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Is homoeopathy scientific or mere placebo effect: A review article

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Abstract
Homoeopathy is the therapeutic method of symptom similarity. And homoeopathic medicines are used in infinite dilution leading to major controversy. Objective of this article is to assess is there any physical existence of starting material present in these extreme dilution. If it is present, mechanism by which starting material is retained in such extreme dilutions and even if there is presence of starting material in these extreme dilution is there any mechanism which explains action of these materials in such a high dilutions. And this article with available information concludes that there is presence of Nano particulate of starting material even in extreme homoeopathic dilutions, process of potentization is responsible for retention of starting material and through hormesis dose -effect response mode of action of low dose homoeopathic medicines can be explained.

Keywords: Homoeopathy, hormesis, nano particulate and homoeopathic dilutions

Introduction
Homoeopathy is mode of therapy established by German physician, Samuel Hahnemann in late 18th century [1]. it can be defined as the therapeutic method of symptom similarity. Drugs which have ability to produce certain set symptoms in the heathy human being are cable of curing diseases with similar symptomatology [2]. homoeopathic medicines are prepared from many natural products derived from herbal, animal, metal and other mineral sources. Which are used in infinite dilution prepared using technique called potentization (succession and Trituration). major controversy regarding action of homoeopathic medicine is lack of evidence of physical existence of the starting material as homoeopathic medicines are used in extreme dilution which includes dilution factors exceeding Avogadro's number. In homoeopathic practice potencies of 30c, 200c having dilution factor 10^{60} and 10^{400} respectively are used. This is for beyond Avogadro's number that is 6.023×10^{23}.[1]
Objective of this review article is to assess Is there any physical existence of starting material present in these extreme dilution. If it is present, mechanism by which starting material is retained in such extreme dilutions and even if there is presence of starting material in these extreme dilution is there any mechanism which explains action of these materials in such a high dilutions.

Is there any starting material present in extreme homoeopathic dilutions?
Extreme homoeopathic dilution retain starting material: A Nano particulate perspective is a study done by chikramane *et al*. in this experiment 6 homoeopathic medicines derived from metals were used, they are gold (aurum metallicum or aurum met), copper (cuprum met), tin (stannum met), zinc (zincum met), silver (argentum met) and platinum (platinum metallicum). These medicines were used in 6c, 30c and200c respectively. And they found out that homoeopathic medicine prepared using metal powders has the starting raw materials retained them in even at extreme potencies of 30c and 200c much beyond Avogadro's number in spite of such enormous dilution, nanoparticles of the metals ranging from 5 to 10 nm were detected by transmission electron microscopy (TEM). And electron diffraction (ED). Another significant observation was that the concentration of these starting materials, albeit at extreme low (pictogram/ milliliter) levels, did not decrease as expected with series of dilution but instead formed asymptote beyond the 6c potency dilution factor of 10^{12}.[1]
And also various study done by ES rajendran showed the presence of nanoparticles in aurum metallicum in 6c, 30c, 200c, 1000c, 50000c and 100000c.hypericum in 6c, 30c, 200c, 1m, 10m, 50m and cm potencies. *Ferrum metallicum* in 6, 30, 200, 1 m, 10 m, 50 m potencies.

natrum muricaticum in 6c-cm and lm1 to lm30 potencies. and lycopodium in different centesimal scale potencies [3, 4, 5, 6, 7].

How nanoparticles of the starting material retained in the extreme homoeopathic dilution.

Why extreme dilutions reach none zero asymptotes: A nanoparticulate hypothesis based on froth flotation is the another study done by chikramane *et al*. in this study Synthetic AuNP mimicking gold and zinc dust were used. These metal powders were subjected to either succession, sparging or ultrasonication. Process of succession was done as follows –for this process AuNP and zinc powder grinded with lactose and without lactose both were used to compare will there any difference. Trituration done was according to homoeopathic guidelines with lactose but in the ratio 1:5. and later series of dilution was done by succusion (vigorous shaking) as per the guidelines of preparation of homoeopathic medicines. And result were compared. Result shown that succession and sparging producing numerous large bubbles aided nanoparticle levitation to the liquid surface, forming a monolayer that preserved in serial of dilutions. . It happens because nanoparticles can be concentrated on liquid surface in a manner similar to the traditional froth floatation process used in the metal ore purification of larger particles. And it also demonstrated that once the concentration of AuNp s reached threshold of few ng/ml, further serial dilutions did not result in a concentration reduction and asymptote was formed. And ultrasonication produced small cavitation bubbles which failed to reach top level of the dilution. High speed digital video was used for assessing succession, sparging and ultasonication and FT-IR spectroscopy, TEM/ SAED of lactose triturated mixture showed that lactose molecules stabilized gold or zinc particles by non-covalent interaction in different way and lactose during grinding helped in nanoparticle cluster formation and whereas gold and zinc powder without lactose produced aggregation of nanoparticle. Nanoparticle cluster prevents aggregation that leads to lower density and easily lifted to top level of dilution during the process of succession [8].

