
THE BIOLOGICAL EFFECT OF A CLASS OF ALTERNATING MAGNETIC FIELD ON LIFE FIELD USING DISTILLED WATER AS TEST MATERIALS

^{*1}Alli-Balogun, A. S., ¹Joshua, D.A, ¹Babatunde, K., ¹Fadele, O.A., ²Oyediji, O.T., ²Muritala, D.S., ²Chukwudebe, E.P. and ²Idowu, O.A.

¹Federal College of Wildlife Management, P.M.B. 268, New Bussa, Nigeria

²Forestry Research Institute of Nigeria, Ibadan, Nigeria.

*Corresponding author email – abiolaallibalogun01@gmail.com +2348138511006

ABSTRACT

This study investigated the biological effect of a class of alternating magnetic field on life field using distilled water as test materials. Extremely low frequency magnetic field (ELF - MF) was carried out using a 50Hz AC power as the source, and a self made copper wire solenoid (magnetic chamber) inside which the sample was placed. A variable transformer was used to vary the current in the magnetic chamber to achieve different field intensities. The results indicate that magnetic field affects the rate of solubility of salts in water as well as an alteration in its pH. This study supports initial reports that extremely low frequency magnetic field alters the physiochemical properties of water.

Keywords: magnetic field, life field, distilled water, biological effect

INTRODUCTION

Electromagnetic field has become an important constituent of man's environmental. Living system has interacted with a diversity of electromagnetic fields which sometimes is indispensable. The impact of a weak alternating magnetic field on water has become a relevant facet of study since man's immediate environments is encompassed by these fields and the human system is made up of about 70% of water, hence any change in the property of water as a result to exposure will definitely affect the human system. The situation is further complicated by the advent of new technologies which serves as artificial (man-made) sources of these fields. There are a number of researches centered at the effect of extremely low frequency fields (ELF) been given off by many households appliances, industrial appliance, transmission lines, mobile phones on a living system but the results are usually small and reproducibility of the same result in subsequent experiment is a problem. Man is exposed to these fields both at home and at work, from the generation and the transmission of electricity, domestic appliances to industrial equipment. Some researchers have linked the exposure to these fields to causes of some diseases (Loomis *et al.*, 1994) while others argued that these fields are helpful to the living system (Marko *et al.*, 2002). These fields does not contain sufficient energy to break chemical bonds (Valberg *et al.*, 1997), thus they can only alter an ongoing biochemical reactions or transport process. The effect of weak alternating magnetic

field has drawn considerable attention over the past few years. Epidemiological studies have suggested that magnetic field (MF) may increase the risk of various types of cancer including leukemia, brain and breast tumors. However, there is a conflicting evidence of these claims which therefore makes it a necessity to investigate the possible effect of these fields so as to arrive at a definite conclusion. This study was carried out to investigate the impact of a low frequency weak alternating magnetic field on water since the body contains about 70% of water.

Living system has increasingly interacted with alternating magnetic fields, it is therefore necessary to investigate the possible effect of this field on a biological system. This project aimed at studying the impact of weak low frequency alternating magnetic field on water and this serve as a contribution to the existing knowledge to the possible effects of these fields on living system.

SCOPE OF RESEARCH STUDY

In this research we have used distilled water as specimen to investigate the effect of weak low frequency of alternating magnetic field on a living system due to the fact that water is the most common and important material in nature and it also accounts for about 70% material composition of a living system, which is required for the transportation of essential nutrients and salts through the body of a living system

OBJECTIVE OF THE STUDY

The purpose of this experiment was to determine the effect of weak low alternating magnetic field on a living system using distilled water as the subject of study. Since the human system is made up of 70% of water, then any variation in the physiochemical properties of water will in turn affect the human system.

MATERIALS AND METHODS

The experiment was accomplished in three different phases:

- Generation of weak alternating magnetic field.
- Exposure of the subject (distilled water) to the magnetic field
- Experimental testing of various parameters on both the exposed and the control experiment.

