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Health Effects Of Radiation On Cells Of Skin, Muscles, Fat And Bone Of Human Beings

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Abstract

Electromagnetic radiations are transmitted from the transmission towers. When these radiations are incident on the assortment of individuals, it's entered inside the body and consequences for the cells of skin, muscles, fat and bone. The infiltrated electric fields are delivered additional expected contrast across the outside of the round and rectangular cells. This additional potential distinction is determined by demonstrating and discovering it is answerable for creating numerous kinds of destructive sicknesses. It can influence the pattern of newly created cells, which reasons for tumours and many infections. This manuscript shows that the potential distinction is expanded from 5.23 to 57.57 mV in the skin, muscle cells and 5.73 to 58.04 mV in fat and bone cells. The likely distinction across the cells of people is likewise expanded because of working close to the electric apparatuses. From the analysis of this manuscript, It is suggested that individuals should avoid the transmission towers and electrical supplies.

Key Words: Electromagnetic waves, cells of human beings, harmful effects, transmission towers, electrical equipment.

Introduction

Radio Frequency sources are widespread around us. Prominent sources are mobile phones and electronic appliances. Exposure of emission arising from such RF (Radio Frequency) sources on the person penetrates inside the body. These sources may be divided into two

classes, One class, which operates close and the second, which operates far from the Human body (1, 2).
Worldwide System for Mobile correspondences – GSM (initially represented Groupe Speciale Mobile), the second era advanced innovation initially produced in Europe, however, which currently has more than 71% of the world market. At first, created for activity in the 41 MHz band and changed for the 202 MHz (3). Sources worked near the human body: One of the models in this class of sources is cell phones; more than 1.5 billion individuals are utilizing cell phones worldwide.

Penetration of electric field into human body: The radio, TV and cell phone transmitters send radio recurrence radiation, that is, electric and attractive fields of radio recurrence increasing in the environment. The size of this electric field is extremely large and diminishes with the increment of the separation. The higher the natural electric field, the higher the potential distinction actuated over the tissues. This high potential contrast upset the synthetic response rate and ordinary working of the body and results in numerous infections (4)
The high or low-frequency electromagnetic fields communicated from the transmission tower penetrate inside human beings. The field can be determined by understanding Maxwell's conditions liable to the given limit condition. The force of the inner electric fields relies upon the boundaries of the outside fields, the recurrence and polarization, size, shape, dielectric properties of the uncovered body, the Spartan arrangement between the presentation source and the uncovered body and the presence of different items in the region (5, 6). A natural body is an inhomogeneous, lossy dielectric whose intricate permittivity portrays visible electrical properties (7, 9). The inhomogeneous conduct of the dielectric properties of the biological cells, tissues, and other organs show some trouble. Just many rearranged models can be broken down. The other methodology is an exploratory one, which additionally has numerous constraints (8).
This original copy is to introduce a specific record of appropriation of the electromagnetic field in organic bodies. Electromagnetic radiation in the air implies the proliferation of electric and attractive fields wavering in commonly opposite ways. The heading of the spread is typical to the two of them. This radiation prompts an electric field inside the individuals. The incited electric field continues diminishing when we go inside the body. The field inside the body can be determined by certain improvements (10, 11).

Let the value of electric fields in air and biological materials be E_1 and E_2, respectively. Parallel and perpendicular components of electric fields in air and biological material are represented by $E_1\|$, $E_2\|$ and $E_1\perp$, $E_2\perp$, respectively. The parallel and perpendicular components of these are connected through Maxwell's equations (10)

$$E_1\| = E_2\| \qquad \text{----------(1)}$$

$$\sigma_1 E_1 \perp - \sigma_2 E_2 \perp = -j\omega\rho_s\sigma \qquad \text{----------(2)}$$

$\varepsilon_1 E_1 \perp - \varepsilon_2 E_2 \perp = \rho_s \sigma$ ----------(3)

Where σ_1, $\sigma 2$ and ε_1, ε_2 are conductivities and permittivity of air and biological material, j = √-1, and ω = 2πf is the angular frequency of wave and ρ_s is charge density.

