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This is to certify that the following activities were conducted under the Collaborative Research Activities signed between Government General Degree College, Mangalkote, Panchanantala, Khudrun Dighi, P.O: Majhigram, Block – Mangalkote, Dist: Purba Bardhaman (W.B.) INDIA, PIN-713132 and Prof. Nirmal Chandra Sukul, President of Sukul Institute of Homeopathic Research, Santiniketan, West Bengal-731235, for a period of five years with effect from 03/12/2019.

Sl. No.	Year of the Activity	Name/Nature of the Activity (Research Publication)	Details of the Activity Paper details (author name, journal, vol, year etc) and Link
1.	Published on 01.02.2022	High Dilutions of a Drug of Covid-19 Origin Show Difference in Ranks as Revealed by Electronic and Vibrational Spectroscopy	Raj Kumar Singh, Sumit Ghosh, Nirmal Chandra Sukul, Mahasweta Nandi, Ananya Pal, Manjula Pal, International Journal of High Dilution Research, 2021, 20(4), 29–42, ISSN 1982-6206. (https://doi.org/10.51910/ijhdr.v20i4.1099)
2	2021	Novel Coronavirus (COVID-19) infection shows mild negative correlation with smoking	Nivedita Pande, Indrani Chakraborty, Nirmal C. Sukul, Anal Jyoti Chakrabarti, Raj Kumar Singh and Anirban Sukul, Int Public Health J, 2021; 13(3).
3.	2021	Effects of Ultra High Dilution of Paraquat 30 cH on Growth, Chlorophyll Content and Yield of Rice Crop	Siddhartha Sankar Banerjee, PriyaMondal, Nirmal Chandra Sukul, Raj Kumar Singh, Indrani Chakraborty, Anirban Sukul, International Journal of High Dilution Research 2021; 20(2-3): 16-23
4.	Published on 03.07.2022	Investigation of the Influence of clathrate hydrate crystals on the Structuring of Homeopathic High Dilutions	Nirmal Sukul, Sumit Ghosh, Raj Kumar Singh, Nivedita Pande, Anirban Sukul, International Journal of High Dilution Research, 2022, 21(cf), 18–26 (https://doi.org/10.51910/ijhdr.v21icf.1153)

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5.	Published on 27.09.2022	High Dilutions of Drugs Show Distinct Variation from Each Other in their Electronic Spectra	Sumit Ghosh, Raj Kumar Singh, Nirmal Chandra Sukul, Nivedita Pande and Anirban Sukul, International Journal of High Dilution Research, 2022, 21(2),26-26. (https://doi.org/10.51910/ijhdr.v21i2.1225)
6.	Submitted on 28 July 2021 and Accepted on 15 November 2021	Homeopathic Drugs Modify Water Structure in Ethanol Water Solution in Their Extreme Dilutions as Revealed by Electronic and Vibrational Spectroscopy	Singh R. K., Ghosh S., Sukul N. C., Pande N., Sukul A., Nandi M., Pal A., Pal M., Water a Multidisciplinary Research Journal, 2022
7.	Submitted on 18 Nov 2021 and Accepted on 13 Jan 2022	Raman Spectroscopy of High Dilutions of Two Drugs in Aqueous Ethanol Solution Shows Variation in Clathrate Hydrate	Nirmal Chandra Sukul, Raj Kumar Singh, Sumit Ghosh, Achintya Singha, Indrani Chakraborty, Nivedita Pandey and Anirban Sukul, Indian Journal of Natural Sciences, 2022, 12(70)
8.	Submitted on 16 Arp 2022 and Accepted on 23 Sept 2022	Clathrate Hydrate Crystals and Charge Transfer Interaction Characterize High Dilutions of Two Homeopathic Drugs Cannabis sativa and Colchicum autumnale	Raj Kumar Singh, Sumit Ghosh, Nirmal Chandra Sukul, Nivedita Pandey and Anirban Sukul, Indian Journal of Natural Sciences, 2022, 13(74)
9.	Submitted on 27.11.2022 and Accepted on 03.02.2023	High Dilutions of Homeopathic Drugs Interact with Human Serum Albumin as Revealed by Electronic Spectroscopy	Raj Kumar Singh, Sumit Ghosh, Nirmal Chandra Sukul, Nivedita Pande and Anirban Sukul, JOURNAL OF NATURAL REMEDIES, DOI: 10.18311/jnr/2023/32063

