

# Low Frequency Biological Effects on Human Body Cells

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**Abstract-** The Exposure to electromagnetic fields is not a new phenomenon. However, during the 20th century, environmental exposure to man-made electromagnetic fields has been steadily increasing as growing electricity demand, ever-advancing technologies and changes in social behavior have created more and more artificial sources. The general opinion is that there is gradual hazardous effect at the cellular level related to human health. The study of the low frequency radio frequency wave revealed that different dimension of EM wave have not shown any DNA damage directly hurt there is concern about evidence of cellular effect of EM. Extremely low frequency electromagnetic radiation has received considerable attention recently as a possible threat to the health of persons living near high tension electric power lines, distribution substations, and even in close proximity to common household electric appliances. Ionizing radiation is all around us, and it has been this way since the creation of the Earth. As such, life on Earth has evolved in an environment exposed to ionizing radiation, and has adapted to be able to thrive in its presence. The DNA may be irreparably damaged due to low frequency. Cells with damaged DNA that survive and reproduce can lead to cancer, and failure to correct damage in cells that form gametes (reproductive cells) can result in mutations being passed on to off spring When cells are exposed to ionizing radiation, damage can occur either by direct action or indirect action.

**Index Terms-** Biochemical reaction, Electromagnetic field, Epidemiological RF, Radio frequency, Sterilization, etc.

## I. INTRODUCTION

Until now no satisfactory mechanism has been proposed to explain the biological effects of these fields. This study is to investigate effect of MW radiation on cell proliferation. Health risks associated with such fields include a wide variety of ills ranging from disruption of normal circadian rhythms to childhood cancers. Risk assessment has been particularly difficult to determine in light of an ostensible lack of close-response relationship. The Exposure to electromagnetic fields is not a new phenomenon. However, during the 20th century, environmental exposure to man-made electromagnetic fields has been steadily increasing as growing electricity demand, ever-advancing technologies. Everyone is exposed to a complex mix of weak electric and magnetic fields, both at home and at work, from the generation and transmission of electricity, domestic appliances and industrial equipment, to telecommunications and broadcasting.

Tiny electrical currents exist in the human body due to the chemical reactions that occur as part of the normal bodily

functions, even in the absence of external electric fields. For example, nerves relay signals by transmitting electric impulses. Most biochemical reactions from digestion to brain activities go along with the rearrangement of charged particles. If a cell is exposed to radiation, the probability of the radiation interacting with the DNA molecule is very small since these critical components make up such a small part of the cell. However, each cell, just as is the case for the human body, is mostly water. Therefore, there is a much higher probability of radiation interacting with the water that makes up most of the cell's volume. When radiation interacts with water, it may break the bonds that hold the water molecule together, producing fragments such as hydrogen (H) and hydroxyls (OH). Heating is the main biological effect of the electromagnetic fields of radiofrequency fields. In microwave ovens this fact is employed to warm up food. The levels of radiofrequency fields to which people are normally exposed are very much lower than those needed to produce significant heating. The heating effect of radiowaves forms the underlying basis for current guidelines. Scientists are also investigating the possibility that effects below the threshold level for body heating occur as a result of long-term exposure. To date, no adverse health effects from low level, long-term exposure to radiofrequency or power frequency fields have been confirmed, but scientists are actively continuing to research this area. The electromagnetic spectrum includes forms of energy ranging from cosmic rays and X-rays on the high frequency side to microwaves and electricity on the low frequency end Hertz (Hz) is the term commonly used to describe frequency or the number of times per second that electromagnetic waves alternate. Extremely high frequency radiation such as X-rays and gamma rays are referred to as ionizing and are able to disrupt matter by stripping electrons from atoms. The current controversy focuses on the opposite end of the electromagnetic spectrum, extremely low frequency radiation (ELF).