After solving the above equations:

$$\frac{E_2 \perp}{E_1 \perp} = \frac{\sigma_1 + j\omega\varepsilon_1}{\sigma_2 + j\omega\varepsilon_2}$$

For higher frequencies, the values of σ_1 and σ_2 are negligible in comparison to $\omega\varepsilon_1$ and $\omega\varepsilon_2$. Therefore putting the values of conductivity and permittivity of air and muscle tissue, after solving we find that the ratio of electric fields become

$$\frac{E_2 \perp}{E_1 \perp} = \frac{\varepsilon_1}{\varepsilon_2} = \frac{1}{\varepsilon_r} \quad \text{----------(4)}$$

Where ε_r is the relative permittivity of biological material, which varies with the frequency of penetrating fields, $\frac{E_2 \perp}{E_1 \perp}$ is the ratio of perpendicular components of electric fields in biological material to air. Presently, field quality will diminish for the tissue of organic material well inside the limit because of scattering during spread inside the body. Electric field diminishes dramatically with good ways from the limit and is given by

$$E_z = E_0 e^{\frac{-z}{\delta}} \quad \text{----------(5)}$$

Ez is the field at the separation z, and E0 is the greatness of the field simply inside the limit. The skin profundity δ is the separation over which the field diminishes to (= 0.368) of its worth simply inside the limit. The skin profundity again relies on the recurrence of radiation.

For natural materials, it is given by $\delta = \frac{1}{\omega q}$ ---------- (6)

$$q = \left[\frac{\varepsilon\mu}{2} \left\{ \left(1 + P^2\right) - 1 \right\} \right]^{\frac{1}{2}} \quad \text{----------} \ (7)$$

where $P = \frac{\sigma}{\omega\varepsilon}$ ---------(8)

The conductivity of the material is represented by σ, angular frequency of the radiation is ω, permittivity by ε and permeability by μ (12, 13).

Material and Methods

When electromagnetic waves are radiated around the transmission tower, the electric field is induced around the tower and can be calculated by

$$\frac{P}{4\pi r^2} = \frac{1}{2}\varepsilon_0 E_0^2 c$$

Where E_0 be the electric field around the transmitter of power P is given by (12)

$$E_0 = \left[\frac{P}{2\pi r^2 \varepsilon_0 c} \right]^{\frac{1}{2}} = \frac{7.746\sqrt{P}}{r}$$

The power of the transmitter in this manuscript is 10kW. After putting the values of permittivity of free space ε_0 and speed of radiation c, the electric field at a distance r from the transmission tower becomes

$$E_0 = \frac{7.746}{r} \qquad \text{----------(9)}$$

Radio Frequency sources are inescapable around us. Unmistakable sources are cell phones and electronic machines. The openness of outflow emerging from such RF (Radio Frequency) sources on the distinct individual infiltrates inside the body. These sources might be partitioned into two classes: one class, which works closely and the second, which works a long way from the Human body (1, 2).

Sources worked close to the human body: Of Due to an infiltrated electric field, the potential distinction is initiated across each cell or tissue of the body. The possible distinction across the circular cell of the skin, muscles and bone, fat are given in tables (4) and (5) for both the radiation 41 MHz and 202 MHz individually. The qualities show that the expected distinction across the cell is higher close to the pinnacle. The potential distinction is lower in the higher profundity of the body. On the off chance that the applied electric field is 1.33 x 105 V/m, at that point for the cell of range 5 μm, the possible contrast across the cell become 1 V which is the basic trans-film breakdown voltage. Tables (4) and (5) also show that a potential distinction is higher in higher recurrence. Along these lines, if the recurrence of radiation is expanded, the actuated likely distinction of the cell will likewise build, which is destructive to skin and bone cells. Figure (6) and (7) addresses the variety of the possible contrast across the circular cell of skin and muscles in the body for the radiation of recurrence 41 MHz and 202 MHz separately. Fig. (8) and fig. (9) show the variety of the expected distinction across the round cell of bone and fat in the body for the radiation of recurrence 41 MHz and 202 MHz separately. The expected distinction across the round cell is determined by (13)

$$\Delta U = 1.5 a E_z \qquad \text{----------(10)}$$

where a is radius of round cell and Ez is infiltrated electric field.

