A comparative study of Hahnemannian and Radionically prepared potencies of Natrum muriaticum using Nuclear Magnetic Resonance spectroscopy.

By

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I Clare Allsopp do declare that this dissertation is representative of my own work, both in conception and execution.

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DEDICATION

I dedicate my work to my parents Robert and Valerie Allsopp, my family and my friends for their unconditional love and unquestioning support through my studies.

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ABSTRACT

Aim

The aim of this study was to compare the Nuclear Magnetic Resonance (NMR) spectra of homoeopathic potencies prepared according to the orthodox Hahnemannian method with those produced with Radionic instrumentation.

Methodology

The chemical shift values and relative integration values for the H_2O, CH_2, CH_3 and OH peaks of the 6C, 12C and 30C potencies of Hahnemannian and Radionic *Natrum muriaticum* were compared.

The orthodox Hahnemannian method of preparing potencies involves dilution of the crude substance followed by the dilution and succussion at each subsequent deconcentration (potency) level. The Hahnemannian potencies were prepared according to the German Homoeopathic Pharmacopoeia (GHP) and the potencies diluted using a 1:100 ratio and succussed ten times at each potency level. The Radionic group of potencies were prepared using the 'Magnetogeometric Potency Simulator' (a Radionic apparatus).

NMR testing took place at the Chemistry Department at the University of KwaZulu Natal, Pietermaritzburg using a Bruker Avance lll NMR spectrometer 500MHz.The samples were dispensed into boro-silicate glass NMR tubes with a co-axial tube containing Dimethyl sulfoxide-d6 (DMSO-d6) which was used as a frequency lock around the tube. Three samples were drawn from each group, including the controls, and analysed using the NMR spectrometer.

The NMR spectrometer information was received and the chemical shift and relative integration values of H_2O, OH, CH_2 and CH_3 peaks on the NMR spectra recorded. All the data was entered into a Microsoft Excel© 2000 spreadsheet and then from there transferred into SPSS© software package for statistical analysis. The Kruskal-Wallis test was used to make a comparison between the eight unpaired groups. If a significant difference occurred between the groups

individual comparisons between groups were made using the non-parametric Mann-Whitney test. The significant value was set at $\alpha = 0.05$.

Results

The results of this study revealed significant differences between the Hahnemannian and Radionic samples. The chemical shift values of the parallel potencies showed significant differences for the H_2O, CH_2 and CH_3 peaks. A significant difference for the OH peaks was observed between the 30C potencies. The relative integration values showed a significant difference for the OH and CH_3 peaks between the parallel 12C and 30C potencies but not between the parallel 6C potencies.

Conclusion

From studying the results it can be concluded that the respective manufacture methods resulted in the NMR spectra of the parallel potencies being significantly different (exhibiting distinctive physico-chemical properties) thus confirming the hypotheses of the study. The standardisation of the process of preparing homoeopathic remedies is important as different methods produce potencies with distinct physico-chemical identities. Further studies into different methods should be researched in order to control and standardise the production of potencies.

TABLE OF CONTENTS Page

CHAPTER FOUR

THE RESULTS

LIST OF TABLES AND FIGURES

Appendix B

TABLE OF ABBREVIATIONS

B_o	Static magnetic field
C	Centesimal
CH	Centesimal Hahnemannienne
CH_2	Methylene group
CH_3	Methyl group
DMSO-d6	Dimethyl sulfoxide-d6
h	Planck's constant
H_2O	Water
Hz	Hertz, represents the frequency
ml	Millilitre
NMR	Nuclear Magnetic Resonance
OH	Hydroxyl group
ppm	Parts per million
S.G.	Specific gravity
α	Significance value of the tests
δ	Delta represents the chemical shift
ΔE	Energy difference

DEFINITIONS

Avogadro's number

According to Amedeo Avogadro the number of molecules in one mole of substance is 6.02554×10^{23}. Depending on the substance once it is diluted beyond 12C (24X on the decimal scale) Avogadro's number has been exceeded and no molecules of the substance are left in the solution (Kayne, 2006).

Batch

A set of things or people dealt with together (Oxford, 2004).

Centesimal

This is a scale used which refers to the number of successive dilutions (1:100), each succeeding potency contains one hundredth part of the preceding potency. The 'c' indicates that it is the centesimal method (Kayne, 2006).

Chemical shifts

The chemical shift of a nucleus is the difference between the resonance frequency of the nucleus and a standard, the chemical shift is a very precise metric of the chemical environment around the nucleus (Hornak, 2000).

Clathrates

Clathrates consist of shells of organized hydrogen-bonded of a solvent which surrounds small clusters of a pharmaceutical substance which are formed during the grinding process and the initial dilutions of the substance (Anagnostatos, 1994).

Fourier transforms

The Fourier transform is a mathematical technique that converts time domain data to frequency domain data, an inverse Fourier transform coverts the frequency domain to the time domain (Hornak, 2000).

Integration values

Integration ratios of NMR signals give information about the relative number of spin-active nuclei associated with each resonance. The area under the NMR signals is proportional to the number of spin active nuclei causing the signal. The area under the NMR signal is acquired through integration of the peaks of the NMR spectra (Williams, 1986).

Larmor frequency

The frequency or rate of precession of the nuclear magnetic moment (spins) and is proportional to the magnetic field strength. Radio waves of the Larmor frequency are used to produce RF pulses (Elp, 2009).

Law of similars

The homoeopathic medical art is based on this law, the use of similars to cure disease. Let similars be cured by similars (O'Reily, 1996).

Mother tinctures

These are liquid preparations resulting from the extraction of the starting material with alcohol/water mixture which forms the starting substance for the production of most homoeopathic medicines (Kayne, 2006).

NMR spectroscopy

This is the study of the interaction of electromagnetic radiation with matter; it uses the NMR phenomenon to study physical, chemical and biological properties of matter (Hornak, 2000).

Percussion

A technique of examining part of the body by tapping it with the fingers or an instrument and sensing the resultant vibrations (Oxford Medical Dictionary, 2002).

Potentisation

Also known as dynamisation. This is a two step process involving dilution and succussion, because it increases the therapeutic strength it is referred to as potentisation (Kayne, 2006).

Pharmacopoeia

A book containing a list of drugs used in medicine, with details of their formulae, methods of preparation, dosages, standards of purity, etc. (Oxford Medical Dictionary, 2002).

Potency

The divisions or dilutions of a substance (liquid or solid) are attenuations if succussed at intervals, they are called potencies or dynamizations (Gaier, 1991).

Radionics

Radionics is an instrumental radiesthesia, a variant of medical dowsing in which no, or very few, instruments are required (Baerlein and Dower, 1980).

Remedy

Medicine that cures or relieves a disease, that assists in the management of disease (Oxford, 2004).

Succussion

The solution is subjected to vigorous shaking with impact to produce the desired potency (Kayne, 2006).

INTRODUCTION

Hahnemann's experimentation and experience in manufacturing homoeopathic medication laid down a foundation resulting in standardised methods outlined in the pharmacopoeias, for example the German Homoeopathic Pharmacopeia (GHP), which was utilised in this study. However over many years there have been various modified potentisation techniques. This has made the standardisation of the individual homoeopathic remedies increasingly difficult. Radionic techniques invented by Malcolm Rae using an instrument, the 'magnetogeometric potency simulator', are used to prepare potentised medicines. The technique differs from the methods discovered by Hahnemann which will be discussed further in chapter 2.

Nuclear Magnetic Resonance (NMR) is a tool which is used to study the physical, chemical and biological properties of matter. Certain homoeopathic medicines (high potencies) are considered to be ultra-high dilutions; diluted to the point at which not a single molecule of the original starting substance remains. Once the substance is diluted to 12C, Avogadro's number has been reached and no molecules of the substance are left in the solution. NMR being well suited to study the kinetic and structural properties of water has been used to analyse various homoeopathic remedies (Aabel, 2001, Hornak, 2000, Kayne, 2006).

Radionic machines are used by some practitioners to produce 'homoeopathic remedies', the objective of this study is to determine, using NMR spectroscopy, whether significant differences exist between parallel potencies produced through the standard Hahnemannian methods of potentisation which are outlined in the GHP, and those that are produced through the use of a Radionic device (The Rae Potency Simulator).

1.1 THE AIM OF THE STUDY

The purpose of this study was to compare Hahnemannian and Radionically prepared centesimal potencies of *Natrum muriaticum* using nuclear magnetic resonance spectroscopy.

1.2 THE OBJECTIVES OF THIS STUDY

1.2.1 The first objective

To compare and evaluate the NMR spectra of *Natrum muriaticum* 6C potencies prepared by Hahnemannian and Radionic methods with respect to the chemical shifts and integration values of the CH_2, CH_3, H_2O and OH signals.

1.2.2 The second objective

To compare and evaluate the NMR spectra of *Natrum muriaticum* 12C potencies prepared by Hahnemannian and Radionic methods with respect to the chemical shifts and integration values of the CH_2, CH_3, H_2O and OH signals.

1.2.3 The third objective

To compare and evaluate the NMR spectra of *Natrum muriaticum* 30C potencies prepared by Hahnemannian and Radionic methods with respect to the chemical shifts and integration values of the CH_2, CH_3, H_2O and OH signals.

1.3 THE HYPOTHESES

1.3.1 The first hypothesis

It was hypothesized that differences existed between the chemical shift (δ) and integration values of CH_2, CH_3, H_2O and OH signals of 6CH, 12CH and 30CH potencies of *Natrum muriaticum* which have been produced according to Hahnemannian and Radionic methods respectively.

1.3.2 The second hypothesis

It was hypothesized that the potentisation processes of the two respective methods (Hahnamannian and Radionic) would produce distinctly different physico-chemical identities of parallel potencies of *Natrum muriaticum.*

In order to conclude whether the aim and these hypotheses are accepted the samples were analysed using NMR spectroscopy and the data was processed using statistical analysis.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

Samuel Hahnemann was the physician that founded and formulated the laws and principles on which homoeopathy is based. The treatment of a patient follows two basic principles: firstly the law of similars which states that the symptoms a substance can induce in a healthy subject are the same symptoms it can cure in a diseased one and secondly the substance used to treat the patient is prescribed in an infinitesimal dose (Hahnemann, 2003).

Certain homoeopathic medicines (high potencies) are considered to be ultra-high dilutions; diluted to the point at which not a single molecule of the original starting substance remains, i.e. beyond Avogadro's number. This has been a controversial issue scientifically because of the difficulty in detecting even one molecule of the substance in a homoeopathic solution diluted more than 10^{24}; however NMR has been used to investigate homoeopathic solutions (Aabel, 2001).

NMR studies comparing homoeopathic remedies produced by different manufacture methods have confirmed the existence of distinct physico-chemical properties.

Davies (2001), when comparing Hahnemannian and Korsakovian methods of manufacture of *Natrum muriaticum*, discovered that the respective methods of manufacture produced remedies with significantly different chemical shift values; he concluded that parallel potencies of *Natrum muriaticum* produced by the two respective methods were dissimilar.

Similar conclusions were drawn by Erasmus (2004) who compared homoeopathic remedies produced by Hahnemannian and Anthroposophical Extended Medicine Methods; NMR spectroscopy revealed that the respective remedies possessed significant differences in CH_2 and CH_3 signals concluding that each method of potentisation investigated created a remedy with a distinct physico-chemical identity.

The objective of this study is to determine using NMR spectroscopy whether significant differences exist between parallel potencies of *Natrum muriaticum* produced through the standard methods of potentisation (centesimal Hahnemannian

method as stated within the German Homoeopathic Pharmacopoea [GHP], and those produced through the use of a Radionic device (The Rae Potency Simulator). The GHP did not contain a monograph for the manufacture of Natrum muriaticum, thus the monograph contained within the Encyclopaedia of Homoeopathic Pharmacopoea (2002:1763) was applied, which prescribed the used of Sodium chloride as the starting material for manufacture of Natrum muriaticum. Lyell (2004) too, used Sodium chloride for the starting material for the manufacturing of parallel potencies of Natrum muriaticum for an NMR spectroscopy study to determine the effect of succussion on the potencies.

2.2 HOMOEOPATHIC POTENTISATION

2.2.1 Historical perspectives

The manufacturing of homoeopathic remedies through the method of 'potentisation' was developed by Samuel Hahnemann. The process follows precise instructions that are stated in the sixth edition of the *Organon* (O'Reilly, 1996), based on many years of experience.

Hahnemann decided to experiment with Cinchona bark upon himself while translating Cullen's *Materia Medica*. This led him to the discovery of a fundamental principle, the *Similia* (like cures like) principle and through the application of this principle Hahnemann discovered that the use of smaller doses decreased the toxicological effect while still maintaining the therapeutic effect. In 1796 Hahnemann published an article 'Essay on a New Principle for Ascertaining the Curative Powers of Drugs, and Some Examination of the Previous Principles' in which he referred to using small doses of the substance (Barthel, 1991).

In 1801 Hahnemann published an information brochure on the 'Cure and Prevention of Scarlet Fever' in which he described serial dilution as well as 'shaking' the solution. In the First edition of the *Organon* (1810) he referred to vigorous shaking. In 1814, in an article 'A method of treating typhus', he says 'shaken vigorously for three minutes', he also describes potentisation on the millesimal scale (1:1000), using 12 vials (Barthel, 1991).

Hahnemann also worked with dilutions up to the sextillionth dilution between 1801 and 1811. In volume two of *Materia Medica Pura* (1816), Hahnemann mentions dilution on the centesimal scale with a dilution ratio of 1:100 as far as 30C of *Arsenicum album* and the remedies are 'well shaken' or 'accurately shaken' (Barthel, 1991:113).

In 1821 in the volume 6 of *Materia Medica Pura* Hahnemann mentions for the first time 10 succusions. In 1824 in the Third edition of the *Organon* the method of potentisation changed to trituration up to 3C and only two succussions. In 1837 Hahnemann recorded a change in his method going back to 10 succussions, in the Third volume of *Chronic Disease* (Barthel, 1991).

When the triturated or crude substance is diluted through serial dilution in water or an ethanol-water solution in definite ratio through the potentisation process, the pharmacological message of the original substance is transferred to each potency. The process of succussion activates and arouses the latent curative powers. Important properties of the substances, for example sodium chloride (NaCl), are only observed after dynamization (Gaier, 1991).

The steps in the potentisation process may result in the production of a substance without the physical presence of the initial substance; the remedy may be diluted to the point where there are no original molecules of the original substance present (Aabel, 2001). Anagnostatos (1994) suggests that in a three step hypothesis, the specific organization of the molecules in a solvent have shells of organized hydrogen-bonded molecules of the solvent (clathrates) which are formed around the active molecules of the substance. The clathrate corresponds to the initial substance and therefore possesses some of the properties of that substance even without the physical presence of that substance.

2.2.2 Orthodox homoeopathic potentisation methods

Methods of potentisation and dispensing of remedies is explained in detail in Hahnemann's *Chronic Diseases*, *Materia Medica Pura*, the *Organon* and the homoeopathic pharmacopoeial texts. The first pharmacopoeial form of Hahnemann's method of potentisation was set out in Carl W Caspari's *Homoeopathic Dispensatory* (Gaier, 1991).

Hahnemann's method of potentisation involves using separate vials for each step in the process; each vial is numbered and marked with the name of the substance, then placed in numerical order. Each vial is filled with ninety-nine drops of dilute alcohol; one drop of the solution is added to vial number one and succussed and allowed to rest for three minutes. As illustrated in the previous section, Hahnemann for some time could not decide on the number of succussions necessary. The number of succussions depends on the individual concerned and the pharmacopoeia being used. With each individual manufacturing process the number of succussions is always constant. One drop from vial number one is then added to vial number two and the process is repeated. A symbol H, after the deconcentration level, for example 6CH indicates the use of the Hahnemannian method of potentisation (Gaier, 1991, Kayne, 2006).

General von Korsakoff simplified Hahnemann's lengthy procedure by the use of only one vial; his explanation for this procedure was that sufficient liquid would adhere to the inner surface of the vial from the first deconcentration once the vial is emptied. This would provide one drop required to prepare the next stage. New solvent is then added and the vial is agitated vigorously and the process is repeated. The symbol K is used to denote the use of the Korsakovian method, for example CK. Davies (2001) using NMR proved that Hahnemannian and Korsakovian potencies of *Natrum muriaticum* were not equivalent (Gaier, 1991, Kayne, 2006).

The liquid potencies are prepared according to decimal, centesimal and quinquagenimillesimal (fifty millesimal) scales. The decimal scale (D) contains one tenth part of the homoeopathic drug and the succeeding potencies contain one tenth of the preceding potency. The centesimal scale (C) contains one hundredth part of the original drug substance and the succeeding potencies contain one hundredth part of the preceding potency (Gaier, 1991).

2.3 RADIONICS

2.3.1 History of Radionics

Radionics is used both to analyse the health status of patients as well as in the treatment of disease. Specialized equipment has been developed and is applied in order to treat patients particularly in the instance of energy imbalances. Radionics was developed when a neurologist called Dr Albert Abrams discovered a dull sound on percussion of the abdomen of certain diseased patients. A particular dull sound was observed above the navel in those suffering from cancer. Abrams' theory about the change in the percussion note in certain diseases was that since matter is electrical in nature, certain radiations from diseased tissue affect nerve fibres resulting in a muscle contracting reflex in defined areas. Abrams developed an instrument to measure a patient's energy, he also discovered that there was no need for a patient to be present, a blood sample from the patient could be placed into the instrument and the patient's condition analysed.

A successor of Abrams, Ruth Drown improved the original instrumentation and developed a Radionic camera which would take photographs of the patient's organs and internal anatomy at long range. Her instruments are no longer used today but her 'rates' or dial settings are still used on more modern instruments. George De La Warr designed and produced many new instruments after being asked to make a copy of Ruth Drowns' camera. He conducted comprehensive research into this subject (Baerlein and Dower, 1980, Bradford, 1996).

Malcolm Rae became an influential figure in the modern Radionics. He was a skillful pendulum operator who extensively researched his methods and he added to the development of Radionics with the invention of his instruments. One of Rae's most remarkable inventions was his 'magnetogeometric potency simulator' which is discussed further in 2.3.3 (Baerlein and Dower, 1980, Bradford, 1996).

2.3.2 Clinical application of Radionics

A trained radiesthetic sense with the aid of an instrument can select the remedy needed to prescribe to a patient. Radiesthetists use a 100cm rule to measure potency energy of a remedy, the sample is located on zero of the rule; a pendulum is

moved from left to right taking note of where the pendulum swings at exact right angles to the rule. This point indicates the potency of the remedy. This indicates the boundary between the remedies local energy field and a component of the earth's magnetic field (Rae, 1977).

The treatment of the patient is done through transmitting corrective 'healing energies' over any distance to the patient, or transferring similar 'energies' to sugar pills to be taken by mouth, using Radionic 'instruments' or devices (Fellows, 1997).

2.3.3 Radionically prepared 'homoeopathic remedies'

Radionically prepared homoeopathic remedies are prepared using an energy pattern which mimics the therapeutic action of the original substances. The creation of a unique value (Radionic rate) representing each remedy from the homoeopathic *Materia Medica* is used therapeutically. The practitioner is able to use instrumentation to produce such remedies (Franks, 2000).

Radionically prepared homoeopathic remedies can be prepared using one of Rae's inventions a 'magnetogeometric potency simulator'. Magneto Geometry was developed by Rae (1977), when he made a series of measurements in respect to several different remedies using the remedy vial as the central point and finding the balance point along the rule, with it pointing in turn to each of the Cardinal and half Cardinal points of the compass. The results were then plotted on polar graph paper, and the adjacent points joined by straight lines to form a geometric pattern relating to each remedy. This interaction resulted in certain distinct patterns relating to different remedies. Rae noted that if the interaction of the remedy's energy field with the earth's field resulted in a pattern related to the remedy, it seemed not unlikely that the interaction of the earth's field and the pattern could be used to create a replica of the remedy. The individual patterns are then printed on cards which are placed into the 'potency simulator' to produce the remedy.

There is a vast range of cards with the geometric patterns representing many different homoeopathic remedies. These cards are used in conjunction with the 'potency simulator' to manufacture their corresponding remedies. The 'potency simulator' can be used in two ways, to subject the patient directly to the energy pattern by placing a witness (e.g. a strand of the patients hair) in the well of the

instrument, or to impregnate distilled water or lactose tablets with the energy pattern of the specific remedy (Baerlein, Dower, 1980:24).

Crude starting substances are not used in the manufacture of Radionically produced remedies nor are the processes of dilution and succussion applied. Practitioners prescribing these remedies however do so according to homoeopathic principles. No studies have been conducted comparing and verifying the effectiveness or similarity of such remedies with the corresponding remedies produced according to conventional Hahnemannian methods.

Radionically produced remedies have certain advantages, they are prepared by magneto-geometry and the standard is consistently accurate to which the individual cards are drawn. The remedies do not vary according to variations in mother tinctures which can occur when producing remedies using the standard methods. Radionic remedies are economically beneficial to practitioners as each card for individual remedies can produce unlimited quantities in any potency. Practitioners don't need to store large stocks of remedies and also have any concerns regarding shelf life of the remedies as Radionic remedies can easily be produced on demand using the Potency Simulator and the cards (Rae, 1977).

2.4 NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

2.4.1 Introduction

Nuclear magnetic resonance (NMR) is a tool which can be used to investigate homoeopathic potencies, especially those beyond the molecular level of testing (Bol, 1997). It is used to study the physical, chemical and biological properties of matter. The protons possess a property called spin which are small magnetic fields which cause an NMR signal (Hornak, 2000). When placed in a strong magnetic field there is a process whereby interactions between magnetic dipoles and electromagnetic radiation are observed (Weingartner,1990).

Nuclei of certain atoms, when immersed in a static magnetic field and exposed to a second oscillating magnetic field, show the NMR phenomenon. Some nuclei do not experience this phenomenon; it is dependent on whether they possess spin. Spin comes in multiples of a half and can be positive (+) or negative (-). Electrons, protons and neutrons that are unpaired each possess a spin of a half. When the proton is

placed in the external magnetic field, the spin vector aligns itself with this external field similarly how a magnet would (Hornak, 2000). Certain nuclei like protons, carbon-13 and fluorine-19 are said to be spin-active when placed in a strong magnetic field as they absorb the electromagnetic radiation, they can orientate themselves in more than one way either with the external field or against it. The frequencies of these spin –active nuclei can be detected by the NMR spectrometers (Williams, 1986).

The particle with a net spin within a magnetic field is able to absorb a photon; when this occurs it undergoes a transition, from a lower energy state into an upper energy state. The energy of this photon must exactly match the energy difference between the two states (Hornak, 2000). The energy difference (E) is directly proportional to the magnetic field strength; this is a fundamental observation of the NMR phenomenon (Williams, 1986).

The photon's energy (E), is related to its frequency (v), by Plank's constant ($h=6.626 \times 10^{-34}$ J s).

$$\triangle E = hv$$

The quantity v is called the resonance frequency and the Larmor frequency.

The frequency of the photon in the NMR experiment is in the radio frequency (RF) range.

The signal in the NMR spectroscopy results from the difference between the energy absorbed by the spin, which make a transition from the lower energy state to the higher energy state, and the energy emitted by the spins, which simultaneously make a transition from the higher state into the lower energy state. The signal is thus proportional to the population difference between the states. It can be illustrated by the following equation:

$$N- / N+ = e^{-E/kT}$$

At room temperature, the number of spins in the lower energy level, N^+, slightly outnumbers the number in the upper level, N^-. Boltzman statistics tells us that.

The energy differences between the spin states is the E, k is the Boltzmann's constant, 1.3850×10^{-23} J/Kelvin, T is the temperature in Kelvin (Hornak, 2000).

There are four NMR parameters that are used for quantative and qualitative analysis. These are chemical shifts, spin-spin coupling constants, relaxation times and integrations (Williams, 1986).

i) Chemical shifts

The main analytic use of this parameter is qualitative. The chemical shift of a nucleus is the difference between the resonance of the nucleus and a standard, relative to the standard (Hornak, 2000). The usual standard is tetramethylsilane (TMS) whose proton and carbon resonances are highly shielded and are defined as the zero point of the spectrum (Williams, 1986).

An isolated nucleus has a set Larmor frequency but in a molecule for example a carbon atom with other carbons and hydrogen as well as other elements which are bonded to it, the Larmor frequencies differ. Electrons in a molecule create small magnetic fields around the nucleus which oppose the external magnetic field, $B_{O.}$ This shield will vary according to the electron density at a particular nucleus which is dependent on molecular structure. Chemically different nuclei will then be shielded to different extents and will then resonate at slightly different frequencies (Williams, 1986).

