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## Homoeopathy - A Nano Medicine

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### Abstract

Homoeopathic drug dynamisation theory was introduced by Dr. Samuel Hahnemann in 5<sup>th</sup> edition of Organon of Medicine in 1926. Absence of modern technological aid to support this theory led to strong criticism from contemporary therapeutic system, until the use of new technologies like different electronic microscopes which demonstrated presence of nanoparticles in Homoeopathic ultra-diluted medicines. Ultra diluted Homoeopathic medicines demonstrate properties similar to nanoparticles like gene expression, electromagnetic, mechanical, optical, thermal, chemical, biological and quantum properties causing enhanced bioavailability, increased reactivity and adsorptive capacity resulting in adaptive changes of Hormesis. These technological evidences have bridged the wide gap between the Homoeopathic Philosophy and Modern Science.

**Keywords:** Homoeopathy, Drug dynamisation, Nanoparticles, Hormesis

### Introduction

Homoeopathy has exhibited promising results over many years; rather centuries, in controlling morbidity as well as mortality in various diseases and also in previous pandemics [1]. Homoeopathy is suggested to be helpful in boosting the immunological responses in various conditions [2] and can thus be used as an adjuvant tool in the fight against the ongoing COVID-19 pandemic [3] and its sequelae [4]. Homoeopathic drug dynamisation theory was introduced by Dr. Samuel Hahnemann in 5th edition of Organon of Medicine in 1926. Homoeopathic medicines are prepared at such high dilutions that the physical existence of even a single molecule of the original substance is said to be hypothetically impossible. The curative effect of individualised Homoeopathic potencies is experiential but incomprehensible by the conventional principles of science. This statement is a highly contentious topic of debate between rationalists and Homoeopaths. Recent discoveries related to the Nano particulate nature of Homoeopathic ultra-high potencies and their potential effect on individual gene expression gives new insights into this complex issue. As it uses minute, including sub molecular, 'doses', homoeopathy might be perceived as 'Nano-medicine'.

**Nano-perspective:** As per National Nanotechnology Initiative, nanotechnology is defined as the manipulation of matter with at least one dimension sized from 1 to 100 Nano meters. Nanotechnology deals with very tiny particles i.e. Nano meter size. Nanotechnology is the manipulation of matter on an atomic, molecular and supramolecular scale [5]. Homoeopathic medicines prepared at such high dilutions with no physical existence of even a single molecule of the original substance is said to be theoretically impossible; but it has been noticed that there are apparent biological effects of these highly potentized Homoeopathic medicines [6]. With the use of new technologies like Transmission Electron Microscopy (TEM), Electron diffraction and chemical analysis by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) and energy dispersive spectroscopy revealed presence of physical entities in Homoeopathic higher dilutions, in the form of nanoparticles of the starting metals and their aggregates [7].

A study sought to evaluate High Dilutions of homeopathic drug Ferrum metallicum (Ferr) 6, 30, 200, 1M, 10Mc and 50Mc showed that all of which except for 6c surpass Avogadro's number. Using high resolution transmission electron microscopy (HRTEM) and energy dispersive spectroscopy (EDS) it was conclusively shown that all the investigated high dilutions of Ferr contained plenty of nanoparticles and the size of NPs were within the quantum dots size range, except for 50Mc, in which larger particles were found (12.61nm).

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Nano Particles contained iron in various weight percentages; the weight percentage of iron was highest in HDs10Mc and 50Mc [8].

