# STUDY OF HEART RATE IN SWISS ALBINO MICE TREATED WITH POTENTISED SODIUM PENTOBARBITONE DURING ANAESTHESIA

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## Abstract

With an object to demonstrate the action of solvents potentised beyond the limit of existence of the medicinal material in them, heart rate was monitored as a function of time in twenty Swiss Albino Mice under anaesthesia. It was observed that the normalised heart rate decreased to 0.818± 0.0796 during anaesthesia in ten animals treated with distilled water. The anaesthised animals treated with 15th potency of sodium pentobarbitone showed an initial increase in the heart rate with subsequent reduction to 0.936± 0.086, significantly different from that of controls.

## Introduction

In a homoeopathic medicine of a potency (n) greater than 12 it is physically not possible to have any medicinal material in order to be consistent with the Avogadros hypothesis. However, curative powers of these medicines have been claimed over past two centuries, mainly on the basis of their clinical success. Attempts have been made to explain the action of higher homoeo potencies (n > 12) on the basis of a hypothesis that the parent solvent can exist in a number of metastable states with very long life times, which differ from each other by the nature of hydrogen bonded networks present in them[1]. There have been very few laboratory experiments to substantiate the claim with unsatisfactory reproducibility[2]. Crystallization of copper sulphate from its solution is said to give patterns characteristic of the material of which a potency is added to the solution[3]. This method lacks reliability as it is highly sensitive to the impurities unavoidable even in distilled water. Conventional spectroscopic methods are not promising because of the absence of material difference between pure and potentised solvent. The authors have failed to record any difference between the infra-red, ultra-violet and nuclear magnetic resonance spectra of the pure and potentised solvent for more than five samples. Pharmacological evaluation of homoeopathic medicines with n > 12 is not possible due to absence of medicinal material in them. Clinical success suggests that the biological systems might be capable of discriminating and enhancing the information hidden in potentised solvent. This is evidenced, for instance, by a study of population growth in guinea pigs which has been shown to be retarded in a group administered with Natrum Muriaticum in higher potency[4]. It is also substantiated by observations of the impedence plethysmograms recorded in a group of 15 patients before and after the commencement of their treatment[5,6]. Marked haemodynamic changes at the affected site were observed within 10 to 60 minutes of the administration of their constitutional medicines[7] though with different potencies. This demonstrated the therapeutic action of the medicine as well as the importance of a potency. However, these experiments do not give a conclusive evidence of the action of a potentised solvent (i) due to the irreversibility of the effect of a medicine on an individual and (ii) because a single medicine cannot produce similar effects in different individuals.

As an initial step in designing an experiment to demonstrate the action of homoeo potencies greater than 12 in a laboratory, effect of potentised solvents on the heart rate of anaesthised Swiss Albino Mice has been measured as a function of time. The results of these investigations are reported in this paper.

## Materials and Methods

A population of twenty Swiss Albino Mice (SAM) body weight (BW) ranging from 23.5 to 37.0 grams, was used in this study. Heart rate was selected as the parameter to be monitored and was measured using an indigenous Electro Cardiograph (ECG). 15th potency of sodium pentobarbitone (NaP) was prepared in distilled water according to Hahnemann's method[8]

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and was termed as sample. Distilled water was used as a control. In each experiment, a SAM was anaesthetized with sodium pentobarbitone and treated with sample or control. A set of ten experiments were conducted for sample (group B) as well as for control (group A) studies.

A stock solution of the anaesthesia used on SAM was prepared as follows: 65mg of NaP was dissolved in 1ml of water and this colloidal solution was diluted with 25ml of water containing 10 percent ethyl alcohol. The solution was preserved in refrigerator and was brought to room temperature before use on an animal. Precautions were taken to avoid solvent evaporation. 20mg NaP per kilogram BW of the animal was injected intraperitonially using 24 size needle for inducing anaesthesia in the animal.

Before starting the experiment, heart rate of the animal was allowed to settle for about 20 to 30 minutes and the basal heart rate was obtained after three consecutive readings (5 minutes apart) and were found to be steady. One dose of sample or control was then administered subcutaneously and this instant was taken as reference time (t=0) for the experiment. At t=5 minutes, the anaesthesia was injected. Second dose of sample/control was given at t=15 minutes and the HR was monitored at intervals of 5 minutes upto 70 minutes. The heart rates measured during the experiments were normalised with respect to the basal heart rate.