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Original Article

High Dilutions of a Drug of Covid-19 Origin Show Difference in Ranks as Revealed by Electronic and Vibrational Spectroscopy

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Abstract

Background: High dilutions (HDs) of drugs used in Homeopathy are identical in the composition containing ethanol and water. Yet they show specific therapeutic action on patients. **Aims**: HDs prepared by serial dilution and succussion are called potencies. Do the potency ranks show any difference from each other? Do serial dilution and succussion contribute to the difference in potency ranks? This study aims to address these two questions. **Methodology**: The throat swab of a Covid-19 patient was preserved and diluted with aqueous EtOH 90% to prepare the mother tincture(MT)and five different potencies of Covid named Covidinum 6, 12, 30, 200, and 1000cH.Electronic and vibrational (FT-IR) spectroscopy analyzed these potencies and their solvent media. **Results and Discussion**: Charge transfer (CT) and proton transfer interactions occur during the preparation of the potencies. After normalization, the FT-IR spectra of all the test samples show differences from each other concerning O-H stretching and bending (v2)bands. Serial dilution and succussion contribute to the observed difference in ranks and CT interactions. Covidinum is a new Homeopathic nosode, and its symptoms and therapeutic effect have not yet been ascertained. It is a preliminary study.

Keywords: High dilution, UV-spectra, FT-IR spectra, Charge transfer, Hydrogen bond.

Introduction

Following the standard preparation and dynamization, a new Homeopathic nosode Covidinum has been prepared [1-2]. Five centesimal potencies 6, 12, 30, 200, and 1000 cH have been prepared. These new potencies have not yet been tested on man, and their effect on healthy and diseased individuals has not yet been determined. The purpose of the experimental study is to see whether these potencies show any difference from each other by electronic and vibrational spectroscopy. This is a preliminary study. Appropriate statistics have analyzed the data.

High dilutions (HDs) of drugs have been used to treat human diseases for more than a couple of centuries. The German physician Dr. Samuel Hahnemann introduced this therapeutic system called Homeopathy in 1796 [3-4]. For the centesimal scale, these HDs are prepared by serial dilution of drugs in EtOH water mixture (1:100) followed by mechanical agitation or succussion in each serial rank. The succussed HDs are called potencies. The rank of a potency is denoted by a number like 6cH, 12cH, 30cH, 200cH, 1000cH (1M), etc. Do the potency ranks differ from each other? Do serial dilution and succussion have a scientific bearing? This study aims to address these two questions. The dilution of the 12th centesimal potency is 1024. Thus the 12 cH and higher potencies have crossed the Avogadro number and are expected to contain no drug molecules. For this, Homeopathy has not been

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ANNEX-1

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Novel Coronavirus (COVID-19) infection shows mild negative correlation with smoking

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Abstract

Coronavirus (COVID-19) infection affects respiratory system. Smoking also does the same but slowly. This study aims to find any relationship between smoking and COVID-19 in Indian states and different countries of the world. We obtained raw data from published literature and analysed them by appropriate statistics. COVID-19 shows low negative correlation with both tobacco and cannabis smoking. Recovery from and death due to the disease are also separately correlated with both tobacco and cannabis smokers. Cannabis shows more protective effect on viral infection than tobacco. Chemical components present in tobacco and cannabis smoke and their effect on lungs and other organs were discussed. Receptors for COVID-19 and those for nicotine and cannabinoid in host cells were also discussed. It is concluded that cannabinoid holds promise for its potential use against the virus.

Keywords: COVID-19, cannabis, tobacco, correlation, world population, India

Introduction

Novel Coronavirus (COVID-19) infection was first reported from Wuhan, China in December, 2019. The disease spread rapidly to other countries in Asia, Europe, Australia, Africa and Americas. The symptoms include fever and respiratory distress. The infected lungs show oedema, proteinaceous exudate, hyperplasia of pneumocytes and infiltration of inflammatory cells (1). A similar type of virus of the family Coronaviridae infected people in China in 2003. The authors reported an extensive infection with this virus in November 2002 invading 7,053 people in 33 countries with 506 deaths (2). Pathological changes due to COVID-19 infection include diffuse alveolar damage with presence of multinucleated pneumocytes (3). Nearly 80% patients show only mild symptoms, and recover without any

