Commentary

Is complementary and alternative medicine compatible with evidence-based medicine?

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Over the past 2 decades, the concepts, methods, and terminology of EBM have come to dominate human medicine. Health-care institutions and physicians have come to recognize that clinical decisions made on the basis of individual experience, intuition, tradition, reasoning from basic principles, and the advice and opinions of respected clinicians and teachers are less reliable than those based on high-quality clinical research and, as a result, have begun to rely on the principles and techniques of EBM as an aid to clinical decision making. The same shift is happening, albeit at a somewhat slower pace, in veterinary medicine. Although veterinarians must confront various special challenges when trying to adopt an EBVM approach, it is widely accepted that the inadequacies of other models for clinical decision making are great enough to justify moving toward such an approach.[1,2]

This shift has not been without controversy. Early critics of EBM claimed that it was not a real change from previous practice, that it was an unattainable academic ideal, or that it was a form of cookbook medicine that ignored the importance of clinical judgment and individual patient characteristics.[3] In veterinary medicine, in particular, it has been argued that the paucity of high-quality research evidence and the limited resources to generate such evidence may make EBVM impractical.[4] These concerns have been diminished, to some degree, by the evolution of EBM methods and by the growing recognition that EBM can be a pragmatic and effective approach to improving patient care that respects the importance of clinical expertise and the unique circumstances and values of individual patients.[5,6]

However, a more fundamental and persistent controversy has arisen regarding the applicability of EBM to the heterogeneous collection of theories and practices commonly known as CAM. Supporters of EBM, along with some advocates of CAM, have proposed that CAM interventions should be evaluated by means of the same methods and standards used to evaluate conventional treatments and should be accepted or rejected on the basis of the results of those evaluations.[7,8] Others, however, have claimed that the philosophy and methods of CAM are fundamentally incompatible with those of EBM.[9–13]

Given the growing acceptance of EBVM and the perceived popularity of CAVM,[14] discussions about how best to identify safe and effective treatments in veterinary medicine seem particularly important. An important facet of such discussions is whether EBM and CAM (and, by extension, EBVM and CAVM) are fundamentally compatible or incompatible.

Abbreviations

CAM	Complementary and alternative medicine
CAVM	Complementary and alternative veterinary medicine
EBM	Evidence-based medicine
EBVM	Evidence-based veterinary medicine

Definitions

To answer the question of whether CAM and EBM can be compatible, it is first necessary to define these terms. These definitions are often contentious, and no concise summary can ever completely capture the intricacies and nuances of the complex sets of ideas and practices underlying EBM and CAM. However, certain terms and characterizations are commonly used and should allow the discussion to proceed from a clear starting point.

The definition of EBM has evolved over time. The initial emphasis in human medicine was on the "conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."[3] With recognition of the need to incorporate clinical skills and patient priorities, the definition was refined to include "the integration of best research evidence with clinical expertise and patient values."[5] In EBVM, the concept of patient values is most often replaced with the values of the owners, managers, and veterinarians involved in the care of patients.[15]

However, these definitions do not entirely capture the philosophy that underlies EBM and EBVM. At their heart, EBM and EBVM reflect a profound confidence that scientific methodology, as it has developed over the centuries, enables us to distinguish what is likely to be true from what is likely to be false.[1] Evidence-based medicine and EBVM reflect the application of the scientific method to the generation and use of knowledge in medicine. They are, in effect, an extension of the epistemology of science (ie, the scientific way of gathering and validating knowledge).

Of course, many specific methods and techniques make up the methods of EBM. The so-called hierarchy of evidence, techniques for critical appraisal of published

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research, and standards for conducting and publishing research are fundamental to EBM.[1,2] However, all of these methodologies are predicated on the general philosophical principles underlying the scientific method.

By contrast, CAM is more challenging to define than EBM, not least because CAM encompasses such a wide variety of principles and methods, often with quite different philosophies and origins. In addition, terms such as complementary, alternative, holistic, integrative, and natural are frequently used together or interchangeably when discussing CAM, making the terminology in this area complex and unsettled.

