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**“PROPERTY OF ELECTROMAGNETIC FIELDS  
(EMF), RADIO FREQUENCY FIELDS (RF)  
AND MICROWAVE RADIATION ON HUMAN BEING  
FITNESS”**

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# “Property of Electromagnetic Fields (EMF), Radio Frequency Fields (RF) and Microwave Radiation on Human Being Fitness”

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**Abstract –** These papers deliberate the effects of Electromagnetic in human beings and heat (energy) in a biological or non-biological system is frequency and also discussed on the exposure of microwaves from cellular networks. It describes the energy content, interaction of microwave with biological system, measurement techniques and safety standards. In the era of wireless communication, the exposure to electromagnetic radiations is increasing. Most of these radiations fall in the category of microwaves. In addition, domestic appliances and medical treatments also use microwaves for various purposes. Though the human body could compensate for and handle the extra energy load through the thermoregulatory mechanisms without obvious increase in temperature, stress could still

**Keywords:** Electromagnetic Field, Bio Effects, Radio Frequency, Microwave Develop.

## INTRODUCTION

The effects of Electromagnetic Fields (EMF) on humans are observational in nature, which renders problematic the assessment of causality. In a classic essay (2), Austin Bradford Hill laid down a series of criteria useful in drawing a conclusion as to whether a relationship between an alleged cause and an effect expresses causation or merely an association. With the exception of the first criterion, none of the others is a *sine qua non*. The hypothesis of causation become stronger as the number of fulfilled criteria increases. The criteria are:

- Strength of the association, commonly expressed in terms of relative risk, *i.e.* the factor by which the probability of developing the disease is increased in the exposed over the non-exposed population groups.
- Biological gradient, *i.e.* a dose-response effect.
- Coherence of the cause-to-effect interpretation with generally known facts on the natural history and biology of the disease.

## MICROWAVE BIO EFFECTS

The microwave frequency spectrum ranges from 300 MHz-300 GHz and RF Radiation from 0.5MHz - 300 MHz. The sources of microwave and RF radiation are Air Traffic Control Systems, Police and Military Radar, Earth to Satellite Television Broadcast Systems, Long Distance Telephone Equipment, Medical Diathermy

Devices, Cancer Diagnostic & Therapeutic (Hyperthermia) Equipment, Microwave Ovens, Industrial Applications and Microwave Generators. The standards that limit microwave exposure were set at 0.4 W/kg SAR for occupational and 0.08W/Kg for public exposure. The averaging time for determination of SAR was 6 minutes. The mechanisms of interaction have been described as thermal effects, with rise in body/tissue temperature of more than 1°C, non-thermal effects, with no obvious increase in body temperature and micro thermal with thermo elastic expansion in the brain giving rise to microwave hearing effect. Microwaves produce thermal effects on biological systems at high power levels. The energy absorption at high power levels probably leads to nonspecific stimulation of hypothalamic-hypophyseal-adrenal axis with liberation of corticosterone that causes sequestration of cells, an effect induced by any known stressor. Some of the thermal effects reported include cataract formation, foetal abnormalities, decreased thyroid function (through hypothalamic-hypophyseal-thyroid axis inhibition), suppression of behavioural responses, gonadal function and natural killer cell activity, increase in the number of complement receptor positive cells and increased phagocytic activity of peritoneal macrophages. At non thermal levels (<0.5°C rise in rectal temperature) stimulation of thyroid, increased susceptibility of the organism to bacterial infections, decline in neutrophil and complement activity, increased lymphoblastoid transformation of lymphocytes, abnormalities in the erythrocyte/lymphocyte precursors in bone marrow are some of the reported effects. The various review

articles describe the microwave effects in detail [1, 2, 3,4]

### NERVOUS SYSTEM:

In the absence of heating, evidence for changes in neuronal excitability, neurotransmitter function and innate and learned behaviour and for changes in the blood - brain barrier has been inconsistent and unconvincing. Extrapolation from laboratory studies in rats to humans is problematic because of the differences in the pattern of RF energy deposition between rodents and humans. Furthermore, in contrast to humans, rats have the capacity to perceive RF as sounds, which is likely to influence their reactivity. Some studies have suggested an effect on membrane proteins and on the flux of calcium and other ions across the membrane of neurons and EEG rhythms but these are not reproducible.

### HEART AND BLOOD PRESSURE:

With the exception of a well-designed but small study (which therefore requires confirmation in larger and independent investigations) reporting early effects on blood pressure in volunteers exposed to a conventional GSM digital mobile phone position close to the head, available findings provide no consistent evidence of an effect of mobile phones on the heart and circulation.

### NEUROBEHAVIORAL EFFECTS AND EFFECTS ON DRIVING:

Relevance of experimental studies to man is uncertain because of interspecies differences in the perception of intense pulsed RF fields. Studies on the acute effects of mobile phones on human volunteers have shown some neurobehavioral changes (such so-called neurobehavioral effects are mostly reporting of subjective malaise), the mechanism of which might include a localized heating effect. The interaction between electromagnetic fields and drugs has not been adequately investigated. The main effects of the use of mobile phones on driving are attributable to diversion of the attention.

### OBSERVATIONS IN HUMAN BEING REGARDING HEALTH

Among people exposed to radio waves or otherwise exposed to electromagnetic fields, there have been case reports or reports of small series of cases of subjective symptoms (fatigue, stress, sleep disturbances, depression, burning sensations, rashes, muscular pain, ear, nose, and throat problems, as well as digestive disorders etc.) in individuals that have been characterized as "hypersensitive".

The symptoms described seem to affect a limited number of persons but as yet there are no reliable estimates of the frequency of its occurrence. Almost

nothing is known on the role of conditions of exposure (frequency, concentration, duration etc.). Limited studies on volunteers found no connection between reported symptoms and exposure to electromagnetic fields. It is therefore very difficult to ascertain whether these are true effects.

### MEASUREMENT OF MICROWAVE EXPOSURE

For studies of health effects on people exposed to RF fields it is must to estimates the exposure over time. Instruments have been developed to estimates the exposure using personal exposure monitors worn on the body [7]. The type of monitor has been dependent on the environment to which subject is exposed. Workers on antenna sites have worn pocket-sized devices whereas more sensitive instruments have been developed to capture relatively low level exposures over the general population. The field strength recorded by a body worn instrument may differ from that recorded by the same instrument in the same position with the body absent by up to 10-15 dB; when operating close to body resonance frequencies (few tens of MHz), depending on the direction of incidence and the polarization of the radiation. The accuracy of personal monitors is also affected by non-uniformity of field strength over the exposed body. In alternate to the measurement of external electric and magnetic fields, it is also possible to estimate the exposure by measuring currents induced as a result of exposure to RF fields.

### CONCLUSION:

In this paper we observe that a major determinant for the initiation of current or heat in a biological or non-biological system is frequency. The unit of authentication is current density ( $A/m^2$ ) which depends on the field strength ( $H$  in  $A/m$ ), the frequency and the body length. Exposure to ELF (Extremely low frequency fields) does not result in a deposition of energy in the body, whereas exposure to RF and microwaves, (such as 900 MHz and 1800 GMS-radiation etc.) does. The measure of the energy deposition or absorption in the body is the SAR. The energy of all electric, magnetic and electromagnetic fields is orders of magnitudes below that of ionizing radiation.

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