Measuring absolute frequencies is difficult in NMR spectroscopy it is easier to measure precise frequency differences between resonances, the positions of these resonances are measured with respect to their shift from the standard which is added to the sample. The set of resonances are said to have chemical shifts with respect to TMS which is used as the standard, the twelve protons and four carbons are highly shielded and it does not interact with samples.

Chemical shift is given from the ratio of frequency difference between the resonance and that of TMS and the operating frequency.

$$\delta = \frac{v_R - v_{TMS} \times 10^{-6}}{v_{spectrometer}}$$

v_R is the resonance frequency of the nucleus in question, v_{TMS} is the resonance frequency of TMS and $v_{spectrometer}$ is the operating frequency in MHz (Williams, 1986).

ii) Spin-spin coupling (J Coupling)

Coupling constants are measured in Hertz (Hz) and provide information about the number of adjacent spin-active nuclei via the $2nI + 1$ rule. This rule helps explain the presence of some patterns of peaks in carbon-13 and proton NMR spectra that have nothing to do with the compound being studied. The '*n*' stands for the number of equivalent nuclei coupling to the nucleus under consideration, while *I* is their spin quantum number. Spin active nuclei are able to sense the various spin states of adjacent nuclei (Williams, 1986). Nuclei experiencing the same chemical environment or chemical shift are called equivalent and those nuclei experiencing a different environment or having different chemical shifts are non-equivalent. When nuclei are non-equivalent on the NMR spectrum the effect is called spin-spin coupling (Hornak, 2000).

iii) Relaxation times

Relaxation times affect the intensity and shape, specifically the line widths of the NMR signals. The spin-active nucleus can be excited from its lower spin state to a higher spin state by radiofrequency radiation at its Larmor frequency however the spin-active nucleus must lose that extra energy if it is to return to the lower spin state. This means that where the energy is lost it is known as relaxation. There is a loss of spin energy to the molecular system –spin- spin-lattice relaxation- or transfer of spins between nuclei- spin-spin relaxation. The

rates of these processes are exponential decays governed by time constants T_1 and T_2 (Williams, 1986).

T_1 is known as the spin-lattice relaxation time, this process occurs by the loss of energy from the excited nuclear spins to the surrounding molecular lattice. T_2 is the spin-spin relaxation which arises from the redistribution of energy among the spin system, as with spin-lattice relaxation, it gives rise to an exponential decay in the observed signal (Abrahams, Fisher, Loftus, 1988).

A macroscopic number of nuclei in a magnetic field distribute themselves among the various energy levels according to the Boltzman distribution,

$$N- / N+= e^{-E/kT}$$

When substituting the appropriate values into this equation it would tell us the populations of the two spin states, when in equilibrium, are nearly equal, typically there are only about five spins per million excess in the lower energy state. This shows us why relaxation time is so important to NMR spectroscopy, if the excited nuclei could not relax back to the lower energy state then the NMR signal will be lost after just one scan (Williams, 1986).

iv) Integrations

Integration ratios of NMR signals give information about the relative number of spin-active nuclei associated with each resonance. The area under the NMR signals is proportional to the number of spin active nuclei causing the signal. The area under the NMR signal is acquired through integration of the peaks. The result is displayed as a ‘step’ curve by the instrumentation, the height of each curve is proportional to the area underneath (Williams, 1986).

2.4.2 NMR spectrometer

The NMR spectrometer has four main features a magnet with a device for stabilising the magnetic field, a sample probe which encases the sample and allows resonance to take place, a source of radiofrequency radiation and a data recorder.

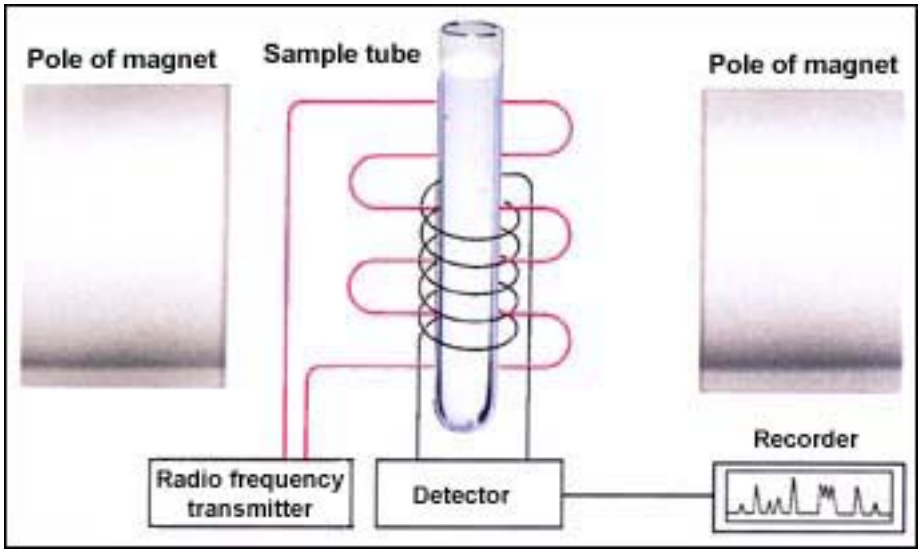

Figure 1 - A simple diagram of an NMR spectrometer (Brookscole,2009).

The pulse of radiation from the NMR spectrometer contains a broad band of frequencies and it causes all the spin-active nuclei to resonate at once at their Larmor frequencies. The detector system in the spectrometer senses the changes in magnetisation of the sample and the decay of the magnetisation with respect to time. The decay is called the *free induction decay* (FID). The NMR spectrum is complex and the FID is difficult to interpret. The mathematics of Fourier Transfer (FT) is used to change the FID spectrum which is a *time-domain* spectrum into a frequency-domain spectrum (Williams,1986).

The NMR spectrometer computer will perform the Fourier Transfer on the data collected to give a graphical representation of the readings obtained (Hornak, 2000).

2.4.3 Analysis of ultra-high dilutions using NMR

NMR has been shown to be a reliable tool in testing homoeopathic remedies; Barnard (1965) developed the idea of the solvent carrying the information content of the original solute rather than the solute itself. Smith and Boericke (1966) pioneered NMR research on homoeopathic remedies trying to evaluate Barnard's idea. They found characteristic differences in the NMR spectra of potentised and non-potentised remedies of Sulphur D12. Since then further NMR studies have been conducted with successful results (Weingartner, 1990).

Using NMR Erasmus (2004) successfully demonstrated that distinct chemical shifts of CH_2 and CH_3 signals exist for remedies produced using the Hahnemannian and Extended Medicine Methods respectively, i.e. each possessed distinct physico-chemical identities.

Davies (2001) also using NMR found a significant difference between the chemical shift values in comparing Hahnemannian and Korsakovian test potencies of Natrum muriaticum, however the relative integration values showed no significant differences for any of the peaks or potency levels. The final conclusion drawn was that potencies of *Natrum muriaticum* produced by the respective potentisation methods were not equivalent.

Lyell (2004) studied the effects of succussion on parallel potencies of *Natrum muriaticum* using NMR. The results showed that the number of succussions has an effect on the physiocochemical structure of the samples. The study also confirmed that succussion did have a statistically significant effect on the samples that were examined as compared to those not succussed.

Homoeopathic research using NMR is worthwhile in terms of standardizing each potency but also in the standardization of the preparation of homoeopathic remedies to ensure the highest quality of homoeopathic practice and manufacture (Botha, 2009)

2.5 Summary

Based on previous NMR studies it is evident that the method of manufacture of homoeopathic remedies and the degree of succussion influences the NMR spectra thereof effectively producing distinctly different substances. It has also been proven that remedies that are succussed are different to those that don't include this step in the manufacturing process. It is anticipated therefore that the NMR spectra of Radionically produced remedies (although prescribed under similar circumstances to the routinely manufactured remedies) will have dissimilar NMR spectra to those of 'equivalent' remedies produced by Hahnemannian methods. This is particularly due to unique production of Radionically produced remedies i.e. the absence of succussion and dilution and the absence of crude starting materials.

CHAPTER THREE

MATERIALS AND METHODS

The study started with the production of the samples utilising both Hahnemannian and Radionic methods. The samples were then measured using NMR and the data collected was statistically analysed.

3.1 PRODUCTION OF SAMPLE POTENCIES

The sample potencies produced were of two manufacture methods. The method of manufacture of the Hahnemannian potencies is detailed in 3.1.1 and the method of manufacture of the Radionic potencies outlined in 3.1.2 respectively.

3.1.1 Production of Hahnemannian samples

The Hahnemannian samples of 6CH, 12CH and 30CH *Natrum muriaticum* were prepared according to the German Homoeopathic Pharmacopoeia (GHP) method 5a; the samples were manufactured by hand and not by machine (British Homeopathic Association, 1985).

Sodium chloride (NaCl) was used as the starting substance for the Hahnemannian group according to the monograph in the *Encyclopaedia of Homoeopathic Pharmacopoeia* (2002:1763), NaCl was used as the starting substance for the manufacturing of remedies of *Natrum muriaticum* in an NMR spectroscopy study on the effect of succussion on potencies (Lyell, 2004). The NaCl used in this study was obtained from the Chemistry department at DUT, they received the NaCl from Merck Chemicals, the Batch number was 1025110. The NaCl was dissolved into an aqueous i.e. *Aqua distillata* preparation according to method 5a of the GHP (Appendix A) for the manufacturing of the 1CH. The proceeding samples of *Natrum muriaticum* from the 1CH were prepared also according to the instructions of method 5a from the GHP in the laminar flow room at a DUT laboratory to avoid contamination (GHP, 1985). Method 5a states that 43% alcohol should be used in the preparation however 87% alcohol was used in order to be reproducible and congruent with the other NMR studies. The glass bottles that were used were autoclaved and sterilised before use. The same batch of 87% (Specific Gravity

0,850) alcohol was used throughout the process for the Hahnemannian and Radionic remedies as well as the controls.

The Hahnemannian samples consist of 6CH, 12CH and 30CH potencies and a control of 87% alcohol.

German Homoeopathic Pharmacopoeia- Method 5a - Solutions

The Hahnemannian samples were liquid preparations made from a basic drug substance, NaCl. Firstly 1CH *Natrum muriaticum* was manufactured using 0.1 g of sodium chloride which was placed into a 25 ml amber bottle containing 9,9ml of distilled water and allowed to dissolve before succussing it 10 times.

The 2CH to 29CH potencies were manufactured by placing 2.97ml of 87% alcohol into a 5ml screw top bottle and then adding 0.03ml of 1CH *Natrum muriaticum* and succussing it 10 times for each of the potencies.

A 25ml amber bottle was used in the final process to be able to produce enough of the liquid potency for three samples of each of the 6CH, 12CH and 30CH potencies to be analysed. Firstly 15.84ml of 87% alcohol and 0.16ml of the preceding potency is placed into the 25ml amber bottle which is then succussed 10 times to produce the required potency.

A detailed description of the methodology is stated within Appendix A.

3.1.2 Production of Radionic samples

The Radionic samples of 6CH, 12CH and 30CH *Natrum muriaticum* were produced using the 'magnetogeometric potency simulator'. A card representing *Natrum muriaticum* was placed into the card slot in the simulator and an amber glass bottle containing 87% alcohol was placed into the well of the simulator. The same batch of 25ml amber glass bottles and alcohol used in the Hahnemannian remedies was used for the Radionically prepared remedies.

The potencies 6C, 12C and 30C were prepared by changing the setting of the dial on the simulator to the appropriate potencies and leaving the neutral alcohol in the simulator for six minutes each.

The Radionic and the Hahnemannian control comprised alcohol of the same batch and concentration used to produce all the other samples. The control was placed in the simulator, no card was placed in the machine and the dial was set on neutral, this setting is used to convert potentised remedies back to neutral, unpotentised substances, the alcohol was left in the simulator for six minutes.

3.2 Handling of samples

The remedies were stored in a temperature controlled environment and away from any magnetic influences.

The samples together with the controls were transported to the Chemistry Department at University of Kwa-Zulu/Natal, Pietermaritzburg, they were transported in a box filled with tissue paper by car and were kept away from light and any electric devices or devices that would emit radiation.

3.3 NMR Measurements of Samples

At the NMR laboratory samples from each respective potency and manufacture method were drawn with separately allocated boro-silicate glass Pasteur pipettes, Milgrom (2001) suggests the use of boro-silicate, the remedies in each of the bottles were labelled A to H (The Radionic remedies were labelled A,B,C. A=6CH, B=12CH, C=30CH, D=control for Radionic remedies and the Hahnemannian remedies were labled E, F, G. E=6CH, F=12CH, G=30CH, H=control for Hahnemannian group.) Each of the remedies A to H was sampled using three separate runs which were analysed using NMR.

Each remedy was dispensed from a pipette into a boro-silicate glass NMR tube; the tube was then sealed with a plastic cap. A co-axial capillary tube containing Dimethyl sulfoxide- d6, DMSO-d6 was used as a frequency lock around the tube; (mixing of the DMSO-d6 with the sample does not take place).The tubes were placed into a turbine; they were set at a correct position for the magnet centre line with the centre line of the sample. The turbine was lowered into the magnet using compressed air lift or drop (Grimmer, 2008).

Once thermal equilibrium was reached the lock was applied and the magnet was shimmed, the purpose of shim coils is to correct minor spatial in-homogeneities in the magnetic field, the NMR experiment was then carried out. Then turbine was ejected from the magnet using compressed air lift (Hornak, 2000, Grimmer, 2008).

The proton spectra were acquired on a Bruker Avance III NMR spectrometer with an 11.7 T Oxford Cryogenics magnet; proton frequency 500 MHz and the sample temperature was 30 °C. The serial number for the NMR system used was HH0068-06.

Samples were prepared immediately before use and were temperature-equilibrated before any data was acquired. The pulse sequence was zg30 (30 degree read pulse) with 64K acquired data points on each scan; 32 scans for each spectrum were acquired.

The NMR spectrometer computer performed the Fourier transform on the data collected to give a graphical representation of the readings obtained, a standard Fourier transform with no weighting, zero-filling to 256K data points was used (Grimmer, 2008).

3.4 Statistical Analysis

The NMR spectrometer information was received and the chemical shift and relative integration values of H_2O, OH, CH_2 and CH_3 peaks on the NMR spectra was recorded. The CH_2 and CH_3 peaks on the spectra consisted of more than one peak, for the chemical shift values an average of these values from the peaks were calculated to produce one value. The relative integration values for each peak was calculated from integration values which represent the total area under each peak, the value of each peak was divided by the sum of all the integration values for that specific run.

All the data was entered into a Microsoft Excel© 2000 spreadsheet and then from there transferred into SPSS© software package for statistical analysis. Samples were then compared with each other to determine if statistically significant differences existed between them. Descriptive statistics showing the mean, median and standard deviation for all eight samples were analysed, a Kuskall-Wallis test was

then applied to the data. The sample size per group was small therefore the non-parametric Kruskal-Wallis test was used to make a comparison between the eight unpaired groups. If a significant difference occurred between the groups individual comparisons between groups were made using the non-parametric Mann-Whitney test.

3.4.1 The Kruskal-Wallis test

The Kruskal-Wallis test is a nonparametric test which is used to compare three or more groups of sample data. This test is used when assumptions of ANOVA are not met. When ANOVA is used it is assumed that the distribution of each group should be normally distributed. In the Kruskal-Wallis test there are no assumptions about the distribution or size of the samples.

The process for calculating the Kuskal-Wallis statistics is as follows:

1. Firstly arrange the data of the samples in a single series in ascending order.
2. Assign rank to them in ascending order. In the case of a repeated value, assign ranks to them by averaging their rank position.
3. Once this is complete, ranks or the different samples are separated and summed up as R_1 R_2 R_3, etc.
4. To calculate the value of Kruskal-Wallis test, apply the following formula:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{R_i^2}{} - 3(n+1)$$

H = Kruskal-Wallis test

n = total number of observations in all samples

R_i = Rank of the sample

Kruskal-Wallis test statistics is approximately a chi-square distrubution, with k-1 degree of freedom where n_i should be greater than 5.

If the calculated value of Kruskal-Wallis test is less than the chi-square table value, then the null hypothesis will be accepted. If the calculated value of Kruskal-Wallis test H is greater than the chi-square table value, then we will reject the null hypothesis and say that the sample comes from a different group.

- The significance (α) is set to 0.05
- Null hypothesis

H_o**:** In the Kruskal-Wallis test the null hypothesis assumes that the samples are from identical populations.

- Alternative hypothesis

H_a**:** In Kruskal-Wallis test, alternative hypothesis assumes that the sample comes from different populations.

The hypothesis were accepted or rejected according to the following rule:

Accept H_o: if $p > \alpha$

Accept H_a: if $p \leq \alpha$

The null hypothesis in this NMR study were rejected when differences exist between the chemical shift (δ) and integration values of CH_2, CH_3, H_2O and OH signals of 6CH, 12CH and 30CH potencies of *Natrum muriaticum* which have been produced according to Hahnemannian and Radionic methods respectively.

3.4.2 The Mann-Whitney U Test

Individual comparisons between groups were made using the Mann-Whitney U test. This test is a non-parametric test that is used for determining if the mean of two groups are different from each other.

To calculate the value of Mann-Whitney U test, the following formula is used:

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_2} R_i$$

Where:

U=Mann-Whitney U test

N_1=sample size one

N2= sample size two

R_i = Rank of the sample size

In the Mann-Whitney U test the U represents the P value; this value helps to decide whether or not the mean (median) of two populations are equal. This value was compared to the significant value (α) which was set at 0.05.

The hypotheses were accepted or rejected according to the following rule:

Accept H_o: if $p > \alpha$

Accept H_a: if $p \leq \alpha$

The null hypothesis in this NMR study were rejected when differences exist between the chemical shift (δ) and integration values of CH_2, CH_3, H_2O and OH signals of 6CH, 12CH and 30CH potencies of *Natrum muriaticum* which have been produced according to Hahnemannian and Radionic methods respectively (Winks Statistic Software,2009).

The data from the NMR studies of each of the samples was collected and statistically analysed, the data was then formatted into tables.

CHAPTER 4- THE RESULTS

The results were carefully analysed, descriptive stats for each of the samples were recorded, then a non-parametric Kruskall-Wallis test was used and a significant difference was noted. Therefore a Mann-Whitney test was used to compare the sample groups.

4.1 CRITERIA GOVERNING THE AMISSIBILITY OF THE DATA

Homoeopathic remedies are sensitive to external influences therefore the samples were carefully handled during the preparation, transportation and analysis. During the manufacturing process the samples were prepared precisely and cautiously according to methods 3.1.1 and 3.1.2. The sample bottles were all stored under the same conditions and transported carefully to avoid all external influences. During the NMR analysis three samples were drawn from each bottle in a linear method, using a separate pipette for each bottle to avoid possible contamination. Then sixteen transients per sample were used to generate the NMR spectra. The chemical shift values and the relative integration values were recorded and then subjected to statistical analysis according to 3.4.

4.2 DESRIPTIVE RESULTS

4.2.1 Descriptive statistics- Chemical Shift

Table 1 Descriptive statistics- chemical shift values

		Radionic				Hahnemannian			
		6	12	30	Control	6	12	30	Control
H_2O	Mean	5.160	5.160	5.161	5.160	5.160	5.159	5.158	5.158
	Median	5.160	5.160	5.161	5.160	5.160	5.159	5.158	5.158
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OH	Mean	4.417	4.417	4.418	4.416	5.160	4.417	4.417	4.417
	Median	4.417	4.416	4.418	4.417	5.160	4.147	4.417	4.417
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CH2	Mean	3.489	3.487	3.488	3.487	3.487	3.485	3.485	3.486
	Median	3.487	3.487	3.488	3.487	3.487	3.486	3.485	3.486
	Standard Deviation	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CH3	Mean	1.045	1.045	1.046	1.050	1.045	1.043	1.043	1.044
	Median	1.045	1.045	1.046	1.050	1.045	1.043	1.043	1.044
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

When studying the chemical shifts from the descriptive statistics of all of the samples, the mean and median figures showed differences for the H_2O, OH, CH_2 and CH_3 values therefore one can expect differences when calculating the significant differences between the samples. The standard deviation which indicates any

differences between the three runs for each specific sample showed no variations therefore each run is the same for each of the sample groups. This also validates the choice for using only three runs for each of the samples.

4.2.2 Descriptive statistics – Relative Integration

Table 2 Descriptive statistics- relative integration values

		Radionic				Hahnemannian			
		6	12	30	Control	6	12	30	Control
H2O	Mean	0.133	0.133	0.133	0.133	0.133	0.132	0.132	0.132
	Median	0.133	0.133	0.133	0.133	0.133	0.132	0.132	0.132
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OH	Mean	0.191	0.191	0.191	0.191	0.191	0.193	0.194	0.193
	Median	0.191	0.191	0.191	0.192	0.191	0.193	0.195	0.192
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
CH2	Mean	0.270	0.270	0.270	0.270	0.270	0.269	0.271	0.271
	Median	0.271	0.270	0.270	0.270	0.270	0.269	0.270	0.270
	Standard Deviation	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.002
CH3	Mean	0.404	0.405	0.404	0.404	0.404	0.403	0.405	0.405
	Median	0.404	0.405	0.404	0.404	0.404	0.403	0.405	0.404
	Standard Deviation	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002

The descriptive statistics of the relative integration levels for each of the samples showed no differences for the mean and median H_2O values and the standard deviation however differences in the OH mean values for the Hahnemannian group showed a difference between the individual sample groups therefore it can be expected a difference should occur when calculating the significant differences. These differences once calculated confirm that the sample groups are different. The mean values for the Radionic group showed no differences but median values for both the Radionic and Hahnemannian groups were different. The standard deviation for the Hahnemannian control showed that the OH, CH_2 and CH_3 were slightly deviated by 0.001 and 0.002 which indicates that there is a variation between the three runs that were tested for this sample group.

A standard deviation can also be seen when studying the CH_2 value for the Radionic 12C group and the CH_3 value for the Hahnemannian 30C group therefore a variation also exists between the three runs that were tested for each of these sample groups.

The mean and median values for the CH_2 and CH_3 showed differences between the samples groups except for the CH_2 mean values for the Radionic group there were no differences between these samples indicating that there may be no difference when calculating the significance differences.

Further tests were applied to these results to investigate whether significant differences were present between the sample groups. The Kruskal-Wallis test and the Mann-Whitney test were both used to confirm whether differences existed.

4.3 COMPARISON OF ALL THE DATA OBTAINED

4.3.1 Comparison of Chemical Shift values

Table 3 Comparison of Chemical Shift values

	H_2O	OH	CH_2	CH_3
α*	**0.004**	0.126	**0.005**	**0.002**

*Kuskal-Wallis test

α = p value ≤ 0.05

The comparison of the chemical shift values between the eight samples shows a significant difference between the H_2O, CH_2 and CH_3 peaks for all the samples. The null hypotheses are thus rejected. These significant differences indicate that the samples are not the same and the null hypotheses are thus rejected. An insignificant difference can be observed between the OH peaks. The null hypotheses are not rejected in this case.

4.3.2 Comparison of Relative Integration values

Table 4 Comparison of Relative Integration values

	H_2O	OH	CH_2	CH_3
α*	0.110	**0.008**	0.179	0.074

*Kuskal-Wallis test

α = p value ≤ 0.05

The comparison of the relative integration values of all the samples show an insignificant difference for H_2O, CH_2 and CH_3 peaks. The null hypotheses are not rejected. A significant difference can be observed for the OH peaks. The null hypothesis are thus rejected for these peaks.

