

# A Review of the Evidence for the Existence of Acupuncture Points and Meridians

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A review of the existing historical and experimental evidence provides no convincing evidence that either acupuncture points or meridians exist as discrete entities. Author's address: PO Box 5231, Glendale, CA 91221. © 2000 AAEP.

## Introduction

According to Chinese tradition, acupuncture points are specifically chosen sites associated with the manipulation of a "vital force" referred to as *qi*. Under such tradition, acupuncture needles are placed in accordance with certain theories (yin-yang, five phases, etc.) according to the training and experience of the practitioner. Acupuncture points may reportedly also be used for diagnostic purposes. The term *acupuncture* is used in this paper to connote the insertion of dry needles into the body at specifically chosen sites.

The term *meridian* is a modern term usurped from geography to denote channels along which *qi* flowed. In traditional Chinese practice, these vessels were known variously as *mai*, *jing*, or *lo*. The term *meridian* is used in this paper to connote these theoretical pathways.

## Materials and Methods

Scientific information pertaining to acupuncture points and meridians was obtained by MEDLINE search using search terms "acupuncture point," "meridian," and "acupuncture meridian." Additional scientific information was obtained from texts on medical and veterinary acupuncture. Historical in-

formation was obtained from published translations of original Chinese source material and textbooks of medical history.

## Acupuncture Points

### Historical Evidence

The association of specific body points with internal organs of the body, or a postulated relationship between external body points and various effects on the body, is not uniquely Chinese, nor is it unique to acupuncture. In fact, it is part of the medical historical record of a number of ancient societies. For example, ayurvedic (Indian) tradition recognizes over 100 *marmas*, which are sensitive points to be avoided by surgeons and serious when wounded, although they are not used therapeutically. Medieval Arabic medicine also assumes a correlation between internal organs and at least one external point on the body in their tradition of cauterization, as seen in the *Hui-hui-yao-fang* ("Muslim Medicinal Recipes"), four chapters of which survive in a Ming dynasty copy.

Classical Chinese acupuncture theory originally recognized 365 acupuncture points in humans,<sup>1</sup> based on a "cosmological correspondence" between the number of points and the days of the year.<sup>2,3</sup> Acupuncture

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## NOTES

points were not shown to be in precise anatomical locations in early texts; this only happened later.<sup>4</sup> However, there is no evidence for classical acupuncture points in animals, if one defines acupuncture points as associated with the manipulation of *qi* travelling in *mai*, *jing*, or *lo* (such a definition is generally accepted by historians of Chinese medicine). While there are illustrations from classical Chinese texts indicating points for the treatment of several domestic species, reading the texts associated with these illustrations does not make it clear that these points were used for dry needling. Rather, they appear to be points from which blood was let (therapeutic phlebotomy) or at which other therapeutic interventions (e.g., moxibustion) were applied.

### Empirical Difficulties

Besides the original 365 points in humans, many additional acupuncture points and systems have been proposed, ranging from auricular acupuncture, proposed in the 1950s by a French physician, to Korean hand acupuncture, in which approximately 150 discrete points are said to exist on the human hand. The points used in the various systems do not necessarily agree with each other. Felix Mann, a co-founder of the British acupuncture society, has therefore concluded that acupuncture points do not exist and has observed that, if modern texts are to be believed, there is no skin left which is not an acupuncture point.<sup>5</sup> Further muddying the empirical waters is the fact that some types of acupuncture are not employed using a traditional theoretical basis. In these approaches, for example, “western” acupuncture, needle placement may be unrelated to the presence or absence of actual anatomical acupuncture point entities. All systems claim therapeutic efficacy.

Similar difficulties exist in assessing animal acupuncture points. Animal acupuncture points have been derived from Chinese point drawings, as well as from transposing one or more systems of human acupuncture points onto animal anatomy. Published charts of “traditional” and “transpositional” points in horses have failed to agree on a single point of association.<sup>6</sup>

### Histological Evidence

No convincing evidence exists that acupuncture points have consistent anatomical features.<sup>7</sup> Acupuncture points may be located in the vicinity of peripheral nerves, ligaments, or tendons,<sup>8</sup> however, there is no consistent association with any one specific gross anatomical structure. Several investigators have reported various histological findings at acupuncture points, such as nerve terminals, neurovascular bundles, or mast cell accumulations, however, none of the studies has used statistical evaluation of quantitative histological data.<sup>9</sup>

### Biochemical Evidence

One report, in dogs, suggests that the concentrations of the neurotransmitter substance P is higher in the skin and muscle tissue of acupuncture points of dogs, although not in the subcutis, when these points are compared to control areas.<sup>10</sup> Substance P is a neurotransmitter associated with the sensation of pain. Repeated measurements of the same four animals were used instead of individual measurements of a large group of animals to obtain this data, but the analysis proceeded as if the data was obtained independently. Furthermore, individual points were not compared in this study.