Many definitions of CAM and CAVM simply emphasize their opposition to conventional medicine or list the more popular methods that these terms encompass. The AVMA Guidelines for CAVM,[16] for example, identify CAVM as "a heterogeneous group of preventive, diagnostic, and therapeutic philosophies and practices" and go on to indicate that "[t]he theoretical bases and techniques of CAVM may diverge from veterinary medicine routinely taught in North American veterinary medical schools or may differ from current scientific knowledge, or both."

Organizations of practitioners supportive of CAVM tend to define CAVM in terms of the attitudes or perspectives believed to underlie it as well as in terms of the actual methods included. As an example, the American Holistic Veterinary Medicine Association states on its website, "Holistic (or integrative) veterinary medicine is the examination and diagnosis of an animal, considering all aspects of the animal's life and employing all of the practitioner's senses, as well as the combination of conventional and alternative (or complementary) modalities of treatment."[17] The Veterinary Institute of Integrative Medicine[18] states that holistic medicine is

> [a] healing philosophy which views the patient as a whole body rather than as a disease or a collection of symptoms. A patient's emotional and spiritual state can affect the patient's condition. Holistic practitioners may combine traditional forms of treatment (medication and surgery) with alternative forms of treatment including homeopathy, acupuncture, chiropractic, massage, and herbal medicine.

On the other hand, some critics of CAM and CAVM claim that these are artificial categories and that the only unifying features of the approaches they encompass are the lack of credible scientific evidence of safety and efficacy and the unwillingness of dedicated adherents to abandon them.[8,19,20]

Philosophical Features of EBM and CAM

From these definitions of EBM and CAM and the associated published literature, certain core philosophical principles behind each approach can be identified. Examining these principles allows us to see the assumptions, biases, strengths, and weaknesses of these methods and helps us to assess whether apparent conflicts between them are superficial or fundamental.

From this point of view, EBM is ultimately an extension of the scientific method and shares an epistemological basis with science generally. The philosophy of science is well established, and the general principles underlying scientific epistemology are not controversial. Some of the more important principles underlying the scientific method and therefore EBM are realism (ie, the world exists independent of human beliefs), empiricism (ie, it is possible to develop a true knowledge of the world through perception and experimentation), reductionism (ie, complex entities can be understood by investigating their component parts), methodological naturalism (ie, only claims about the natural, physical world can be tested), and skepticism (ie, claims must be justified by means of scientific evidence).

Because CAM encompasses a variety of epistemological perspectives, there is less consistency in the philosophical foundations among the groups and individuals practicing these approaches. However, certain philosophical principles are commonly found among textbooks, journals, and websites devoted to CAM, including constructivism (ie, models of reality are only social or cultural constructs), relativism (ie, all cultural paradigms are of equal value), holism (ie, complex systems can only be understood as whole entities), vitalism (ie, living systems are defined by the presence of a nonphysical vital essence), and what might be called, for want of a better term, panepistemism (ie, the concept that nonempirical forms of evidence, including tradition, intuition, and revelation, are equivalent to empirical evidence).

At its most basic, realism is simply the position that there is an actual physical reality that exists independent of how humans perceive or understand it. Most veterinarians, regardless of their approach to practice, would agree with this view of realism, and few would seriously advocate the antirealist view that nothing exists outside the human mind. However, in terms of scientific evidence, realism also entails the argument that our sense perceptions are caused by the actions of real, independent entities on our sense organs and that, therefore, our sensations are true representations of actual phenomena. This leads to the concept of empiricism, which holds that we can derive a true knowledge of the world by using our senses to interact with it. This empiricist view is fundamental to the scientific processes of observing and experimenting to deduce the rules that govern the natural world.

