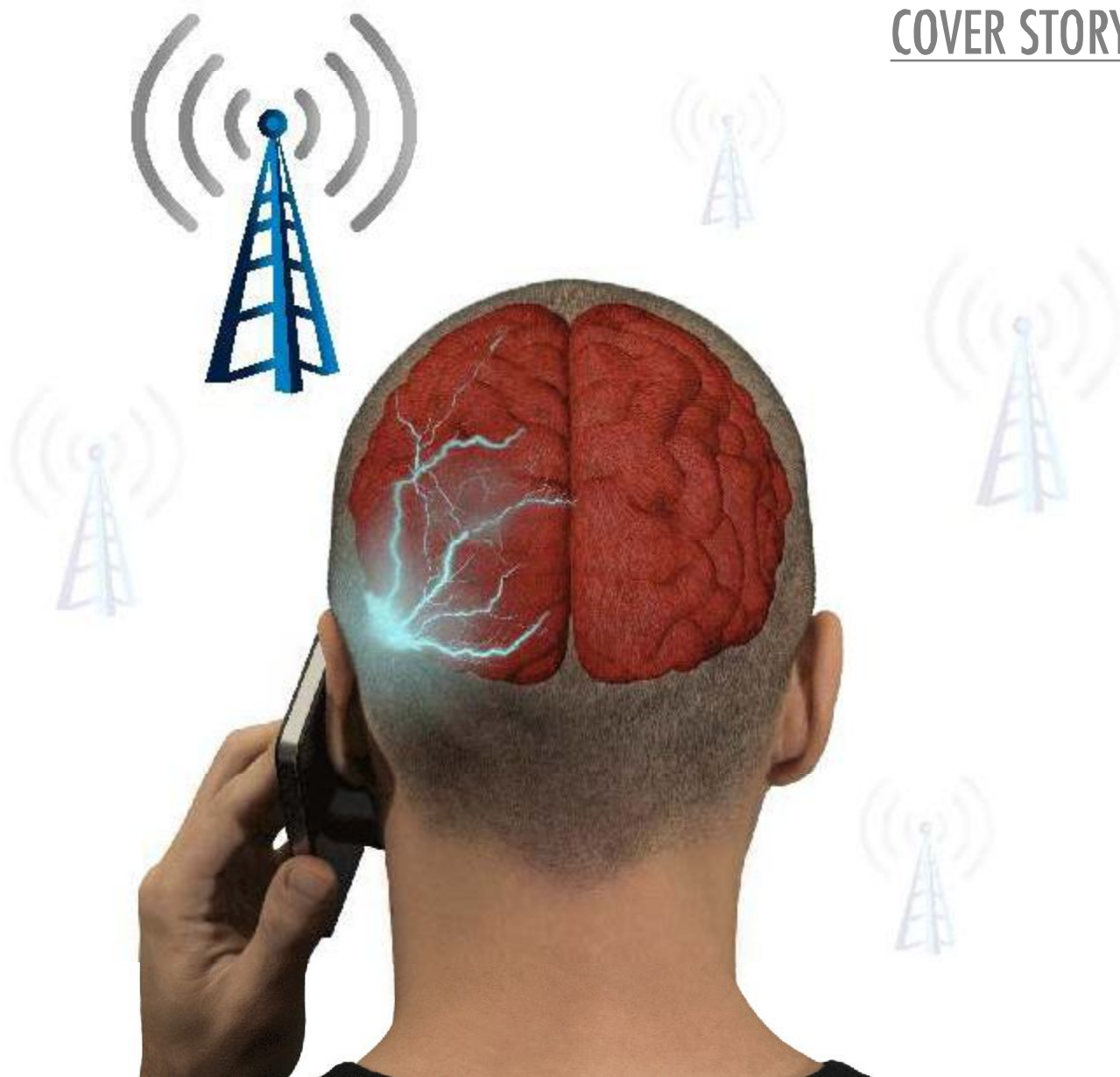


Universal
Health*of***India**
Transforming Healthcare



CELL PHONE, TOWER RADIATION
HAZARDS AND **SOLUTIONS**



CELL PHONE, TOWER RADIATION **HAZARDS** AND **SOLUTIONS**



Advantages and Disadvantages of Cell Phone Technology

Cell phone technology has revolutionized the telecommunication scenario in India. It was started in 1995 and due to its several advantages, cell phone technology has grown rapidly in the last two decades. There are more than 100 crore cell phone subscribers and nearly 6 lakh cell phone towers. The numbers of cell phones and cell towers are increasing without giving due respect to its disadvantages. All over the world, people have been debating about associated health hazards due to radiation from cell phones and cell towers.



