

**Addendum #1 to CVMA Proposed AVMA Resolution:
“Homeopathy has been identified as an ineffective practice
and its use is discouraged.”**

White Paper: The Case Against Homeopathy

Summary

It is widely accepted, within the veterinary medical community and in human health care, that the safety and efficacy of medical therapies should be established by scientific methods and that unsafe and ineffective therapies should not be employed. Even organizations that support unconventional and alternative therapies generally acknowledge this.

While habit, tradition, uncontrolled clinical experience, and anecdotes may appear to support the value of a given therapy, these sources of information are deeply unreliable. They inevitably conform to our pre-existing biases, and they can be found to support every possible practice, thus never allowing us to reject any therapy as ineffective. The dramatic and undeniable success of scientific medicine has come from relying on scientific evidence to compensate for our biases and identify which practices are effective and which are not.

Homeopaths frequently claim that homeopathy goes beyond the capabilities of conventional medicine, aiming to cure the underlying cause of disease while scientific medicine merely suppresses symptoms. And they frequently claim to be able to accomplish this with no significant side effects, no need for withdrawal times in food animals, and none of the other limitations of conventional therapies. Any therapy that was able to live up to these claims ought to be able to easily and convincingly demonstrate them in clinical trials and other scientific investigations.

However, while homeopathy has been studied and used for 200 years, and continues to be supported by small minorities within the scientific and healthcare communities, in controlled scientific investigations it has failed to demonstrate effectiveness beyond placebo for any indication. This practice has failed to be validated scientifically at all levels of evidence:

1. The theoretical foundations proposed for homeopathy have not been substantiated and are inconsistent with established scientific knowledge. A dramatically new understanding of physics, chemistry, and biology which overturns the very foundations of modern biomedical science would be necessary for these proposed mechanisms to be valid.
2. There is no consistent body of *in vitro* or animal model research evidence showing the presence of any biologically active factor in homeopathic remedies or a meaningful biological effect of homeopathic treatment beyond placebo. While some apparently positive studies exist, published almost exclusively in journals dedicated to the promotion of homeopathy and other alternative therapies, independent investigation of these studies have found a high risk of bias and have failed to confirm positive findings.

3. There is an enormous clinical trial literature in humans concerning homeopathic treatment. Again, some apparently positive trials exist, but these are of low-quality and highly subject to bias. Systematic reviews of the clinical trial literature consistently find no evidence of an effect beyond placebo, and that lower quality trials are more likely to be positive and higher quality trials more likely to be negative, consistent with placebo effects and inadequately controlled bias, and confounding. The failure to find a consistent effect in properly designed and conducted trials despite many hundreds of attempts over two centuries is strong evidence of the lack of a meaningful therapeutic benefit.
4. There are very few veterinary clinical trials examining homeopathic treatment, most published in homeopathic or alternative medicine journals and all with significant methodological weaknesses. As in the human clinical trial literature, no consistent evidence of a real effect is found when adequate controls for placebo, bias, and confounding are in place.

Despite the continued popularity of homeopathy among a small, but passionate community of advocates, who respond aggressively to any criticism of the practice, a growing number of veterinary, human healthcare, and governmental organizations are acknowledging that existing scientific evidence strongly supports the conclusion that homeopathy has no effect beyond placebo. Because it is unethical to offer ineffective therapies to clients, and dangerous to substitute a placebo therapy for truly effective medicine, there is a movement towards publically acknowledging that there is no reason to believe homeopathic treatment has any real value in preventing or treating disease.

The veterinary profession has an obligation to society and to our clients to acknowledge the conclusions of science even when there is not absolute unanimity within the profession. If we wish to retain the trust of the public, upon which our work depends, we must demonstrate that our recommendations are based on sound science and that we are willing to put the welfare of our patients and clients first even when some of our colleagues object.

As the House of Commons Science and Technology Committee concluded after an extensive review of the evidence concerning homeopathy:

“For patient choice to be real choice, patients must be adequately informed to understand the implications of treatments. For homeopathy this would certainly require an explanation that homeopathy is a placebo. When this is not done, patient choice is meaningless.”

In veterinary medicine, our clients can only have real choice, and justified faith in their veterinarians, if we are willing to be clear and honest in informing them when practices, such as homeopathy, are shown to be ineffective.

Medical Therapies Should be Science-Based and Ineffective Therapies Should Be Discarded

I. Statements from the AVMA

The AVMA has repeatedly affirmed in numerous position statements that all veterinary therapies should be evaluated by the scientific method, and that ineffective and unsafe therapies should be avoided. The following is a selection of examples of AVMA positions and guidelines which affirm this principle.

- A. The AVMA Guidelines for Complementary and Alternative Medicine (Approved by AVMA House of Delegates 2001; revised by the AVMA Executive Board April 2006, November 2007) state:

“The AVMA believes that all veterinary medicine, including CAVM, should be held to the same standards. Claims for safety and effectiveness ultimately should be proven by the scientific method... Practices and philosophies that are ineffective or unsafe should be discarded... Recommendations for effective and safe care should be based on available scientific knowledge and the medical judgment of the veterinarian.”

These guidelines also point out that official recognition of veterinary specialty certification is contingent on the existence of a substantive body of scientific knowledge supporting this status:

“The AVMA does not officially recognize diplomate-status or certificates other than those awarded by veterinary specialty organizations that are members of the AVMA American Board of Veterinary Specialties (ABVS)... Recognition of a veterinary specialty organization by the AVMA requires demonstration of a substantial body of scientific knowledge.”

As a consequence of the absence of a “substantial body of scientific knowledge,” the ABVS does not recognize any certification or specialization in veterinary homeopathy, including that of the Academy of Veterinary Homeopathy which identifies itself as “the only certifying veterinary body in North America” for homeopathy.

- B. The AVMA Guidelines for Assessment of New Therapies for Alleviation of Acute Pain in Animals (Oversight: COR; EB approved 11/06; EB approved revisions 11/11) also emphasize the importance of scientific research in establishing safety and efficacy of therapeutic compounds:

“The assessment of the analgesic efficacy and potency of a variety of pharmaceutical agents for use in veterinary clinical practice is an important goal of applied and clinical veterinary research. Well-designed and appropriately controlled experimental clinical trials are vital to the development of safe and effective compounds.”

- C. The AVMA Guidelines on the Use of Biotechnology in Veterinary Medicine and Animal Agriculture (Oversight: AALC; EB approved 4/07) state:

“The AVMA supports a science-based regulatory policy for the approval of products developed through biotechnology...Future evaluations should be solidly based on sound science and meaningful risk assessments.”

- D. The AVMA position statement on Compounding (Oversight: COBTA; EB approved 11/00; revised 03/05; 04/09) states:

“The decision to use a compounded drug should be veterinarian (not pharmacist) driven, based on a veterinarian-client-patient relationship. Whenever possible the veterinarian should make that decision utilizing evidence-based medicine.”

- E. The AVMA position on Pet Food Health Claims (Approved by the AVMA Executive Board April 2008) states:

“The AVMA encourages the pet food industry to act responsibly by only making health or therapeutic claims that are supported by quality scientific evidence.

Veterinarians should assess relevant product information through principles of evidence-based medicine prior to using or recommending wellness or therapeutic pet foods.”

- F. The AVMA Policy to Promote Veterinary Medical Research and Discovery (COR Oversight; EB approved 11/09) states:

“The AVMA recognizes that the veterinary medical profession is uniquely qualified to provide the highest quality science-based clinical services...the AVMA also recognizes that without vigorous veterinary medical research programs and a sustained infusion of new knowledge, the profession will be unable to continue to provide science-based education and clinical service to meet future societal needs...the Association will support programs that emphasize research and science.”