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Original Article

Effects of Ultra High Dilution of Paraquat 30 cH on Growth, Chlorophyll Content and Yield of Rice Crop

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Abstract

The application of synthetic fertilizers reduces the natural fertility of the soil and contaminates groundwater. Some photosynthesis inhibitors at ultra-high dilution (UHD) increase photosynthesis, growth, and yield of crops. A weedicide Paraquat at UHD enhanced the growth and yield of potatoes in fields. The objective is to see whether the UHD of Paraquat is also effective on rice. This weedicide was serially diluted with distilled water and manually succussed in 30 steps following the preparation of homeopathic dilutions called potencies. In this way, the 30th potency of Paraquat called Paraquat 30 cH was prepared and preserved in 90 % ethanol. Paraquat 30 cH was diluted with water 1:1000 (v/v) and sprayed on rice plants in a field measuring 0.3125 acres. The control plot of the same area was situated 300 meters away from the test plot. Three treatments were given at an interval of 7 days. The treated plot showed increased growth, chlorophyll content, and rice yield significantly compared to control. The UHD of the weedicide produced precisely the opposite effect of the crude material on plants. The increased growth and yield of rice by Paraquat 30 cH may be due to the enhancement of photosynthesis of treated plants. The UHD of Paraquat increased the yield of rice by 19.35% over the control.

Keywords: Weedicide, potentization, field trial, paddy, increased productivity.

Introduction

In order to boost crop yield, synthetic fertilizers are extensively applied, about 181.9 million Metric tonnes in the world [1]. They affect the quality of soil and its microbial properties [2-3]. They also weaken the shoot and root system of crops and reduce their nutrient value [4]. Ammonium nitrate is used as a synthetic nitrogen fertilizer. It is very much toxic to humans creating malfunction of the liver and kidneys [5]. Here comes the need to find an alternative to these fertilizers. A photosynthesis promoter would be a suitable alternative. We have already observed that some weedicides and drugs at UHD promote photosynthesis and increase about 20% yield of crops [6-9]. We have also observed that Paraquat, a weedicide at UHD, enhances the growth and yield of potatoes [10]. The objective of the present study is to see whether the UHD of Paraquat could enhance the growth and yield of rice.

Rice has been selected because it is a staple food, mainly in Asia, Africa, and Latin America. About 520 million people consume rice in Asia [11]. The three countries, which are the topmost in rice production, are China (148.5 million Metric tonnes), India (116.42 million Metric tonnes), and Indonesia (46.7 million Metric tonnes) [12].

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Original article

Investigation of the Influence of clathrate hydrate crystals on the Structuring of Homeopathic High Dilutions

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Abstract

High dilutions (HD) of drugs used in homeopathy are mostly too dilute to contain original drug molecules. But evidence supports their specific biological and therapeutic effects. The reason behind this is thought to be the water structure characteristic of the original drug. Spectroscopic studies indicate that the specific water structure in HDs can be resolved into free water molecules, the hydrogen bonding strength of water hydroxyl, the number of hydrogen bonds, and clathrate hydrate crystals (CHC). HDs are prepared in EtOH water solution by serial dilution and mechanical agitation and are called potencies. The objective of the present study is to further confirm the presence of CHCs in the two potencies of three drugs. Electronic spectra of the HDs of the potencies indicate two broad peaks and marked differences in intensities of absorption. Fourier Transform Infrared (FT-IR) spectra of the test potencies and their control show difference in intensity shift and contour shape of OH stretching and bending bands. All the experimental data indicate the presence of CHCs in varying amounts in the test potencies. Potentization of drugs involves charge transfer (CT) interaction.

Keywords: High dilutions, FT-IR spectra, UV spectra, Clathrate hydrate crystal, Water structure, Charge transfer interaction.

Introduction

High dilutions of drugs (HDs) have been used in homeopathy for more than 200 years. This therapeutic system was introduced by Dr. Samuel Hahnemann, a German physician, in 1756 [1,2]. The HDs, prepared by serial dilution followed by mechanical agitation or succussion in several progressive steps, are called potencies. The drugs are diluted in 90% EtOH in the proportion of 1:100. The twelfth potency has a dilution of 10^{-24} which crosses the Avogadro number. So the twelfth and higher potencies are too dilute to contain original drug molecules. This makes homeopathy scientifically untenable. But there is a large number of evidence that shows that these potencies have biological and therapeutic effects [3,4].

