Mathematical modelling and simulation for quasi quantum model of drug dynamization in homoeopathy: a proof -of-concept study

Tejas Gosavi[1], Shrikant Pawar[2], *Manisha Gajendragadkar[1]

[1]Bharati Vidyapeeth (Deemed to be University Homoeopathic Medical College, Pune, Maharashtra, India.
[2]Department of Computer Science and Biology, Claflin University, U.S.A

Corresponding Author: Dr. Manisha Gajendragadkar, Prof. Dept. of Homoeopathic Pharmacy, Bharati Vidyapeeth (Deemed to be University) Homoeopathic Medical College, Pune.
Mobile No: +91 9423566552

Tejas Gosavi, PhD scholar, Dept. of Homoeopathic Pharmacy, Bharati Vidyapeeth (Deemed to be University) Homoeopathic Medical College, Pune.
Mobile No: +91 9689676714

Shrikant Pawar, Assistant prof. Dept. of Computer Science, Claflin University, U.S.A
Mobile No: 404-431-0231

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Abstract:

Quantum mechanics forms the basis for homoeopathic potentization process**.** Homoeopathic potentization involves two processes namely trituration and succussion. The process of dynamization currently can only be explained with mathematical equation owing to its ultramolecular high dilution nature. Time dependent Schrodinger's equation can be best applied to the process of homoeopathic drug dynamization. This study simulated the mathematical equation using 'R' to solve the enigma around homoeopathic drug dynamization and found that solvent concentration increases while active substance concentration decreases with respect to certain time.

Introduction:

Homoeopathic potentization is a mathematico-mechanical process of reducing drug substance and arousing latent medicinal power of medicine. The process is different for solid insoluble drug substances and liquid drug material. For solid insoluble drug substances trituration is a popular

method while for liquid drug substances succussion is the method of choice [Hahnemann, *1982*]. Homoeopathic dilutions cross Avogadro's number beyond 12CH potency. It is highly implausible to detect active drug substance in the ultramolecular homoeopathic dilutions because the sensitivity of currently available analytical tools is very limited and homoeopathic drug exists beyond their lower limit of detection. Thus, conventional science denies having any medicinal quantity left in the homoeopathic dilution making it more complex further to explain its clinical or biological effects. Marcin Molski attempted to solve this mathematical enigma regarding the mechanics of homoeopathic drug dynamization through 'quasi-quantum' model of potentization in his research paper. It further explains that solvent concentration increases over a period of time and can be best shown with the help of time-dependent & time independent Schrodinger's equation [Molski, *2011*].

Methods:

A. Calculating potentization time of homeopathic medicines:

A probability potentization (x) relationship where A(x) is the active substance and S(x) is the solvent in medicine with active substance of mass m_A dissolved in the solvent of mass m_S (grams) with M as the total mass of the medicine can be presented with following equations:

$$A(x) = m_A/M * 100$$

$$S(x) = m_S/M * 100$$

A potentization of medicine is obtained by sequence of dilutions in a given time sequences. From previous findings, a homogenization of the active substance in the liquid solvent usually takes 4 minutes for mineral substances and 2.5 minutes for plant sub- stances and animal compounds; the homogenization of solid substances by trituration takes about 1 hour per step. This information can be expressed as x-dependent functions A(x) and S(x) in the time-dependent forms.

B. Calculating active substance concentration in homeopathic medicines:

The concentrations A(x) and S(x) from section A can be presented in terms of time-points (t=0, 1, 2, 3, n) with functions A(t) and S(t). The functions A(x) and S(x) can be used to calculate the probability of finding a molecule of the active substance or a molecule of the solvent in the medicine.

$$A(t) = 10^{-x(t)}$$

$$S(t) = 1 - 10^{-x(t)}$$

The simulation was performed in R, and the code is as below,

#The functions A(x) and S(x) can also be inter- preted as the probability of finding a molecule of the active substance or a molecule of the solvent in the medicine.

```
# x-dependent functions A(x) and S(x) in the time-dependent form as follows:
# Potentization time with 10 time-points each say with 1 hour
t <- c(1:100)
# Concentration of active substance
# At <- 10 ^ -x(t)
output_list = list()
for(val in t){
  At = 10 ^ -val
# store in list
  output_list[[val]] = log(At)
}

# Concentration of solvent
# St <- 1 - 10 ^ -x(t)
output_list2 = list()
for(val in t){
  St = 1 - 10 ^ -val
# store in list
  output_list2[[val]] = log(St)
}

options(scipen = 999)
x <- 1:100
plot(x, output_list, type = "S", pch = 19,
    col = "red", xlab = "Potentization Time (Hours)", ylab = "Concentration (Grams)",
xlim=c(0,16), ylim=c(-50,1))

# Add a second line
lines(x, output_list2, pch = 18, col = "blue", type = "S", lty = 2)
# Add a legend to the plot
legend("bottomleft", legend=c("Active Substance A(t)", "Solvent Concentration S(t)"),
       col=c("red", "blue"), lty = 1:2, cex=0.8)
text(x, output_list, round(as.numeric(output_list), 2), cex=0.45)
text(x, output_list2, round(as.numeric(output_list2), 6), cex=0.45)
```