- G. The AVMA Policy of Raw or Undercooked Animal-Source Protein in Cat and Dog Diets (Approved by the AVMA Executive Board April 2012; approved by the AVMA House of Delegates July 2012) discourages the use of such diets based on scientific evidence of risk:

“The AVMA discourages the feeding to cats and dogs of any animal-source protein that has not first been subjected to a process to eliminate pathogens because of the risk of illness to cats and dogs as well as humans...Several studies reported in peer-reviewed scientific journals have demonstrated that raw or undercooked animal-source protein may be contaminated with a variety of pathogenic organisms....”

- H. The AVMA position on Revaccination Intervals (EB-4/99; COBTA reviewed 3/04; revised 11/08) states:

“The AVMA encourages the USDA APHIS Center for Veterinary Biologics to ensure the scientific basis of vaccine label revaccination interval recommendations.”

- I. The AVMA (Approved by the AVMA Executive Board November 1991; Revised by the AVMA Executive Board June 2002, November 2008) position on Safety Testing states:

“The AVMA supports the research and development of safe and efficacious drugs, vaccines, chemical compounds, and medical devices that benefit humans and animals through humane and responsible safety testing, using scientifically valid principles and procedures... and will continue to oppose activities that seek to eliminate animal-based safety assessments that are not based on sound scientific principles.”

II. Statements from Other Veterinary Organizations

Other veterinary organizations around the world also have formal policies recognizing that veterinary therapies should be validated primarily by scientific research and that therapies which are not safe or effective should not be employed.

- A. In November, 2005, the Federation of Veterinarians in Europe instructed its members:

"to work only on the basis of scientifically proven and evidence-based methods and to stay away from non-evidence-based methods."

- B. European Board of Veterinary Specialties policy states:

“The veterinary profession received the prerogative for diagnosis and treatment of animal diseases based on the assumption that veterinarians are guided by scientific methods. The EBVS therefore only recognises scientific, evidence-based veterinary medicine which complies with animal welfare legislation. Specialists or Colleges who practise or support implausible treatment modalities with no proof of effectiveness run the risk of withdrawal of their specialist status. No credit points can be granted for education or training in these so-called supplementary, complementary and alternative treatment modalities.”

- C. The British Veterinary Association policy states:

“The BVA cannot endorse the use of homeopathic medicines, or indeed any medicine making therapeutic claims, which have no proven efficacy. As with any medicine, BVA believes that veterinary medicinal products must be evidence-based, with any medicinal claims made by a manufacturer supported.”

- D. The Australia Veterinary Association policy states:

"Australian Veterinary Association (AVA) resources will not be used to promote therapies that, in the Board's opinion, are not compatible with current

understanding of physiology and pathophysiology and have been demonstrated to be ineffective by the current accumulated body of knowledge.”

E. The Evidence-Based Veterinary Medicine Association policy states:

“The EBVMA was formed to strengthen the resolve of the veterinary profession in North America to base the practice of veterinary medicine on results from research studies that have been critically-designed and statistically evaluated.”

F. Several policies of the Canadian Veterinary Medical Association echo the AVMA emphasis on the need for scientific validation of veterinary therapies:

1. “The CVMA considers that the use of alternative and complementary therapies may be appropriate in some situations but is concerned that sound clinical research which supports the use of these modalities in animals is lacking for many of the applications...Claims for safety and effectiveness ultimately should be proven scientifically.”
2. “Feeding pets raw meat based diets is a recent trend. Multiple benefits of feeding these diets are touted, but all are supported only by anecdotal reports. To date, no scientific evidence to support the efficacy or safety of these diets have been published. There are now multiple peer-reviewed studies documenting potential risks from bacterial pathogens present in raw meats for both pets fed these diets, and for in-contact humans...the documented scientific evidence of potential animal and public health risks in feeding raw meats outweigh any perceived benefits of this feeding practice.”
3. “The CVMA acknowledges that veterinarians will exercise their best professional judgment in order to optimize disease prevention when formulating vaccination protocols. This would include evaluating the needs of the individual patient for vaccination by applying current scientific information on infectious diseases on a case-by-case basis.”

G. The American Association of Veterinary State Boards, which is responsible for certifying continuing education (CE) courses for veterinarians taken in support of continued state licensure through the Registry of Approved Continuing Education (RACE), explicitly requires that subjects approved for RACE continuing education credit be based on sound scientific evidence, and the teaching of ineffective or unsafe practices cannot be approved as continuing education for veterinarians:

“CE offerings shall be designed to...refresh the participant in the standards for practice and the foundational, evidence-based material presented in accredited colleges or schools of veterinary medicine... CE programs that advocate unscientific modalities of diagnosis or therapy are not eligible for RACE approval.

Furthermore, those programs that promote treatments known to pose significant risks, dangers that outweigh benefits or unproven effectiveness are generally not considered approvable. All scientific information referred to, reported or used in RACE Program Applications in support or justification of an animal-care recommendation must conform to the medically accepted and scientifically supported standards of experimental design, data collection and analysis.”

III. Statements from Governmental Organizations

A number of governmental organizations involved in medical research and regulation and healthcare have also affirmed that medical therapies should be validated by scientific investigation and that ineffective or unsafe practices should not be employed.

A. The National Center for Complementary and Alternative Medicine (NCCAM) at the National Institutes of Health states:

“NCCAM's mission is to define, through rigorous scientific investigation, the usefulness and safety of complementary and alternative medicine interventions and their roles in improving health and health care.... Rigorous, well-designed clinical trials for many CAM therapies are often lacking; therefore, the safety and effectiveness of many CAM therapies are uncertain.”

B. The Food and Drug Administration, charged with regulating medicines and medical devices relies strictly on scientific evidence to establish safety and efficacy. For example, in the FDA medical device guidelines, the agency states:

“Although the manufacturer may submit any form of evidence to the Food and Drug Administration in an attempt to substantiate the safety and effectiveness of a device, the agency relies upon only valid scientific evidence to determine whether there is reasonable assurance that the device is safe and effective.”

Homeopathy is Ineffective

I. Plausibility and Pre-clinical Research Evidence

A. Law of Similars

The foundational principle of homeopathy is that a substance which causes a symptom in a healthy individual can, when properly processed (c.f. Potentization by Dilution and Succussion below), cure the underlying cause of that symptom in a diseases individual.

The Academy of Veterinary Homeopathy gives the following description of this principle:

“Homeopathic practitioners have found that substances that produce symptoms similar to the symptoms of disease can be used to cure that disease.... In homeopathy a medicine (remedy) is selected which would produce in a healthy body the same symptoms found in the sick animal (“like cures like”).

The way a particular substance is associated with a given symptom or set of symptoms is by referring to collections of what are called “pathogenetic trials” or “provings.” This is a method in which healthy individuals ingest or are otherwise exposed to a substance and keep a diary for days or weeks afterwards listing every physical and emotional experience they have. These diaries are then evaluated and patterns of similar symptoms are identified and then codified as symptoms that substance can cause.

Many of the provings used to guide homeopathic treatment today were conducted by Samuel Hahneman himself, who invented homeopathy in the late 18th century. Subsequent efforts to demonstrate consistency or reproducibility of homeopathic provings have been unsuccessful. (1-6)

The concept of "like cures like" has an appealing logic and symmetry to it. It is essentially a variation of "sympathetic magic," the idea that things which resemble one another in some superficial way must be meaningfully related and that one can influence the other. Many cultures have magical practices in which one makes an effigy or figure resembling an individual, a "voodoo doll" for example, and then uses it to indirectly affect the health of that individual. Yellow plants are used to treat jaundice. Walnuts are eaten to treat problems in the brain because walnuts look a little like the human brain. Preparations of mandrake root are used to aid fertility because the root looks a little like a human penis. Examples of such sympathetic magic, which can be found in folk medicine traditions throughout the world. Scientific investigation has not, however, found the idea of sympathetic magic to be a reliable principle for deciding which substances in the natural world will be useful as medicines.

And despite the primacy of the Law of Similars in homeopathic theory, it is often difficult to relate this to the remedies actually used. It is possible, for example, to buy homeopathic products made from body parts such as hip joints and colons, animals such as iguana and dragonfly, and different kinds of sunlight. It is also possible to buy products derived from precious archaeological features such as the Great Wall of China and Stonehenge. It is difficult to understand what symptoms could be induced (and therefore be treated) by these products under the like-cures-like principle.