Scientists believe that the biological effects of potencies are due to characteristic water structures [5-8]. In a series of experiments, we have demonstrated that water structures in the potencies involve free water molecules, hydrogen bond strength of water hydroxyl, and several hydrogen bonds. We have recently demonstrated that the potencies of two homeopathic drugs contain clathrate hydrate crystals (CHC) in addition to other factors already reported [9]. The objective of the present study is to further confirm the presence of CHCs in the potencies of other drugs. These crystals occur in methane gas trapped in ice crystals and break down at higher temperatures [10,11]. Homeopathic

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RESEARCH ARTICLE

High Dilutions of Drugs Show Distinct Variation from Each Other in their Electronic Spectra

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ABSTRACT

Drugs at high dilution (HD) produce therapeutic effect on man, animals and plants. Experimental evidence shows that free water molecules and hydrogen bond strength of OH groups constitute the physical basis of HDs which are otherwise devoid of original drug molecules. HDs are produced in aqueous EtOH by serial dilution of a substance with mechanical agitation or succussion in each step, and are called potencies. Three potencies 6 cH, 12 cH and 30 cH of two drugs *Anacardium orientale* and *Natrum muriaticum* (NaCl) and their mother tincture (MT) are used in this study. Electronic spectra of these MTs and potencies, all in 90% EtOH, were taken in the wavelength region of 190 nm – 350 nm. The objective is to find out any additional physico-chemical entities in potencies besides the aforesaid two factors. It was reported earlier that charge transfer (CT) interaction accompanies potentization of drugs. This study focused on the CT interaction. The results indicate that spectral pattern and absorbance intensities of the test samples vary from each other. Potentization involves CT interaction in consecutive potencies. Water and EtOH do not form a homogeneous mixture and have aggregates of EtOH and water molecules. CT interactions occur in these individual aggregates and are mostly inter molecular within EtOH or water. These aggregates vary from each other in the test samples. It is concluded that water and EtOH aggregates and their relative distribution constitute additional phyco-chemical basis of potencies.

Keywords: High dilution, Electronic Spectra, Water, Ethanol, Charge Transfer.

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EVIDENCE OF WATER STRUCTURE

Homeopathic Drugs Modify Water Structure in Ethanol Water Solution in Their Extreme Dilutions as Revealed by Electronic and Vibrational Spectroscopy

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Keywords: High dilutions, Hydrogen bonding strength, Free water molecules, Electronic spectra, Vibrational spectra.

Abstract

High dilutions (HD) of drugs used in homeopathy are too dilute to contain original drug molecules. Clinical and experimental evidence shows, however, that the HDs produce specific biological effects. Water structures in HDs are thought to be responsible for those effects. In our earlier experimental studies, we defined the water structure in terms of free water molecules (FWM) and the hydrogen bond strength (HBS) of the water hydroxyl in the aqueous ethanol solvent medium of HDs. The objective of this preliminary study is to further confirm the components of water structure by electronic (ES) and vibrational spectroscopy (VS). HDs, prepared by serial dilution of a drug followed by succussion, are called potencies. Three common homeopathic drugs, *Bryonia alba, Rhus toxicodendron* and *Thuja occidentalis,* and three potencies of each drug were analyzed by ES and VS using appropriate statistics. The results show that the potencies tested differ from each other with respect to FWM and HBS of the

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RESEARCH ARTICLE

Raman Spectroscopy of High Dilutions of Two Drugs in Aqueous Ethanol Solution Shows Variation in Clathrate Hydrate Crystals

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ABSTRACT

High dilutions (HD) of drugs, used in homeopathy, are too dilute to contain original drug molecules. HDs are prepared by serial dilution of a substance in aqueous EtOH followed by mechanical agitation or succussion. These agitated HDs are called potencies. Mechanical agitation initiates and promotes the process of nucleation. Two potencies of two drugs, *Medorrhinum* (Medor) and *Psorinum* (Psor) were analysed by Laser Raman spectroscopy. The spectra show difference in intensity of CH and OH stretching vibrations in the potencies and the control. The contour shape of each spectrum as analysed by intensity ratios at two frequencies show variation in the hydrogen bonding strength indifferent potencies. The chemical nature of the drugs and different levels of succussion appear to have contributed to the variation in the hydrogen bonding strength of the OH groups in potencies. Clathrate hydrate crystals appear to vary in the potencies of the drugs tested. Succussion helps in the nucleation of the crystals and thus plays an important role in the preparation of potencies. The crystals may be responsible for the biological effects of HDs of drugs and contribute to one of the components in the water structure of a potency.

