ELECTROMAGNETIC fields have always been part of the earth’s environment. The pressure and temperature of the core of the interior of the earth are assumed to be over three million atmospheres and around 6000°C respectively, and the ionosphere is an electrically charged layer of the atmosphere. Thus, resonances occur between the earth’s molten iron-nickel core and the charged gases of the ionosphere.

These pulses at definite frequencies (between 0.1 and 25Hz; mostly at about 10Hz), act as regulators for the biological time clocks of all living creatures. If man, or any animal or plant is totally shielded from these fields for any length of time, the result is discomfort and even death. It has recently been shown that even each cell division is timed according to these pulses. However, anything too much is bad for us.

The sun, once considered the essence of our existence and source of all energies, can also be hazardous to human health by overexposure to its rays. Strong electromagnetic fields (EMFs) of about 50 to 60 cycles per second (hertz, or Hz) and the related electromagnetic radiation (EMR) are detrimental for us. The expansion of electromagnetic fields creates contaminants (radioactive particles) that penetrate our air, food, the bloodstream and our bones.

Levels of this type of radiation have increased more than a thousand-fold in the last decade especially from mobile telecommunications, electric train tracks, television transmitters and FM radio stations. The human body is good at adapting, but there are limits to such adaptation. There is deadly electro-magnetic smog everywhere. The rays are attacking our senses and our bodies every moment. The worst part is they are invisible.

This man-made electromagnetic smog affects human health, and also terribly impinges on the functioning of different investigatory equipments in laboratories and hospitals. This form of pollution probably causes more harm to humans than all other forms of pollution put together.

The dangers of electro-magnetic fields are created artificially not only by microwaves from TV broadcasts, FM radio stations, radar, satellites and aircraft landing systems but also from power lines, underground cables, house mains circuits, electrically driven trains and motors, household electric appliances, microwave ovens, fluorescent lights, television sets, computers and even battery operated watches and most importantly from cell phones. Unknowingly many diseases and disorders are now attributed to the consequences of radiation.

At higher frequencies, electric and magnetic fields combine to produce electromagnetic radiation. A lamp shuts off if we pull the plug, but television signals continue to radiate outward even after we have turned off the power. Similarly, mobile antennas always emit a high frequency radiation.

All electrical appliances convert the alternating current to direct current by virtue of which the appliances can be operated using less electricity. In this process, high frequencies are generated that go to the electrical circuit and cause

We are generally concerned about what we can feel and observe—photochemical smog, hazardous substances, industrial effluents, polluted water bodies, ruthless deforestation, dirty solid wastes and unhygienic biomedical wastes. But we are more intimately and persistently affected by invisible electromagnetic rays.
high-frequency electromagnetic waves to radiate out from the circuits. In other words, some radio wave and microwave frequencies disseminate their energy through the air rather than follow the electrical circuits. These polluting high frequency fields are detrimental to human health.

You are even subjected to the high frequencies generated in your neighbour’s house. These high frequency radiations flow easily from one home to another and pollute the environment instead of returning through the transformer and on to the substation via the grid. Just as a river becomes more polluted downstream, so does the electrical power stream, becomes more polluted downstream, substation. For example, in a house all electrical appliances “upstream” contribute high frequencies to the overall electrical pollution of the grid downstream from.

The relationship between biological effects and electromagnetic exposure has been evidently established from epidemiological and experimental studies.

The growing use of mobile communication in the last decade has introduced concerns about health risks from so-called man made electromagnetic smog.

Sources of Radiation
One of the major sources of electrical pollution is the dimmer switch. In this process the excess light is converted to radio frequencies. Another imperative source is the energy-efficient compact fluorescent light which is encouraged at all levels for conserving electricity. In the process of conversion to lower wattage, high frequencies are generated. Moreover, high-intensity light bulbs, in the process of compacting their energy use, create high frequencies.

Lastly, but not the least, the boom and revolution in the use of the cellular phone has evidently increased electromagnetic pollution. Mobile telecommunication companies in fact have established telecom-towers in every corner of the country. In their over-exuberance for the speed of network roll out and covering the entire population for good communication range, they have put the general public open to the continuous exposure of electromagnetic radiation, which is leading to permanent effects on human health and behaviour.

Health Hazard
Recent research shows higher magnetic fields are associated with greater risk of leukemia especially in children. Other studies report a slight increase in male breast cancer for occupational exposure; an increase in brain tumours above 10 milli-gauss (mG, the unit for measuring strength of a magnetic field) and an increased incidence of miscarriages above 16 mG.