Girish Kumar received Ph.D. degree in Electrical Engineering from IIT Kanpur in 1983. From 1983 to 1985, he was a Research Associate in the Electrical Engineering Department, Univ. of Manitoba, Winnipeg, Canada. From 1985 to 1991, he was an Assistant Professor in the Electrical Engineering Department, Univ. of North Dakota, Grand Forks, USA. Since 1991, he is at IIT Bombay, where he is currently a Professor in the Electrical Engineering Department. His areas of interest are: Antennas, Microwave Circuits and Systems. He has written more than 270 papers in the international and national journals and conference proceedings. He is author of the two books and has filed 5 patents.

He has been working on hazards of microwave radiation for the last one decade. Has written several reports and given presentations at various forums on the topic related to Cell Phone and Tower Radiation Hazards and Solutions.

He is also chairman of the company "Wilcom Technologies Pvt. Ltd.", which is an IIT Bombay incubated company formed through Society for Innovation and Entrepreneurship (SINE).

Radiation from Cell Phone

A cell phone transmits 1 to 2 Watt of power in the frequency range of 824 - 849 MHz (CDMA), 890 - 915 MHz (GSM900), 1710 - 1780 MHz (GSM1800), 1920 - 1980 MHz (3G) and 2300 - 2400 MHz (4G). The radiation from a cell phone is defined by its SAR (Specific Absorption Rate) value. In USA, SAR limit for cell phones is 1.6W/Kg which is actually for 6 minutes per day usage. It has a safety margin of 3 to 4, so a person should not use cell phone for more than 18 to 24 minutes per day. This information is not commonly known to the people in India, so crores of people use cell phones for more than an hour per day without realizing the health problems.

Interphone study report in May 2010 mentioned that excessive users of mobile phones (i.e., 1/2 hour/day over 8 to 10 years) have doubled to quadrupled brain tumor risk. On May 31, 2011, International Agency for Research in Cancer (IARC), part of WHO (World Health Organization), designated cell phones as "Possible Human Carcinogen" (Class 2B). They found evidence of increase in glioma and acoustic neuroma brain cancer for excessive cell phone users. Children are at higher risk than adults due to the fact that their skulls are thinner and still developing. Due to these reasons, countries like Belgium, France, Finland, Germany, Russia and Israel have publicly discouraged use of cell phones by children. Prolong use of cell phones leads to several other health hazards, such as, sleep disorder, headache, lack of concentration, memory loss, ear and eyes problems, irreversible infertility, DNA damage, cancer risk, etc. For example, people have experienced that their ear gets warm after about 20 minutes of use of cell

phone. It is because microwave radiation from cell phone heats the blood in the ear lobe. This leads to pain in the ear, hearing loss and ear tumor.

RF Exposure information for iPhone 7: To reduce exposure to RF energy, use a hands-free option, such as the built-in speakerphone, the supplied headphones, or other similar accessories. Carry iPhone at least 5mm away from your body to ensure exposure levels remain at or below the as-tested levels (www.apple.com/legal/rfexposure/iphone9,1/en/).

This does not mean that we have to stop using cell phones. One can take some of the following precautions:

- Limit the use of cell phones
- Talk for short duration

- If possible, use SMS
- Use cell phone with lower SAR value
- Can use speakerphone or wired hands free or Bluetooth, but keep cell phone at a distance of at least 30cm from your body
- Use land-line phone when available
- Do not keep cell phones in your hand/pocket for long.
- At home/office, keep cell phone away from you.

