Particles search

Gelsemium sempervirens

MD Michel Van Wassenhoven
High Performance Liquid Chromatography. HPLC-UV

• *Gelsemium sempervirens*
High Performance Liquid Chromatography. HPLC-UV

- **Gelsemium sempervirens**
High Performance Liquid Chromatography. HPLC-UV

- *Gelsemium sempervirens*
High Performance Liquid Chromatography. HPLC-UV

• *Gelsemium sempervirens*

<table>
<thead>
<tr>
<th></th>
<th>Sempervirine</th>
<th>Gelsemine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Mean ± standard deviation)</td>
<td>(Mean ± standard deviation)</td>
</tr>
<tr>
<td>Mother Tincture (dilution 50x)</td>
<td>577.1 µg/ml ± 1.1</td>
<td>354.0 µg/ml ± 1.5</td>
</tr>
<tr>
<td>Mother Tincture (dilution 20x)</td>
<td>577.5 µg/ml ± 3.8</td>
<td>360.2 µg/ml ± 0.3</td>
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<tr>
<td>1D</td>
<td>165.5 µg/ml ± 1.7</td>
<td>116.1 µg/ml ± 1.7</td>
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<tr>
<td>10⁻¹</td>
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<td>111.6 µg/ml ± 1.7</td>
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<td>2D</td>
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<td>10⁻²</td>
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<td>3D</td>
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<td>10⁻³</td>
<td>1.56 µg/ml ± 2.7</td>
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<td>4D</td>
<td>0.117 µg/ml ± 8.3</td>
<td>0.115 µg/ml ± 2.8</td>
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<td>10⁻⁴</td>
<td>0.117 µg/ml ± 5</td>
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<td>5D</td>
<td>0.00722 µg/ml ± 11.1</td>
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<td>10⁻⁵</td>
<td>0.00749 µg/ml ± 2.4</td>
<td>0.01074 µg/ml ± 0.7</td>
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<tr>
<td>6D</td>
<td>Non quantifiable</td>
<td>Non quantifiable</td>
</tr>
<tr>
<td>10⁻⁶</td>
<td>Non quantifiable</td>
<td>Non quantifiable</td>
</tr>
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</table>
**NTA : Nanoparticle Tracking Analysis**

- Gelsemium 4CH
- Gelsemium $10^{-8}$
- Gelsemium 30CH
- Gelsemium $10^{-60}$
- Gelsemium 200K
- Aqua Pura 30CH (Glass containers)
Mean particules sizes in nanometers. (Gelsemium and controls).
Particules sizes distribution (D90) in nanometers. (Gelsemium)
NTA : Nanoparticle Tracking Analysis

• Conclusions.
  • Particles exist even in highest dilutions but in very low quantities in a relatively stable concentration.
  • Compared with a metal or potentized water control in glass containers, the concentration of particles is similar in all samples. Only for K potencies is the amount of detectable particles higher.
  • There is a clear difference for all aspects between potentized Gelsemium and potentized water control prepared in PET containers.
  • This PET water control is at the limit of the NTA methodology, the visualized particles are considered here as non-homogenous artefacts.
  • The nature of the particles needs further identification by SEM/EDS.
Lyophilisation process

• **Gelsemium sempervirens**

SEM/EDX = Scanning Electron Microscopy with X-ray microanalysis.

Starting from 400cc (20 x 20cc 4CH samples), lyophilized (concentrated) we are able to identify these particles. 200cc of 200K and 30CH, contains also particles!
SEM/EDX

