

# Hemato-Biochemical Impact Analysis of Acoustical Environment (Music Therapy) on the of Human and Albinorat

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## I. INTRODUCTION

**Abstract**—Music, as a stimulus has three different properties on humans. The first property is that music is a discriminative stimulus, in other words humans have the ability to discriminate various styles of music and no one can deny that of music has a pleasurable or reinforcing property. Music induces mood change in either a depressive or a vigour direction. The *acoustical environment* can be defined as combination of both natural sounds (wind, water, wildlife, vegetation) and cultural and historic sounds. Because the acoustical environment is made up of many sounds the wellbeing of acoustical environment depends on interactions between the amplitudes and frequencies of all the sounds. Understanding these interactions is vital in protecting the acoustical environments for current and future generations. Properly balanced acoustical environments are vital for the natural functioning of wildlife of park and forest ecosystems in a number of ways including: Courtship and mating, Effective use of habitat, Intra-species communication, Nurturing and protecting young, Predation and predator avoidance, Proper metabolism of each individual, Territory establishment and finding desirable habitat. Many natural sounds have a calming and relaxing effect. The symphony of natural sounds within our national parks is an important natural resource and a critical component of the ecological communities. When a bird sang or a mammal or amphibian vocalised, the voices appeared to fit in relation to all the natural sounds in terms of frequency and prosody (rhythm). Animal and insect vocalisations tended to occupy small bands of frequencies leaving "spectral niches" (bands of little or no energy) into which the vocalisations (fundamental and formants) of other animals, birds or insects can fit. In our studies over albino rats and humans, we observed that the natural sounds have their impact over the normal physiology by altering the levels of biochemical and haematological parameters such as significant decrease in serum total cholesterol, non significant decrease in triglycerides, non significant decrease in VLDL and LDL, significant increase in HDL in most cases. The decreases of various lipids are indicative of good health. so, we can say that all natural sounds in an ecosystem interact to each other and maintain a unique and balanced wildlife and ecosystem.

**Keywords**— Acoustical environment, Music Therapy, Lipids, Lipoproteins, Triglycerides.

THE acoustical environment is the combination of all the physical sound resources within a given area including both natural sounds (wind, water, wildlife, vegetation) and cultural and historic sounds (battle re-enactments, tribal ceremonies, quiet reverence). Noise is in fact sound that is negatively evaluated (undesired) or extraneous to an environment. Because the acoustical environment is made up of many sounds the well being of acoustical environment depends on interactions between the amplitudes and frequencies of all the sounds. Different sounds interact in interesting and sometimes surprising ways to determine the health of the environment. Some frequencies may block out or "mask" other frequencies, and some sounds may highlight or enhance others. Understanding these relationships is vital to protecting acoustical environments and soundscapes for current and future generations. Properly balanced acoustical environments are vital to the natural functioning of park and forest ecosystems in a number of ways including: Courtship and mating, inter and intra specific communication, proper metabolism and territory establishment finding effective habitat. When a bird sang or a mammal or amphibian vocalised, the voices appeared to fit in relation to all the natural sounds in terms of frequency and prosody (rhythm). : Animal and insect vocalisations tended to occupy small bands of frequencies leaving "spectral niches" (bands of little or no energy) into which the vocalisations (fundamental and formants) of other animals, birds or insects can fit. In the present study it has been found that each natural sound has it's far reaching effect almost on all aspects of an animal's life and in integrity, for the maintenance of ecological sustainable development. The conclusion is based on our studies over albino rats in which we observed that the natural sounds have their impact over the normal physiology by altering the levels of biochemical and haematological parameters.