Some proponents of CAM, however, take a postmodernist, constructivist position that although objective reality may exist, our sensory data are so extensively filtered through our concepts and beliefs that these data should be viewed as symbolic, rather than representative of that objective reality. Under this view, the models we create to describe and predict reality are merely metaphors, constructs that are determined more by social and cultural values than by the essential nature of reality, and we cannot trust that our perceptions or our interpretations of them accurately represent reality.

This constructivist viewpoint that models of reality are determined more by the cultural context in which they originate than by the true nature of reality leads to the conclusion that it is inappropriate to judge one model of reality by the standards of another. As stated by Churchill,[21] "If no paradigm does have absolute

value, there is no absolute basis with which to judge another paradigm. Any paradigm will appear limited or incorrect from the perspective of a different paradigm, so Chinese medicine will seem incorrect from a biomedical point of view, and vice versa." Similarly, Shea[22] suggests that

> [EBM] frameworks presume the "objectivity" of the evidentiary practices of modern Western science and privilege the epistemologies, ontologies, and practices that underlie biomedicine. [Some Chinese medicine practitioners] hold that notions of evidence underlying EBM standards and [randomized controlled trials] entail a series of assumptions that are incompatible with theories and practices central to Chinese medicine.

Fundamentally, the constructivist position holds that the hierarchy of evidence that characterizes EBM, along with the preference for certain kinds of evidence over others, is illegitimate and that, because the production of scientific evidence is a social process, there cannot be a single body of evidence universally accepted as true, just competing bodies of evidence.[23]

Constructivism is closely related to the principle of cultural relativism, which argues that cultural beliefs structure how we interpret our interactions with the world, such that our understanding of reality can only be viewed in the context of the culture that created it. From this, it is argued that one cannot legitimately judge the relative merits of ideas generated in different cultures or judge the concepts of one culture by the standards of another.

In the domain of medicine, this is understood to mean that the epistemology of science and EBM, which developed predominantly in Western Europe and North America, cannot be used to evaluate approaches to health and disease generated by other cultures, such as traditional Chinese medicine, Indian Ayurvedic medicine, and other folk medicine practices. According to Churchill,[21] for instance, "The invocation of a saint can cure intractable cancer; a voodoo curse can kill.… A shaman applying a curse does not consider it to be a placebo, nor does his victim. To them, real magic is involved. To interpret it otherwise is to make a culturally, paradigmatically biased judgment. We can never prove the shaman wrong, only offer an alternative explanation." Similarly, McCorkle[24] has stated that "[ethnoveterinary medicine] integrates social-scientific and biologic-technical understandings, with as much input from insiders (emic) as outsiders (etic). This approach need not invalidate either alternative or conventional medical realities.…The aim is not to impose one cultural tradition on another but rather to create contact points between them."

The scientific approach to knowledge underlying EBM acknowledges that individual scientists and clinicians have cultural biases that influence their understandings and actions. However, the process of science is understood to compensate for these, allowing us to generate reliable knowledge about the world. Because reality is consistent and independent of human beliefs, mistaken beliefs about reality will fail to accurately represent it and so will eventually be corrected. The more successful a theory is at predicting reality and the more data that accumulate to support it, the greater credibility that theory has, until eventually certain models become sufficiently strong that to doubt that they represent reality becomes irrational.

In contrast, some CAM proponents argue that scientific epistemology is too deeply embedded in its own culture of origin to be effective at guarding against cultural bias in the production of empirical evidence.[13] One of the empirical tools of the scientific method that particularly concerns CAM advocates is reductionism. In its extreme form, reductionism can be taken to mean that the functioning of complex entities, such as individual organisms, can always be reduced to operational principles of physics or chemistry and that complex systems are nothing more than the sum of their components. However, such extreme reductionist views are not widely held.[25]

As applied in the scientific epistemology underlying EBM, reductionism simply means that insight into the nature of complex systems can be gained by attempting to understand their components and how these components interact. This philosophy does not deny that there are emergent properties of such systems that cannot be predicted from an analysis of their components or that context and the interaction between systems is important for a comprehensive understanding. Nevertheless, reductionism has been a powerful tool for building our understanding of health and disease.[26]

