

Physiological effect of electromagnetic fields

Electromagnetic field

Electromagnetic field is an electric field and a magnetic field propagating normal each other. The electric field is produced by static charges and the magnetic field by moving charges in conductors. It affects the behavior of charged particles in the nearness of the field. Throughout the space, electromagnetic field extends and describes the electromagnetic interaction (as a one of the main four interactions).

Sources of electromagnetic field

o Natural sources: As electromagnetic spectrum that presented everywhere in our environment but invisible to the human eye. Electric fields are produced by accumulating the electric charges in the atmosphere correlating with thunderstorms. The earth's magnetic field causes a compass needle to be in a North-South direction.

X-rays sources, electricity power stations, various kinds radiofrequency wave that are used to transmit information (via TV antennas, radio, and mobile phone stations)

Biological effect of the radiofrequency (RF) radiation

The photon energies of this part of frequency are too weak to break atomic bonds and therefore it doesn't cause ionization effect in a biological system. Furthermore, RF radiation with high intensity (high number of photons) cannot cause ionization effect.

When a biological systems irradiated by an RF radiation, they absorb different amount of energy depending on the wavelength of radiation and the physical properties of the biological system. Actually, the hazard of this rang of frequency comes from the higher frequency (shorter wavelength) part as a results of thermal heating. The degree of heating is depends on the water content of the body being irradiated.

In general, the biological effects of the RF radiation have been classified as thermal and non thermal effects.

Thermal effects

It has been attributed to the dielectric heating phenomenon. The RF radiation causes a thermal heating of the biological molecules and an increase of the temperature is the noticeable effect, which lead to the following:

- Denaturation of some molecules (as proteins) has been recognized as a result of longtime exposure with large changes in the temperature.
- Blood flow increases to keep the body temperature constant (thermoregulation),
- Metabolic rate increases as a result of increasing the body temperature.
- Internal hot spots result in tissue damage (long before the overall body temperature increases) due to the penetration characteristic (about 0.1 of the radiation wavelength).
- The tissue in the brain is sensitive to the occurrence of the hot-spots. Uncontrolled of these effects are existed during the use of mobile phone and other wireless communication devices due to there are several (shape and size of the head).
- The thermal effect of the RF radiation to the eye makes a serious problem since the eye lens's is un- adequate for the exchange of heat. Even the increase in temperature due to the thermal effect of the RF radiation is small, it could cause protein of the lens to aggregate which may cause opacities in the lens.
- Without increasing of the body temperature, there is effect called electrophonic effect is recognized in the microwave hearing. Where the brain tissue absorbed energy of these range of frequency that produced thermoelastic expansion and leads to acoustic pressure wave. These acoustic pressure increases the acoustic sound level (as noise pulse) that could causes annoyance, the simplest case, and the noise pulse rate affects the heart beat and metabolic rates.

Non-thermal effects

Non-thermal effects such as changes in enzyme levels. Such these effects don't have any health problems, since the body can easily compensate them. The mechanism of the effect is not clear, it could be due to normal responses of living cells to heating (thermal effect).

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Bibliography