## Results

The normalised heart rates of the group A and the group B animals are represented in figure 1(a) and 1(b) respectively. As can be seen, for group A animals the NHR goes on decreasing, ,reaches a minima between t=30 and t=50 minutes, and then gradually increases towards the base value. The average value of the minimum NHR with its standard deviation ($s_1$) during the control experiments is $C_{min}$=0.818±0.079. For group B animals (figure 1(b)) NHR shows a marginal increase between t=0 to t=20 minutes followed with a decrease, reaches a minima between t=30 and t=50 minutes and then gradually increases towards the base value. The average value of the minima in NHR with its standard deviation ($s_2$) is $S_{min}$=0.936 ± 0.086 and that of the maxima is $S_{max}$ =1.04 + 0.047. The value of student's t. ($t_s$) for the average of the minima of these two groups is estimated by using the relation[9].

## TABLE 1

Ensemble average of normalised heart rates as a function of time with their standard deviations

| Time in minutes | Group A | Group B |
|---|---|---|
| | Average - SD | Average SD |
| 0 | 1.00 | 1.00 |
| 5 | 0.98 ± 0.013 | 1.00 ± 0.027 |
| 10 | 0.97 ± 0.018 | 1.01 ± 0.030 |
| 15 | 0.97 ± 0.024 | 1.03 ± 0.042 |
| 20 | 0.95 ± 0.030 | 1.00 ± 0.080 |
| 25 | 0.89 ± 0.053 | 0.99 ± 0.090 |
| 30 | 0.85 ± 0.059 | 0.96 ± 0.085 |
| 35 | 0.84 ± 0.063 | 0.96 ± 0.086 |
| 40 | 0.83 ± 0.077 | 0.95 ± 0.074 |
| 45 | 0.83 ± 0.085 | 0.96 ± 0.072 |
| 50 | 0.84 ± 0.071 | 0.97 ± 0.093 |
| 55 | 0.87 ± 0.089 | 0.99 ± 0.077 |
| 60 | 0.88 ± 0.092 | 1.00 ± 0.084 |
| 65 | 0.89 ± 0.085 | 0.99 ± 0.075 |
| 70 | 0.92 ± 0.088 | 0.99 ± 0.048 |

Ensemble averages of the normalised heart rates as a function of time in sample and control experiments.