The alternative perspective embodied in the concept of holism is a basic philosophical principle that almost all CAM approaches claim as a foundational idea and that is often characterized as antithetical to reductionism. Holism can also take a variety of forms. In its most common and pragmatic form, it is simply the recognition that a complete understanding of patients and their health requires considering them as whole individuals interacting with a complex environment. Importantly, there is nothing about this idea that limits it to CAM approaches, any more than reasonable reductionism is exclusive to conventional medicine.

On the other hand, a more extreme form of holism denies that an understanding of component parts contributes anything to our understanding of the health of organisms as a whole, and adherents of this extreme form of holism reject the kinds of research evidence most highly valued in EBM. For example, as stated on the website of the Alternative Veterinary Medicine Centre, a veterinary practice in the United Kingdom devoted to holistic medicine, "Animals (and humans) do not function in parts, we function as a whole and mind, body (with all its individual organs and parts) and spirit are an inseparable entity. This is a fact and to think and work otherwise will inevitably lead to failure."[27]

Such an extreme interpretation of holism, however, fails to address the issue of clinical relevance. It is impossible, when examining or treating an animal, to take into account every aspect of the patient, the universe, and every possible interaction between them. A clinician must always make judgments about the relevance of specific factors to health and illness. Claiming a holistic perspective does not obviate making such judg-

ments, although it can make such judgments implicit rather than explicit, so that no efforts are made to justify the relevance of specific factors identified as important for health.

Although holism and reductionism, when properly and reasonably construed, can be complementary rather than antagonistic, the presumed incompatibility of these views is one of the most commonly cited reasons for why CAM cannot be effectively evaluated by EBM methods. Jagtenberg et al,[12] for example has stated that

> [EBM] buttresses the idea that there is a legitimate hierarchy of knowledge and method with the [randomized control trial] as the gold standard and the clinician's notes, observations, and judgments right down there in status with ethnography, sociology and anecdote…there are practitioners of naturopathic modalities who do not subscribe to this hierarchy at all; they tend to see this as a form of nonholistic reductionism.

Similarly, Kneuven[28] has stated that "the concept of holism stands in direct opposition to the Western reductionist view."

Holism is also frequently linked to vitalism, the principle that living entities are defined by nonphysical energetic or spiritual forces and that their health cannot be maintained or restored by any system that does not account for these forces. In fact, CAM approaches are often defined by their adherents as more holistic than conventional approaches precisely because they address such forces. Richard Palmquist is quoted in an article[29] in the *Whole Dog Journal* as stating, "Acupuncture reconnects and balances Life energy.… Energy medicines such as homeopathy, homotoxicology, Reiki, craniosacral therapy, and others align the physical, mental, and spiritual portions of the organism. Yes, I did say spiritual and that is a big part of holistic medicine—recognizing the spiritual nature of Life." Stefanatos[30] has contended that "pharmacological and surgical approaches appear incomplete [from a holistic perspective] because they ignore the Vital Force which animates and breathes life into the biomachinery of living systems" and that "[e]nergetic force is unique, distinguishing living from nonliving systems and people from machines. Medical therapies that promote this energy…should be given primary consideration."

Vitalism was a common feature in most prescientific models of health and disease, and many CAM approaches retain a vitalist perspective. Traditional Chinese medicine, Ayurvedic medicine, acupuncture, homeopathy, chiropractic, energy medicine, and many other CAM approaches have theoretical foundations that recognize energetic or spiritual forces at the root of illness.[28] In contrast, the scientific epistemology that underlies EBM adheres to the principle of methodological naturalism, which holds that scientific investigations must be limited to physical objects and processes that can be measured and manipulated and that obey laws of nature that can potentially be deduced.

