiritually degrading. This critique, which originated largely outside of the medical system, seems increasingly to be able to find a home within the medical establishment.

The Unraveling of the Acupuncture Revolution

As the new millennium dawned there emerged stirrings of hope that a medical revolution may be imminent. Between 1997 and 2003 evidence suggested that acupuncture was on the verge of entering standard medical practice. This evidence held out the promise of a newly integrated medicine that would combine intellectual power of cutting edge science with intuition of alternative medicine. It was during these years that two world renowned government health organizations, the World Health Organization (WHO) and the National Institutes of Health (NIH), issued reports that endorsed acupuncture as an effective therapy for a range of medical complaints. Though the NIH cautioned that more research was needed, the results certainly seemed encouraging:

[P]romising results have emerged, for example, showing the efficacy of acupuncture in adult postoperative nausea and vomiting and in postoperative dental pain. There are other situations such as addiction, stroke rehabilitation, headache, menstrual cramps, tennis elbow, fibromyalgia, myofascial pain, osteoarthritis, low back pain, carpal tunnel syndrome, and asthma, in which acupuncture may be useful as an adjunct treatment or an acceptable alternative or be included in a comprehensive management program. (NIH Acupuncture Consensus Statement Online)

This broad endorsement of acupuncture seemed to open the possibility a new epoch in healthcare.

In the years since their publication, these documents continue to be cited as evidence that acupuncture should be integrated into standard medical practice. Proponents of the Federal Acupuncture Coverage Act of 2009 (H.R. 646), a bill sponsored by New York Representative Maurice Hinchey that would require Medicare to cover acupuncture treatments, continues to use the language of the NIH report to justify incorporating acupuncture into the public health system. In a letter to his Congressional colleagues asking for their support of H.R. 646 Rep. Hinchey explicitly refers to the NIH's supposed endorsement of acupuncture:

We all represent constituents suffering from chronic pain, migraines, osteoarthritis, addiction, carpal tunnel syndrome, and fibromyalgia, or recovering from the effects of a stroke... Did you know that the National Institutes of Health has found acupuncture to be an effective treatment for these conditions? (Hinchey)

Garnering only five cosponsors when this bill was first introduced in 1993, by 2006 support had grown to 51 cosponsors. (H.R. 646 Fact Sheet) Though prospects for passage of this bill remain doubtful, it shows the legitimizing power of the 1997 NIH consensus statement—a report that seemed to open the door for the incorporation of acupuncture into our most important healthcare institutions.

The state of evidence, however, has moved inexorably away from positions in the WHO and NIH document. The WHO and NIH documents rested their conclusions on a body of literature that many researchers now consider compromised by flawed methodology. The WHO report, which researcher Edzard Ernst has called “perhaps the most obviously over-optimistic overview” of acupuncture (Ernst, 2006, 129) included a large number of studies from China, where the communist-controlled government maintained an interest in promoting acupuncture. The Chinese studies were particularly poor, some claiming outlandish improvements in health quality that should have been cause for exclusion from the review. (Ernst and Singh 71-72)

The NIH study has been strongly criticized for the composition of its review panel. The panel was dominated by acupuncture advocates and practitioners. Not one researcher who had published negative studies was included on the panel. (Sampson, Wallace) The NIH study was also hamstrung by a methodological problem that pervades acupuncture research: the difficulty of finding a convincing placebo. Because acupuncture involves the sensation of puncturing the skin with needles, creating a placebo was more complicated than simply giving one group real pills and a second group sugar pills. (Ernst and Sing 68) For results to be accurate, both those research subjects receiving active treatment and those in the control group must have equal faith that they are being treated. Scientists have long known that the placebo effect can have a powerful effect on the perceptions of pain. A study by Henry K. Beecher in the 1955 *Journal of the American Medical Association* showed that, on average, the placebo effect is equivalent to an average of 35% improvement in symptoms, with numbers ranging between 21% and 58% depending on the ailment (cited in Lasagna 1236).