4.4 INTRA-GROUP ANALYSIS- Comparing the Radionically prepared remedies

4.4.1 Chemical Shift values

Table 5 Comparing chemical shift values for Radionically prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
a) Radionic 6C vs. Radionic 12C	0.658	0.178	0.513	**0.050**
b) Radionic 6C vs. Radionic 30C	**0.050**	**0.050**	0.507	**0.046**
c) Radionic 6C vs. Radionic Control	**0.046**	**0.050**	0.513	**0.050**
d) Radionic 12C vs. Radionic 30C	**0.050**	**0.046**	**0.046**	**0.046**
e) Radionic 12C vs. Radionic Control	**0.046**	0.817	0.077	**0.050**
f) Radionic 30C vs. Radionic Control	**0.046**	**0.050**	**0.046**	**0.046**

*Mann-Whitney test

p value ≤ 0.05

a) Radionic 6C vs Radionic 12C

The comparison of the chemical shift values of the Radionic 6C vs. Radionic 12C shows a difference for the CH_3 peaks. Thus the null hypotheses are thus rejected and the samples are different. An insignificant difference can be observed between H_2O, OH and CH_2 peaks. The null hypotheses are thus accepted in the case of these three peaks which indicate that the samples are similar.

b) Radionic 6C vs. Radionic 30C

When comparing the chemical shift values of the Radionic 6C vs. Radionic 30C, a significant difference is observable between the CH_3, H_2O and OH peaks. The null hypotheses are thus rejected. These samples are not the same as there is an observable difference between these peaks and the null hypotheses are thus rejected. An insignificant difference is observed between

CH_2 peaks. The null hypotheses are thus accepted for this peak indicating that they are similar.

c) Radionic 6C vs. Radionic Control

The comparison of the chemical shift values of the Radionic 6C vs. Radionic Control shows a difference for the H_2O, OH and CH_3 peaks. The null hypotheses are thus rejected which shows that these samples are different. An insignificant difference is observed between CH2 peaks. The null hypotheses are thus accepted for this peak which indicates that they are similar.

d) Radionic 12C vs. Radionic 30C

Comparing the chemical shift values for Radionic 12C vs. Radionic 30C shows a significant difference for the H_2O, OH, CH_2 and CH_3 peaks. The null hypotheses are thus rejected and the sample groups are different.

e) Radionic 12C vs. Radionic Control

The comparison of the chemical shift values for the Radionic 12C vs. Radionic Control shows a significant difference for the H_2O and CH_3 peaks. The null hypotheses are thus rejected therefore the sample groups are different. An insignificant difference is observable for the OH and CH_2 peaks. Thus the null hypotheses are accepted for these three peaks and the sample groups are similar.

f) Radionic 30C vs. Radionic Control

When comparing the chemical shift values for the Radionic 30C vs. Radionic Control a significant difference was observed for all the peaks. The null hypotheses are thus rejected therefore these sample groups are different.

4.4.2 Relative Integration values

Table 6 Comparing relative integration values for Radionically prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
Radionic 6C vs. Radionic 12C	0.507	0.369	0.507	0.072
Radionic 6C vs. Radionic 30C	0.637	0.346	0.637	0.637
Radionic 6C vs. Radionic Control	0.068	0.068	0.361	0.361
Radionic 12C vs. Radionic 30C	0.513	0.184	0.513	0.077
Radionic 12C vs. Radionic Control	0.507	0.072	0.507	0.072
Radionic 30C vs. Radionic Control	0.072	0.653	0.369	1.000

*Mann-Whitney test

p value ≤ 0.05

When comparing the relative integration values for the Radionic remedies no significant differences were observed for the H_2O, OH, CH_2 and CH_3 peaks. The Null hypotheses for these peaks are thus accepted therefore all the sample groups are similar.

4.5 INTRA-GROUP ANALYSIS- Comparing the Hahnemannian prepared remedies

4.5.1 Chemical Shift values

Table 7 Comparing chemical shift values of Hahnemannian prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
a) Hahnemannian 6CH vs. Hahnemannian 12CH	**0.050**	0.658	**0.050**	**0.046**
b) Hahnemannian 6CH vs. Hahnemannian 30CH	**0.050**	0.827	**0.050**	**0.050**
c) Hahnemannian 6CH vs. Hahnemannian Control	**0.050**	0.827	**0.050**	**0.050**
d) Hahnemannian 12CH vs. Hahnemannian 30CH	0.275	0.827	**0.050**	**0.046**
e) Hahnemannian 12CH vs. Hahnemannian Control	0.275	0.376	**0.050**	**0.046**
f) Hahnemannian 30CH vs. Hahnemannian Control	0.513	0.658	**0.050**	**0.050**

*Mann-Whitney test

p value ≤ 0.05

a) Hahnemannian 6CH vs. Hahnemannian 12CH

When comparing the chemical shift values for Hahnemannian 6CH vs. Hahnemannian 12CH a significant difference was observed for the H_20, CH_2 and CH_3 peaks. The null hypotheses are thus rejected and the two sample groups are different. An insignificant difference was observed for the OH peaks. The null hypotheses for this peak are thus accepted which means that these sample groups are similar.

b) Hahnemannian 6CH vs. Hahnemannian 30CH

When comparing the chemical shift values for the Hahnemannian 6CH vs. Hahnemannian 30CH significant differences were observed for the H_2O, CH_2 and CH_3 peaks. The null hypotheses for these peaks are thus rejected which means that these samples are different. An insignificant difference was observed for OH peaks. The null hypotheses are thus accepted for this peak.

c) Hahnemannian 6CH vs. Hahnemannian Control

The comparison of the chemical shift values for the Hahnemannian 6CH vs. Hahnemannian Control a significant differences for the H_2O, CH_2 and CH_3 peaks. The null hypotheses for these peaks are thus rejected which indicates that these samples are different. An insignificant difference is observable for the OH peaks. The null hypotheses are thus accepted for this peak.

d) Hahnemannian 12CH vs. Hahnemannian 30CH

The comparison of the chemical shift values for the Hahnemannian 12CH vs. Hahnemannian 30CH shows a significant difference for the CH_2 and CH_3 peaks. The null hypotheses are thus rejected which means that the samples are different. An insignificant difference is observable for the H_2O and OH peaks. Thus the null hypotheses are accepted for these peaks therefore the samples are similar.

e) Hahnemannian 12CH vs. Hahnemannian Control

When comparing the chemical shift values for the Hahnemannian 12CH vs. Hahnemannian Control a significant difference was observed for CH_2 and CH_3 peaks. The null hypotheses are thus rejected which indicates that these samples are different. An insignificant difference was observed for H_2O and OH peaks. The null hypotheses for these peaks are thus accepted which means that these samples are similar.

f) Hahnemannian 30CH vs. Hahnemannian Control

Comparing the chemical shift values for Hahnemannian 30CH vs. Hahnemannian Control shows a significant difference for CH_2 and CH_3 peaks.

The null hypotheses are thus rejected therefore the samples are different. An insignificant difference was observed for H_2O and OH peaks. The null hypotheses are thus accepted which means that the samples are similar.

4.5.2 Relative Integration values

Table 8 Comparing relative integration values of Hahnemannian prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
a) Hahnemannian 6CH vs. Hahnemannian 12CH	**0.043**	**0.043**	**0.043**	**0.043**
b) Hahnemannian 6CH vs. Hahnemannian 30CH	**0.043**	**0.046**	**0.043**	0.261
c) Hahnemannian 6CH vs. Hahnemannian Control	**0.043**	**0.046**	0.507	0.507
d) Hahnemannian 12CH vs. Hahnemannian 30CH	1.000	0.105	**0.043**	**0.043**
e) Hahnemannian 12CH vs. Hahnemannian Control	1.000	0.653	0.072	0.346
f) Hahnemannian 30CH vs. Hahnemannian Control	1.000	0.184	0.817	0.507

*Mann-Whitney test

p value ≤ 0.05

a) Hahnemannian 6CH vs. Hahnemannian 12CH

When comparing the relative integration values for Hahnemannian 6CH vs. Hahnemannian 12CH a significant difference is observable for all the peaks. The null hypotheses are thus rejected which means that the samples are different.

b) Hahnemannian 6CH vs. Hahnemannian 30CH

The comparison of the relative integration values for Hahnemannian 6CH vs. Hahnemannian 30CH shows a difference for H_2O, OH and CH_2 peaks. The null hypotheses are thus rejected therefore the samples are different. An insignificant difference is observed for the CH_3 peaks. The null hypotheses are thus accepted for this peak, this means that the samples for this peak are similar.

c) Hahnemannian 6CH vs. Hahnemannian Control

When comparing the relative integration values for Hahnemannian 6CH vs. Hahnemannian Control, a significant difference was observed for H_2O and OH peaks. The null hypotheses are thus rejected which means that the samples are different. An insignificant difference is observable for CH_2 and CH_3 peaks. The hypotheses are thus accepted therefore for these peaks the samples are similar.

d) Hahnemannian 12CH vs. Hahnemannian 30CH

The relative integration values for Hahnemannian 12CH vs. Hahnemannian 30CH, show a significant difference for the CH_2 and CH_3 peaks. The hypotheses are thus rejected and the samples are different. An insignificant difference is observable for H_2O and OH peaks. The null hypotheses are thus accepted for these peaks which indicate that the samples are similar.

e) Hahnemannian 12CH vs. Hahnemannian Control

In comparing the relative integration values of Hahnemannian 12CH vs. Hahnemannian Control no significant differences is observable for all the peaks. The null hypotheses are thus rejected which means that these sample groups are different.

f) Hahnemannian 30CH vs. Hahnemannian Control

The comparison of the relative integration values of Hahnemannian 30CH vs. Hahnemannian Control shows no significant difference between all the peaks.

The null hypotheses are thus accepted which means that these samples are similar.

4.6 INTER-GROUP ANALYSIS – Comparing the Radionic and Hahnemannian prepared remedies

4.6.1 Chemical Shift values

Table 9 Comparing chemical shift values between Radionic and Hahnemannian prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
a) Radionic 6C vs. Hahnemannian 6CH	0.658	0.275	0.513	**0.050**
b) Radionic 12C vs. Hahnemannian 12CH	**0.050**	0.268	**0.050**	**0.046**
c) Radionic 30C vs. Hahnemannian 30CH	**0.050**	**0.050**	**0.046**	**0.046**

*Mann-Whitney test
p value ≤ 0.05

a) Radionic 6C vs. Hahnemannian 6CH

The comparison of the chemical shift values for Radionic 6C vs. Hahnemannian 6CH shows a difference for CH_3 peaks. The null hypotheses are thus rejected which means that the samples are different. An insignificant difference is observed for the H_20, OH and CH_2 peaks. The null hypotheses are thus accepted for these peaks which means that these samples are similar.

b) Radionic 12C vs. Hahnemannian 12CH

In comparing the chemical shift values of Radionic 12C vs. Hahnemannian 12CH a significant difference is seen between H_2O, CH_2 and CH_3 peaks. The null hypotheses are thus rejected which indicates that these samples

are different. An insignificant difference can be observed for OH peaks. The null hypotheses are thus accepted therefore these samples are similar for this peak.

c) Radionic 30C vs. Hahnemannian 30CH

The chemical shift values of Radionic 30C vs. Hahnemannian 30CH, show a significant difference for all the peaks. The null hypotheses are thus rejected which means that these samples are different.

4.6.2 Relative Integration values

Table 10 Comparing relative integration values between Radionic and Hahnemannian prepared remedies

	Significance*			
	H_2O	OH	CH_2	CH_3
a) Radionic 6C vs. Hahnemannian 6CH	0.099	0.814	0.239	0.099
b) Radionic 12C vs. Hahnemannian 12CH	0.507	**0.046**	0.507	**0.046**
c) Radionic 30C vs. Hahnemannian 30CH	0.346	**0.050**	0.487	**0.046**

*Mann-Whitney test
p value ≤ 0.05

a) Radionic 6C vs. Hahnemannian 6CH

The comparison of the chemical shift values of Radionic 6C vs. Hahnemannian 6CH show no significant difference for all the peaks. The null hypotheses are thus accepted which means that these samples are same.

b) Radionic 12C vs. Hahnemannian 12CH

The chemical shift values of Radionic 12C vs. Hahnemannian 12CH, show a significant difference for OH and CH_3 peaks. The null hypotheses are thus rejected which indicates that these samples are different. An insignificant

difference is observable between H_2O and CH_2 peaks. The null hypotheses are thus accepted which means that these samples are similar.

c) Radionic 30C vs. Hahnemannian 30CH

In comparing the chemical shift values of Radionic 30C vs. Hahnemannian 30CH a significant difference is seen between OH and CH_3 peaks. The null hypotheses are thus rejected which means that the samples are different. An insignificant difference can be observed for H_2O and CH_2 peaks. The null hypotheses are thus accepted which means that the samples are similar for these peaks.

The data obtained was statistically analysed and the resultant descriptive statistics, the intra-group and inter-group analyses were recorded, the hypotheses were either accepted or rejected depending on the significant value. The results are further discussed in the following chapter.

CHAPTER 5- DISCUSSION

The purpose of this study was to compare Hahnemannian and Radionically prepared centesimal potencies of *Natrum muriaticum* using NMR spectroscopy. The results of this study suggest that parallel potencies of Hahnemanian and Radionically produced *Natrum muriaticum* differed significantly in terms of their respective NMR spectra.

Intra-group analyses of respective Hahnemannian and Radionic groups revealed significant differences when studying the chemical shift values for H_2O, CH_2 and CH_3 peaks. The OH peaks showed significant differences when comparing Radionic 6C and 30C, 6C and the Radionic control, 12C and 30C as well as the 30C and the Radionic control. There relative integration values for the Radionic group showed no significant results (all Radionic potencies had similar relative integration values), however significant differences were observed when comparing the Hahnemannian 6CH and 12CH, 6CH and 30CH, 6CH and the Hanemannian control as well as the 12CH and 30CH potencies.

On studying the data derived from the inter-group analyses, it was evident that the chemical shift values of the respective parallel potencies differed significantly. A significant difference in the respective OH peaks was observed for the parallel 30C potencies. With respect to the relative integration values; the OH and CH_3 peaks of the parallel potencies of 12C and 30C differed significantly however the 6C potencies did not differ significantly.

At lower levels of deconcentration, i.e. at the 6C level the Hahnemannian and Radionically prepared potencies do not differ significantly in terms of their respective relative integration values; their CH_3 peak chemical shift values do differ significantly however. Higher potencies i.e. the 12C and 30C were dissimilar in terms of both chemical shift values and relative integration values.

Of all the data derived from NMR spectroscopy, the chemical shift values are considered most significant as they are more sensitive to changes within the respective samples. Chemical shift responds to changes within a magnetic

environment as opposed to integration which should remain constant irrespective of shift due to the number of protons remaining the same in each environment (Grimmer, 2009). Therefore it can be assumed that the 6C samples from the Radionic and Hahnemannian groups are in fact different (Only their respective relative integration values were similar).

The 6C potency is at a deconcentration level which is below Avogadro's number (6.02554×10^{23}), potencies which have been diluted beyond 12C exceed Avogadro's number and theoretically no molecules of the original substance are left in the solution. The 6CH Hahnemannian potency therefore still has the traces of the original substance compared to all the other potencies, this may be a contributing factor to the relative integration values of the comparison of the Radionic 6C and Hahnemannian 6CH which indicate that they are equivalent. In order to confirm this, further studies into lower potencies of both Hahnemannian and Radionic remedies should be conducted (Kayne, 2006).

The Hahnemannian method of potentisation relies on serial dilution and succussion in the preparation of remedies in order to understand the differences that occurred in the intra-group analysis of the Hahnemannian group a study of the Clathrate Model is appropriate as it highlights the importance of the force of succussion with dilution in the preparation of Hahnemannian manufactured homoeopathic remedies.

According to Anagnostatos (1994) small clusters of the original pharmaceutical substance are formed during grinding and the first stages of dilution. Molecules of the solvent (water) form a shell of hydrogen-bonded molecules (clathrates) which have a similar shape to the small cluster.

With the applied force of succussion and different inertial properties the small clusters move out of the clathrate shells. New clathrates are then formed around the relocated small cluster leaving the initial clathrate hollow (core-clathrate) and an additional clathrate (mantle-clathrate) is formed around the core clathrate, eventually through dilution not one of the molecules of the initial substance are present and the core clathrate becomes the nucleus for the formation of other clathrates, all with the original pattern.

Therefore the remedy through the process of microdilution has the properties of the initial substance without the physical presence of the original substance. The clathrate model gives an explanation on how water molecules can become the means of transmitting information.

The significant differences that were demonstrated between the Hahnemannian and Radionic 6C, 12C and 30C potencies are likely directly due to the process described by the Clathrate Model; the Hahnemannian *Natrum muriaticum* being derived from sodium chloride as the crude starting substance and the Radionic potencies not. The structural organization of liquid water is highly structured but at the same time extremely flexible. The hydrogen bonds are easily formed and influenced by the environment. When solutes for example salts, acids, bases and water-soluble organic substances are dissolved in a liquid, changes occur, they are referred to as “structure breakers”. The intermolecular O-O bonds are shortened especially around the solute and the structure of the whole solution is modified to contain the structural information derived from the solute (Resch & Gutmann, 1987).

As the solutes reach the inner boundaries of the liquid system, the oscillating gas molecules in the voids are influenced by the solutes and act as synchronizing nodes which preserve the structural information dynamically. Therefore the structural information is not lost through the dilution process (Resch & Gutmann, 1987).

The absence of an original, crude starting substance (in this case sodium chloride) in the manufacturing process is most likely attributable to parallel potencies (Hahnemannian and Radionic) of *Natrum muriaticum* produced having dissimilar NMR spectra.

The Hahnemannian controls although produced from the same batch of 87% alcohol as used in the manufacture of the other potenties (Hahnemannian and Radionic) did not undergo serial dilution and succussion. The results of the study show that the NMR spectroscopy of 6CH, 12CH and 30CH potencies differed to their respective Hahnemannian control (87% alcohol). As a result of the oversight in the manufacture of the Hahnemannian controls the additional variables introduced by the act of succussion and serial dillution are

most likely atleast partially accountable for these differences in the NMR spectra as opposed physico-chemical imprint left by the Sodium Chloride itself. The implication of succussion on NMR spectroscopy study was demonstrated using 12CH *Natrum muriaticum* which displayed significant differences between different numbers of succussions when compared to a control which had 0 succussions (Lyell, 2004).

Erasmus (2004) compared Anthroposophical potentisation methods with those of Hahnemannian, the sucussion methods of which differ significantly with respect to the technique applied. Of the Anthroposophical potentisation techniques the Weleda succussion technique requires the bottle to be moved in a figure of eight motion and the Wala method requires a horizontal movement of the arm from back to front, resulting in a vortex being created in the bottle. The results of this study showed that statistically significant differences were observed on the NMR spectroscopy between parallel potencies of Hahnemannian and Anthroposophical potentisation methods. Davies (2001) demonstrated that parallel potencies of Natrum muriaticum using the Korsakovian and Hahnemannian methods respectively were dissimilar in terms of their NMR spectra and thus concluded that 'equivalent' potencies produced by the Korsakovian and Hahnemannian potentisation methods do not result in remedies that have equivalent NMR identities.

Based on related literature and the findings of this study one can conclude that the NMR spectra of homoeopathic remedies are influenced by their respective methods of manufacture i.e. in terms of their respective NMR spectra ‘equivalent’ potencies or remedies have been shown to differ statistically.

Although the influence of manufacture method on NMR spectra can be clearly concluded, one cannot assume that the clinical or biological activity of the remedy is directly related to its NMR spectrum. In this particular study although the Hahnemannian and Radionic potencies of *Natrum muriaticum* were distinctly different in terms of their respective NMR spectra one cannot assume that their biological activity therefore is not comparable.

This was confirmed by Sukul et al. (2001) who determined that succussed and unsuccussed potencies of *Nux vomica 30C* each (of which differed significantly in terms of their respective NMR spectra) produced comparable biological activity in terms of reduced ethanol induced sleep time in toads. All the toads treated with *Nux vomica* 30C succussed and *Nux vomica* 30C unsuccussed regained the righting reflex (RR), which is a normal erect posture and the ability to operate through a series of responses in 100 minutes and those of the control group in 140 minutes.

Although NMR spectroscopy is able to distinguish between homoeopathic remedies produced by distinctly different manufacture methods it is unknown whether this method is sensitive enough to detect minor deviations in the manufacture process, further research is thus required before this tool can be proposed as a method of homoeopharmaceutical standardisation.

Literature suggests further that biological activity of homoeopathic remedies is not directly related to the NMR spectrum of the remedy, thus although Radionic and Hahnemannian forms of *Natrum muriaticum* differ significantly in terms of their NMR spectra one cannot conclude that their respective biological effects will differ accordingly.

On examination of NMR spectroscopy data of this study one can conclude that the chemical shift and integration values of potencies produced by the Hahnemannian and Radionic methods respectively were statistically distinct i.e. that these manufacture methods produce remedies which are physico-chemically distinct. Based on this outcome the first and second hypotheses of this study are accepted.

CHAPTER SIX – CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This NMR spectroscopy study comparing the standard Hahnemannian method and Radionic methods of manufacturing remedies was conducted to confirm the hypotheses that differences existed between the chemical shift and relative integration values of CH_2, CH_3, H_2O and OH signals of parallel potencies of *Natrum muriaticum.* There are many methods of potentisation used to manufacture 'homoeopathic remedies', machines are also widely used, in order to ensure standardisation in the manufacturing processes NMR spectroscopy can be used as a tool to study the different methods to distinguish whether the remedies are the same physico-chemically.

Three potencies of *Natrum muriaticum* were prepared, 6C, 12C and 30C using Hahnemannian and Radionic methods, a control for each groups was also prepared. These samples were sent to an NMR spectroscopy laboratory for analysis and the data was processed and statistically analysed.

The results confirmed the hypotheses that differences exist between the chemical shift values of CH_2, CH_3, H_2O and OH signals of parallel potencies of *Natrum muriaticum* produced according to Hahnemannian and Radionic means. Similarly relative integration values showed significant differences for OH and CH_3 signals for the 12C and 30C potencies prepared according to the two different methods to confirming the respective hypotheses.

In studying the results, one can conclude that the method of manufacture of homoeopathic remedies plays a role in determining the individualizing physioco-chemical identity of remedies.

6.2 RECOMMENDATIONS

1. Further NMR spectroscopy studies into homoeopathic remedies

With the rapid expansion of the homoeopathic profession as well as the homoeopharmaceutical industry in the interest of quality control it is imperative that standardisation of remedy manufacture implemented. NMR spectroscopy is a potential tool through which this could be achieved.

2. Further studies into Radionic potencies

Although this study suggests that the physico-chemical properties of the respective parallel potencies of Radionic and Hahnemmannian produced *Natrum muriaticum* differ significantly, one can only speculate with regard to the comparability of the biological and therapeutic activity thereof. It is thus recommended that the biological activity of Radionically produced remedies be formally investigated and compared with that of 'equivalent' Hahnemannian produced remedies.

3. A wider range of studies on different machines

There are numerous Radionic machines which are being used in the production of 'homoeopathic' remedies which do not use the pharmaceutical or original substance but rely on frequencies and alternate input to produce remedies described within the homoeopathic materia medica. Further studies on the individual machines would produce standard NMR spectra representing the identity of the resulting remedies and therefore contribute to the standardization of homoeopharmaceutical manufacturing methods.

4. Repetition of the study

Before accepting the findings of the study, it should be repeated several times to determine whether the results are consistent.

In order to eliminate the variables introduced by the act of sucussion and serial dilution it is imperative that the Hahnemannian controls in future studies undergo the same process of succussion and serial dilution as the remedies against which they will be compared.

5. Testing lower potencies

In this study it was concluded from the results that the 6C potencies produced by the Hanemannian and Radionic methods were the same when studying the relative integration values. Paradoxically the 6C potency is below Avogadro's number thus the Hahnemannian 6C still has the original substance present as opposed to the Radionic form which was not derived from the original substance at all. Further investigation of this phenomenon is thus warranted.

6. Environmental influence on Hahnemannian and Radionic potencies

The influence of environmental stimuli on the NMR spectra of homoeopathic remedies is relatively unknown and must be investigated, furthermore the impact of such stimuli may differ between Hahnemannian and Radionic forms of homoeopathic remedies as a result having implications on shelf life and stability. It is suggested that such influences be assessed formally.

7. Testing higher potencies

The current study was limited 6C, 12C and 30C potencies, it is suggested that similar assessments of high potencies beyond 200C be conducted to further explore the relationship between these forms of manufacture.

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APPENDIX A

German Homoeopathic Pharmacopoeia- Method 5a - Solutions

Liquid preparations made by method 5a is solutions produced from basic drug materials and a liquid vehicle, 1 part of the basic drug material is dissolved in 9 parts of liquid vehicle and succussed.

1) Aim:

To produce a liquid preparation of *Natrum muriaticum* (soluble), 6CH, 12CH and 30CH.

Apparatus:

Mass balance

2ml and 5 ml Pipettes

crucible

Consumables:

Filter paper

25ml Amber screw top bottle

Labels

Pen

Ingredients:

30% alcohol

87% alcohol

Distilled water

Sodium chloride crystals (Batch number:1025110 , supplier: Merck Chemicals)

Method:

All apparatus must be sterile/flamed and dry.

1. Place a piece of filter paper on the scale and tare it.

2. Mass 0.1 g of Sodium chloride on the filter paper. Place it in a 25 ml amber bottle.

3. Measure 9,9ml of distilled water using a 5ml pipette and place into the 25ml bottle, close the bottle and succuss 10 times. Label *Natrum muriaticum* 1CH.

4. Place 99 parts 87% alcohol in a 5ml clear glass screw top bottle. (99/100 x 3ml = 2.97ml). Add 1 part *Natrum muriaticum* 1CH. (1/100 x 3ml = 0.03 ml). Succuss 10 times without stopping. Label *Natrum muriaticum* 2CH.

