HOMEOPATHY AND WATER

Volume 4

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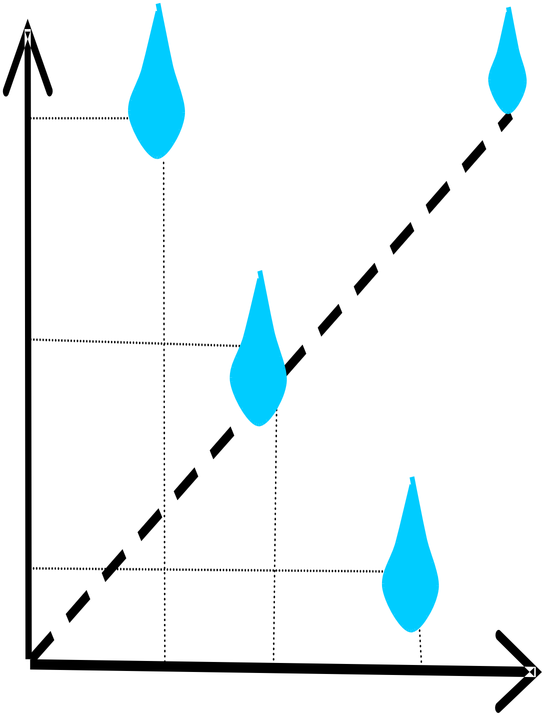

Federal University of Viçosa
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Vicente Wagner Dias Casali
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HOMEOPATHY AND WATER

Volume 4

Experimental results on water treatment with high dilutions

Federal University of Viçosa
Center for Agricultural Sciences
Department of Plant Science

Viçosa – MG
Brazil
2012

HOMEOPATHY AND WATER

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HOMEOPATHY AND WATER

Volume 4

Experimental results on water treatment with high dilutions

Interpretation on the effects of high dilutions according to the principles of Homeopathy.

This book is part of the Extension Program at UFV - "Disclosure of Medicinal Plants, Homeopathy and Organic Foods Production" and distributed to Libraries, Agricultural Family Schools and Organizations (non-government and government).

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HOMEOPATHY AND WATER

GRATEFULNESS

To God, present at all times.

To Hahnemann, for valuable science of Homeopathy.

To Agricultural Family for the wisdom and simplicity.

To the students of Homeopathy for their dedication.

To Federal University of Viçosa and Department of Plant Science, for their support.

To Family relatives for their love.

To friends for their confidence.

HONORABLE MENTION

CNPq (Brazilian Council for Scientific and Technological Development).

CONAHOM (National Council of Homeopathy)

UNESCO and Brazil Bank Foundation

DEDICATION

To Agricultural Families.

To Earth.

To Water.

HOMEOPATHY AND WATER

Contents

HOMEOPATHY AND WATER

Preface

This collection of works entitled "Homeopathy and Water" arose from the need for fast communication of trial results about basic knowledge on effects of homeopathic preparations. It is a priority to disclose the effects of high dilutions on the physico-chemical properties of water and to stimulate new researches on this important phenomenon for life on Earth.

Several objectives where met by carring out the laboratory experiments. Training undergraduate or graduate students, to take data and to write the communications which include the methodology, the results and the statistical analysis.

The contribution of this collection is tiny and modest, but we are confident about the impact of this knowledge. There are people that still think only the molecular model and they have difficulties to think the high dilutions, within the principles of Homeopathy. So when they confront with these effects on the water, as just shown here and the prior volumes (1,2,3), they may review those solidified concepts and may think the reality of these biophysical phenomenon.

The students who carried out the trials showed significant appreciation for the opportunity to take data, interpret them statistically, and deliver them as scientific contributions. These trials were carried out following scientific methodology. The scientific works of this publication followed the basic guidelines on communication of knowledges generated through experimentation.

Basic research on water treatment with homeopathic preparations aims at generate knowledge for the development of some efficient low-cost technologies that can contribute effectively to public institutions which are responsible for water treatment and water distribution to communities. Farming families are waiting for simple procedures that may allow autonomy on water treatment in rural areas.

Sanitation and environment adjusted to life are regarded as essential for public health. For the sake of social order, citizens have the right to health. The water is understood as a public and limited resource, a priority for human and animals health and important to many other living organisms.

In the cities, the population is usually supplied with treated water or with captured water from safely sources. In rural areas, there is greater diversity in the origin of water for use by agricultural families. However, the contamination of water supplies is being increased by anthropogenic activities. People do not realize this danger and only take actions after health consequences.

The most common procedures of water treatment such as drip water flocculation, sedimentation and filtration are being considered in studies of homeopathic preparations. The various sources that provide water for treatment are being prioritized, such as artesian springs, cisterns and groundwater.

There are some parameters for monitoring the water treatments. Electrical conductivity, acidity (pH), turbidity, dissolved oxygen and temperature. These are the commonly used.

By the method of experimentation it is known the effects of homeopathic solutions in water under treatment. The trials are conducted scientifically, and allow the monitoring of results, which revealed the activity of homeopathic preparations by the signs in the water along with the tests. The experiments are performed in double-blind procedure. The person who applies the treatment does not know the identity of the homeopathic preparation under test. The coordinator of the research in the laboratory, only knows the preparations by codes provided by the superviser of experimentation. The superviser is the only person who knows the identity of homeopathic preparations. The tests are conducted with appropriate statistical design and a fair number of replicates.

Statistical processing of data is by analysis of variance that provides the reliability of the results by the coefficient of variation. The analysis also shows the significance of treatment effects, in relation to the total effects after withdrawing the influences of the replicates when the design is the randomized block, also the treatment means are compared to control mean.

Where it is possible, the results of experiments are compared to published data, even if they are from another source. However, this confrontation has been limited by the availability of research in this area of knowledge. Interpretations aim activities of homeopathic preparations based on theories of chemistry, physics, physico-chemistry and biophysics.

The results of high dilutions applications also are been understood according to the principle of similarity. The signals generated in trials guide the decisions about the use of homeopathic preparations for treatments, in general. This guidance is based on the similarity between those signs and the symptoms of the imbalance in water, usually characterized by chemical or physical data: pH, electrical conductivity, turbidity, dissolved oxygen, among others.

So, this is a book of contributions, of the new experiences old named “Homeopathic Acognosy” or “Homeopathic Acology”, replacing the older name

“Homeopathic Medical Matter” (Homeopathic Materia Medica).

CHAPTER 1

Changes in Physical and Chemical Properties of Water Treated with the Homeopathic Preparation of Calcium Carbonate

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Introduction

The water boiling point, and heat of vaporization is greater than most common solvents. These unusual properties of water are a consequence of attractions between adjacent water molecules that give to liquid water a strong internal cohesion. The observation of the

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electronic structure of water reveals the cause of these intermolecular attractions. Liquid water is of considerable short-range order and consists of aggregates connected by hydrogen bonds. The polarity and the ability to form hydrogen bonds characterize water as potent solvent of many ionic compounds and other polar molecules. Non-polar compounds, including CO_2, O_2 and N_2 are poorly soluble in water. The colligating properties (boiling points, vapor pressure and osmotic pressure) depend on the number of dissolved particles (ions, molecules), and not on their molecular masses and chemical properties (LEHNINGER et al., 2002; HARNED & OWEN, 1950).

The ionization of the water can be measured by electrical conductivity. Pure water carries on the electrical current as the H + migrates towards the cathode and OH toward the anode. The motion of hydronium and hydroxide ions in the electric field is unusually fast compared to other ions, such as: Na+ , K+ e Cl- (SUTCLIFFE, 1980).

The non-polar compounds such as benzene and hexane are hydrophobic, unable to interact energetically with the water molecules and interfere with the hydrogen bonds between water molecules. All molecules or ions dissolved in water interfere with the hydrogen bonds of some water molecules that are in its immediate vicinity. However, polar or charged solutes like NaCl compensate the loss of hydrogen bonding water-water by forming new water-solute interactions (LEHNINGER et al., 2002; HARNED & OWEN, 1950).

Water hardness is defined as the difficulty of water in dissolving solutes by effect of calcium and other elements.

The temporary hardness or carbonates hardness are due to calcium ions and magnesium ions heating combined to bicarbonate and carbonate, so, this hardness can be eliminated by boiling (COTTON et al., 1968).

Calcium carbonate is the main salt in the limestone which is used in acid soils. Calcium carbonate is also the main component of the basic preparation (tincture) of *Calcarea carbonica*, an important homeopathic preparation recommended in the treatment of soils for increasing the respiration rate and metabolic quotient. It is also recommended for water treatment (CASALI, 2009).

The objective of this research was to find the effects of some homeopathic potencies of calcium carbonate in spring water and distilled water.

Materials e Methods

The experiments were carried out in March 2009 at the Laboratory of Homeopathy, Department of Plant Science, Federal University of Viçosa.

In borosilicate transparent, vials, with 80 ml of water to be treated were applied 20 drops of each treatment. Controls were mine water (spring water) and distilled water.

The mine water was collected from the spring (water head) located on the campus of UFV, with the PVC pipe attached directly to the spring. The water was kept in the polypropylene containers of 15 L.

Distilled water originated from the Water Treatment Plant at UFV and was stored in polypropylene container of 15L.

The experiments was set up in a factorial arrangement of 13 treatments and two waters, in a randomized block design of four replicates and 104 experimental plots. The treatments were the potencies of Calcium carbonate (1CH to 12CH) and the control no-application.

The data were processed statistically by analysis of variance in the program SAEG 9.1 (2007). The means were compared by Tukey test at 5% probability. For comparisons of mean potencies with control, Dunnett test was applied at 5% probability. The interactions were not considered because of restricted period of colecting data.

The tincture (TM) of Calcium carbonate (CaCO3), purity= 98.7%, MW= 100.09, was prepared in the Laboratory of Homeopathy, according to Brazilian Homeopathic Pharmacopoeia (BRASIL, 1977).

From the TM were prepared the 12 potencies (1CH, 2CH, 3CH, 4CH, 5CH, 6CH, 7CH, 8CH, 9CH, 10CH, 11CH, 12CH). As the standard procedure, 2/3 of the vial with distilled water was the succussed volume. One drop of homeopathic preparations (1CH to 11CH) and 99 drops of the solvent (distilled water) was the ratio. The 100 succussions were performed by a machine of mechanical arm system.

The measurements were performed at the Laboratory of Homeopathy, Department of Plant Science at UFV. After the reading of each sample, the electrode was washed off with distilled water and dried.

It was used the Potentiometer DM 23 (measuring range of pH 2-20) calibrated by two normal solutions. First, by standard solution pH 7 prepared of dibasic potassium phosphate (K2HPO4) of 0,025 M and monobasic potassium phosphate (KH2PO4) of 0.025 M. Then, by standard solution pH 4, prepared of potassium biphthalate (HOCOC6H4COOK) of 0.05 M. The electrode was immersed directly into the water sample.

It was used the Conductivimeter DM 32. A standard solution prepared with deionized water, potassium chloride (KCl) and bactericide was used for calibration. The electrode was immersed directly into the water sample and the values of Electrical Conductivity were measured in µS/cm.

For Dissolved Oxygen (DO) measurements it was used the Oximeter DM calibrated in distilled water. The electrode was immersed directly into the sample and the water values were in mg / L.

The digital portable Turbidimeter, DM TU was calibrated by the factory. Measuring range was from 0 to 1000 NT U.

Experiment 1 - The readings were taken in each plot (experimental parcel) after 17 hours of treatment application.

Experiment 2 - The readings were taken in each plot, after 41 hours of the first application and after 17 hours of the second treatment application.

Experiment 3 - The readings were taken in each plot, after 65 hours of the first application, after 41 hours of the second and after 17 hours of the third treatment application.

Experiment 4 - The readings were taken in each plot, after 137 hours of the first application, after 113 hours of the second and after 89 hours of the third and after 65 hours of the fourth treatment application.

Results and Discussion

There was significant interaction effects between water and treatments. The study aimed physico-chemical differences of mine water and distilled water. The interactions were not considered because of restricted period of collecting data.

Experiment 1 (Mine Water)

The potencies of calcium carbonate caused statistically significant effects on the physico-chemical properties of the water depending on the source, distilled water or mine water (Table 1).

Table 1 - Analysis of variance of Potential Hydrogen (pH), Electrical Conductivity (CE) and Dissolved Oxygen (DO) data, after 17h of the first application of Calcium Carbonate (1CH to 12H). Experiment 1. Viçosa, MG. 2009.

Source of Variation	**DF**	**Mean Square**		
		pH	**CE**	**DO**
Block	3	0.07005737	3.171729	25.24709
Water (W)	1	2.717078**	252862.7**	68.85139**
Treatment (T)	12	0.03016571^{ns}	2.322463*	0.5991529 ^{ns}
WxT	12	0.05310705*	2.150807*	0.5156468 ^{ns}
Residue	75	0.02609537	1.118829	0.5903663
VC (%)		2.30	2.05	14.91

* Significant at 5% probability by F test.
** Significant at 1% probability by F test
^{ns} not significant
VC-Variation Coefficient
DF- Degrees of freedom

The treatment means after 17 hours of the first application are in Table 2 (Tukey test) and Table 3 (Dunnett test).

