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Research Article

A Homeopathy Model in the Light of Hahnemann's Pristine Idea

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Abstract

The well-known definition of disease, which Samuel Hahnemann presented while making a challenge to provide a tentative theory for his new science and art of healing, is used as a starting point for the model. The biochemical equilibrium is used for a demonstration of the Le Chatelier-Braun principle and/or the Guldberg–Waage Law in order to clarify the principles and to explain the well-known "Law of Similar". It is shown that a high dilution accompanied by succession is required to release the remedies to their constituent molecular species in order to increase their "vital energy" when taking part in the overall complex biochemical equilibrium that is essential for healing. In addition, it is revealed that, in principle, a single remedy constituent molecular species, when it is in excess, as well as satisfying the dynamic equilibrium, can shift this biochemical equilibrium and trigger the healing process.

Keywords

Homeopathy; Samuel Hahnemann; Law of similar; Le Chatelier-Braun principle; Guldberg-Waage law; Dynamic equilibrium

Introduction

The principle of treating "like with like", as the primary axiom of homeopathy, often referred to as the "Law of Similar", dates back to Hippocrates (460-377 BC). Though, in its present form, homeopathy has been used all over the world for more than 200 years. This type of cure was discovered by the German doctor Samuel Hahnemann, who presented his therapy in Germany at the end of the 18th Century, since when it has remained popular [1]. The observation and the use of the "Law of Similar" date back to the time of mankind's early development and were accepted very early on by the ancients and perhaps even before those times. In other words, this axiom is a phenomenon that has been part of human history from the very beginning and was used in various periods of our development, and continues in a similar form to the present day. We now consider this phenomenon to be a natural one, which must have its basis in natural science, just as is the case with many other phenomena of which mankind is aware and we have explained during our development to present-day society. Homeopathy is nowadays regularly practiced and has a high profile. However, it is criticized in terms of medically confirmed results and a belief that it is based on unconfirmed statements that lack any scientific evidence. The basis of homeopathic curing was, and still is, frequently discussed in the literature, although its origins

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and a confirmation of its efficacy in scientific terms have not been clearly reported. In recent times researchers have proposed a variety of theories for homeopathic remedy effects. Among them, models centered on the memory of unique water structures are very common [2-10]. This is in addition to: Quantum macro entanglement models [11-12], the silica crystals and structures glass-derived concept [13], electromagnetic activities [14], biological signaling [15], the nonlinear dynamics of complex systems [16-18], stressor effects and hormesis [19-20], the bio psychosocial model and a chemical thermodynamics-based model [21,22]. Recently, an extensive and wide-ranging study was reported by Bell and Koithan [23] that takes into account many of the theoretical and practical assumptions from earlier work. In general, the current investigations taking place to explain the homeopathic mechanism are spreading into interdisciplinary areas of science. The purpose of this contribution is to describe a model that is grounded in Hahnemann's original ideas [1], is based on the principles of chemical thermodynamics, and which could give an answer to homeopathy's mechanism of healing.
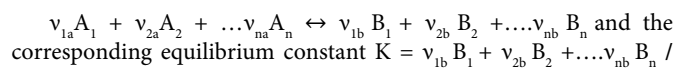
The Origins of Homeopathic Treatments

