

## **CYBER RADIATION – A Fact File**

ElectroMagnetic waves are emitted by many natural and man made sources and play an important part in our lives. We are warmed by the electromagnetic emissions of the sun and we see using the part of the electromagnetic spectrum that our eyes detect as visible light. Electromagnetic (EM) radiation is a self-propagating wave in space or through transparent matter. EM radiation has an electric and magnetic field component which oscillate in phase perpendicular to each other and to the direction of energy propagation. Electromagnetic radiation includes radio waves, microwaves, terahertz radiation, infrared radiation, visible light, ultraviolet radiation, x rays and gamma rays. The electromagnetic spectrum extends from below the frequencies of radio waves at the long-wavelength end through gamma radiation at the short wavelength end. Human body is exposed to different kinds of EM radiation that includes the natural radioactivity in the earth, cosmic rays from outer space and also manmade radiations coming from electric and electronic instruments. Diagnostic X ray machine, television sets, computers, microwave oven, radar devices, laser devices, mobile phones etc, generates radiations of different frequencies which exists in our environment as 'electronic smog'. All electromagnetic radiation consists of oscillating electric and magnetic fields and the frequency of which is, the number of times per second at which the wave oscillates. Frequency is measured in Hertz (Hz) where 1 Hz is one oscillation per second. 1 kHz is a thousand, 1MHz is a million and 1 GHz is a thousand million. Frequencies between 30 kHz and 300 GHz are widely used in telecommunication systems like radio, TV and mobile phony. If these radiations are not properly controlled, they can be a serious health hazard in the near future.

When you sit in front of a computer or television, you are being bombarded by harmful waves quietly emanating from it. Even if you turn off the device, your biomagnetic field is still bombarded 24 hours a day, 7 days a week by the EM radiations from power cables, electric and electronic instruments. Extremely low frequencies waves (ELF) exist wherever electricity flows and radiate it from every electrical item in your environment .ELF radiation, the most underrated of the electromagnetic spectrum, deserves evaluation. CRT (Cathode Ray Tube) based computer monitors use a beam of electrons accelerated by high voltage to generate image on the fluorescent screen. X rays may be produced when electrons are accelerated by high voltage, and strikes an obstacle in vacuum. In CRT based monitors, the image is formed by shooting a stream of electrons on the back of the screen, scanning back and forth across the screen, one line at a time. These electrons cause the screen to light up to produce the picture. Some of the energy from the electron beam escapes in the form of radiations at various frequencies particularly in the VLF (Very Low Frequency) and ELF (Extremely Low Frequency) bands. The spot of electrons which sweeps the screen generates PEMR (Pulsed ElectroMagneticRadiation) which at close range, disturbs the balance of all living cells. It has been established that, the harmful effects of PEMR exists all around the screen, especially in front and behind the monitor. The PEMR persists several hours even after the computer is switched off. Most people know that sitting too close to the screen increases the danger of radiation. But many do not realize that the sides and rear of the monitor are more dangerous. This means that even if you stay at two feet safe distance away from the screen, you may get radiation from the sides or rear of another computer terminal.

### **Some important features of PEMR are:**

1. PEMR travels through absolutely everything including the casing of computer, walls, filters and muscles.
2. CRT monitor radiates as far as eight times its own diagonal, with the most intense emission at close range with in a 110 degree cone area in front and back of the screen.
3. The CRT monitor (in computer and TV) that is switched off continues to radiate for several hours afterwards, even if the device is unplugged.

### **Biological effects of electromagnetic radiation**

Unnatural EM fields are continuously disrupting our body's biomagnetic field, within which millions of electrical impulses regulate the activity of cells. With electrical and magnetic energy reaching us from power lines, cables, microwave oven, computer, TV, mobile phones and other industrial and domestic appliances, it is estimated that we are getting 200 million times more radiation than our ancestors. The standard for x ray emission from CRT monitor is 0.5 milli Roentgen per hour (mR/hr). Magnetic field as low as 5 milli gauss could trigger induced current in the body that may be sufficient to cause a cellular metabolism. Researches are going on to study the biological effects of computer radiation on the human body. It is suggesting that if the body is exposed for prolonged time to radiation, the following ill effects may be produced.