B. Potentization by Dilution and Succussion

The problem with giving a remedy that causes certain symptoms in order to treat those symptoms is that, obviously, doing so will almost certainly make the patient worse. In developing the theories of homeopathy, Hahneman solved this problem by progressively diluting the remedies until, in most cases, they no longer contain any active ingredients at all. Homeopaths believe that the more dilute a remedy is, the more potent it is, though only if it is vigorously shaken during the dilution process.

In testimony before the House of Commons Science and Technology Committee, Dr Peter Fisher, Director of the Royal London Homeopathic Hospital, described how homeopathic dilutions are made:

“[They] are prepared by a process of sequential dilution with vigorous shaking at each stage of dilution, known as succussion. Dilution is usually in steps of 1:10 or 1:100, referred to as x or d (decimal) or c (centesimal) respectively.

For example, a 30C dilution indicates that the solution has been diluted in the ratio of 1:100, thirty times successively; one drop of the original solution would be diluted with 100 drops of water and the resulting solution would be diluted again, and so on until 30 dilutions had taken place. According to the Prince's Foundation for Integrated Health, in some homeopathic products "not even a single molecule of the original substance remains in the diluted medicine prescribed to the patient."

Dr Fisher stated that the process of "shaking is important" but was unable to say how much shaking was required. He said "that has not been fully investigated" but did indicate that "You have to shake it vigorously...if you just stir it gently, it does not work."

The principle that a therapeutic substance becomes more potent the lower the dose, and that it can still be active even when it contains only the diluent (water), is inconsistent with the fundamental principles of chemistry and physiology underlying all of scientific medicine. A revolution in basic science would need to take place for this idea to have any possibility of being correct, and the inconsistent and low-quality studies that have attempted to validate homeopathic theory do not justify such a revolution.(7-9)

The Royal Pharmaceutical Society of Great Britain (RPSGB) offers the following comments on this issue:

“The philosophy of homeopathy that a substance becomes more potent as it is diluted goes against the conventional theory of the pharmacological action of compounds in the body...There is no robust scientific evidence to suggest that differences can be detected between ultradilute homeopathic remedies and the diluent used to prepare the remedy in terms of their physical properties and behaviour.”

“As a consequence of their extreme dilution, most high dilution/potency homeopathic remedies do not contain a single active molecule. The administration of a preparation containing substance at such large dilutions leads to a RPSGB view that such preparations will not produce clinical effects.”

There have been many attempts to demonstrate that ultradilute substances can have biological effects, *in vitro* or *in vivo*. Some studies in dedicated homeopathy or alternative medicine journals have reported positive findings, but a review of these studies found numerous methodological problems and ultimately concluded:

“There is a lack of independent replication of any pre-clinical research in homeopathy. In the few instances where a research team has set out to replicate the work of another, either the results were negative or the methodology was questionable.”(9)

Other reviews have also found that replications of pre-clinical studies in homeopathy are often not successful, leading to an absence of consistent, repeatable evidence for the basic theoretical principles behind the practice.(10) Even the Prince's Foundation for Integrated Health, which is generally supportive of homeopathy, notes, "any specific mechanism of action based on extreme dilution is implausible and regarded as unsupportable by the majority of scientists working in this field."

One of the few studies published in the mainstream medical literature concerning ultradilute homeopathic remedies, published in *Nature* in 1988, purported to show that such a remedy could influence the degranulation of human basophils. (11) Because the findings were so revolutionary, the journal took the unprecedented step of arranging for an independent team of investigators to observe replications of the experiment.

This team found that the results had been generated by an unblinded technician, and when this individual was unaware of the treatment given to each sample, the positive findings disappeared.(12) Subsequently, multiple attempts by independent researchers to replicate the original experiment also failed to find an effect.(13-14) A review published in a homeopathy journal in 2009 concluded that after twenty years of research, it was still impossible to determine conclusively that purported effects of ultradilute solutions on human basophils were not due solely to artifact.(15)

Many theories have been proposed to explain how water containing no other substances could have potent and specific therapeutic effects. Homeopaths have claimed water has selective memory for the substances used to make homeopathic remedies or that in some way not yet understood quantum mechanics validates their claims. Attempts to validate claims that homeopathic remedies are measurably distinct from ordinary water have been methodologically weak and not reproducible.(16-18)

The proposed mechanisms of homeopathy are shown to be implausible when analyzed from a physical and chemical perspective, and thus it is of no surprise that the biological effects of homeopathy cannot be measured in large-scale clinical trials.

II. Clinical Trial Evidence

A. Human Studies

There have been an enormous number of clinical trials of homeopathy conducted in humans. These have been summarized in many systematic reviews over the last twenty years, and several clear patterns have emerged:

1. Most studies are of poor quality, at high risk of bias, and published in journals dedicated to homeopathy and other alternative therapies. Despite this, a consistent clinical effect has not been identified.
2. Higher quality studies are much more likely to have negative findings. Studies with poor control for bias, confounding, and non-specific effects of participation in a clinical trial (placebo effect, Hawthorne effect, regression to the mean, spontaneous resolution, etc.) are more likely to have positive results.
3. Occasional positive findings cannot be replicated and disappear when methodological flaws are corrected.
4. The positive effects sometimes reported are far weaker than those for matched conventional therapies and unlikely to be clinically meaningful.
5. The balance of the evidence unquestionably indicates that the effects of homeopathic treatment are due to placebo effects, chance, bias, confounding, and other sources of error, *not* true therapeutic effects.

After an extensive review of the evidence and testimony from experts both supportive and critical of homeopathy, the House of Commons Science and Technology Committee concluded:

“In our view, the systematic reviews and meta-analyses conclusively demonstrate that homeopathic products perform no better than placebos. We could find no support from independent experts for the idea that there is good evidence for the efficacy of homeopathy.

The most recent review has specifically compared studies of homeopathic treatments with matched studies of conventional therapies to identify whether a clear effect beyond placebo could be seen for either. The conclusion was that while all clinical trials are imperfect, it is possible to distinguish a true therapeutic effect from placebo effects for conventional therapies but not for homeopathic treatment:

“Biases are present in placebo-controlled trials of both homoeopathy and conventional medicine. When account was taken for these biases in the analysis, there was weak evidence for a specific effect of homoeopathic remedies, but strong evidence for specific effects of conventional interventions. This finding is compatible with the notion that the clinical effects of homoeopathy are placebo effects.”(19)

Because there have been so many systematic reviews of clinical trials on homeopathic treatment, there is even a systematic review of those reviews. This review evaluated all prior systematic reviews and meta-analyses of homeopathy. According to the summary of this review:

“Electronic databases were searched for systematic reviews/meta-analysis on [homeopathy]. Seventeen articles fulfilled the inclusion/exclusion criteria. Six of them related to re-analyses of one landmark meta-analysis. Collectively they implied that the overall positive result of this meta-analysis is not supported by a critical analysis of the data.

Eleven independent systematic reviews were located. Collectively they failed to provide strong evidence in favour of homeopathy. In particular, there was no condition which responds convincingly better to homeopathic treatment than to placebo or other control interventions. Similarly, there was no homeopathic remedy that was demonstrated to yield clinical effects that are convincingly different from placebo.