The instigated electric field is determined in bone and fat by the occurrence electric field around the pinnacle. By this, the incited electric field, the expected distinction across the cell of our body is additionally determined. Here, the condition 10 addresses the connection between possible distinction and entered the electric field of the cell of the skin;

next it addresses the likely contrast across cell of the skin. In the event that we utilize electric field of cell of bone, at that point it addresses the likely distinction across the cell of bone. The human body is a dielectric thus far tissues and cell. Due to ingestion of energy, the electric field gets diminished in the body. It is applied across all the cells and a potential contrast made across them relies on their shape and size. Cell of direct measurement l in the field E will have possible contrast

$\Delta U = E_z \times l$ ---------- ---------(11)

Because of potential difference, cell configuration may be disturbed. As the field is not static, it changes many times per second and the cells can feel stressed that changes the direction as many times per second.

Observations

Table 1– The variation of induced electric field at different distances from the transmission tower

Distance from the tower (m)	1	5	10	15	20	25	50	100	150	200	250	500	1000
Induced electric field (V/m)	774.6	154.92	77.46	51.64	38.73	30.98	15.49	7.74	5.16	3.87	3.098	1.5592	.7746

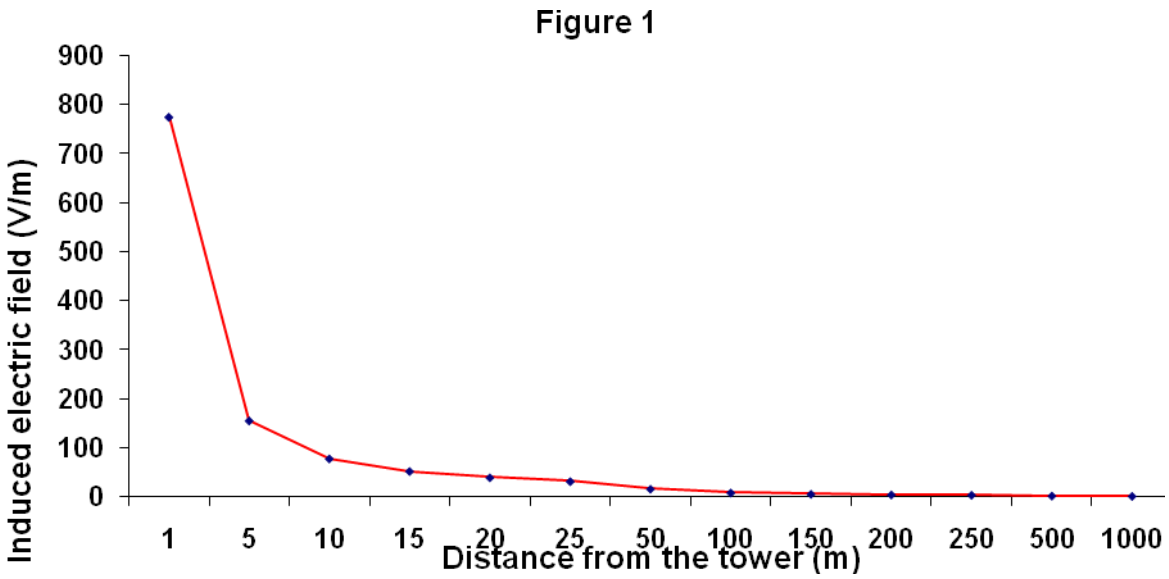

Figure 1 The variation of induced electric field at different distances from the transmission tower

Table 2- Variation of potential difference across the spherical cell of skin and muscles.

