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HOMEOPATHY A NANOMEDICINE– IDENTIFICATION AND CHARACTERIZATION OF NPS IN HYPERICUMPERFORATUM 6C, 30C, 200C, 1M, 10M, 50M AND CM

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ABSTRACT

Homeopathy is a therapeutic method discovered by DrSamuel Hahnemann and is being practiced around the world. The validity of the science of homeopathy was questioned due to the lack of evidence of any material content in its ultra-high dilutions. The current paper as well as the earlier research papers of the author established the presence of large number of nanoparticles and quantum dots in all scales of dilutions of homeopathic drugs. The body of evidence presented are sufficient to establish the fact that homeopathy is not a placebo therapy but a nanomedicine.

INTRODUCTION

Dr. Samuel Hahnemann published his discovery of new therapeutic method in the paper "Fragmenta de viru bus medicamentorumpositivissive in sano corpora humanoobservatis" in 1796 in Hufeland's journal (Dudgeon, 1995). He coined his science of therapeutics (Carrol Dunham, 1993) based on the principle 'Similia Similibus Curentur' in 1790 during his experiments with cinchona bark (Hahnemann Samuel, 1990). Homeopathic mode of treatment use the drugs at ultra-low doses and high dilutions that even the physical existence of a single molecule of the original drug substance becomes theoretically impossible, yet the ultra-high dilutions in homeopathy has repeatedly proved their efficacy in treating diseases. Nobody could clearly define the nature of this therapeutic method more, than the initial assumption of Dr. Hahnemann that homeopathic high potencies acts at dynamic vital principle of human organism (Hahnemann Samuel, 1993).

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Later Khuda – Bukhsh *et al* suggested that potentized homeopathic drugs diluted beyond Avogadro's limit can modulate certain signal proteins (AnisurRahmanKhuda-Bukhsh, 2011). The bodies of evidence shown by the researchers around the world for the two decades delineate a new vision to explain the mode of action of homeopathic potencies (Sumit Goel, 2007) as well as guidance for further research in homeopathy and general medical science……vhnbThe research publications of the author "An evaluation of Avogadro's number in the light of HRTEM and EDS studies of highdilutions of Ferrummetallicum 6, 30, 200, 1M, 10M and 50Mc" (Rajendran, 2015), "Field Emission Scanning Electron Microscopy (FESEM) and Energy Dispersive Spectroscopy (EDS) studies of centesimal scale potencies of the homeopathic drug Lycopodiumclavatum (Rajendran, 2015)", "Nano Pharmacological Aspect of Homeopathic Drugs - A Comparative Study of Different Scales of Ultra-High Dilutions Based on HRTEM Analysis and NP Characterization of Homeopathic Drug NatrumMuriaticum 6C – CM and LM1 -LM30 (Rajendran, 2017)" and 13 other homeopathic drugs in various potencies in nanodynamics (Rajendran *et al*., 2015) conclusively demonstrated the presence of NPs (Zaochun, 2009; Alivisatos, 1996) & QDs in all high dilutions of homeopathic drugs.

SaifulHaque, Debarsi Das, Saugato Bhattacharya *et al*. (2016) demonstrated the clinical efficacy of Calcphos 30, 200 & 1M potencies in the treatment of patients suffering from loss of lumbar lordosis. Nandy, (Nandy, 2015) demonstrated the nano-dimensional property of homeopathic medicines; Aconitum napellus and Cuprum metallicum in 6c, 30c and 200c potencies. The author has shown the therapeutic efficacy of Lyco 30c, Lyco 0/3, Thuja 1M, Arsalb 30c, Calccarb 30c, Ferphos 0/3, Ferphos 0/4 and Ferphos 0/6 in his earlier paper Homeopathy as a supportive therapy in cancer (Rajendran, 2004). He also shown the clinical utility of Natrumsulphuricum 10M, Sulphur 10M, Natrummuriaticum 10M, Calcareacarbonicum 10M and Silicea 10M in the treatment of Molluscum contagiosum (Rajendran, 2002). The most commonly used nanoparticles today include polymeric nanoparticles, micelles, nanoshells, dendrimers, engineered viral nanoparticles, metallic nanoparticles and ceramic nanoparticles. These nanoparticles have shown therapeutic potentials for almost every branch of medicine such as oncology, cardiology, immunology, neurology, endocrinology, ophthalmology, pulmonology, orthopedics and dentistry. (Farokhzad, 2016).