It is concluded that the best clinical evidence for homeopathy available to date does not warrant positive recommendations for its use in clinical practice.”(20)

The assessment of the eleven independent systematic reviews analyzed is summarized in Table 1.(21-31)

The “landmark meta-analysis” referred to in this review, and often cited by supporters of homeopathy, concluded homeopathy did have an effect greater than placebo:

“The results of our meta-analysis are not compatible with the hypothesis that the clinical effects of homeopathy are completely due to placebo. However, we found insufficient evidence from these studies that homeopathy is clearly efficacious for any single clinical condition.”(32)

Due to numerous criticisms of the methodology used, this study has been re-analyzed six times, including one re-analysis by the original authors. These subsequent analyses are summarized in Table 2.(33-38) All of the independent re-analyses concluded that the appearance of effects greater than placebo was related to the inclusion of poor-quality studies in the original analysis. The authors’ re-analysis of their own study concluded:

“Studies that were explicitly randomized and were double-blind as well as studies scoring above the cut-points yielded significantly less positive results than studies not meeting the criteria. In the cumulative meta-analyses, there was a trend for increasing effect sizes when more studies with lower-quality scores were added... We conclude that in the study set investigated, there was clear evidence that studies with better methodological quality tended to yield less positive results.”(35)

A comprehensive and critical look at the voluminous clinical trial evidence in humans concerning homeopathy demonstrates that despite centuries of use and study, no reliable or consistent evidence has been generated to show homeopathy is effective for a single indication, and it is impossible to demonstrate that the effects which are sometimes reported for homeopathic treatment are due to anything other than placebo effects and non-specific clinical trial effects inadequately controlled for in poor-quality trials. This contrasts starkly with the enormous advancement scientific medicine has made in the same time period, and illustrates clearly that homeopathy is an ineffective therapy.

B. Veterinary Studies

Not surprisingly, the clinical trial literature concerning homeopathy in veterinary medicine is considerably weaker in quantity and quality than the human clinical trial evidence. No systematic reviews or meta-analyses exist. The clinical trials that have been reported are generally small, not replicated, and have significant methodological limitations. Both positive and negative trials are reported, but despite claims of efficacy and decades of use and investigation, no clear pattern of evidence has emerged to support the efficacy of homeopathy for any indication.

An informal review in 1998, which was rather positive in tone about the potential value of veterinary homeopathy, identified 3 trials with purportedly positive effects, 6 reporting no effect, and 7 that were difficult to interpret.(39) All trials had significant methodological problems.

Since then, there have been a number of additional clinical trials, but clear evidence of any meaningful clinical effect is still lacking. Table 3 lists some of the better clinical trials reporting an effect for a homeopathic treatment, illustrating the limitations of even the best of such studies.(40-53) None have been independently replicated, and negative studies of homeopathy for similar indications are frequently available.

Given that publication bias, placebo effects, and the other sources of error that affect all clinical trial research generally lead to falsely positive, rather than falsely negative findings, the abundance of negative studies of veterinary homeopathy is compelling evidence for a true lack of efficacy. Many of the studies with the tightest controls for bias and chance are among those reporting negative results.(56-70)

Most studies reporting an effect of homeopathy have been published in journals devoted to homeopathy or alternative therapies, so the issue of publication bias must also be considered. Negative studies are far less commonly published in such journals, so the relative number of positive and negative trials should be considered with this in mind. In any case, despite decades of research, only a few positive trials have been published, all small and with important limitations.

Considering the clear pattern for small, poor quality human clinical trials to show positive results which cannot be replicated and which are contradicted by negative results in larger, better quality trials, the veterinary literature is not convincingly supportive of homeopathy. None of the few positive trials are methodologically adequate to rule out chance, bias, confounding, and other sources of falsely positive results.

The argument is sometimes made that the presence of some positive results in the published literature, even given limitations in the control for potential sources of error, justifies deferring judgment on the efficacy of homeopathy and pursuing additional research. While those interested in this therapy are, of course, free to continue trying to produce convincing evidence of efficacy for homeopathy, it is difficult to justify indefinitely withholding judgment on a medical therapy that has failed to conclusively demonstrate its value in over 200 years.

The theoretical foundations of the practice are implausible and incompatible with established science. The enormous pre-clinical and clinical trial literature in humans has failed to validate the practice. And the limited research in veterinary species is more compatible with homeopathy being a placebo than with having a clinically meaningful therapeutic effect. As the House of Commons Science and Technology Committee concluded:

“There has been enough testing of homeopathy and plenty of evidence showing that it is not efficacious. Competition for research funding is fierce and we cannot see how further research on the efficacy of homeopathy is justified in the face of competing priorities.”

Mainstream Scientific Interpretation of Existing Evidence

II. Statements from Veterinary Organizations

- A. Since 2009, the Registry for Approved Continuing Education (RACE) has denied approval for continuing education offerings involving the teaching of homeopathy because homeopathy does not meet the requirements set forth in the RACE standards as it is not taught in accredited schools of veterinary medicine. In response, the community of homeopathy providers (and other providers of alternative therapies) attempted to bypass the standards set by the mainstream veterinary community and established a separate CE approval organization, the Registry of Alternative and Integrative Veterinary Medical Education (RAIVE). RAIVE is not recognized by any of the veterinary state medical boards.

This further illustrates that homeopathy as a discipline does not to meet the standards of evidence for safety and efficacy established for veterinary medicine as a whole.

- B. The AVMA requires specialty boards to demonstrate “a substantial body of scientific knowledge,” and does not recognize the Academy of Veterinary homeopathy certification process due to the failure to meet this requirement:

“The AVMA does not officially recognize diplomate-status or certificates other than those awarded by veterinary specialty organizations that are members of the AVMA American Board of Veterinary Specialties (ABVS), nor has it evaluated the training or education programs of other entities that provide such certificates. Recognition of a veterinary specialty organization by the AVMA requires

demonstration of a substantial body of scientific knowledge. The AVMA encourages CAVM organizations to demonstrate such a body of knowledge.”

- C. The British veterinary Association does not recognize the scientific legitimacy of claims of efficacy for homeopathy.

“The BVA cannot endorse the use of homeopathic medicines, or indeed any medicine making therapeutic claims, which have no proven efficacy.”

- D. The Australian Veterinary Association has concluded:

“That the Board agreed that the veterinary therapies of homeopathy and homotoxicology are considered ineffective therapies in accordance with the AVA promotion of ineffective therapies Board resolution.”

II. Statements from Other Medical Organizations

- A. The British Medical Association has issued numerous statements decrying the use and teaching of homeopathy by the National Health Service, including these:

“No UK training post should include a placement in homeopathy”

“Pharmacists and chemists should remove homeopathic remedies from shelves indicating they are 'medicines' of any description, and place them on shelves clearly labeled 'placebos'.”

“Homeopathy should not be funded by the NHS due to lack of convincing evidence that it is effective. In fact there is recent evidence that it does not work any better than a placebo and can divert patients away from more evidence based therapy that they may require.”

Dr. Tom Dolphin, an official of the BMA, has gone so far as to call homeopathy “witchcraft” and to argue that British government involvement with the practice is “a disgrace.”

Several other national medical associations, including those of Sweden and the Czech Republic, have officially declared homeopathy to be ineffective and have discouraged their members from utilizing it.

III. Statements from Government Agencies

- A. Even National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health, which is specifically charged with investigating alternative therapies, acknowledges the lack of scientific evidence for efficacy:

“Most rigorous clinical trials and systematic analyses of the research on homeopathy have concluded that there is little evidence to support homeopathy as an effective treatment for any specific condition.”

“Homeopathy is a controversial topic in complementary medicine research. A number of the key concepts of homeopathy are not consistent with fundamental concepts of chemistry and physics. For example, it is not possible to explain in scientific terms how a remedy containing little or no active ingredient can have any effect. This, in turn, creates major challenges to rigorous clinical investigation of homeopathic remedies. For example, one cannot confirm that an extremely dilute remedy contains what is listed on the label, or develop objective measures that show effects of extremely dilute remedies in the human body.”

“Certain homeopathic products (called “nosodes” or “homeopathic immunizations”) have been promoted by some as substitutes for conventional immunizations, but data to support such claims is lacking. The National Center for Complementary and Alternative Medicine (NCCAM) supports the Centers for Disease Control and Prevention’s recommendations for immunizations/vaccinations.”