Govt. must warn people that there are several health hazards associated with overuse of cell phones. It must be posted on various websites, published in newspapers in various languages, advertised in the TV, etc.



Radiation from Cell Towers

Cell tower antennas transmit in the frequency range of 869 - 894 MHz (CDMA), 935 - 960 MHz (GSM900), 1810 - 1880 MHz (GSM1800), 2110 - 2170 MHz (3G) and 2300 - 2400 MHz (4G). Majority of these towers are mounted near the residential and office buildings to provide good mobile phone coverage to the users. In India, a cellular operator is allowed to transmit 20W of power per carrier frequency and each operator may have 2 to 6 allocated carrier frequencies. There may be antennas of 3 to 4 operators on the same roof top or tower, thereby total transmitted power may be 100 to 400W. These antennas transmit radiation 24×7 , so people living within 10 to 100 meters from the tower will receive 10,000 to 10,000,000 times stronger signal than required for mobile communication. In India, crores of people reside within these high radiation zones.

Radiation pattern of a typical GSM900 transmitting antenna in the horizontal and vertical planes is

shown in Fig. 1. For the main lobe, beam is wide in the horizontal direction and narrow in the vertical direction. There are several side lobes in the vertical pattern.

At many places, cell phone towers are mounted on the roof top of residential /commercial buildings.

Even though antenna radiates less power vertically down but the distance between the antenna and top floor is usually a few meters. Since power density varies as $1/R^2$, so compared to someone living in the front direction at 50m, the distance may be less than 5 meters at the top floor, so the radiation density will be 100 times more from distance point of view. Hence, overall radiation levels remain very high at the top floor or in the near vicinity of back side of the wall.

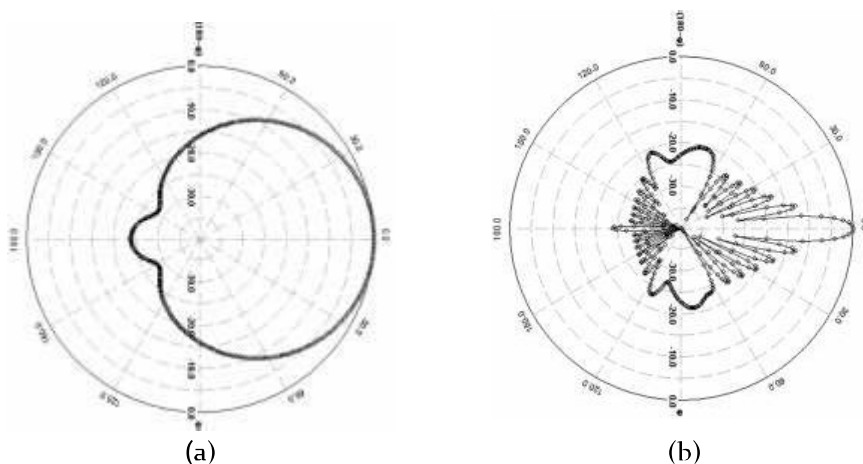


Fig. 1 - (a) Horizontal and (b) Vertical radiation pattern of a typical GSM900 antenna

Radiation Norms Adopted in Different Countries

In India, we had adopted radiation norms given by ICNIRP guidelines of 1998 for safe power density of $f/200$, where frequency (f) is in MHz. Hence, for GSM900 transmitting band (935-960 MHz), power density is 4.7 W/m^2 and for GSM1800 transmitting band (1810-1880 MHz), it is 9.2 W/m^2 . The ICNIRP guidelines clearly state it is for short term exposure, which is averaged over 6

minutes. From Sep. 1, 2012, India has adopted 1/10th of ICNIRP guidelines based on Inter-Ministerial Committee (IMC) Report of Jan. 2011, which is still very high as described below. Some of the people (especially older people, house wives, small children) living near the towers are exposed to this radiation 24 hours a day.