Another study to test the higher potencies of Homoeopathic drug Lycopodium to find a substantial evidence of the original drug substance was done with assistance of Field Emission Scanning Electron Microscopy (FESEM) and Energy Dispersive Spectroscopy (EDS) which showed an existence of nanoparticles in all potencies tested of Lycopodium [9]. A study aimed to find presence of nanoparticles in different potencies of Hypericum perforatum revealed with the help of modern technologies like FESEM & EDS analysis in all potencies of centesimal scale of Hypericum there proved to be an existence of Nanoparticles [10]. A study conducted to detect the presence of nanoparticles in different potencies of Aurum Met & Carbo Veg drug with the help of HRTEM, FESEM & EDS revealed presence of plenty of nanoparticles in Nano meter & Quantum dots (QD – less than 10nm) with presence of gold in all the potencies of Aurum. Plenty of nanoparticles were identified in all the potencies of Carbo-V in Nano meter scale composed of Carbon and Oxygen [11]. The presence of nanoparticles in different potencies of Natrum Mur from 6C to CM were detected and it revealed that LM scale was highly rich with the presence of a number of nanoparticles. Nanoparticles in LM scale were much smaller than the nanoparticles in centesimal scale [12].

Nanotechnology has provided a scientific basis to the Homoeopathic therapeutic system by establishing a connection between the old unquantifiable effects and the latest quantifiable technology thus validating Homoeopathy under the domain of science [13]. Nano medicine delivery methods have advantages over crude conventional medicines, like better disease targeting, especially for intracellular pathogens, lower doses effective to get the same effect, ability to cross membranes and enter cells, act as highly catalytic, longer duration drug action, reduced side effects and cost savings from lower doses. In comparison to bulk forms, nanoparticles have enhanced bioavailability, large ratio of surface area to volume causes increased reactivity and adsorptive capacity; with unique electromagnetic, mechanical, optical, thermal, chemical, biological and quantum properties. Nanoparticles can differentiate between healthy and unhealthy cells while bulk concentrations of medicine cannot [14]. In few studies it was found out that the presence of the original source materials physical chemistry “fingerprint” properties retained in remedy solutions. Homoeopathic remedies contain small but detectable amounts of nanoparticles, which is simply extremely small particles of the original source material. Nanoparticles can be similar in size to viruses, and can enter the body and its cells very easily. Even though these drug substances are in so diluted form, still they have such individualized properties. These individual properties of nanoparticles vary remarkably from their bulk forms of the same material [10]. Quantum mechanics has shown that these tiny particles can and do have impact on our macro world, with respect to Homoeopathy it is observed that at the very highest prescription strength dilutions of a homoeopathic substance (50M), there are still Nano particles of the original substance that exist [15]. Separate physical chemistry and biophysics studies reflect that Homoeopathic remedies can emit electromagnetic and optical signals. Other techniques with the help of solvatochromic dyes also

support the concept that a Homoeopathic remedy carries signal properties. The smallest nanoparticles are quantum dots, which can contain 10-50 atoms. The sizes of the nanoparticles range from Quantum dots to larger nanostructures. Quantum dot sized nanoparticles can generate quantum coherence and quantum entanglement types of phenomena. Extremely small quantum dots trap source material atoms and their electrons on the particle surface, leading to photon emission in certain circumstances [16].

**Hormesis:** Principles and applications of Hormesis states the beneficial or stimulatory effect of low doses of toxins, with a J or inverted U shaped dose response as opposed to the conventional sigmoid S shaped curve assumed in conventional pharmacology. Thus it signifies a relationship between Hormesis and Homoeopathy via Arndt-Schulz Law [17]. Homoeopathic prepared medicines stimulate a dose response which causes a specific Hormesis which in turn ensures that homeostasis is maintained and thus cures [18]. Another virus like similar characteristic observed is Homoeopathic nanoparticles is they could have virus like activation of cell defence response (CDR) mediator pathways/ networks, thus resulting in secondary action of the medicine. Different sizes of nanoparticles of the same source material can exert different effects, this characteristics feature of nanoparticles thus emphasizes on how vital dosage of Homoeopathic and conventional pharmaceutical drugs can have different effects depending upon on its dosage. Nanoparticles are known to act on gene expression, cytokine release and signalling pathways or networks as cell danger signals for the body as a part by activating Danger Associated Molecular Pattern (DAMP) recognition receptors. The factors responsible for the endogenous response to nanoparticles are immune/ inflammatory/metabolic mediator modulation, nervous system cross sensitization and adaptive changes of Hormesis. In a study, Hormesis was demonstrated i.e. low dose reversal in direction of effects using a toxicity model system. The biological stress response reversed towards normal by administering homoeopathically prepared forms of the same source materials. Nanoparticles in Homoeopathic medicines modulate adaptive biological pathways to generate state dependent bidirectional changes in living systems. Multiple studies have demonstrated the ability of various nanomaterial’s to trigger the adaptive non-linear dose response phenomenon of Hormesis at low doses [19]. It is known that nanoparticles especially smaller sizes such as 1-7 nm, cannot just access the olfactory nervous system but also trigger the cell damage defence networks of DAMPs of the immune system and thus Hermetic adaptations [20]. Nanoparticles can cause Hormesis. Therefore, it appears that homoeopathically prepared remedies may also stimulate a similar response, causing a specific Hormesis which, in turn ensures that homeostasis is maintained and thus counteracts illness in a curative manner. With respect to Homoeopathic medicines it’s always less that is more [21].