Methodological naturalism does not require taking a position on the existence or importance of supernatural forces; it merely excludes consideration of these from scientific investigation.[31] The value of this approach is that it ensures that the data used to defend or challenge explanations for natural phenomena can be evaluated empirically by everyone. In contrast, the data used to challenge or defend claims based on supernatural phenomena come from inherently subjective and nonempirical sources of information, such as intuition, revelation, and faith. When belief itself becomes the basis for defending and challenging claims about the world, no objective standard of evidence can be persuasive. Methodological naturalism has allowed great progress in our understanding of the natural world, despite a rich variety of beliefs among scientists about the supernatural, because it allows for a common ground of objective evidence when debating claims about the natural world.

Although vitalism is not a necessary part of all CAM practices, it is central to many, and the conflict between vitalism and methodological naturalism is a substantial challenge to applying EBM methods and standards to these CAM practices. For example, Kneuven[28] has stated, "Because medical science has defined itself on a strictly physical basis, it is true that vitalism is unscientific. By definition, vitalism embraces a concept about a nonphysical force that can never be understood within the current scientific, medical paradigm." Tonelli et al[9] claim, "The belief that spiritual, emotional, psychological, or other non-measurable aspects of the individual patient's presentation are important for healing does not require one to reject evidence obtained from clinical trials, but it does require the recognition that knowledge gained from such methods will be insufficient to guide optimal clinical practice" and go on to state, "The importance of Qi in traditional Chinese medicine means that research that cannot and does not account for the force will never be compelling for a [traditional Chinese medicine] practitioner."

Finally, a core element of EBM approaches is scientific skepticism. This is the principle that claims about the world must be justified by scientific, empirical evidence. With regard to EBM, tradition, personal experience, intuition, authority, and similar sources of evidence are considered inherently inferior to results of controlled scientific research. It is recognized that one may need to rely on these sources when higher quality data are not available, but the central tenet of EBM is that not all evidence is created equal and that deference should be given to the highest level and quality of evidence available. Under this view, the gold standard for the highest level of evidence would be results of the systematic appraisal of multiple well-designed randomized controlled clinical trials.

Such gold standard evidence is rare in conventional veterinary medicine and does not exist for any of the areas that make up CAVM. The key difference between EBVM and CAVM, however, is not simply the amount or quality of evidence currently available, but the attitude toward the types of evidence that should be sought and the degree of confidence one can have in clinical interventions based on weak scientific or entirely unscientific evidence. Acceptance of EBM requires acceptance of the primacy of empirical evidence. Among practitioners who use CAM, however, there is broader

acceptance of the concept of panepistemia, which holds that nonempirical forms of evidence can be equivalent or superior to empirical evidence, and that randomized controlled trials are not necessary, or sometimes even desirable, to justify clinical practices. Curtis,[32] for example, has suggested, that "[f]or ancient and traditional healing modalities, one could argue that history provides the evidence on which to base clinical practice" and that "[o]ne cannot conclude that, because a healing system cannot be measured conventionally, it is ineffective or unsafe." Similarly, Barry[23] reports, "Users of homeopathy did not see a need for scientific testing and were happy with their own judgment of whether the treatment was working for them…[Randomized clinical trials] came at the bottom of their hierarchy of evidence." And it is not uncommon to see statements such as Jewell's[33] that "[a]s a veterinarian now practicing homeopathy and chiropractic almost exclusively, I have all the proof I need every day in my practice to justify these modalities."

Thus, a core conflict between CAM and EBM is that many CAM practitioners and their clients do not accept the need for scientific evidence because their epistemic philosophy values other forms of evidence equally or even more highly. Some CAM advocates have gone so far as to suggest that EBM is a destructive force that, if applied to CAM interventions, would strip them of the very features that give them value, stating, "Scientifically constructed 'evidence' for an alternative therapy only works when the therapy has mutated into a medicalised version and divested itself of its alternative philosophy. The very publication of trials can act as a reformulation of the very nature of a therapy, generally in the direction of medicalisation."[23]

Conclusions

Given the complexity of the issues involved, the question of whether CAM and EBM are fundamentally compatible or incompatible is, not surprisingly, itself complex. A wide range of therapeutic modalities and methods can be considered to fall into the category of CAM, and because of this, it seems likely that at least some can be evaluated according to the methods of EBM and accepted or rejected as being safe and effective on the basis of results of those evaluations. In addition, at least some CAM practitioners have advocated for rigorous application of EBM methods to CAM.