Table 2 - Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS / cm and Dissolved Oxygen (DO) in mg / L, after 17h of the first application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 1. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.11 Aa	7.09 Aa	99.58Ab	2.66Ba	5.59	4.99
C. Carb. 2CH	7.15 Aa	6.81Bab	100.07Ab	2.32Ba	602	4.30
C. Carb. 3CH	7.13 Aa	6.77Bab	100.03Ab	2.27Ba	5.75	3.98
C. Carb. 4CH	7.16 Aa	6.94Aab	100.03Ab	1.69Ba	6.06	4.62
C. Carb. 5CH	7.20 Aa	6.79Bab	100.53Aab	1.94Ba	5.70	4.45
C. Carb. 6CH	7.13 Aa	7.07Aa	100.67Aab	2.01Ba	5.30	3.82
C. Carb. 7CH	7.16 Aa	6.82Bab	100.75Aab	1.78Ba	6.21	3.99
C. Carb. 8CH	7.16 Aa	6.81Bab	103.03 Aa	2.28 Ba	5.58	4.56
C. Carb. 9CH	7.18 Aa	6.87Bab	100.88Aab	2.13 Ba	5.78	4.40
C. Carb. 10CH	7.14 Aa	6.78Bab	100.85Aab	2.02 Ba	6.07	4.32
C. Carb. 11CH	7.17 Aa	6.68Bb	100.64Aab	2.47 Ba	6.65	4.64
C. Carb. 12CH	7.17 Aa	6.88Bab	100.90Aab	2.79 Ba	6.63	4.42
Control	7.22Aa	6.57Bb	102.76Aa	2.34Ba	6.24	3.91
Means					5.97	4.34

Means followed by same letter in columns and capital letter on the lines do not differ by Tukey test at 5% probability.
µS / cm = microsiemens per centimeter.

Table 3 - Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS / cm and Dissolved Oxygen (DO) in mg / L, after 17h of the first application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 1. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.11 a	7.09 b	99.58A b	266 a	5.59	4.99
C. Carb 2CH	7.15 a	6.81 a	100.07 b	2.32 a	6.02	4.30
C. Carb 3CH	7.13 a	6.77 a	100.03 b	2.27 a	5.75	3.98
C. Carb 4CH	7.16 a	6.94 b	100.03 b	1.69 a	6.06	4.62
C. Carb 5CH	7.20 a	6.79 a	100.53 b	1.94 a	5.70	4.45
C. Carb 6CH	7.13 a	7.07 b	100.67 a	2.01 a	5.30	3.82
C. Carb 7CH	7.16 a	6.82 a	100.75 a	1.78 a	6.21	3.99
C. Carb 8CH	7.16 a	6.81 a	103.03 a	2.28 a	5.58	4.56
C. Carb 9CH	7.18 a	6.87 a	100.88 a	2.13 a	5.78	4.40
C. Carb 10CH	7.14 a	6.78 a	100.85 a	2.02 a	6.07	4.32
C. Carb 11CH	7.17 a	6.68 a	100.64 a	2.47 a	6.65	4.64
C. Carb 12CH	7.17 a	6.88 a	100.90 a	2.79 a	6.63	4.42
Control	7.22 a	6.57 a	102.76 a	2.34 a	6.24	3.91
Means					5.97	4.34

Means followed by "b" differ statistically from control by Dunnett test at 5% probability.
µS/cm = microsiemens per centimeter.

Potential Hydrogen (pH)

The pH of the mine water remained unchanged, according to Tukey test (Table 2). In distilled water the pH was statistically increased, as compared to control, by potencies 1CH, 4CH and 6CH (Table 3). The dynamization procedure probably changes water structure and influences the dissolution of atmospheric carbon dioxide.

Electrical Conductivity (EC)

The means of Electrical Conductivity (CE) differed between MW and DW (Table 2). As compared to control, the potencies 1CH and 5CH reduced the EC (Table 3).

The mine water was introduced in the experiment in order to be a reference of healthy water. The ionic components and molecules, along with gases, solutes and silica, are the factors of this equilibrium (HOLANDINO et al., 2008). The mine water is supposed to have components which promote some increase in the EC (Tables 2 and 3).

Dissolved Oxygen (DO)

In mine water and distilled water the treatments means were not significantly different and also did not differ from the means of each control (Tables 2 and 3). The Dissolved Oxygen in water comes away mainly from the atmosphere, and the content is very variable, even along with the day. Furthermore, DO is influenced by the water molecule itself and its polarity (FIGUEIREDO, 2009).

The variation coefficient (14.91) of the variable DO was greater in relation to other variables, so, data of dissolved oxygen is less controllable and demand increase in the number of replicates.

Experiment 2

There was statistically significant treatment effects in the EC and DO and significant difference between the two waters (Table 4).

Table 4 - Analysis of variance of Potential Hydrogen (pH), Electrical Conductivity (CE) and Dissolved Oxygen (DO) data, after 41h of the first application and after 17h of the second application of Calcium Carbonate (1CH to 12CH). Experiment 2. Viçosa, MG. 2009.

Source of Variation	**DF**	**Mean Square**		
		pH	**CE**	**DO**
Block	3	0.5213522	1.26784	44.13381
Water (W)	1	0.002700962^{ns}	244434.2**	6.455078**
Treatment (T)	12	0.030593 ^{ns}	4.796341**	1.004918***
T. x W	12	0.1623655**	6.135925**	0.4061758 ^{ns}
Residue	75	0.03334491	0.4234388	0.5641286
VC (%)		2.40	1.27	16.15

* Significant at 5% probability by F test.
** Significant at 1% probability by F test
***Significant at 10% probability by test F.
^{ns} not significant.
VC-Variation Coefficient
DF- Degrees of freedom

In Experiment 2, the longest time (41 h) and the two applications allowed increased activity of homeopathic preparations.

Table 5 - Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS/cm and Dissolved Oxygen (DO) in mg / L, after 41h of the first application and after 17h of the second application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 2. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.14 Bb	7.93 Aa	96.24 Ac	3.17 Ba	5.15	4.57
C. Carb. 2CH	7.50 Aab	7.74 Aab	98.51 Ab	2.61 Ba	5.20	4.44
C. Carb. 3CH	7.58 Aab	7.62 Aab	99.30 Ab	2.60 Ba	5.41	5.41
C. Carb. 4CH	7.64 Aab	7.67 Aab	99.37 Ab	1.90 Ba	4.75	4.94
C. Carb. 5CH	7.68 Aab	7.59 Aab	99.55 Ab	2.32 Ba	4.87	4.35
C. Carb. 6CH	7.72 Aa	7.72 Aab	99.63 Ab	2.56 Ba	4.49	4.21
C. Carb. 7CH	7.65 Aab	7.69 Aab	99.49 Ab	2.26 Ba	3.86	4.04
C. Carb. 8CH	7.69 Aab	7.57 Aab	99.48 Ab	2.81 Ba	4.84	4.57
C. Carb. 9CH	7.74 Aa	7.60 Aab	99.72 Ab	2.64 Ba	5.04	4.06
C. Carb. 10CH	7.64 Aab	7.45 Ab	99.65 Ab	2.53 Ba	5.28	4.38
C. Carb. 11CH	7.62 Aab	7.48 Ab	99.79 Ab	2.96 Ba	5.26	4.22
C. Carb. 12CH	7.67 Aab	7.45 Ab	99.84 Ab	3.14 Ba	5.11	3.98
Control	7.72Aa	7.34 Bb	103.91Aa	2.49Ba	4.44	4.04
Means					4.90A	4.40B

Means followed by same letter in columns and capital letter on the lines do not differ by Tukey test at 5% probability.
µS/cm = microsiemens per centimeter.

Table 6 - Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS / cm and Dissolved Oxygen (DO) in mg / L, after 41h of the first application and after 17h of the second application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 2. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.14 b	7.93 b	96.24 b	3.17 a	5.15	4.57
C. Carb. 2CH	7.50 a	7.74 b	98.51 b	2.61 a	5.20	4.44
C. Carb. 3CH	7.58 a	7.62 a	99.30 b	2.60 a	5.41	5.41
C. Carb. 4CH	7.64 a	7.67 a	99.37 b	1.90 a	4.75	4.94
C. Carb. 5CH	7.68 a	7.59 a	99.55 b	2.32 a	4.87	4.35
C. Carb. 6CH	7.72 a	7.72 b	99.63 b	2.56 a	4.49	4.21
C. Carb. 7CH	7.65 a	7.69 a	99.49 b	2.26 a	3.86	4.04
C. Carb. 8CH	7.69 a	7.57 a	99.48 b	2.81 a	4.84	4.57
C. Carb. 9CH	7.74 a	7.60 a	99.72 b	2.64 a	5.04	4.06
C. Carb. 10CH	7.64 a	7.45 a	99.65 b	2.53 a	5.28	4.38
C. Carb. 11CH	7.62 a	7.48 a	99.79 b	2.96 a	5.26	4.22
C. Carb. 12CH	7.67 a	7.45 a	99.84 b	3.14 a	5.11	3.98
Control	7.72 a	7.34 a	103.91 a	2.49 a	4.44	4.04
Means					4.90A	4.40B

Means followed by "b" differ statistically from control by Dunnett test at 5% probability.
µS/cm = microsiemens per centimeter.

Potential Hydrogen (pH) - Compared to controls (Table 5) the potency 1CH increased the pH of distilled water and decreased the pH of mine water.

In distilled water pH means of (Table 5) the potencies 1CH, 2CH and 6CH were increased compared to control (Table 6).

The mean pH of the mine water was increased after treatment with the potency 1CH (Table 5).

Electrical Conductivity (CE) - In mine water all potencies decreased the CE compared to control. The lowest CE was caused by the potency 1CH.

Dissolved Oxygen (DO) - Even with the increased time of measurement (41 h), and more applications, mine water and distilled water did not changed significantly the dissolved oxygen (Tables 5 and 6). The Dissolved Oxygen in water is transient, and environmental factors, especially light and temperature (HADDAD and REGINA, 1994) causes variation in the replicated plots then the coefficient of variation is high.

Experiment 3

There was statistically significant effect of treatments on pH and CE (Table 7).

Table 7 - Analysis of variance of the Hydrogen Potential (pH), Electrical Conductivity (CE) and Dissolved Oxygen (DO) data, after 65h of the first application, after 41h of the second application and after 17h of the third application of Calcium Carbonate (1CH to 12CH) in mine water and distilled water. Experiment 3. Viçosa, MG. 2009.

Source of Variation	**DF**	**Mean Square**		
		pH	**CE**	**DO**
Block	3	0.08406154	0.7363453	71.33268
Water (W)	1	6.420246**	279268.4**	19.84505**
Treatment (T)	12	0.05512788**	9.937997**	0.8165455 ^{ns}
Tx W	12	0.08047949**	10.72726**	0.4433054 ^{ns}
Residue	75	0.01515821	1.451509	1.189041
VC (%)		1.67	2.19	25.18

** Significant at 1% probability by F test.

^{ns} not significant.

VC-Variation Coefficient

DF- Degrees of freedom

The means of the treatment after 65 hours of the first application, after 41 hours of the second application and after 17 hours of the third application of homeopathic preparations are in Tables 8 and 9.

The potency 12CH caused a significant decrease in the pH of distilled water and in the CE of mine water compared to control (Table 9).

Table 8 – Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS / cm and Dissolved Oxygen (DO) in mg / L, after 65h the first application, after 41h of the second application and after 17h of the third application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 3. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb.1CH	7.14 Ab	7.17 Aab	104.24 Ac	3.50 Ba	5.13	4.30
C. Carb. 2CH	7.49 Aa	7.04 Bb	105.17 Abc	2.97 Ba	4.88	3.92
C. Carb. 3CH	7.63 Aa	7.20 Bab	105.96 Abc	3.01 Ba	4.78	4.77
C. Carb. 4CH	7.62 Aa	7.05 Bb	106.22 Abc	2.29 Ba	4.86	4.47
C. Carb. 5CH	7.73 Aa	7.06 Bb	106.74 Abc	2.72 Ba	4.96	3.99
C. Carb. 6CH	7.71 Aa	7.01 Bb	106.76 Abc	2.96 Ba	4.51	3.55
C. Carb. 7CH	7.65 Aa	7.12 Bab	105.26 Abc	2.72 Ba	3.92	3.24
C. Carb. 8CH	7.71 Aa	7.09 Bab	105.45 Abc	3.42 Ba	4.45	3.81
C. Carb. 9CH	7.65 Aa	7.11 Bab	106.58 Abc	3.12 Ba	4.70	3.63
C. Carb. 10CH	7.69 Aa	7.14 Bab	107.00 Abc	2.95 Ba	4.69	3.80
C. Carb. 11CH	7.66 Aa	7.09 Bab	106.85 Abc	3.49 Ba	4.85	3.71
C. Carb. 12CH	7.69 Aa	7.04 Bb	107.21 Ab	3.62 Ba	5.48	3.41
Control	7.61 Aa	7.38 Ba	113.56 Aa	2.92 Ba	4.77	3.99
Means					4.77 A	3.89 B

Means followed by same letter in columns and capital letter on the lines do not differ by Tukey test at 5% probability
µS/cm = microsiemens per centimeter.

