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"Effect of Extremely Low Electromagnetic Field on Bio-chemical Aspects of Fresh Water Fish *Rasbora daniconius*"

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ABSTRACT

During past few years there has been growing concern in the general public of a perceived health risks associated with exposure to extremely low frequency electromagnetic fields. Though they are present everywhere, where electricity flows, the health effects of exposure are still debated. There is concern that EMF around high voltage sources such a power transmission lines may be linked to cancer. Studies on the impact of the extremely low magnetic fields on fishes are not fairly attempted so far. Hence the present study is undertaken to study the effect of electromagnetic field (EMF) on biochemical aspects of the fresh water fish *Rasbora Daniconius*.

KEYWORDS: EMF, Frequency, *Rasbora daniconius*.

INTRODUCTION

There is concern that EMF around high voltage sources such a power transmission lines may be linked to cancer. The first indication of a possible health risk first reported from epidemiological studies by and variety of biological processes can be influenced by 50Hz it is shown by further investigation in laboratory. (Shang et al, 2004; Lupke et al 2006; Mehri et al 2008).

The electromagnetic field causes a change in everything it encounters. Electromagnetic is a broad term which included electric field generated by charged particles, magnetic fields generated by charged particles in motion, and radiated fields such as TV, radio, microwave. The electric fields are measured in units of volts per meter (v/m) and the strength of magnetic field measured in ampere per meter (A/M). More commonly in electromagnetic field research, scientist related quantity the flux density (in microtesla, μ t, militesla mT) Instead magnetic field are not blocked by common material such as buildings.

The field is always strongest near the sources and diminishes as one move away



from the sources. These energies have the ability to influence particles at great distances. An important property of the time varying EMF is its frequency as measured in hertz (Hz number of oscillations per second). The electromagnetic fields (EMF) are sometimes called radiation when frequency is measured in kilohertz and above. Electromagnetic fields are categorized, according to their frequency or wavelength, in the electromagnetic spectrum. This spectrum spans an enormous range of frequencies. The lowest frequency EMFs (below 300 Hz or 3KHz) are called as extremely low frequency (ELF) fields. They are mainly generated by AC current devices and power lines and usually have frequency of 60 Hz (North America) or 50 Hz (elsewhere).

The basic concept of EMF lies on the basis of magnetism. Nobody knows that what magnet consist in it to attract the iron towards itself. Frequencies in the kHz (thousand hertz) and low MHz (megahertz, million hertz) region are called radio frequency (RF) fields or radiation used for cell phones, personal communication systems, microwave ovens and radar systems. The visible light is a narrow band of frequencies around 10 Hz. The frequency above microwave and below visible light (10 -15 Hz) are called as Infrared radiation.

It is not clear how the extremely low electromagnetic field (EMF) affects the animals. It has been found that the primary response of extremely low frequency (ELF) is response to the neural and neuron endocrine organs (Anderson and kaune, 1989).

Earlier reports showed a possible relationship between exposures to EMF's and human health. Symptoms such as general malaise, headache, insomnia, upper respiratory tract infection and fatigue are present among people exposed to electrical plants also the poor digestion, minor changes in ECG and EEG of humans have been reported (Waible 1975). A decreased libido, loss of sleep, and increased irritability were observed among workers after prolonged exposure to EMF (up to 26 kv/m) (Frey, 1993). Moreover circadian rhythm of mammals has been affected by electric (Wilson et al, 1981, Maestroni et al, 1988) or magnetic (Kavaliers et al, 1984) fields. Electric field is created by differences in voltage, when voltage is higher the resultant fields will be stronger. Magnetic fields are created when electric current flows; when current is greater the magnetic field is strong. Electric field will exist even when there is no current flowing. If current does flow, the strength of magnetic field will vary with power consumption but the electric field strength will be constant. "The combination of electric field which generated by charged particles and magnetic field generated by particles are known as electromagnetic field."

MATERIALS AND METHODS

Experimental Fish: RASBORA DANICONIUS

The *Rasbora daniconius* was used as the experimental species. The fishes were collected from local bodies. They were brought to laboratory and acclimatized for a week in



glass aquarium. Healthy and active fishes having approximately size (7 to 9 cm) were selected for experiment.

