Effects of Electromagnetic Radiation on Health and Environment

Prof. Mrs. Mulani A. T.
Professor
Department of Electronics & Telecommunication Engineering
Adarsh Institute of Technology, Vita, Maharashtra

Abstract—All the transmitting towers, such as AM and FM towers, TV towers, cell towers, etc. emit RF/microwave radiation continuously. Also, Wi-Fi (wireless Internet), wireless computers, cordless phones and their base units, cell phones and all other wireless devices emit microwave radiation. A cell phone that is ON but not in use is also radiating. The purpose of this report is to create awareness amongst people of the possible health hazards which microwave radiation could lead, and the urgency to take necessary precautions to avoid major public health consequences, or else the impact could be worse than Cancer, AIDS, World War, Tsunami, etc.

Key words: Electromagnetic Radiation (EMR), World Health Organization (WHO), Heat Shock Proteins (HSPs), Radio Frequency (RF), Extremely Low Frequency (ELF), Specific Absorption Rate (SAR)

I. INTRODUCTION

Cell phones operate within the frequency band of 800 MHz, 900 MHz and 1800 MHz and the latest 3G technology works between 1900 – 2200 MHz. Computers and laptops operate within the frequency range of 1000 – 3600MHz, and most Wi-Fi systems and some cordless phones operate around 2450 MHz, which is same frequency as that of a microwave oven! The growing use of wireless communication in the last decade has introduced concerns about health risks from the so called man made electro smog. Various epidemiological and experimental studies have been carried out and the results have shown to have a close relation between biological effects and Electromagnetic radiation (EMR)

II. FUNDAMENTALS

Microwave radiation effect can be classified as - thermal and non-thermal. The thermal effect has been largely studied and refers to the heat that is generated due to absorption of microwave radiation. Being exposed to the thermal effect could cause fatigue, cataracts and reduced mental concentration. Research is going on to study the non-thermal effects of radiation, and it has been associated with affecting the cell membrane permeability. Sadly the current exposure safety standards are purely based on the thermal effect while ignoring the non-thermal effects of radiation. Likewise microwave absorption effect is much more significant by the body parts which contain more fluid (water, blood, etc.) like the brain which consists of about 90% water. Effect is more pronounced where the movement of the fluid is less, for example, eyes, brain, joints, heart, abdomen, etc. The effect has shown to be much more severe for children and pregnant women. The effectiveness or seriousness of the issue has not been realized among the common man yet as one can not see or smell or hear microwave and its effect on health is noted after a long period of time. Therefore, majority of the people tend to have casualness towards personal protection.

Unfortunately, ignorance and non-awareness adds to this misery and all of us are absorbing this slow poison unknowingly. Electromagnetic fields and/or electromagnetic radiation, as electromagnetic pollution, affect various elements of the environment. Therefore it becomes very important to appropriately determine the nature and related side effects of electromagnetic pollution and its impact on living organisms.

III. EFFECT OF CELL PHONES AND MICROWAVE EXPOSURE ON HEALTH

A. Increased Risk for Brain Tumors

World Health Organization (WHO) discovered that the chances of developing a malignant tumor are “significantly increased” for people who use cell phones for ten years. They also found that a type of brain tumor called glioma is more likely in long-term mobile users.

B. DNA is Damaged by Mobile Phone Radiation

In 1995, it was found that DNA damage in the brain cells of rats exposed to radiation similar to that emitted by cell phones. In December 2004, it found that radiation at some cell phone levels damages DNA and the damage could not always be repaired by the injured cell. EMR causes membrane leakage due to loss of calcium ions. Leaks in the membranes of lysosomes (small bodies in living cells packed with digestive enzymes) release DNAase (an enzyme that destroys DNA), which explains the fragmentation of DNA seen in cells exposed to mobile phone signals.

C. Mobile Phone Radiation Wrecks Your Sleep

According to research by mobile phone makers own scientists, use of the handsets before bed, delays and reduces sleep, and causes headaches, confusion and depression.

D. Effect of TV and FM Towers on Health

It is found that children living near TV and FM broadcast towers (similar to cell towers) had more than twice the rate of leukemia as children living more than seven miles away from these towers.

E. Risk to Pregnant Women

A pregnant woman and the fetus both are vulnerable because of the fact that these RF radiations continuously react with the developing embryo, increasing cells, because of thermal heat also.