• Gelsemium sempervirens

Solution frozen to -120°C
500cc glass ball, negative pressure
Slowly coming back at room C°.
Process repeated several times
Residual material collected & weighted.
<table>
<thead>
<tr>
<th></th>
<th>Uncertainty/g*</th>
<th>Gelsemine /g</th>
<th>Real dry material/g</th>
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<tbody>
<tr>
<td><strong>MT</strong></td>
<td></td>
<td>360.200µg +/- 0.3</td>
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<tr>
<td>1 D</td>
<td>+/- 3x10⁻⁹</td>
<td>116.100µg +/- 1.7</td>
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<td>2 D</td>
<td>+/- 3x10⁻⁹</td>
<td>16.500µg +/- 1.5</td>
<td></td>
</tr>
<tr>
<td>3 D</td>
<td>+/- 3x10⁻⁹</td>
<td>1.440µg +/- 2.2</td>
<td></td>
</tr>
<tr>
<td>4 D</td>
<td>+/- 3x10⁻⁹</td>
<td>115µg +/- 2.8</td>
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<tr>
<td>5 D</td>
<td>+/- 3x10⁻⁹</td>
<td>10.76µg +/- 11.2</td>
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</tr>
<tr>
<td>6 D (3C)</td>
<td>+/- 3x10⁻⁹</td>
<td>NQ (In theory +/-1µg)</td>
<td></td>
</tr>
<tr>
<td>4C</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-0.01µg</td>
<td>0.042mg = 42µg</td>
</tr>
<tr>
<td>30C</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-10⁻⁵⁴µg</td>
<td>0.036mg = 36 µg</td>
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<tr>
<td>200K</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-10⁻⁵⁴µg</td>
<td>0.0305mg = 30.5 µg</td>
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<tr>
<td>Diluted 10⁻⁶₀</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-10⁻⁵⁴µg</td>
<td>0.071mg = 71 µg</td>
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<tr>
<td>Pure aqua 30C</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-10⁻⁵⁴µg</td>
<td>0.002mg = 2 µg</td>
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<tr>
<td>Cuprum 30C</td>
<td>+/- 3x10⁻⁹</td>
<td>In theory +/-10⁻⁵⁴µg</td>
<td>0.001mg = 1 µg</td>
</tr>
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</table>
Conclusions:

• Clearly it is possible, using this methodology, to differentiate visually Gelsemium sempervirens in several potentisations from controls or other remedies.
• CH and K preparations generate specific images.
• Quantities of collected material are much higher for plants than for metals or water control.
EDX

• *Gelsemium sempervirens*

EDX =

Electron Microscopy with X-ray microanalysis is allowing the chemical analyze of the observed material.
There is a clear difference in chemistry between the different samples. The proportion of Carbon, Oxygen, Sodium are always high, Silicium and Calcium are also good discriminant factors. Molybden is a specific compound of plant roots.
There is a clear difference in chemistry between the different samples. The proportion of Carbon, Oxygen, Sodium are always high, Silicium and Calcium are also good discriminant factors. Molybden is a specific compound of plant roots.
Possible modelisation of these particles (100 smaller than in reality)

Yellow = Na; Red = O; Magenta = Si; Blue = C; Grey = Ca; White = H.

More compact model if Si/C decreases.
Conclusions SEM/EDX (1)

- For Cuprum 30C, the number of particles was comparable but only 1 µg/g was collected (40 times lower than in Gelsemium 30C).
- The presence of this material demonstrate that the used step by step process (dynamized or not) is not a simple dilution process.
- The lyophilized dry material obtained from Gelsemium 4C, 30C, 200K, dilution 10^-60, Cuprum 30C and Water 30C observed by SEM/EDS, allowing a detailed view of the obtained lyophilized dry material, produce remarkable images.
Conclusions SEM/EDX (2)

- If we compare the nature of the material, the diversity of shapes is the most complex in the 4C but can also be found in Gelsemium 30C and 200K. The shapes are also easily discriminated from simply diluted Gelsemium 10^-60, potentized coper or Kalium muriaticum 30C or potentized water 30C materials.

- The chemistry of the materials, determined by EDS, shows that this material is not composed of all original molecular compounds of the MT. Example: already in Gels 4C, no nitrogen found, meaning absence of specific Gelsemium alkaloids. There is a specific composition for each of the samples. The proportion of the different atoms results in a specific chemical profile.
Conclusions SEM/EDX (3)

• The Molybdenum identified in Gelsemium 4C is an original component of the MT. This atom was not found in the other samples, excluding an involvement of glass containers. It is part of the xanthine oxidase, enzyme largely expressed in the roots of plants.