## II. MATERIAL AND METHODS

### A. Selection of Natural Sound (Test compound)

A sound is selected on the basis of their property. Specific Natural Sounds are selected for the treatment of Albino rat, where as for human volunteers specific songs are selected from the list they have been provided in questionnaire, based on specific Natural sounds. Three sets of pre-recorded Natural

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classical sounds are selected on the basis of trial and error methods. They are given to the experimental animals for a period of 90 days. The biochemical analysis of blood samples are carried at 30 days, 60 days and 90 days. The results were analyzed and after that the similar sound treatment are given to volunteers for a period of 90 days. The biochemical analysis of blood samples are carried at 30 days, 60 days and 90 days interval. The blood samples of volunteers are collected by a physician hired for the purpose, where as the blood of albino rats was taken in lab from treated and control groups. Sound of specific Indian ragas at a 60-80 db (controlled by sound meter) are given to albino rat for two hours (9-10 AM and 3-4 PM) daily by speakers attached to the wall of their cage for 30, 60, 90 days, whereas human volunteers are allowed to listen a specific sounds through head phones provided them at home (for the same time period as to rats) after training them in workshops organized in department on Sundays and holidays. Control groups of both rats and humans are also assigned to listen to taped "white noise" ("White noise" or "synthetic silence" is an attempt to block out environmental noise. In this case it was a pre nature sound such as sea sounds, which themselves are rhythmic) through headphones, or to a control group.

#### B. Maintenance and Feeding of Experimental Albino Rats-

The experimental albino rats (*Rattus norvegicus* [Berkenhout]), procured from inbred colony were acclimated for one month to the laboratory conditions (temperature.  $25 \pm 0.50^\circ\text{C}$ , relative humidity  $60 \pm 5\%$  and photoperiod 12 hr/day) before using them for the experiment. Adult male and female rats of almost equal size and weight were kept in the polypropylene cages and cleaned regularly to avoid any

infection or undesirable odour in the laboratory. Each cage was equipped with a metallic food plate and water bottle. The albino rats were offered fresh feed daily throughout the experimentation on Gold Mohar rat and mice feed, manufactured by Hindustan Lever Ltd., India at regular interval and water was provided ad libitum.

#### C. Selection of Individuals-

Albino Rats: For the experimentation individuals selected randomly irrespective of sex. Five healthy adult albino rats (6-8 weeks of age, with average body weight of 150-200 g) were selected randomly for test and control studies their blood was collected after 30, 60 and 90 days for the present investigation. Each rat was assigned a number for convenience prior to experimentation.

Volunteers-The Volunteers were selected through a wide publicity (Newspaper, SMS, TV Programmes) from Agra, Noida, Delhi, Ghaziabad, Gurgaon region. They are provided to fill a questionnaire. On the basis of a questionnaire they are provide a recorded CD of selected songs and sounds.

#### D. Collection of Blood Samples

The blood from rats collected in the early morning hours (7-8 AM) in lab on the scheduled date. The blood samples were obtained with the help of 2.0 ml disposable syringe from the tail of albino rats, Whereas the blood samples of human were collected by a physician hired for the purpose. The various biochemical parameters of rats were analyzed with the help of a standard kit methods in departmental lab, while human blood tests were conducted in authorized labs of a respective city.

### III. RESULTS

TABLE I

Parameters	Albino Rat (In Lab)			Human Volunteers		
	Sound A	Sound B	Sound C	Sound A	Sound B	Sound C
Adrenalin	↑NS	↑NS	↑NS	↑S	↓S	↑S
Cholesterol	↓VHS	↓NS	↓VHS	↓HS	↓NS	↓S
Cortisol	↓S	↓NS	↓S	↓S	↓NS	↓S
HDL	↑HS	↑S	↑NS	↑S	↑S	↑NS
LDL	↓NS	↓NS	↓S	↓NS	↓NS	↓S
TG	↓NS	↓NS	↓S	↓NS	↓NS	↓S
VLDL	↓NS	↓NS	↓S	↓NS	↓NS	↓S

Significant Level:  $P < 0.01$  (↑↑=Highly Significant increase, ↓↓↓=Highly Significant decrease),  $P < 0.05$  (↑=Significant increase, ↓=Significant decrease),  $P > 0.05$  (↑=Non significant increase, ↓=Non-Significant decrease).

### IV. DISCUSSION

Lipid bound proteins are called lipoproteins. Lipoproteins are found in plasma and their function is to transport lipids. Lipoprotein includes VLDL, LDL and HDL. In the present study VLDL and LDL are decrease Non significantly except in case of sound "C". The HDL significantly increased in most cases. The decrease of serum LDL and VLDL will lead to the decrease of triglycerides and cholesterol which means favourable lipid concentration in body and a healthy heart. In

the present study sound vibrations found to increase the adrenalin level in both humans and albino rats while decreasing the level of cortisol. The decreases of various lipids are indicative of good health. And support the view that sound can be used as a drug to control various lipid parameters.

