

Disrupted Immune Function from Exposure to Low-Intensity Non-Ionizing Radiation (Radiofrequency Radiation)

Power Density (uW/cm ²)		References
0.0006 - 0.001 uW/cm ²	Chronic exposure to base station RF (whole-body) in humans showed increased stress hormones; levels substantially decreased; higher levels of adrenaline and nor-adrenaline; dose-response seen; chronic physiological stress in cells even after 1.5 years	Buchner, 2012
1.0 uW/cm ²	RFR caused significant effect on immune function In mice	Fesenko, 1999
1.0 uW/cm ²	RFR at 8.15 - 18 GHz significantly increased immune function of T-cells and macrophage cells	Novoselova, 1999
1.0 uW/cm ²	RFR at 8.15 to 18 GHz caused significant increase In tumor necrosis factor in macrophage cells interfering with process of cell immunity status	Novoselova, 1998
1.0 uW/cm ²	130% to 150% increase in cytotoxic activity of NK cells from 8.15 - 18 GHz persisting 24 hours after cessation of RFR exposure indicating hyperactive immune function.	Fesenko, 1999
2 - 4 uW/cm ²	Acetylcholine-induced ion channel disruption and altered cell membranes	D'Inzeo, 1988
5 uW/cm ²	RFR exposure caused decreased immune function in NK lymphocytes	Boscol, 2001
5.25 uW/cm ²	20 minutes of RFR at cell tower frequencies induced cell stress, changes in cell membrane	Kwee, 2001
13.5 uW/cm ²	RFR affected human lymphocytes (immune cells) and induced stress response in cells	Sarimov, 2004
37.5 uW/cm ²	Weakening of immune function with 9.4 GHz pulsed RFR over 5 days	Veyret, 1991
60 uW/cm ²	900 MHz pulsed RFR intensified immune function in white blood cells indicating hyperactive immune response	Stankiewicz, 2006
92.5 uW/cm ²	915 MHz RFR caused genetic changes in human lymphocytes (white blood cells)	Belyaev, 2005
100 uW/cm ²	Increase In immune function due to RFR exposure (activation response)	Elekes, 1996

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150 uW/cm2	42 GHz (millimeter wave) exposure of leukocytes and blood neutrophils 20-min/day caused profound effect (50% suppression) of peripheral blood neutrophil activity and persisted for 24-hr after cessation of exposure. Lymphocytes increased by 44%, remained abnormal for 5 dys after cessation of exposure	Kolomytseva, 2002
150 uW/cm2	42 GHz repeated exposures prior to immunization decreased immunity response by -14.5% in spleen cells and by -17.5% in thymus cells	Lushnikova, 2001
10 - 1000 uW/cm2	1.8 GHz RFR produced morphological changes in cell conformation in human peripheral blood lymphocytes (between 12 V/m and 42 V/m)	Jirillo, 2014
2000 uW/cm2	2450 MHz RFR for 90-min significantly affected placental parameters and showed that opioid systems were involved in reducing natural killer cell activity	Nakamura, 1998
2000 uW/cm2	2450 MHz RFR exposure decreased blood flow of uteroplacental circulatory system	Nakamura, 2000
5000 uW/cm2	Chronic exposure to 2.1 GHz RFR significantly suppressed T-lymphocyte numbers at 2 months (exhibiting T-cell mediated immunity (a delayed type hypersensitivity response))	Nageswari, 1991
10,000 uW/cm2	2450 MHz RFR exposure of pregnant rats significantly suppressed natural killer cell activity and activated the hypothalamic-pituitary-adrenal axis indicating great stress on pregnancy	Nakamura, 1997

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W/kg**

References

0.000021 - 0.0021	Changes in cell cycle, cell proliferation from exposure to 960 MHz mobile phone RFR	Kwee, 1997
0.18 W/kg	1300 MHz pulsed RFR stimulated pro-inflammatory activity of human immune cells (monocytes)	Dabrowski, 2001

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0.18 W/kg	1300 MHz pulsed RFR resulted in significant increase in proportion of monocytes and immune response by lymphocytes.	Dabrowski, 2003
0.21 W/kg	1.8 GHz exposure of human peripheral blood lymphocytes caused deformed shaped cells and impaired mitochondria activity of monocyte immune cells; impaired metabolic homeostasis. Progressive changes in oxidative metabolism occur; relatively short time of exposure (5-12 hr) causing impairment of function of inner mitochondrial membrane; malfunction of mitochondria. Competence of immune cell function (innate and acquired immune response and activation of immune-competent cells) - these results imply risks to immune function	Lasalvia, 2018
0.21 W/kg	1.8 GHz RFR exposure changed the shape of human blood leukocytes (immune cells), mainly cell surface area	Jirillo, 2014
0.21 W/kg	1.8 GHz RFR caused destruction of organelle and nucleus structures in immune cells (human peripheral blood lymphocytes) and caused destruction of membrane integrity and cytoplasm lysis	Esmekaya, 2011
0.037 W/kg	1-hr GSM mobile phone radiation at nonthermal level significantly affects chromatin conformation in human lymphocytes by stress response and/or DNA damage in both healthy and EHS persons	Markova, 2005
1.25 W/kg	Significant changes in leukocytes behavior including rapid changes in shape and behavior (cell shrinking, rolling and expanding) in just in 2.5 min exposure to 1.8 GHz RFR	Ashraf, 2011
1.0 W/kg	Cell phone use caused nitric oxide (NO) nasal vasodilation (swelling inside nasal passage) on side of head phone was used	Paredi, 2001
7.0 W/kg	864.3 MHz CW on human mast cells 20-min, 3X/day, 7 days altered gene expression of oncogenes and apoptosis-associated gene	Harvey, 2000
3000 W/kg	835 MHz RFR exposure 20-min, 3X/ day for 7 days caused mast cells to have increased rate of DNA synthesis and cell replication. Cell morphology was altered (actin distribution)	Donnellan, 1997