From this study we can conclude that process of potentization (trituration and succession) is the crucial step which helps in retention of starting materials in such a high dilution.

Even if there is presence of starting material in these extreme dilution is there any mechanism which explains action of these materials in such a high dilutions

Hormesis: hormesis is defined as biphasic dose response relationship in which the response at low doses is opposite to the effect at high doses. According to this concept a small dose of noxious agent can produce beneficial effect [9].

This concept was discovered by hugo schulz at university of Greifswald in Germany in 1880. By accident schulz noticed biphasic response while experimenting effect of well-known disinfectants on the metabolism of yeasts. He observed that all the disinfectants enhanced metabolism and survival of yeast in lower concentration and became toxic at higher concentration. And he replicated this experiment several times which yielded same result.

Hormesis and its relation with homoeopathy

The Young schulz collaborated with senior colleague Rudolph Arndt, in an attempt to correlate understanding of yeast data with recent clinical findings of homoeopathic literature.

In recent finding of homoeopathy showed that plant derived medicine veratrine was effective in the treatment of gastroenteritis in a small number of patients. So, schulz obtained a culture of the causative agent from the laboratory of Robert Koch. And then tested whether the veratrine was able to kill microbes. But schulz found out that the veratrine was not able to do so regardless of doses. He did not express doubt about clinical efficacy of homoeopathy but he was unable to explain how veratrine acted effectively in human patients at the low dose. So, Schulz and Arndt integrated the available information to formulate new theory – hormesis dose-response concept. They hypothesized that homoeopathic medicine was effective in the treatment of gastroenteritis not by killing microbes. But due to result of low dose of veratrine has enhanced the individual adaptive capacity to resist or fight off the infection. This was the reason why the veratrine was unable to kill the microbe. And also they concluded that stimulating effect of low dose disinfectant on yeast was due to enhancement of adoptive response of the yeast against disinfectant. Inference of these experiments lead to discovery of biphasic dose response concept that is hormesis.

But generalisation of concept of hormesis and collaborating this concept with newly discovered therapeutic method lead to many opposition and controversies. As a result it was dismissed by scientific and medical communities in the 1st half of 20th century.

But Sarah branham replicated findings of schulz within modern microbiology laboratory settings in 1929 but he could not continue with this research. A shift in the scientific fortune of hormesis started in 1970. This intellectual shift occurred in 3 independent experiments. Scientists observed unexpected biphasic response in their research:

Radiation by Thomas luckey at the University of Missouri

Toxicology by tony stebbing at Plymouth marine research station uk,

Pharmacoloygy by elemer szabadi at the University of Liverpool

Even though many scientist observed the effect of hormesis yet there is no special empathises is given on this subject [10]. Despite of several examples presented in the mainstream of scientific journal, text and scientist which was not included in the formulation and application in the field of toxicology and risk assessment [11].

Conclusion

Homoeopathy is the controversial system of therapeutics because of no proper scientific explanation regarding action of medicine yet this mode of treatment withstand the test of time. This review article proposed to understand the mode of action of homoeopathic remedies concludes that there is presence of nanoparticles of starting material even in extreme dilution of homoeopathic remedies and there will be non-zero asymptote formation beyond 6c potency and process of potentization helps to retain the Nano particulates of starting material in extreme dilution which can be explained by a nanopaticulate hypothesis based on froth flotation. And hormesis concept explains the adoptive response to the stimulating effect of the low dose medicine used in the treatment of the disease in the homoeopathy. If more empathises is given for the study of hormesis and its application in homoeopathy which is already proven to be scientific on strong scientific background then homoeopathy cannot be called as mere placebo effect. And not just homoeopathy will be proven as scientific method but there will be reformation in the pharmacology and toxicology regarding pharmacokinetics, monophasic dose response widely used in present day therapeutics will be replaced by biphasic dose response relationship.

Conflict of Interest
There is no conflict of interest.

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