5. Repeat step 4 to produce *Natrum muriaticum* 3CH – 29CH.

6. To prepare *Natrum muriaticum* 6CH, 12CH and 30CH place 99 parts 87% alcohol in a 25ml amber glass bottle. (99/100 x 16ml = 15.84ml). Add 1 part *Natrum muriaticum* of the preceeding potency. Succuss 10 times without stopping. Label.

Preparation of the control:

Method:

All apparatus must be clean and dry.

- Place 25ml of 87% alcohol into a 25ml amber glass bottle. Label control.

APPENDIX B

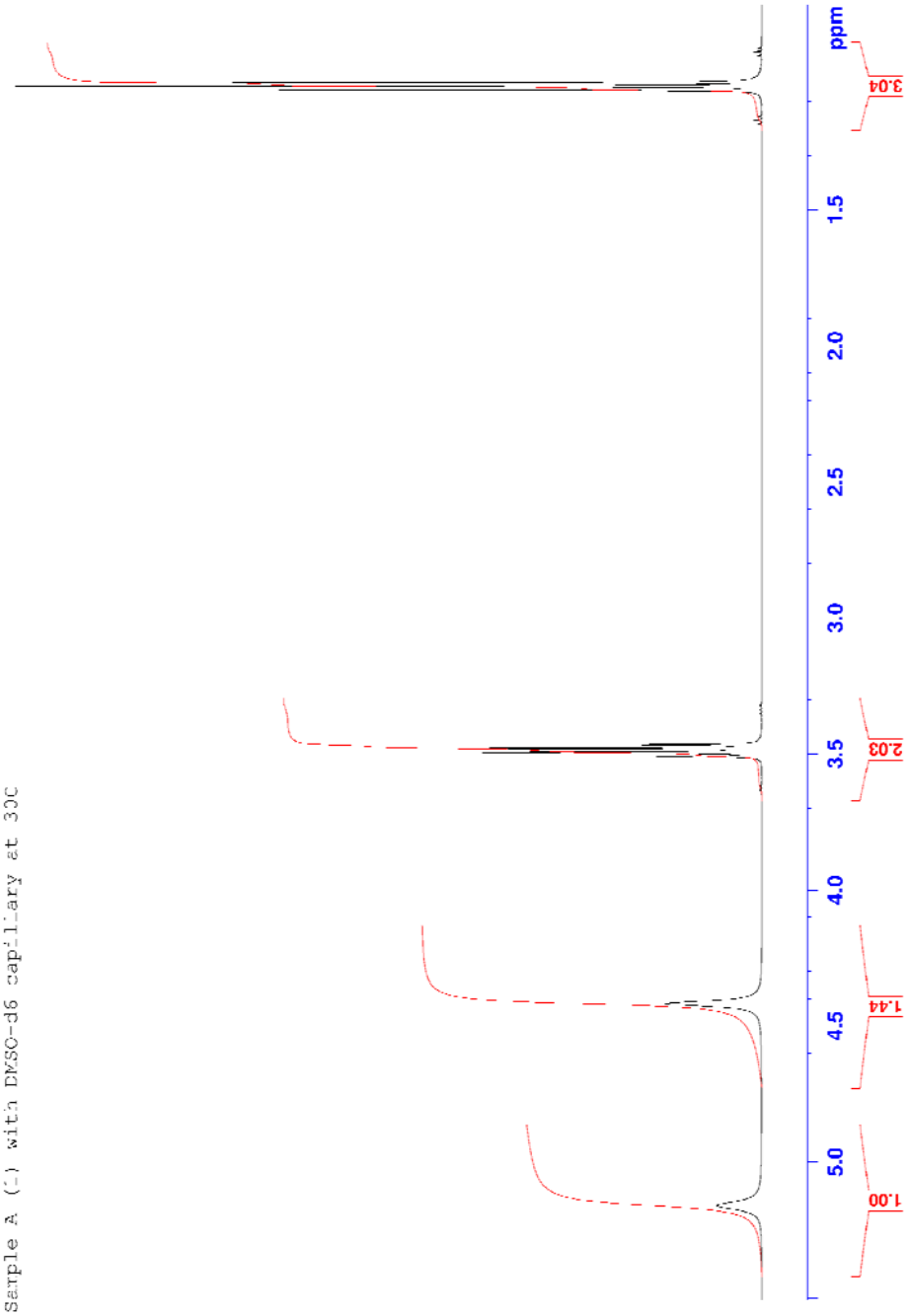

Figure 1: NMR Spectra of Radionic 6C – Run 1

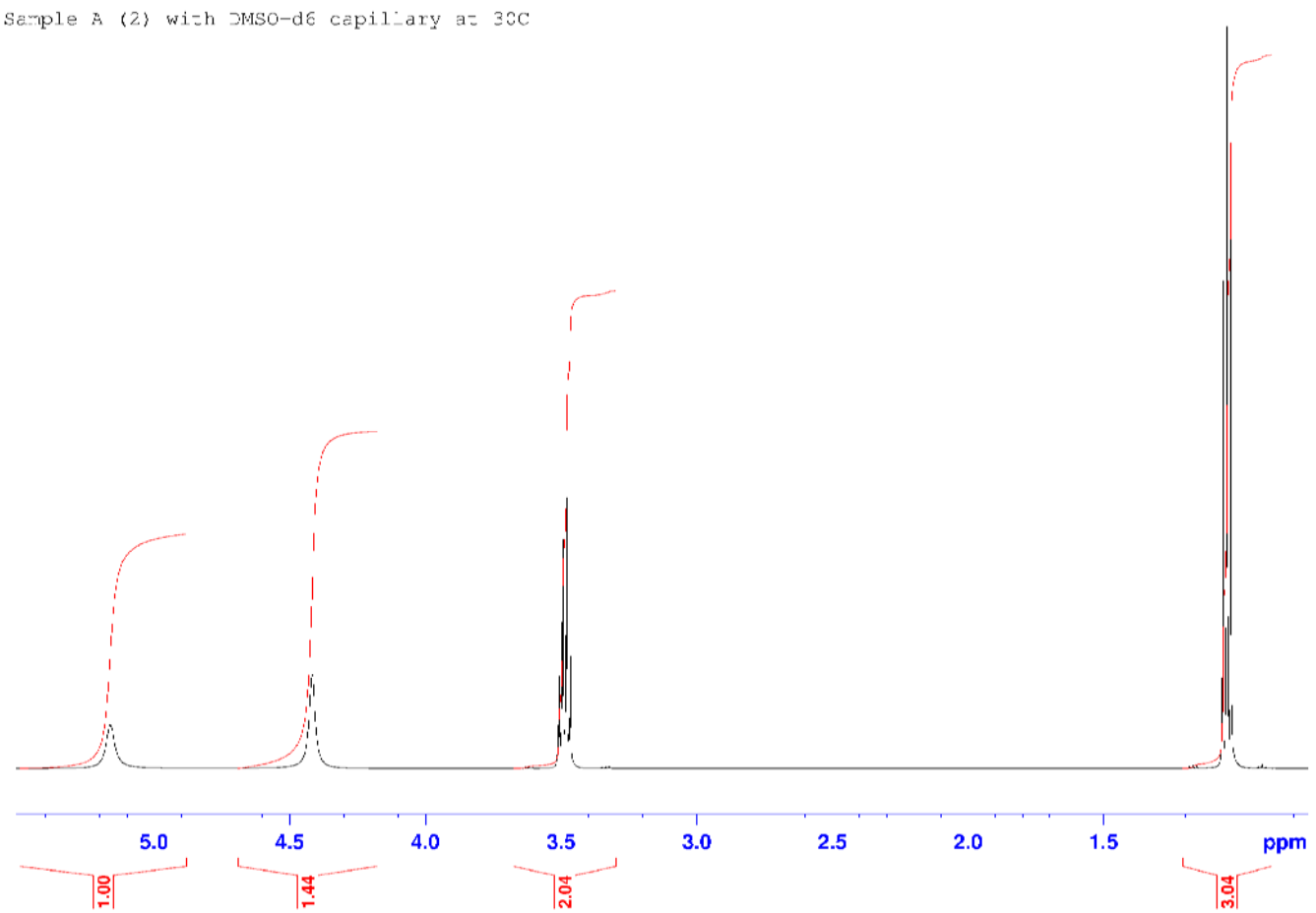

Figure 2: NMR Spectra of Radionic 6C – Run 2

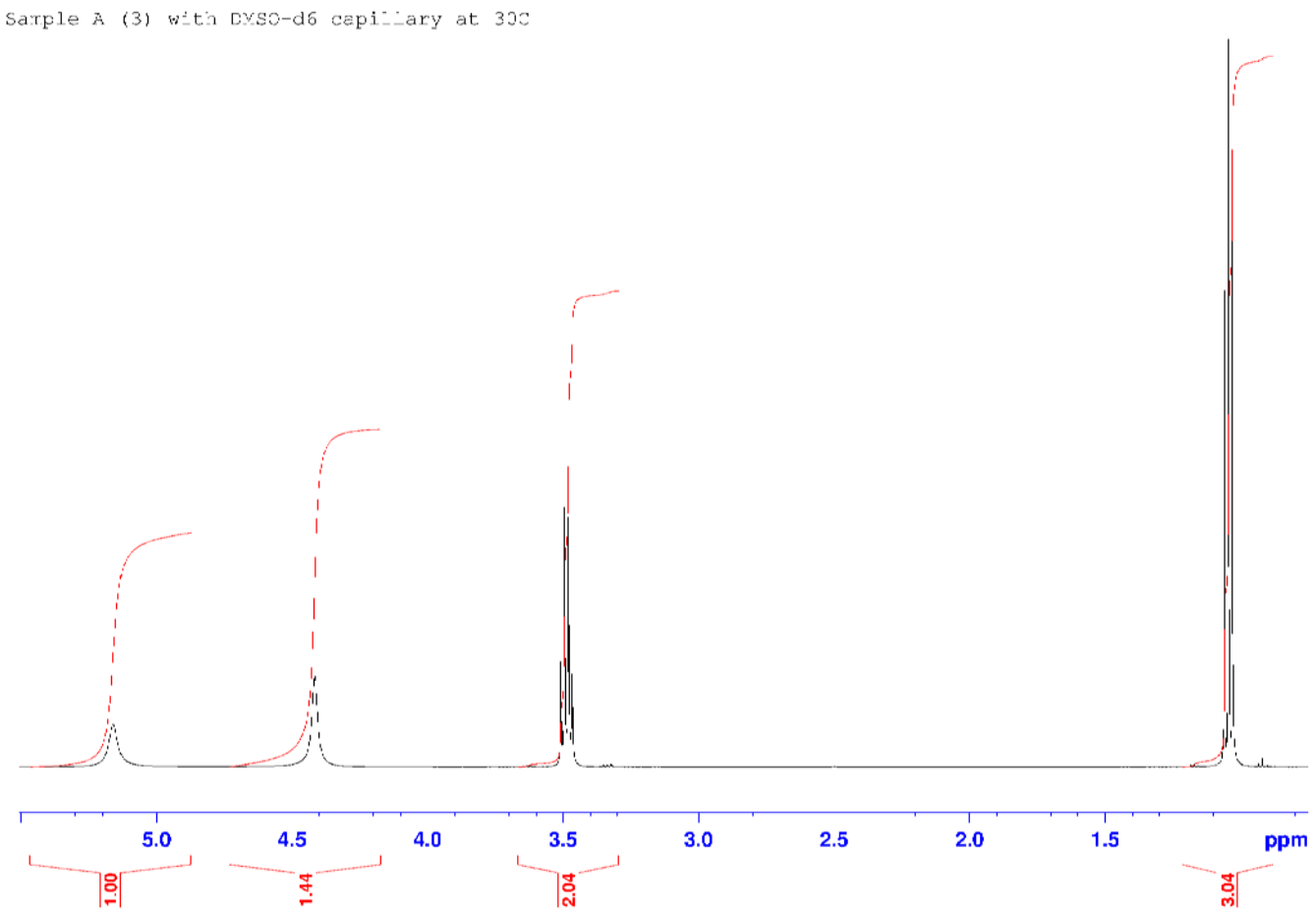

Figure 3: NMR Spectra of Radionic 6C – Run 3

vi

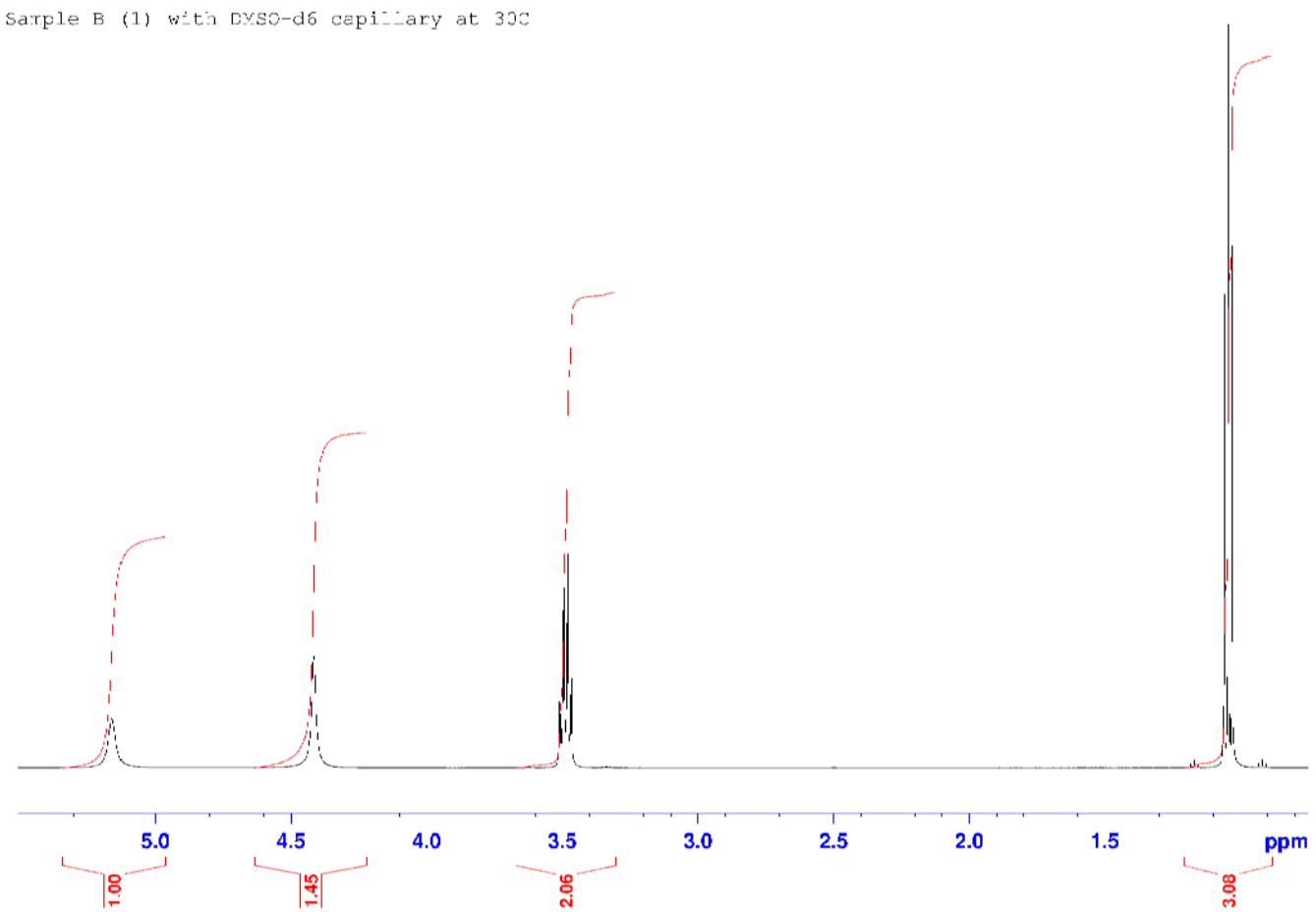

Figure 4: NMR Spectra of Radionic 12C – Run 1

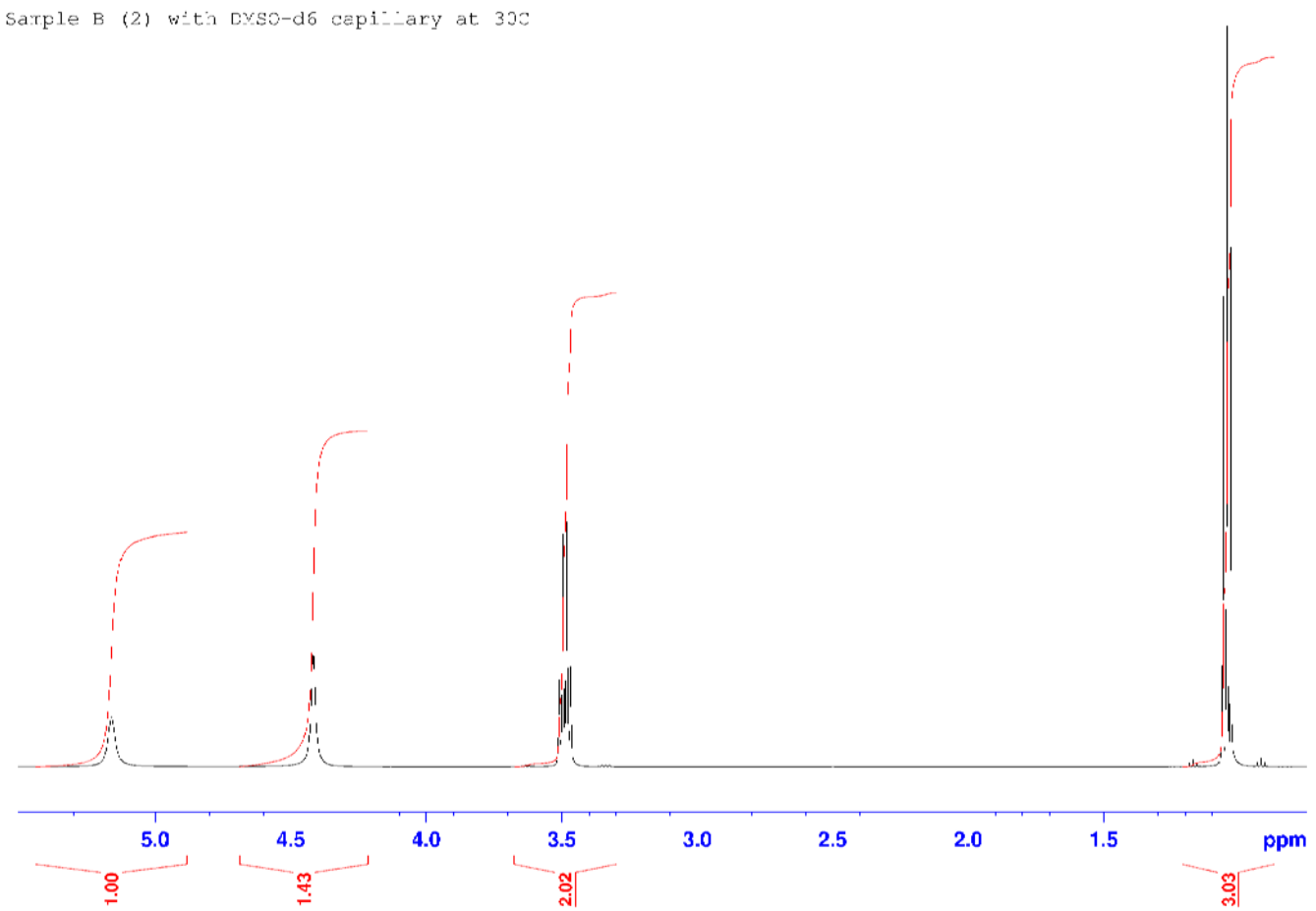

Figure 5: NMR Spectra of Radionic 12C – Run 2

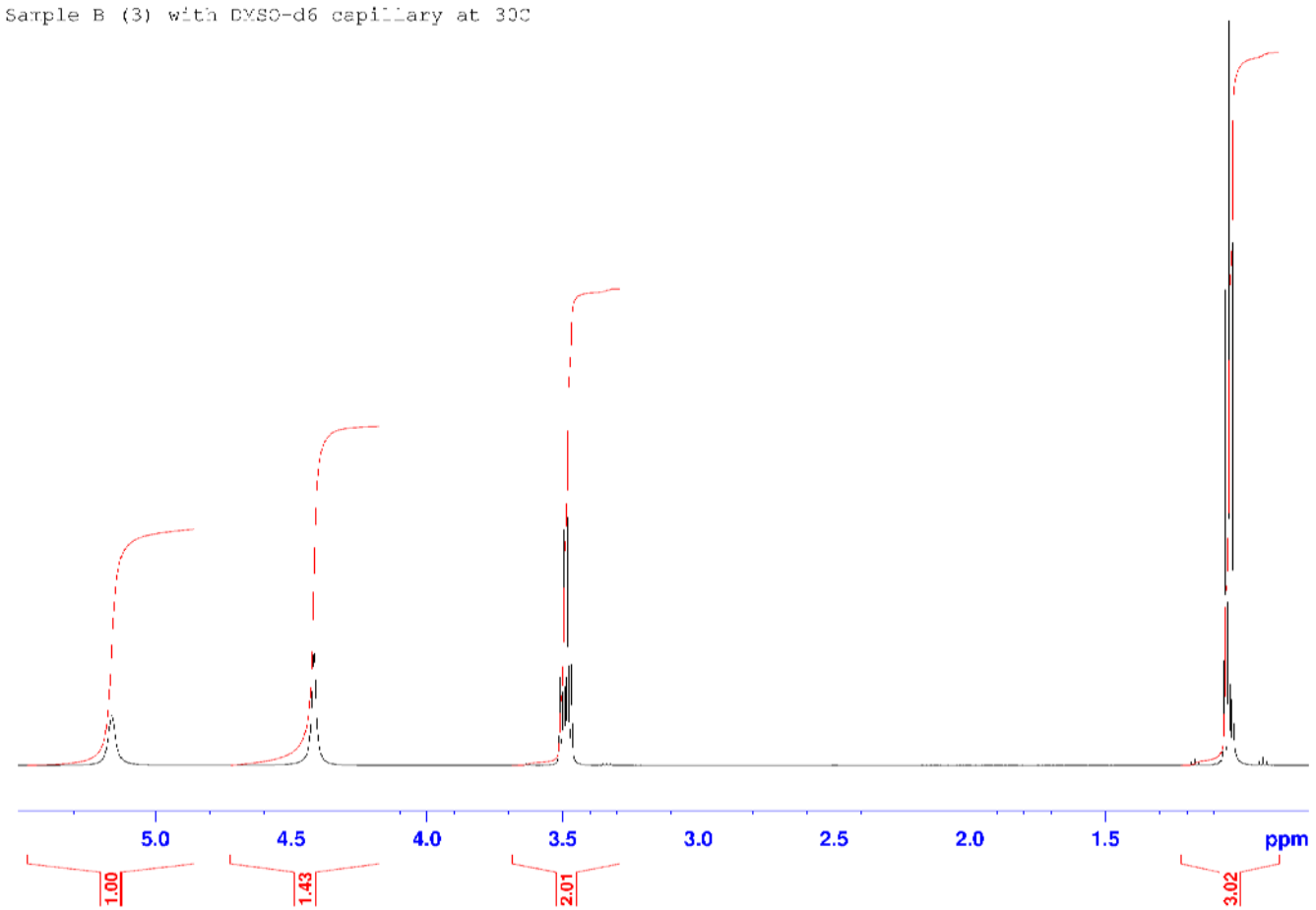

Figure 6: NMR Spectra of Radionic 12C – Run 3

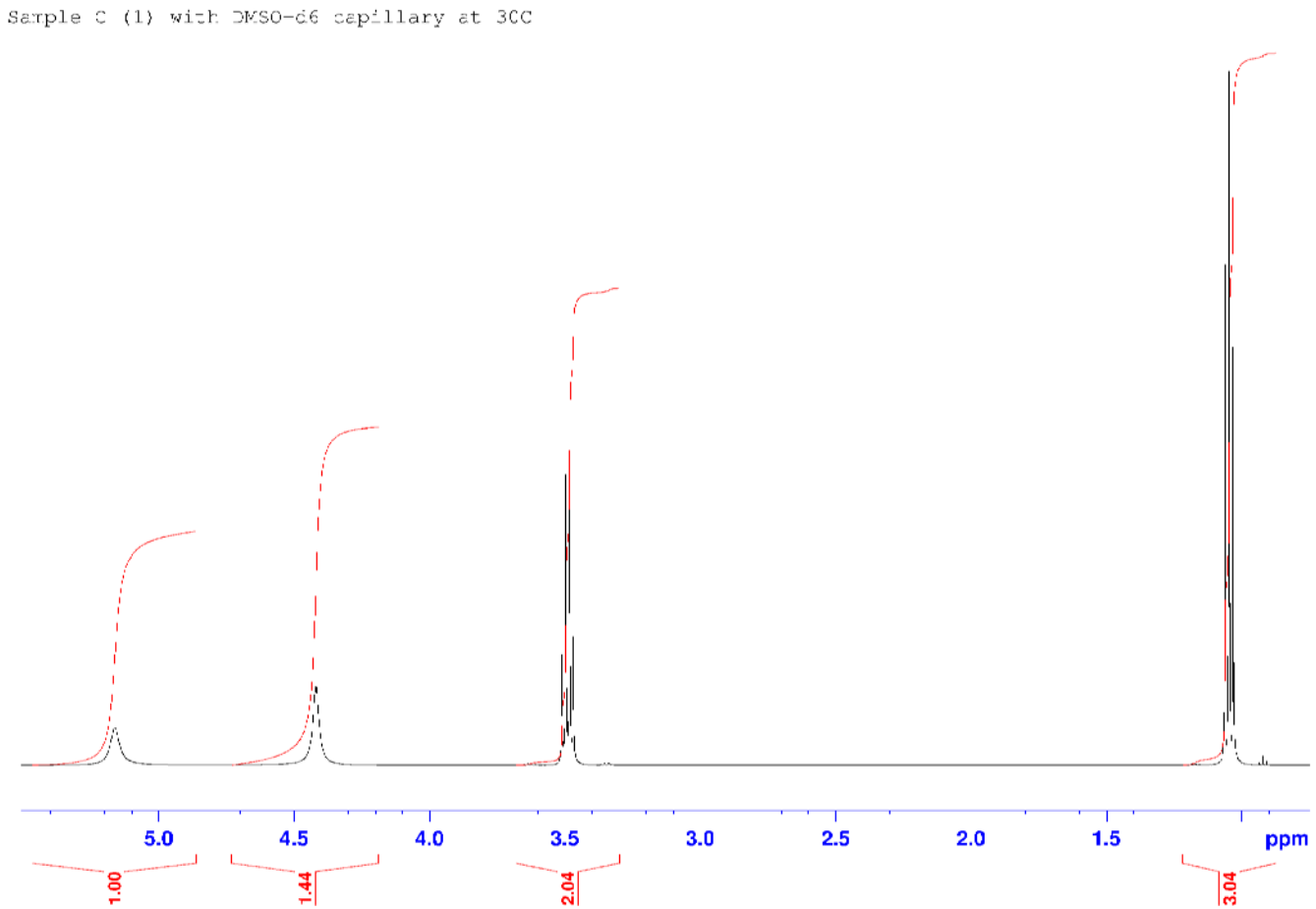

Figure 7: NMR Spectra of Radionic 30C – Run 1

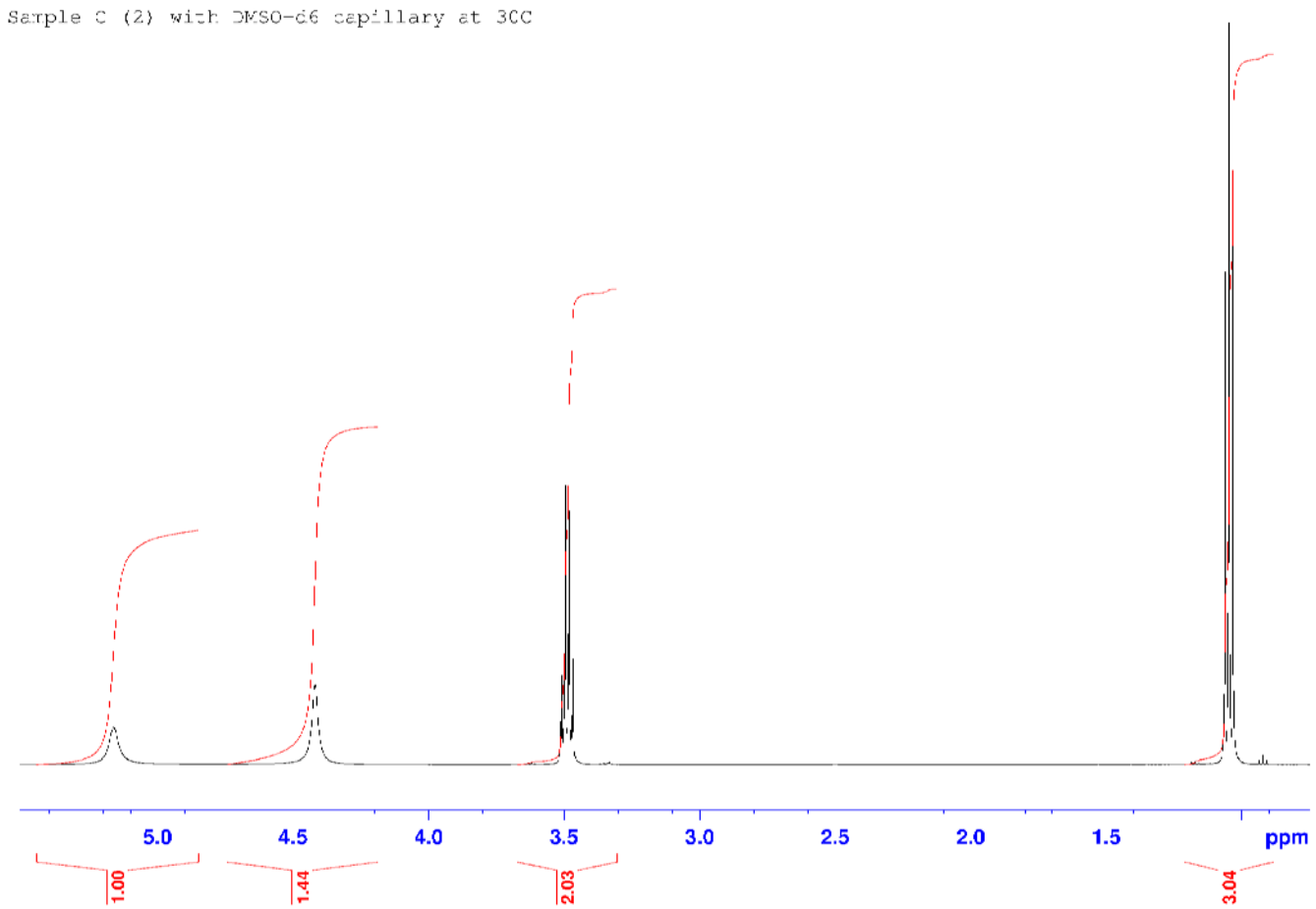

Figure 8: NMR Spectra of Radionic 30C – Run 2

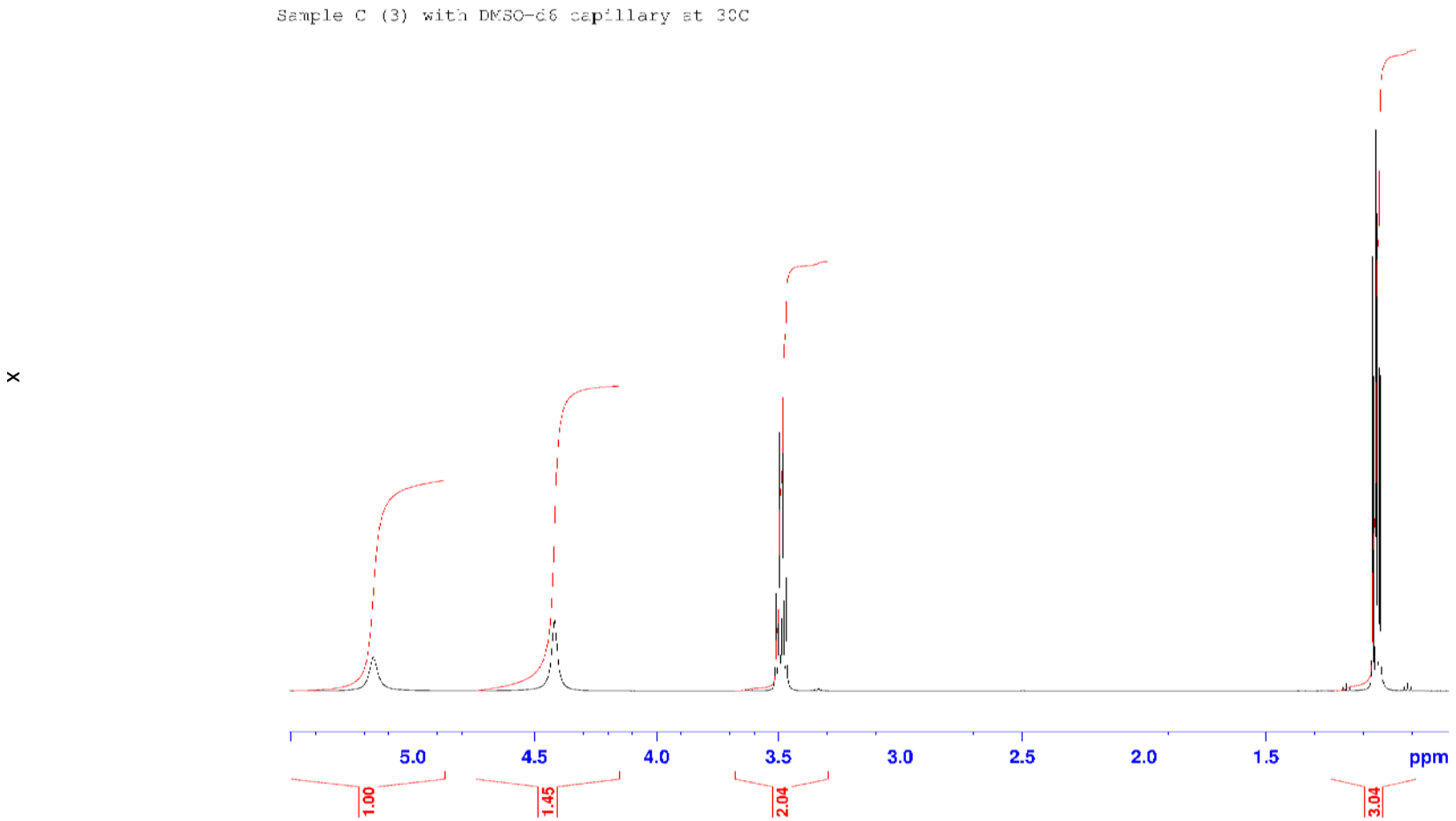

Figure 9: NMR Spectra of Radionic 30C – Run 3

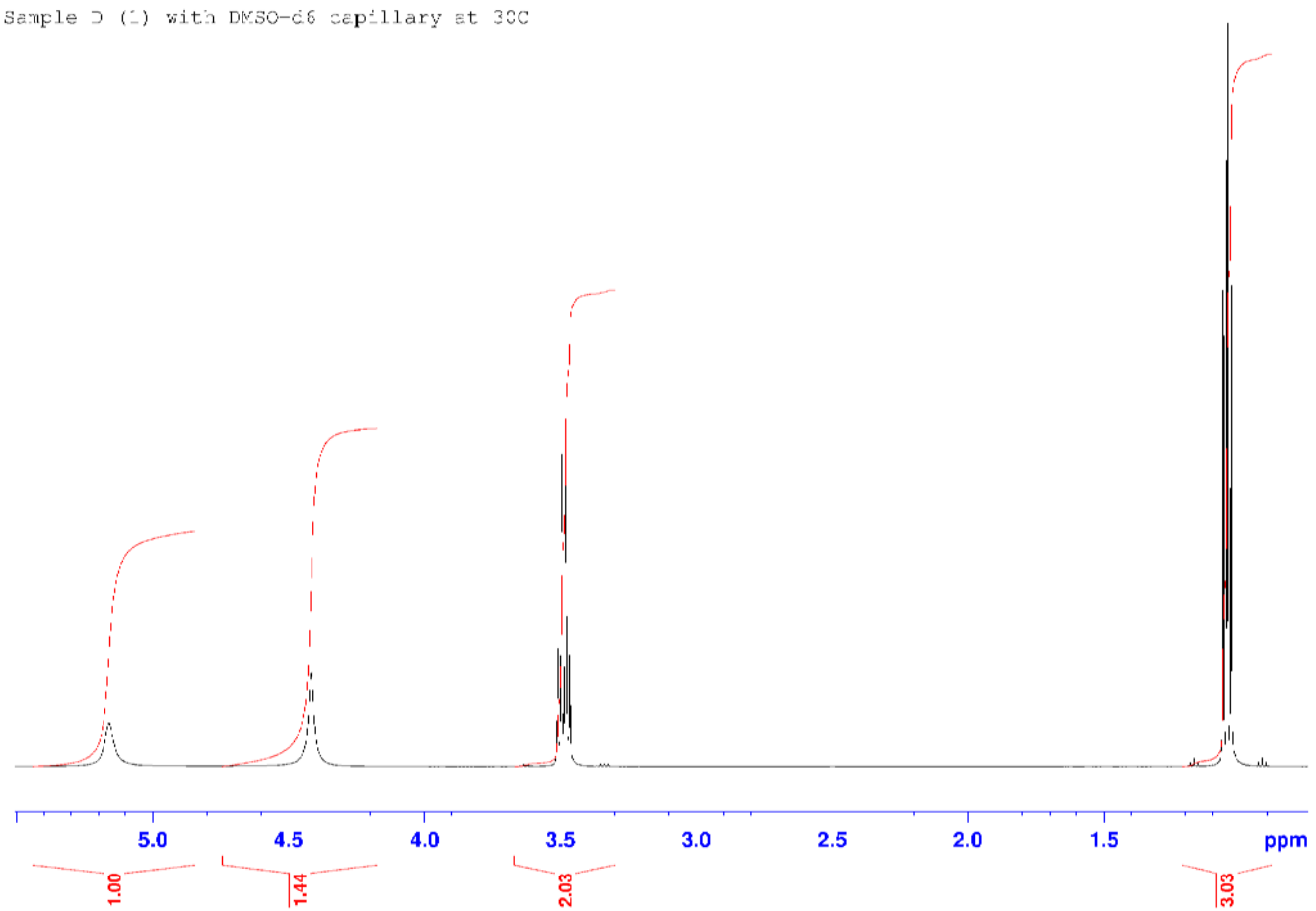

Figure 10: NMR Spectra of Radionic Control – Run 1

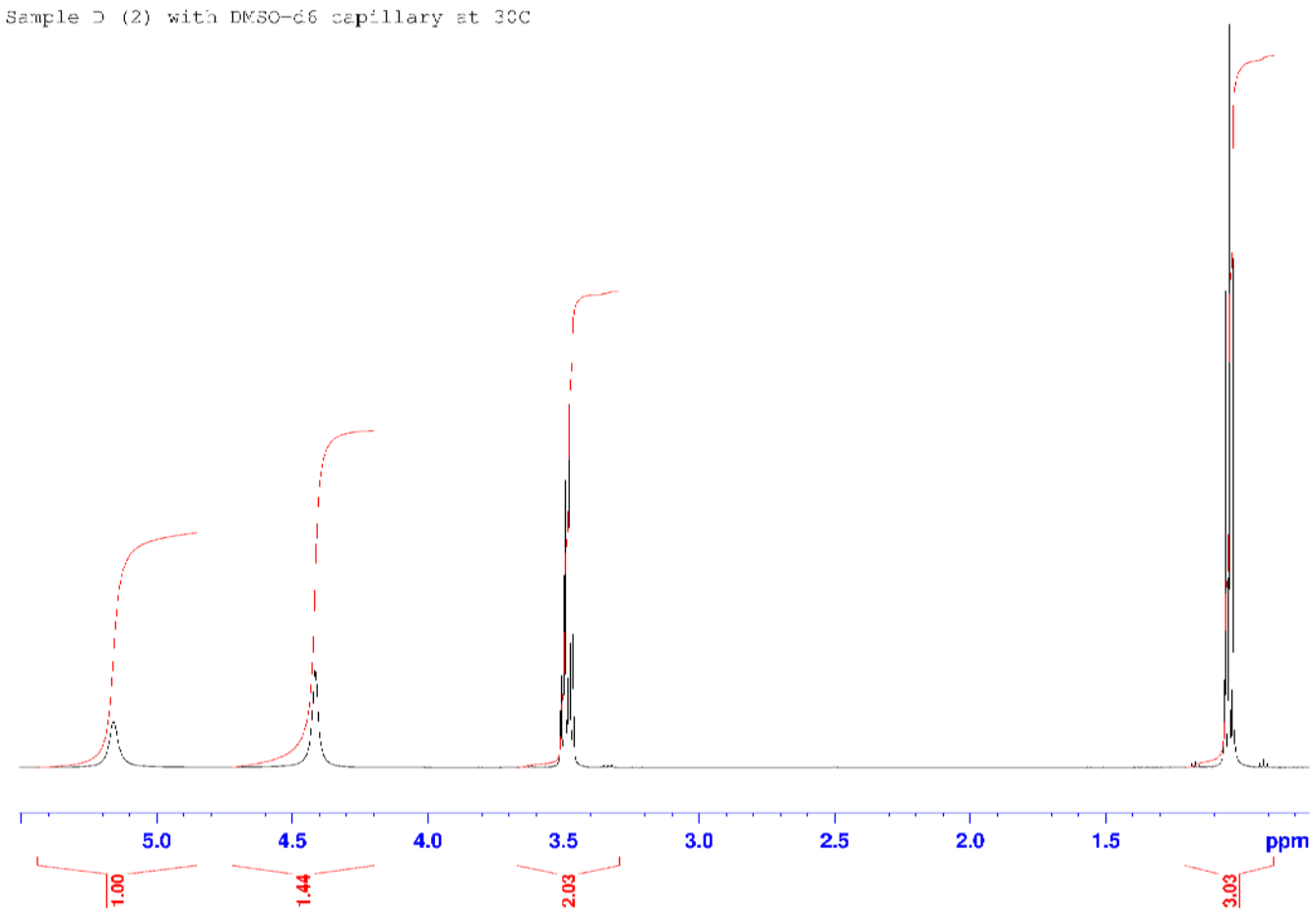

Figure 11: NMR Spectra of Radionic Control – Run 2

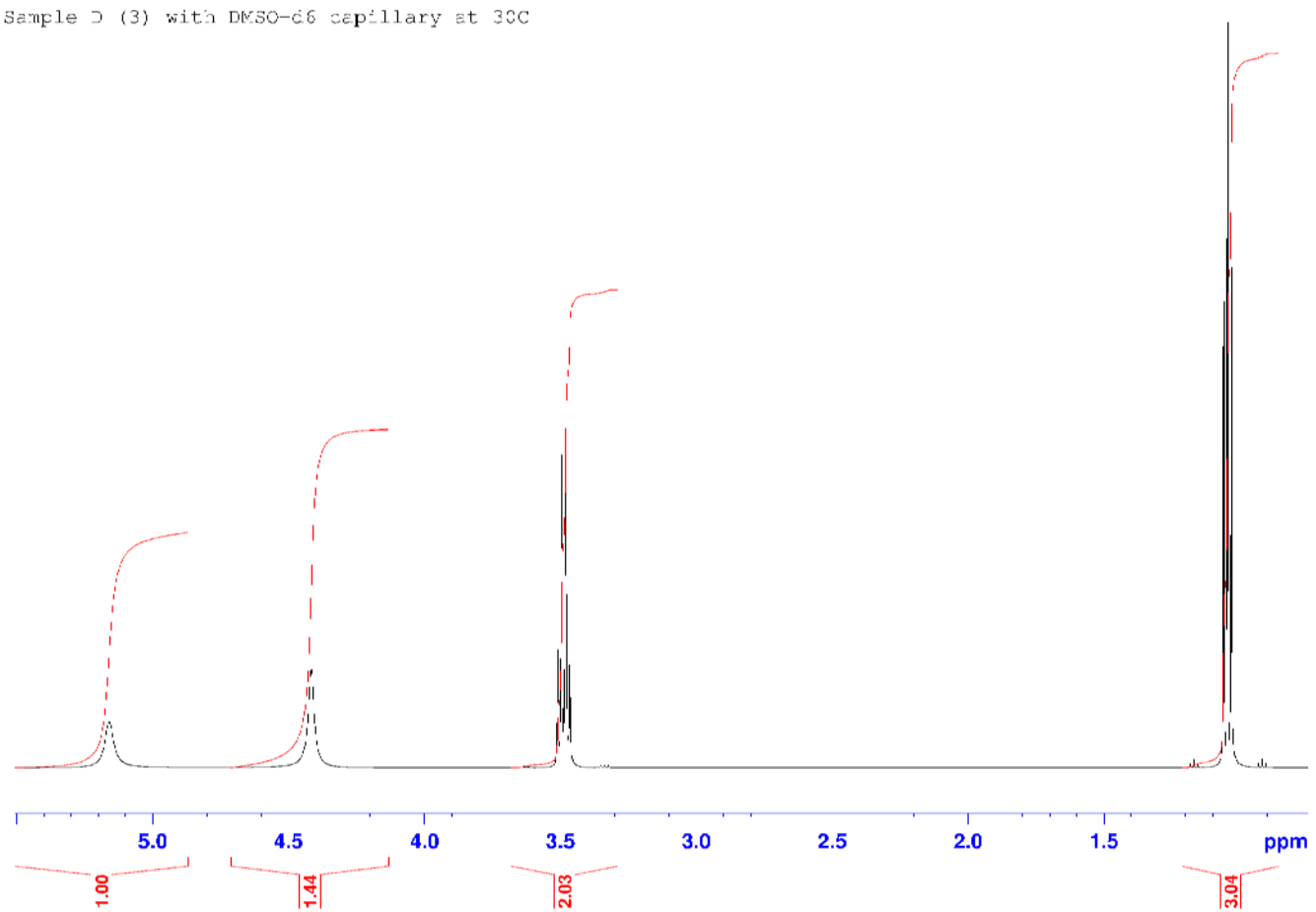

Figure 12: NMR Spectra of Radionic Control – Run 3

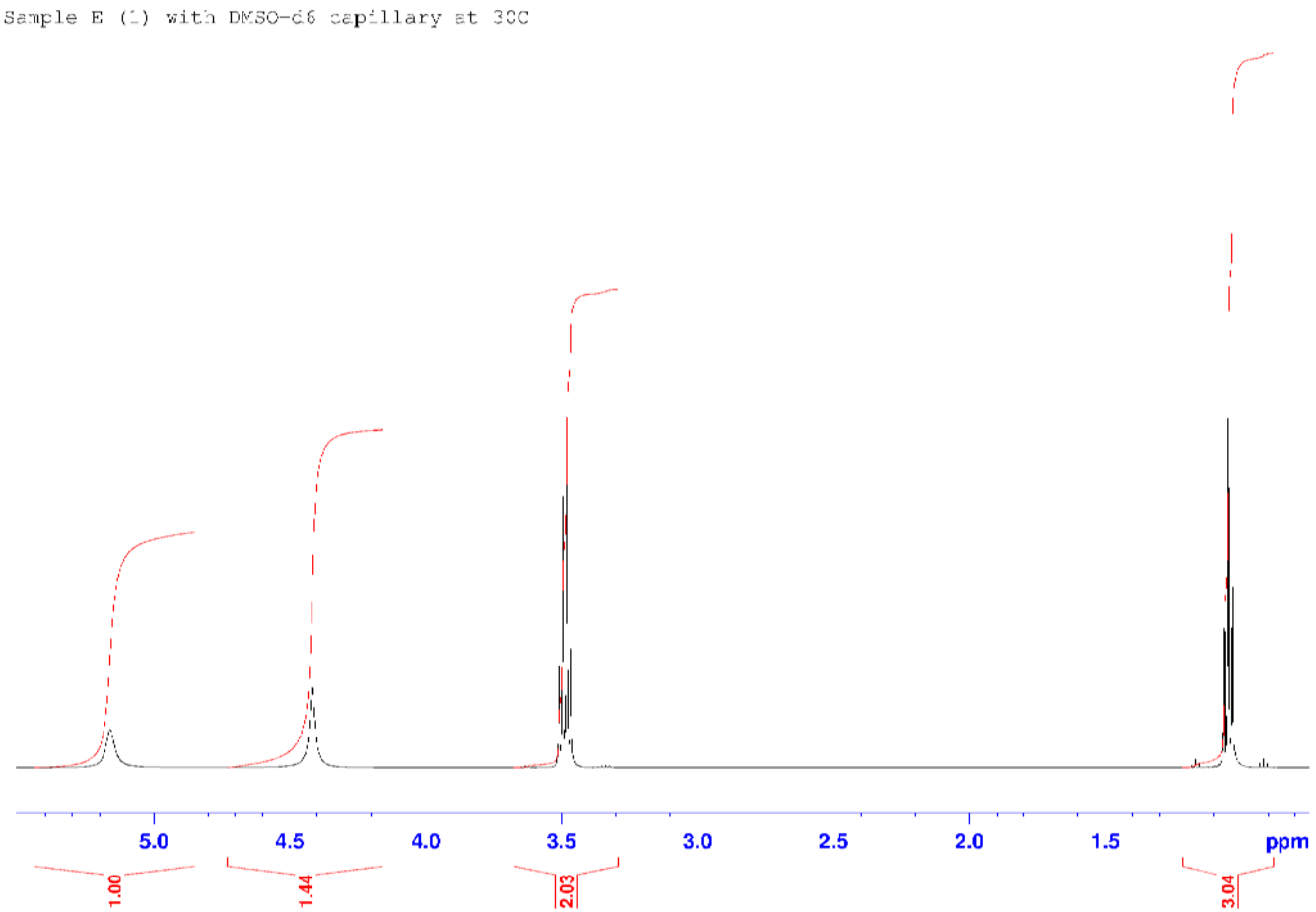

Figure 13: NMR Spectra of Hahnemannian 6CH – Run 1

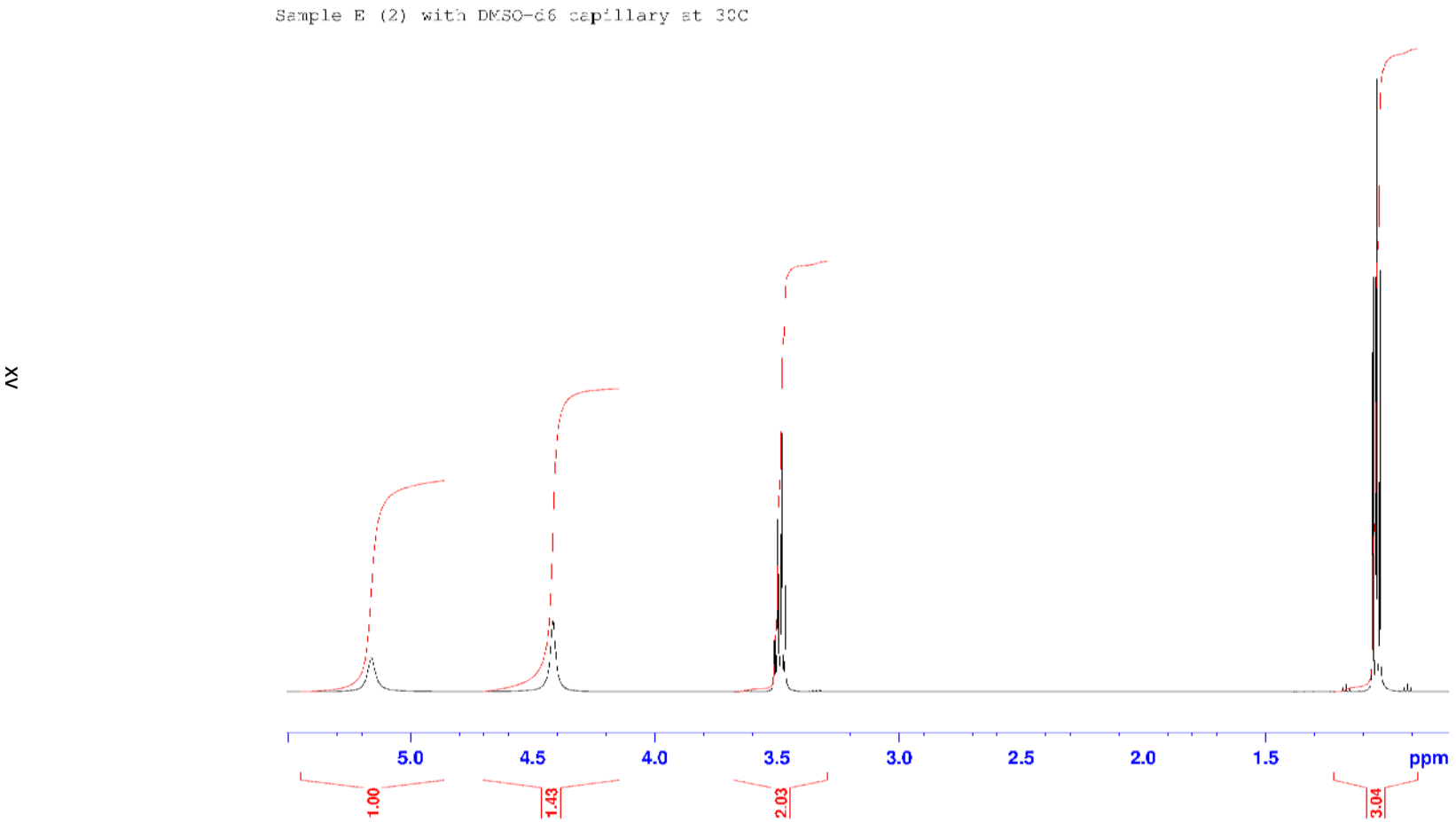

Figure 14: NMR Spectra of Hahnemannian 6CH – Run 2

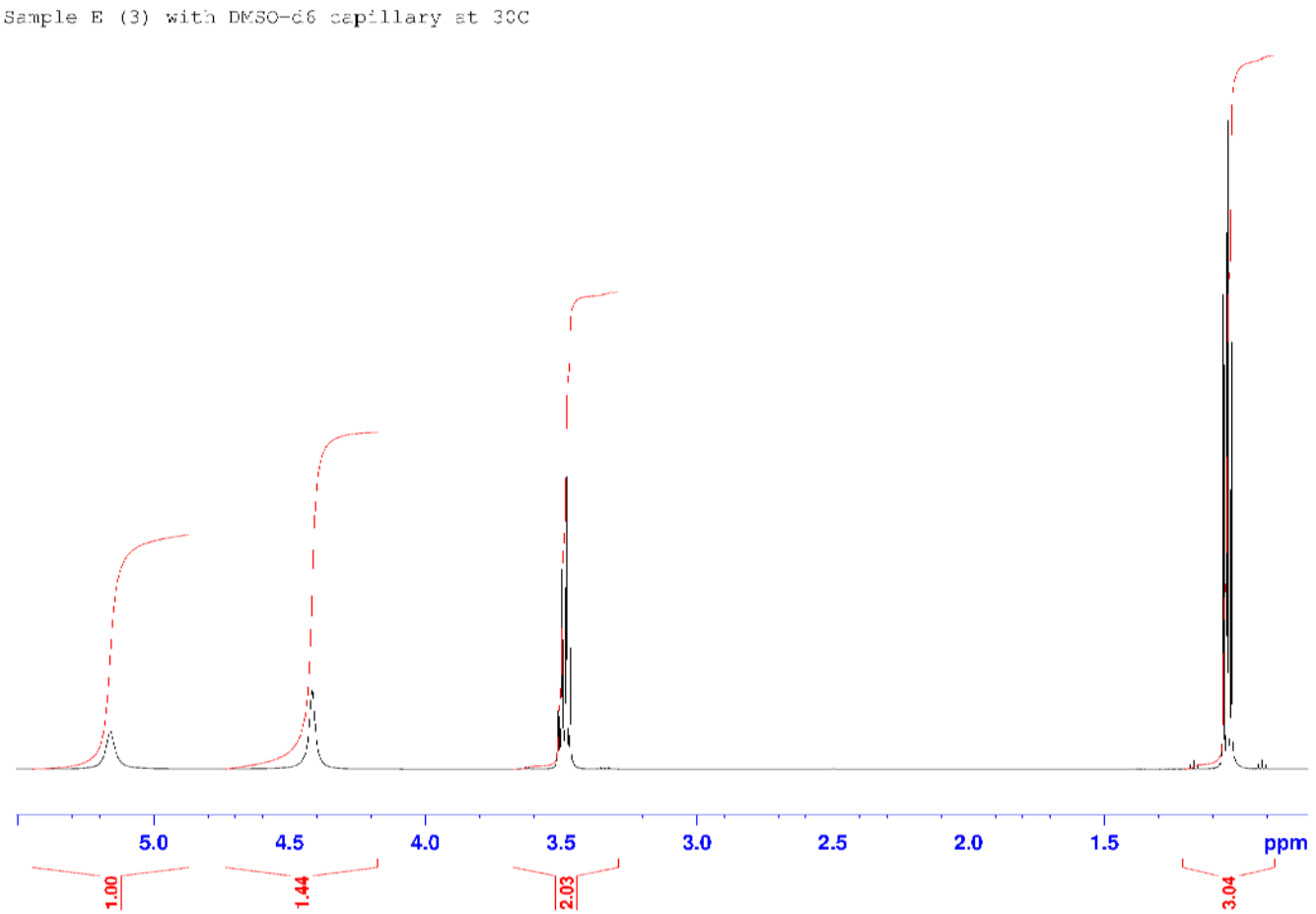

Figure 15: NMR Spectra of Hahnemannian 6CH – Run 3

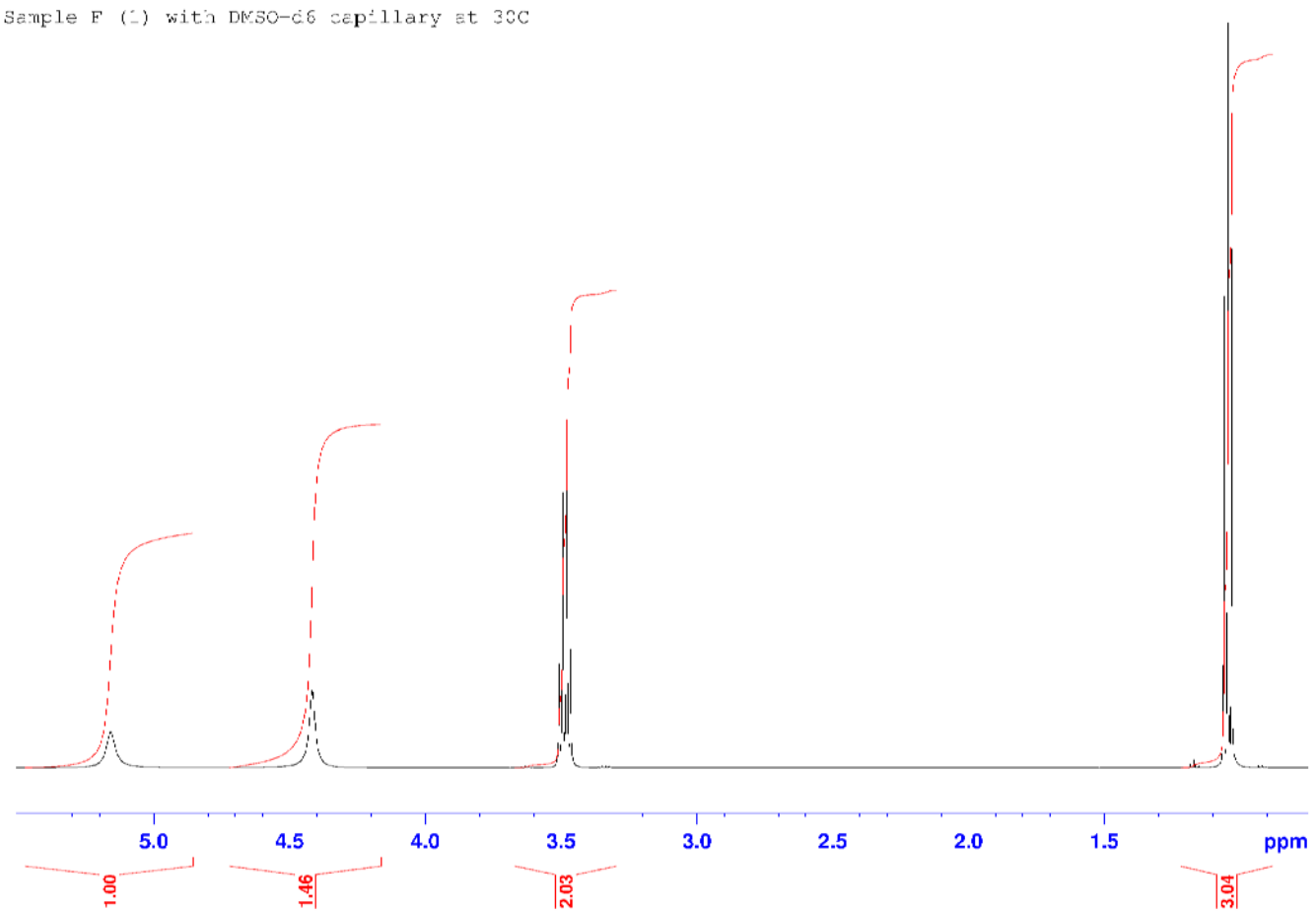

Figure 16: NMR Spectra of Hahnemannian 12CH – Run 1

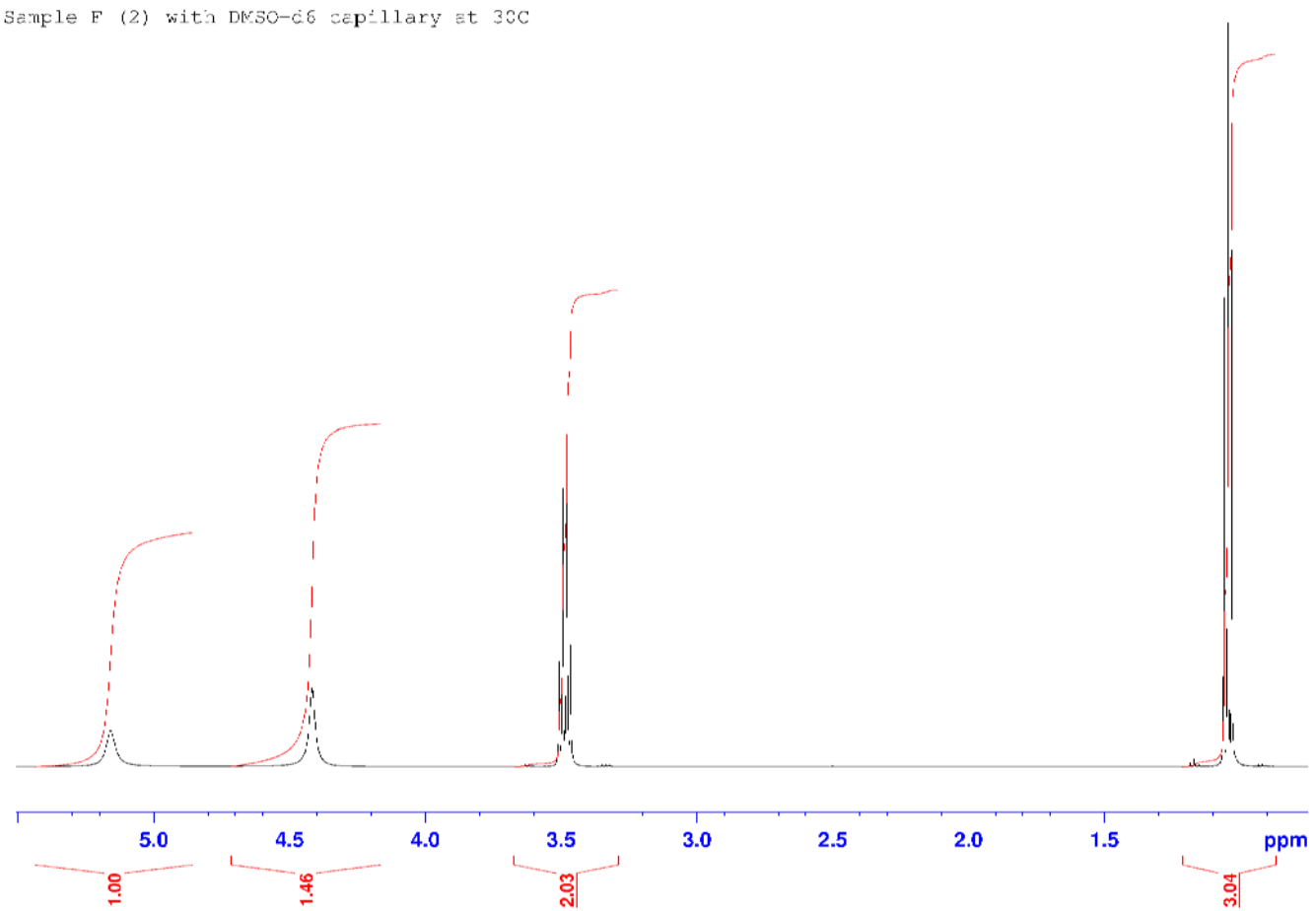

Figure 17: NMR Spectra of Hahnemannian 12CH – Run 2