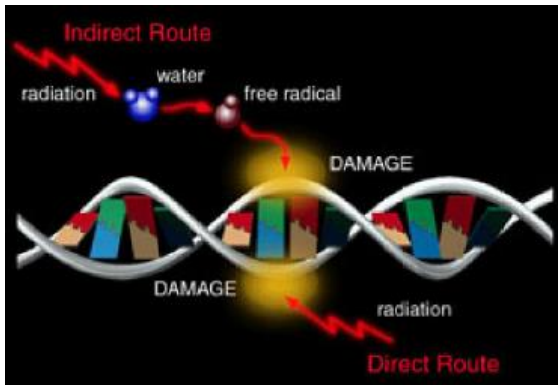
## Biological effects

It is not disputed that electromagnetic fields above certain levels can trigger biological effects. Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the home do not cause any apparent detrimental effects. Biological effects are measurable responses to a stimulus or to a change in the environment. These changes are not necessarily harmful to your health. For example, listening to music, reading a book, eating an apple or playing tennis will produce a range of biological effects. Early development is characterized by the rapid proliferation of embryonic cells, which then differentiate to produce the many specialized types of cells that make up the tissues and organs of multicellular animals. As cells differentiate, their rate of proliferation usually decreases,

and most cells in adult animals are arrested in the G<sub>0</sub> stage of the cell cycle. An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect.

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High frequency radiation or fast moving particles plow into a living cell with enough energy to knock electrons free from molecules that make up the cell. These molecules with missing electrons are called ions. The presence of these ions disrupts the normal functioning of the cell. The most severe damage to the cell results when the DNA (deoxyribonucleic acid) is injured. DNA is at the heart of the cell and contains all the instructions for producing new cells. The DNA is a complex molecule formed of two long strands that are twisted around each other and linked by chemical subunits. There are two major ways that radiation injures the DNA inside your cells.

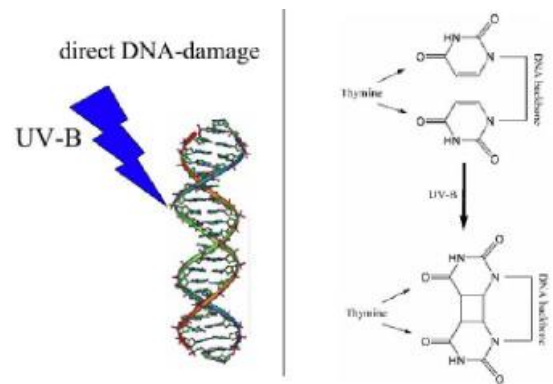


**Fig.1. Biological effect on DNA cells**

There are two main ways of radiation that can damage the DNA inside cells. Radiations can strike the DNA molecules directly, ionizing & damaging it. Alternately, radiation can ionize water molecules, producing free radicals that react with damaged DNA molecules.

In response to growing public health concerns over possible health effects from exposure to an ever increasing number and diversity of electromagnetic field sources, in 1996 the World Health Organization (WHO) launched a large, multidisciplinary research effort. The International EMF Project brings together current knowledge and available resources. In 1996 the World Health Organization (WHO) launched a large, multidisciplinary research effort. The International EMF Project brings together current knowledge and available resources of key international and national agencies and scientific institutions. The cells of adult animals can be grouped into three general categories with respect to cell proliferation.

The UV-photon is directly absorbed by the DNA (left). One of the possible reactions from the excited state is the formation of a thymine cyclobutane dimer (right). The direct DNA damage leads to sunburn, causing an increase in melanin production, thereby leading to a long-lasting.



**Fig.2. Direct effect on DNA cells**

### Neurobehavioral EFFECTS ON living cell

People are generally exposed to MPBS radiation under arfield conditions, i.e. radiation from a source located at a distance of more than one wavelength. This results in relatively homogenous whole-body exposure. MPBS exposure can occur continuously but the levels are considerably lower than the local maximum levels that occur when someone uses a mobile phone handset. Recent study that measured personal exposure to radiofrequency electromagnetic fields in a Swiss population sample demonstrated that the average exposure contribution from MPBSs is relevant for cumulative long-term whole-body exposure to radiofrequency electromagnetic fields. it is of minor importance for cumulative exposure to the head of regular mobile phone users. Personal exposure measurements assess the total radiation absorbed by the whole body, whereas spot measurements quantify short-term exposure in a single place, usually the bedroom.