It is becoming increasingly clear that the placebo effect accounts for much of the optimistic research on acupuncture published between the 1970s and 1990s. With the

development of sham needles during the past decade —needles which retract like stage knives— researchers have since been able to more accurately assess the therapeutic effects of acupuncture. The result has been a complete unraveling of nearly all acupuncture claims. The 1997 NIH report, which can still be found online, now carries the following disclaimer:

This statement is more than five years old and is provided solely for historical purposes. Due to the cumulative nature of medical research, new knowledge has inevitably accumulated in this subject area [...] Thus some of the material is likely to be out of date, and at worst simply wrong. (NIH Acupuncture Consensus Statement Online)

To those wishing to promote the healing power of acupuncture—and traditional medicine in general—it is easy enough to find studies that show that acupuncture reduces pain and increases mobility compared to those who received no treatment. A journalist might read a study that shows positive results from acupuncture when compared to no treatment and report “encouraging evidence” of its effectiveness. But this is an inappropriate standard to judge any medical therapy. A more accurate reading of the research is that acupuncture consistently fails to show clear benefit beyond the control group. The bulk of recent research strongly tends towards the hypothesis that acupuncture’s positive effects are mainly due to a built-in expectation bias. A review of recent studies reveals two themes—that acupuncture offers results resembling sham treatment and that for many conditions no positive benefit is seen at all:

- **Systematic review:** Excluding a large number of studies that showed serious compromises of methodology—including 54% of all acupuncture studies that were not properly randomized—Edzard Ernst concludes:

The new sham devices allow acupuncture trials to be conducted sham-controlled, patient-blind and evaluator blind[...] Of the 13 studies available to date, nine show no significant difference between real and sham acupuncture in the primary outcome measure. Thus the

majority of these trials suggests that the effects of acupuncture could after all be most due to a placebo response. (Ernst 131)

- **Summary of recent pain and nausea studies:** "In summary, a rigorous evidence-based evaluation of acupuncture is that there is conflicting evidence about its use for treating nausea, and there is no evidence for a specific benefit beyond the placebo effect for relief of pain. There is no credible evidence at present supporting the use of acupuncture to treat any other condition." (Marcus and McCullough 1232)
- **Arthritic knee pain:** "Sham-controlled trials show clinically irrelevant short-term benefits of acupuncture for treating knee osteoarthritis. Waiting list–controlled trials [using patients on a waiting list as a nontreated “control” group] suggest clinically relevant benefits, some of which may be due to placebo or expectation effects." (Manheimer, et al.)
- **Systematic review:** "Applying stricter inclusion criteria, however, showed that none of the 35 reviews supported acupuncture, predominantly because there were too few patients in the randomised, double blind studies. Six reviews with more than 200 patients in randomised, double blind studies had good evidence of no benefit." (Derry, et al.)
- **Back pain:** "Acupuncture was more effective in improving pain than no acupuncture treatment in patients with chronic low back pain, whereas there were no significant differences between acupuncture and minimal [i.e. superficial needling at the wrong points] acupuncture." (Brinkhaus, et al., 450)

Despite the cautious academic prose of these studies, a clear picture emerges of a therapy that fails to meet basic standards of efficacy. Rather than making the case that our health system could be strengthened by including acupuncture, it begs the question of why the federal

government spends millions of dollars to integrate this unproven treatment into medical schools and hospitals.

Scientific Integrity in Acupuncture Research

The development of a plausible and testable hypothesis represents a cornerstone of modern science. But for most uses of acupuncture, no plausible biochemical rationale has ever been articulated. Its positive effects are presumably due to realignments of *qi*, a supernatural energy force that cannot be rationalized by any concept of physics or biology. The *qi* hypothesis assumes a metaphysical basis for acupuncture, a wholly unscientific understanding of disease entirely at odds with our best traditions of medicine. Traditional acupuncture theory is further confounded by studies that show that acupuncture is just as effective when performed incorrectly. A recent study on back pain shows, for example, that the placement of needles is clinically irrelevant to outcomes (Cherkin et al., 2008). In the study, randomly placed needles were found to be just as effective as needles inserted precisely at the correct meridians. This is the equivalent of a drug that works exactly the same no matter how much and how often it is taken. (Novella, Steven, Science-Based Medicine blog) Another study even showed that the acupuncture practitioner doesn't even need to puncture the skin. Simply pressing the tip of the needle against the skin is as effective as inserting the needle. Even more remarkably, one study showed that similar results can be achieved by pressing toothpicks into the skin. (Haake, et al.)

The traditional theory of acupuncture—that needles can change the path of *qi* flowing inside the body—has no scientific validity. Because this hypothesis relies upon the existence of an energy force that cannot be seen or measured, it cannot be tested and is entirely speculative. In the vocabulary of philosopher of science Karl Popper, such a hypothesis is not “falsifiable.” It

can neither be proven nor disproven. The traditional theory of acupuncture dictates that placement of needles inside the body is a crucial factor—and its irrelevance in the research suggests that this theory is wholly without merit. The practice of traditional acupuncture rests on a theory that is demonstrably false and has no place in a modern clinical environment.