Frequency of EMF (MHz)	Distance from the tower (m)	Potential difference inside the body at depth (mV)				
		Imm	2mm	3mm	4mm	5mm
41	100	57.57	57.06	56.55	56.05	55.55
	500	11.51	11.4	11.31	11.2	11.10
	1000	5.75	5.70	5.65	5.6	5.55
202	100	56.89	55.71	54.56	53.43	52.33
	500	11.37	11.13	10.91	10.68	10.46
	1000	5.68	5.57	5.45	5.34	5.23

Table 3-Variation of potential difference across the spherical cell of bone and fat.

Frequency of EMF (MHz)	Distance from the tower (m)	Potential difference inside the body at depth (mV)				
		Imm	2mm	3mm	4mm	5mm
41	100	58.04	57.99	57.94	57.89	57.84
	500	11.6	11.59	11.58	11.57	11.56
	1000	5.8	5.79	5.79	5.78	5.78
202	100	57.94	57.79	57.64	57.5	57.35
	500	11.58	11.55	11.52	11.49	11.46
	1000	5.79	5.77	5.76	5.75	5.73

Table 4: Potential difference (in 10^{-3} V) across the different shapes and size of the cell at different distances from the high frequency transmission tower.

Distance from the tower (m) / Cell Shape & Size	0.30	1	100	200	300	400	500	600	700	800	900	1000
Rectangular, length 10 µm	25.8	7.74	.077	.0387	.0258	.0193	.0154	.0129	.011	.0096	.0086	.0077
Rectangular, length 150 µm	387	116.0	1.16	.58	.387	.29	.232	.1936	.165	.145	.129	.116

Rectangular, width 5 µm	12.9	38.0	.038	.019	.0129	.0096	.0077	.0064	.005	.0048	.0043	.0038
Rectangular, width 75 µm	193	58.0	.58	.29	.193	.145	.116	.0968	.082	.0726	.0645	.058
Rectangular, thickness 2.5 µm	6.4	1.9	.019	.0096	.0064	.0048	.0038	.0032	.0027	.0024	.0121	.0019
Rectangular, thickness 37.5 µm	96.0	29.0	.29	.145	.096	.0726	.058	.484	.0414	.0363	.0322	.029
Spherical, Diameter 5 µm	19.0	5.8	.058	.029	.019	.014	.0116	.0097	.0083	.0072	.00645	.0058

Table 5: Potential difference (mV) across the different shapes and size of the cell at 30 cm. from different domestic equipments.

Domestic Equipments / Cell Shape & Size	Stereo Receiver	Iron	Refri - gerator	Mixer	Toas-ter	Hair-dryer	Color TV	Coffee Mach-ine	Vaccum Machine	Light
Rectangular, length 10 µm	1.8	1.2	1.2	1.0	0.8	0.6	0.6	0.5	0.08	0.05
Rectangular, length 150 µm	27	18	18	15	12	9	9	7.5	1.2	0.75
Rectangular, length 75 µm	13.5	9	9	7.5	6	4.5	4.5	3.75	0.6	0.37

Rectangular, length 5 μm	0.9	0.6	0.6	0.5	0.4	0.3	0.3	0.25	0.04	0.02
Rectangular, thickness 2.5 μm	0.45	0.3	0.3	0.25	0.2	0.15	0.15	0.125	0.02	0.01
Rectangular, thickness 37.5 μm	6.75	4.5	4.5	3.75	3	2.25	2.25	1.875	0.3	0.18
Spherical, radius 5 μm	1.35	0.9	0.9	0.75	0.6	0.45	0.45	0.375	0.06	0.03