Now we will try to present arguments that focus on the fact that homeopathy is a chemical phenomenon and, as such, is connected with science, irrespective of whether or not its methods are valuable from the healing point of view. One of the main weaknesses of homeopathy is that it cannot be easily supported by medical science or other scientific disciplines. In contrast, homeopathy is closely connected with the "Law of Similar," which is a guideline that has been used by homeopathic specialists since its early development. Consequently, we cannot simply disregard the procedure of homeopathy and we must consider whether there might be something more scientific than just the "Law of Similar", which can be assumed as an axiom related to chemical thermodynamics, leading to the earliest homeopathic annotations during the use of such remedies for curing. We will start with the familiar definition of disease that Samuel Hahnemann introduced while trying to make available a tentative theory for his new science and art of healing. He said, "Disease is a detuning of the life force. On this basis, curing would be a return of the detuned life force to its original state of tuning" [1]. Here, we will interpret this statement with the elementary principles of chemical thermodynamics and in the place of "original state of tuning" and "detuning of the life force" use the term "basic biochemical equilibrium" connected with a healthy state and the term "new biochemical equilibrium" with an unhealthy state, so curing would be a return of the new biochemical equilibrium to a basic chemical equilibrium. To follow this explanation will assume that the great majority of physical diseases of the human body are connected with biochemical reactions that are in a dynamic equilibrium. An adult human body contains, in terms of weight, about two-thirds water, most of which is located inside cells, whereas the residual water is extracellular, mostly in the blood plasma and the interstitial fluid that bathes the cells. The extracellular water, amounting to about 5% of body weight, serves as a supporting fluid for the blood cells and acts as a means of transferring chemicals between the cells and the external environment. It is mostly 0.15-M solution of salt (NaCl), comprising lesser quantities of other electrolytes, of which the most significant are bicarbonate (HCO_3^-) and anionic proteins [24]. The biochemical reactions are taking place

in human cells. A huge number of extremely sensitive finely adjusted and arranged biochemical reactions that go on in a single cell, so that in a finite time they can satisfy the overall macroscopic biochemical equilibrium. Here, the water is treated as a highly interrelated and influential molecule in most of the biochemical reactions in the body. At this time, the biochemical reactions take place in a closely connected system, and the response times of these biochemical reactions in order to sustain equilibrium are longer than in the case of ionic reactions. This is due to the larger average molar mass of the organic molecular species in contrast to the single ionic species, which for a higher mass means a lower velocity of the molecular species (known as Graham's law); nevertheless, the equilibrium is always relatively quickly matched with the body's state of health. Hence, the human body can, in this context, be treated as a homeostatic "reaction vessel," in which the temperature and pH are maintained at constant values to facilitate the individual biochemical reactions. These reactions are linked to one another via equilibrium constants, where the rate-limiting mechanisms (i.e., the slowest reaction) determine the final, complex biochemical equilibrium [22]. Let us define the original, basic equilibrium in the body of a healthy person as the starting point for further consideration, which means that in an ill patient, the whole biochemical equilibrium complex deviates from a healthy state. This new equilibrium state then rules the status of the ill patient; nonetheless, in such cases, visible signs of the patient's behavior and appearance indicate that the anticipated medicine is a deviation from the norm and/or healthy state. Thus, the patient's behavior is indirectly connected to the vital biochemical reactions of the new equilibrium state. A basic thermodynamic principle for all dynamic chemical equilibria, to which the biochemical reactions in the human body are surely subjected, the Le Chatelier-Braun principle [25], has been known in chemistry for nearly a century and is thermodynamically well-grounded as follows: if a chemical system at equilibrium experiences a change in concentration, temperature, or total pressure, the equilibrium will shift in order to minimize that change. This qualitative law makes it possible to predict an equilibrium displacement in a chemical reaction. However, this law is much more wide-ranging and can be extended to all processes in which dynamic equilibria are vital. In light of this, we must think through the thermodynamic principle that biochemical reactions in a dynamic equilibrium will limit any disruption by shifting the equilibrium in a direction that will lessen it, so when a disruption exhibits similar symptoms to the original disruption, which shifts the equilibrium from the original basic equilibrium state to a new one, inducing illness in the human body, then on the basis of the Le Chatelier-Braun principle, this new chemical equilibrium will alleviate this disruption and shift the equilibrium in the direction of the original equilibrium associated with the healthy state, i.e., as specified at the beginning of this section. Alternatively, we can use for the above idea the Law of Mass Action, which is the basis of the Le Chatelier-Braun principle. Here, we must consider the biochemical equilibrium between the healthy state, i.e., the original state of tuning, and the ill state, i.e., "detuning of the life force" as postulated by Hahnemann. In the healthy state the biochemical equilibrium is placed on the left-hand side of the equilibrium, indicating the healthy state. However, when the biochemical reaction associated with illness (driving force) is taking place, the equilibrium moves to the right-hand side owing to the formation of reaction products, as is schematically presented below. Original, basic state (healthy patient) ↔ new state (ill patient).