## II. EFFECTS ON PREGNANCY AND CANCER

There is little scientific evidence to support the idea of electromagnetic hypersensitivity. Recent Scandinavian studies found that individuals do not show consistent reactions under properly controlled conditions of electromagnetic field exposure. Some members of the public have attributed a diffuse collection of symptoms to low levels of exposure to electromagnetic fields at home. Reported symptoms include headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido. To date, scientific evidence does not support a link between these symptoms and exposure to electromagnetic fields. Many different sources and exposures to electromagnetic fields in the living and working environment, including computer screens, water beds and electric blankets, radiofrequency welding machines, diathermy equipment and radar, have been evaluated by the WHO and other organizations. The overall weight of evidence shows that exposure to fields at typical environmental levels does not increase the risk of any adverse outcome such as spontaneous abortions, malformations, low birth weight, and congenital diseases. There have been occasional reports of associations between health problems and presumed exposure to electromagnetic fields, such as reports of prematurity and low birth weight in children of workers in the electronics industry, but these have not been regarded by the scientific community as

being necessarily caused by the field exposures (as opposed to factors such as exposure to solvents).

Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small. The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults. Some individuals report "hypersensitivity" to electric or magnetic fields. They ask whether aches and pains, headaches, depression, lethargy, sleeping disorders, and even convulsions and epileptic seizures could be associated with electromagnetic field exposure.

Research on this subject is difficult because many other subjective responses may be involved, apart from direct effects of fields themselves. More studies are continuing on the subject.

### III. GENERAL EFFECTS OF ELECTROMAGNETIC FIELD

The electromagnetic spectrum includes forms of energy ranging from cosmic rays and X-rays on the high frequency side to microwaves and electricity on the low frequency end Hertz (Hz) is the term commonly used to describe frequency or the number of times per second that electromagnetic waves alternate. Extremely high frequency radiation such as X-rays and gamma rays are referred to as ionizing and are able to disrupt matter by stripping electrons from atoms. The current controversy focuses on the opposite end of the electromagnetic spectrum, extremely low frequency radiation (ELF). The strength of electric fields is directly related to voltage, the higher the voltage, the stronger the electric field. Electric fields are easily blocked by normal building materials from which houses are constructed. Their strength decreases rapidly with distance from the source. The current controversy focuses not on electric fields but on magnetic fields which produce a series of force waves in concentric loops around electric currents. Both animal and human studies on the effects of ELF electromagnetic fields have shown a decrease in the secretion of pineal melatonin, a hormone which stimulates the daily cycle of sleep and wakefulness, the circadian rhythm. Research on the effects of electromagnetic fields on reproduction have produced mixed and equivocal results. Studies of chicken eggs and miniature swine have indicated slight possibilities of abnormal development, while other studies have shown no measurable effects.

It is difficult, if not impossible, to determine the exposure received by any individual, since magnetic fields vary according to electric usage during different times of day and seasons of the year. Instead, most studies have substituted configuration of wires near the study site as a proxy measure. The accuracy of this measure is particularly suspect in studies of patients from three decades earlier. The low number of childhood cancer patients

does not allow many studies, even those which indicate positive findings, to reach statistical significance.

### IV. CONCLUSIONS

This study is based on methodology and architecture of useful and effectiveness biological effects of electromagnetic and RF microwave signals. These negative effects are particularly important in the electromagnetic fields in the Radiofrequency (RF) zone which are used in communications, radio and television broadcasting, cellular networks and indoor wireless systems. The general opinion is that there is no direct evidence of hazardous effects on human health incurred by low-frequency radiofrequency waves. Studies at the cellular level, which uses relatively higher frequencies, demonstrate undesirable effects. so many popular media health related messages, there is a basic core of facts embedded in an alarmist package which tends to generate hysteria among the public.

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