• Because of the absence of any particles in the used deionized pure water (NTA), the presence of these atoms can only be justified by an interaction between the original stock, the used glass containers and the deionized water.
Conclusions SEM/EDX (4)

• A simple dilution is not a potentization and a difference exists between the C, K potentization processes and controls.
• When using PET containers for the potentization of Aqua pura 30K no significant particles can be observed. Nevertheless, for the potentized Cuprum metallicum 30K also in PET container, particles are observed.
• This fact confirms the role of the stock during the potentization process.
Established differences between measurements using glass or PET containers for the preparations.
A comprehensive approach

✓ Nano particles search

✓ **Solvent (water) behaviour**

✓ Electrons behaviour
NMR

What are we measuring?

- Certain atomic nuclei including 1H exhibit nuclear magnetic resonance. Nuclear “spins” are like magnetic dipoles.
- Spins are normally oriented randomly.
NMR

- Magnetization returns exponentially to equilibrium
- Longitudinal **recovery** time constant is $T_1$ (spin-lattice relaxation time)
- Transverse **decay** time constant is $T_2$ (spin-spin relaxation time)
NMR

What are we measuring?

Measures “fixed” at 63% of final value.  
FID = free induction decay

$T_1$ Relaxation

The FID oscillates at the Larmor frequency but is damped by a process we now call $T_2^*$ decay.
NMR

After these measurements a question arised: « Are these values specific and as such allowing to discriminate the medicines between each other or are they aleatory values? ». To answer this question, statistical analyses are needed.
NMR

Gelsemium Aqua Pura $T_1/T_2$
Absolute deviation: 0.067(0.007)
DI = 1.079(0.002)+CH - 4.82(0.03)
Least square fit: $\chi^2 = 30$, GOF = 0.24
DI = 1.066(0.002)+CH - 4.30(0.02)
Pearson's correlation coefficient
0.999985 ± 0.999933 ± 0.99997

Gelsemium Diluted $T_1/T_2$
Absolute deviation: 0.043(0.006)
DI = 1.079(0.001)+CH - 4.37(0.02)
Least square fit: $\chi^2 = 9$, GOF = 0.999
DI = 1.076(0.002)+CH - 4.32(0.01)
Pearson's correlation coefficient
0.99997 ± 0.99999 ± 0.99999

Gelsemium Dynamized $T_1/T_2$
Absolute deviation: 0.047(0.006)
DI = 1.067(0.002)+CH - 4.29(0.02)
Least square fit: $\chi^2 = 9$, GOF = 0.999
DI = 1.056(0.002)+CH - 4.26(0.02)
Pearson's correlation coefficient
0.99997 ± 0.99999 ± 0.99999

p(KS) = 0.02
p(F) = 0.34
p(t) = 0.02
p(tu) = 0.03
p(tp) = 0.06
p(KS) = 7×10^{-3}
p(F) = 1
p(t) = 4×10^{-3}
p(tu) = 6×10^{-4}
p(tp) = 4×10^{-2}
NMR

Aqua Pura
DI = 2334(2)×CH - 9284(29)
Lactose
DI = 2377(2)×CH - 9509(19)
Diluted
DI = 2353(2)×CH - 9420(19)
Dynamized
DI = 2438(3)×CH - 9731(21)

Copper $T_2$

<table>
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<tr>
<th>Kolmogorov-Smirnov test →</th>
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<td>cAP -</td>
</tr>
<tr>
<td>cLT 12</td>
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<tr>
<td>cLT 32</td>
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<tr>
<td>cAP -</td>
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<td>-</td>
</tr>
<tr>
<td>cDL 66</td>
<td>42</td>
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<tr>
<td>cDN 0.5</td>
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NMR

Aqua Pura
DI = 2341(3)×CH - 9124(54)
Diluted
DI = 2347(2)×CH - 9324(28)
Dynamized
DI = 2387(2)×CH - 9603(29)

Gelsemium T₂

Kolmogorov-Smirnov test →

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<th>gDL</th>
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<td>0.1</td>
<td>0.1</td>
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NMR

Copper Diluted $T_2$
DI = 2353(2)$\times$CH - 9420(19)

Gelsemium Diluted $T_2$
DI = 2347(2)$\times$CH - 9324(28)

Copper Dynamized $T_2$
DI = 2438(3)$\times$CH - 9731(21)