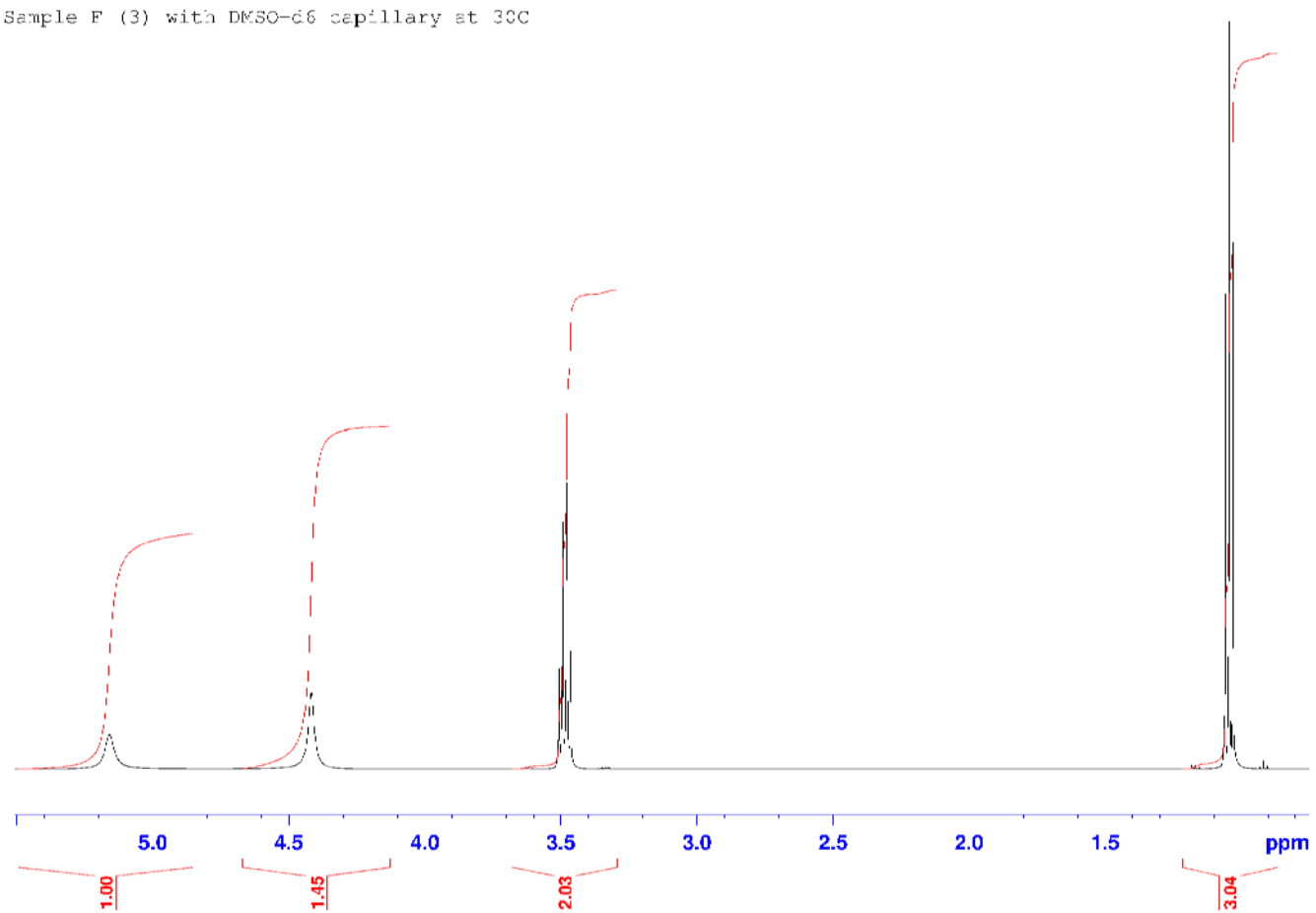

Figure 18: NMR Spectra of Hahnemannian 12CH – Run 3

xx

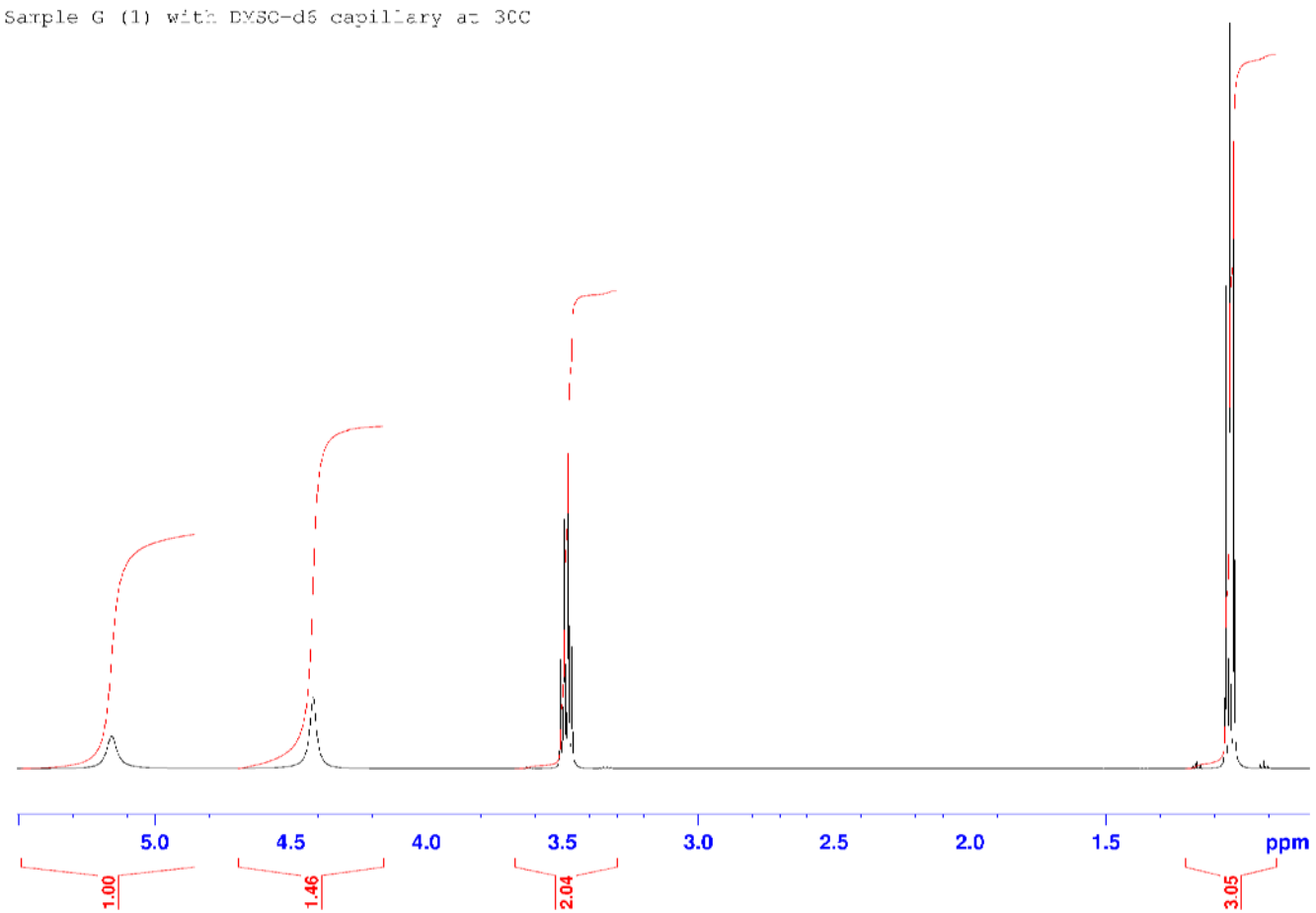

Figure 19: NMR Spectra of Hahnemannian 30CH – Run 1

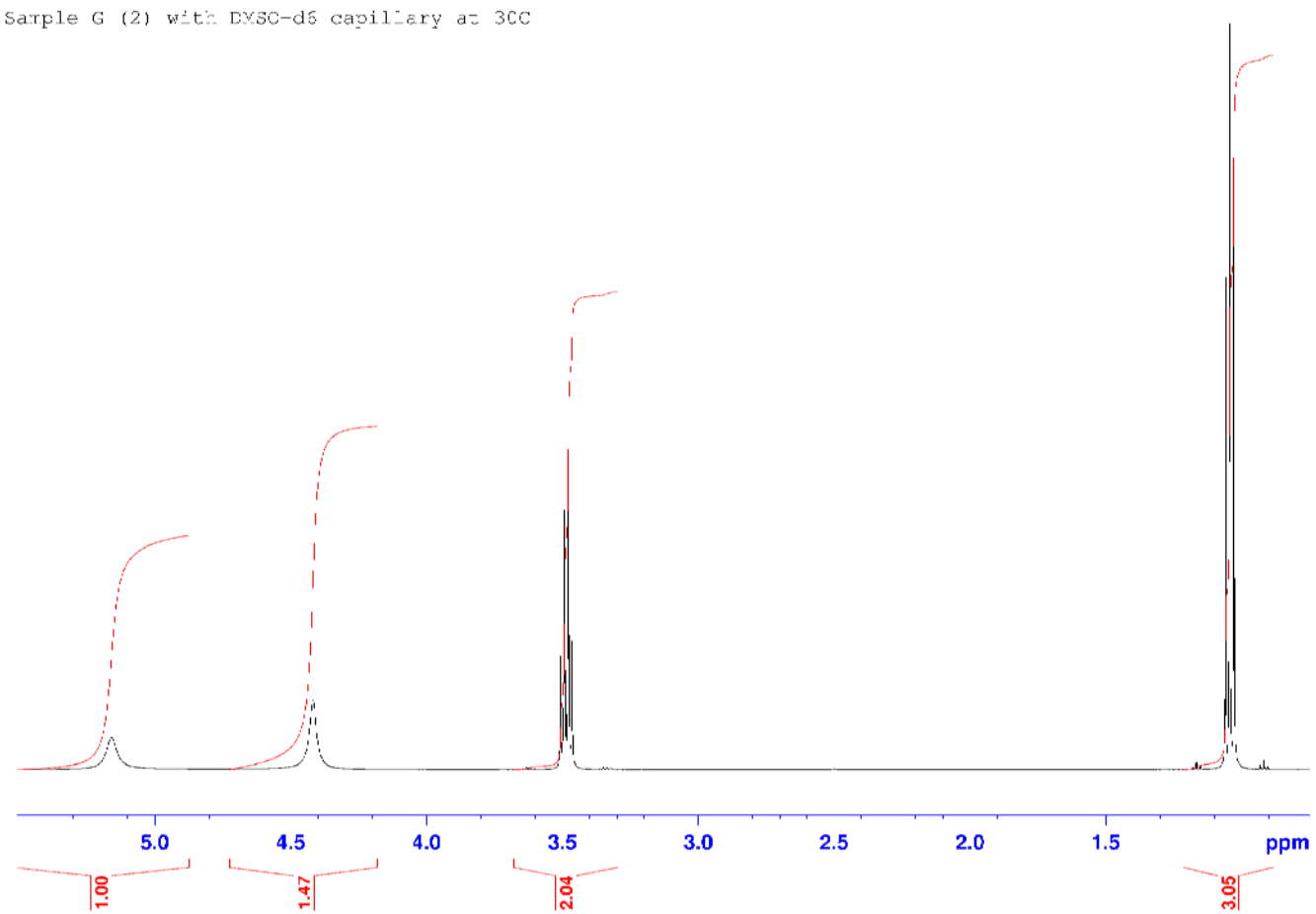

Figure 20: NMR Spectra of Hahnemannian 30CH – Run 2

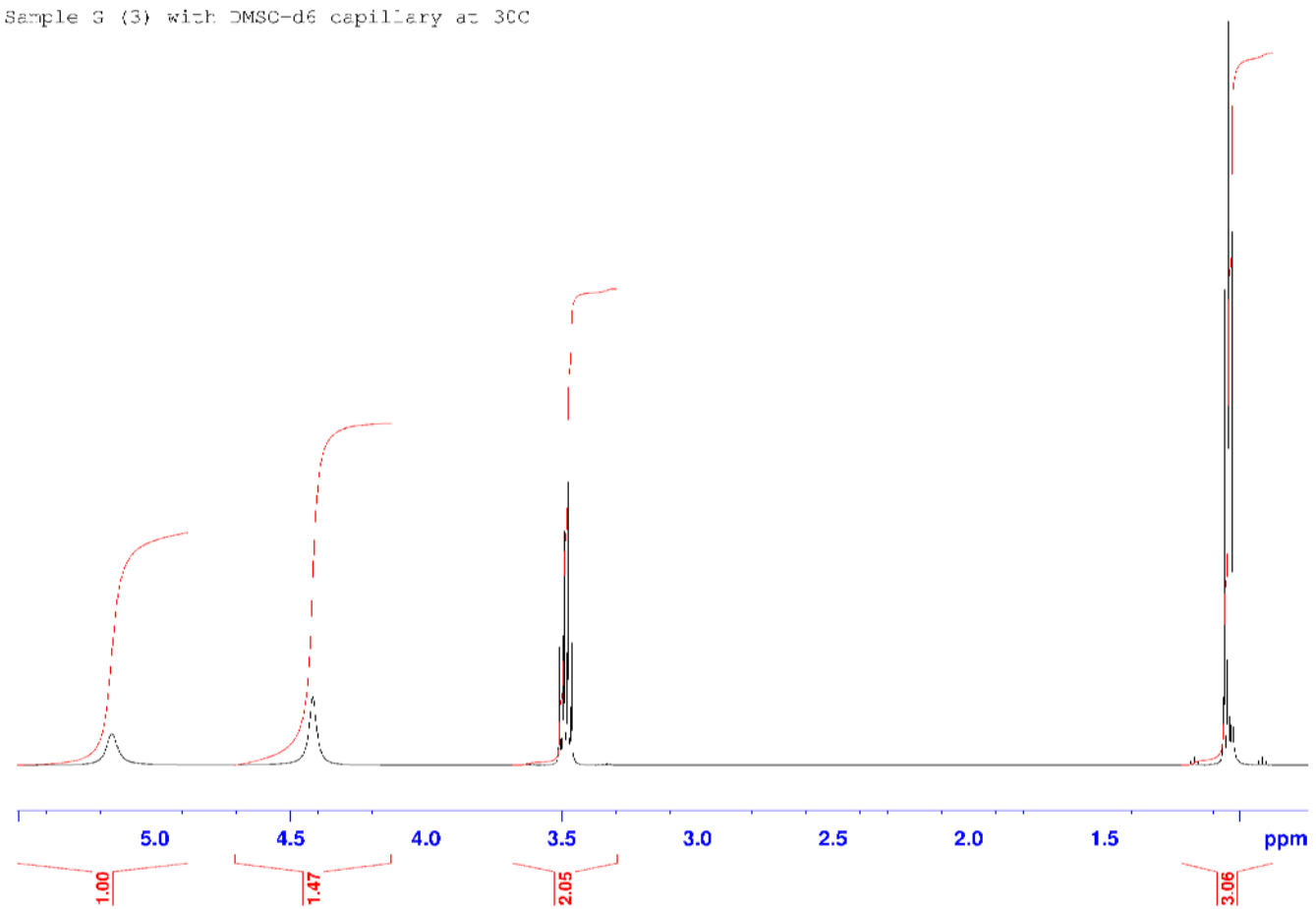

Figure 21: NMR Spectra of Hahnemannian 30CH – Run 3

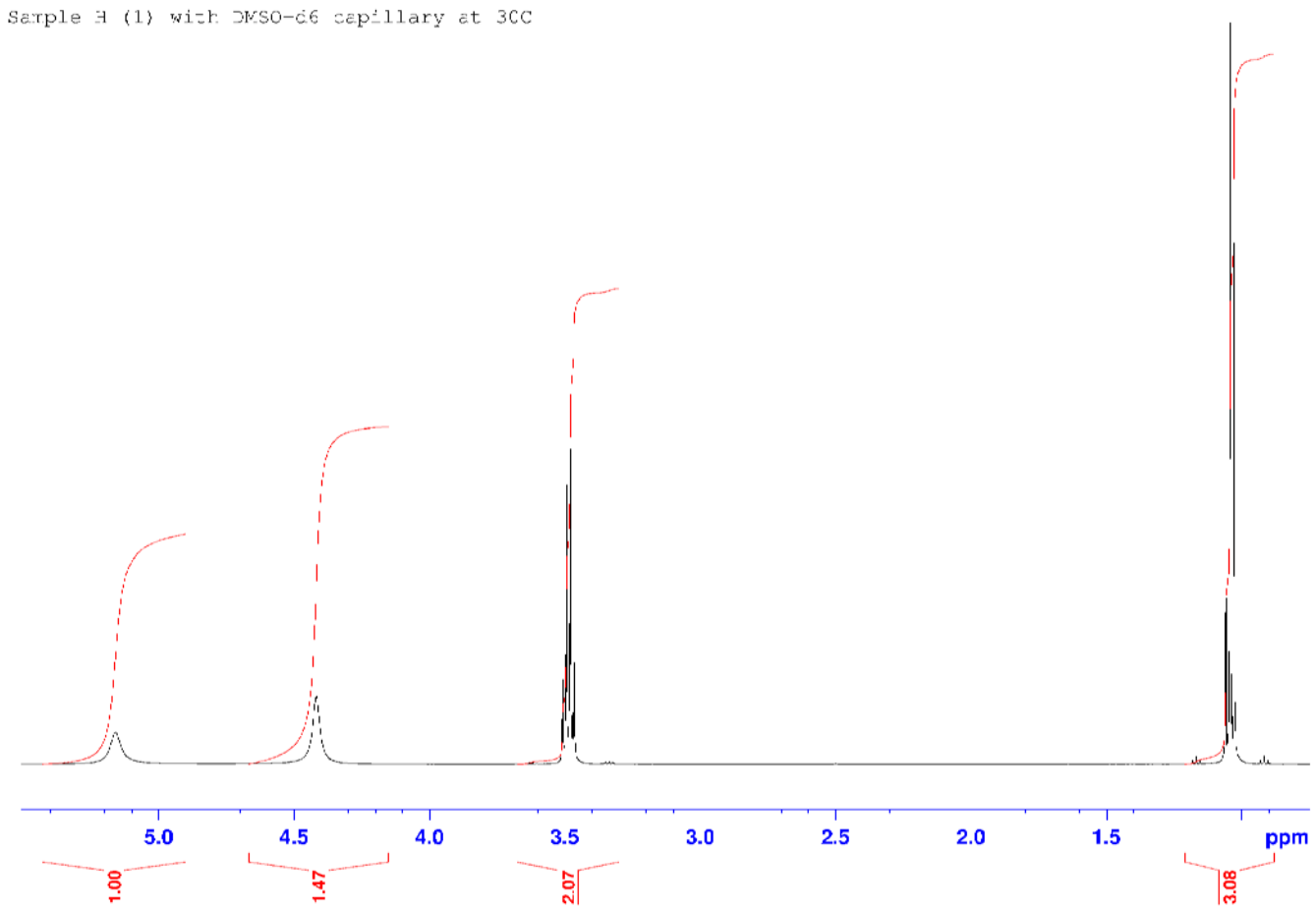

Figure 22: NMR Spectra of Hahnemannian Control – Run 1

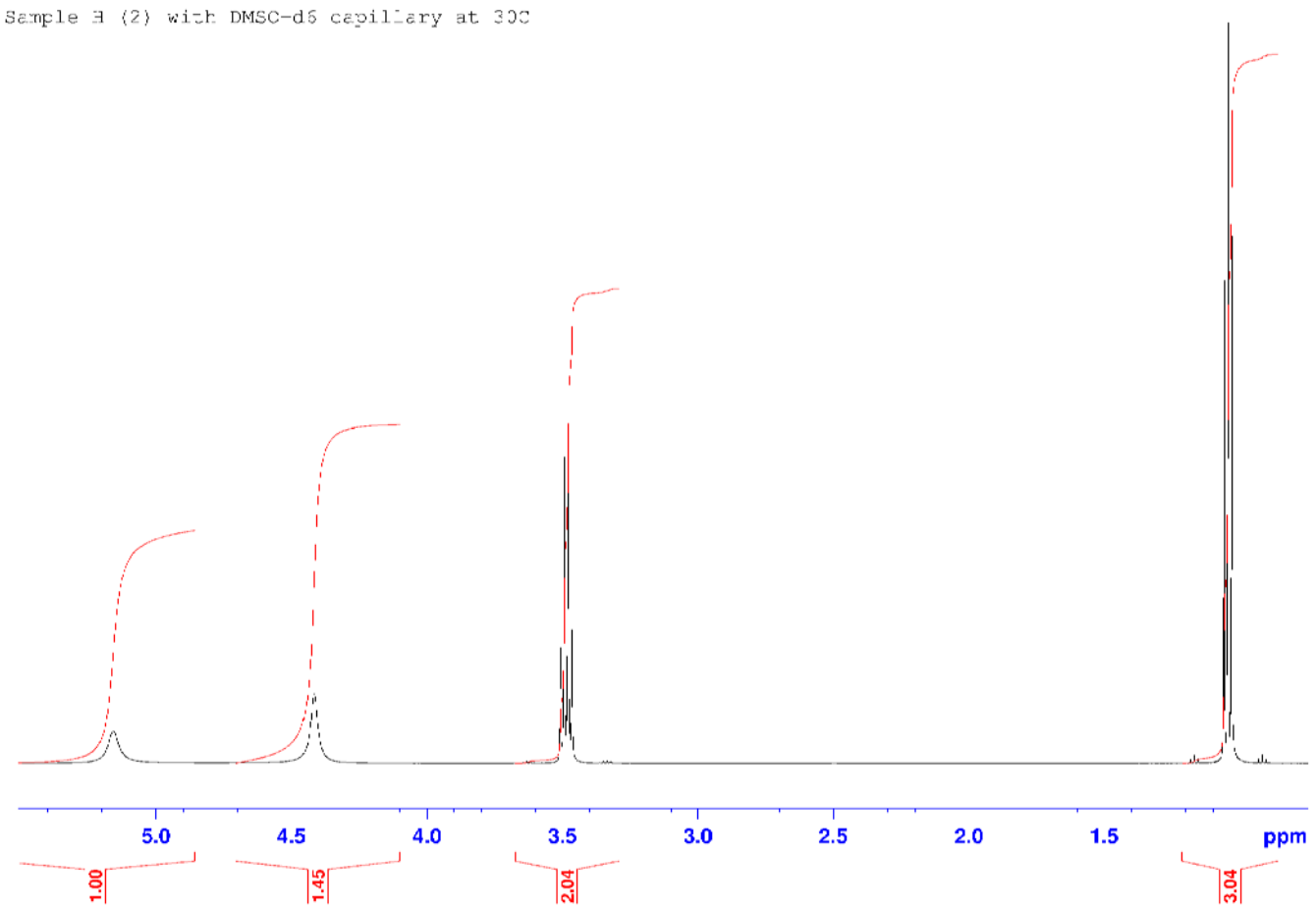

Figure 23: NMR Spectra of Hahnemannian Control – Run 2

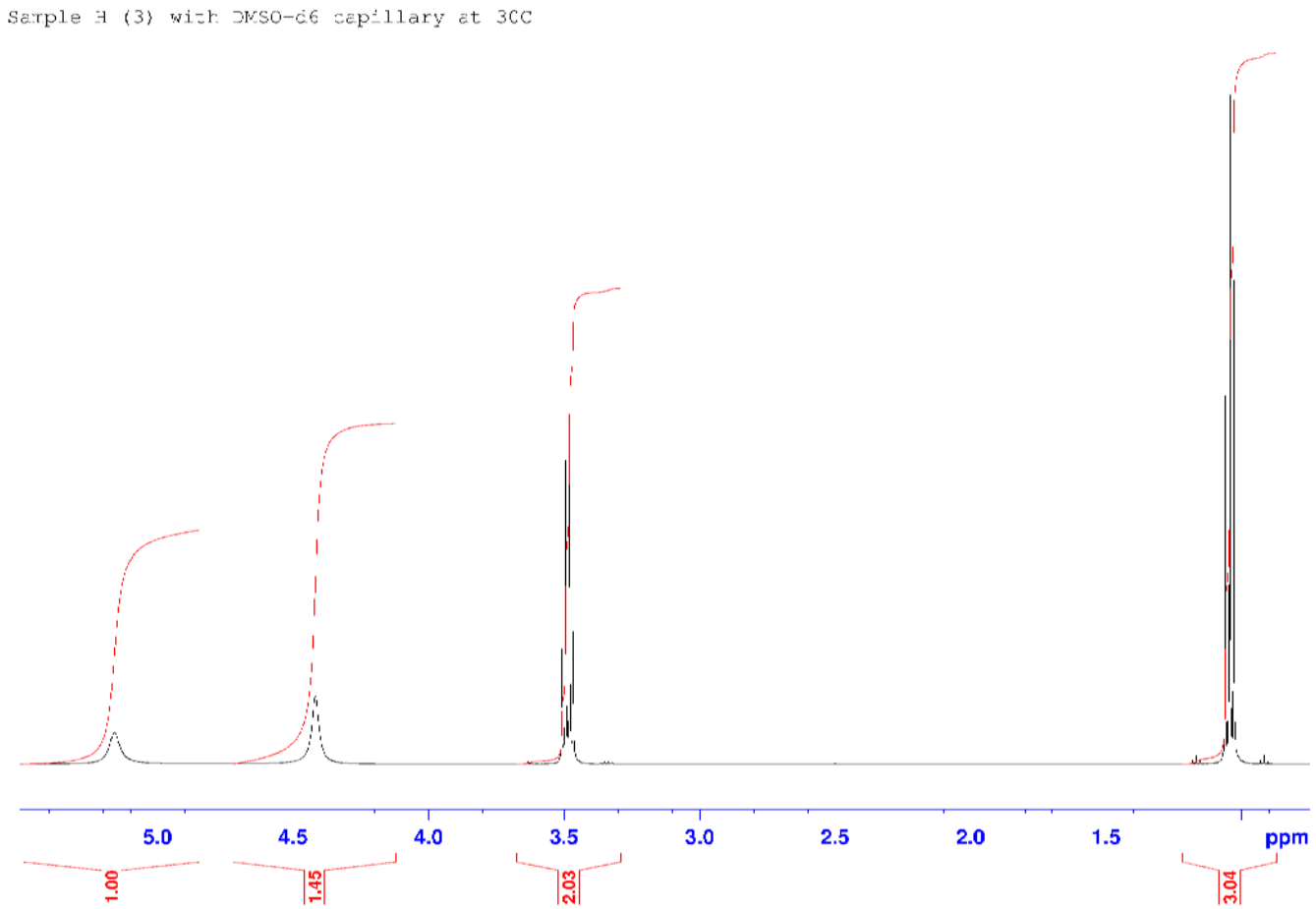

Figure 24: NMR Spectra of Hahnemannian Control – Run 3

APPENDIX C: Results Obtained From Statistical Analysis

KRUSKAL-WALLIS TEST

A) Chemical Shift values

Ranks

	sample	N	Mean Rank
h2o	1	3	17.67
	2	3	16.83
	3	3	23.00
	4	3	11.00
	5	3	16.50
	6	3	6.67
	7	3	3.67
	8	3	4.67
	Total	24	
oh	1	3	15.83
	2	3	7.17
	3	3	23.00
	4	3	7.33
	5	3	11.33
	6	3	13.33
	7	3	12.17
	8	3	9.83
	Total	24	
ch2	1	3	15.00
	2	3	16.00
	3	3	22.00
	4	3	13.17

	5	3	18.83
	6	3	5.00
	7	3	2.00
	8	3	8.00
	Total	24	
ch3	1	3	11.00
	2	3	14.00
	3	3	20.00
	4	3	23.00
	5	3	17.00
	6	3	5.00
	7	3	2.00
	8	3	8.00
	Total	24	

Test Statistics(a,b)

	h2o	oh	ch2	ch3
Chi-Square	20.871	11.299	20.190	22.700
df	7	7	7	7
Asymp. Sig.	.004	.126	.005	.002

a Kruskal Wallis Test

b Grouping Variable: sample

B) Relative Integration

Ranks

	sample	N	Mean Rank
H2O	1	3	13.33
	2	3	16.00
	3	3	11.17
	4	3	19.67
	5	3	18.33
	6	3	7.17
	7	3	7.17
	8	3	7.17
	Total	24	
OH	1	3	6.50
	2	3	4.83
	3	3	10.00
	4	3	12.17
	5	3	6.67
	6	3	19.17
	7	3	22.17
	8	3	18.50
	Total	24	
CH2	1	3	16.33
	2	3	9.67
	3	3	15.17
	4	3	11.67
	5	3	10.33
	6	3	3.17

	7	3	18.67
	8	3	15.00
	Total	24	
CH3	1	3	10.83
	2	3	18.83
	3	3	8.67
	4	3	8.50
	5	3	16.67
	6	3	4.67
	7	3	20.00
	8	3	11.83
	Total	24	

Test Statistics(a,b)

	H2O	OH	CH2	CH3
Chi-Square	11.712	18.930	10.174	12.916
df	7	7	7	7
Asymp. Sig.	.110	.008	.179	.074

a Kruskal Wallis Test

b Grouping Variable: sample

MANN-WHITNEY TEST

