Active Principle in Potentised Medicines: Nanoparticle versus Quantum Domain – An overview

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Abstract

Background: The fact that homoeopathic medicines act even at very high dilutions has created a confusion amongst scientists. This led to different models such as formation of nanoparticles and memory of water. The basic question ‘what is responsible for physiological activity of homoeopathic medicines’ is yet to be answered conclusively. Objective: The objective of this overview was to find out if formation of nanoparticles or creation of quantum domain in the medium is responsible for the physiological activity of homoeopathic medicines.

Methods: This overview is based on the experiments done between 2004 and 2019. Results: The succussion of the medicine has the following effects: i. At high potency, due to the mechanical energy transferred to the system, the size of the substrate reduces to nanodimension increasing membrane permeability. Furthermore, they affect several electrical properties of an electroactive polymer and enhance thermovoltage generation. ii. In the presence of an ambient electromagnetic field, domains composed of the vehicular polar molecules are formed, which bear the signature of the dissolved solute. The domains are sources of quasi-free electrons which are manifested in voltage generation separating two different polar media. The structured water also explains the ultraviolet–visible (UV-Vis) spectra. Conclusion: In high potency, formation of nanoparticles explains the effect of homoeopathic medicines on properties such as permeability, electrical properties of polymers and thermovoltage generation, whereas formation of domains in the vehicle medium explains properties such as voltage generation separating two different polar media and UV-Vis spectra.

Keywords: Ambient electromagnetic field, Critical concentration, Nanoparticle, Quantum domain, Succussion

Introduction

Potentisation, the most vital part of preparation of homoeopathic medicines, brings forth the hidden therapeutic abilities of a substance. It has got two components: (a) serial dilution in a polar medium (b) followed by vigorous vertical jerking, known as succussion: together termed as potentisation.

At ordinary dilution of $10^{-3}$–$10^{-7}$, the effect of the solvated molecules is there, but in case of higher potencies, when the dilution can go up to $10^{19}$ or more, the ratio of number of molecules of dissolved matter to the number of molecules of the vehicle medium will become approximately one to billions of billions. Under this condition, according to classical understanding, in the solution, the solute will not exhibit any of its properties and the solution at this dilution should show the characteristic of the medium, which however is not the case; the solution even at very high dilution does not resemble the medium but shows separate medicinal activity.

The paradox created a debate between believers in Homoeopathy and the so-called rationalists and this threw a big challenge to basic scientists which led to formulation of different models. With this brief introduction and using some experimental evidences, we proceed to review two different models, namely formation of nanoparticles and formation of quantum domains, and show how these models explain the action of homoeopathic medicine on different physical properties.

This overview is based on the experiments done between 2004 and 2019.

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RESULTS

Different experimental results indicate the existence of nanoparticles in homeopathic potentised medicines as also evidence for formation of quantum domains are also there and both of them are responsible to affect some physical properties of matter.

In a prior study, doping of the homeopathic medicine in the electroactive polymer, poly (vinylidene fluoride-co-hexafluoropropylene) films were done by following a low-cost and simple solution casting fabrication technique. Generation of thermovoltage was recorded in a glass U-tube, kept in a temperature-controlled chamber. The two arms of the tube were separated by a platinum foil barrier. Generated voltage was measured by placing two platinum electrodes symmetrically in two sides of the barrier. Diluted hydrochloric acid was poured in one arm, and the homeopathic medicine Zinccum oxydatum of specific potency dissolved in ethanol was poured in the other arm.

DISCUSSION

Formation of nanoparticles

It was our presumption that the size reduction of the original aggregated drug particles to nanodimension takes place during the succussion process, when a large amount of mechanical energy is transferred to the system. An indirect evidence of existence of nanoparticle at extreme potencies for the homeopathic medicine Aconitum napellus was reported in 2010. Formation of nanoparticle at high potency [Figure 1] has been well established by several authors. It has been established that extreme homeopathic dilutions retain starting materials. Temgire et al. have shown that metal and inorganic salt-based homeopathic medicines retain the starting material as nanoparticles, encapsulated within a silicate coating. They proposed ‘that all types of homeopathic medicines consist of silicate-coated nanostructures dispersed in the solvent’.