### Skin Resistance

Some investigators have asserted that acupuncture points can be identified by decreases in skin resistance. However, measurements of skin resistance can be confounded by many factors, including the cross-sectional area of the electrode, the amount of pressure applied (skin pressure readily distorts the stratum corneum layer of the epidermis, which contributes over 90% of skin resistance), and the contact time.<sup>7</sup>

The skin resistance of human acupuncture points has been carefully and systematically investigated. Even when variables such as skin condition, electrode pressure, and diurnal variation were minimized, repeated measurements at eight traditional acupuncture points in ten healthy volunteers were unable to reveal any significant patterns or correlations, either for opposite sides of individual subjects or between different individuals.<sup>11</sup>

### Correlation with Motor Points

Motor points are defined as locations where muscle can be stimulated with the smallest amount of electrical current. To see if there was any relationship between these points and classical acupuncture points, acupuncturists and neurophysiologists independently identified points on a volunteer and marked them with invisible ink. Under UV light examination, 15 of 31 points were more than 10 mm apart, leading to the conclusion that acupuncture points and motor points are not synonymous.<sup>12</sup>

### Correlation with Trigger Points

Myofascial “trigger points,” a controversial concept developed in the 1950s independently of acupuncture, are usually defined as a localized area of muscle or connective tissue which is firmer than usual. Palpation of a trigger point is said to cause pain and it is also said to cause pain referred to specific areas often well away from the trigger point.<sup>13</sup> A relationship between trigger points and acupuncture points has been suggested in humans, and approximately 70% of commonly found trigger points corresponded within 3 cm to the location of acupuncture points used for treating pain in one study.<sup>14</sup> However, the concept of an acupuncture point is clearly broader than that of a trigger point,

because acupuncture points are also used for treating conditions other than pain. Furthermore, only a subset of acupuncture point locations coincide with trigger point locations. Finally, the existence of trigger points themselves has been questioned.<sup>15</sup>

#### Functional MRI

Functional MRI is a new technique that attempts to measure brain activity by detecting differences in oxygen delivery to parts of the brain while the subject is undergoing sensory stimulation, either at rest or while performing some task. Recent reports have suggested that acupuncture stimulation caused such differences to be detected in parts of the human limbic system and somatosensory cortex.<sup>16</sup> Unfortunately, such studies have not used sham controls so it is not possible to state that such changes, if they are significant, are specific to acupuncture points. Indeed, increased brain activity in studied areas would be expected from a variety of sensory inputs. The studies have also not shown that the changes ascribed to acupuncture stimulation are specific to the areas of the brain examined.

#### Clinical Evidence

Many clinical studies of acupuncture have used sham controls, that is, control needling has been applied at sham points adjacent to or distant from “real” points. In general, when effects of acupuncture are seen, sham acupuncture appears at least to be almost as active as “real” acupuncture.<sup>17</sup> Needle sensation is not unique to acupuncture points<sup>18</sup> and identical, transient, quick reflex responses of the sympathetic nervous responses have been seen whether “real” or “sham” points are needled.<sup>19</sup> In addition, whether “traditional” or “transpositional” points are employed in horses, equal therapeutic efficacy has been reported.<sup>6</sup>

### Meridians

#### Historical Evidence

The earliest known Chinese texts (*Mawangdui*) describe eleven *mai* (vessels) which were described as containing both blood and *qi*. Blood vessels are the obvious original referent of *mai*. The earliest use of the word is fourth century B.C., in a *Zuozhuan* description of a horse: ‘chaotic vapor, untamed, erupts; dark blood springs forth, coursing; ridges of swollen vessels (*mai*) bulge.’ (*Zouzhuan*, Xi 15,14.3a)<sup>20</sup> The term meridian was coined in 1939, by a Frenchman.<sup>21</sup>

In human acupuncture, meridians have changed in number, name, character and even position through history. By the late first century B.C. (*Huangdi neijing suwen*) the number of vessels had grown to twelve. “The transition from the old idea of blood vessels to physiological theory whose main purpose was to explain the movement of vapor in the body directed attention away from the blood vessels *per se* and towards an idealized system. . . .”<sup>19</sup>