There are more recent concerns that cell phone users are more likely to suffer from brain tumours, cardiac arrest and even impotency. Latest researches also demonstrate that even exposure to weak electromagnetic fields (EMFs) can disturb the production of the hormone melatonin by the pineal gland in the brain, eventually leading to an increase in the risk of breast cancer and degenerative diseases such as coronary artery disease, Parkinson’s and Alzheimer’s. It also aggravates different respiratory, dermatological, cardiac, neurological and ophthalmologic health hazards.

Majority of Indian households have at least one cell phone. Recent research by University of Washington found that two hours of radiation damages rat-brain DNA. So talking long hours on cell phones does intensify the risk of brain cancer and tumour development. Genetic damage is also observed in case of frequent cell phone users.

There is also evidence to suggest that electromagnetic fields may have biological effects, including an increase in the rate of cell division. In the case of plants, it has been found that trees growing close to a giant communications antenna in a Michigan forest have grown unusually quickly. It clearly suggests that the microwaves were speeding up cell division.

Radiation also affects the foods that we eat. Electromagnetic radiations (EMRs) are capable of causing chemical changes in foods. Some of these changes result in free radicals such as benzene, formaldehyde and hydrogen peroxide. Many scientists consider these as potential cause for cancer.
**Do’s and Don’ts**

1. Don’t have a radio or mobile by your head for too long.
2. Minimise fluorescent lighting, energy efficient fluorescent bulbs release more radiation in comparison to yellow incandescent bulbs.
3. Don’t play video and computer games for long hours.
4. Electromagnetic fields also drop off with distance, so keep back from appliances and electric ranges. Don’t habitually remain within a few metres of a working electric appliance. Turn them off if you are not using them.
5. Electromagnetic rays exist around power lines, power tools, microwave ovens, electric stoves, heaters, toasters, boilers and freezers when in use, extending several feet or yards around the appliance. Stay away from them as far as possible.
6. Television sets also emit harmful rays. Preferably sit as far away as conveniently possible. The field is strongest directly in front and at the back. View the set at an angle and restrict your exposure to only a few programs daily – the fewer the better.
7. Stay at arm’s length from your computer. Computer monitors apparently have stronger radiations at the sides than at the front.
8. Try to minimise electromagnetic pollution while sleeping when the pineal gland is most susceptible.
9. Also sleep in the dark or at least cover your eyes to produce the immune-stimulating hormone melatonin.
10. Preferably switch off all power points in the bedroom and unplug all electric plugs before going to sleep and definitely any power points close to the bed.
11. If the head faces a wall with power points or other electric wiring inside the wall close to the bed, move the bed towards the middle of the room.
12. Don’t leave an electric blanket plugged in. When using an electric blanket, warm the bed beforehand and pull out the plug when you go to bed.
13. If you have a choice, use a landline (wired, not cordless) instead of cell phone.
14. Limit the length of your calls. As little as a two-minute call results in an altered electrical brain pattern up to an hour later. Use an ear bud.
15. Cell phone radiation has an affinity for metal and water. So metal-framed glasses and wet hair will attract radiations easily.
16. When your phone is on, it automatically transmits at high power to check into the network every minute. So, don’t wear it on your belt or carry it in your shirt/pant pocket.
17. When placing a call, the phone makes the connection at high power, so count to five before putting it to your ear, and don’t press it against your head.
18. Try to use your phone where reception is good. Power cranks up to compensate for a weak signal.
19. Don’t talk on a mobile while driving. This applies to both hand-held and hands-free devices. Radiation disrupts the electrical patterns of your brain.
20. Battery-driven apparently DC items use alternating currents in their circuits. Digital wrist watches use alternating current to drive the display. Thus, we are fastening a portable AC stress generator on our wrist and carrying it throughout the day. Don’t wear a battery-operated wrist watch.
21. Preferably do not live near high-voltage lines, microwave towers or electric-train tracks.
22. Lastly, use and popularise the use of anti-radiation and radiation-safe products like mobile accessories, electronic accessories, uniforms, aprons, medical outfits, fabrics, paints, glasses, window films for less radiation penetration recommended by various scientific organizations.