Biological Effects of Microwave Radiation

Bio-Initiative Report in 2007 prepared by a group of independent scientists concluded after reviewing 2000 scientific/technical papers that the existing standards for public safety are inadequate to protect public health and proposed 0.1 mW/m^2 for indoor, cumulative RF exposure. Bio-Initiative Report of 2012 has reported with certainty adverse effects and given additional 1800 references (www.bioinitiative.org). Cell phone/tower industry criticized the report citing other reports and references. However, Bio-Initiative Reports of 2007 and 2012 are the most authentic reports on this subject, giving references of 3800 research papers, written by more than 1000 scientists, reviewed by equally large number of experts and published in the prestigious journals.

Guideline of the Austrian Medical Association for the diagnosis and treatment of EMF related health problems adopted on 3rd March 2012 in Vienna are.

Over 100 physicians and scientists at Harvard and Boston University Schools of Public Health have called cellular towers a radiation hazard. And, 33 delegate physicians from 7 countries have declared cell phone towers a "public health emergency". Many countries in the world have adopted much stricter maximum radiation density values of 1 to 24 mW/m^2 . The people in these countries have studied extensively the health hazards of cell tower radiation to adopt stricter radiation norms.

Human body consists of 70% liquid and brain contains 80% liquid. When a human body is exposed to microwave radiation from cell phone and cell tower, it penetrates the skin and at a frequency of 900 MHz, water (including blood, fluid, etc.) molecules vibrate at a speed of 900 million times per second, which creates friction, damages DNA and also leads to heating. This heating is from inside to outside and the heat is trapped inside the human body with no escape through the skin. Also, affect of microwave radiation is cumulative in nature and the harmful effects are noticed after a few months to a few years depending upon the intensity of the radiation. Microwave absorption effect is much more significant by the body parts, which contain more fluid (water, blood, etc.). Effect is more pronounced where the movement of the fluid is less, for example, eyes, brain, joints, heart, abdomen, etc.

There are several health hazards associated with cell phones and cell towers. Some of these are: Sleep disorder, headache, irritation, lack of concentration, memory loss, ear and eyes problems, irreversible infertility, miscarriage, DNA damage, increase in cancer risk, etc. Figure 2 shows various health hazards at power density levels of 1 to 10 mW/m^2 .

There have been several epidemiological studies of people living near cell phone antennas in Spain, Netherlands, Israel, Germany, Egypt, Austria, Brazil, etc. All these studies documents adverse health effects at exposures much lesser than ICNIRP guidelines. In India, there have been several clusters of cancer cases in Mumbai, Jaipur, Delhi, and other cities. In addition, large number of people living in the vicinity of cell towers are complaining about headaches, sleep disorder, memory loss, miscarriage, infertility, etc.

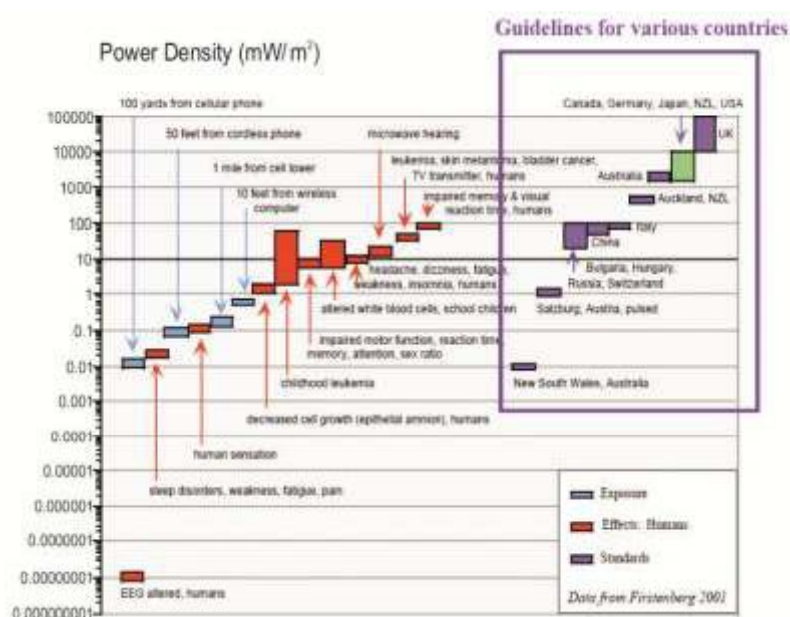


Figure 2: Guidelines, exposures and effects of radio frequency radiation at various power densities. (Reference: Data from Firstenberg 2001. Diagram was prepared by Dr. Magda Iavias, Trent University, Canada)