**Modus operandi of Homoeopathy:** Herbs and minerals containing nanoparticles can treat infections via enhanced bioavailability, anti-inflammatory, antioxidants and immunomodulatory effects [22]. Homoeopathic remedies modulate Nanoparticle-Allostatic Cross-Adaptation

Sensitization (NPCAS) Model with multiple dynamic short and long term effects. Similimum remedy nanoparticles, act as novel mild stressor corresponding to the organism's dysfunction initiate time dependent cross sensitization, reversing the direction of dysfunctional reactivity to environmental stressors [15]. In Homoeopathy, the appropriate homoeopathic remedy is a mild salient stressor (Hormetin) for the organism as a whole [10]. The factors that could particularly foster host adaptive responses encompass virus like properties of certain nanoparticles and their ability to trigger the cell danger response pathways of the body as exogenous stressors or stimuli. Some larger nanoparticles can exert bacteria like effects on living systems as well. Homoeopathic medicines rather acting on local end organ tissue receptors per se, they act mainly via modulation of adaptive biological pathways in the body involved in the stress response. These interconnected pathways include immune, inflammatory, hormonal, and metabolic and nervous system mediation. Nanoparticles tend to trigger responses related to viruses, whereas larger micro sized particles affect responses related to bacteria. Biologically small nanoparticles have extremely high bioavailability and unimpeded capacity to cross cell membranes [19]. For Homoeopathic dosing, very low doses of nanoparticles can mobilize hermetic adaptation mechanisms in complex living systems by serving as novel, foreign stressors to stimulate beneficial compensatory response in the organism as a whole. The organism's adaptive responses grow and evolve over time via non-linear Meta plastic and plastic sensitization mechanisms in bodily cells across the endogenous, self-organized network of the dynamical living system. The primary pathways involve adaptive reactions rather than direct pharmacological actions [23]. Recent research work suggests that Homoeopathic remedies exist in a dual form, that is, a still molecular form at low dilution and a Nano particulate form at high dilution, and the remnants of source remedy persists in extremely high dilutions. Literature confirms that both the odorants and the nanoparticles can enter the body through inhalation, digestive absorption, or through the skin especially, nanoparticles or viruses can directly reach the brain through axons of the nerves. The Nano particulate form may activate the immune system at multiple levels, induce systemic various biological responses through the pituitary axis and inflammation factors or modulate gene expression at the cellular level. Assuming that the Nano particulate forms of high dilutions of the Homoeopathic remedies possess similar properties as to the conventional nanoparticles, they would exhibit much higher bioavailability, membrane permeability and intracellular reactivity than the molecular form of low dilutions of Homoeopathic remedies [24].

**Silicate:** During the process of succession, information from starting material gets encrypted by epitaxial on silicone rich crystalline nanoparticles present in the resulting Homoeopathic medicine. Depending on degree of dilution the size of information encrypted on nanoparticles varies. Thus Homoeopathy can be a representative of Nano medicine system [25]. Surface adsorbed materials from the surface of the container, during the process of Homoeopathic drug preparation, modifies silica Nanoparticle bio reactivity, potentially carry the source material fingerprint and could amplify the information of the original source into higher potencies. A study concludes

that increasing the number of successions; it will reduce the particle size of plant source materials into the Nano scale range [26].