Some acupuncture proponents have wisely abandoned the metaphysical baggage of traditional acupuncture and developed what is called “western medical acupuncture” (White 33). These researchers explain the potential therapeutic effects of acupuncture in the “release of “opioid peptides and serotonin” and other physiological effects (Ibid. 33). This hypothesis attempts to ground acupuncture in a biomedical explanation, representing the only scientifically valid path towards integrating acupuncture with conventional medicine. Though this interpretation of acupuncture puts it on firmer theoretical footing, it also wholly undercuts acupuncture as a holistic healing art requiring special consideration. If acupuncture can be explained by physiological processes, what is left to integrate? In what way does this interpretation of acupuncture differ in practice from other forms of manipulative medicine like electrostimulation of muscle tissue and augmented physical therapy? A therapy that is explained by conventional processes *is* conventional medicine. Its claim as an “alternative” medical system withers when it is translated into biomedical terms, making it at best a marginal addition to a narrow subset of medicine related to musculature.

The Center for Inquiry questions the value of a privileged class of medicine called “alternative” medicine. The only defensible premise for therapeutic benefit of acupuncture is entirely based on ordinary biochemistry—all other explanations resort to metaphysic conjecture. The threshold for acceptance of acupuncture is ultimately the same for any other therapy: when it can be shown to measurably affect clinically relevant biochemical processes. If the effects of

acupuncture are purely biochemical, however, why does acupuncture require special support? Stripped of its aura of spirituality, the practice of acupuncture is no different than applying empty syringes into the body at random locations. CFI does not accept the artificial category of “integrative medicine” because we believe there is nothing to integrate. If a therapy offers positive benefit—and the evidence suggests that acupuncture does not—it does so for wholly ordinary, nonmystical reasons. Acupuncture deserves to stand or fall on its own merits.

Proponents of acupuncture often argue that it is misleading to judge acupuncture by the reductionist standards of western medicine. For advocates of alternative medicine, therapeutic success is not measured in terms of reduced pathology but in terms of a generic sense of wellness. These advocates make the case that research inadequately accounts for the holistic effects of treatments like acupuncture. A monograph published by the University of North Carolina at Chapel Hill medical school distinguishes between a treatment’s “internal validity” and its “external validity.” (Cited in Marcus and McCollough) This distinction suggests that interventions that cannot be justified by research data might be supported merely by clinical impressions.

Likewise, the country’s leading proponent of alternative medicine, Dr. Andrew Weil, frequently articulates a similar two-tiered system of evidence. “I teach and urge people to use a sliding scale of evidence,” reports Weil in a story on CAM in *U.S. News & World Report*. “The greater the potential to cause harm, the greater the standard of evidence should be.” (Camarow 2008) Though this expresses a laudable concern for patient safety—even though falsely suggesting that alternative medicine is inherently safer—it also suggests that alternative therapies should be judged by a more forgiving standard. By this logic, treatments that have the least physiological effect should be given the most therapeutic preference. There is little reason to

believe that properly conducted acupuncture treatments are particularly unsafe². (Ernst 131; Kaptchuk 380) The evidence in terms of both efficacy and adverse effects is that acupuncture is largely inert. Because it is generally harmless (though spiritually evocative) it does not follow that acupuncture evidence should be evaluated with a “sliding scale.”

The Center for Inquiry wholeheartedly concurs with the editors of *The New England Journal of Medicine* when they call for a single set of scientific standards:

There cannot be two kinds of medicine -- conventional and alternative. There is only medicine that has been adequately tested and medicine that has not, medicine that works and medicine that may or may not work. (Angell and Kassirer)

The suggestion that acupuncture deserves asylum status in the foreign country of conventional medicine represents a threat to scientific integrity. The question we should ask is how acupuncture would be treated if it were not a 3000 year old Chinese folk medicine. What if it had instead been developed in a conventional laboratory in the United States—if that were the case, would there still be a need to evaluate it with a “sliding scale” and fund its integration into standard medical practice?

The Institutionalization of Acupuncture

The National Center for Complementary and Alternative Medicine (NCCAM) was founded in 1992 under the auspices of the National Institutes of Health. Initially known as the Office of Alternative Medicine, it was granted an initial budget of \$2 million (NCCAM Website). The organization was originally mandated to coordinate CAM research within NIH.