Adverse Effect on Birds, Animals, Trees and Environment



Electromagnetic radiation from cell phone and cell tower affects the birds, animals, plant and environment. Ten eminent scientists of India have submitted a report on "Possible Impacts of Communication Towers on wildlife including birds and bees", to the Environment Minister in Nov. 2011. They have given 919 technical/scientific references. Out of 919 research studies collected, 593 papers reported there is an adverse impact, 130 papers reported there is no impact and 196 papers reported neutral or inconclusive impact. Sparrow and honey bee population is going down. Dairy people have mentioned that milk yield of their cows has significantly reduced after installation of the towers in the vicinity. Many people have reported serious health problems to their domestic animals living near cell towers.

Electromagnetic radiation emanating from cell towers can also affect vegetables, crops and plants in its vicinity. Studies show definitive clues that cell phone EMF can choke seeds, inhibit germination and root growth, thereby affecting the overall growth of agricultural crops and plants. Fruit yield of the trees has gone down substantially in the vicinity of cell towers due to high radiation.

Solutions

There are several health hazards due to high radiation from the cell towers to the human, birds, animals, trees and environment. From Sep. 1, 2012, India has adopted 1/10th of the ICNIRP norms, i.e., 920 mW/m² for GSM1800 for 24x7 exposure, which is very high. It should be reduced to less than 1 mW/m². It is recommended that the power transmitted must be reduced to max. 1 to 2W in the densely populated area to protect the health of the people. Solution is to have more numbers of cell towers with lesser transmitted power. If low power transmitters are used, then number of towers and/or repeaters will increase considerably, which will increase the cost of network deployment. However, health is more important than the wealth. Health is a fundamental right of citizen of India.

Cell phone industry is becoming another cigarette industry, which kept claiming that smoking is not harmful and now there are millions of people around the world, who have suffered from smoking. In fact, cell phone/tower radiation is worse than smoking; as one cannot see it or smell it, and its effect on health is noted after a long period of exposure.

In addition to the continuous radiation from cell towers, there is radiation from cell phones, wireless phones, Wi-Fi, computers, laptops, TV towers, FM towers, AM towers, microwave ovens, etc. We are exposed to all these radiations, which are additive in nature. Radiation Pollution should be considered as 4th pollution in addition to water, air and noise pollutions. People should unite to convince the Govt. to adopt stricter radiation norms to protect people, birds, animals, trees, plants, etc.



Not very long ago, cell phone was a luxury of elite people, but today, it has become a necessary tool for connecting people and reaching even the bottom of the society. Today it is hard to imagine our life without a cell phone. There are 7.4 billion subscribers worldwide and 1.053 billion subscribers in India as on August 31, 2016. Wherever you look, people are holding cell phones in their hands or pockets, just as Lord Krishna used to wear Sudarshan Chakra on his index finger. Mukesh Ambani played a great role in spreading the Cell phone revolution in India. His slogan "Carlo dunia mutthi mein" was very popular and made him the richest man of India. Recently, he launched the much-awaited Reliance Jio 4G services and called it an effort to fulfill the Digital India dream of Prime Minister Narendra Modi.

CELL PHONE

a FRIEND or FOE



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History

Motorola was the first company to introduce a handheld cell phone. On April 3, 1973, Martin Cooper (December 26, 1928, in Chicago, Illinois, USA), researcher and executive at Motorola, stood on Manhattan street and placed the world's first call from a cell phone to Dr. Joel S. Engel of Bell Labs. The phone used by Cooper weighed 1.1 kg and measured 23x13x4.45 cm and offered a talk time of just 30 minutes and took 10 hours to re-charge. He is Founder & CEO of Array Comm and Dyna LLC. Motorola Company launched the first cell phone services in the US in 1983. While India's first cell phone service was launched by Modi Telstra Mobilenet Company in West Bengal, on July 31, 1995 and was inaugurated by the Chief Minister. The costliest smart phone available today is Apple iPhone FALCON Super Nova with 18 karat gold casing with a huge diamond on the back. It costs \$110.5 Million, which is around Rs. 681 crores.