F. Effects on Stress Proteins (Heat Shock Proteins)

Heat shock proteins (HSPs), also called stress proteins, are a group of proteins that are found in virtually all living organisms. Expression of these proteins is increased when a
cell undergoes various types of environmental stresses like heat, cold, heavy metal poisoning and oxygen deprivation.

It has been observed that very low-level ELF and RF exposures can cause the cells to produce stress proteins (heat shock proteins), which means that the cells recognizes ELF and RF exposures as harmful. Hence ELF and RF exposures add to the list of environmental stressors that cause a physiological stress response. This further demonstrates that ELF and RF exposures can be harmful, and it happens at levels far below the existing public safety standards.

IV. EFFECT OF CELL PHONES ON ENVIRONMENT

A. Effect on Birds

Research shows that when birds are exposed to weak electromagnetic fields, they disorient and begin to fly in all directions, which explains migratory birds undermining navigational abilities.

B. Effect on Farm Animals

Some farmers have observed that cows grazing near cell towers are more likely to experience still births, spontaneous abortions, birth deformities and behavioral problems, and general declines in overall health. Moving cattle herds away from such towers has reportedly led to immediate health improvements.

C. Vanishing Bees

India found that electromagnetic radiations from cell phone towers can lead to diseases in plants and animals, and is the reason for the vanishing butterflies; some insects and birds like sparrows. Bees are vital pollinators for agriculture. With the vanishing of bees, a major food crisis could ensue.

V. CONTROL MEASURES ELECTROMAGNETIC RADIATION POLLUTION

A. Specific Absorption Rate (SAR)

Rate at which radiation is absorbed by the human body is measured by specific absorption rate (SAR), measured in units of watts per kg (W/kg) of tissue. If the heat generated is small, the body’s thermoregulatory mechanism can dissipate it without causing adverse effects. If the temperature exceeds this capacity, about 1 to 2 degree Celsius, tissue damage may occur. Every mobile phone comes with a SAR rating. Increase in thermal effects occurs when whole-body energy absorption exceeds a SAR of 4W/kg. Taking this value as threshold for harmful effects, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) applies a safety factor of 50 to derive safe limits for exposure to general public.

B. Minimize Time and Intensity

Preferably use the mobile phone only for very short duration, of a few minutes length, and never for several minutes. Mobile phones were invented for emergency use but unfortunately they have now become part of our daily lifestyle.

C. Minimize the Intensity of the Irradiation

Always check the signal intensity and don’t call when the signal is weak, then the mobile will irradiate maximally. Hold the phone as far away as possible from the body while calling.

Use safe headsets. The kind having a plastic tube between the earpiece and the phone are best.

Use a loudspeaker phone, as your headset may not always be available. But be careful, your face should be as far away as possible from the phone to reduce absorption of radiation by the face.

D. Avoid other Sources of Microwave Radiation

1) Keep out of Wi-Fi fields:
If you have Wi-Fi based internet at home, get rid of it and use cable connection or switch it off when not in use. Some studies indicate that the Wi-Fi irradiation is stronger than the producers maintain. Don’t stay long in Wi-Fi cafés as its radiation is continuous.

2) Avoid using cordless phones in your home:
Their base station, the charger/antenna, emits strong and continuous microwave radiation throughout the whole house. Use ordinary landlines only.

3) Keep out of Mobile phone towers / base stations:
Studies indicate an increased rate of diseases, including cancers, within about 400 m from them. Until now, man has been absorbing the harmful, unseen electromagnetic radiations without even being aware of it, but now, with the rapid advent in technology, this RF Radiation pollution has started having ill effects on human health, health of animals, functioning of normal household, medical investigatory equipments and even on food products being consumed by everybody. Hence, there is an urgent need to take precautionary steps.

4) Positive drug control:
Apart from the emission source, but also the use of shielding, limiting working hours, increase body resistance and so on. Indirectly, including the adoption of the precautionary approach to conditioning, such as drugs, such as eating some vitamin A, vitamin C and protein foods such as carrots, seaweed, cabbage and animal liver and so on, to strengthen the body’s ability to resist electromagnetic radiation.

VI. CONCLUSION

It may be concluded that, no residential complex should exist at a radius of 50 meters from the cell phone towers, as serious health concerns have been linked with public health and the base stations. A report has been prepared by the WHO- World Health Organization on Electromagnetic fields and public health: mobile telephones and their base stations in 2000.

REFERENCES


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