The use of materials in nanoscale provides unparallel freedom to modify fundamental properties such as solubility, diffusivity, blood circulation half-time, drug release characteristics and immunogenicity (Zang, 2008). As a part of modern medicine (Allopathy), in the last two decades, a number of nanoparticles based therapeutic agents have been developed for the treatment of cancer, diabetes, pain, Asthma, Allergy, infections and so on (Brannon-Peppas, 2004; Kawasaki, 2005).

Chikramane*et al*[21]proved the presence of starting material in the form of nanoparticles in six metallic homeopathic drugs; Gold (Aurum metallicum), Copper (Cuprummetallicum), Tin (Stannummetallicum), Zinc (Zincummetallicum), Silver (Argentum metallicum) and Platinum (Platinum metallicum) in 6c, 30c & 200c potencies. Hahnemann's experiments of drug proving on himself, his family members and volunteers helped him to confirm the idea 'like cures like'. The results of his large-scale proving's led Hahnemann to conclude that, if a compound caused signs & symptoms in healthy volunteers, it should then also serve as a remedy for patients who suffer from similar signs & symptoms (AnisurRahmanKhuda-Bukhsh, 2003). A R KhudaBukhsh[23] hypothesized that one way by which potentised homeopathic drugs act is through regulatory action on gene expression. He proposed homeopathic remedies carry specific "signals" that can be identified by specific receptors and can act as a trigger to turn 'on' or 'off' some relevant genes, initiating a cascade of gene actions to alter and correct the gene expressions that went wrong to produce the disorder/disease.

Davenasetal, (2003) using the molecular weight of immunoglobulin's and Avogadro's number, calculated that less than one molecule of antibody in present in the assay when anti-serum is diluted to $1x10^{14}$ (corresponding to $2.2x10^{-20}$ m). But in the experiments reported, they have detected significant basophil deregulation down to the $1x10^{120}$ dilution. Specific effects have also been triggered by highly diluted agents in other in vitro and in vivo biological systems. Therefore, they proposed that none of the starting molecules is present in the dilutions beyond the Avogadro limit and that specific information must have been transmitted during the dilution process.

Water could act as a 'template' for the molecule, for example by an infinite hydrogen-bonded network, or electric and magnetic fields. In this study of 1988 they could only be speculative on the nature of the specific activity present in the highly diluted solutions. But the more advanced research in the last decade helped to clear the speculative nature of the drug action of homeopathic potencies. Now we are sure about the nano particulate nature of all ultra-high dilutions of homeopathic drugs, gene regulatory action of these dilutions and the capabilities of Nano particles to initiate epigenetic programming. SantuKumarSahaetal[25]advanced these studies with exhaustive experimental evidences from both the higher organisms like mammals and lower organisms like yeast and bacteria. The results of the study provided strong evidence of the capability of the potentised homeopathic drugs to trigger specific gene activity in the bacteria to render protective effects against phage attack.

MATERIALS AND METHODS

Hypericumperforatum (Hypericum) is a homeopathic dug prepared from the whole plant. The method of preparation in centesimal scale[26] is based on a dilution factor of 1:100. The process is commonly called potentisation (Hahnemann, 1995).