Table 9 - Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS / cm and Dissolved Oxygen (DO) in mg / L, after 65 h of the first application, after 41h of the second application and after 17h of the third application of Calcium Carbonate (1CH to 12CH) in mine water (MW) and distilled water (DW). Experiment 3. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.14 b	7.17 a	104.24 b	3.50 a	5.13	4.30
C. Carb. 2CH	7.49 a	7.04 b	105.17 b	2.97 a	4.88	3.92
C. Carb. 3CH	7.63 a	7.20 a	105.96 b	3.01 a	4.78	4.77
C. Carb. 4CH	7.62 a	7.05 b	106.22 b	2.29 a	4.86	4.47
C. Carb. 5CH	7.73 a	7.06 b	106.74 b	2.72 a	4.96	3.99
C. Carb. 6CH	7.71 a	7.01 b	106.76 b	2.96 a	4.51	3.55
C. Carb. 7CH	7.65 a	7.12 b	105.26 b	2.72 a	3.92	3.24
C. Carb. 8CH	7.71 a	7.09 b	105.45 b	3.42 a	4.45	3.81
C. Carb. 9CH	7.65 a	7.11 b	106.58 b	3.12 a	4.70	3.63
C. Carb. 10CH	7.69 a	7.14 b	107.00 b	2.95 a	4.69	3.80
C. Carb. 11CH	7.66 a	7.09 b	106.85 b	3.49 a	4.85	3.71
C. Carb. 12CH	7.69 a	7.04 b	107.21 b	3.62 a	5.48	3.41
Control	7.61 a	7.38 a	113.56 a	2.92 a	4.77	3.99
Means					4.77 A	3.89 B

Means followed by "b" differ statistically from control by Dunnett test at 5% probability.

µS/cm = microsiemens per centimeter.

Potential Hydrogen (pH)

In mine water the pH was reduced significantly by the potency 1CH (Table 8) compared to control (Table 9).

In distilled water pH means differed statistically among them (Table 8). Except the means of the potencies 1CH, 3CH and 10CH all remained means decreased compared to control (Table 9). The pH of the mine water and distilled water did not differ when they were treated by the potency 1CH.

In experiment 1, there was variation of potencies effects on mine water, whereas on distilled water, pH was increased. In experiment 2 the pH of the mine water dropped while in distilled water was increased by treatments. In this experiment 3, in both waters there was also a reduction in pH (Tables 8 and 9). Distilled water required more time (65 hours) or more applications for the response to treatments. As Holandino reported (2008), the distilled water is an imbalanced water. According to Lisboa (2005) the more diseased the system the more the time to recover and turn healthy again.

Electrical Conductivity (CE)

The means of CE differed among them (Table 8) and were lowered by treatments as compared to control (Table 9).

Mean values of CE were statistically significant as an effect of the potencies (Table 8).

It was evident the statistically significant influence of all potencies on decreasing CE of mine water (Tables 8 and 9).

It was proved that the CE reflects the organization of water molecules (ELIA et al., 2008). The structure of the water, because of various configurations of hydrogen, may be modified by succussion. The specific organizations influenced by Hydrogen after succussion are related to the identity of the original substance and the information on its power. The hydrogen bond strength is increased by succussion (SUKUL e SUKUL, 2004), so the power of the solution is increased. In distilled water CE did not vary along with the potencies (Tables 8 and 9). Thus, the energy of the succussion and of increasing potencies did not restore the electrical conductivity of distilled water.

Dissolved Oxygen (DO)

The DO was influenced only by the origin of the water (Tables 8 and 9). The rate of oxygen in any water results from the balance of the actual content of oxygen, the atmospheric pressure and the temperature (HADDAD & REGINA, 1994). So, the environmental conditions and the activity of homeopathic preparations may have influenced the quantification of DO of this experiment.

The Variation Coefficient (25. 18) was the highest among the variables (Table 7), so indicating that the quantification of DO was less precise and more samples are required experimentally to allow broad generalizations of the conclusions.

Experiment 4

By analysis of variance (Table 10) of the four variables there was statistically significant effect of treatments and of the waters.

Table 10 - Analysis of variance of Potential Hydrogen (pH), Electrical Conductivity (CE), Dissolved Oxygen (DO) and Turbidity (TURB) data, after 137h of the first application, after 113h of the second application, after 89h of the third application and after 65h of the fourth application of Calcium Carbonate (1CH to 12CH) in mine water and distilled water. Experiment 4. Viçosa, MG. 2009.

Source of Variation	DF	Mean Square			
		pH	CE	DO	TURB
Block	3	0.4034625	4.048045	47.27877	0.07791891
Water (W)	1	8.938847**	288164.2**	19.48847**	0.2856010***
Treatment (T)	12	0.07354663**	18.02983**	1.744916^{ns}	0.7975758**
W x T	12	0.07789920**	19.38329**	0.5383216^{ns}	0.1695447*
Residue	75	0.02668050	1.087856	1.142469	0.08508558
VC (%)		2.21	1.86	27.82	127.30

* Significant at 5% probability by F test.
** Significant at 1% probability by F test
*** Significant at 10% probability by F test.
^{ns} Not significant.
VC-Variation Coefficient
DF- Degrees of freedom

The treatment means after 137 hours of the first application, after 113 hours of the second application, after

89 hours of the third application and after 65 hours of the fourth application are in the Tables 11 and 12.

Table 11 – Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS/cm, Dissolved Oxygen (DO) in mg/L and Turbidity (TURB) in NTU, after 137h of the first application, after 113h of the second application after 89h of the third application, and after 65h of the fourth application of Calcium Carbonate in water mine (MW) and distilled water (DW). Experiment 4. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**		**TURB**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.26Ab	7.14Aab	105.45Ac	3.98Ba	3.94	4.27	1.78Aa	0.76Ba
C. Carb. 2CH	7.70Aab	7.32Ba	107.36Abc	3.22Ba	4.74	3.59	0.12Ab	0.12Aa
C. Carb. 3CH	7.72Aab	7.15Bab	107.69Abc	3.20Ba	5.08	3.74	0.10Ab	0.11Aa
C. Carb. 4CH	7.72Aab	7.13Bab	108.26Abc	2.59Ba	5.34	3.71	0.12Ab	0.14Aa
C. Carb. 5CH	7.70Aab	7.12Bab	108.11Abc	2.96Ba	5.25	3.92	0.16Ab	0.12Aa
C. Carb. 6CH	7.70Aab	7.07Bab	107.65Abc	3.23Ba	4.49	3.33	0.12Ab	0.16Aa
C. Carb. 7CH	7.64Aab	7.06Bab	107.24Abc	2.99Ba	4.01	2.91	0.19Ab	0.12Aa
C. Carb. 8CH	7.68Aab	7.07Bab	108.25Abc	3.61Ba	3.57	3.32	0.45Ab	0.11Aa
C. Carb. 9CH	7.70Aab	6.96Bab	108.37Abc	3.38Ba	3.78	3.07	0.16Ab	0.12Aa
C. Carb. 10CH	7.70Aab	7.03Bab	107.97Abc	3.32Ba	4.12	3.29	0.11Ab	0.13Aa
C. Carb. 11CH	7.72Aab	6.78Bb	108.38Abc	3.70Ba	3.88	3.16	0.12Ab	0.13Aa
C. Carb. 12CH	7.71Aab	6.97Bab	108.93Ab	4.01Ba	3.90	3.00	0.11Ab	0.17Aa
Control	7.80Aa	7.33Ba	118.31Aa	3.20 Ba	3.48	3.02	0.13Ab	0.12Aa
Means					4.27A	3.41B		

Means followed by same letter in columns and capital letter on the lines do not differ by Tukey test at 5% probability.

µS / cm = microsiemens per centimeter.

NTU = Nefelometric Turbidity Unit.

Table 12 – Mean values of Potential Hydrogen (pH), Electrical Conductivity (CE) in µS/cm, Dissolved Oxygen (DO) in mg/L and turbidity (TURB) in NTU, after 137h of the first application, after 113h of the second application after 89h of the third application and after 65h of the fourth application of Calcium Carbonate (1CH to 12CH) in water mine (MW) and distilled water (DW). Experiment 4. Viçosa, MG. 2009.

Treatments	**pH**		**CE**		**DO**		**TURB**	
	MW	**DW**	**MW**	**DW**	**MW**	**DW**	**MW**	**DW**
C. Carb. 1CH	7.26 b	7.14 a	105.45 b	3.98 a	3.94	4.27	1.78 b	0.76 b
C. Carb. 2CH	7.70 a	7.32 a	107.36 b	3.22 a	4.74	3.59	0.12 a	0.12 a
C. Carb. 3CH	7.72 a	7.15 a	107.69 b	3.20 a	5.08	3.74	0.10 a	0.11 a
C. Carb. 4CH	7.72 a	7.13 a	108.26 b	2.59 a	5.34	3.71	0.12 a	0.14 a
C. Carb. 5CH	7.70 a	7.12 a	108.11 b	2.96 a	5.25	3.92	0.16 a	0.12 a
C. Carb. 6CH	7.70 a	7.07 a	107.65 b	3.23 a	4.49	3.33	0.12 a	0.16 a
C. Carb. 7CH	7.64 a	7.06 a	107.24 b	2.99 a	4.01	2.91	0.19 a	0.12 a
C. Carb. 8CH	7.68 a	7.07 a	108.25 b	3.61 a	3.57	3.32	0.45 a	0.11 a
C. Carb. 9CH	7.70 a	6.96 b	108.37 b	3.38 a	3.78	3.07	0.16 a	0.12 a
C. Carb. 10CH	7.70 a	7.03 a	107.97 b	3.32 a	4.12	3.29	0.11 a	0.13 a
C. Carb. 11CH	7.72 a	6.78 b	108.38 b	3.70 a	3.88	3.16	0.12 a	0.13 a
C. Carb. 12CH	7.71 a	6.97 b	108.93 b	4.01 a	3.90	3.00	0.11 a	0.17 a
Control	7.80 a	7.33 a	118.31 a	3.20a	3.48	3.02	0.13 a	0.12 a
Means					4.27A	3.41B		

Means followed by "b" differ statistically from the control by Dunnett test at 5% probability.

µS/cm = microsiemens per centimeter.

NTU = Nefelometric Turbidity Unit.

In all experiments, so far, the increase of potencies was not followed by a progressive increase of the mean for any treatment variable. The response to higher potencies not necessarily was associated to increased reaction.

Potential Hydrogen (pH)

In distilled water the pH means were statistically different among them (Table 11). Compared to control, the potencies 9CH, 11CH 12CH decreased the pH (Table 12). In mine water and distilled water the pH was reduced by treatments (Tables 11 and 12).

The potency 1CH changed the pH in time since there were more applications. The pH of the mine water was reduced (Table 6, 8, 9, 12CH) the same way as in the Experiment 3.

The potencies 9CH, 11CH and 12CH significantly decreased the pH (Table 12), proving that the presence of the solute is not a determinant of water responses.

Electrical conductivity (CE)

The potencies 1CH to 12CH reduced the Electrical Conductivity of mine water (Table 12). The homeopathic solutions decreased the CE of mine water (Tables 11 and 12). In mine water, in the experiments 2, 3, 4 significant decrease of CE was followed by a significant decrease in pH (Tables 6, 9 and 12), what means that the potencies decreased the electricity flow of the mine water.

Dissolved oxygen (DO)

The treatment means of mine water and of distilled water did not differ significantly in all experiments (Tables 2, 3, 5, 6, 8, 9, 11 and 12). It should be noted that experimentally the DO variable had the highest coefficient of variation in Experiments 1, 2, 3, and the second highest coefficient of variation in Experiment 4, confirming again the need to increase the number of replicates in order to improve the experimental accuracy.

According to Esteves (1998), the dissolved oxygen content is very variable because the dissolution is dependent on several processes. The levels of DO were low (Tables 11 and 12), although it is known that the solubility of oxygen is influenced by the polar characteristics of the water molecule. Another argument about the levels being low is that the solutions have no other source except the oxygen from atmosphere, because in such a short time, there is no possibility of the photosynthetic process to contribute for increasing Dissolved Oxygen (McKEE e WOLF, 1971).