- C. The Food and Drug Administration (FDA) regulates medical therapies and drugs. Homeopathic remedies are categorized as a drug and exempt from FDA requirements for pre-market clinical trial evaluation because they were grandfathered into the Food, Drug and Cosmetic Act of 1938 by the author, a senator who also practiced homeopathy. However, the FDA clearly states that while homeopathic remedies may be freely marketed for this historical reason”

“FDA is not aware of scientific evidence to support homeopathy as effective.”

With regard to veterinary use, the FDA considers homeopathic unapproved animal drugs but has made no attempts to regulate their use or require any evidence of safety and efficacy.

- D. European Union Regulations, designed to accommodate a variety of countries some of which have a historical tradition of homeopathic medicine and others which do not, acknowledge that these remedies have no therapeutic indication and requires they be labeled to indicate this. These remedies can be marketed so long as:

1. They contain no active ingredient:

“there is a sufficient degree of dilution to guarantee the safety of the medicinal product; in particular, the medicinal product may not contain either more than one part per 10000 of the mother tincture or more than 1/100th of the smallest dose used in allopathy with regard to active substances whose presence in an allopathic medicinal product results in the obligation to submit a doctor's prescription.”

2. They are acknowledge to have no recognized therapeutic use:

“The proof of therapeutic efficacy shall not be required for homeopathic medicinal products.”

3. The label indicates the absence of any recognized therapeutic use with the words:

"homeopathic medicinal product without approved therapeutic indications."

- E. The Australian National Health and Medical Research Council, in a draft statement in 2010, has said:

“NHMRC’s position is that it is unethical for health practitioners to treat patients using homeopathy, for the reason that homeopathy (as a medicine or procedure) has been shown not to be efficacious.”

- F. As already noted, the House of Commons Science and Technology Committee conducted an in-depth investigation into the scientific merits of homeopathy in 2010 and concluded that the fundamental principles behind the practice were implausible and inconsistent with established science, that there was adequate evidence to conclude the practice was ineffective, and that there was little justification for further research on the subject. After the report was completed, the Chief Scientific Advisor to the British government accepted it and stated that he could not “envisage scientifically credible proposals for funding research into homeopathy in the future.”

IV. The Dangers of Homeopathy

A. Direct Harm

It is generally assumed that because homeopathic preparations frequently do not contain any active ingredients or any trace of the substance from which they were originally made, that they are intrinsically safe. For the most part, direct harm from ingestion of homeopathic remedies is very uncommon. However, there is evidence that direct harm from such remedies does occur.

The World Health Organization (WHO) supports, as a matter of policy, traditional or folk systems of medicine as an expression of cultural identity. Without taking a position on the scientific evidence for efficacy, the WHO has provided guidelines for countries wishing to permit the sale and use of homeopathic remedies. In these guidelines, the WHO acknowledges:

“there are a few aspects of the production of homeopathic medicines that could constitute potential safety hazards. Firstly, not all homeopathic medicines are administered at a high dilution. Sometimes, a homeopathic medicine made from source material, such as a mother tincture, is administered in the most concentrated form.

Secondly, homeopathic medicines are made from a wide range of natural or synthetic sources: minerals and chemicals, but also plant materials, including roots, stems, leaves, flowers, bark, pollen, lichen, moss, ferns and algae; microorganisms, including fungi, bacteria, viruses and plant parasites; animal organs, tissues, secretions and cell lines. Human materials may include tissues, secretions, hormones, and cell lines. Some of these source materials constitute potential safety hazards, even at high dilutions.”

“However, safety assessment should also consider possible impurities of the source material or contamination and failures of good manufacturing practice.”

There have been some reports of detectable heavy metal contamination of homeopathic remedies.(71) Given the absence of evidence for efficacy, even such small risks seem difficult to justify.

- B. A much more significant risk is the substitution of an ineffective therapy for truly beneficial care. Homeopaths frequently recommend their patients avoid conventional medicine. For example, the Academy of Veterinary Homeopathy (AVH) Standards of Practice state:

“Only the remedy that is homeopathic to the patient is to be used.”

“Drugs and methods of treatment which are not homeopathic to the case are to be avoided because of the possibility of interference with the progress of cure.” [the footnote reads, " Organon of Medicine, 6th edition, paragraphs 23, 25-45, 69, and 291. Here discussion of the curative effect of similar medicines and the harmful effects of non-similar medicines is made clear. Drugs, herbs and other forms of treatment prevent cure and cause ultimate harm to the patient. Hahnemann states that only the medicine homeopathic to the patient's condition is to be used in treatment."]

Exceptions are made for life-threatening illnesses and situations in which there is a clear reason a patient cannot stop taking a conventional medicine, but this only emphasizes that homeopathy is self-evidently not effective in such cases. The danger lies in selecting homeopathic treatment over scientific medicine in cases where the threat to health and life is not immediately apparent.

The AVH also takes a position well beyond that justified by science concerning the use of vaccines:

“During homeopathic treatment, vaccination is usually contraindicated. If health problems have arisen or are exacerbated by vaccination, homeopathy is one of the few medical specialties that recognizes these problems and has the potential to address them curatively. Some veterinary homeopaths recommend no vaccines of any kind. Some will tailor a limited vaccination protocol for you and your pet. Whatever your options and your decision, your veterinary homeopath can provide guidance and an important perspective.”

While not all homeopaths discourage conventional therapy, the practice is fundamentally based on the premise that conventional, scientific medicine is in error in its basic approach and that homeopathy is an entirely different, and superior, way to truly cure disease. There have been a number of well-documented cases of people following this line of reasoning strictly and suffering severe injury or death as a result.(72)

Given that all medicine involves balancing risks against benefits, the case against homeopathy seems clear. There is a conspicuous absence of evidence of benefits despite centuries of use and investigation. And there are real risks, not to mention ethical concerns, associated with substituting an ineffective therapy for truly beneficial medical care. The balance seems unquestionably weighted against treating homeopathy as a legitimate veterinary therapy.

Table 1
INDEPENDENT SYSTEMATIC REVIEWS OF HOMEOPATHY

<i>Reference</i>	<i>Included trials (number)</i>	<i>Total patient number</i>	<i>Assessment of methodological quality</i>	<i>Meta-analysis</i>	<i>Overall conclusion</i>	<i>Comment</i>
Barnes 21 (1997)	all placebo-controlled trials of homeopathy for post-operative ileus (n=6)	776	Yes	weighted mean difference to time until first sign of peristalsis was in favor of homeopathy (-7.4 hours)	homeopathic treatment can reduce the duration of post-operative ileus, however, several caveats preclude a definitive judgment	the methodologically best trial was convincingly negative
Ernst 22 (1998)	all placebo-controlled trials of homeopathy for delayed onset muscle soreness (DOMS) (n=8)	311	Yes	no meta-analysis possible, all randomized trials were negative	the evidence does not support the hypothesis that homeopathic remedies are more efficacious than placebo for DOMS	DOMS was chosen because it was submitted to clinical trials more often than any other condition
Ernst 23 (1998)	all placebo-controlled trials of homeopathic arnica (n=8)	338	Yes	no meta-analysis possible, no clear trend in favor of homeopathy	the claim that homeopathic arnica is efficacious beyond a placebo effect is not supported by rigorous clinical trials	this analysis set out to test the remedy that had been most frequently submitted to clinical trials, ie arnica (see also Lüdtkke below)
Ernst 24 (1999)	all RCTs of homeopathy for migraine prophylaxis (n=4)	284	Yes	no meta-analysis possible; 3 of 4 trials were negative (including the methodologically best)	the trial data ... do not suggest that homeopathy is effective in the prophylaxis of migraine or headache beyond a placebo effect	this analysis tested the efficacy for a condition that homeopaths often treat in clinical practice
Ernst 25 (1999)	all controlled clinical trials of "classical"* homeopathy versus conventional treatments (n=6)	605	No	no meta-analysis possible	no clear trend in favor of homeopathy	non-randomized studies were also included