$\nu_{1a}A_1 + \nu_{2a}A_2 + \dots\nu_{na}A_n \leftrightarrow \nu_{1b}B_1 + \nu_{2b}B_2 + \dots\nu_{nb}B_n$ and the corresponding equilibrium constant $K = \nu_{1b}B_1 + \nu_{2b}B_2 + \dots\nu_{nb}B_n$ /

$\nu_{1a}A_1 + \nu_{2a}A_2 + \dots\nu_{na}A_n$. Here, ν_{na} represents the number of vital molecules A_n in the original basic state maintaining the healthy state in the human body before the start of the illness process. On the other hand, ν_{nb} represent the number of molecules of the reaction products B_n formed during the progress of the illness. After the ill person digests the remedy the concentration of the overall reaction products molecules [B] increases. The above considerations (equilibrium constant) can be linked to the Guldberg-Waage Law of Mass Action. In chemistry, the Law of Mass Action is the proposition that the rate of a chemical reaction is directly proportional to the product of the concentration of the reactants. Specifically, it implies that for a chemical reaction mixture that is in equilibrium, the ratio (K) between the concentration of the reaction products [B] and the vital molecules [A] is constant. Therefore, the Law of Mass Action when the equilibrium constant is expressed in the very simplified form as: K = [B]/[A] literally means that an increase in the concentration of reaction products induced by the income of remedy [B] will make an increase in the percentage of the vital molecules [A], so that in biochemical equilibrium the percentage of vital molecules [A] which are the holder of the healthy state increases at the expense of the remedy digested. This will restore the healthy state of the patient. This is the point where the ancient, pre-historical "wisdom" observations come into consideration. The remedy molecules that induce an illness with identical symptoms to a healthy person can cure an ill person. This observation is associated with the idea that the biochemical reactions and the symptoms caused by the remedy molecules in a healthy person cause similar symptoms that also occur in an ill patient, including the formation of identical product molecules. So, when the concentration or the mass of the reaction products is increased by adding remedies that supply these substance molecules the equilibrium will move to the left, to the basic equilibrium that is associated with the healthy state-and is in accordance with the Law of Mass Action and covers the "Law of Similar" and/or the axiom "like cures like". This axiom might be, in this context, considered as the elementary, thermodynamically grounded mechanism of the curing principle of homeopathy. Here the symptoms that a patient experiences in an ill state are implicitly connected to the essential biochemical reaction that governs the disease, i.e., similar symptoms, similar vital biochemical reactions. Therefore, in order to start the curing of the targeted illness on this basis, we have to find the right substances (remedies) that will produce alike symptoms in a healthy person. Consequently, a homeopathic specialist searches for an ingredient that produces, in a healthy person, those same symptoms that a patient experiences in the ill state. Nevertheless, the choice or obtaining of such an ingredient, for this argument, is not appropriate. Even if Hahnemann tried with the idea of multiple prescribing, his final principle was using a single remedy to treat a patient's illness, since he supposed that a patient could not suffer from more than one illness at a time, i.e., symptoms, however diverse, were therefore all connected to a single cause. He wrote in the "Organ on of the medical art" [1] "In no case under treatment is it necessary to, and therefore not permissible to, administer to a patient more than one single, simple medicinal substance at one time". This statement is in exact accordance with the chemical thermodynamics concept that covers only one chemical equilibrium for the disease under consideration, i.e., there cannot be more of them at the same time [26]. In order to illustrate this point, we should mention the most well-known example of homeopathy, the use of Atropa belladonna (common name, deadly nightshade). This berry, which induces fever in healthy patients, is a homeopathic substance used to cure the fever in sick patients, and there are many other substances that show a similar