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RESEARCH ARTICLE

Clathrate Hydrate Crystals and Charge Transfer Interaction Characterize High Dilutions of Two Homeopathic Drugs *Cannabis sativa* and *Colchicum autumnale*

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ABSTRACT

High dilutions (HD) of drugs used in homeopathy are mostly devoid of original drug molecules. Water structure has been reported to carry the information of original drug molecules. We have defined the water structure in terms of free water molecules, hydrogen bond strength and number of hydrogen bonds. We have also reported that charge transfer interaction (CT) has been associated with HDs. In the present study we have analysed two drugs *Cannabis sativa* and *Colchicum autumnale*, and two potencies 6cH and 30cH by electronic and vibrational spectroscopy. The UV-Vis spectra of each potency show two peaks one at 200 nm and another 220 nm wave length. The first peak belongs to the absorbance by clathrate hydrate crystal (CHC), the second peak at higher wave length has been assigned to the CT interaction. In the CT interaction dissolved oxygen serve as electron acceptor and water or ethanol as electron donor. Dissolved oxygen might have been introduced in the solvent medium (EtOH-water) of the potencies during their preparation by mechanical agitation or succussion. CT interaction appears to

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SHORT COMMUNICATION

High Dilutions of Homeopathic Drugs Interact with Human Serum Albumin as Revealed by Electronic Spectroscopy

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Abstract

Homeopathy uses drugs in extreme dilutions that are mostly devoid of the original drug molecules. Drug-induced water structures are thought to be responsible for their therapeutic effect. We have already observed that homeopathic potencies first interact with serum albumin, which is present in the oral mucosa. In this experimental study, we have shown that the homeopathic potencies of three drugs, *Bryonia alba* (Br), *Rhux toxicodendron* (Rt), and *Thuja occidentalis* (Th), initiate their action on Human Serum Albumin (HSA). The potency-HSA complexation has been observed by electronic spectroscopy. The control, HSA plus water, shows only one peak at 216 nm, but the potencies plus HSA show two peaks, one at 205 nm and another around 265 nm. The first peak is due to the peptide bond. The first peak in the control shows a marked red shift. The second peak at higher wavelength is due to the aromatic amino acids. The first peak with the potencies shows a marked blue shift, possibly due to a change induced by the potencies on the peptide bond. Unlike water control the potencies interact with aromatic amino acids. It is evident that the complexes made up of HSA and potency are different from those of the control. This means that homeopathic potencies are not ordinary water. It is concluded that water control interacting with HSA shows a single peak in UV-spectra at lower wavelength, but homeopathic potencies show one additional peak at a higher wavelength besides the peak at the lower wave length. HDs can produce effects on aromatic amino acids. The mother tinctures and their HDs show marked differences from each other in their electronic spectra.

Keywords: Homeopathic Potencies, Human Serum Albumin, Modification of Protein, Water Structure

1. Introduction

Homeopathy uses extremely diluted drugs, which usually do not contain the original drug molecules. We now describe the basic process of preparing HDs. The drugs are prepared by serial dilution with a solvent medium 1:100 followed by mechanical agitation or succussion. These diluted drugs are called potencies. In our earlier experimental study, we reported that the potency interacts with a protein, such as Bovine Serum Albumin (BSA). Using Isothermal Calorimetry (ITC) we have already demonstrated that a homeopathic potency interacts with BSA, Human Serum Albumin (HSA) and insulin[1-4]. Homeopathic potencies are applied to the oral mucosa, which contains many proteins, including HSA[5]. Saliva contains oral mucosal exudates. Salivary glands are surrounded by many capillaries through which molecules exchange[6]. The purpose of the present study is to find out the interaction between homeopathic potencies and HSA with the help of electronic spectroscopy. We tested two potencies, 6 cH and 30 cH of three drugs: *Bryonia alba*, *Rhux toxicodendron*, and *Thuja occidentalis*. We also tested the interaction between the Mother Tincture (MT)

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