Ludtke 26 (1999)	all controlled clinical trials of homeopathic arnica (n=37)	n.d.p.	Yes	no meta-analysis possible	no clear evidence in favor of homeopathic arnica was found	paper probably not peer-reviewed, trials that used arnica in combination with other remedies and those which were not placebo controlled were also included
Cucherat 27 (2000)	all RCTs of homeopathy vs placebo with clinical or surrogate endpoints (n=16)	2,617	Yes	combined 2-tailed p value was highly significant (p=0.000056) in favor of homeopathy	there is some evidence that homeopathic treatments are more effective than placebo	strength of evidence was estimated to be low by the authors
Vickers 28 (2000)	all RCTs of homeopathic oscillococcinum vs placebo for influenza (n=7)	3,459	Yes	RR=0.64 for influenza prevention; RR=0.28 for influenza treatment	treatment reduced length of illness significantly by 0.28 days	the authors stated that "the data are not strong enough to make a general recommendation"
Linde 29 (2000)	all RCTs of homeopathy vs placebo for chronic asthma (n=3)	154	Yes	no meta-analysis possible	no clear trend in favor of homeopathy	not enough evidence for reliable assessment
Jonas 30 (2000)	all controlled clinical trials of homeopathy for rheumatic conditions (n=6)	392	yes	combined OR = 2.19	homeopathic remedies work better than placebo	not enough trials for any specific condition to allow reliable assessment
Long 31 (2001)	all RCTs of homeopathy for osteoarthritis (n=4)	406	yes	no meta-analysis possible	no clear trend in favor of homeopathy	not enough evidence for reliable assessment

RCT = randomized clinical trial, OR = odds ratio, RR = relative risk

* classical homeopathy = approach where remedies are individualized according to patient characteristics deemed important by homeopaths.

Table 2

THE SYSTEMATIC REVIEW BY LINDE ET AL AND ITS SUBSEQUENT RE-ANALYSES

<i>Reference</i>	<i>Included trials (number)</i>	<i>Total patient number</i>	<i>Assessment of quality</i>	<i>Meta-analysis</i>	<i>Overall conclusion*</i>	<i>Comment</i>
Linde 32 (1997)	all double-blind and/or randomized placebo-controlled trials of any clinical condition (n=186)	2,588	yes	of 89 trials which could be submitted to meta-analysis: OR = 2.45; of 26 "good quality trials": OR = 1.66 (both in favor of homeopathy)	clinical effects of homeopathy are not completely due to placebo	review was criticized for 1) including different remedies 2) including different conditions 3) including non-randomized trials
Ernst 33 (1998)	all studies from Linde <i>et al</i> 11 which received 90 (of 100) points in at least 1 of the 2 quality ratings, using highly dilute remedies, following the principles of "classical"* homeopathy (n=5)	587	yes	OR=1.0 (no evidence in favor of homeopathy)	homeopathic remedies are associated with the same clinical effects as placebo	this analysis specifically tested the efficacy of highly diluted remedies (other remedies could still work via conventional pharmaceutical effects)
Linde 34 (1998)	all trials from Linde <i>et al</i> 11 which tested "classical"* homeopathic remedies against placebo, no treatment or another treatment (n=32)	1,778	yes	19 placebo-controlled trials were submitted to meta-analysis; OR = 1.62; however, when this analysis was restricted to the methodologically best trials the effect was no longer significant	individualized homeopathy has an effect over placebo; the evidence, however, is not convincing	not all of the included trials were randomized and many had other serious methodological weaknesses
Linde 35 (1999)	all trials from Linde <i>et al</i> 11 which could be submitted to meta-analysis (n=89)	n.d.p.	yes	the mean OR of the best studies was not in favor of homeopathy	there was clear evidence that studies with better methodological quality tended to yield less positive results	the authors felt that these results "weaken the findings of [their] original meta-analysis"
Morrison 36 (2000)	26 trials classified by Linde <i>et al</i> 11	n.d.p.	yes	none	no significant trend was seen when	large multicenter trials were

	as high quality (n=26)				correlating security of randomization and trial result	recommended
Ernst 37 (2000)	all trials from Linde <i>et al</i> that received quality ratings between 1-4 on the Jadad score (n=77)	n.d.p.	yes	none	there is a ... strong linear correlation between OR and Jadad score (n=0.97, p<05); homeopathic remedies are, in fact, placebos	extrapolation from this correlation implies that the most rigorous studies yield an effect size of zero
Sterne 38 (2000)	89 trials of Linde <i>et al</i> review compared to 89 trials of allopathic medicines	n.d.p.	yes	strong evidence for publication bias causing a false positive result in favour of homeopathy	when adjusting high quality trials [of homeopathy] for publication bias, the OR changed from 0.52 to 1.19 but remained unchanged for allopathy	paper probably not peer-reviewed, adjusting for bias nullified the effect of homeopathy but not for allopathy

RCT = randomized clinical trial, OR = odds ratio, RR = relative risk

* classical homeopathy = approach where remedies are individualized according to patient characteristics deemed important by homeopaths.

Table 3
SELECTED VETERINARY CLINICAL TRIALS OF HOMEOPATHY REPORTING
POSITIVE RESULTS

<i>Reference</i>	<i>Randomization</i>	<i>Blinding</i>	<i>Control Group</i>	<i>Sample Size</i>	<i>Overall conclusion</i>	<i>Comment</i>
Wolter 40 (1966)	Not randomized, sequential allocation	Yes	Yes	5 (2 treatment, 3 control)	Labor followed injection in 2 treatment animals, not in 3 control animals	Haphazard allocation, subjective evaluation of response
Sommer 41 (1972)	Yes	Yes	Yes	48 (40 treatment, 18 control)	Treated had lower rate of disease and less severe disease; no effect on estrus	Lacking statistical analysis
Schutte 42 (1988)	Yes	No	Yes	64 (33 homeopathic treatment, 31 conventional treatment)	Small difference in duration of illness; difference in piglet survival	A variety of homeopathic remedies used, incomplete statistical information
Williamson 43 (1991)	Yes	Yes	Yes	133 (32 untreated, 101 in two treatment groups)	Significant differences seen in 5 or 23 comparisons	No correction for multiple comparisons; Control and treatment groups different
Williamson 44 (1995)	Yes	Yes	Yes	90 (14 untreated, 26 placebo, 50 in two homeopathic treatments groups)	No statistically significant difference between treatment/placebo and treated groups	Highest rate of periparturient disorders was in treated groups
Searcy 45 (1995)	Yes	Unclear	Yes	26 (13 treatment, 13 control)	Less subclinical mastitis in treatment group, no difference in milk production	Subjective measure of disease
Guajardo 46 (1996)	Unclear	Yes	Yes	10 (5 treatment, 5 control)	13% greater weaning weight of piglets whose mothers received treatment	Lack of randomization; No difference in other measures
Sandoval 47 (1998)	Yes	Unclear	Yes	400 (200 antibiotic treatment, 200 homeopathic treatment)	No difference in mortality between groups	
Beceriklisoy 48 (2005)	Yes	No	Yes	38 (15 each two homeopathic treatments, 8 placebo)	Resolution of pseudopregnancy symptoms	Subjective measure; placebo and treatment not matched

Özyurtlu 49 (2005)	Unclear	No	Yes	30 (15 treatment, 15 placebo)	Resolution of pseudopregnancy symptoms	Subjective measure
Faulstich 50 (2006)	Yes	Yes	Yes		No difference in lameness between treatment and hyaluronic acid IV	Subjective measure; Comparator not proven effective
Zacharias 51 (2008)	Yes	No	Yes	20 (7 treatment, 7 positive control, 6 untreated)	Most measures not significantly different	Not clear if outcome meaningful; no control for multiple comparisons
Hielm 52 (2009)	Yes	Possibly	Yes	44 (14 homeopathic, 14 placebo, 15 NSAID)	Significant difference 3/6 measures	Subjective measures; placebo and Tx not identical; questionable data analysis
Coelho 53 (2009)	Unclear	Yes	Yes	46 (11 antibiotic treatment, 35 in 3 homeopathy groups)	No effect on illness, marginal effect on mortality/weight	Inconsistent effects, borderline significance
Klocke 54 (2010)	Yes	No	Yes	102	Multiple measures, few differences between groups	Treatments not matched; comparator not standard of care; treatment not clearly better than no treatment
Camerlink 55 (2010)	Yes	Yes	Yes	52 (26 treatment, 26 placebo)	Diarrhea incidence lower in treated group	Dx of E. coli not confirmed