**Potentization:** When Homoeopathic medicines dilute and potentized, the kinetic energy (in succession) or mechanical energy (in trituration) is converted and stored as potential energy; this is in align with the equation  $E=MC^2$ ; wherein it states that energy cannot be created nor destroyed, it can only be converted into one form to another [27]. During the process of drug potentization, the mechanical energy transferred in all probability reduces the size of the drug aggregates. The drug then penetrates easily through the membrane barrier and thereby gives rise to enhanced activity of the medicine [26].

During the process of succession, vital Nano bubbles are produced along with very high forces and temperatures which remain consistent with the size and shape of the metal nanoparticles. This formation of nanoparticle-Nano bubble complexes is used as a starting material for the next dilution and through this process again successions will lead to production of Nano bubbles which later form the nanoparticle-Nano bubble complex, hence as the process of succession increases the nanoparticle-Nano bubble complex increases [28]. These Nano bubbles have a characteristic properties like low buoyancy, longevity and release of high energy when its busted or collapsed. Nano bubbles are associated with superstructures which increase in size when there is an increased dilution to the extent of ultra-molecular range [17]. Depending upon the origin of nanoparticles the level of interaction with CT-DNA is varied reflecting the difference in their respective binding capacities. Differences in their cellular entry and biological action are due to different sizes of nanoparticles [29]. Homoeopathy is a form of Nano pharmacology where homoeopathic medicines, during the process of potentization, results in breaking down of medicinal substance into nanoparticles. A study states that homoeopathically prepared plant and metal remedies contain 1-4000 picograms/millimetre of nanoparticles (5-100 Nano meter size) in mother tincture up to 200C potencies. Dr. Jayesh Bellare, head of Chemical Engineering Department at IIT-B states that even the highest dilutions of remedies have left signatures of respective original molecules in their nanoparticle form, when subjected to electron microscopy studies, validated later by wavelength analysis. He also co related the succession process could break the quantum domain of a medical substance and accelerate and decelerate protein activity like electromagnetic waves do. In a study conducted by IIT – Kharagpur with the help of Fluorescence Spectroscopy and Cyclic Voltammetry found the presence of biologically active digoxin like substance in *Digitalis Purpurea* 30C and 200C [13]. Homoeopathic manufacturing is a crude form of top-down mechanical attrition methods for making nanoparticles. The hypothesis is that the original metals forms Nano bubbles and floats on the surface of the highly diluted mixtures. The particle of the starting material gets adsorbed on the surface of these Nano bubbles and cavitation's. This nanoparticle-Nano bubble complex rises to the surface and can be within a monolayer once the total metal concentrations are well below 1 ppm [30]. During the process of Homoeopathic medicine preparation like mechanical grinding results in virus like particle surface defects like cracks, fissures, roughness, folds and pores