EMRs also acutely affect meat. Meat is high on the food chain. By the time the animal is slaughtered for food, it has ingested high concentrations of radioactive material and electromagnetic radiation. Contaminants increase in toxicity as they pass down from the grass ingested by the animal to the flesh and organs eventually eaten by humans. Unlike carnivores, whose intestinal tracts are short, vegetarian animals retain foods in the digestive tract for longer periods and so radioactive materials permeate their bodies to a larger extent.

People, who are normally exposed to electromagnetic fields during their work time, manifest hypochondriac reactions and a feeling of fear. Sometimes they perceive nervous tension, mental depression and memory impairment. They complain of a pulling sensation in the scalp and on the brow, loss of hair, pain in the muscles and in the heart region and breathing difficulties. Slight trembling of the eyelids, the tongue, and the fingers, and increased perspiration of the extremities, dermographism, and brittleness of fingernails are also observed. There is also decrease of lactation in nursing mothers.

Electrical pollution affects so many people in so many different ways because the most prevalent detrimental body currents (radio frequencies) directly impair the immune system. A single irradiation may cause a drop in the resistance of the organism. It is believed that these radio frequencies use the bone marrow as their main conducting circuit within the body. The bone marrow is the part of the immune system where antibodies, white blood cells and other essential “germ-fighters” are generated.

**Risk to Pre Adolescent Children:**

Children are more at risk than adults because of easy absorption of microwaves as their nervous system are still developing. Hence children should only use cell phones in emergency situations. Because their immune systems are still developing, kids have greater absorption, as well as a longer lifetime exposure. The increased mitotic activity in cells of developing children makes them more susceptible to genetic damage. Doctors
from the United Kingdom have issued warnings urging children under 16 not to use cell phones, to reduce their exposure to radio frequency radiation.

**Risk to Pregnant Women:** Pregnant women and the foetus both are vulnerable because these radio frequency radiations continuously react with the developing embryo. They also cause thermal heat, which badly affects the foetus. When the pregnant ladies either use mobile phones or when illuminated with such radiations, the developing child can become affected.

**Risk to Human Brain:** Human brain is the most vulnerable portion. Some of the known effects are neurological effects, increase in ODC (Ornithine De Carboxylase) activity, effect on enzymes and free radicals decreasing the brain metabolism.

**Risk to Patients Carrying Pace Makers:** This exposure adversely affects the implanted Pace Maker and becomes arrhythemical. These radiations may stop the Pace Maker from delivering pulses in a regular way or may generate some kind of external controlling pulse putting the patient’s life at risk.

**General Symptoms**

There are several general symptoms of various respiratory, cardiac, ophthalmologic, dermatological and neurological disorders due to overexposure of electromagnetic radiations.

**Respiratory:** bronchitis, pneumonia, sinusitis and asthma.

**Cardiac:** pain or pressure in the chest, low or high blood pressure, slow or fast heart rate, palpitations, arrhythmias and shortness of breath.

**Ophthalmologic:** deteriorating vision, floaters, cataracts, pain/burning in the eyes and pressure in/behind the eyes.

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Dermatological: burning, facial flushing, skin rash and itching.

Neurological: muscle spasms, numbness, tingling, altered reflexes, muscle and joint pain, leg/foot pain, headaches, dizziness, nausea, difficulty in concentrating, memory loss, irritability, depression, anxiety, insomnia, fatigue, weakness, tremors, flu-like symptoms, fever. More severe reactions can include seizures, paralysis and psychosis and stroke.

Others: dryness of lips, tongue, mouth, eyes; great thirst; dehydration; nosebleeds; internal bleeding; altered sugar metabolism; immune system abnormalities; redistribution of metals within the body; digestive problems; abdominal pain; enlarged thyroid, testicular/ovarian pain; hair loss; pain in the teeth; ringing in the ears; impaired sense of smell.

Therefore, it is always advisable to try and maintain a safe level of exposure to such radiations. Children's exposure should be less than 3 mG; for adults, it must be less than 10 mG (mG is the unit for measuring strength of a magnetic field).

The relationship between biological effects and electromagnetic exposure has been evidently established from epidemiological and experimental studies. The growing use of mobile communication in the last decade has introduced concerns about health risks from so-called man made electromagnetic smog. As the adverse health effects of EMR exposure started coming to the notice of medical and radiological scientists certain measures were taken in advanced countries to formulate certain guidelines and to regulate exposure limits within safe levels.

In India, too, an effort must be made at all levels for abatement of electromagnetic pollution. Remedial measures should be taken by all of us in general and by the Government to ensure a clean, green and EMR safe environment.

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