The Risk of Cell Phones

Cell phones transmit electromagnetic radiation in the microwave range (450-2100 MHz). Microwaves are electromagnetic or radio waves, travel at the speed of light. Their frequency is usually 1900 MHz, that means they oscillate at millions to billions cycles per second. Cell phone converts the sound waves into smaller packets, load over microwaves and transmit from one place to another. Microwaves act as a transport system for the sound waves. The Journal of Cellular Biochemistry reports that these waves cause cancer and other diseases by interfering with cellular DNA and its repair mechanisms, promotes rapid cell aging. Washington University Professor Dr. Henry Lai proved that brain cells are clearly damaged by microwave levels far below the "safety" guidelines.

Several decades ago, many scientists speculated that the microwaves may cause cancer. During the Cold War, the Soviets irradiated the U.S. Embassy in Moscow, with low level microwave radiation. Two successive ambassadors developed leukemia. Other staffs also developed cancer, or their blood showed DNA damage, which precedes cancer.



General Disorder

Thermal effects of radiation from cell phone can affect the body. Some non-thermal effects such as scalp irritation, rashes, fatigue, insomnia, dizziness, tingling, loss of response time, loss of concentration, headache, decreased sense of smell, digestive disturbances, stimulate asthma by producing histamine in mast cells, increased heartbeat, joint pain, muscle stiffness and tremors in the limbs, etc. are also possible. Severe problems include miscarriages, irreversible infertility, and irregular heart beat. Heavy cell phone users often complain of "ringxiety", a new term which means 'the false sensation that your phone is ringing or vibrating.



Children And Teens More Vulnerable

Children are at a greater risk of catching diseases from the excess usage of cell phones, because their skull is comparatively thin, brain is soft and developing myelin is open. Uncontrolled cell phone usage in children is a major risk of procuring brain damage, loss in hearing and vision, memory loss, mood and behavior disorders. Some European countries have issued strict instructions to the parents to keep their children away from cell phones.

We have started using mobile phones later in life, but these days children right from the age of 10 and 12 want a mobile phone and we provide them. No one wants to use a landline anymore. What will happen after 20 and 30 years? Only time will tell. We hope that it is not a time-bomb which will explode when today's children will be 50 and 60 years old.

Car

A cell phone must greatly increase its field strength to maintain communications within the metallic cage of a car. Thus, the effect of radiation inside the car is more intense. Volkswagen of Europe has warned that cell phone usage inside a car can be "injurious to health due to the extremely high electromagnetic fields generated."

Brain And Cancer

Cell phones inflict damage to the nerves of the scalp. It opens the blood-brain barrier, so that viruses and toxins can enter the brain. EM waves emitted by cell phones decrease melatonin levels. The melatonin is a powerful antioxidant, anti-depressant, immunity booster and regulates our biological clock. It also prevents cancer, Alzheimer's and Parkinson's disease.

Microwaves cause intracellular free-radical buildup, genetic damage and disruption of DNA repair process. Cells pay more attention for protection rather than metabolism. Cell membranes harden, keeping nutrients out and waste products in. Waste accumulating inside the cells creates free radicals, leading to both disruption of DNA repair and cellular dysfunction. This is the mechanism that contributes to cancer.

EM radiation causes Acoustic neuroma, Glioma, Meningioma, brain lymphoma, and Neuroepithelial tumor. After 1975, incidence of brain cancer in the US has increased by 25%. In 2001, 185,000 people in the US suffered from brain cancer. Brain cancer is usually fatal, grows very fast, and the patient dies within 6-12 months.

India's situation is even worse. In Jaipur, Sanjay Kasliwal, a jeweler, has been living in C-Scheme with his family since the 1970s. In 2010, he was diagnosed with brain Cancer. He rushed to U.S.A. for treatment. After just 3 months, his brother Pramod was also suffered with brain cancer. "His doctor enquired about our surroundings. When we told him there are three cell phone towers within 20 meters of our house, he cautioned us," says Kasliwal. Around the same time, his dog fell victim to cancer.