References

1. Dantas F, Fisher P. A systematic review of homeopathic pathogenic trials ('provings') published in the United Kingdom from 1945 to 1995. In: Ernst E, editor. *Homeopathy: a critical appraisal*. London: Butterworth Heinemann; 1998. pp. 69–97.
2. Brien S, Prescott P, Owen D, Lewith G. How do homeopaths make decisions? An exploratory study of inter-rater reliability and intuition in the decision making process. *Homeopathy*. 2004 Jul;93(3):125-31.
3. Fisher P, Dantas F. Homeopathic pathogenetic trials of *Acidum malicum* and *Acidum ascorbicum*. *British Journal of Homeopathy*. 2001;90:118–125.
4. Sarah Brien, George Lewith, and Trevor Bryant¹: Ultramolecular homeopathy has no observable clinical effects. A randomized, double-blind, placebo-controlled proving trial of *Belladonna 30C*. *British Journal of Clinical Pharmacology*. 2003;56(5):562–568.
5. Walach H, Koster H, Hennig T, Haag G. Symptoms produced from homeopathic *Belladonna C30* are likely due to chance. *Journal of Psychosomatic Research*. 2001;50:155–160.
6. K Goodyear, G Lewith, and J L Low Randomized double-blind placebo-controlled trial of homeopathic 'proving' for *Belladonna C30*. *Journal of the Royal Society of Medicine*. 1998;91(11):579–582.
7. Grimes D. Proposed mechanisms for homeopathy are physically impossible. *Focus on Complementary and Alternative Therapies* 2012;17:149-154.
8. Becker-Witt C, Weissshuhn TE, Lüdtker R, Willich SN. Quality assessment of physical research in homeopathy. *Journal of Alternative and Complementary Medicine*. 2003;9(1):113-32.
9. Vickers AJ. Independent replication of pre-clinical research in homeopathy: a systematic review. *Forschende Komplementarmedizin*. 1999;6:311-20.
10. Endler et al. Repetitions of fundamental research models for homeopathically prepared dilutions beyond 10-23: a bibliometric study. *Homeopathy*. 2010;99: 25-36.
11. Davenas E, Beauvais F, Amara J, Oberbaum M, Robinzon B, Miadonna A, Tedeschi A, Pomeranz B, Fortner P, Belon P, et al. Human basophil degranulation triggered by very

dilute antiserum against IgE. *Nature*. 1988 Jun 30;333(6176):816-8.

12. Maddox, J. Randi, J. Stewart, W. "High-dilution" experiments a delusion. *Nature* 1988;334:287-290.
13. Ovelgonne, J.H.; Bol, A.W.; Hop, W.C.; Van Wijk, R. Mechanical agitation of very dilute antiserum against IgE has no effect on basophil straining properties. *Experientia* 1992;48(5):504-8.
14. Hirst, S.J.; Hayes, N.A.; Burridge, J.; Pearce, F.L.; Foreman, J.C. Human basophil degranulation is not triggered by very dilute antiserum against human IgE. *Nature* 1993;366(6455):527.
15. Ennis, M. Basophil models of homeopathy: a sceptical view. *Homeopathy* 2010;99(1):51-56.
16. M. F. Chaplin, The memory of water; an overview, *Homeopathy*. 2007;96:143-150.
17. J. Teixeira, Can water possibly have a memory? A sceptical view, *Homeopathy*. 2007;96:158-162.
18. D. J. Anick, High sensitivity ¹H-NMR spectroscopy of homeopathic remedies made in water. *Complementary and Alternative Medicine*.2004;4:15.
19. Shang A, Huwiler-Muntener K, Nartey L, Juni P, Sterne J A C, Pewsner D et al. Are the clinical effects of homoeopathy placebo effects? Comparative study of placebo-controlled trials of homoeopathy and allopathy. *Lancet* 2005; 366:726-732.
20. Ernst E. A systematic review of systematic reviews of homeopathy. *British Journal of Clinical Pharmacology*. 2002;54:577-582.
21. Barnes J, Resch K L, Ernst E. Homeopathy for Postoperative Ileus. *Journal of Clinical Gastroenterology*. 1997;25:628-633.
22. Ernst E, Barnes J. Are homoeopathic remedies effective for delayed-onset muscle soreness? A systematic review of placebo-controlled trials. *Perfusion*. 1998;11:4-8.
23. Ernst E, Pittler M H. Efficacy of homeopathic arnica. A systematic review of placebo-controlled clinical trials. *Archives of Surgery*. 1998;133:1187-1190.
24. Ernst E. Homoeopathic prophylaxis of headaches and migraine? A systematic review. *Journal of Pain and Symptom Management*. 1999;18:353-357.
25. Ernst E. Classical homoeopathy versus conventional treatments: a systematic review. *Perfusion*. 1999; 12:13-15.

26. Ludtke R, Wilkens J. Klinische Wirksamkeitsstudien zu Arnica in homöopathischen Zubereitungen. In: Company Report, Carstens Stiftung. Essen, German: 1999.
27. Cucherat M, Haugh M C, Gooch M, Boissel J-P. Evidence of clinical efficacy of homeopathy. A meta-analysis of clinical trials. *European Journal of Clinical Pharmacology*. 2000;56:27-33.
28. Vickers A J, Smith C. Homeopathic oscillococcinum for preventing and treating influenza and influenza-like syndromes. *The Cochrane Library*. 2001;1:1-10.
29. Linde K, Jobst K A. Homeopathy for chronic asthma. *The Cochrane Library* 1998; 1:1-7.
30. Jonas W B, Linde K, Ramirez G. Homeopathy and rheumatic disease. *Rheumatic Diseases Clinics of North America*. 2000;26:117-123.
31. Long L, Ernst E. Homeopathic remedies for the treatment of osteoarthritis: a systematic review. *British Homeopathic Journal*. 2001;90:37-43.
32. Linde K, Clausius N, Ramirez G, Melchart D, Eitel F, Hedges L V et al. Are the clinical effects of homeopathy placebo effects? A meta-analysis of placebo-controlled trials. *Lancet*. 1997;50:834-843.
33. Ernst E. Are highly dilute homeopathic remedies placebos? *Perfusion*. 1998;11:291-292.
34. Linde K, Melchart D. Randomized controlled trials of individualized homeopathy: a state-of-the-art review. *Journal of Alternative and Complementary Medicine*. 1998;4(371):388.
35. Linde K, Scholz M, Ramirez G, Clausius N, Melchart D, Jonas WB. Impact of study quality on outcome in placebo controlled trials of homeopathy. *Journal of Clinical Epidemiology*. 1999;52:631-636.
36. Morrison B, Lilford R J, Ernst E. Methodological rigour and results of clinical trials of homeopathic remedies. *Perfusion*. 2000;13:132-138.
37. Ernst E, Pittler M H. Re-analysis of previous meta-analysis of clinical trials of homeopathy. *Journal of Clinical Epidemiology*. 2000;53:1188.
38. Sterne J, Egger M, Smith G D. Investigating the dealing with publication and other biases. In: *Systematic reviews in healthcare: meta-analysis in context*. In: Egger M, Smith GD, Altman DG, editors. London: 2001. 189-208.
39. Wynn, S.G. Studies on use of homeopathy in animals. *JAVMA* 1998;212(5):719-24.
40. Wolter H. Arzneiwirkungsprüfung an Caulophyllum D 30: Ein doppelter Blindversuch [Drug efficacy testing of Caulophyllum D 30: A double-blind trial]. *Allgemeine*