The mean size of the nanoparticles of Cuprum metallicum at three different potencies 6 C, 30 C and 200 C, as measured by dynamic light scattering (DLS), is approximately in the range of 13.5–18.5 nm, 1.5–1.7 nm and 0.62 nm, respectively [Figure 1 (a-c)]. This is also supported by the HRTEM measurements [Figure 1(d-f)]. However, the size distribution, obtained from DLS study when the experimental sample was in the liquid state, is not exactly the same as measured by HRTEM image study where aggregation takes place during drying the sample under vacuum.

Using several different homeopathic medicines, an empirical formula relating the size of the drug associate (Y) with the potency (X) was derived

\[ Y = aX^{-n} \]

where ‘a’ and ‘n’ are characteristic constants of the medicine. It has been experimentally proved that extreme homeopathic dilutions retain starting materials. To understand the extreme dilutions from a biological perspective, it has been shown that metal concentration as low as fg/ml increases the intracellular protein synthesis. Hence, the term potentisation indicates the qualitative and quantitative increase in medicinal power as compared to mere dilution. And thus, Homeopathy is truly defined as nanomedicine.

The idea of formation of nanoparticles has been used to explain the effect of these medicines incorporated in the poly (vinylidene fluoride-co-hexafluoropropylene) films. An enhancement of electrical conductivity, dielectric constant and decrease of tangent loss of this electroactive polymer has been observed [Figure 2a-c] making these medicine-doped films a suitable candidate for efficient charge storage device and useful in electronic industry.

The nanoparticle formation at higher potency has been used to explain the enhancement of membrane permeability. The effect of Cuprum metallicum on the microviscosity of the liposomal membrane is shown and the result indicates an increase in the membrane rigidity (measured as anisotropy of the membrane) with increasing potency of the drug, suggesting more penetration of the drug into the membrane [Figure 3]. An explanation for this effect had been sought at the molecular level, based on the drug–lipid interaction. The result is evidence that the initial aggregated structure of the drug decreased in size with potentisation, leading to nanoparticle formation of smaller dimensions, which facilitated enhanced membrane penetration and decreased membrane fluidity. In case of microbial membrane, the enhanced permeability has an antimicrobial effect as it damages the membrane.
In an experiment using *Zincum oxydatum*, it has been observed that thermovoltage generation increases with increase in potency [Figure 4]. Maximum voltage generated was found to increase with potency of the medicine. Efficiency of the cell with the medicine at potency 30 C at 40°C is ~0.39. Using a dye with ZnO, a similar photovoltaic effect is obtained. This enhancement is due to formation of nanoparticle which increases the surface area manifold with potency and the surface absorption of the radiation becomes more.

### Formation of quantum domains

However, the idea of formation of quantum domains comes into the picture to explain several experimental results, namely ultraviolet–visible (UV-Vis) absorption spectra [Figure 5] at high dilution and development of electric field in the vehicle medium and its increase with potency, as these cannot be explained by considering the formation of nanoparticles.

In the UV-Vis absorption spectra [Figure 5], the absorption band of 225–325 nm is typical for structured water. The absorption band of 200–225 nm is also due to structured water. There is a clearly distinguishable increase in the absorbance with potency, which indicates that structuring of water increases with potency and the differences between homoeopathic medicines at different potencies are distinguishable (private correspondence with Dr. T. A. Yinnon).

In the customary models, electrostatic forces are explicitly included and electrodynamic ones are treated as perturbation. However, in the quantum electrodynamic (QED) theory for polar liquids, forces due to electromagnetic field (EMF) are explicitly included showing interaction between EMF and liquid molecule. Self-organisation takes place in the polar medium where molecules oscillate with the EMF.

In the presence of the EMF, the molecules of the polar medium distribute over a coherent phase (CP) and a non-coherent phase (NCP). In the CP, all molecules coherently oscillate, and a part of these CP molecules are organised in coherent domains (CD_{co}). Here, they coherently oscillate between their ground electronic state and a well-defined excited state, where the electrons are nearly free, i.e., quasi-free electrons. Only a small amount of energy is sufficient to free these electrons. The other part of the CP molecules coherently oscillates between two rotational states. These molecules organise in coherent domains (CD_{ro}), wherein their electric dipoles are aligned.