Results and Discussions

In this original copy, the electric fields are determined around the transmission pinnacle of force 10 kW and addressed in table 1. At the point when this electric field is infiltrated inside the people, it creates a possible distinction across the natural cells. The states of cell might be rectangular with measurements around 150 x 75 x 37.5 μm3 and 10 x 5 x 2.5 μm3. The assortment of likely contrasts across the rectangular cells with the good ways from the pinnacle is appeared in table (6) (4, 5). The likely contrast across round cells and rectangular cells is determined by condition (10) and (11). This table delineates that the expected distinction across the cell turns out to be high when an individual draws close to the transmission tower. Homegrown supplies which are utilized in kitchen emanated low recurrence electromagnetic waves. These EMWs when infiltrates inside the natural body, delivered possible contrast across each cell and tissue of the body. The expected contrasts across the rectangular and round cells because of EMW of homegrown supplies at 30 cm distance are addressed in table (7).

The information about the impacts of EMW on human wellbeing are accessible in most noteworthy amount. The most interesting information are accessible for disease, youth leukemia; grown-up leukemia and grown-up mind tumor have some epidemiologic help for a relationship with EMW, as bosom malignant growth. The substantialness of proof sponsorships a relationship of region to electrical links and peril of, regardless, youth leukemia, and the weight of proof support a relationship of positive word related EMW presentation and extended threat of leukemia and cerebrum tumor. The hypothesis that deferred alluring field introduction may extend the risk of sickness in individuals serves continues with certifiable assessment. On account of EMW, the prospects are of more than hypothetical interest since the openings are for all intents and purposes pervasive in

industrialized social orders. Indeed, even a little height in malignant growth or other sickness among all the more exceptionally uncovered people would have a significant effect because of the inescapability of such openness. Because of this work on conceivable wellbeing impacts of EMW is a significant factor of bio-electromagnetic examination.
The high recurrence electric field is determined around the transmission tower which diminishes with the good ways from the pinnacle. At the point when this variable electric field infiltrates inside the human body, the potential contrast is determined across each tissue and cell of the body. This potential distinction likewise differs with the separation from the pinnacle. In our home low recurrence electric field is delivered around the electric homegrown types of gear which are additionally made the likely distinction across each cell and tissue of the body. The high potential contrast addresses the high assimilation of energy of an electric field. The outcomes address that the rectangular cells of length 150μm assimilate the greatest energy from the electric field of the sound system beneficiary, electric iron, and fridge and transmission tower. Be that as it may, because of high recurrence electric fields of transmission tower, power ingestion of cells is in excess of a low recurrence electric field of homegrown types of gear as demonstrated in table (6) and table (7).

Conclusion

From the above analysis, it is concluded that the electric field is induced around the transmission tower and the amplitude of the electric field is decreased with respect to the distance from the tower. When electromagnetic waves are penetrated inside the human body, the potential difference is produced around the cell. The shapes of biological cells may be spherical and rectangular of different dimensions. The potential differences across the spherical cells of the skin and muscles are varied from 57.57 to 5.55 mV for 41 MHz radiation and 56.89 to 5.23 mV for 202 MHz radiation from 1 km to 100 m distance respectively. The potential difference across the cells of bone and fat are changed from 58.04 to 5.78 mV for 41 MHz and 57.94 to 5.73 mV for 202 MHz respectively. The potential difference across different cells of the body is varied from 387 mV to 0.0058 mV around the transmission tower when a person moves from 30 cm to 1 km distance from the tower. The induced potential difference is varied from 27 to 0.01 mV when a person is available (30 cm) near to the domestic documents as stereo receiver, iron, refrigerator, mixer grinder, toaster, hair dryer, TV, coffee machine, vacuum cleaner etc. For smooth functioning of the human body, the potential difference across cells and tissues are required. But the extra potential difference which is induced due to the incidence of electromagnetic radiation may produce adverse effects on the health of cells and tissues of human beings.

Suggestions: From the above discussion, it is suggested that:

1. The people should watch the programs of TV from a long distance.
2. The people should keep away the electric domestic gadgets from the body.

3. The people should also keep away from the transmission towers of mobile phones, radio, TV and wi fi transmitter.
4. The people should also keep away from the mobile phones.

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