1. Changes in the permeability of the blood-brain barrier, a special defense system in the brain to prevent the entry of foreign molecules.
2. Alter the behavior of cells, tissues and organs.
3. Affects biological cycles like hormone secretion, sleep etc, and alter motor functions.
4. Disturb hormone balance, leading to altered mood, fatigue, fear, depression, disorientation, etc.
5. Causes excess secretion of Nor- adrenaline hormone with in 15 minutes after the exposure.
6. Severely affects the production of Melatonin hormone leading to sleeplessness.
7. Causes miscarriage, developmental abnormalities and alterations in embryos.
8. Causes eye strain, vision problems and cataract.
9. Causes over activity in children due to excess hormone secretion.

### **Computer Vision Syndrome (CVS)**

If you use a CRT based computer for many hours, some ill effects like eyestrain and fatigue may develop which is known as *Computer Vision Syndrome*. This is mainly due to pulsed electromagnetic radiation and artificial light from the monitor. The same thing happens if you watch TV for long time. The CRT monitor uses fast beam of electrons that generates pulsed electromagnetic radiation carrying energy. At close range, this energy disturbs the metabolism and electrical activities of living cells. Artificial fluorescent light from the monitor is the form of fractioned light which leaves out many segments of the spectral range. Flickering of the screen is also dangerous since the flickering rate is higher than the 'Flicker-Fusion' rate of the human eye. CVS is also caused due to bad contrast or excessively or poorly illuminated screen. Background illumination, posture, positioning of the monitor, ocular conditions like dry eyes and uncorrected

refractive errors etc, increases the risk of CVS. Close watching reduces the muscle movements of the eyes and causes strain and fatigue.

To reduce the effects of CVS, many safety measures are recommended. The first and most important rule is to keep a safe distance of 14 inches from the screen although 24 inches preferred. More than 24 inches distance is necessary from the sides and rear of a near by monitor. It is important to note that Laptop computers using Liquid Crystal Display (LCD) are completely safe since there is no X ray emission from the screen.

If you feel discomfort while doing computer for prolonged time, this simple technique will relieve eye strain. Keep your head still and gently move your eyes up and down five times. Next move your eyes side to side as far as possible. Repeat three times. Finally move your eyes slowly in a circle and back in the reverse direction. Take rest for some minutes and repeat all over again.

### **Mobile Radiation**

Mobile phone radiation and health concerns have been raised, especially following the enormous increase in the use of wireless mobile telephony throughout the world. This is because mobile phones use ElectroMagnetic radiation in the Microwave range. These concerns have induced a large body of research in animals and in humans. When we talk on mobile phones, the transmitter takes the sound and encodes on to a continuous “sine wave”. The sine wave radiates out from the antenna and fluctuates evenly through space. Once the encoded sound has been placed on the sine wave, the transmitter sends the signal to the antenna which then sends the signal out. The encoded signals are made up of electromagnetic radiations. These waves are picked up by the receiver in the base station tower. The base station antenna emits radiations continuously to make a link with the subscribers. The Global System for Mobile Communication (GSM) and the Code Division Multiple Access (CDMA) Systems are digital mobile phone services that consist of a Base station antenna which communicates with the mobile phones through Radio Frequency (RF) transmission. The mobile phone system is referred to as “cellular telephone system because the coverage area is divided into “cells “each of which has a base station antenna.