² Though acupuncture is largely considered safe—at least when practitioners use sterile needles—according to Woo, et al., over 50 cases of bacteria infection have been identified in acupuncture—and epidemiological evidence suggests that acupuncture may be an underreported source of HIV and Hepatitis C infection.

The creation of a government-funded clearinghouse for CAM research was championed by Senator Tom Harkin of Iowa, who had a special interest in alternative medicine (Atwood). The director of NIH, Harold Varmus, a Nobel Prize-winning researcher, proposed that the organization concentrate on coordinating alternative medicine research in NIH's over 20 existing research centers, guiding alternative medical research to the appropriate research center. Varmus wanted to assure that scientific standards were maintained at the fledgling organization. Varmus' cautious approach created conflict with Senator Harkin, who envisioned a far more dynamic role. Harkin introduced legislation that dramatically increased its profile (Ibid.) and budget—which now stands at \$128.8 million (NCCAM Website)—transforming it into a national center. All federally-funded CAM research would now be consolidated within a single high profile institution known as NCCAM.

With its newfound prestige, NCCAM was now in a strong position to drive the debate about alternative medicine. Critics accused NCCAM of functioning more like an advocacy than a research organization. If there was bias in favor of alternative medicine, it could partially be explained by its charter. At least 11 of the 15 members of its advisory board were to be “selected [by the NIH director] based on their knowledge and expertise in the fields of complementary and alternative therapeutic cancer treatments” (CAPCAM Charter 2002, cited in Atwood). At Congressional hearings, however, Senator Harkin criticized NCCAM for not doing more to substantiate the claims of alternative medicine. “Most of its focus has been on disproving things, rather than seeking out and proving things,” he chided NCCAM administrators. (Brown) Though this criticism reflects a common misperception about the function of science, it also reveals some of the ideological commitments built into the NCCAM program. Some critics, in fact,

complained that NCCAM was being run by politically-minded “Harkinities” rather than scientists motivated by a dispassionate pursuit of the truth. (Atwood)

During the first half of the 2000s, NCCAM funded a series of dubious studies that suggested an orientation towards “proving” rather than “disproving.” The center funded studies on healing touch and distance healing that could only be described as baseless. One study investigated a cancer protocol called the Gonzalez Therapy which required hundreds of nutritional supplements each day, analyses of hair samples, and coffee enemas. (Ibid.) In 2000 NCCAM published a grant program for what was called “Frontier Science.” NCCAM defined Frontier Science as alternative medical practices “for which there is no plausible biomedical explanation” and included as examples magnetic therapy, energy healing, homeopathy, and spiritual healing. (Cited in Atwood) In the late 1990s, NCCAM funded a research center at the University of Arizona called the Center for Frontier Medicine in Biofield Science. An OAM document defined a “biofield” as a energy field that has no mass and “(a) is not necessarily electromagnetic, (b) surrounds and permeates living bodies, (c) affects the body, and (d) possibly is related to *qi* 1997)” (Cited in Atwood) This research seemed to be an explicit—and a highly unscientific—effort to discover some confirmation of traditional acupuncture.

In a paper published by the Center for Inquiry, biological physicist Eugenie V. Mielczarek has reviewed the science of biofields. Many CAM practitioners point to the body's magnetic field as the potential source of a healing “biofield.” As Mielczarek points out, however, at 2 milligauss, or less than one percent of the strength of the earth’s magnetic field, this energy is much too weak to exert any physiological effect. The postulate of a medically healing biomagnetic energy field—as in Therapeutic Touch, Reiki, and Qiqong practitioners—fails all tests of science. The presence of an unsubstantiated biomagnetic energy field that eludes

all science-based investigation but nevertheless transmits energies large enough to create healing flies in the face of all scientific reasoning and the laws of physics. The definition of “biofield” is almost entirely conjectural, including the conjecture that this undetected—possibly electromagnetic—field might be *qi*. It reverses the order of scientific investigation, which is presumed to work from observed phenomena and towards hypothesis.

For advocates of acupuncture, the founding of NCCAM must have seemed a long-awaited validation. The prestige and resources available to NCCAM certainly goes a long way towards legitimizing acupuncture. Regardless of the outcome of the studies it funds, NCCAM gives the federal government’s endorsement to a whole class of treatment modalities that range from the plausible (herbal medication) to the absurd (distance healing). In addition to research, NCCAM is tasked with three other types of activity:

- Disseminating study results;
- Training of researchers; and
- “Supporting the integration of proven results.”