Preparation of *Hypericumperforatum* potencies (Homeopathic Pharmacopeia, 1971)

100g of Hypericumperforatum in moderately coarse powder is taken and 250ml of purified water and 780ml of strong alcohol is added to make 1000ml of mother tincture. 1 ml of mother tincture is added to 2 ml of purified water and seven ml of strong alcohol and given 10 succussions to get Hypericum 2X. This is equal to 1C potency in the centesimal scale.1ml of *Hypericum*1C is added to 99 ml of dispensing alcohol and given 10 succussions to get *Hypericum* 2C. Further potencies are prepared by adding 1 ml of the previous potency and 99 ml of dispensing alcohol and giving 10 succussions.

Hypericum 6C is prepared by adding 1 part of *Hypericum* 5C and 99 parts of alcohol and giving 10 succussions.Hypericum 30C, 200C, 1M, 10M, 50M and CM are all prepared from the previous potencyin the same way as in 6C. As per Avogadro's number, 6.023×10^{23} dilution is the possible limit of tracing atoms or molecules of the starting material in dilutions. Accordingly a substance diluted more than 10^{23} does not contain any atoms of that substance. Homeopathic potency 12C crosses this limit, as it has a dilution factor of $10^{24.}$

The dilution factor achieved in various potencies of Hypericum is as follows;

Table 1. The dilution factor achieved in various potencies of Hypericumperforatum

Potency	Dilution factor
6C	10^{12}
30C	10^{60}
200C	10^{400}
1M	10^{2000}
10M	10^{20000}
50M	10^{100000}
CM	10^{200000}

(SumitGoel, 2007). All the above mentioned potencies of H*ypericum*are subjected to the study to thoroughly examine the presence of starting material in higher levels of dilutions.

Sample 1

***Hypericum* 6C**

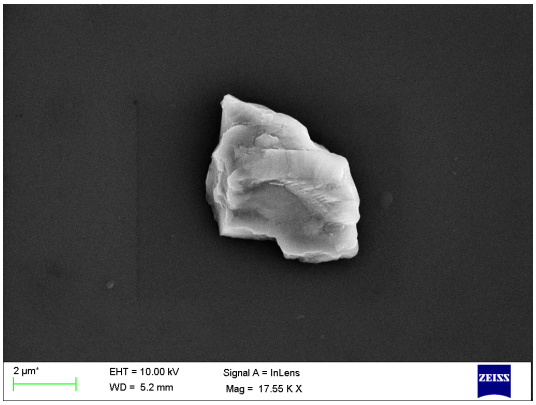

Figure: 1. *Hypericum* 6Cunder 2µm scale

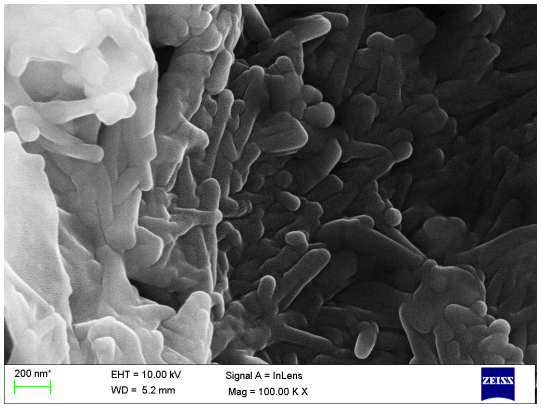

Figure: 2. *Hypericum*6C under 200nm scale

The figures 1 and 2 showed the nanoparticles of Hypericum 6C independently and as agglomerates. The size of the particles varied from 58.99nm - 77.08nm.