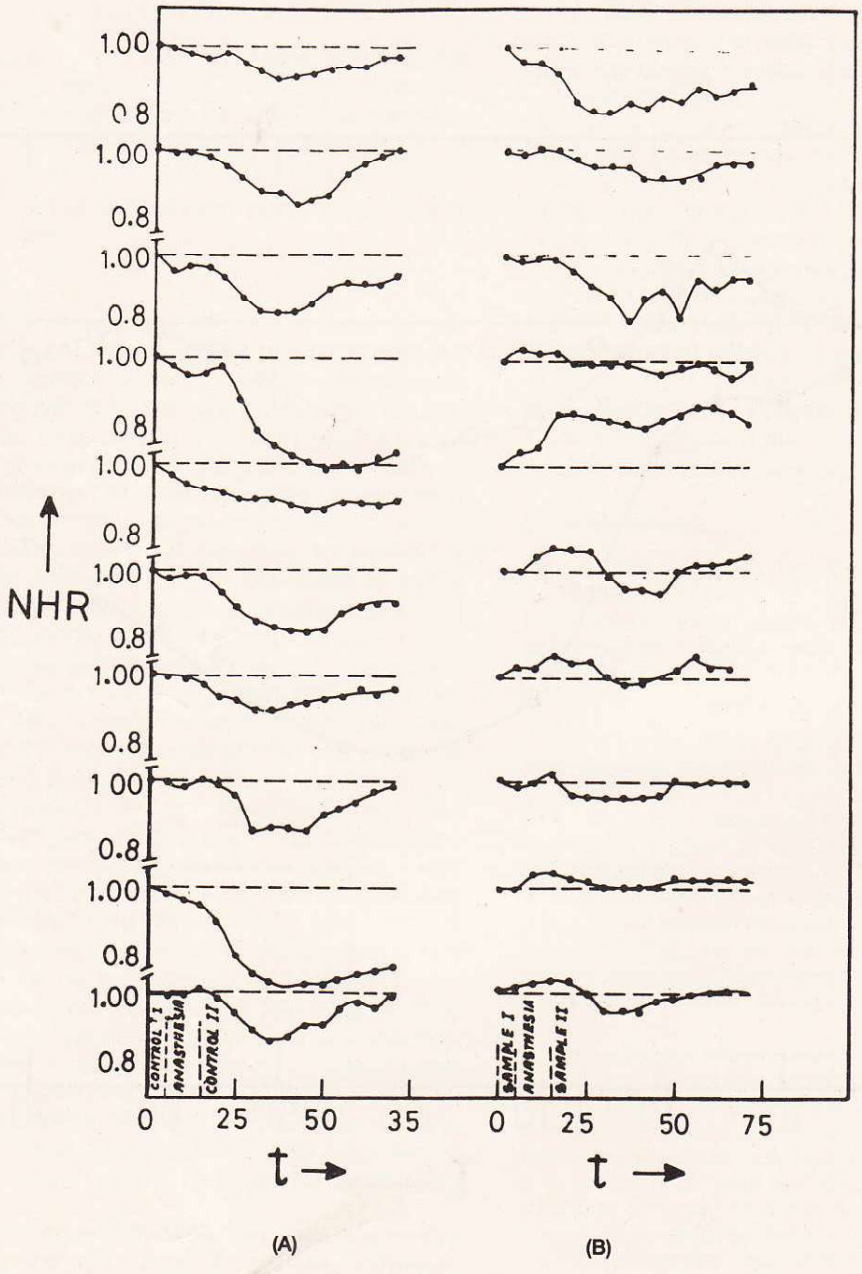


**FIG. 1.** Normalised heart rate (NHR) of anaesthised Swiss Albino Mice as a function of time (t) in minutes, (a) for control animals treated with NaP15. First dose of control/sample is given at t=0 minus, anaesthesia at t=5 minutes and the second dose of control/sample at t=15 minutes. Dashed line shows the basal heart rate normalised to 1. Solid line is for visual enhancement.