Turbidity (TURB)

In mine water the mean of Turbidity after application of potency 1CH, was higher than of remaining potencies (Table 11). Compared to control the potency 1CH reduced statistically the pH and increased the turbidity.

Conclusion

1. The potencies of Calcium Carbonate (1CH to 12CH) cause effect on pH, Electrical Conductivity and Turbidity of water.
2. Responses of mine water and distilled water depend on the potencies for evidencing the individuality of homeopathic solutions and of the water.

Final Thoughts

Because of the broad use of limestone in agriculture the Calcium carbonate, must be taken into greater consideration about the chemical effects on the aqueous solution of soils. In preparing the homeopathic solution of *Calcarea carbonica*, again, Calcium is the major component of the basic preparation (tincture).

Several approaches should be considered for interpreting the results of this research, by starting with understanding, as Weingartner (2007), that the effects of the homeopathic solution calcium carbonate were influenced by the physical phenomenon of resonance patterns.

First approach - Resonance (WEINGARTNER, 2007)

The basic research of Weingartner (2007) was initiated in 1987 and aimed at description physics, of some phenomena of high dilutions, by laws of specifically in the case of electromagnetic fields forces, because living systems respond to electromagnetic signals and because the most important mean of communication within the alive systems is through electromagnetic way.

Weingartner (2007) concluded that the activity of homeopathic preparations should be by resonance of electromagnetic waves. So, there should be a measurable physical properties, of electromagnetic origin, that might differentiate potencies and solvents (water, in the case of this research).

Homeopathic preparations of Calcium Carbonate effects on mine water and distilled water could be attributed to the resonance between treated water and homeopathic preparation. After all, the minimum similarity that allows resonance is present at the experiment, and they are, the homeopathic preparation of water and the treated water. Moreover the mine water contain calcium carbonate even if tiny amount. Similarly distilled water contain trace amounts of calcium carbonate. The energy from succussion introduced in homeopathic preparation and the distilled water (with less vitality and imbalanced) demand energy in order to be rebalanced. This transferred energy was in the form of resonance information because there is similarity between both: solvent water of dynamized calcium carbonate and the treated water.

In this approach Weingartner (2007) stands the assertion that the phenomenon of high dilutions (dynamized systems) to be understood according to principles of homeopathy, it is necessary the theory of physics while there is less necessity of the theory of the chemistry. It is known that in this research with calcium carbonate (1CH, 2CH, 3CH, 4CH), for interpreting of some effects on the acidity of the treated water, the presence of molecules is important. So, the generalization of Weingartner (2007) does not apply to the results of this research however, it is valid as the energy effects from 100 succussions of 1CH.

Second approach - The state of water (PORTO, 1998)

The polarity of water molecule is greater than any similar molecule. By means of hydrogen bonding it is formed the network, typically an overmolecular network of molecules by having, as the minimum a net pentamer of five molecules. The two hydrogen atoms are considered not-heavy. But they are linked to heavy oxygen which is 16 times heavier than hydrogen. The water is chemically very reactive and is available in high concentration. The reactivity of water at room temperature is moderate because of the volume of bondings and the system of hydrogen bonding. Under reduced number of hydrogen bonds by high temperatures or electromagnetic fields, there will be increased reactivity of the water molecule. The water in liquid state is the most typical and anomalous substance however, life on Earth depends on this state. Thus, the vitality of the Earth is related to water status. The high capacity of thermal conductivity and the high percentage of water in living organisms provides thermal regulation.

In the experiment with high dilutions of calcium carbonate, according to the descriptions of water status (PORTO, 1998), the responses to homeopathic preparations of calcium carbonate are related to the potential reactivity at room temperature where the trial was conducted. In distilled water (Table 5) there was no effects on the electrical conductivity. But, there was effects in spring water in which the 1CH decreased the electrical conductivity compared to control (distilled water).

Third approach - Molecular Marking of Polymers (CHANDRAN, 2012)

The water (considered as a polymer) records informations as image or as a field after dilution-succussion of the original substance. In modern synthetic polymer, markings are made on macromolecules. As a result of these markings nanocavities are formed in polymers of three-dimensional configuration. These cavities are complementary to marked macromolecules and are generated through interactions over the polymer in the surfaces cavities. In these cavities marked polymers can be used to connect molecules of similar configuration (with similarity) to the macromolecule marker. The marking technique of polymers is being used in testing laboratories generating powerful adsorption surfaces. The marking of polymers is already very popular and useful in many areas of science and in some technologies. Synthetic marked polymers are not used as therapeutic agents because they are alien substances to living organisms. Another difficulty is the fact that the natural enzymes of the organisms are unable to degrade these synthetic polymers.

There are researches aimed at security in molecular marking of therapeutic substances. The goal is to use water (polymer) and its physicochemical properties, in order to make the molecular marks of therapeutic molecules. Other compounds of potential use in the formation of polymers through hydrogen bonding, are ethanol and lactose.

In the experiment with homeopathic preparations of calcium carbonate (Table 8), the pH of distilled water and the electrical conductivity of the mine water were statistically different from control. Thus, the pH decreased and there was an increase in acidity by the activity of homeopathic preparation Calcium Carbonate 12CH. There are two hypotheses of this activity. First, there was the phenomenon of solvation or fluvial concentration allowing the presence of calcium carbonate in 12CH (few molecules) with activity increased by the energy from the succussion. Second, the electrical conductivity was reduced because the water polymer, marked during the succussions, generated cavities that housed the few molecules of calcium carbonate and thus, the electrical conductivity of the treated water decreased.

Fourth approach - Restructuring of the clusters (ELIA, 2004), (HOLANDINO, 2008) and (MIRANDA, 2008)

The discovery of the water composition in 1781 was assigned to Cavendish. Beginning in 1972 models involving the clusters, and the polymerization have been proposed. So the difficulties in the interpretation of responses to homeopathic treatment of water with high dilutions of calcium carbonate in this experiment are related to the lack of knowledge on physics and chemistry of water (MIRANDA, 2008). The studies of heterogeneous clusters demonstrate the flexibility of the water polymer and the possibility of magnetic fields, with complex forces, for setting network formation of H2O molecules.

In the experiments with homeopathic preparations of calcium carbonate (1CH to 12CH), the probable effect of the heterogeneity of the clusters is present at Tables 3 and 6, where the mean pH of potency 6CH was different from control. It is well known that distillation turns the water imbalanced (HOLANDINO, 2008). It is known also that the ability to self-organization of water was regarded as the property of the highest hierarchy in terms of physical structure (Elia, 2004). Thus, Calcium Carbonate 6CH in the treatment of distilled water would have the activity of restructuring, because the presence of alien elements inside aqueous medium causes responses of reordering (ELIA, 2004) in distilled water, regarded by Holandino (2008) as imbalanced water.

Fifth approach - Pure Water (ZHENG, 2006)

The design and the understanding of some characteristics of water, when it is limited to the space of the bottle, is not easy. Also the relations with dilution and succussion in homeopathy (high dilutions) also are not well understood.

A truly pure water may not yet be available. Thus, pure water presumably contains impurities. There are some complicating factors when handling the water in bottles in laboratories. The water that remains limited in the bottle is affected by the wall of the bottle. This effect enters hundreds of microns in the water.

On another scale of values, experimentation with homeopathic preparations of calcium carbonate may have revealed some of these water features. Table 2 shows the differences in pH between the distilled water and spring water. It is understood that the distillation did not allowed water to be pure water and some components are still present to affect the acidity after treatment with homeopathic preparation of calcium carbonate.

Sixty approach - Connection forces in the water (LEHNINGER, 2002 and MIRANDA, 2008)

The forces of cohesion among water molecules (liquid) comes from the weak interaction named hydrogen bond. By the theory of chemistry there is the interaction force "van der Waals" whose important function is in the three-dimensional structures of proteins, polysaccharides and others. Hydrogen bonds have greater significance acting associated, thus allowing the tertiary structure of proteins, for example. Hydrogen bonds allow the cohesion of the water molecules resulting in the liquid, with unusual properties (MIRANDA, 2008).

The hydrogen bonds are weaker than covalent bonds. In water (liquid) hydrogen dissociation energy is 20KJ/mol while the binding covalent carbon-carbon is 348KJ/mol.

It is known that the entropy is increased when crystalline substances are dissolved. Based on thermodynamics, the formed solution with water and calcium carbonate (to prepare a mother tincture) occurs with a favorable change in free energy. At room temperature there is compensation for the tendency of the molecules to be linked by hydrogen bonds. This compensation is by the tendency or by the force towards disorder (LEHNINGER, 2002).

In the experiments with homeopathic preparations of calcium carbonate the effects on the binding of hydrogen chemically occurred along with the preparation of basic tincture and the first dynamizations.

According to physico-chemical theories, after the initial dynamizations probably other bonds occurs like solvation and fluvial concentration. Going beyond the Avogadro constant there is total predominance of the effects of similarity and the energy from succussion. This energy is the basis of the effects of Calcium Carbonate 12CH, as they are in tables 2, 3, 5, 6, 8, 9, 11 and 12 relating to treatment of distilled water and the mine water.

Seventh approach - Micro-clusters and fields (MIRANDA 2004)

Researchers who follow the model of structured water named "mixed model" assume the balance of the components of the mixture. Thus the molecules of water (liquid state) are regarded as forming units of the micro fields or clusters. The molecules located within the cluster (or component of the cluster) interact more with the solute. The absent intermolecular interactions characterize the molecules that are out of the cluster or free molecules.

The molecular interactions cause influences in the water (the body of the liquid water), as stated by Miranda (2004). But there is a balance between water molecules: free molecules and cluster molecules.

In the experiments with high dilutions of calcium carbonate the dynamizations caused changes in the treated water such that were detectable by measurements of pH, electrical conductivity and turbidity. The fact that there was probabilistically no-presence or minimum quantities of solutes, assign the response of the structure of water to the presence of drops of calcium carbonate homeopathic preparations. Thus, it was observed that there may be changes in water structure by means of non-molecular interactions.

Eighth approach - Dynamization and new substance (BASTIDE, 1998)

Homeopathy procedures were initiated by diluting separately the substances. Some years after this beginning (1796) there was the introduction of the shaking process (succussion). Homeopathy was then characterized as another therapeutic practice, as a new treatment modality. Currently researchers of Homeopathy termed "high dilutions" this area of knowledge which involves obtaining the homeopathic solution from any substance (chemical, biological, compounds natural salts, industrial molecules, microorganisms and endogenous molecules, among others). Then, they are diluted in series. Each step of dilution is followed by the succussion. The solvent commonly used is water or ethanol plus water. These solution are named dynamized or potencies. Nuclear magnetic resonance have proved that they are significantly different: dynamized control and dynamized solution. Thus, it is valid to assume that there were modifications of the original substance. So two assumptions are acceptable. First - the structure of the original substance was marked in the solvent. Second – the dynamized solution contains information from the original substance. There is no doubt that dynamized solution and dynamized solvent are two substances (BASTIDE, 1998).

In the experimentation of homeopathic preparations of calcium carbonate the control was the untreated water. The failure to introduce the solvent (water) as a control was consistent with the bibliography. Thus, each solution of preparation homeopathic calcium carbonate is regarded a distinct new substance.

Nineth approach - Fluvial Concentration and non-molecular preparations (CHATTOPADHYAY, 2003)

In 2003, Chattopadhyay published interesting literature review and new mathematical model for proposing that the homeopathic preparation should not be considered without molecules after the 11CH dynamization. The work of Chattopadhyay (2003) was included in this approach because somehow the interpretations of the activities of high dilutions on the water along with the treatment may take a different direction or even two directions.

Another statement that reorients the interpretations is the fact that the scale (ratio) adopted in the pharmacopoeia (10g of solute per 100 mL) in the preparation of mother tincture means that, being less than a mole, a homeopathic preparation will be non-molecular before 11CH. This statement implies that in the experiment with homeopathic preparations of calcium carbonate the arguments for the effects of preparations 1CH to 12CH could be revised. As a discussion, it should be consider other views of the author and the presence of solute in homeopathic solutions. New justifications should be added to the apparent inconsistencies of the effects so common in the published journals in this area of knowledge as reported by Romanach (2003). As well as the inconsistencies, Romanach (2003) refered to the paradoxes of unexpected data and expected data which are not explained. Romanach (2003) states that in setting up expectations, certain properties of solutes become inconvenient to the models.

Chattopadhyay (2003) reported that repeating the process of dilution-succussion the solvent involves the solute and generate water "capsules" with the solute inside. Thus, there is a loss of homogeneity of the solution as the gradient of capsules is formed. Then dilution - succussion procedure makes the capsules decrease in number and stay limited to the bottom of the bottle, having movements such as gas and generate the critical volume named critical concentration or fluvial concentration.