Sample 2

***Hypericum* 30C**

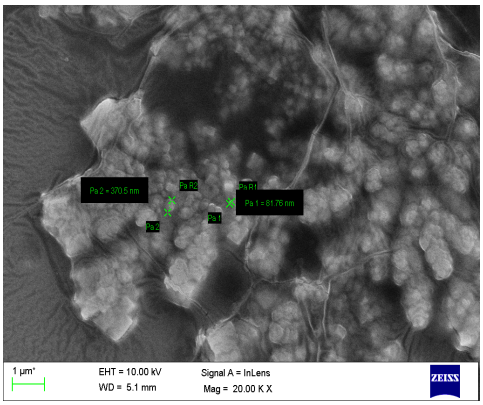

Figure: 3. *Hypericum* 30C under 1µm scale

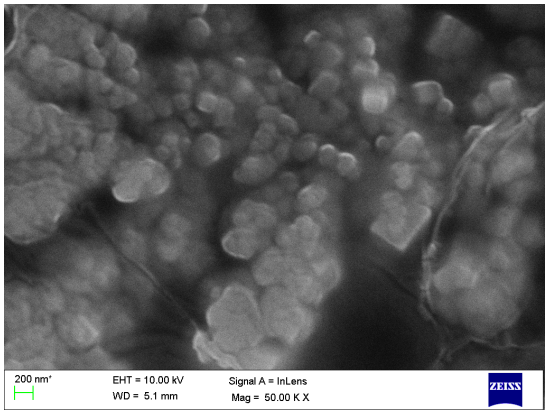

Figure: 4. *Hypericum* 30C under 200nm scale

The Figures 3 and 4 showed plenty of nanoparticles differing in morphology compared to 6C. The size of the particles varied from 67.42nm – 190.9nm.

Sample 3

***Hypericum*200C**

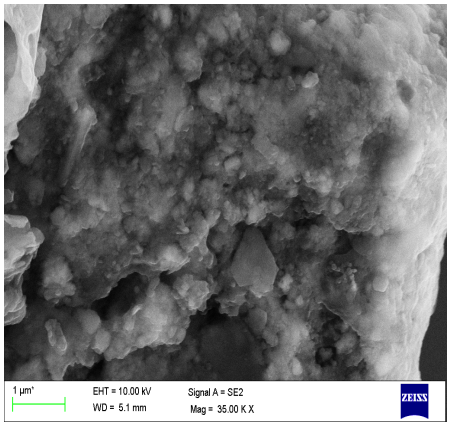

Figure. 5. *Hypericum* 200Cunder 1µm scale

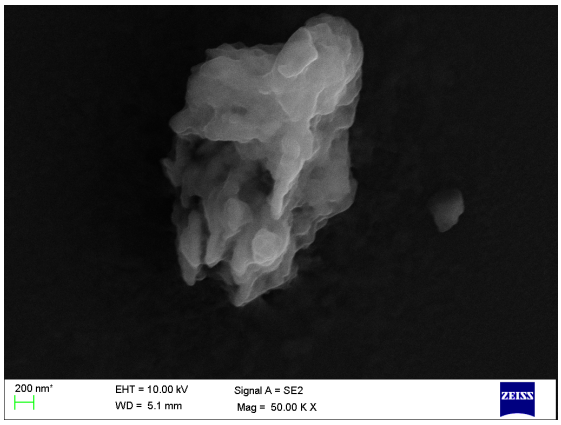

Figure. 6. *Hypericum*200C under 200nm scale

Figures 5 and 6 showed plenty of nanoparticles and agglomerates. The particle size varied from 72.26nm – 233nm.