SITE OF COLLECTION- GANGAPUR DAM:

Fish exposure set up:

Ten fish species were kept in a five sets of aquarium (60 x 30 x 30 cm) they were kept under the same experimental conditions with continuous aeration. Out of these five sets one aquarium served as control group and four sets served as the exposure tank. The top of the tank are covered by metal lids and current is passed over the water through copper wire, which is generally used for house hold fittings. This wire prevented any contact with water the fish were fed 30 % protein fish diet during the experimental period. The wet muscle tissue was weighed and used for the analysis of biochemical constituents after exposure of 5 day, 10 days, 20days and 30 days. No mortality more recorded during the experimental period. The biochemical studies performed were protein and glycogen. The methodology applied for biochemical assay for protein by Burette method and the glycogen is estimated by the Glucose Oxidase method.

Electromagnetic field (EMF) :

In present study, the effect of extremely low frequency (ELF), electromagnetic fields on biochemical constituents were studied, and constant frequency of 50 Hz was used.

RESULTS

Animal behaviour:

The behavioural changes were monitored throughout the experiment period. The behaviour observations show that there were no changes in swimming balance of the exposed fish *Rosbora daniconius*. Fishes were calmer and stayed, most of the time, at the bottom of aquarium; they could be very aggressive and start to jump if they were stimulated at the time of feeding and cleaning of aquarium. They move up to the surface of the aquarium at the time of feeding. They start to drop to the bottom to follow the food particles. There was no indication of imbalance in their swimming pattern.

Respiration (opercular movement) among the control fish were a steady and regular movement of the operculum. However, the movements of operculum among the exposed fish were not steady nor could be described as regular. the exposed fish had to move the operculum slowly once or twice then it stopped its movement for a few seconds. Then, a sudden two or three opercular movement was observed.

Proteins:

The protein in muscle tissue in fish *Rosbora daniconius* shows depletion value when compare to control. The muscle of control fish contains 4.7% proteins. In the experimental fish decreases of 4.3% , 3.9%, 3.2% ,2.1% protein contain after exposure of EMF 5 days, 10



days 20days, 30days respectively.

Glycogen:

The glycogen concentration of muscle tissue of experimental fish *Rosbora daniconius* decreases from control fish glycogen concentration. The muscle of control fish glycogen concentration was found as 1.8%. In the muscle of experimental fish decreases of 1.64%, 1.53%, 1.36%, 1.12% where observed glycogen content after exposure of EMF 5days, 10days, 20 days,30 days respectively.

TABLE 1: SHOWING PROTEIN DEPLETION

Sr. No.	Exposure Period(Days)	Amount of Protein % in mg
1	Control	4.7
2	5	4.3
3	10	3.9
4	20	3.2
5	30	2.1

GRAPH 1: SHOWING PROTEIN DEPLETION

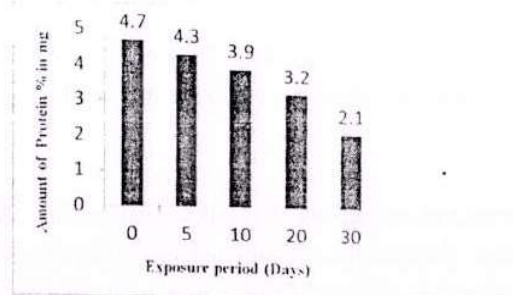
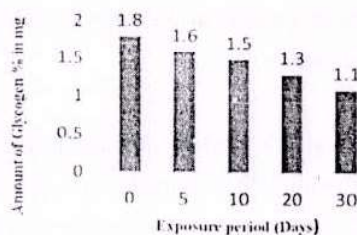


TABLE 2: SHOWING GLYCOGEN DEPLETION

SR.NO	EXPOSURE PERIOD(DAYS)	AMOUNT OF GLYCOGEN%IN MG
1	CONTROL	1.8
2	5	1.6
3	10	1.5
4	20	1.3
5	30	1.1

GRAPH 2: SHOWING GLYCOGEN DEPLETION





CONCLUSION

From the above discussion it is clear that effect of electromagnetic field (EMF) on the biochemical aspects such as protein and glycogen in the fish *Rosbora daniconius* shows adverse effect of EMF through the interaction through EMF force matrix, transduction modify molecules membrane and ions current is not perceptible by cells. The cells signalling and amplification shows within normal variation and no functional consequents of current. In biological response changes in cell behaviour taken place because of that cell dysfunction will be taken place. Due to this adverse effect on the living system causes the alteration in biochemical status of the body. This study reveals the depletion in protein and glycogen taken place after exposure to low frequency EMF for 5, 10, 20, 30 days.

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