curative effect. On the basis of the consideration above, we can state that the biochemical reactions in the human body that cause, in this case, a high fever resulting from the ingesting of A. belladonna, will according to common thermodynamic principles force the targeted biochemical equilibrium in a direction to lessen the disturbing influence of the homeopathic substance that decreased the body temperature, which is, in effect, healing the fever using homeopathic substances and encompassing the unique axiom "like cures like". In theory, homeopathic healing is a phenomenon grounded in chemical and thermodynamic values and should also be usable for alike homeopathic medicines. In healthy patients homeopathic substances will cause the symptoms of the illness for which it was introduced to the patient. The healing in homeopathy is implicit since we do not know which biochemical reaction is crucial, i.e., which reaction products $v_{nb} B_n$ is essential, but the human body, supported by chemical thermodynamics, instinctively chooses the proper reaction. On the other hand, the traditional medicine is targeting the reaction that is supposed and/or has been recognized to be the fundamental biochemical reaction.

Activation of the "Vital Energy" of Homeopathic Remedies by Using Dilution

Homeopathy is connected with one of the so-called "dilution of homeopathic remedies" and was introduced by Hahnemann, based on a belief that a process of successive dilutions activated the "vital energy" of the diluted substance and increased the "potency" of the remedy [1]. The issue is a challenging one, related to understanding the homeopathic mechanism of healing. In brief, homeopathy involves a process whereby an original water and then vigorously shaken in a process referred to as "succession". Insoluble solids, for example, quartz and oyster shells, are diluted by grinding them since nano-dimensions stimulate a modest solubility. Let us start with an inherent property of substances, including remedies, i.e., when they appear in the form of molecular constituent species, they are subjected to inter-molecular forces, forming local associations. In other words, reversible, non-covalent, linked aggregations that are in equilibrium with the molecular constituent species. At an ordinary dilution only a portion of the aggregates is dissociated into molecular species and totally at an "infinite" dilution under succession. This remedy molecular constituent species are a part of the complex biochemical equilibrium considered throughout this contribution. Here, we must emphasize that in order to maintain the biochemical equilibrium, only the released molecular constituent species of the remedies are essential. Therefore, any kind of association of the remedy molecular species vitiates the remedy's activity, which is otherwise required to best administrate the biochemical equilibrium and consequently cures the disease. One can speculate that the level of the associated remedy molecular species persisting during the dilution might be significant, so a progressive dilution must go together with succession to release the associated molecular species to the greatest possible extent. In the course of the preparation of a remedy solution, we are confronted with two limiting conditions: in the first case, i) the associations of the remedy molecular species are not completely released in ordinary solutions; in the second case, ii) due to a huge watering down, i.e., ultra-high dilution (UHD), a number of remedy molecular species (in a hypothetical case) are not present in the solution and its impact on sustaining the equilibrium and the curing disappears. Therefore, it is obvious that in between both extremes there must be an optimum where the homogeneously distributed remedy molecular species will primarily administrate the

chemical equilibrium and cure the disease due to a large increase in the remedy's potency. To illustrate the above thought we can think through a comparison with a solution of weak electrolytes that is not completely dissociated for the time when it is considered; however, upon further dilution the electrolyte is "activated" since the number of free ionic species generated during the dilution strongly increases its activity, i.e., its "potency", which is directly observable through a large increase in the electrical conductivity. The phenomenon is based on the fact that only a percentage of the electrolyte is dissociated into ions under normal dilution conditions, but it is totally dissociated at infinite dilution. The same basic thinking can be expected with the use of the remedy in homeopathy. Here, besides a high dilution (HD) a succession is needed to completely (to a very large extent) release the remedy's molecular species. Once the remedy substances dissociate and become free of dispersion forces they will be strongly diluted so that the opportunity to meet an identical molecular species and associate again is diminished to a large extent. Under optimal conditions the solvated single remedy molecular constituent species are equivalently distributed in the diluent media and in accordance with the homeopathic practice ("vital energy") exhibit an optimal healing effect due to effectively administrating the biochemical equilibrium.