Results:

Simulated data shows a decrease in active concentration with increase in solvent concentration at time-points 1 hour, 4 minutes and 2.5 minutes:

We generated sequentially (by = 0.06) simulated distances to calculate A(t) and S(t) concentrations with time-points 1 hour, 4 minutes and 2.5 minutes respectively. A decrease in active concentration on increase in solvent concentration was consistently observed for each of these 3 time-point sets. The maximum potentization time-points we choose to use here are 20, 10000, and 100000. In

figures 1 and 2, a sharp decrease in A(t) is observed for each of the 3 selected time-points, however, a slow increase is seen with S(t) concentration. There are subtle improvements in S(t) concentration as seen with a flat line in all 3 plots.

Figure 1: A(t) and S(t) concentrations at time-point 1 hour with maximum potentization time-points of 20 (A), 10000 (B), and 100000 (C).

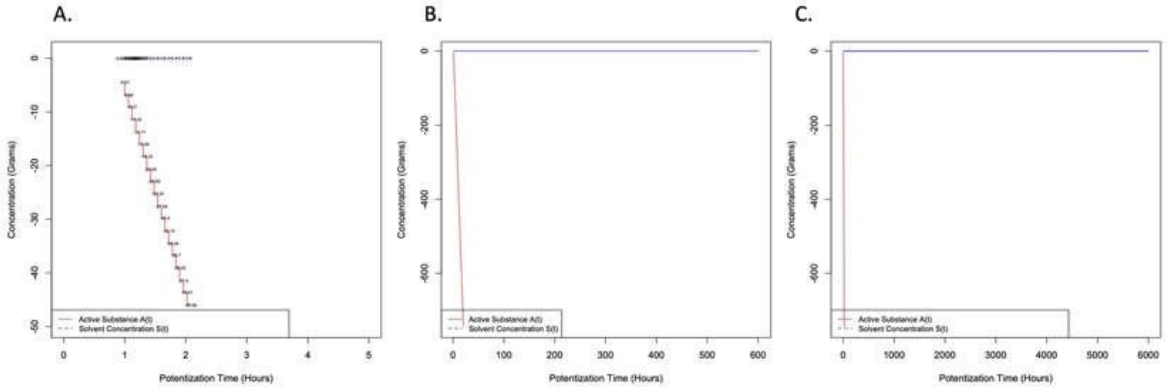
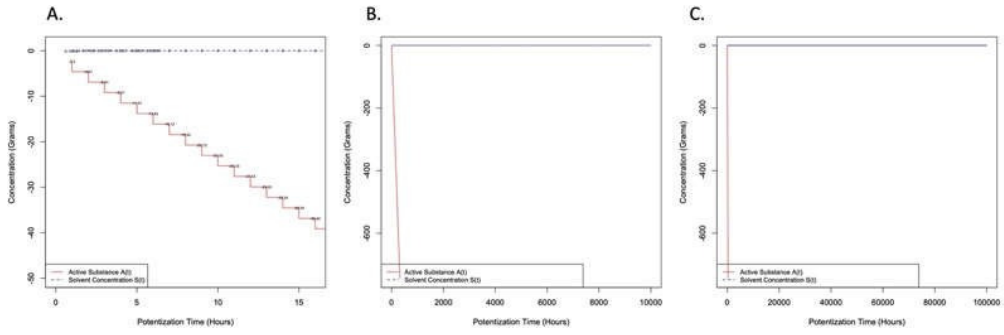


Figure 2: A(t) and S(t) concentrations at time-point 4 min with maximum potentization time-points of 20 (A), 10000 (B), and 100000 (C).



Discussion:

The present study was investigated as a proof-of-concept study for the quasi-quantum model of potentization by Marcin Molski. Schrödinger's equation is found to be a promising solution to explain the homoeopathic mathematicomechanical process of drug dynamization [Molski, *2011*].

This study used mathematical modelling and simulation for calculating the concentration of active drug substance and solvent with relation to the potentization time. In the first step potentization time was calculated and in second step active substance concentration was calculated. The mathematical simulations were coded using 'R' [Dihovicni, *et al*. 2011]

It was observed that there was decrease in the concentration of the active drug substance with increase in the concentration of solvent at various timepoints according to the homogenization time. The minimum iterations run was 20 and maximum were 100000. The solution of the time-dependent Schrödinger equation analytically is exact and limited to certain problems of spatial coordinate problems

Conclusion:

The solvent concentration time-dependently increases in the homoeopathic serial dilution process when demonstrated through mathematical modelling and simulations.

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Conflict of Interest

None.

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None.

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