To its credit, NCCAM does not entirely hide the unprepossessing results of the current state of evidence regarding acupuncture. Evaluations of acupuncture research are published in an easy-to-find summary on its Web site. Its conclusions about acupuncture for pain, considered the most promising indication for acupuncture, seem largely honest, if unnecessarily murky:

An emerging theme in acupuncture research is the role of the placebo. For example, a 2009 systematic review of research on the pain-relieving effects of acupuncture compared with placebo (simulated) or no acupuncture was inconclusive. The reviewers found a small difference between acupuncture and placebo and a moderate difference between placebo and no acupuncture; the effect of placebo acupuncture varied considerably, and the effect of acupuncture appeared

unrelated to the specific kind of placebo procedure used. (NCCAM, “Get the Facts: Information for Consumers.”)

For other conditions, NCCAM’s evaluations are less trustworthy. We have already seen that acupuncture for osteoarthritis of the knee is not supported by current research. The NCCAM Web site refers to one study showing positive outcomes, however, that is contradicted by systematic evaluations of the research.

As evidence mounts that acupuncture has no clinical value, NCCAM continues to support acupuncture in other ways. The training of a new generation of CAM researchers, for example, can only serve to perpetuate an independent CAM bureaucracy. Such specialized training creates a class of researchers whose careers are closely wedded to alternative medicine. The training of a new generation of CAM researchers creates incentives for expanding the CAM bureaucracy further. With careers on the line, it is in the best interest of CAM researchers to prolong debate, manufacturing new complexities even when the data are clear. As in all bureaucracies, NCCAM has constructed an institutional framework that both supports it and feeds off it. For some researchers, NCCAM has become a reliable source of grant money, resulting, “in the establishment of a cadre of academics who have come to rely on NCCAM funds or who otherwise defend the NCCAM’s existence, with little regard for the scientific issues raised here.” (Atwood)

At the same time, the center is tasked with not only advancing research but integrating “proven” modalities into the healthcare system. Despite being a wholly unproven therapy, however, NCCAM continues to underwrite the integrated medical centers that offer acupuncture. Like other hospitals throughout the country, the University of Michigan medical center has used NCCAM funding to start an integrative center. Purporting to take “into account the whole person (body, mind, spirit, and emotion),” the University of Michigan Integrative Center offers a range of “therapies such as holistic nutrition, relaxation techniques, acupuncture, massage, herbs and

supplements [that] are blended with the best of medical science and technology that is the hallmark of the Michigan Difference.” (University of Michigan Integrative Medicine Web site.) It is easy to see why the integrative medical centers appeal to hospital administrators. Besides being a source of money to build new facilities, offering acupuncture represents a way of offering something other hospitals don’t. Even if the science isn’t good, holistic medicine can certainly be compelling marketing, making a visit to the hospital sound something between holy experience and a spa visit.

In an essay advocating the integration of medicine, CAM advocate Mann notes that when providers adopt treatments like acupuncture, scientific evidence is rarely the paramount consideration:

Health insurers and managed care organizations that have incorporated CAM into their policies state that their primary motivation is market demand. Therapies such as nutritional counseling, biofeedback, acupuncture, preventative medicine, and chiropractic are increasingly covered under many health plans (Mann, et al., 157)

Consumer demand is also the likeliest explanation identified by a Henry J. Kaiser Foundation study indicating that 47% of all health plans now cover acupuncture (Henry J. Kaiser Family Foundation Web site). Not surprisingly, patients want access to every treatment they suspect may benefit them. From the perspective of a sufferer of chronic illness, the decision to experiment with a treatment they have been lead to believe may do some good and probably will not do any harm is not irrational. The media messages received by the average healthcare consumer are ambiguous at best, sensationalistic at worst. Consumer interest in alternative medicine, however, sets up a feedback loop that distorts the entire healthcare landscape. Consumers tell providers they want alternative treatment options; providers respond by promoting CAM as something desirable, which in turn reinforces consumer desire. Though doing nothing to improve health

outcomes, treatments like acupuncture respond to the desires of both consumers and providers for a medicine that transcends current medical technology.