Experiment 1

GENERATION OF WEAK ALTERNATING MAGNETIC FIELD

MATERIALS

Inverter, ammeter, A.C. signal function generator, solenoid, conducting wires, test tubes, voltmeter.

METHOD

The magnetic field was generated when an AC was made to pass through a solenoid. The solenoid was made by winding a coil of thickness 33mm around a hollow plastic. The combination of the solenoid and the hollow plastic is regarded as the magnetic chamber.

The magnetic chamber and its test tube rack were constructed in such a way so as to satisfy the following requirements:

- There must be a uniform across all test subjects
- Minimal heating effect

The heating effect is minimized by making sure the solenoid was wound in such a way that the coils were close together and ensure that they do not overlap. To further reduce the heating effect, it was then garnished.

Since the solenoid embeds a strong magnetic field within its core, the rack was constructed in such a way that it was positioned at the centre of the chamber (core) and the distance of the tube holders were uniform.

The inverter which served the purpose of a constant power supply since it was almost certain that there would be a power outage, had as its AC source the public electricity (220v, 15A), and its DC source were two 12V batteries connected in series, the output of the inverter was connected directly to the signal generator, the signal generator in this case performed two basic functions:

- To generate a sinusoidal wave form of our desired frequency
- To reduce the current passed into the coil so as to avoid coil damage.

The voltmeter was connected across the frequency generator in parallel so as to determine the voltage and an ammeter was connected in series so as to know the flowing current then it was finally connected to the magnetic chamber.

PRECAUTIONS

- All connections were well tightened
- During the process of coil winding, it was ensured that the turns did not overlap.

EXPERIMENT 2

INTERACTION OF WEAK MAGNETIC FIELD WITH DISTILLED WATER

MATERIALS

Distilled water, test tube, magnetic chamber, source of AC power

METHOD

After the successful generation of the magnetic field by the magnetic chamber, the distilled water was exposed to the field by putting the desired quantity in a test tube and placing it in the test tube rack of the chamber, the rack was placed inside the magnetic chamber.

The exposure was carried out for 7hrs and the properties of the water were in turn tested for. To get more accurate results, the frequency on a daily basis was varied by varying the input current and voltage.

For better result, analysis and comparison of effects, a control experiment was set outside the range of the magnetic field but under the same room conditions. This control experiment was used to compare the extent to which the magnetic field has interacted with the distilled water.

PRECAUTIONS

An uninterrupted power supply was ensured during this experiment

The control experiment was placed far from the setup

EXPERIMENT 3

TEST FOR pH

MATERIALS

Digital pH meter, Beaker and Water Sample

METHODS

After the distilled water has been exposed to the magnetic field for 7hours, it was brought out at time due and poured into a beaker. A digital pH meter which has been carefully calibrated by the use of a buffer solution was dipped into the exposed distilled water to test maybe the magnetic field has caused a change to make it more acidic or increase its alkalinity, the readings on the screen of the pH meter was recorded. This same process was also done for the control experiment also and the reading was also recorded.

PRECAUTIONS

- The pH meter was calibrated before usage
- The reading was steady on the pH meter's screen before it was taken.

RESULTS AND DISCUSSION

RESULTS

Table 1 shows the results recorded from the experiments carried out in order to know the effect of weak low magnetic field on distilled water using four parameters.

TABLE 1: THE MAGNETIC FIELD STRENGTH AT THE CENTRE OF THE SOLENOID

DAYS	VOLTAGE (V)	CURRENT (A)	MAGNETIC FIELD STRENGTH (TESLA)
1	250	6.0	0.015
2	200	7.5	0.018
3	150	10	0.025
4	100	15	0.038

TABLE 2: DETERMINED TEMPERATURE OF SAMPLES

DAYS	INITIAL TEMP (°C)	FINAL TEMP OF EXPOSED (°C)	FINAL TEMP OF UNEXPOSED (°C)
1	29	38	32
2	29	34	31
3	28	34	31
4	28	30	29