The effect of succussion on CD_{ro} and CD_{co} has been explained in great details. Successions break up these domains. The
broken pieces of CD$_{\text{elec}}$ reassemble very quickly, whereas in the broken pieces of CD$_{\text{rot}}$, the molecules have their electric dipoles aligned and thus they can be regarded as electric dipole aggregates, which enhance stabilisation of CD$_{\text{elec}}$, the source of quasi-free electrons.\[33\] Once these domains are stabilised, they are perpetuated in the resulting dilutes. The relative abundance of CP and NCP is temperature dependent. No domains stabilise in the absence of EMF as predicted by QED and experimentally verified.\[34\] Serially diluted solutions, which at each dilution step are not vigorously shaken, do not contain groupings for C below C$_{\text{thr}}$. It was also shown that on omitting the vigorous shaking, the physicochemical variables of serially diluted liquids and ‘normal’ liquids were the same.\[32\] Recently, it has been shown that in the absence of serial dilution, for potentisation only by succussion, the nanoparticle aspect predominates.\[1\]

Using an U-shaped glass tube where one arm contains bidistilled water and the other arm potentised ethyl alcohol (91%), separated by a platinum foil, voltage is generated across two platinum electrodes and a dc power of the order of nanoW has been measured. The generated voltage and the power lasted for many hours and their magnitude increased with increase in potency.\[25-27\] Considering the absence of any significant quantity of ionic solutes in the medium, this voltage generation from two different polar liquids, separated by a metal separator, is a unique phenomenon in the context of classical electrochemistry and can only be explained by the principle of QED. The quasi-free electrons released from CD$_{\text{elec}}$, as predicted by QED model, perhaps is responsible for this increase in voltage across the two electrodes\[26\] and the associated power generated. The potency-dependent activity of these medicines has been compared from classical and quantum mechanical approach.\[35\]

**CONCLUSION**

We have studied the effects of potency of homoeopathic medicine on some physical properties of matter and looked for the factors that control the effect of the medicine on these properties at higher potency such as formation of nanoparticles or formation of quantum domains. It has been shown that due to formation of nanoparticles, the size of the drug associates decreases and the surface area increases manifold. Due to these reasons, entry into the biological membrane increases\[4,15-17\] causing higher membrane permeability. The amount of radiation absorbed on the surface increases\[21-23\] enhancing thermal or photovoltaic effects. Furthermore, the enhancement of electrical properties of electroactive polymer\[9-14\] arises due to the nanoparticle nature of the medicine at higher potential (these two effects can be used as an application of Homoeopathy in technology – thereby giving rise to a new field technohomoeopathy).\[36\]

Thus, the formation of nanoparticle at higher potencies is responsible for several membrane-based phenomena. Tengire et al.\[17\] have shown that the particles develop a coat of silica and proposed ‘that all types of homoeopathic medicines consist of silicate-coated nanostructures dispersed in the solvent’. It has also been noted that in the absence of serial dilution, for potentisation only by succussion, the nanoparticle aspect predominates.\[34\] The dilution followed by succussion affects the liquid’s structural properties.\[37\]

However, the UV-Vis absorption spectra of Cuprum metallicum measured at different potencies can only be explained by considering the formation of structured water due to interaction of the media with the EMF.\[28\] In the presence of the EMF, the molecules of the polar medium distribute over a CP and a NCP. In the CP, all molecules coherently oscillate.\[24,29,31,33\] A part of these CP molecules are organised in domains (CD$_{\text{elec}}$ and CD$_{\text{rot}}$). The domains are present only when the solutions are diluted beyond a solute-dependent threshold concentration C$_{\text{thr}}$.\[38\] The process of succussion interacts with the domains formed in the polar
medium and the effect gets enhanced with increase in potency. The quasi-free electrons released from CD, as predicted by QED model, is responsible for the increase in voltage across the electrodes placed between two different polar lipids and the associated power generated.

