



## **Health Hazards Linked to Using Mobile Cellular Phones**

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### **ABSTRACT**

Advances in mobile phone technology have resulted in maximum usage of mobile phones worldwide. Even in developing countries the mobile phones has gone from being an expensive item used by elite to a personal communication tool for the general population. However, the impact of regular use of mobile phone has raised concern about the potential health hazards. In this paper, an attempt has been made to explore the major harms of cell phone usage at various stages of life and accordingly suggestions for the safe usage have been proposed to minimize their impact on human health.

**INSPEC Classification :** B5000, B5200, D1040, D4045

### **1. INTRODUCTION**

The use of cellular telephones has increased rapidly during the late 1990s. Newer wireless communication technologies also employ hand-held transceivers. These include specialized mobile radio (SMR) and personal communications services (PCS) (which are also cellular wireless systems). Mobile phone radiation and health concerns have been raised from very first year of its innovation and every researcher tries to find out the actual hazard to human health especially, for the same WHO also have concerns, IEEE committee on Man and Radiation (COMAR) also have serious public safety concerns about the exposures of public in front of radio frequency (RF) and microwave (MW) field from hand held, portable and cell phones. This is because mobile phones use electromagnetic radiation in the microwave range.

Although in the every part of the world a huge number of national and international organizations have established guidelines for human exposure to radio frequency energy. These include the IEEE C95.1 standard (IEEE C95.1-1991). and the recommendations of

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the National Council on Radiation Protection and Measurements (NCRP) the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the National Radiation Protection Board (NRPB) in the United Kingdom . While these guidelines differ in some respects, their limits in the frequency range used by wireless communications devices are almost similar. The consensus of the scientific community, as reflected in these exposure guidelines, is that exposure to RF energy below recommended limits in these guidelines is safe.

The World Health Organization, based upon the consensus view of the scientific and medical communities, that serious health effects (e.g. cancer) are very unlikely to be caused by cellular phones or their base stations, and expects to make recommendations about mobile phones.

## **2. BACKGROUND**

This paper addresses the concerns that have been expressed by some members of the public about the safety of exposure to radio frequency (RF) radiation from handheld communications devices, with particular reference to cellular telephone handsets.

When considering possible hazards from exposure to wireless transmitters, several considerations must be taken into account. The first consideration is frequency because exposure guidelines vary with frequency. Wireless communications operate in a variety of frequency ranges. In the USA, hand-held and mobile cellular telephones operate at frequencies between 824 and 849 MHz, while digital personal communication systems (PCS) operate in the 1850-1990 MHz band. Portable transceivers (such as "walkie-talkies") used for two-way communication typically operate near 30, 150 and 450 MHz. Cordless telephone units typically operate near 50, 915, or 2450 MHz.

A second consideration is the power output of the transmitter, and its distance from the body. Hand-held units (either cellular phones or other communications handsets) operate at comparatively low power levels but are used very close to the body. Mobile units operate at higher power levels, but their transmitting antennas are located some distance from their users.

A person's exposure to RF energy can be measured in several ways. For assessing exposure from transmitters located near the body, the most useful quantity is the Specific Absorption Rate (SAR). SAR is a measure of the power absorbed in the body (either in a localized region of tissue or averaged over the whole body).

Part of the radio waves emitted by a mobile telephone handset is absorbed by the human head. The radio waves emitted by a GSM handset, can have a peak power of 2 watts, and a US analogue phone had a maximum transmit power of 3.6 watts. Other digital mobile technologies, such as CDMA TDMA, use lower output power, typically below 1 watt. The maximum power output from a mobile phone is regulated by the mobile phone standard it is following and by the regulatory agencies in each country. In most systems the cellphone and the base station check reception quality and signal strength and the power level is increased or decreased automatically, within a certain span, to accommodate for different situations such as inside or outside of buildings and vehicles.

SAR's maximum levels for modern handsetshave been set by governmental regulating SAR's agencies in many countries. In the USA, the FCC has set a SAR limit of 1.6 W/kg, averaged over a volume of 1 gram of tissue, for the head. In Europe, the limit is 2 W/kg, averaged over a volume of 10 grams of tissue. SAR values are heavily dependent on the size of the averaging volume. Without information about the averaging volume used comparisons between different measurements can not be made. Thus, the European 10-gram ratings should be compared among themselves, and the American 1-gram ratings

should only be compared among themselves. SAR data for specific mobile phones, along with other useful information, can be found directly on manufacturers' websites, as well as on third party web sites.

### **3. RF SAFETY STANDARDS AND GUIDELINES**

A number of organizations have established limits for human exposure to RF fields. These include the IEEE, the NCRP, the ICNIRP, and the United Kingdom National Radiation Protection Board (NRPB). (A table of acronyms and definitions is in the Appendix.) Out of these standards the International Commission for Non-Ionizing Radiation Protection (ICNIRP) is the most respected one, and has been adopted so far by more than 80 countries. For radio stations, ICNIRP proposes two safety levels: one for occupational exposure, another one for the general population.