The report of Chattopadhyay (2003) on fluvial concentration is very similar to the report of Lehninger (2002) as involving the solvation by water molecules through hydrophobic "optimal arrangements of hydrogen bonds." Lehninger (2002) affirms that is formed the solvation shells of the molecules of structured water around the polar molecules (as is the case of ethanol).

The statements of these authors are very important in the interpretation of the effects of hydroalcoholic solutions of high dilutions (homeopathic). The experiment of calcium carbonate was conducted by homeopathic preparations without the presence of ethanol. This methodology does not rule out the possible presence of molecules of calcium carbonate surrounded by structured water forming something like an envelope.

Whereas the phase of succussion, there is a release of energy (CHATTOPADHYAY, 2003) as well as introduction of heat when performed manually (COUNT, 1996). It is understood that in the next step of treatment, with such preparations, most of the free energy may have been released. Calcium carbonate, because it is smaller than protein molecule, should have a lower conformational entropy (LEHNINGER, 2002).

Because van der Waals forces are inversely proportional to the seventh power of the distance between dipoles, Chattopadhyay (2003) concluded that the attraction is very weak in the lower dilutions, and is very strong in high dilutions when the water molecules (dipole) are closer to each other. Despite the high dielectric constant of water solutes are encapsulated. This is because the van der Waals forces generate charge selection of the solute and thus the solution homogeneity is decreased while the density gradient is increased.

The encapsulated molecules of calcium carbonate were reduced in number by repeating the process of dilution-succussion, as the understanding Chattopadhyay (2003). But the protection of the encapsulated water molecules (solvent) was increased. Along with the dynamization process of the calcium carbonate, according to the author, the encapsulated molecules are located at the bottle base to reach the fluvial concentration.

Interpreting Chattopadhyay (2003), the potencies of calcium carbonate always will have encapsulated molecules in high potencies and in the very high potencies because of the fluvial concentration.

Thus, in water treatment by homeopathic preparations of calcium carbonate the solute (the salt molecules) always would be present at the solution and participating in the treatment, along with the energy from succussion, according to the proposal of Chattopadhyay (2003). It was also understood that the encapsulated molecules from homeopathic preparation of calcium carbonate would be inside the water under treatment and without the presence of ethanol in “capsules”.

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CHAPTER 2

Physical and chemical properties of acid water treated with *Alumina* and *Calcarea carbonica* and their relations with Homeopathy and Hormesis

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Introduction

The knowledge of the water structure is important in understanding the phenomenom of high dilutions, Homeopathy and Hormesis.

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Among the most important and current water models is that of Pople (LEHNINGER, 2002), who in 1951 proposed the continuous networks of molecules. In this model, water is a flexible three-dimensional network formed by hydrogen bonds with the possibility of distortions that generate variation of energy. The model allows to predict the radial distribution, the dielectric constant and heat capacity. In the model of Frank and Wen (PORTO, 2004), there are two possibilities for interconversion: the monomers and the clusters. Hydrogen bonds have covalent character, the half life of the bond is 10 seconds, they promote groups to make structure but antagonized by groups which disrupt those structures (PORTO, 2004). In subsequent models, the structures are like clusters of water, and the differences are on the amount of molecules in each cluster.

The ionization of water may be measured by means of electrical conductivity. Pure water carries on the electrical current as the H+ migrates towards the cathode and OH toward the anode. The movement of hydronium and hydroxide ions in the electric field is very fast compared to ions such as Na+, K+ and Cl- (SUTCLIFFE, 1980).

Chemically, the water is amphoteric, that is, may react either as acid or base. At pH 7 (neutral medium), the concentration of hydroxide ions (OH-) is equal to the hydronium ions (H3O+) or hydrogen (H+). If this equilibrium is disturbed, the solution may be acid or base (LEHNINGER et al., 2002).

According to quantum electrodynamics, the field is not represented by clusters of inert molecules. It is dynamic, able to select, and to catalyze the reactions according to the electromagnetic fields that are within it. Via mathematical models, Del Giudice and Preparata (1998) speculated that electromagnetic field of substances in solution may generate in the solvent "coherence domains", which are specifics and stables, as "electromagnetic signature of the substance in the water" ("theory of water memory"). Thus, the organization of water would be regarded as a coherent dynamic process, associated with electromagnetic interactions of long range and very low intensity. Experimental results obtained in Terahertz Laser Spectrometers pointed that the electromagnetic field of the solute induces the formation of stable sites for coherence in the solvent, with structure and vibration, even without specific solute, producing clumps or clusters of water molecules with dimensions and geometry of their own. Each spatial conformation of clusters would generate specific electromagnetic field, thus influencing the physico-chemical properties of the solution (pH, density, heat capacity, viscosity, acidity and dielectric constant, among others). According to Del Giudice and Preparata (1998), the clusters of water are also structured as non-ionic substances.

The physico-chemical properties of water and aqueous solutions are important. Recently, scientific attention on these properties is the main motivation for understanding the mechanisms of action for high dilutions. Several physical and chemical properties of the water and aqueous solutions remain obscure, particularly the ultra diluted and succussed aqueous solutions (FAIGLE e PORTO, 2006).

According to Bastide (2006), dynamized substances in aqueous solutions can cause behavior abnormalities in the water. The main alterations are: changes in electrical conductivity, pH and the fluorescence spectrum. Some of these anomalies are intrinsic to the water, regarded as a complex system and able to self-organize after disturbances (BELLAVITE, 2003). As indicators of water quality, some physico-chemical parameters (pH, electrical conductivity and dissolved oxygen) are very useful. These changes measured after homeopathic treatments assure the activity of ultra diluted solutions (FIGUEIREDO, 2009).

The pH (potential hydrogen) is used universally, and expresses the degree of acidity or alkalinity of water what means the activity of hydrogen ions [H +] in the water. The balance of the hydrogen ions [H +] and hydroxide [OH-] determine if the water is acidic (pH less than 7) or basic (pH above 7). In chemically pure water, the H+ ions are under equilibrium with the OH-ions and the medium is neutral, ie, pH = 7 (at 25° C). The pH of the water depends on its natural origin and natural characteristics, but may be modified by residues (LEHNINGER et al., 2002).

Electrical conductivity is the ability of water to conduct electrical current and is related to the presence of free ions in water, which are electrically charged particles. The greater the quantity of free ions, the greater the conductivity of the water, which may also vary according to the temperature. In water with pH values in the extreme ranges (pH greater than pH 9 or less than 5), conductivity is due to high concentration of ions in solution, among which the most common are H+ and OH- (ESTEVES, 1998).

Among the gases dissolved in water, oxygen is especially important for the dynamics and characterization of aquatic ecosystems (ESTEVES, 1998).

The rate of dissolved oxygen daily variation is the largest. The oxygen concentration is directly related to the processes of photosynthesis, respiration and decomposition, in turn, they are directly associated to light intensity and temperature (ESTEVES, 1998).

The conceptualization of scientific knowledge in the area of Hormesis has been the subject of deep reflexive thinking since the article by Henschler (2006). He reported that the phenomenon of Hormesis is very often, not specific about the biological system or about the agents, and it is reproducible and quantifiable. Apart from the researchers who denied studies, hormesis (CALABRESE and BALDWIN, 2000) is considered a generalizable effect in biology with potential to be regulatory in many systems (HENSCHLER, 2006). In the mechanistic conception, the phenomenon hormesis is biphasic, adaptive, and the positive responses come from interactions or reactions of compensation (CALABRESE and BALDWIN, 2002). In the model "dose response", the effect of the agent or stressor in low doses stimulates the functions, while in high doses are inhibitory, intoxicating or lethal (SUKUL, 2004). The agents are chemical, physical (mechanical, electrical, thermal) or radiological. According to Henschler (2006), historical researchers of the phenomenon of hormesis were Schulz (pharmacologist), Virchow (pathologist) and Arndt (psychiatrist). Given that, the first homeopathic potencies own quantifiable molecules and because they are often made with strong substances, it is important scientifically to interpret the preparations of low potencies also as solutions containing low doses of original substance (CASALI et al., 2006) and as a phenomenon of hormesis. It is even necessary this reasoning, in experiments with high dilutions because of the transition from chemical effects (hormesis) to physico-chemical effects (Homeopathy) caused by progressive dilutions, as it is common in trials with plants, soil and water.

The marginalization of hormesis is something incongruous in the scientific minds. However, over the time, the repeatability of results, the effects of the tests and the recent return to the themes have caused new challenges (HENSCHLER, 2006). Interpreting results of low dose effects means respecting the condition of rationality intrinsic to *Homo sapiens (*CALABRESE and BALDWIN, 2000).

Modern research on ecotoxicology are analyzing the basic data according to hormesis and working out, too, the dose-response curves with a dose limit, as Azevedo and Chasin (2003).

The evaluation of the dose-response is the process for characterizing the relationship between the dose, of one or more substances, and the incidence of adverse events (AZEVEDO and CHASIN, 2003; SUKUL, 2004). The assertion of the authors extends the study of dose-response to the environment, including water. The binomial "dose-response" came out of the restriction made by pharmacologists and came in to the environment.

The aim of this study was to determine the pathogenesis of two homeopathic preparations quantified by physico-chemical parameters of water.

Materials and Methods

The experiments were carried out at the Laboratory of Homeopathy, Department of Plant Science, Federal University of Viçosa (UFV) in Viçosa-MG, (Brazil), in September 2010.

The 28 borosilicate vials were filled with 40 ml of distilled water and 10 drops of each treatment. The control was the distilled water of pH 7.63, electrical conductivity 1.20 µS / cm and dissolved oxygen 9.77 mg/L. The acid water was prepared at the Laboratory of Homeopathy, with distilled water and AlCl36H20, 2.0 mg / L (10 times the maximum allowable in water for consumption and irrigation). The pH of the acidic water was 4.55, electrical conductivity 51.85 µS / cm and dissolved oxygen 6.0 mg/L.

Evaluations of pH, electrical conductivity and dissolved oxygen were at the Laboratory of Homeopathy (UFV). The electrodes were immersed directly in the sample.

Alumina 3CH and *Calcarea carbonica* 3CH were purchased in a homeopathic laboratory. From the potency 3CH were prepared five potencies (5CH, 7CH, 9CH, 11CH, 13CH) in the Laboratory of Homeopathy, according to the Brazilian Homeopathic Pharmacopoeia (BRAZIL, 1977). As recommended, 2/3 of the vial volume was completed by the solution in the ratio of one drop of the homeopathic preparation and 99 drops of vehicle (distilled water). The succession (100) was performed by an automatic machine system model 10-50 (mechanical arm).

Measurements of pH were by the potenciometer DM 23, measuring range pH 2-20, calibrated with two buffer solutions. First was the buffer pH 7, prepared with dibasic potassium phosphate BP (K2HPO4), 0.025 Mol/L monobasic potassium phosphate PA (KH2PO4), 0.025 Mol/L. The buffer pH 4 was prepared with potassium biphthalate PA (HOOCC6H4COOK), 0.05 M.

The conductivimeter DM 32 was calibrated with a standard solution of KCl (2.10 mol / L) prepared in deionized water. The electrode was immersed directly into the sample and readings were in µS/cm.

The calibration of the oximeter model DM 4P was in distilled water. The electrodes were immersed directly into the sample and the values were read in mg/L.

Four experiments were carried out in a completely randomized design, two homeopathic preparations (*Alumina* and *Calcarea carbonica*), four replicates, six potencies (3CH, 5CH, 7CH, 9CH, 11CH and 13CH), distilled water as the control, 28 treatments in each experiment, under double-blind procedure . The potencies were prepared in distilled water to avoid the effect of Ethanol 70% (solvent commonly used).

Measurements were taken immediately after application of treatments and at 24-hour intervals until 72 hours. The readings of the variables were started 2:00 pm and completed before 30 minutes.

The statistical processing of data was by analysis of variance and the mean comparison test (Dunnett) at 5% significance level, by the program SAEG. 9.1 (2007).

Experiment 1 – Pathogenesis of *Alumina*

In 28 borosilicate vials of 80 mL with 40 mL of distilled water, were applied 10 drops of *Alumina* (3CH, 5CH, 7CH, 9CH, 11CH and of 13CH) and of distilled water (as control).

Experiment 2 - Pathogenesis of *Calcarea carbonica*

In 28 borosilicate vials of 80 mL with 40mL of distilled water, were applied 10 drops of *Calcarea carbonica* (3CH, 5CH, 7CH, 9CH, 11CH and 13CH) and of distilled water (as control).

Experiment 3 - Treatment of acid water with *Alumina*

In 28 borosilicate vials of 80 mL with 40 ml of acidic water (distilled water solution with 2.0 mg / L AlCl36H2O) were applied 10 drops of *Alumina* (3CH, 5CH, 7CH, 9CH, 11CH and 13CH) and of distilled water (as control).