Ultra Dilution of Homeopathic Remedies-An Almost-Deciphered Enigma

In the traditional method of developing homeopathic medicines the preparation process involves trituration in lactose and/or serial dilution in an ethanol-water solution and succession in glass vials. These actions are designed to accommodate the solution's properties for the biological activities, including curing the diseases. In theory after a major serial dilution, more than 24x or 12 C none of the bulk form source molecules can be found. Here, C means a centesimal or "C scale", diluting an ingredient by a factor of 100 at each step. According to this we are justified in rejecting the credibility of homeopathy since there is a probable absence of sufficient bulk-form material to utilize a pharmacological common dose-response effect. In typical clinical pharmacology, lower bulk-form amounts should result in a smaller effect until there is no biological/healing effect at all. The above statements are accurate when homeopathic medicines are regular, i.e., dissolved and diluted bulk-form chemical medicine in a true solution that could act alone pharmacologically with a linear dose-response relation [23]. Since in some cases, in spite of appearing to be a pure water-based solution, apparently without any remedying molecules, the curing of illnesses was noted, the "memory effect of water", according to which the water "remembers" the substances mixed in it, and passes on the effect of those substances when consumed, was used to explain the curative effect. However, recent investigations reveal that even in commercial medical remedies that are titrated, diluted and hand successes to 30 or even 200 C the potencies retain nanoparticles of their source materials [27]. In addition, physico chemical studies of extremely diluted homeopathic remedies and high potencies have unequivocally shown the presence of starting raw bulk-form material in nanoparticle form. The concentration of the remedy is not linearly dependent on the number of dilution steps during serial dilution. The remedy constituent species in the solution declines asymptotically, mainly due to the fact that the air - liquid phase boundary induced during succession behaves as an impurity snare keeping back the diluent molecular constituent species, so that one can expect a contamination of the solution with remedy whatever the dilution protocol is planned [28]. Thus, at present we

must take into consideration that greatly diluted remedying solutions (nominally super-Avogadro>10^{23}) might contain traces of the remedy and can show a biological and/or a curing effect. Consequently, the curing solutions that are believed to be without any remedy still contain some traces of the remedies. In the light of these results the "memory concept of water" is in fact not necessary to explain the effectiveness of the curing. Therefore, the wording 'memory of water' has to be seen as being a superfluous subject in any discussion of homeopathy. The proof, disproof, or simple mistrust that water has, or can have, a memory has been unnecessarily often confused with a proof of whether homeopathy may or may not be efficacious. Consequently, the "memory effect of water" should be separated from a proof of whether homeopathy is worthwhile. On the other hand, in the literature there is information that shows evidence that water might have a memory and then again there is evidence against the "memory of water" (see Chaplin) [3]. In spite of all this, we still need to understand the role of small remedying concentrations during healing. How it is possible that such a small amount of a remedy can cure the disease and what is the final concentration that might trigger the curing? To answer this question we should again put to good use the basic principles of chemical thermodynamics. Here we linked the healthy state of a human body with the re-establishment of a basic equilibrium. Following this statement then, in theory a single molecular constituent species of a remedy that is in excess, while satisfying the dynamic equilibrium, is a necessary and sufficient condition to force the new biochemical equilibrium associated with an unhealthy state in the direction of the basic original equilibrium associated with a healthy state. Since the biochemical reactions that occur while maintaining the equilibrium precede on a molecular level, can a larger amount of remedy block the restoration of the equilibrium and impede the healing. This is consistent with the practice of curing in homeopathy, where an ultra-small concentration might be effective, while a high concentration can hinder curing. Is homeopathy anyhow connected with hormesis? [29]. we can see that the presented model might elucidate the paradox of an "endangered" remedy concentration associated with curing the target diseases and is also consistent with an archetypal homeopathic routine.

Conclusion

In the case that healing is considered in the frame of chemical thermodynamics, both key mechanisms are explainable in the frame of natural science: i) the role of the remedy to cure the disease, i.e., the Le Chatelier-Braun principle and ii) the function of an ultimate number of remedy molecules, i.e., the basic principle of dynamic equilibrium. Based on the arguments presented in this contribution, which are in accordance with chemical thermodynamics, we are justified in believing that the concept of healing that is still in practice today is most probably based on natural science, i.e., on chemical thermodynamics. The Le Chatelier–Braun principle and the concept of dynamic equilibrium applied in homeopathy confirm this.

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