Sample 4

***Hypericum*1M**

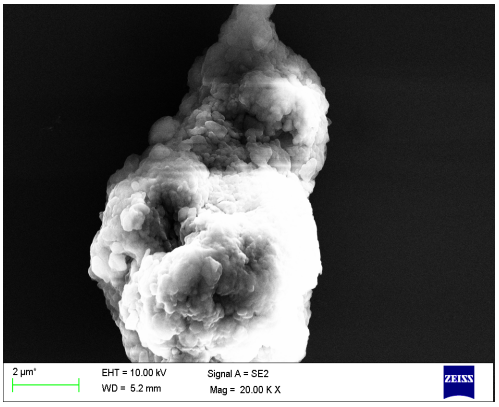

Figure 7. *Hypericum*1M under 2µm scale

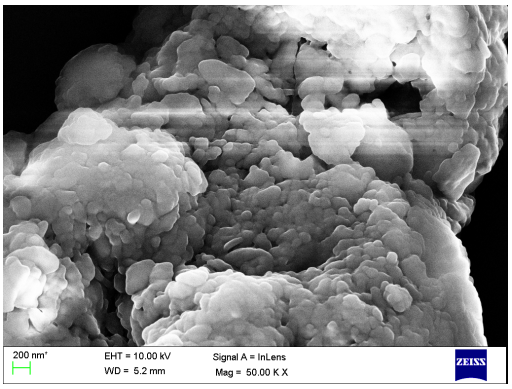

Figure 8. *Hypericum*1M under 200nm scale

Figures 7 and 8 showedplenty of particles and agglomerates. Particle size varied from 21.47 – 37.67nm. The size of particle considerably reduced in Hypericum 1m compared to 6C, 30C and 200C.

Sample 5

***Hypericum* 10M**

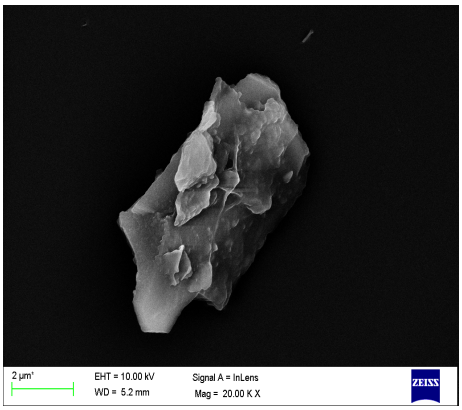

Figure: 9. *Hypericum* 10M under 2µm scale

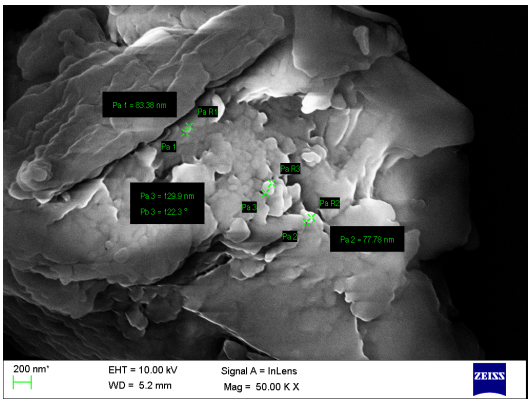

Figure: 10. *Hypericum*10M under 200nm scale

Figures 9 and 10 showed particles spread all over as in the earlier potencies. The size of particle varied from 41.69nm – 146.4nm.