Experiment 4 - Treatment of acid water with *Calcarea carbonica*

In 28 borosilicate vials of 80 mL with 40 ml of acidic water (distilled water solution with 2.0 mg / L AlCl36H2O) were applied 10 drops of *Calcarea carbonica* (3CH, 5CH, 7CH, 9CH, 11CH and 13CH) and of distilled water (as control).

Results and Discussion

Experiment 1 – Pathogenesis of *Alumina*

Potential Hydrogen (pH)

By the analysis of variance of pH data there was statistically significant effects of treatments (Table 1).

Table 1 - Analysis of variance of potential hydrogen (pH) data of distilled water, immediately after treatment (T1), and each 24h (T2, T3 and T4) after application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Square**			
		pHT1	**pHT2**	**pHT3**	**pHT4**
Treatments	6	0.1398**	0.1341*	0.0370^{ns}	0.0220**
Residues	21	0.0196	0.0497	0.0132	0.0014
VC (%)		1.84	3.15	1.55	2.93

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} Not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 2 - Mean values of potential hydrogen (pH) of distilled water immediately after application (pHT1), 24h (pHT2), 48h (pHT3) and 72h (pHT4) after application of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**pHT1**	**pHT2**	**pHT3**	**pHT4**
Alumina 3CH	7.79*	7.34*	7.40	7.35*
Alumina 5CH	7.64*	6.90	7.37	7.48
Alumina 7CH	7.39	6.93	7.42	7.55
Alumina 9CH	7.54*	6.92	7.24	7.49
Alumina 11CH	7.71*	7.16	7.56	7.49
Alumina 13CH	7.74*	7.23	7.47	7.60
Distilled water	7.30	6.91	7.39	7.51

Means followed by * (column) differ significantly from control at 5% probability by Dunnett test.

The *Alumina* 3CH increased the pH of distilled water at T1 and T2. At T4, *Alumina* 3CH decreased the pH. *Alumina* 5CH, 9CH, 11CH and 13CH increased pH at the T1, compared to control (Table 2).

According to Gomes (2009) homeopathic preparations of calcium carbonate in potencies 1CH, 4CH and 6CH, increased significantly the pH of distilled water after treatment. After application of homeopathic preparations of sodium chloride, immediately after application and after 72 hours of application, Cesar (2010) found statistically significant changes in pH. Lisboa (2010), measured the physico-chemical alterations of water treated with homeopathic preparations, and detected an increase in pH of distilled water. In the three experimental reports there was coherence in that the pH of the water is influenced by high dilutions, thus confirming the effects found in this experiment.

The pathogenesis of *Alumina* 3CH was characterized by increasing the pH of the distilled water immediately after application and after 24 hours of application. But the pH was reduced after 72h of applications. *Alumina* 5CH, 9CH, 11CH 13CH increased the pH immediately after application.

There is no reference in the bibliography of experiments on *Alumina* in water. The pathogenesis of *Alumina* in water, measured by the pH, was characterized by increasing and by decreasing in the pH depending on the potency.

In Table 2, the results indicate the relations with Homeopathy and Hormesis at T1 and T2, respectively. The hormesic effect in Table 2 is interpreted as the acidification of the water by aluminum oxide and decreasing the pH. But the aluminum oxide, in an very low amount, reversed the effect. The hormesic effect disappeared beginning on 5CH and at T2 (Table 2). In 5CH and on, there is the homeopathic effect (T1: 9CH, 11CH and 13CH). In this study, the simultaneous hormesic effect and the homeopathic effect (chemical with physico-chemical) is intrinsic to the method of homeopathic preparations.

Therapeutic or corrective *Alumina* 3CH results, provides some knowledge about what effect resulted in the homeostasis of the system. There is demand for more and new research.

It is known by the theory of Homeopathy (Royal Law) that the homeopathic effect ceases when the potency applied is low (CASALI, 2006). But the hormesic effect stay as long as there is dilute molecules in the system. The chemical effect persists and is detectable when the original substance is strong, reactive or toxic.

The effects of 9CH, 11CH and 13CH disappeared after T1, showing the Royal Law. But the effect of 3CH persisted at T4 because the mean pH was statistically significant, so resulting in the chemical effect of the small number of molecules in *Alumina* 3CH.

The pH change in T1, caused by 3CH and 5CH (Table 2) is justified by the chemical reactions of the original substance of the preparations. *Alumina* homeopathic solution is prepared with aluminum oxide, of rapid action in aqueous medium because water in the ionic medium is like reactant (LEHNINGER, 2002).

The basic principle of homeopathy, the experimentation, must be accomplished with many potencies of the homeopathic preparations under research. By experimenting, it is known and it is characterized the pathogenesis of each dynamized substance (LISBOA, 2005). By the Hormesis Theory, in the preparation *Alumina* 3CH molecules of aluminum oxide are present, at low amounts, but there was reversed pH effects. Thus, the effects of *Alumina* 3CH on pH (Table 2) were attributed to the low number of molecules (very small amount), and the phenomenon of hormesis (reverse action) could be related to the pH increase at T1 and T2 (Table 2).

The results of experiments on homeopathic preparations have not been interpreted by considering both physical effects (Homeopathy) and chemical effects (Hormesis). The basic principles of those interpretations are: in Homeopathy, the principle of similarity and in Hormesis the principle of reverse action. There has been marginalization of the principle of hormesis (CALABRESE and BALDWIN, 2002) in several areas of knowledge relevant to the principle of reverse action, such as in biology, in pharmacology, toxicology, and even in physico-chemistry (HENSCHLER, 2006).

The analysis of the effect of few molecules of aluminum (*Alumina* CH 3) should consider the statement of Lehninger (2002), "the presence of ions in aqueous medium provokes a reaction, because in this ionic medium water behaves as a reagent." This statement by Lehninger (2002) is barely noticeable, this reaction with minor consequence is because the total volume of water. However some variables of the system can be indicators, such as pH or the whole system.

Electrical conductivity (CE)

By analysis of variance of the electrical conductivity data of distilled water there was a statistically significant effect of treatments (Table 3).

Table 3 - Analysis of variance of electrical conductivity (CE) of distilled water, immediately after application (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Square**			
		CET1	**CET2**	**CET3**	**CET4**
Treatments	6	0.0220**	0.0165**	0.0230*	0.0350**
Residues	21	0.0014	0.0033	0.0090	0.0090
VC (%)		2.93	4.45	7.31	7.23

** Significant at 1% probability by F test
* Significant at 5% probability by F test.
VC-Variation Coefficient
DF- Degrees of freedom

Table 4 - Mean values of electrical conductivity (CE) in µS / cm of distilled water, immediately after the application (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**CET1**	**CET2**	**CET3**	**CET4**
Alumina 3CH	1.447*	1.430*	1.467*	1.517*
Alumina 5CH	1.255	1.277	1.252	1.237
Alumina 7CH	1.247	1.245	1.262	1.290
Alumina 9CH	1.297*	1.305	1.285	1.320
Alumina 11CH	1.305*	1.280	1.307	1.327
Alumina 13CH	1.250	1.275	1.317	1.305
Distilled water	1.222	1.240	1.242	1.240

Means followed by* (column) differ significantly from control at 5% probability by Dunnett test.
µS/cm (microssiemens per centimeter).

The pathogenesis of *Alumina* 3CH was characterized by increased CE at T1, T2, T3 and T4. The *Alumina* 9CH and 11CH increased the CE at T1. In the study of pathogenesis held by Lisboa (2010), there was a statistically significant increase in CE of distilled water, compared to control (distilled water), after 24, 48 and 72 hours of application of *Calcarea carbonica*. Therefore, the CE is really influenced by homeopathic preparations.

In the literature review no studies were found on the activity of *Alumina* in water. Thus, the pathogenesis of *Alumina* 3CH is the CE increase. After 72 hours of application new study of pathogenesis is required in distilled water.

By the theory of homeopathy, the signs are pathogenesis, but they cease when the cause is stopped. This is the common understanding of the texts, theses and scientific papers that discuss the studies on pathogenesis (LISBOA, 2005). By the Theory of Hormesis, the signs do not cease, as they are measured by physico-chemical parameters such as the CE.

In Table 4, the CE values resulting from the activity of *Alumina* 3CH, are effects also of the molecules still present in the homeopathic preparation (3CH). However, the direction in which the values took over the control reveals that the effect was not reversed, and the CE indicates the effect of molecules from the original compound (chemical effect).

In Hormesis the chemical or biochemical effect depends on the presence of molecules, while in Homeopathy depends on the presence of power (energy, information, strength) from the succussion or as a result of this.

The homeopathic effect is illustrated in Table 4 by the value of CE as a consequence of *Alumina* 11CH application. There was an increase in the CE without introduction of solutes, since the preparation has been made only with distilled water, the same water of control. The hormesic effect is very characterized by the reverse action or reversed responses caused by tiny amounts as compared to high amounts of the solute.

In homeopathic treatment of disturbances (experiments 3 and 4), the homeopathic preparation was applied in order to reverse the disorder installed (acidity). Therefore the objective to be attained is the same when are applying low amounts, which are recognized in causing the reverse effect. The difference is the preparation, because low doses of the homeopathic preparation are accompanied by succussion and follow the methodology of dilution, 1:99 (centesimal ratio). The principles of reversibility (hormesis) and similarity (Homeopathy) are of common procedure to achieve their own purposes, as Casali et al. (2009) and Lisboa (2005).

Dissolved Oxygen (DO)

By analysis of variance there were statistically significant effects of treatments (Table 5).

Table 5 - Analysis of variance of data from dissolved oxygen (DO) in distilled water, immediately after application (DOT1), after 24h (DOT2), after 48h (DOT3) and after 72h (DOT4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Square**			
		DOT1	**DOT2**	**DOT3**	**DOT4**
Treatments	6	0.6836	1.5972*	0.6441*	0.45202**
Residues	21	0.4650	0.5954	0.2154	0.09702
VC (%)		7.59	10.09	7.67	6.17

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

ns not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 6 - Mean values of dissolved oxygen (DO) in distilled water, immediately after application (DOT1), after 24h (DOT2), after 48h (DOT3) and after 72h (DOT4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**DOT1**	**DOT2**	**DOT3**	**DOT4**
Alumina 3CH	8.875	7.975	6.300	5.075
Alumina 5CH	9.125	7.775	6.400	5.250
Alumina 7CH	8.625	6.400	5.250	4.300*
Alumina 9CH	9.400	8.225	6.200	5.250
Alumina 11CH	8.275	7.325	6.125	5.100
Alumina 13CH	9.175	8.175	6.275	5.200
Distilled water	9.375	7.625	5.800	5.510

Means followed by* (column) differ significantly from control at 5% probability by Dunnett test.

The data of dissolved oxygen in distilled water do not reflect (Table 6) photosynthesis and decomposition of waste. No studies were found clearly to report the state of polarity of water. For these reasons, nothing can be argued on the assumption that the polarity of water influenced the dissolved oxygen content. It is accepted that the distillation lowers the DO due to high temperature what also negates the possibility of residues decomposition to influence via DO.

The dynamics of DO in distilled water (Table 6) was thus limited to the dissolution of atmospheric air, which may be increased by temperature or atmospheric pressure (SUTCLIFFE, 1980; HADDAD, 1994).

The understanding of the results (Table 6) leads to the possibility of DO to be more influenced by uncontrolled factors, such as the movement of the water at the time of the oximeter reading. With this view, the experimental inaccuracy was the major obstacle in the determination of DO and therefore the number of replicates should have been greater.

The oxygen (O_2), non-polar molecule, is slightly soluble in water. The polarity of the water together with the ability to form hydrogen bonds, characterized the liquid water as solvent of ionic compounds and other polar molecules. Thus, few molecules of aluminum (Table 6, *Alumina* 3CH) as influencing the polarity, also exert influence on the solubility of the oxygen and on DO. As shown in Table 6, only 7 CH altered the DO.

There was effect on DO, as compared to control at T2 and T3 (Table 6). At T4, *Alumina* 7CH reduced the DO. Gomes (2009), after treating the water with homeopathic preparations of calcium carbonate reported that mean values of oxygen dissolved in distilled water did not differ significantly among them. The coefficient of variation of DO was the highest, meaning that any procedure or environmental condition, did influence on results but that was not controlled by the experimental methodology. Gomes (2009) found statistical differences between spring water and distilled water, ie, between DO 4.77 and DO 3.89, respectively. After the addition of Calcium Carbonate 1CH, to both waters the results were DO 5.13 and DO 4.30, respectively, and were of statistical significance.

In Table 6 the pathogenesis of *Alumina* 7CH was characterized by the decrease of DO in distilled water after 72 hours of applications. The effect on pH and CE was delayed. This effect may be of rare appearance or idiosyncratic. The treatments did not affect the dissolved oxygen within 48 hours, and only 7CH caused late effect. So, it is allowed the hypothesis that the DO is probably not reliable whenever is adopted the methodology such as was in this trial.