However, the twelve vessels described in the *Huangdi neijing* follow substantially different courses than the eleven described in the earlier *Mawangdui* texts. The historical waters were further muddied when, in 1993, a lacquer conduit-figurine was recovered from a Western Han tomb depicting only nine *mai*, even though it appears to date from after the treatises describing eleven *mai*. Moreover, two of the *mai* etched on the figurine are ones that the earlier treatises fail to discuss.<sup>22</sup> In the 18<sup>th</sup> century, a Chinese medical philosopher lamented the loss of the “original” human conduits.<sup>23</sup>

Equine acupuncture meridians date only to the 1970s and were apparently invented at the insistence of Western practitioners.<sup>24</sup> Since then, various authors have “discovered” meridians in cattle, pigs, dogs, cats, and various other species, mostly by transposition from one of many human charts (this explains why horses apparently have a gall bladder meridian, although they lack a gall bladder).<sup>25</sup> Some modern practitioners of veterinary acupuncture question the existence of acupuncture meridians in the horse,<sup>26</sup> as do some practitioners of acupuncture in humans.<sup>4</sup>

#### Empirical Evidence

Attempting to define the number of acupuncture meridians leads one to the conclusion that if they exist, at least there is no consensus as to the “correct” number. In humans, if one includes the historical record, it is possible to find reference to 9, 11, 12, 14, 20, or 36 meridians, along with numerous submeridians, traveling along divergent and often unrelated paths.

#### Histological Evidence

In humans, meridians have been examined for their correspondence with nerves, blood, and lymphatic vessels.<sup>27</sup> It is difficult to assess these reports, because minimal detail is usually provided in them. It does appear that points are occasionally linked by the same nerve, or the same blood vessel or, although less likely, the same lymphatic channel. However, no channel studied has ever completely correlated with any of these three structures.<sup>28</sup>

#### Electrical Resistance

One investigation concluded that the electrical resistance along one meridian in the human arm was less than that which was found between non-acupuncture points,<sup>29</sup> however, such investigations would be subject to the same problems that beset determination of acupuncture points by that methodology.

#### Radiotracer Studies

There have been at least three attempts to validate the concept of meridians using radiotracer injections. Early investigators concluded that an in-

jected radiotracer was cleared via non-lymphatic and non-venous pathways and suggested that this demonstrated the existence of acupuncture meridians. However, a subsequent attempt to replicate this finding was unsuccessful and concluded that the radiotracer was removed along normal venous pathways.<sup>30</sup> A subsequent investigation concluded that technetium uptake was faster from certain acupuncture points than from non-points, but that thereafter it was removed by the venous system.<sup>31</sup>

#### Radiation

Insertion of acupuncture needles may cause radiation of needle sensation in humans away from the point of insertion. However, radiation does not generally correspond to the discrete paths of the postulated meridians.<sup>4</sup> Furthermore, such sensations appear to be quite variable, occurring more typically in certain regions of the body and in response to certain needle techniques.<sup>32</sup> Still, it is interesting to speculate whether such sensations contributed to the development of the idea of meridians. Obviously, radiation sensations can neither be confirmed nor denied in animals.

#### Thermography, Ultrasonography, Magnetism, Light, Heat

Some investigators have claimed that temperature changes on the surface of the body are a reflection of meridians.<sup>32</sup> Others have claimed that a variety of modalities, including ultrasound, magnetism, and light have demonstrated variations between meridians and other areas.<sup>33</sup> Such experiments are difficult to assess because the details provided are generally sketchy and the investigations are rarely conducted under rigorous conditions.<sup>34</sup> At least, reports that meridians can be reliably located by some physical means require replication.

#### Conclusion

Research on the nature of acupuncture points and meridians is often difficult to evaluate because of the diverse nature of the claims made, incomplete data provided in published studies and the variety of parameters involved in the assessment of these claims. Many of the studies purporting to have identified acupuncture points or meridians come from China; the role of publication bias in Chinese literature needs to be considered in light of the fact that no trial published in China from 1966 through 1995 found a test treatment to be ineffective.<sup>35</sup> Obvious contradictions exist between current acupuncture practice and the historical record, as well as on the "correct" number of points and meridians reported by current practitioners of acupuncture. From an empirical standpoint—discrete structures such as acupuncture points and/or meridians would revolutionize the study of anatomy and physiology—no such revolution has occurred. Whatever the clinical efficacy of needling, there is, as yet, no convincing evidence to show that acupuncture points or meridians exist as discrete entities.<sup>36</sup>

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