which increases bio-molecular binding and cell uptake. Nanoparticles are often more potent in relation to their crude form. Bulk forms of a material are inherently much larger than their Nano scale counterparts and such differences in their forms can lead to the significant differences in properties as a function of size. One study states that during the process of Homoeopathic drug preparation, increasing the number of successions produced progressively smaller and smaller sizes of nanoparticles of source plant extract materials down to approximately 14 nanometres. Exosomes are small sized membrane vesicles that can contain lipids, adhesions and intercellular signalling molecules, proteins and RNAs from their original source cell interior. Homoeopathic investigators repeatedly found that during the process of Homoeopathic drug manufacturing the repeated agitation releases variable but readily measurable amounts of elemental silicon into solution from the inner walls of the glassware in the parts per million ranges. In a study by Ives *et al.* they showed that repeated successions will gradually lower the pH of a homoeopathically prepared solution from alkaline toward a more neutral buffered Ph near 7. A study states that, the drift of pH value helps conversion of precursor monomer silicates of the solution into nanoparticles forms of silica. Therefore Nano silica is highly likely to be a key constituent of any homoeopathically prepared potency in liquid solutions made in glass. The nature of nanoparticle interactions with cells and resultant biological activity is based upon the sizes, shapes, surface areas and surface charges and surface chemistry of nanoparticles. Contrary to the bulk pharmaceutical drugs, nanoparticles are distinctly able to generate aging, pH sensitivity, electromagnetic, photoluminescence and quantum mechanical effects. Multiple studies have converged on the hypothesis of Homoeopathic nanoparticles as salient mild systemic stressors<sup>[19]</sup>. A study by Ramnarian Ruia College, Mumbai in 2013 stated that the dose of medicine required is reduced by orders of magnitude when it is in nanoparticle size which is in conformity with the principles of Homoeopathy. Homoeopathy is per se a form of Nano pharmacology, as through a specific pharmacological process of potentization/trituration there is breaking down of medicinal substance into nanoparticles<sup>[21]</sup>.

**Variant Potency, Variant Effects:** Homoeopathic medicines act as enhanced micro and Nano scale forms of their source material via direct local ligand receptor interactions at very low potencies and at higher potencies systemic adaptive network produces dynamical effects via nanoparticles based electromagnetic, thermal, biochemical, optical and quantum mechanical properties. Hence it can be said that Homoeopathic medicine preparation process like dilution modify the sizes, shapes and surface charges of nanoparticles thereby causing differences in physio-chemical properties and biological effects<sup>[31]</sup>. Ultra diluted Homoeopathic medicine (potency) contains Nano particle and very high potency (sub Nano scale or beyond sub Nano scale) obey the law of quantum mechanics<sup>[32]</sup>. A study states that the dose of medicine required is reduced by orders of magnitude when it is in nanoparticle size which comply the principles of Homoeopathy<sup>[18]</sup>. Very low Homoeopathic potencies would exert direct pharmacological or hypersensitivity effects related to enhanced bioavailability, drug delivery capacity and

duration of action of natural source nanomaterial's. Higher Homoeopathic potencies in water would bring about their effects as virus like systemic stressors. The concentration of the pulsed doses of a well-chosen homoeopathic medicine can be very low and still trigger individual bio reactivity in a state dependent nonlinear manner<sup>[19]</sup>. In a study conducted on animals it was found that higher potencies can induce longer lasting effects in comparison to lower potencies of the same remedy<sup>[25]</sup>. An exploratory randomized study conducted to observe nanoparticles in homoeopathically prepared Argentum Metallicum 6C, 30C, 200C successes and unsuccessful control solutions revealed that successes solutions were significantly larger sized across potencies also Zeta potentials of successes group were more negative relatively<sup>[33]</sup>.

Considering the conclusion of many controlled laboratory experiments in vivo a convergent conclusion indicates that homoeopathic remedies can act at molecular, sub cellular, cellular and physiological levels and can effectively enhance the DNA repair process, which involves active participation of some specific genes<sup>[34]</sup>. A significant body of clinical research including randomized clinical trials suggest that Homoeopathy has an effectiveness in not just curing the symptoms but also in improving the quality of life of the patients.<sup>16</sup> As working on the Nano scale level, Homoeopathy can be termed as 'Smart Medicine'<sup>[35]</sup>.

### Conclusion

Homoeopathy is a form of Nano pharmacology where homoeopathic medicines, during the process of potentization, results in breaking down of medicinal substance into nanoparticles. Ultra diluted Homoeopathic medicines demonstrate properties similar to nanoparticles like gene expression, electromagnetic, mechanical, optical, thermal, chemical, biological and quantum properties causing enhanced bioavailability, increased reactivity and adsorptive capacity resulting in adaptive changes of Hormesis. Thus the presence of nanoparticles is one of the evidence to support Nano pharmacological nature of Homoeopathic drug action. These technological evidences have bridged the wide gap between the Homoeopathic Philosophy and Modern Science.

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