### **Biological effects of mobile radiation**

Mobile phone technology uses electromagnetic radiation in the Giga hertz range. These radiations are close to microwave range and with similar properties. Part of the radio wave emitted from the mobile phone is absorbed by the human head. The radiation emitted by a GSM handset can have a peak power of 2 watts. The rate at which radiation is absorbed by the human body is measured by the **Specific Absorption Rate (SAR)** and its maximum levels for modern handset is set between 1.6 to 2 W/Kg averaged for 1 gram tissue. If the SAR level is above the limit, it may cause both *thermal and non thermal effects* on the body especially on the ear and head since these are at the “Near Field” of the radiation. Thermal effect of microwave is the dielectric heating in which any dielectric material such as living tissue is heated by rotations of polar molecules. In the case of a person using mobile handset for hours in a day, most of the heating effects will occur in the earpinna, internal ear, head surface and even in the brain. Internal ear has fluid filled structures which are more susceptible to heating effect. Brain tissue is

delicate and there is blood-brain barrier system to eliminate excess heat generated. Some of the brain waves that determine mood and alertness resemble the mobile radiation in frequency. So that normal brain functions will be affected even in a few persons using mobile phones continuously. Another structure that can be affected by heating is the cornea of the eye. It is the transparent covering on the front part of the eye. Cornea lacks blood supply, so that the heat generated can not be removed and may cause premature cataract. Non thermal effects include alterations in bio-cycles, cellular metabolism, spermatogenesis, abnormalities in foetal developments, miscarriage etc. Some users of mobile phones feel several unspecific symptoms during and after the use of mobile phones in the form of burning and tingling sensations, fatigue, sleep disturbances, dizziness, loss of mental concentration etc. All these may be due to the influence of the radiation on the biomagnetic field of the body.

### **NoMo Phobia**

Being out of mobile contact may be the 21<sup>st</sup> century's latest contribution to our hectic life. When we run out of credit or battery, lose of phone or are in an area with no reception, being phoneless can bring a panic symptom referred to as *NoMo Phobia* or *No Mobile phobia*. A study carried out in UK revealed that many people are apparently suffering from NoMo phobia. Some 48 percent of women and 52 percent men feel sudden stress if there is a connection break or if the battery is flat. This may creates moments of extreme anxiety. Physiological changes including secretion of adrenaline is the cause of the stressful situation. The possible ways to avoid such a stress includes keeping of a fully charged battery and keeping the credit level constant. Another method is to keep away the mobile phone for hours or days so that you may feel that it is not a must.

### **Ways to protect from harmful radiations**

Several problems have been observed in people who spend more than four hours a day in close proximity to an unprotected video terminal that uses a CRT based monitor. Stress, headaches, irritability, insomnia, eye strain, abnormal general fatigue, decrease in natural immunity, hormonal disturbances, disorders in the menstrual cycle are some of the ill effects of radiations. Even more disturbing fact is that, exposure to radiation for long periods reduces spermatogenesis as observed in experimental animals. As the principle of precaution says "*Faced with the risk of serious and irreversible damage, we cannot wait until we have all the scientific evidences before taking precautionary measures*". "*Absence of certainty must not delay action*". Then what can we do? We can do something to protect ourselves.

1. Unplug all electrical devices which are not using.
2. Get rid of microwave oven. It uses heat generating radiations for cooking. If the appliance is not well protected, microwaves will leak out.
3. Avoid using watches with radium dial.
4. Remove computer and TV from bedroom. During sleep, normal detoxification process takes place in the liver which may be blocked by the electromagnetic stress. Electromagnetic radiations from wiring cables, CRT monitors, Mobile phones etc, impinge on the pineal gland of brain suppressing its melatonin hormone. This hormone is important to regulate our biological cycles including sleep.

5. Do not use computers or TV in children's room. Children are more susceptible to the harmful effects of EMFs.
6. Do not keep mobile phones close to you while sleeping. Its emissions can alter your sleep physiology.
7. Do not give mobile phones to children.
8. Expecting mothers are more susceptible to the ill effects of radiation. The soft tissues of the fetus may develop abnormalities if the tissues get radiation. So it is necessary to avoid environments that contain high intensity electromagnetic radiations.

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