Sample 6

***Hypericum* 50M**

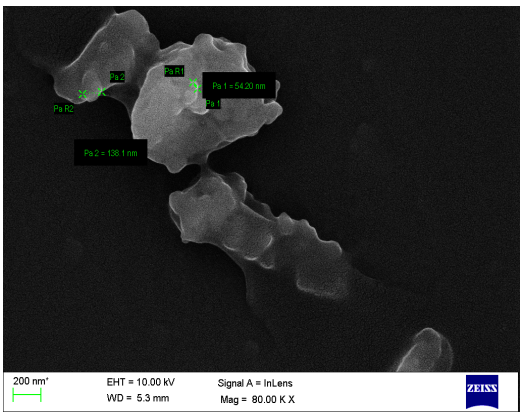

Figure:11. *Hypericum* 50M in 200nm scale

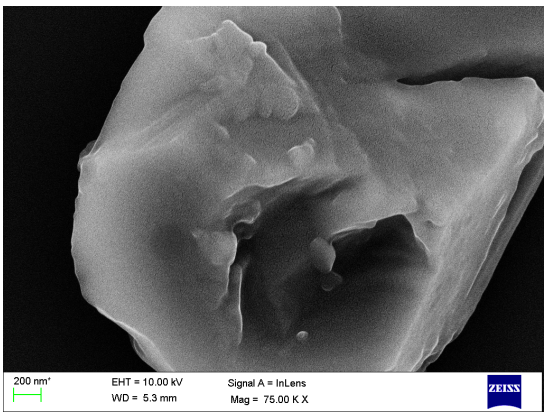

Figure:12. *Hypericum*50Min 200nm scale

Figures 11 and 12 showed peculiar structures and the size of nanoparticles varied from 65.97nm – 210.4nm.

The potencies of H*ypericum*were obtained from Willmar Schwabe India (P) Ltd, New Delhi, which is a certified Homeopathic pharmaceutical company.

Sample preparation

The selected potencies of H*ypericum* have been studied with the help of Field Emission Scanning Electron Microscope (FESEM) with Energy Dispersive Spectroscopy (EDS).

Sample 7

***Hypericum* CM**

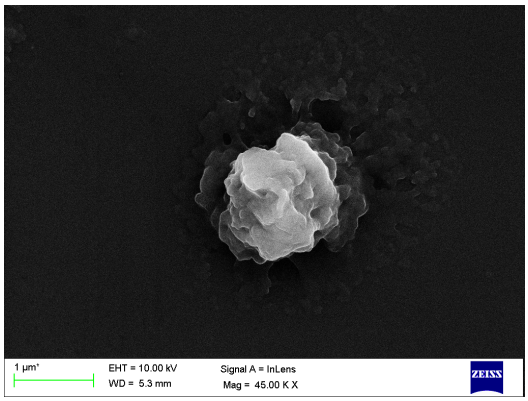

Figure: 13. *Hypericum* CM under 1µm scale

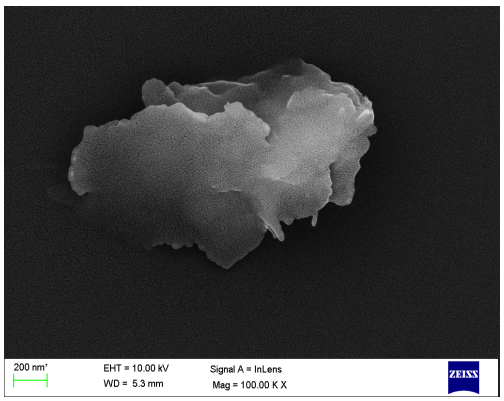

Figure: 14. *Hypericum* CM under 200nm scale

Figures 13 and 14 showed nanoparticles with variedsize from 17.37nm – 66.81nm. In all the potencies of Hypericum(6C – CM), particles were seen all over the field. In 50M and CM potencies, more numbers of particles were seen compared to the earlier potencies. Clarity of the particles was also better in 50M and CM. Among all the potencies CM has shown abundance of particles.

Table 2. Elementary composition of NPs in various high dilutions of *Hypericum*

	C	O	Si	Ca	Cl	Cu	Na
Hypericum 6C	12.24	43.96	3.59	40.23			
Hypericum 30C	37.4	19.82	5.41		9.57	27.8	
Hypericum 200C	35.55	43.52	20.93				1.82
Hypericum 1M	38.48	5.01	56.51				
Hypericum 10M	45.86	28.03	18.39				7.72
Hypericum 50M	16.56	47.53	2.65	33.27			
Hypericum CM	23.32	45.92	6.78	23.97			

Table 3. Particle size of NPs in various high dilutions of Hypericum

Potency	Particle size
*Hypericum*6C	58.99 – 77.08 nm
*Hypericum*30C	67.42 – 190.9 nm
Hypericum 200C	72.26 - 233 nm
*Hypericum*1M	21.47 – 37.67 nm
*Hypericum*10M	41.69 – 146.4 nm
Hypericum 50M	65.97 – 210.4 nm
*Hypericum*CM	17.37 – 66.81 nm