There are, in addition, various governmental limits that are usually based on these standards. The different standards vary somewhat in their exposure limits and in other particulars. However, at frequencies used for wireless communications systems, these different guidelines are broadly similar.

All of these standards include provisions for different exposure situations. These include limits for whole-body exposure or partial body exposure (which is more relevant to users of wireless communications). The standards also require that the exposure be averaged over time periods ranging from 6-30 minutes (which means that incidental exposures shorter than the averaging time can be higher than the limits).

All of these standards were developed by committees of scientists and engineers, who examined the scientific literature to identify potential hazards of RF exposure. Major standards were based on a comprehensive review of several thousand scientific papers, including engineering studies, whole-animal and cellular studies, and human (epidemiological) studies. The standards were approved only after a long review process involving a range of stakeholders including in many cases the general public.

Radio base licensing procedures have been established in the majority of urban spaces regulated either at municipal/county, provincial/state or national level. Mobile telephone service providers are, in many regions, required to obtain construction licenses, provide certification of antenna emission levels and assure compliance to ICNIRP standards and/or to other environmental legislation.

### **4. EXPOSURES PRODUCED BY CELLULAR TELEPHONES**

#### **4.1. Direct Health Problems due to RF Radiations**

Science has proved that mobile phones act like a microwave transmitter bearing a cancer warning! Energy at millions to billions of cycles per second can do more harm than good - it has been reported that these frequencies cause cancer and several other diseases by intercepting in the body the nodes with cellular DNA and its repair mechanisms. This in turn promotes cell aging.

Prof Rony Seger, a cancer researcher at the Weizmann Institute of Science in Rehovot, Israel, and colleagues exposed rat and human cells to electromagnetic radiation at a similar frequency to that emitted by mobiles but at only about one tenth of the power.

After just five minutes the researchers identified the production of extra cellular signal-regulated kinases (ERK1/2) - natural chemicals that stimulate cell division and growth.

Cancers develop when the body is unable to prevent excessive growth and division of cells

in the wrong place.

There are several studies (including several in *The Journal of Cellular Biochemistry*) that prove the following damage to the body:

- Corroding the nerves in the scalp.
- Memory confusion and memory lapses.
- Headaches and whizzing sounds in the ear.
- Cause blood cells to leak hemoglobin
- Cause headaches and induce extreme fatigue
- Create joint pain, muscle spasms and tremors
- Create burning sensation and rash on the skin
- Alter the brain's electrical activity during sleep
- Induce ringing in the ears, impair sense of smell
- Precipitate cataracts, retina damage and eye cancer
- Open the blood-brain barrier to viruses and toxins
- Reduce the number and efficiency of white blood cells
- Stimulate asthma by producing histamine in mast cells
- Cause digestive problems and raise bad cholesterol levels
- Stress the endocrine system, especially pancreas, thyroid and even more here is the latest news from the world.

- 2008, Cell Phone More Of A Cancer Hazard Than Cigarettes....

A study by an award-winning cancer expert shows that cell phone use could kill more people than smoking, it is reported. According to the U.K.'s Independent newspaper, the study, headed by Dr. Vini Khurana, shows that there is a growing body of evidence that using handsets for 10 years or more can double the risk of brain cancer.

- ScienceDaily (Feb. 15, 2008) - An Israeli scientist, Dr. Siegal Sadetzki, has found a link between cell phone usage and the development of tumors.

- Dr. Sadetzki, a physician, epidemiologist and lecturer at Tel Aviv University, published the results of a study recently in the *American Journal of Epidemiology*, in which she and her colleagues found that heavy cell phone users were subject to a higher risk of benign and malignant tumors of the salivary gland. Those who used a cell phone heavily on the side of the head where the tumor developed were found to have an increased risk of about 50% for developing a tumor of the main salivary gland (parotid), compared to those who did not use cell phones.

- Published: Monday, 31-Mar-2008, Medical Research News

One of Australia's leading neurosurgeons has warned about the heavy reliance on mobile phones in today's society.

Dr. Vini Khurana, who is one of the world's top neurosurgeons, says mobile phones could present an even greater threat to human health than smoking and asbestos. After conducting a 15-month critical review of the link between mobile phones and malignant brain tumors, Dr. Khurana says using mobiles for more than 10 years could more than double the risk of brain cancer.

- Monday, June 26, 2006;

WASHINGTON (Reuters) -- Cell phone emissions excite the part of the brain cortex nearest to the phone, but it is not clear if these effects are harmful, Italian researchers reported on Monday.

They had 15 young male volunteers use a GSM 900 cell phone for 45 minutes. In 12 of the 15, the cells in the motor cortex adjacent to the cell phone showed excitability during phone use but returned to normal within an hour.

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The cortex is the outside layer of the brain and the motor cortex is known as the "excitable area" because magnetic stimulation has been shown to cause a muscle twitch.

- may 2005

As much as they still want to deny it... the fact is there is a link b/w mobile phone use & brain tumor. even a weak link is enough to say it's problematic and should be minimized.....

The study, headed by Lennart Hardell, a professor of oncology at University Hospital in Orebro, is published today in a specialist British journal, Occupational and Environmental Medicine. Over the past six years, a series of studies, several of them carried out by the Orebro team, have suggested a higher statistical risk of brain tumors among heavy and long-term users of mobile phones.