George Carlo, PhD, JD

Former Chairman of The CTIA Wireless Technology Research Program (WTR)

Has served as an advisor to : the US Congress, World Health Organization, National Institutes of Health, Food and Drug Administration, Environmental Protection Agency, Centers for Disease Control, and Agency for Toxic Substances and Disease Registry

Dr. Carlo Heads Cell phone Research

Originally, cell phone was developed for the Department of Defense. This device was never tested for safety and entered the market due to a regulatory loophole. Questions about cell phone safety arose in the early 1990s, when Florida businessman David Reynard filed a lawsuit against cell phone manufacturer NEC. Reynard's wife, Susan, died of a brain cancer due to cell phones use. Reynard revealed the suit to the public on the Larry King Live show, complete with dramatic x-rays showing the tumor close to where Susan held her cell phone to her head for hours each day.

The next day, telecommunications shares collapsed. The Telecommunications Industry Association (TIA) went into crisis mode, claiming thousands of studies proved cell phones were safe and the government had approved cell phones. The media demanded to see the studies. To address the questions of cell phone safety, the cell phone industry set up a research project, the Interphone study, conducted with the aim of determining whether mobile phone use increased the risk of certain tumors, namely, glioma, meningioma and acoustic neuroma. The study was conducted by the International Agency for Research on Cancer (IARC) on 14,000 people in thirteen different countries from

1993 to 1999. Industry promised to provide \$28.5 Million.

Dr. Carlo headed the project. He said that when the research found adverse health effects such as DNA damage and cancer, industry cut the funding, attempts were made to discredit him, and toward the end of 1998, his house was mysteriously burned down.

Cell phone industry was not ready to admit that there are harmful effects just like cigarette industry. People have to unite to convince policy makers to adopt strict radiation norms to protect people, birds, animals, plants and our mother earth.



Ways To Reduce Cell Phone Radiation

1. When talking on cell phone, safest bet is speaker phone mode or wired headset. Air tube headset is much better. Use cell phone for shorter duration, keep it away from children and pregnant women. Never sleep with a cell phone under the pillow, because cell phones pump out electro-pollution all night long.
2. Do not keep your cell phones in your hands or pockets for long.
3. Try to use your phone when you have the maximum number of bars, indicating the best reception. When signal quality is poor, your phone emits more radiation.
4. Try not to use your cell phone in elevators, cars, trains or planes. Cell phones emit more radiation, in enclosed metal spaces.
5. Text or whatsapp instead of calling whenever possible.
6. When you are at home or office, keep cell phone away from you and use a wired landline.
7. If you have a wireless modem, keep it in a little-used room and out of the bedroom (or turn it off at night). Strive to keep your bedroom as free of electronic radiation as possible. Unplug electric devices near the bed. Use a "wired-only" modem, printer, mouse and keyboard.
8. Always buy cell phone with lowest S.A.R. rating. The rate at

Cordless phones also emit same radiation.

which energy is absorbed by the human body is measured by the Specific Absorption Rate (SAR), and has units of watts per kilogram (watt/Kg). In India, maximum limit of SAR is 1.6 watt/Kg.

9. If cell phone tower is near your house, get the radiation level checked and use appropriate shielding solutions.



Flax Oil can cure Radiation sickness

I was exposed to a microwave transmission from a mobile phone tower while working on the roof of a building in 2002. Basically my head had been microwaved by electromagnetic field, causing the following symptoms:

1. Constant pain & irritation
2. Head was sensitive when near mobile phones or microwaves.
3. Burning sensation in the middle of my head at night time - like a burning welding rod is inserted into my head

I couldn't find a doctor could cure my symptoms I was experiencing. By chance I discovered that victims of the Russian nuclear disaster were given flaxseed oil to drink. I was desperate and started drinking 1/4 glass of flaxseed oil to stop the constant pain. The extreme symptoms I experienced had gone. However I still get some burning irritation in my temples if I go near a microwave oven or a mobile phone.

Alex Seeley, Australia