Gelsemium Dynamized $T_2$
DI = 2367(2)$\times$CH - 9603(29)

$p(KS) = 47$
$p(F) = 2$
$p(t) = 53$
$p(tu) = 53$
$p(tp) = 53$

$p(KS) = 0.2$
$p(F) = 3\times10^4$
$p(t) = 0.2$
$p(tu) = 0.2$
$p(tp) = 0.3$
NMR Conclusions (1)

- NMR proton relaxation is sensitive to the dynamics of the water molecule H$_2$O (solvent), through the interaction of the spin of the proton (¹H) with external magnetic and electromagnetic fields.
- This study confirms that it is possible to monitor dilution and potentization processes through measurements of ¹H spin-lattice $T_1$ and spin-spin $T_2$ relaxation times.
- In order to interpret the recorded fluctuations, experimental data have been linearized (dilution integral or DI). It was possible to show that such fluctuations cannot be attributed to random noise and/or experimental errors, evidencing a kind of memory effect that can be quantified.
- All potentized samples show very good discrimination (at least nine-sigma level) against aqua pura, lactose or simple dilution.
NMR Conclusions (2)

• Our experiments point to a considerable **slowing down of molecular movements** around water molecules up to a distance of 3.7 Å, values. It was also possible to rule out other possible mechanisms of relaxation (diffusive motion, $^{17}$O-$^1$H relaxation or coupling with the electronic spin, $S = 1$, of dissolved dioxygen molecules).

• This is clear evidence that homeopathic solutions **cannot be considered as pure water** as commonly assumed. Instead, we have evidence a clear memory effect upon dilution/potentization of a substance (water, lactose, copper, gelsemium) reflected by different rotational correlation times and average H...H distances.

• A possible explanation for such a memory effect may lie in the formation of mesoscopic **water structures around nanoparticles and/or nanobubbles** mediated by zero-point fluctuations of the vacuum electromagnetic field as suggested by quantum field theories.
• It follows that the existence of a putative of Avogadro’s wall for homeopathically-prepared medicines is not supported by our data. It should be rather considered that all dilutions may have a specific material configuration ruled not only by the potentized substance but also by the chemical nature of the containers, the chemical nature of dissolved gases and even by the electromagnetic environment.

• This sensitivity of homeopathically-prepared medicines towards electromagnetic fields may be amplified by the highly non-linear processing routinely applied in the preparation of homeopathic medicines.

• Future work is obviously needed in such directions, and we think that time is now ripe for a complete demystification of the principles involved in the preparation of homeopathic remedies.
A comprehensive approach

✓ Nano particles search
✓ Solvent (water) behaviour
✓ Electrons behaviour
An electric field successively mobilizes electric charges at the surface and in the thickness of the object to be analyzed causing ionization of the gaseous environment around the studied body (plasma gas). This ionization creates an electronic avalanche which, by splitting the gas molecules, release UV photons that are recorded by the camera. All these phenomena don’t appear simultaneously, but one after the other, depending on the pulse generator. Images acquisition provides an idea of the statistical distribution of light emission during exposure time. Numerous experiments have shown that charges are mainly distributed in two different ways:
- The positive pulses of the generator, leading to filamentary structures called “streamers”.
- The negative pulses creating rounded and globular forms called “coronae”.
These acquisitions allow appreciating the growing richness of the image depending as the complexity of the analyzed object increase.
It is worth noticing that many environmental physical factors are to be taken into account in conducting electrophotonic experiments. Among them, we may cite: ambient atmosphere (gas), moisture (crucial factor for ionization), and dust (highly sensitive to electric fields).