- Johnny Cochrane`s brain tumor linked to cell phone use

CNN TV

Tuesday, July 19, 2005

Johnny Cochrane, the famous lawyer from the O.J.Simpson trial died recently from a brain tumour. Dr Keith Black, well known neuro surgeon from Cedars -Sinai medical center in Los Angeles has determined that the tumour and his death were strongly connected to his cell phone use.

One well-understood effect of microwave radiation is dielectric heating, in which any dielectric material (such as living tissue) is heated by rotations of polar molecules induced by the electromagnetic field. In the case of a person using a cell phone, most of the heating effect will occur at the surface of the head, causing its temperature to increase by a fraction of a degree. In this case, the level of temperature increase is an order of magnitude less than that obtained during the exposure of the head to direct sunlight. The brain's blood circulation is capable of disposing of excess heat by increasing local blood flow. However, the cornea of the eye does not have this temperature regulation mechanism and exposure of 2-3 hours' duration has been reported to produce cataracts in rabbits' eyes at SAR values from 100-140W/kg, which produced lenticular temperatures of 41-41°C.

#### **4.2. In Direct Health Hazard by Cell Phone.**

There are number of indirect health hazard which are caused just because of the mobile phone use. Road accident due to use of mobile phones during driving a vehicle, is the best example of it. According to the the maximum ratio of the road accident almost 36% is just because of Cellular phone use during the road drive.

#### **4.3 Health Hazard due to Base stations**

Another area of worry about effects on the population's health have been the radiation emitted by base stations (the antennas on the surface which communicate with the phones), because, in contrast to mobile handsets, it is emitted continuously and is more powerful at close quarters. On the other hand due to the attenuation of power with the square of distance, field intensities drop rapidly with distance away from the base of the antenna. Base station emissions must comply with ICNIRP guidelines of a maximum power density of 4.5 W/m<sup>2</sup> for 900 MHz and 9 W/m<sup>2</sup> for 1800 MHz.

These guidelines are set for short term heating, which is the only understood mechanism of electromagnetic fields on biological tissue. The ICNIRP guidelines are distrusted by some scientists, such as the BioInitiative group, who report that the existing standards for public safety are inadequate to protect public health.

A 2002 survey study by Santini et al. in France found a variety of self-reported symptoms for people who reported that they were living within 300 metres (984 ft) of GSM cell towers in rural areas, or within 100 m (328 ft) of base stations in urban areas. Fatigue,

headache, sleep disruption and loss of memory were among the symptoms reported. Similar results have been obtained with GSM cell towers in Spain, Egypt, Poland and Austria. It is, however, important to note that these surveys do not show statistically significant clustering or causality and those complaining of adverse symptoms may be displaying the nocebo effect, unless this is controlled in the study. There are significant challenges in conducting studies of populations near base stations, especially in assessment of individual exposure.

## 5. SAFETY MEASURES

Some national radiation advisory authorities, including those of Austria, France, and Germany, recommended to their citizens measures to minimize exposure. Examples of the recommendations are:

- Use hands-free to decrease the radiation to the head.
- Keep the mobile phone away from the body.
- Do not telephone in a car without an external antenna.

However, the use of "hands-free" was not recommended by the British Consumers' Association in a statement in November 2000 as they believed that exposure was increased.. However, measurements for the (then) UK Department of Trade and Industry, showed substantial reductions.

## 6. PRECAUTIONARY PRINCIPLE

In 2000, the World Health Organization (WHO) recommended that the precautionary principle could be voluntarily adopted in this case. It follows the recommendations of the European Community for environmental risks. According to the WHO, the "precautionary principle" is "a risk management policy applied in circumstances with a high degree of scientific uncertainty, reflecting the need to take action for a potentially serious risk without awaiting the results of scientific research." Other less stringent recommended approaches are prudent avoidance principle and ALARA (As Low as Reasonably Achievable). Although all of these are problematic in application, due to the widespread use and economic importance of wireless telecommunication systems in modern civilization, there is an increased popularity of such measures in the general public, though also evidence that such approaches may increase concern. They involve recommendations such as the minimization of cellphone usage, the limitation of use by at-risk population (such as children), the adoption of cellphones and microcells with ALARA levels of radiation, the wider use of hands-off and earphone technologies such as Bluetooth headsets, the adoption of maximal standards of exposure, RF field intensity and distance of base stations antennas from human habitations, and so forth.

## 7. CONCLUSIONS

The cellular networks and mobile phones provide great convenience for mobile users and in fact it is a major part of technological growth also. However, they emit RF radiations, which can be harmful to humans. To minimize the harmful effects

- The local SARs produced by hand-held, transportable and mobile transceivers and cellular telephones normally do not exceed safety limits.
- The base stations should be placed as far away from densely populated sites as possible in network planning.
- One should minimize the use of cell phone as much as we can it.
- One should avoid using cellular phone more than 3 minutes continuously and must maintain a gap of 15 minutes between two uses.
- Don't keep mobile phone close to your body. Use hands free options.



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