A) Chemical Shift values

1) Radionic 6C vs Radionic 12C

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	3.83	11.50
	2	3	3.17	9.50
	Total	6		
oh	1	3	4.50	13.50
	2	3	2.50	7.50
	Total	6		
ch2	1	3	3.00	9.00
	2	3	4.00	12.00
	Total	6		
ch3	1	3	2.00	6.00
	2	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	3.500	1.500	3.000	.000
Wilcoxon W	9.500	7.500	9.000	6.000
Z	-.443	-1.348	-.655	-1.964
Asymp. Sig. (2-tailed)	.658	.178	.513	.050
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.200(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

2) Radionic 6C vs Radionic 30C

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		
oh	1	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		
ch2	1	3	3.00	9.00
	3	3	4.00	12.00
	Total	6		
ch3	1	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	3.000	.000
Wilcoxon W	6.000	6.000	9.000	6.000
Z	-1.964	-1.964	-.664	-1.993
Asymp. Sig. (2-tailed)	.050	.050	.507	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

3) Radionic 6C vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
oh	1	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
ch2	1	3	3.00	9.00
	4	3	4.00	12.00
	Total	6		
ch3	1	3	2.00	6.00
	4	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	3.000	.000
Wilcoxon W	6.000	6.000	9.000	6.000
Z	-1.993	-1.964	-.655	-1.964
Asymp. Sig. (2-tailed)	.046	.050	.513	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

4) Radionic 6C vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	3.83	11.50
	5	3	3.17	9.50
	Total	6		
oh	1	3	4.33	13.00
	5	3	2.67	8.00
	Total	6		
ch2	1	3	3.00	9.00
	5	3	4.00	12.00
	Total	6		
ch3	1	3	2.00	6.00
	5	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	3.500	2.000	3.000	.000
Wilcoxon W	9.500	8.000	9.000	6.000
Z	-.443	-1.091	-.655	-1.964
Asymp. Sig. (2-tailed)	.658	.275	.513	.050
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.400(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

5) Radionic 6C vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
oh	1	3	4.00	12.00
	6	3	3.00	9.00
	Total	6		