If nothing else, treatments like acupuncture represent a dream of a medicine without gaps—a complementary system wherein what cannot be supplied with science can be supplied with intuition. Research indicates that the people who are most apt to turn to acupuncture are patients afflicted by chronic, hard-to-treat illness:

[R]ates of Cam use among pediatric patients with chronic conditions such as cancer, rheumatoid arthritis and cystic fibrosis range from 30 to 70%. For many of these conditions, chronic pain is among the reasons CAM is used. (Tsao and Zeltzer,149)

In a comprehensive survey of alternative medicine use in the United States published by the Centers for Disease Control (CDC), 44.2% of acupuncture users say conventional medicine's inability to treat their condition was one reason they tried acupuncture and 56.2% said they hoped acupuncture in conjunction with standard medicine might work better—the two top reasons cited. (Barnes, Bloom & Nahin 13) These data suggest that people turn to treatments like acupuncture out of a sense of desperation with the limits of conventional medicine. “The most frequently cited reason for consumer use of CAM is dissatisfaction with the ability of conventional medicine to adequately treat chronic illnesses.” (Astin, et al., 2303) This is not to say, however, that their interest in alternative medicine means they have lost faith in conventional medicine. Only 4.4% of Americans rely primarily on alternative forms of health care. (Ibid.) A pattern emerges that suggests that treatments like acupuncture attract patients with chronic or hard-to-treat conditions precisely because it is an “alternative.” When a patient feels no relief after all available conventional interventions have been exhausted, the existence of an entirely different form of medicine is naturally appealing.

Though patients—especially those afflicted by chronic, hard-to-treat conditions—may want access to every medical treatment available, consumer demand should not be the overriding shaper of our healthcare system. Efficiency, ethics and cost considerations dictate that health care policies remain based solely on a sober evaluation of the evidence. NCCAM serves to foster the growth of a sprawling institutional apparatus that creates false hope and false expectations, draining the resources of talent and money that could be put to better use improving the system of science-based medicine.

Conclusion

We are fortunate to be living during a time of genuine revolution in medical care, though this revolution has little to do with spiritually guided medicine. This modest but far-reaching revolution is known as evidenced-based medicine (EBM). Evidence-based medicine is an orientation towards medical care that attempts to align—to the greatest degree possible— clinical practice with empirical data. Medical schools that adopt EBM train physicians to bring state-of-the-art research into their clinical practice. The age-old reliance on “clinical impressions,” in which a physician prescribes treatments based on her memory of what has worked in the past, is minimized. Physicians trained in EBM are dispassionately interested in what works best. They do not maintain ideological commitments to particular therapies. This revolution, though entirely unheralded by the popular press, represents a culmination in our history of science-based medicine. It represents the vanguard of science in the training and practice of medical care, guiding us to a future where physicians treat their patients based on demonstrable facts rather than what they hope will work.

Through science-based analysis, the modern physician can open vistas into the body that are as amazing as any spiritual system of healing. (We routinely refer to novel medical treatments as “wonder drugs” or “miracles,” a testament to the astonishing pace of medical advancement.) This ability to precisely measure biological processes would have made the invention of speculative systems of healing like acupuncture entirely unnecessary. Is there any reason to think that acupuncture would have been invented had blood panels, MRIs, and respiratory functioning tests been available? It was pre-modern humanity’s inability to understand and accurately describe the functioning of the human body that created the need for supernatural-based theories of medicine. The future of medicine does not lie in systems of medicine born of necessity in the absence of scientific knowledge. The future lies in developing ever more precise methods of measuring, analyzing, and correcting medical pathologies.

The advance in our understanding of the biological causes and treatments of disease has led to stunning improvements in health and longevity. The embrace of pre-scientific speculations about disease, on the other hand, represents a hesitant and fateful step backward into a benighted past. This suggests that at least a small segment of the medical establishment has forgotten what has made modern medicine so spectacularly successful: a respect for science-based medicine. We make the mistake of thinking of conventional medicine as a set of technologies. What binds conventional, science-based medicine is not technology but a set of assumptions. The central assumption of modern medicine is that clinical practices are to be judged by standards that are consistent, testable, unbiased, and replicable. Conventional medicine is not perfect, but it has extended the lives of billions during its rapid ascent. The best way to transcend the limitations of contemporary medicine is not to return to ancient folk remedies like acupuncture. The gaps in

medical knowledge we all dread are not likely to be filled by energy fields, meridians, and astrology, but by the purposeful pursuit knowledge under a single set of standards we call science. The way forward is through a careful and purposeful pursuit of scientific truth, even if it means leaving some of our most romantic fallacies behind us.

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