Most of the above biochemical findings of present investigation are helpful to establish the doctrine that natural sounds and music based upon natural sounds can be used for various cardiovascular disorders. The effect of music on the cardiovascular disorders has been initially evident in

“Lancet”(medical journal), In which Vincent and Thompson (1929) made an attempt to discover the influence of listening to gramophone, and radio, music on blood pressure and he observed that listening to music was accompanied by a slight rise in blood pressure in the listener. Bason and Celler (1972) observed that the human heart rate could be varied over a certain range by entrainment of the sinus rhythm with external auditory stimulus. Bason`s paper is important for supporting the proposition often made by music therapists that meeting the tempo of the patient influences their musical playing and is the initial key to therapeutic change. An extension of this premise, that musical rhythm is a pacemaker, was investigated by Haas et al. (1986) in terms of the effects of perceived rhythm on respiratory pattern, a pattern that serves both metabolic and behavioural functions. He hypothesized an external rhythmical musical activity, in this case listening to taped music.

Several authors have investigated this relationship in the setting of hospital care (Bonny1983; Davis et al. 1987; Zimmerman et al. 1988; Guzzetta 1989; Philip 1989; Elliott 1994) often with the intent of reducing anxiety in chronically ill patients (Gross and Swartz 1982; Standley 1986), for treating anxiety in general (Robb 2000), or specifically in musicians (Brodsky and Sloboda 1997). Bonny (1978,1983) has suggested a series of musical selections for tape recordings which can be chosen for their sedative effects and according to other mood criteria, associative imagery and relaxation potential, none of which have been empirically confirmed. For this Updike (1990) conducted an experiment and confirms Bonny`s impression that there is a decreased systolic blood pressure, and a beneficial mood change from anxiety to relaxed calm, when sedative music is played. Rider (1985a,b) explained that disease related stress was caused by the desynchronization of circadian oscillators and that listening to sedative music, with a guided imagery induction, would promote the entrainment of circadian rhythms as expressed in temperature and corticosteroid levels of nursing staff. This study found no conclusive results, mainly because there was no control group. Guzzetta (1989) conducted a study to determine whether relaxation and music therapy were effective in reducing stress in patients admitted to a coronary care unit with the presumptive diagnosis of acute myocardial infarction. In this experimental study, 80 patients were randomly assigned to a relaxation, music therapy, or control group. Music therapy was comprised of a relaxation induction and listening to a 20 minute musical cassette tape selected from three alternative musical styles; soothing classical music, soothing popular music and non-traditional music. Stress was evaluated by apical heart rates, peripheral temperatures, cardiac complications, and qualitative patient evaluative data. Data analysis revealed that lowering apical heart rates and raising peripheral temperatures were more successful in the relaxation and music therapy groups than in the control group. The incidence of cardiac complications was found to be lower in the intervention groups, and most

intervention subjects believed that such therapy was helpful. Both relaxation and music therapy were found to be effective modalities of reducing stress in these patients, and music listening was more effective than relaxation alone. Furthermore, apical heart rates were lowered in response to music over a series of sessions thus supporting the argument that the assessment of music therapy on physiological parameters is dependent upon adaptation over time. Further research strategies may wish to make longitudinal studies of the influence of music on physiological parameters.

Bason`s (1972) study could influence heart rate by matching the heart rate of the patient, then we must conclude that studies of the influence of music on heart rate must match the music to the individual patient. This also makes psychological sense as different people have varied reactions to the same music. Furthermore, improvised music playing which takes meeting the tempo of the patient as one of its main principles may have an impact other than the passive listening to music. In addition, the work of Haas (Haas et al. 1986) mentioned above showed that listening, coupled with tapping, synchronizes respiration pattern with musical rhythm, further emphasizing that active music playing can be used to influence physiological parameters and that this synchronization can be learned.

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