In characterizing the pathogenesis, the system must be healthy, well balanced or ordered. In this experiment, it was used the distilled water. Due to the distillation, water is not the same (GOMES, 2009), it is clean, purified, almost free of metals, and salts, free of microrganisms, but is not healthy, as cited by Holandino (2008). In their study Holandino (2008) reported that the water after distillation is considered imbalanced. The mine water (spring water) is probably well balanced, and the variables represent the healthy state (GOMES, 2009).

The oxygen in water (DO) is prominent among the dissolved gases, because of the dynamics and potential oxidant in natural waters. The concentration of dissolved oxygen is variable and transient. In depends on the characteristics of water (polarity, dissolution of atmospheric air in the water which is the most important source), photosynthesis (mainly algae), the state of waste decomposition (oxygen consuming) and the binomial temperature x atmospheric pressure (SUTCLIFFE, 1980; HADDAD, 1994, ESTEVES, 1998). In the experiment with distilled water in a stable environment, without shaking the bottles, without algae, the change in DO could be more dependent on the natural dissolution and on the polarity state.

With the pathogenesis described, the A*lumina* may be used because of the corrective effect of reducing pH and electrical conductivity, according to the principle of similarity.

Experiment 2 – Pathogenesis of *Calcarea carbonica*

Potential Hydrogen (pH)

By the analysis of variance of pH data there was statistically significant effects of treatments (Table 7).

Table 7 - Analysis of variance of potential hydrogen (pH) data of distilled water, immediately after application (pHT1), after 24h (pHT2), after 48h (pHT3) and after 72h (pHT4) of application of six potencies of *Calcarea carbonica* . Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Squares**			
		pHT1	**pHT2**	**pHT3**	**pHT4**
Treataments	6	0.0605*	0.7290**	0.1870^{ns}	0.3055**
Residue	21	0.0168	0.0500	0.8957	0.0172
VC (%)		1.68	3.22	1.23	2.10

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

ns not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 8 - Mean values of potential hydrogen (pH) of distilled water, immediately after treatment (pHT1), after 24h (pHT2), after 48h (pHT3) and after 72 hours (pHT4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**pHT1**	**pHT2**	**pHT3**	**pHT4**
Calcarea carbonica 3CH	7.705	6.440	7.675	6.517
Calcarea carbonica 5CH	7.730	7.465*	7.625	5.880*
Calcarea carbonica 7CH	7.840*	7.440*	7.660	6.072*
Calcarea carbonica 9CH	7.827*	6.610	7.787	6.217*
Calcarea carbonica 11CH	7.620	7.005*	7.572	6.115*
Calcarea carbonica 13CH	7.520	7.075*	7.617	6.215*
Distilled water	7.572	6.507	7.651	6.695

Means followed by* (column) differ significantly from control at 5% probability by Dunnett test.

Calcarea carbonica 7CH and 9CH increased pH at (T1), in comparison with the control. The treatments 5CH, 7CH, 11CH, 13CH increased pH at T2 (Table 8). At T4 all treatments reduced the pH, except *Calcarea carbonica* 3CH (Table 8).

Gomes (2009) reported that homeopathic solutions of calcium carbonate (1CH, 4CH and 6CH) increased the pH of the water. Cesar (2010) reported that homeopathic solutions of sodium chloride affected the pH of water. Lisboa (2010) reported that in water treated by homeopathic preparations the pH was increased. The increase in pH caused by the treatments (Table 8) is similar to that reported by Casali et al. (2009), Gomes (2009) and Lisboa (2010). The pathogenesis of *Calcarea carbonica* 5CH then can be characterized by the pH increase at T2 and *Calcarea carbonica* 7CH at T1 and T2. The potencies 3CH, 5CH, 7CH, 9CH, 11CH and 13CH reduced the pH after 72 hours of treatment.

The pH at T1 was only changed by *Calcarea carbonica* 7CH and 9CH. The effect of 7CH persisted until T4 (Table 8).

Electrical conductivity (CE)

By analysis of variance of CE data, there was no effect of treatment (Table 9).

Table 9 - Analysis of variance of the electrical conductivity (CE) data of distilled water immediately after application (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of treatment application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Square**			
		CET1	**CET2**	**CET3**	**CET4**
Treatments	6	0.0139^{ns}	0.0101^{ns}	0.0128^{ns}	0.0087^{ns}
Residues	21	0.0135	0.0090	0.0091	0.0100
VC (%)		8.94	7.70	7.45	7.75

^{ns} Not significant by F test (5%).
VC-Variation Coefficient
DF- Degrees of freedom

Table 10 - Mean values of electrical conductivity (CE) of distilled water immediately after treatments (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**CET1**	**CET2**	**CET3**	**CET4**
Calcarea carbonica 3CH	1.267	1.195	1.235	1.262
Calcarea carbonica 5CH	1.285	1.232	1.317	1.290
Calcarea carbonica 7CH	1.277	1.232	1.307	1.310
Calcarea carbonica 9CH	1.257	1.200	1.235	1.267
Calcarea carbonica 11CH	1.260	1.207	1.250	1.262
Calcarea carbonica 13CH	1.425	1.342	1.390	1.395
Distilled Water	1.312	1.245	1.252	1.287

The electrical conductivity (CE) was not affected by the treatments, probably due to the distillation process that reduced the presence of ions (Table 10).

Lisboa (2010) found increase in CE of distilled water after 24 hours, after 48 hours and after 72 hours of application of *Calcarea carbonica*. *Calcarea carbonica* 5CH increased the electrical conductivity.

Dissolved oxygen (DO)

By the analysis of variance of DO data, there was statistically significant effects of treatments in three measurement times (Table 11).

Table 11 - Analysis of variance of dissolved oxygen (DO) data of distilled water, immediately after treatments of (DOT1), after 24h (DOT2), after 48h (DOT3) and after 72h (DOT4) of application of six potencies of *Calcarea carbonica* . Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean squares**			
		DOT1	**DOT2**	**DOT3**	**DOT4**
Treatments	6	0.8573^{ns}	6.8653**	0.1140**	0.5828*
Residues	21	0.5772	1.0459	0.0247	0.2133
VC (%)		8.47	11.08	1.40	7.92

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 12 - Mean values of dissolved oxygen (DO) of distilled water, immediately after treatment (DO T1), after 24h (DO T2), after 48h (DO T3) and after 72h (DO T4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**DOT1**	**DOT2**	**DOT3**	**DOT4**
Calcarea carbonica 3CH	9.525	9.300	11.175	6.250
Calcarea carbonica 5CH	9.100	8.800	11.150	6.025
Calcarea carbonica 7CH	8.275	11.875*	11.350	5.300
Calcarea carbonica 9CH	9.425	8.475	11.025*	5.975
Calcarea carbonica 11CH	9.150	9.100	11.250	5.975
Calcarea carbonica 13CH	8.600	7.650	10.875*	5.275
Distilled water	8.650	9.400	11.325	6.000

Means followed by* (column) are significantly different from control at 5% probability by Dunnett test.
The control plot was the application of 10 drops of distilled water.

Calcarea carbonica 7CH increased the DO at T2 while *Calcarea carbonica* 9CH and 13CH reduced the DO at T3 (Table 12).

Gomes (2009) treated the water with homeopathic preparations of calcium carbonate. Dissolved Oxygen in distilled water was not affected statistically because the coefficient of variation was high. *Calcarea carbonica* 5 CH increased dissolved oxygen, as Casali et al. (2009). The pathogenesis of *Calcarea carbonica* 7CH was characterized by the increase of dissolved oxygen, while 9CH and 13CH by the reduction of DO (Casali et al., 2009). The pathogenesis of high dilutions is identified by means of repeated experiments with many healthy systems. These results are the beginning of more determinations, in order to meet the experimental protocol of Homeopathy.

Experiment 3 - Treatment of acid water (2 mg / L AlCl36H2O) with *Alumina*

Potential Hydrogen (pH)

By analysis of variance of pH data there was statistically significant effects in two times, 24 hours and 48 hours (Table 13). The fact of no effect at T1 may be interpreted that *Alumina* is of slow activity, as it was reported in studies of Homeopathic Acology (CASALI et al., 2009). At T2 *Alumina* 5CH, 11CH and 13CH decreased the pH compared to control. At T3, *Alumina* 3CH decreased the pH, compared to control (Table 14).

Table 13 - Analysis of variance of the hydrogen potential (pH) data of acid water, immediately after treatment (pHT1), after 24h (pHT2), after 48h (pHT3) and after 72h (pHT4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean squares**			
		pHT1	**pHT2**	**pHT3**	**pHT4**
Treatments	6	0.0126^{ns}	0.0470**	0.0246**	0.0088^{ns}
Residues	21	0.007	0.0051	0.0043	0.0053
VC (%)		1.73	1.42	1.39	1.47

** Significant at 1% probability by F test

^{ns} not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 14 - Mean values of potential hydrogen (pH) data of acid water after treatment (pHT1), after 24h (pHT2), after 48h (pHT3), after 72h (pHT4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**pHT1**	**pHT2**	**pHT3**	**pHT4**
Alumina 3CH	4.882	5.097	4.620*	4.965
Alumina 5CH	4.755	4.927*	4.797	4.930
Alumina 7CH	4.900	5.167	4.762	5.015
Alumina 9CH	4.820	5.055	4.727	5.000
Alumina 11CH	4.770	4.905*	4.715	4.895
*Alumina*13CH	4.875	4.890*	4.855	4.935
Acid Water (Control)	4.837	5.070	4.822	5.015

Means followed by* (column) differ significantly from control at 5% probability by Dunnett test.

The control plot was the application of 10 drops of distilled water

Calcium carbonate is an alkaline salt and its homeopathic solution, prepared by Gomes (2009), potencies 1CH, 4CH and 6CH, statistically increased the pH of distilled water.

In experiment 1 (pathogenesis), in distilled water, *Alumina* 5CH, 9CH, 11CH and 13CH increased the pH at T1. *Alumina* 3CH increased the pH at T1, T2 and T3, but reduced at T4 (Table 2). The pathogenesis described in Experiment 1 means that *Alumina* 3CH primary action is to increase the pH. By the principle of similarity *Alumina* 3CH caused secondary action in acidic water (Experiment 3) and the pH was reduced after 72 hours of applications although not statistically confirmed (Table 14).

The potencies of *Alumina* come from the basic preparation of aluminum oxide. The aluminum solution and in the water acidified the medium, and the pH is below 7, depending on the amount of this oxide. In acid water prepared with aluminum chloride, the aluminum content is the acidity agent for ionizing. This acidity by aluminum, taken as the toxic reference, is the substrate of the slow activity by *Alumina* 3CH and its molecules. It is the acidity of these aluminum molecules in acid solution which causes the reverse effect termed Hormesis.

The reverse effect caused by the *Alumina* 3CH at T2 statistically need to be confirmed (Table 14). However, at T3 a significant increase in acidity (pH 4.62) showed the effect of aluminum chloride molecules which are in the solution of potency 3CH. So, the hormesic effect of molecules and the homeopathic effect of 3CH are simultaneous.

At T4 there was not statistically difference of treatment means and the control (Table 14), indicating that the effects of *Alumina* ceased, according to the Royal Law (CASALI et al., 2009). But also stopped the effects of the molecules according to the law of reversibility, at 5% level of statistical reliability under those experimental conditions.

Electrical conductivity (CE)

By the analysis of variance of CE data there was statistically significant effect of treatments after 72 hours of applications (Table 15).

Table 15 - Analysis of variance of the electrical conductivity (CE) data of acidic water immediately after treatments (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean squares**			
		CET1	**CET2**	**CET3**	**CET4**
Treatments	6	0.1942^{ns}	1.5166^{ns}	0.6095^{ns}	1.1408*
Residues	21	0.2698	0.7129	0.5258	0.3166
CV(%)		1.023	1.72	1.50	1.12

* Significant at 5% probability by F test.

^{ns} Not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 16 - Mean values of electrical conductivity (CE) of acidic water, after treatment (CET1), after 24h (CET2), after 48h (CET3), after 72h (CET4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**CET1**	**CET2**	**CET3**	**CET4**
Alumina 3CH	50.662	49.220	48.612	49.1975*
Alumina 5CH	50.887	49.137	48.190	50.4275
Alumina 7CH	50.385	48.282	47.815	49.8600
Alumina 9CH	51.007	49.442	48.130	50.1750
Alumina 11CH	50.712	49.160	48.890	50.9075
Alumina 13CH	51.010	47.722	47.857	50.2500
Acid water (Control)	50.807	48.972	48.367	50.4000

Means followed by * (column) differ significantly from the control, 5% probability by Dunnett test.
Condutivity: µS/cm.
The control plot was the application of 10 drops of distilled water.