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<td>R.H. %</td>
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<td>36-44</td>
<td>39-46</td>
<td>39-42</td>
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Electrophotonic images with their fast Fourier transform. Impregnated pills seem to be characterized by much higher standard deviations than non-impregnated pills. Energies and contrasts are found to be different at a one sigma level of significance, while entropies cannot be differentiated.
EPA Pills CUPRUM

The top one refer to the preparation made in 2016 for this study, while the second one corresponds to a preparation made 30 years ago by the same pharmacy. It is observed that aging does not alter the photonic energy or the contrast energy that appear to be significantly higher than the reference. It also appears that the aged sample seems to be more emissive and have a higher entropy than the fresh one. This tends to prove that the quality of an homeopathic preparation may be quite stable for a long period of time. The higher entropy of the aged sample means that the information content seems to have increased over time, while the FFT evidences a smaller frequency spreading.
EPA Pills CUPRUM

Potentized CUPRUM impregnated pills

**Energy** average energy value is found to be statistically different from the granules impregnated with the pure solvent.

**Contrast** average contrast value is found to be not statistically different from the reference.

**Entropy** average entropy value is found to be not statistically different from the reference.
**EPA Pills CUPRUM**

*Impregnated simple dilution Cuprum*

*Impregnated potentized Cuprum*

*Electrophotonic images with their fast Fourier transform.* One observes a systematic reduction in energy, contrast and entropy for the dynamized samples relative to the diluted ones.
The top one refer to the preparation made in 2016 for this study, while the second one corresponds to a preparation made 30 years ago by the same pharmacy. It is again observed that aging does not alter the photonic energy or the contrast energy that appear to be significantly higher than the reference and quite similar to the one observed for a 5CH preparation. It again appears that the aged sample seems to be more emissive and have a higher entropy than the fresh one. This tends to prove that the quality of an homeopathic preparation using the Korsakov method may also be quite stable for a long period of time. As with the Hahnemann method, the higher entropy of the aged sample means that the information content seems to have increased over time, while the FFT evidences a smaller frequency spreading.
EPA Pills CUPRUM

K Potentized CUPRUM impreg. pills

Energy average energy value is found to be not statistically different from the granules impregnated with the pure solvent.

Contrast average contrast value is found to be not statistically different from the reference.

Entropy average entropy value is found to be statistically different from the reference.
EPA Pills GELSEMIUM

Impregnated simple dilution
Gelsemium

Impregnated potentized Gelsemium

Electrophotonic images with their fast Fourier transform. One observes a systematic reduction in energy, contrast and entropy for the dynamized samples relative to the diluted ones.
EPA Pills GELSEMIUM

Potentized Gelsemium impreg. pills

Energy  average energy value is found to be not statistically different from the granules impregnated with the pure solvent

Contrast average contrast value is found to be not statistically different from the reference

Entropy  average entropy value is found to be not statistically different from the reference
Electrophotonic images with their fast Fourier transform. Looking at individual data, most granules display a contrast significantly different than the reference value plus or minus one standard deviation (green and blue lines). It follows that as already observed for the energy, gelsemium samples appear to behave quite differently from *cuprum metallicum* ones. By contrast with the energy distribution a negative skewness (left asymmetry) relative to a normal distribution is observed, meaning that high dilutions have more contrast than low dilutions. The kurtosis is also found to be negative relative to a normal distribution, meaning that the tails of the distribution (low and high dilutions) are depleted relative to the center (medium dilutions).
By contrast with *cuprum metallicum* samples, it is observed that aging does not increase the photonic energy or the contrast. It also appears that the aged sample seems to be less emissive and have a lower entropy than the fresh one. The lower entropy of the aged sample means that the information content seems to have decreased over time, while the FFT evidences a larger frequency spreading.
EPA Pills GELSEMIUM

K Potentized GELSEMIUM imp. pills

Energy  average energy value is found to be statistically different from the granules impregnated with the pure solvent

Contrast  average contrast value is found to be not statistically different from the reference

Entropy  average entropy value is found to be statistically different from the reference
Conclusions:

- Granules impregnated with *cuprum metallicum* or *gelsemium* dynamized solutions are clearly distinguishable using electrophotonic analysis.
- Hahnemann’s and Korsakov’s protocols also lead to distinguishable images for the same kind of samples.
- It was also observed that samples aged of tens of years remains distinguishable from the reference or from fresh samples, evolving with time and evidencing a kind of improvement over time quite similar to that observed with wine and alcohols for example.
- All electrophotonic images display a characteristic more or less brilliant globular aspect, meaning that samples reacts mainly to the negative pulses of the generator and are insensitive to the positive pulses.