TABLE 3: THE pH VALUES OF WATER SAMPLES

DAYS	EXPOSED	UNEXPOSED
1	7.3	7.0
2	7.4	7.1
3	7.3	7.0
4	7.3	7.1

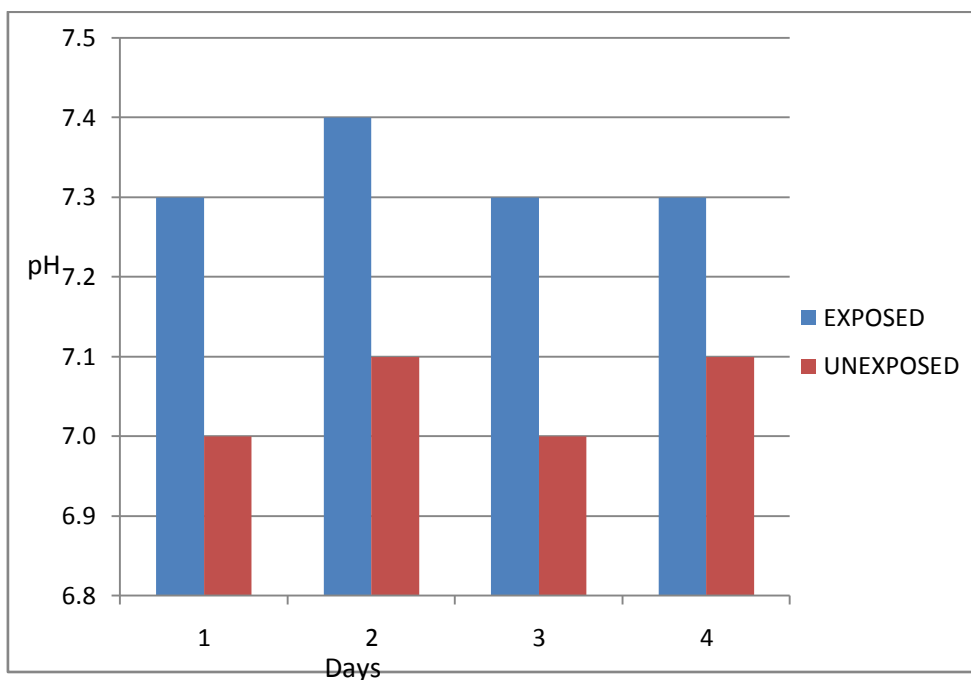


Figure 1: Graph of pH values in days for exposed and unexposed water samples

DISCUSSION

From Table 3, the graph (figure 1) showed that there was a variation in the pH of the exposed distilled. The pH of the exposed has slightly increased as a result of the effect of the magnetic field on the water molecules. Statistically the mean value of the pH of the exposed was determined below:

$$\text{mean} = 7.3+7.4+7.3+7.3 = 7.325$$

the mean value of the unexposed was:

$$\text{mean} = 7.0+7.1+7.0+7.1 = 7.05$$

the above has revealed that there has been a mean change of 0.275 as a result of the exposure hence the magnetic field has affected the pH property of the distilled water.

These results have shown that the magnetic field has an effect on the angle of minimum deviation of the distilled water.



CONCLUSION

From the experimental values and analysis, it was concluded that the magnetic field has an effect on distilled water, because all parameters tested were affected and a significant difference was observed between the exposed and the unexposed.

It was concluded that if distilled water which is exposed to magnetic field could give us such a result then it would in turn have a cumulative effect on the body system since the body is constantly exposed of extremely low frequency field, and the body contains about 70% of water.

Furthermore, if this experiment were to be carried out on longer hours compared to ours, we believe it would give a more significant difference in the effect that the exposed has to the unexposed. At this point we can conclude that the magnetic field could have an adverse effect on all living system since it affects water to a reasonable extent.

REFERENCES

Marko, S. Markov and Agata, P. Colbert (2002). Magnetic and electromagnetic field therapy.

Valberg, P.A., Kavet, R. and Rafferty, C.N. (1997). Can low level 50/60Hz electric and magnetic fields cause biological effects? *Radiation Res.* 148:2-21.