The machine used for FESEM analysis is Carl Zeiss, Ultra 55 and the EDS is done with Oxford instruments X-max 50mm$^{2.}$ The selected potency of the drug in a sealed bottle is sonicated (Fukudome, 1995) for 8 minutes. Studs are procured, cleaned well and double sided adhesive carbon tapes are fixed on the stud. Silicon wafers cleaned with isoproponyl alcohol are cut into adequate sizes and fixed on the carbon tapes. Micro drops of sonicated drug solution is extracted from the middle of the bottle by a micropipette and poured independently on the fixed silicon wafer on the stud.

The samples are allowed to dry and then placed in a vacuum dessicator overnight. Afterwards the stud containing samples are placed in a gold sputtering unit for gold coating to make the surface of the sample conducting. The gold coating is done in Quorum-Q 150 RES machine. Once the gold coating is done, the samples are mounted for FESEM and EDS analysis. The particles are identified and focused for the study. After identifying the particles, the size of the particles are measured. The aggregation and cluster formations of the particles are also focused.

The results are taken as FESEM images of the particles identified. The elements of the particles are identified and their weight percentage measured using Energy Dispersive Spectroscopy (EDS).

RESULTS

Figures 13 and 14 showed nanoparticles with variedsize from 17.37nm – 66.81nm. In all the potencies of Hypericum(6C – CM), particles were seen all over the field.

In 50M and CM potencies, more numbers of particles were seen compared to the earlier potencies. Clarity of the particles was also better in 50M and CM. Among all the potencies CM has shown abundance of particles.

DISCUSSION

The FESEM and EDS analysis of all the commonly used centesimal scale potencies of the homeopathic drug Hypericum prove the presence of nanoparticles and the elementary composition of all the studied particles shows the presence of C and O as universal elements in them. The presence of Si in EDS is necessarily the reflection of Silicon in Silicon wafers used for preparing the samples of potencies for analysis. The presence of other elements like Ca, Cl, Cu and Na occasionally in various samples could be treated as impurities, yet their presence demand further investigation. The universal presence of NPs in all the samples studied from every potency of Hypericum confirms the presence of NPs as the Nanopharmacological therapeutic agents of the homeopathic drug action. Findings in this study corroborates the earlier published study results (Rajendran, 2015; Rajendran, 2015; Rajendran, 2017; SaifulHaque, 2016; Nandy, 2015; Chikramane, 2010). The presence of NPs are not the only evidence to support nanaopharmacological nature of homeopathic drug action. The detailed studies of the researchers (Anisur Rahman Khuda-Bukhsh, 2009; Saha, 2012) from different fields of science provided evidence of the capability of the potentised homeopathic drugs to trigger specific gene activity and other epigenetic programmings.

Conclusion

The body of evidence provided by the author and the other researchers are conclusive to prove that 'homeopathy is nanomedicine'. These study results effectively nullify the burden on homeopaths to prove the scientific basis of homeopathic drug potencies and their therapeutic action. As the nanopharmacological nature of homeopathic potencies and the ability of homeopathic NPs and QDs in drug solutions modify the gene expressions are well proved , it is imperative to define that homeopathy is truly a nanomedicine. This changesthe definition of homeopathy from a dynamic medicine to a material medicine, which is active at intra cellular biologically active nano units. This will be a revolutionary revelation in the field of medicine as well as general science. Therefore, further research in medicine should focus on these two related capabilities of homeopathic drug potencies, viz.

- Nanopharmacologicalnature of homeopathicultra-high dilutions
- Gene regulatory capabilities of NPs and QDs in homeopathic ultra-high dilutions.

I am sure that such a change upgrades the current research protocols in the field of medicine from the basis of molecular medicine to nanomedicine. Undoubtedly that leads to a medical and scientific revolution in the human history.

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