Thus, we conclude that the effect of homeopathic medicines on some physical properties of matter can be explained either by considering the formation of nanoparticle of the drug associates or by the formation of domains in the vehicular medium, as the case may be. Till now, the conventional thinking was unable to differentiate between pure solvent (such as water or alcohol) and potentised homeopathic medicine. The present scientific findings are now able to differentiate between them in terms of the presence of nanoparticles or quantum domain in the medicines which render them the medicinal properties. How these nanoparticles or quantum domain acts in the body is again a matter of research. Clinical research is to be initiated for in-depth study of the physiological properties of these nanoparticles or quantum domains.

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Figures 1-5 have been reproduced from the Indian Journal of Research in Homeopathy 2015, 9(3), 141-151 with the kind permission of the editorial board of the Journal.

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Conflicts of interest
None declared.

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Principe actif dans dynamisés médicaments: Quantum Nanoparticules contre Domain - Une vue d'ensemble

Fond: Le fait que les médicaments agissent même à homéopathes très hautes dilutions a créé une confusion parmi les scientifiques. Cela a conduit à différents modèles tels que la formation de nanoparticules et de la mémoire de l'eau. La question fondamentale « ce qui est responsable de l'activité physiologique des médicaments homéopathiques » est encore à répondre de façon concluante. Objectif: L'objectif de cette étude était de savoir si la formation de nanoparticules ou création de domaine quantique dans le milieu est responsable de l'activité physiologique des médicaments homéopathiques. Méthodes: Cette étude est basée sur les expériences effectuées entre 2004 et 2019. Résultats: La succussion du médicament a les effets suivants: i. A forte puissance, en raison de l'énergie mécanique transférée dans le système, la taille du substrat réduit la perméabilité de la membrane de plus en plus de nanodimension. De plus, ils affectent plusieurs propriétés électriques d'un polymère électroactif et d'améliorer la génération thermoélectrique ii. En présence d'un champ électromagnétique ambiant, des domaines constitués de molécules polaires de véhicules sont formées, qui portent la signature du soluté dissous. Les domaines sont des sources d'électrons quasi-libre qui se manifestent dans la génération de tension séparant deux milieux polaires différents. L'eau structurée explique également les spectres ultraviolet-visible (UV-Vis). Conclusion: A forte puissance, la formation de nanoparticules explique l'effet des médicaments homéopathiques sur des propriétés telles que la perméabilité, les propriétés électriques des polymères et thermoélectrique génération, tandis que la formation de domaines dans le milieu du véhicule explique les propriétés telles que la génération de tension séparant deux milieux polaires différents et UV -Vis spectres.
Wirkstoff in der Potenzmedizin: Nanopartikel versus Quantendomäne - Ein Überblick


Schlussfolgerung: Bei hoher Wirksamkeit erklärt die Bildung von Nanopartikeln die Wirkung homöopathischer Arzneimittel auf Eigenschaften wie Permeabilität, elektrische Eigenschaften von Polymeren und Thermospannungserzeugung, während die Bildung von Domänen im Fahrzeugmedium Eigenschaften wie Spannungserzeugung erklärt, die zwei verschiedene Polarmedien und UV-Vis-Spektren trennt.

有效药物中的活性原理：纳米粒子与量子域-概述

背景：同源性药物即使在极高的稀释作用，这一事实在科学家中造成了混乱。这导致了不同的模型，如纳米粒子的形成和水的记忆。"什么对同源性药物的生理活动负责"这一基本问题尚未得到最终回答。目的：本研究的目的是查明纳米粒子的形成或介质域的产生是否对同源性药物的生理活动负责。方法：此审查基于 2004 年至 2019 年间进行的实验。结果：药物的诱导有以下效果：i. 在高功效下，由于机械能转移到系统，基板的大小减少到纳米尺寸，增加了膜的渗透性。此外，它们还影响电活性聚合物的几种电气特性，并增强热电压生成 ii. 在环境电磁场的存在下，形成了由车辆极性分子组成的区域，这些极性分子具有溶解溶解的溶解特征。这些域是准无电子的来源，表现在分隔两种不同极性介质的电压生成中。结构化水也解释了紫外线-可见（紫外-维斯）光谱。结论：在高功效下，纳米粒子的形成解释了同源性药物对透气性、聚合物的电特性和热电一代等特性的影响，而车辆介质中的域的形成解释了电压生成分离两种不同极性介质和紫外线光谱等特性。