ch2	1	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch3	1	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	3.000	.000	.000
Wilcoxon W	6.000	9.000	6.000	6.000
Z	-1.964	-.655	-1.964	-1.993
Asymp. Sig. (2-tailed)	.050	.513	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

6) Radionic 6C vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
oh	1	3	3.83	11.50
	7	3	3.17	9.50
	Total	6		
ch2	1	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	1	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	3.500	.000	.000
Wilcoxon W	6.000	9.500	6.000	6.000
Z	-1.964	-.443	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.658	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

7) Radionic 6C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	1	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
oh	1	3	4.17	12.50
	8	3	2.83	8.50
	Total	6		
ch2	1	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch3	1	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	2.500	.000	.000
Wilcoxon W	6.000	8.500	6.000	6.000
Z	-1.964	-.886	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.376	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

8) Radionic 12C vs Radionic 30C

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		
oh	2	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		
ch2	2	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		
ch3	2	3	2.00	6.00
	3	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.964	-1.993	-1.993	-1.993
Asymp. Sig. (2-tailed)	.050	.046	.046	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

9) Radionic 12C vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
oh	2	3	3.33	10.00
	4	3	3.67	11.00
	Total	6		
ch2	2	3	4.83	14.50
	4	3	2.17	6.50
	Total	6		
ch3	2	3	2.00	6.00
	4	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	4.000	.500	.000
Wilcoxon W	6.000	10.000	6.500	6.000
Z	-1.993	-.232	-1.771	-1.964
Asymp. Sig. (2-tailed)	.046	.817	.077	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	1.000(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