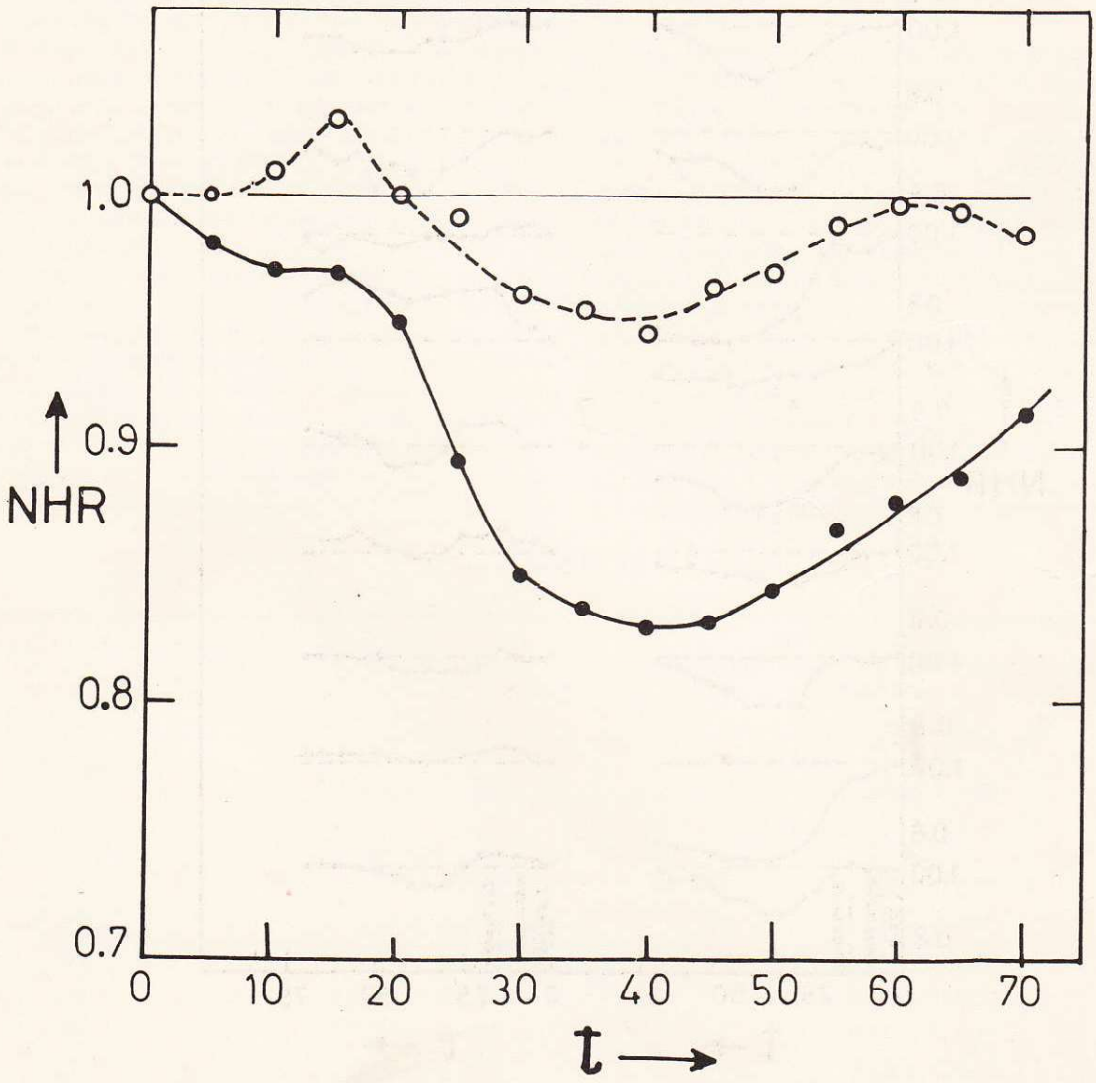


**FIG. 2.** Ensemble average of the normalised heart rate (NHR) as a function of time, (0) control animals, (0) sample animals. Dashed and solid lines are for visual clarity.

$$t_s = (\bar{S}min - \bar{C}min) \bigstar \sqrt{\frac{n_1 n_2}{n_1+n_2}} \bigstar \sqrt{\frac{n_1+n_2-2}{n_1 S_1^{\,2} + n_2 S_2^{\,2}}}$$

Where $n_1$ and $n_2$ are the population sizes of the two groups. In the present case $n_1=n_2=10$. $t_s$ is estimated to be $> 3.18$ indicating that the difference between the two populations is statistically significant at a significance level of 0.01, meaning that the probability of these two sets of experiments being same is less than one per cent.

## Discussion

The main objective of this study has been to demonstrate that a potentised solvent (n>12) is different from the pure solvent. Since physical methods have failed to distinguish the pure and potentised solvent, an attempt has been made to explore the potentials of biological system in unravelling any difference between them. Swiss Albino Mice, representing a biological system, have been chosen as probes in this study. Biological systems have the capability to accept all kinds of inputs and yet respond selectively to either of them. This response is often at macroscopic level and is easy to monitor in the laboratory. Further more, the probe can be conditioned to respond selectively to a homoeo potency by inducing a particular pathological condition which can be easily diagnosed and assessed after the therapy. Anaesthesia has been the induced disease in this study due to its established effect on the nervous system. Heart rate has been monitored as the parameter of this study as the same is slowed down following anaesthesia and is easily measurable in the laboratory. A nerve rich area was chosen for administering the sample. The dose of anaesthesia has been optimised to 20mg per kg BW of the animal as a lower dose was found to be ineffective in the control experiments and a significantly higher dose made the action of the sample ineffective. NaP15 has been chosen as sample as a consequence of inconclusive experiments performed in our laboratory with potentised Arnica Montana, Phosphorus, Opium, Adrenalin and Arsenicum Album. It also becomes a logical choice as the parent material has been used for anaesthesia.

As seen from figure 1(a) NHR has shown a similar variation in all the ten group A animals. However, variation in NHR in the group B animals has differed slightly from animal to animal as follows:

(a) In seven animals the NHR has shown a slight increase following anaesthesia upto t=15 to t=20 minutes and then a decrease upto t=30 to t=40 minutes followed by regression towards the base value.

(b) Three animals have shown decrease in NHR with a minima between t=30 to t=40 minutes and then regression towards the base value.

Since the variation of NHR in group B animals does not follow a trend, ensemble averaging has been employed to represent the group behaviour. Table I gives the ensemble averages of the NHR with their standard deviations as a function of time in these two groups. Figure 2 shows the plot of ensemble average of NHR in these two groups and the difference between the two variation patterns is evident. Student's 't' for the minimum value of NHR in these two groups has been estimated to be 3.18 and highlights the difference between the two populations. The results presented here conclusively illustrate the action of potentised Sodium Pentobarbitone (n=15) on the Swiss Albino Mice anaesthetized with Sodium Pentobarbitone.

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