However, if such interventions are tested and shown to be effective, then it is not clear that they should still be considered complementary or alternative. Many skeptics and proponents of CAM seem to agree that the features that characterize a practice as CAM disappear if that practice is used and evaluated in the context of the conventional biomedical model of health and disease. Thus, it would appear that rigorous application of EBM to CAM practices would obviate the need for the CAM category altogether. In fact, proponents of EBM generally see this as desirable and have suggested, "There is no alternative medicine. There is only scientifically proven, evidence-based medicine supported by solid data or unproven medicine, for which scientific evidence is lacking. Whether a therapeutic practice is 'Eastern' or 'Western,' is unconventional or mainstream…is largely irrelevant except for historical purposes and cultural interest."[7] Angell and Kassirer[20] go on to state,

> 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. Once a treatment has been tested rigorously, it no longer matters whether it was considered alternative at the outset. If it is found to be reasonably safe and effective, it will be accepted.

Certain advocates of CAM practices, however, are concerned that such medicalization of CAM practices robs those practices of their essential character and, possibly, their therapeutic value. For example, Churchill[21] states, "Because of the incommensurability of paradigms, any CAM practiced its original way cannot be the same as its biomedical version.…If the biomedical paradigm is adopted, the system will have the characteristics of that paradigm—materialistic, mechanistic, reductionistic, linear-causal, and deterministic." Such a belief denies any possibility of integrating EBM and CAM and, effectively, makes it clear that EBM and CAM cannot be compatible.

Potentially, one could declare CAM to be compatible with EBM simply by elevating forms of evidence (eg, case reports, observational studies, and anecdotal observations) currently regarded by advocates of EBM as being low-level evidence or by designing new research methods that can accommodate the philosophy of CAM.[34] Borgerson,[35] for example, has stated, "There is no reason to think that mainstream medicine…has any exclusive grasp of the true nature of health or disease or any special claim to epistemological superiority in the assumptions of the evidence hierarchy" and has suggested, "What researchers of alternative medicine might do is question the current standard of evidence: the evidence hierarchy designed by the EBM movement." However, skeptics of CAM see this as special pleading, and proponents of EBM argue that the hierarchy of evidence is well founded and should not be restructured to accommodate unconventional modalities.

Finally, whether CAM can be considered compatible with EBM appears to depend largely on how one defines CAM. If CAM is viewed simply as a set of tools that can be evaluated and used individually according to a conventional scientific understanding of health and disease, then CAM and EBM can be considered compatible, although arguably such practices can no longer be considered alternative in any meaningful sense. However, if CAM is defined in terms of philosophical principles such as constructivism, holism, and vitalism, which are fundamentally incompatible with the philosophy and methods of EBM, it cannot be compatible with EBM, and any attempts to apply EBM methods to CAM defined in this way would fail because their use would strip CAM practices of their defining characteristics.

To truly answer the question of whether EBM and CAM are compatible, both EBM advocates and CAM proponents will have to reflect on the philosophical

underpinnings of their approaches and the extent to which these can accommodate one another. Fundamentally, we must ask whether the veterinary profession wishes to adhere to the scientific epistemology of EBM, which entails holding all proposed treatments to the same standards and rejecting those that fail to generate appropriate supporting evidence, or wishes to give greater autonomy to individual clinicians and clients who may pursue various CAM modalities regardless of the empirical evidence for or against them. How we answer these questions will have a dramatic impact on the character of veterinary medicine and the kinds of treatments we use.

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