10) Radionic 12C vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	3.67	11.00
	5	3	3.33	10.00
	Total	6		
oh	2	3	2.67	8.00
	5	3	4.33	13.00
	Total	6		
ch2	2	3	2.17	6.50
	5	3	4.83	14.50
	Total	6		
ch3	2	3	2.00	6.00
	5	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	4.000	2.000	.500	.000
Wilcoxon W	10.000	8.000	6.500	6.000
Z	-.218	-1.107	-1.771	-1.964
Asymp. Sig. (2-tailed)	.827	.268	.077	.050
Exact Sig. [2*(1-tailed Sig.)]	1.000(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

11) Radionic 12C vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
oh	2	3	2.67	8.00
	6	3	4.33	13.00
	Total	6		
ch2	2	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch3	2	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	2.000	.000	.000
Wilcoxon W	6.000	8.000	6.000	6.000
Z	-1.964	-1.107	-1.964	-1.993
Asymp. Sig. (2-tailed)	.050	.268	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

12) Radionic 12C vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
oh	2	3	3.00	9.00
	7	3	4.00	12.00
	Total	6		
ch2	2	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	2	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	3.000	.000	.000
Wilcoxon W	6.000	9.000	6.000	6.000
Z	-1.964	-.696	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.487	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

13) Radionic 12C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	2	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
oh	2	3	3.00	9.00
	8	3	4.00	12.00
	Total	6		
ch2	2	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch3	2	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	3.000	.000	.000
Wilcoxon W	6.000	9.000	6.000	6.000
Z	-1.964	-.696	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.487	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

14) Radionic 30C vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	3	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
oh	3	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
ch2	3	3	5.00	15.00
	4	3	2.00	6.00
	Total	6		
ch3	3	3	2.00	6.00
	4	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.993	-1.964	-1.993	-1.993
Asymp. Sig. (2-tailed)	.046	.050	.046	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

15) Radionic 30C vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	3	3	5.00	15.00
	5	3	2.00	6.00
	Total	6		
oh	3	3	5.00	15.00
	5	3	2.00	6.00
	Total	6		
ch2	3	3	5.00	15.00
	5	3	2.00	6.00
	Total	6		
ch3	3	3	5.00	15.00
	5	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.964	-1.964	-1.993	-1.993
Asymp. Sig. (2-tailed)	.050	.050	.046	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

16) Radionic 30C vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	3	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
oh	3	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch2	3	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch3	3	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.964	-1.964	-1.993	-2.023
Asymp. Sig. (2-tailed)	.050	.050	.046	.043
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

17) Radionic 30C vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	3	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
oh	3	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch2	3	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	3	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.964	-1.964	-1.993	-1.993
Asymp. Sig. (2-tailed)	.050	.050	.046	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

18) Radionic 30C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	3	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
oh	3	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch2	3	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch3	3	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-1.964	-1.964	-1.993	-1.993
Asymp. Sig. (2-tailed)	.050	.050	.046	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

19) Radionic Control vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	4	3	2.00	6.00
	5	3	5.00	15.00
	Total	6		
oh	4	3	2.83	8.50
	5	3	4.17	12.50
	Total	6		
ch2	4	3	2.00	6.00
	5	3	5.00	15.00
	Total	6		
ch3	4	3	5.00	15.00
	5	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	2.500	.000	.000
Wilcoxon W	6.000	8.500	6.000	6.000
Z	-1.993	-.886	-1.964	-1.964
Asymp. Sig. (2-tailed)	.046	.376	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

20) Radionic Control vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	4	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
oh	4	3	2.67	8.00
	6	3	4.33	13.00
	Total	6		
ch2	4	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch3	4	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	2.000	.000	.000
Wilcoxon W	6.000	8.000	6.000	6.000
Z	-1.993	-1.124	-1.964	-1.993
Asymp. Sig. (2-tailed)	.046	.261	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

21) Radionic Control vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	4	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
oh	4	3	2.83	8.50
	7	3	4.17	12.50
	Total	6		
ch2	4	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	4	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	2.500	.000	.000
Wilcoxon W	6.000	8.500	6.000	6.000
Z	-1.993	-.886	-1.964	-1.964
Asymp. Sig. (2-tailed)	.046	.376	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

22) Radionic Control vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	4	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
oh	4	3	3.33	10.00
	8	3	3.67	11.00
	Total	6		
ch2	4	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch3	4	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	4.000	.000	.000
Wilcoxon W	6.000	10.000	6.000	6.000
Z	-1.993	-.225	-1.964	-1.964
Asymp. Sig. (2-tailed)	.046	.822	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	1.000(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

23) Hahnemannian 6CH vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
oh	5	3	3.17	9.50
	6	3	3.83	11.50
	Total	6		
ch2	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
ch3	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	3.500	.000	.000
Wilcoxon W	6.000	9.500	6.000	6.000
Z	-1.964	-.443	-1.964	-1.993
Asymp. Sig. (2-tailed)	.050	.658	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

24) Hahnemannian 6CH vs Hahnemannain 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	5	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
oh	5	3	3.33	10.00
	7	3	3.67	11.00
	Total	6		
ch2	5	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	5	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	4.000	.000	.000
Wilcoxon W	6.000	10.000	6.000	6.000
Z	-1.964	-.218	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.827	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	1.000(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

25) Hahnemannian 6CH vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	5	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
oh	5	3	3.67	11.00
	8	3	3.33	10.00
	Total	6		
ch2	5	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
ch3	5	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	.000	4.000	.000	.000
Wilcoxon W	6.000	10.000	6.000	6.000
Z	-1.964	-.218	-1.964	-1.964
Asymp. Sig. (2-tailed)	.050	.827	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	1.000(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

26) Hahnemannian 12CH vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	6	3	4.33	13.00
	7	3	2.67	8.00
	Total	6		
oh	6	3	3.67	11.00
	7	3	3.33	10.00
	Total	6		
ch2	6	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
ch3	6	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	2.000	4.000	.000	.000
Wilcoxon W	8.000	10.000	6.000	6.000
Z	-1.091	-.218	-1.964	-1.993
Asymp. Sig. (2-tailed)	.275	.827	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.400(a)	1.000(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

27) Hahnemannian 12CH vs Hahnemannain Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	6	3	4.33	13.00
	8	3	2.67	8.00
	Total	6		
oh	6	3	4.17	12.50
	8	3	2.83	8.50
	Total	6		
ch2	6	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
ch3	6	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	2.000	2.500	.000	.000
Wilcoxon W	8.000	8.500	6.000	6.000
Z	-1.091	-.886	-1.964	-1.993
Asymp. Sig. (2-tailed)	.275	.376	.050	.046
Exact Sig. [2*(1-tailed Sig.)]	.400(a)	.400(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

28) Hahnemannian 30CH vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
h2o	7	3	3.00	9.00
	8	3	4.00	12.00
	Total	6		
oh	7	3	3.83	11.50
	8	3	3.17	9.50
	Total	6		
ch2	7	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
ch3	7	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		

Test Statistics(b)

	h2o	oh	ch2	ch3
Mann-Whitney U	3.000	3.500	.000	.000
Wilcoxon W	9.000	9.500	6.000	6.000
Z	-.655	-.443	-1.964	-1.964
Asymp. Sig. (2-tailed)	.513	.658	.050	.050
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.700(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

B) Relative Integration values

1) Radionic 6C vs Radionic 12C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	3.00	9.00
	2	3	4.00	12.00
	Total	6		
OH	1	3	4.17	12.50
	2	3	2.83	8.50
	Total	6		
CH2	1	3	4.00	12.00
	2	3	3.00	9.00
	Total	6		
CH3	1	3	2.17	6.50
	2	3	4.83	14.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	2.500	3.000	.500
Wilcoxon W	9.000	8.500	9.000	6.500
Z	-.664	-.899	-.664	-1.798
Asymp. Sig. (2-tailed)	.507	.369	.507	.072
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.400(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

2) Radionic 6C vs Radionic 30C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	3.83	11.50
	3	3	3.17	9.50
	Total	6		
OH	1	3	2.83	8.50
	3	3	4.17	12.50
	Total	6		
CH2	1	3	3.83	11.50
	3	3	3.17	9.50
	Total	6		
CH3	1	3	3.83	11.50
	3	3	3.17	9.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.500	2.500	3.500	3.500
Wilcoxon W	9.500	8.500	9.500	9.500
Z	-.471	-.943	-.471	-.471
Asymp. Sig. (2-tailed)	.637	.346	.637	.637
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.400(a)	.700(a)	.700(a)

a Not corrected for ties.

b Grouping Variable: sample

3) Radionic 6C vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	2.17	6.50
	4	3	4.83	14.50
	Total	6		
OH	1	3	2.17	6.50
	4	3	4.83	14.50
	Total	6		
CH2	1	3	4.17	12.50
	4	3	2.83	8.50
	Total	6		
CH3	1	3	4.17	12.50
	4	3	2.83	8.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.500	.500	2.500	2.500
Wilcoxon W	6.500	6.500	8.500	8.500
Z	-1.826	-1.826	-.913	-.913
Asymp. Sig. (2-tailed)	.068	.068	.361	.361
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.400(a)	.400(a)

a Not corrected for ties.

b Grouping Variable: sample

4) Radionic 6C vs Hahnemannian 6C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	2.33	7.00
	5	3	4.67	14.00
	Total	6		
OH	1	3	3.33	10.00
	5	3	3.67	11.00
	Total	6		
CH2	1	3	4.33	13.00
	5	3	2.67	8.00
	Total	6		
CH3	1	3	2.33	7.00
	5	3	4.67	14.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	1.000	4.000	2.000	1.000
Wilcoxon W	7.000	10.000	8.000	7.000
Z	-1.650	-.236	-1.179	-1.650
Asymp. Sig. (2-tailed)	.099	.814	.239	.099
Exact Sig. [2*(1-tailed Sig.)]	.200(a)	1.000(a)	.400(a)	.200(a)

a Not corrected for ties.

b Grouping Variable: sample

5) Radionic 6C vs Hahnemannian 12C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	4.67	14.00
	6	3	2.33	7.00
	Total	6		
OH	1	3	2.00	6.00
	6	3	5.00	15.00
	Total	6		
CH2	1	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
CH3	1	3	4.67	14.00
	6	3	2.33	7.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	1.000	.000	.000	1.000
Wilcoxon W	7.000	6.000	6.000	7.000
Z	-1.650	-2.023	-2.023	-1.650
Asymp. Sig. (2-tailed)	.099	.043	.043	.099
Exact Sig. [2*(1-tailed Sig.)]	.200(a)	.100(a)	.100(a)	.200(a)

a Not corrected for ties.

b Grouping Variable: sample

6) Radionic 6C vs Hahnemannian 30C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	4.67	14.00
	7	3	2.33	7.00
	Total	6		
OH	1	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH2	1	3	3.33	10.00
	7	3	3.67	11.00
	Total	6		
CH3	1	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	1.000	.000	4.000	.000
Wilcoxon W	7.000	6.000	10.000	6.000
Z	-1.650	-1.993	-.225	-2.023
Asymp. Sig. (2-tailed)	.099	.046	.822	.043
Exact Sig. [2*(1-tailed Sig.)]	.200(a)	.100(a)	1.000(a)	.100(a)

a Not corrected for ties.
b Grouping Variable: sample

7) Radionic 6C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	1	3	4.67	14.00
	8	3	2.33	7.00
	Total	6		
OH	1	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
CH2	1	3	3.67	11.00
	8	3	3.33	10.00
	Total	6		
CH3	1	3	3.67	11.00
	8	3	3.33	10.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	1.000	.000	4.000	4.000
Wilcoxon W	7.000	6.000	10.000	10.000
Z	-1.650	-1.993	-.221	-.232
Asymp. Sig. (2-tailed)	.099	.046	.825	.817
Exact Sig. [2*(1-tailed Sig.)]	.200(a)	.100(a)	1.000(a)	1.000(a)

a Not corrected for ties.

b Grouping Variable: sample

8) Radionic 12C vs Radionic 30C

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	3	3	3.00	9.00
	Total	6		
OH	2	3	2.50	7.50
	3	3	4.50	13.50
	Total	6		
CH2	2	3	3.00	9.00
	3	3	4.00	12.00
	Total	6		
CH3	2	3	4.83	14.50
	3	3	2.17	6.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	1.500	3.000	.500
Wilcoxon W	9.000	7.500	9.000	6.500
Z	-.655	-1.328	-.655	-1.771
Asymp. Sig. (2-tailed)	.513	.184	.513	.077
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.200(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

9) Radionic 12C vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	4	3	3.00	9.00
	Total	6		
OH	2	3	2.17	6.50
	4	3	4.83	14.50
	Total	6		
CH2	2	3	3.00	9.00
	4	3	4.00	12.00
	Total	6		
CH3	2	3	4.83	14.50
	4	3	2.17	6.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	.500	3.000	.500
Wilcoxon W	9.000	6.500	9.000	6.500
Z	-.664	-1.798	-.664	-1.798
Asymp. Sig. (2-tailed)	.507	.072	.507	.072
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.100(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

10) Radionic 12C vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	5	3	3.00	9.00
	Total	6		
OH	2	3	3.33	10.00
	5	3	3.67	11.00
	Total	6		
CH2	2	3	3.00	9.00
	5	3	4.00	12.00
	Total	6		
CH3	2	3	4.00	12.00
	5	3	3.00	9.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	4.000	3.000	3.000
Wilcoxon W	9.000	10.000	9.000	9.000
Z	-.664	-.232	-.664	-.696
Asymp. Sig. (2-tailed)	.507	.817	.507	.487
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	1.000(a)	.700(a)	.700(a)

a Not corrected for ties.

b Grouping Variable: sample

11) Radionic 12C vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	6	3	3.00	9.00
	Total	6		
OH	2	3	2.00	6.00
	6	3	5.00	15.00
	Total	6		
CH2	2	3	4.00	12.00
	6	3	3.00	9.00
	Total	6		
CH3	2	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	.000	3.000	.000
Wilcoxon W	9.000	6.000	9.000	6.000
Z	-.664	-1.993	-.664	-1.993
Asymp. Sig. (2-tailed)	.507	.046	.507	.046
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.100(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

12) Radionic 12C vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	7	3	3.00	9.00
	Total	6		
OH	2	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH2	2	3	2.67	8.00
	7	3	4.33	13.00
	Total	6		
CH3	2	3	3.33	10.00
	7	3	3.67	11.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	.000	2.000	4.000
Wilcoxon W	9.000	6.000	8.000	10.000
Z	-.664	-1.964	-1.107	-.221
Asymp. Sig. (2-tailed)	.507	.050	.268	.825
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.100(a)	.400(a)	1.000(a)

a Not corrected for ties.

b Grouping Variable: sample

13) Radionic 12C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	2	3	4.00	12.00
	8	3	3.00	9.00
	Total	6		
OH	2	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
CH2	2	3	3.00	9.00
	8	3	4.00	12.00
	Total	6		
CH3	2	3	4.00	12.00
	8	3	3.00	9.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	.000	3.000	3.000
Wilcoxon W	9.000	6.000	9.000	9.000
Z	-.664	-1.964	-.655	-.655
Asymp. Sig. (2-tailed)	.507	.050	.513	.513
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.100(a)	.700(a)	.700(a)

a Not corrected for ties.

b Grouping Variable: sample

14) Radionic 30CH vs Radionic Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	3	3	2.17	6.50
	4	3	4.83	14.50
	Total	6		
OH	3	3	3.17	9.50
	4	3	3.83	11.50
	Total	6		
CH2	3	3	4.17	12.50
	4	3	2.83	8.50
	Total	6		
CH3	3	3	3.50	10.50
	4	3	3.50	10.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.500	3.500	2.500	4.500
Wilcoxon W	6.500	9.500	8.500	10.500
Z	-1.798	-.449	-.899	.000
Asymp. Sig. (2-tailed)	.072	.653	.369	1.000
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.700(a)	.400(a)	1.000(a)

a Not corrected for ties.

b Grouping Variable: sample

15) Radionic 30C vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	3	3	2.33	7.00
	5	3	4.67	14.00
	Total	6		
OH	3	3	4.00	12.00
	5	3	3.00	9.00
	Total	6		
CH2	3	3	4.33	13.00
	5	3	2.67	8.00
	Total	6		
CH3	3	3	2.33	7.00
	5	3	4.67	14.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	1.000	3.000	2.000	1.000
Wilcoxon W	7.000	9.000	8.000	7.000
Z	-1.623	-.696	-1.159	-1.623
Asymp. Sig. (2-tailed)	.105	.487	.246	.105
Exact Sig. [2*(1-tailed Sig.)]	.200(a)	.700(a)	.400(a)	.200(a)

a Not corrected for ties.

b Grouping Variable: sample

16) Radionic 30C vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	3	3	4.17	12.50
	6	3	2.83	8.50
	Total	6		
OH	3	3	2.00	6.00
	6	3	5.00	15.00
	Total	6		
CH2	3	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
CH3	3	3	4.17	12.50
	6	3	2.83	8.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	2.500	.000	.000	2.500
Wilcoxon W	8.500	6.000	6.000	8.500
Z	-.943	-1.993	-1.993	-.943
Asymp. Sig. (2-tailed)	.346	.046	.046	.346
Exact Sig. [2*(1-tailed Sig.)]	.400(a)	.100(a)	.100(a)	.400(a)

a Not corrected for ties.

b Grouping Variable: sample

17) Radionic 30C vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	3	3	4.17	12.50
	7	3	2.83	8.50
	Total	6		
OH	3	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH2	3	3	3.00	9.00
	7	3	4.00	12.00
	Total	6		
CH3	3	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	2.500	.000	3.000	.000
Wilcoxon W	8.500	6.000	9.000	6.000
Z	-.943	-1.964	-.696	-1.993
Asymp. Sig. (2-tailed)	.346	.050	.487	.046
Exact Sig. [2*(1-tailed Sig.)]	.400(a)	.100(a)	.700(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

18) Radionic 30C vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	3	3	4.17	12.50
	8	3	2.83	8.50
	Total	6		
OH	3	3	2.17	6.50
	8	3	4.83	14.50
	Total	6		
CH2	3	3	3.50	10.50
	8	3	3.50	10.50
	Total	6		
CH3	3	3	3.33	10.00
	8	3	3.67	11.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	2.500	.500	4.500	4.000
Wilcoxon W	8.500	6.500	10.500	10.000
Z	-.943	-1.771	.000	-.225
Asymp. Sig. (2-tailed)	.346	.077	1.000	.822
Exact Sig. [2*(1-tailed Sig.)]	.400(a)	.100(a)	1.000(a)	1.000(a)

a Not corrected for ties.

b Grouping Variable: sample

19) Radionic Control vs Hahnemannian 6CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	4	3	4.00	12.00
	5	3	3.00	9.00
	Total	6		
OH	4	3	4.67	14.00
	5	3	2.33	7.00
	Total	6		
CH2	4	3	4.00	12.00
	5	3	3.00	9.00
	Total	6		
CH3	4	3	2.33	7.00
	5	3	4.67	14.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	3.000	1.000	3.000	1.000
Wilcoxon W	9.000	7.000	9.000	7.000
Z	-.745	-1.650	-.745	-1.650
Asymp. Sig. (2-tailed)	.456	.099	.456	.099
Exact Sig. [2*(1-tailed Sig.)]	.700(a)	.200(a)	.700(a)	.200(a)

a Not corrected for ties.

b Grouping Variable: sample

20) Radionic Control vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	4	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
OH	4	3	2.00	6.00
	6	3	5.00	15.00
	Total	6		
CH2	4	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
CH3	4	3	4.33	13.00
	6	3	2.67	8.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	.000	2.000
Wilcoxon W	6.000	6.000	6.000	8.000
Z	-2.023	-2.023	-2.023	-1.124
Asymp. Sig. (2-tailed)	.043	.043	.043	.261
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.400(a)

a Not corrected for ties.

b Grouping Variable: sample

21) Radionic Control vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	4	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
OH	4	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH2	4	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH3	4	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-2.023	-1.993	-2.023	-2.023
Asymp. Sig. (2-tailed)	.043	.046	.043	.043
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

22) Radionic Control vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	4	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
OH	4	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
CH2	4	3	3.00	9.00
	8	3	4.00	12.00
	Total	6		
CH3	4	3	3.33	10.00
	8	3	3.67	11.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	3.000	4.000
Wilcoxon W	6.000	6.000	9.000	10.000
Z	-2.023	-1.993	-.664	-.221
Asymp. Sig. (2-tailed)	.043	.046	.507	.825
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.700(a)	1.000(a)

a Not corrected for ties.

b Grouping Variable: sample

23) Hahnemannian 6CH vs Hahnemannian 12CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
OH	5	3	2.00	6.00
	6	3	5.00	15.00
	Total	6		
CH2	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		
CH3	5	3	5.00	15.00
	6	3	2.00	6.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	.000	.000
Wilcoxon W	6.000	6.000	6.000	6.000
Z	-2.023	-2.023	-2.023	-2.023
Asymp. Sig. (2-tailed)	.043	.043	.043	.043
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

24) Hahnemannian 6CH vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	5	3	5.00	15.00
	7	3	2.00	6.00
	Total	6		
OH	5	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH2	5	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH3	5	3	2.67	8.00
	7	3	4.33	13.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	.000	2.000
Wilcoxon W	6.000	6.000	6.000	8.000
Z	-2.023	-1.993	-2.023	-1.124
Asymp. Sig. (2-tailed)	.043	.046	.043	.261
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.100(a)	.400(a)

a Not corrected for ties.

b Grouping Variable: sample

25) Hahnemannian 6CH vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	5	3	5.00	15.00
	8	3	2.00	6.00
	Total	6		
OH	5	3	2.00	6.00
	8	3	5.00	15.00
	Total	6		
CH2	5	3	3.00	9.00
	8	3	4.00	12.00
	Total	6		
CH3	5	3	4.00	12.00
	8	3	3.00	9.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	.000	.000	3.000	3.000
Wilcoxon W	6.000	6.000	9.000	9.000
Z	-2.023	-1.993	-.664	-.664
Asymp. Sig. (2-tailed)	.043	.046	.507	.507
Exact Sig. [2*(1-tailed Sig.)]	.100(a)	.100(a)	.700(a)	.700(a)

a Not corrected for ties.

b Grouping Variable: sample

26) Hahnemannian 12CH vs Hahnemannian 30CH

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	6	3	3.50	10.50
	7	3	3.50	10.50
	Total	6		
OH	6	3	2.33	7.00
	7	3	4.67	14.00
	Total	6		
CH2	6	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		
CH3	6	3	2.00	6.00
	7	3	5.00	15.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	4.500	1.000	.000	.000
Wilcoxon W	10.500	7.000	6.000	6.000
Z	.000	-1.623	-2.023	-2.023
Asymp. Sig. (2-tailed)	1.000	.105	.043	.043
Exact Sig. [2*(1-tailed Sig.)]	1.000(a)	.200(a)	.100(a)	.100(a)

a Not corrected for ties.

b Grouping Variable: sample

27) Hahnemannian 12CH vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	6	3	3.50	10.50
	8	3	3.50	10.50
	Total	6		
OH	6	3	3.83	11.50
	8	3	3.17	9.50
	Total	6		
CH2	6	3	2.17	6.50
	8	3	4.83	14.50
	Total	6		
CH3	6	3	2.83	8.50
	8	3	4.17	12.50
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	4.500	3.500	.500	2.500
Wilcoxon W	10.500	9.500	6.500	8.500
Z	.000	-.449	-1.798	-.943
Asymp. Sig. (2-tailed)	1.000	.653	.072	.346
Exact Sig. [2*(1-tailed Sig.)]	1.000(a)	.700(a)	.100(a)	.400(a)

a Not corrected for ties.

b Grouping Variable: sample

28) Hahnemannian 30CH vs Hahnemannian Control

Ranks

	sample	N	Mean Rank	Sum of Ranks
H2O	7	3	3.50	10.50
	8	3	3.50	10.50
	Total	6		
OH	7	3	4.50	13.50
	8	3	2.50	7.50
	Total	6		
CH2	7	3	3.67	11.00
	8	3	3.33	10.00
	Total	6		
CH3	7	3	4.00	12.00
	8	3	3.00	9.00
	Total	6		

Test Statistics(b)

	H2O	OH	CH2	CH3
Mann-Whitney U	4.500	1.500	4.000	3.000
Wilcoxon W	10.500	7.500	10.000	9.000
Z	.000	-1.328	-.232	-.664
Asymp. Sig. (2-tailed)	1.000	.184	.817	.507
Exact Sig. [2*(1-tailed Sig.)]	1.000(a)	.200(a)	1.000(a)	.700(a)

a Not corrected for ties.

b Grouping Variable: sample