41. Sommer H, Marx D. Metaphylaktische Anwendung von Pulsatilla miniplex in der Sterilitätsbekämpfung des Rindes [Metaphylactic application of Pulsatilla miniplex in fertility control in cattle]. Praktischer Tierarzt 1972;53:45-46.
42. Schütte A. Neue Ergebnisse aus Untersuchungen zur Behandlung des Puerperalsyndroms der Zuchtsauen [New results from investigations concerning the treatment of the puerperal syndrome of breeding sows]. Praktische Tierarzt Colleg Vet 1988; 19: 67-73.
43. Williamson AV, Mackie WL, Crawford WJ, Rennie B. A study using Sepia 200c given prophylactically postpartum to prevent anoestrus problems in the dairy cow. Br Homeopathic J 1991; 80: 149–156.
44. Williamson AV, Mackie WL, Crawford WJ, Rennie B. A trial of Sepia 200c. Prevention of anoestrus problems in dairy cows. Br Homeopathic J 1995; 84: 14–20.
45. Searcy R, Reyes O, Guajardo G. Control of subclinical bovine mastitis: utilization of a homoeopathic combination. Br Homeopathic J 1995; 84: 67–70.
46. Guajardo-Bernal G, Searcy-Bernal R, Soto-Avila J. Growth-promoting effect of Sulphur 201c in pigs. Br Homeopath J 1996; 85: 15–16.
47. Sandoval CH, Morfin LL, Lopez BB. Preliminary research for testing *Baptisia tinctoria* 30c effectiveness against salmonellosis in first and second quality broiler chickens. British homeopathic Journal 1998;87:131-134.
48. Özyurtlu N, Alaçam E. Effectiveness of Homeopathy for the Treatment of Pseudopregnancy in Bitches. Turk J Vet Anim Sci. 2005;29:903-907.
49. Faulstich A, Lutz H, Hellmann K. Vergleich der Wirkung von Zeel® ad us. vet. bei durch nicht-infektiöse Gelenkentzündungen hervorgerufenen Lahmheiten von Pferden mit Hyaluronsäure [Comparison of the effect of Zeel® ad us. vet. in lameness of horses caused by non-infectious arthropathy to the effect of hyaluronic acid]. Praktische Tierarzt 2006; 87: 362-370.
50. Beceriklisoy HB, Özyurtlu N, Kaya D, Handler J, Aslan S. Effectiveness of Thuja occidentalis and Urtica urens in pseudopregnant bitches. Wiener Tierärztliche Monatsschrift 2008; 95: 263-268.
51. Zacharias F, Guimaraes JE, Araujo RR, et al. Effect of homeopathic medicines on helminth parasitism and resistance of Haemonchus contortus infected sheep. Homeopathy

2008: 145-151.

52. Hielm-Björkman A, Tulamo RM, Salonen H, Raekallio M. Evaluating complementary therapies for canine osteoarthritis--Part II: a homeopathic combination preparation (Zeel). *eCAM* 2009; 6: 465-471.
53. Coelho C de P, Soto FRM, Vuaden ER, Melville PA, Oliveira FCS, Benites NR. Evaluation of preventive homeopathic treatment against colibacillosis in swine production. *Int J High Dil Res* 2009; 8: 183-190.
54. Klocke P, Ivemeyer S, Butler G, Maeschli A, Heil F. A randomized controlled trial to compare the use of homeopathy and internal Teat Sealers for the prevention of mastitis in organically farmed dairy cows during the dry period and 100 days post-calving. *Homeopathy* 2010; 99: 90–98.
55. Camerlink I, Ellinger L, Bakker EJ, Lantinga EA. Homeopathy as replacement to antibiotics in the case of *Escherichia coli* diarrhoea in neonatal piglets. *Homeopathy* 2010; 99: 57–62.
56. Larson L., Wynn S., and Schultz R.D. A Canine Parvovirus Nosode Study. Proceedings of the Second Annual Midwest Holistic Veterinary Conference 1996.
57. Andersson, R. ; Morcillo, L. L. et al. Untersuchungen über den Einsatz von homöopathischen Arzneimitteln bei der Behandlung und Prophylaxe subklinischer Mastitiden von Milchkühen. *Tierärztliche Umschau* 1997, 52: 7 , 407-412
58. Egan J. Homeopathic mastitis control: A study on the uptake and efficacy of products in the Republic of Ireland. Proceedings of the British Mastitis Conference. 1998;11:22-28.
59. Scott DW. Miller WH. Senter DA. Cook CP. Kirker JE. Cobb SM. Treatment of canine atopic dermatitis with a commercial homeopathic remedy: a single-blinded, placebo-controlled study. *Canadian Veterinary Journal* 2002;43:601-603.
60. Scott DW. Treatment with individualized homeopathic remedies unsuccessful. *Can Vet J.* 2003;44(4): 273.
61. de Verdier, K. ; Öhagen, P.; Alenius, S. No effect of a homeopathic preparation on neonatal calf diarrhoea in a randomised double-blind, placebo-controlled clinical trial *Acta Vet. Scand.* 2003;44(1-2):97-101.
62. Hektoen L, Larsen S, Odegaard SA, Loken T. Comparison of homeopathy, placebo and antibiotic treatment of clinical mastitis in dairy cows – methodological issues and results from a randomized-clinical trial. *J Vet Med A Physiol Pathol Clin Med.* 2004;51:439–446.

63. Canapp SO, Cross AR, Brown MP, Lewis DD, Hernandez J, Merritt KA, Tran-Son-Tay R. Examination of synovial fluid and serum following intravenous injections of hyaluronan for the treatment of osteoarthritis in dogs. *Vet Comp Orthop Traumatol.* 2005;18(3):169-74.

64. Taylor RJ, Mallon TR, Green WP. Efficacy of a homeopathic prophylaxis against experimental infection of calves by the bovine lungworm *Dictyocaulus viviparus*. *Veterinary Record.* 2005;124:15-17.

65. Holmes, M.A. ; Cockcroft,P.D.; Booth,C.E.; Heath,M.F. Controlled clinical trial of the effect of a homeopathic nosode on the somatic cell counts in the milk of clinically normal dairy cows. 2005. *Veterinary Record* 156(18), 565-567.

66. Fidelak,C. , Klocke,P., Heuwieser,W. Homöopathische Prophylaxe in der Bestandsbetreuung von Milchkühen Teil 1 – Fruchtbarkeit. *Deutsche Tierärztliche Wochenschrift.* 2007;114(7):268 – 274.

67. Cracknell,N.R. ; Mills,D.S. A double-blind placebo-controlled study into the efficacy of a homeopathic remedy for fear of firework noises in the dog (*Canis familiaris*). *The Veterinary Journal* 2008;177(1), 80-88.
see also detailed critique in Overall KL, Dunham AE. Homeopathy and the curse of the scientific method. *Vet Journal.* 2009;180(2):141-8.

68. Amalcaburio R, Carlos Pinheiro Machado Filho L, Aparecida Honorato L, Antônio Menezes N. Homeopathic remedies in a semi-intensive alternative system of broiler production. *International Journal of High Dilution Research.* 2009;26(8):33.

69. Arlt,S, Padberg,W., Drillich,M., Heuwieser,W. Efficacy of homeopathic remedies as prophylaxis of bovine endometritis. *Journal of Dairy Science* 2009;92(10):4945 – 4953.

70. Arlt S, Padberg W, Drillich M, Heuwieser W. Efficacy of homeopathic remedies as prophylaxis of bovine endometritis. *J Dairy Sci.* 2009 Oct;92(10):4945-53.

71. Tumir H, Bosnir J, Vedrinaro-Dragojević I, Dragun Z, Tomić S, Puntarić D. Preliminary investigation of metal and metalloid contamination of homeopathic products marketed in Croatia. *Homeopathy.* 2010 Jul;99(3):183-8.

72. Freckelton I. Death by homeopathy: Issues for civil, criminal, and coronial law and for health service policy. *Journal of Law and Medicine.* 2012;19(3):454-478.