Alumina 3 CH reduced the CE of acid water after 72 hours of treatment (Table 16). Lisboa (2010) detected an increase in CE mean values in distilled water as compared to the control (distilled water) due to treatment with *Calcarea carbonica* 7CH after, 24, 48 and 72 hours of applications. *Alumina* 3CH decreased the CE at T4 (Table 16). By the principle of reversibility, the phenomenon of Hormesis is theoretically present in Table 16. *Alumina* 3CH contains acidifying molecules which chemically increased the CE of acid water. These molecules in the acid water reversed the effect. There was hormesic effect because low amounts of aluminum in the *Alumina* 3CH reduced the CE.

It is known that the CE increases as new ions are added to water solution.

Dissolved oxygen (DO)

By the analysis of variance of DO data, there was statistically significant effects of treatment at 3 times of measurements (Table 17).

At T4 (after 72 hours of treatment) *Alumina* 3CH reduced the DO, compared to control (Table 18). *Alumina* 7CH at T1 increased the DO of acidic water (Table 18). In experiment 1 the pathogenesis of *Alumina* 7CH was to reduce the DO at T4 (Table 6). *Alumina* 7CH was effective to influence the acid water and increase the DO confirming the homeopathic potential found in experiment 1.

Table 17 - Analysis of variance of dissolved oxygen (DO) data in acidic water, immediately after treatment (DO T1), after 24h (DO T2), after 48h (DO T3), after 72h (DO T4) of application of six potencies of *Alumina*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean squares**			
		DOT1	**DOT2**	**DOT3**	**DOT4**
Treatments	6	3.4036*	0.5853^{ns}	0.6748*	0.5272**
Residues	21	1.0678	0.3330	0.1883	0.1026
VC (%)		16.09	9.91	8.61	6.41

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} Not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 18 - Mean values of dissolved oxygen (DO) in acidic water, immediately after treatments (DO T1), after 24h (DO T2), after 48h (DO T3), after 72h (DO T4) of applications of six potencies of *Alumina*. Viçosa / MG. 2010.

Treatments	**DOT1**	**DOT2**	**DOT3**	**DOT4**
Alumina 3CH	7.475	5.200	4.350	4.350*
Alumina 5CH	5.925	5.400	4.625	5.025
Alumina 7CH	8.375*	6.000b	5.450	5.550
Alumina 9CH	6.175	6.050	5.425	5.150
Alumina 11CH	6.300	5.975	5.250	5.025
Alumina 13CH	6.175	6.275	5.050	4.800
Acid Water (Control)	6.525	5.850	5.100	5.025

Means followed by * in the column differ significantly from the control at 5% probability by Dunnett test.

The control was the application of 10 drops of distilled water.

The DO reading should be done before and after succussion. Then, these data would prove the activity of homeopathic stimulation for trapping O_2 molecules as an effect of water polarity (LEHNINGER, 2002).

The interpretation of DO in experiment 3 involves a review of the theories: Chemistry, Homeopathy and Hormesis. In experiment 3 it was outstanding the significant activity of *Alumina* 3CH on DO. It was observed that *Alumina* 3CH decrease the pH at T3, decrease CE at T4 and decrease DO at T4. So, there was activity of the molecules that were in the solution of *Alumina* 3CH and this activity performed changes in the acid water. On pH, the effectiveness of *Alumina* 3CH was not homeopathic or hormesic. On CE, the effectiveness was really by the principles of Homeopathy and Hormesis. On DO the effectiveness was not homeopathic or hormesic either but was only molecular because the reverse effect did not happen. However, there was the molecular effect for all measured variables. The measurements allowed to interpret the presence of the principles Homeopathy and Hormesis.

Experiment 4 - Treatment of acid water (2mg/L AlCl36H2O) with *Calcarea carbonica*

Potential Hydrogen (pH)

By the analysis of variance of pH data there was statistically significant effects of treatments in the first two measurements (Table 19).

At T1, *Calcarea carbonica* 9CH reduced the pH of the acid water. At T2, the treatments increased pH and the greater increase was by 9CH (Table 20). In pathogenesis trial (experiment 2), *Calcarea carbonica* 9CH and 7CH increased the pH at T1. At T2 *Calcarea carbonica* 5CH, 7CH, 11CH and 13CH increased the pH (Table 8).

Table 19 - Analysis of variance of Potential Hydrogen (pH) of acid water, immediately after treatment (pHT1), after 24h (pHT2), after 48h (pHT3) and after 72h (pHT4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Squares**			
		pHT1	**pHT2**	**pHT3**	**pHT4**
Treatments	6	0.0712**	0.0279**	0.0091^{ns}	0.0066^{ns}
Residues	21	0.0080	0.0027	0.0059	0.0043
VC (%)		1.88	1.04	1.56	1.34

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} Not significant

VC-Variation Coefficient

DF- Degrees of freedom

Table 20 - Mean values of the Potential of Hydrogen (pH) of acid water, immediately after treatment (pHT1), after 24h (pHT2), after 48h (pHT3), after 72h (pHT4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**pHT1**	**pHT2**	**pHT3**	**pHT4**
Calcarea carbonica 3CH	4.620	5.030*	4.900	4.967
Calcarea carbonica 5CH	4.892	4.997*	4.947	4.910
Calcarea carbonica 7CH	4.775	5.080*	4.972	5.017
Calcarea carbonica 9CH	4.532*	5.140*	4.887	4.900
Calcarea carbonica 11CH	4.895	5.055*	5.000	4.925
Calcarea carbonica 13CH	4.712	5.032*	4.960	4.935
Acid water (Control)	4.755	4.870	4.872	4.920

Means followed by * (column) differ significantly from the control at 5% probability by Dunnett test.

The control plot was the application of 10 drops of distilled water.

There was a corrective effect of *Calcarea carbonica* treatment, but it was not according to the pathogenesis characterized in experiment 2. Gomes (2009) reported the effects of Calcium Carbonate 1CH, 4CH and 6CH in pH of water. Lisboa (2010) reported an increase in pH of distilled water after treatment with *Calcarea carbonica*. Casali et al. (2009) reported the pathogenesis of increasing pH by *Calcarea carbonica*. Therefore, the results on treatment of acidic water (experiment 4) were in accordance with the principles of Homeopathy, even if the pathogenesis of the experiment 2, has not allowed full support.

Electrical conductivity (CE)

By the analysis of variance of CE data there was statistically significant effect of treatment at 3 times of measurement (Table 21).

Table 21 - Analysis of variance of electrical conductivity data of acidic water, immediately after treatment (CET1), after 24h (CET2), after 48h (CET3), after 72h (CET4) of applications of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean Squares**			
		CET1	**CET2**	**CET3**	**CET4**
Treatments	6	3.5550^{ns}	1.0730*	2.5328**	3.7015**
Residues	21	4.5319	0.3475	0.6135	0.6117
CV(%)		4.19	1.19	1.60	1.57

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} Not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Calcarea carbonica 5CH and 11CH increased CE at T2. *Calcarea carbonica* 9CH, 11CH and 13CH reduced the CE at T3. The potencies 5CH, 7CH, 11CH and 13CH decreased the CE at T4 (Table 22).

Table 22 - Mean values of electrical conductivity (CE) of acid water immediatly, after application (CET1), after 24h (CET2), after 48h (CET3) and after 72h (CET4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**CET1**	**CET2**	**CET3**	**CET4**
Calcarea carbonica 3 CH	50.320	49.2175	48.5850	50.5450
Calcarea carbonica 5 CH	50.910	50.0150*	49.9950	49.3425*
Calcarea carbonica 7 CH	50.300	49.1725	48.4575	48.7600*
Calcarea carbonica 9 CH	50.300	49.2795	48.0275*	50.4425
Calcarea carbonica 11 CH	50.037	49.4725*	48.2950*	49.1625*
Calcarea carbonica 13CH	52.787	49.2125	48.1400*	48.5550*
Acid water (Control)	50.505	48.2650	49.7675	50.9950

Means followed by * (column) are significantly different from Control, at 5% probability by Dunnett test.
µS/cm= microsiemes per centimeter.
The control was the application of 10 drops of distilled water.

Lisboa (2010) detected increased of CE in distilled water by *Calcarea carbonica* 7CH, after 24, after 48 and 72 hours of application. The results at T2 (Table 22), according to Lisboa (2010) and Casali et al. (2009), followed the principles of Homeopathy.

At time T4, the CE means values of 5CH and 7CH (49.3 and 48.7) were lower than Control (50.9), meaning that theoretically there was similarity effect (homeopathic) and the reverse effect (hormesic effect) despite the very small number of molecules of these preparations (Table

22). Gomes (2009) discussed the CE data of the experiments, but ignoring the theory of hormesis. However, the results interpreted by the theory of hormesis revealed that in the work of Gomes (2009), the reverse effect was statistically significant, confirming this experiment 4. The phenomenon of hormesis is present more frequently and so demanding more rational interpretations (CALABRESE and BALDWIN, 2002).

Dissolved oxygen (DO)

By the analysis of variance of DO data there was statistically significant effect of treatment (Table 23).

Table 23 - Analysis of variance of dissolved oxygen of acid water, immediately after treatment (DO T1), after 24h (DO T2), after 48h (DO T3) and after 72h (DO T4) of applications of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Source of Variation	**DF**	**Mean squares**			
		DOT1	**DOT2**	**DOT3**	**DOT4**
Treatments	6	0.3882**	1.0716**	0.2065*	0.2247*
Residues	21	0.0989	0.2047	0.0727	0.0615
VC (%)		5.34	8.45	5.84	4.99

** Significant at 1% probability by F test

* Significant at 5% probability by F test.

^{ns} Not significant.

VC-Variation Coefficient

DF- Degrees of freedom

Table 24 - Mean values of dissolved oxygen (DO) in acid water, immediatly after treatments (DOT1), after 24h (DOT2), after 48h (DOT3), after 72h (DOT4) of application of six potencies of *Calcarea carbonica*. Viçosa / MG. 2010.

Treatments	**DOT1**	**DOT2**	**DOT3**	**DOT4**
Calcarea carbonica 3CH	5.755	4.925	4.500	4.700
Calcarea carbonica 5CH	5.675	5.425*	4.650	5.025
Calcarea carbonica 7CH	6.375*	6.125*	4.975*	5.275*
Calcarea carbonica 9CH	5.870	5.550*	4.750*	5.150*
Calcarea carbonica 11CH	5.950	5.250	4.500	4.850
Calcarea carbonica 13CH	6.150*	5.650*	4.650	5.075
Acid Water (Control)	5.425	4.525	4.250	4.650

Means followed by * (column) are significantly different from Control, at 5% probability by Dunnett test.

The control plot was the application of with 10 drops of distilled water.

Compared to control, *Calcarea carbonica* 7CH increased DO at all times and *Calcarea carbonica* 13CH increased DO at T1 and T2 (Table 24). In the pathogenesis study of *Calcarea carbonica* described in experiment 2 (Table 12), the potency 7CH increased DO at T2. At T3, 9CH and 13CH reduced the DO.

César (2010) discussed the hypotheses of environment effect outweigh the effect of treatments on dissolved oxygen in distilled water. Gomes (2009) reported that some uncontrolled procedure of experimental methodology or environmental condition did influence the data and there was increased coefficient of variation. The variation of DO in acidic water is regarded as of normal frequency (SUTCLIFE, 1980, ESTEVES, 1998) and does not conflict with the repeatability of the significances at T2, T3 by T4 and *Calcarea carbonica* 7CH and 9CH. So to admit that experimentally the design was inefficient in controlling environmental effects does not invalidate the pertinent part of this work.

The significant results of Table 24 do not confirm the effectiveness the principle of similarity. Distilled water is a purified liquid but is not considered a healthy water (HOLANDINO, 2008). The DO measured by this type of methodology, generally, is of high variation coefficients, so diminishing the probability of statistical significance. In the analyzes of variance of four trials by Gomes (2009), the DO data, repeat the inaccuracies of means as it was observed in this 4th experiment. So, repeating previous reports, analysis of DO variable demands greater number of replicates.

Conclusion

1) The pathogenesis of *Alumina* 3CH in distilled water is to increase the pH and the electrical conductivity, but, of *Alumina* 7CH is to reduce the dissolved oxygen.

2) The pathogenesis of *Calcarea carbonica* is to increase the pH. Also to increase the dissolved oxygen by the 7CH and to reduce dissolved oxygen by 9CH and 13CH. The electrical conductivity did not express pathogenesis.

3) In the treatment of water acidity caused by aluminum, (2mg/L, $AlCl_3 \, 6H_2O$) the *Alumina* was not so effective, but still it was consistent with the pathogenesis data.

4) *Calcarea carbonica* is effective in treating water aluminum acidity.

5) The analysis of homeopathic treatment effects on dissolved oxygen demand improvements in experimental methodology.

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